NORPIX

Digital Video Recording Software

StreamPix User Guide

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Published Date: April 2022

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Introduction

This chapter provides an overview of StreamPix, system requirements, and how to use this documentation. This chapter contains the following sections:

1.1 About this Manual

This manual includes the following sections:

Chapter	Description
Chapter 1: Introduction	Provides a list of StreamPix features and requirements, documentation conventions, and an overview of the interface.
Chapter 2: Getting Started	Explains how to get going using StreamPix.
Chapter 3: HOWTOs	Detailed procedures for the most common tasks.
Chapter 4: Managing Workspaces and Cameras	Describes how to set up and manage multiple workspaces and cameras and how to work with sound and/or DAQ files.
Chapter 5: Using Audio and DAQ	Describes how to manage Audio and DAQ files.
Chapter 6: Managing the Display	Describes how to use display windows and thumbnails.
Chapter 7: Controlling Light and Color	Adjusting Bayer and color balance at different levels.
Chapter 8: Managing Sequences and Markers	Working with image sequences.
Chapter 9: Managing Settings	Establishing StreamPix preferences.
Chapter 10: Tools	For scheduling recording, saving and loading configurations, working with scripts, and monitoring your system.
Appendix A: Plugin Modules	Descriptions of all add-on modules.
Appendix B: Keyboard Shortcuts	A list of keyboard shortcuts.
Index	An index of topics and terms.

Table 1-1: StreamPix User Guide organization

How to Use This Manual

If you are new to StreamPix, it is recommended that you read this entire manual. If you are already familiar with StreamPix, and just want information on a particular subject, consult the Table of Contents, the PDF Bookmarks, or the Index.

This manual is distributed as an Adobe Acrobat® PDF and contains numerous hyperlinks that look like this.

TIP: You can use the Adobe Acrobat® previous/next view buttons (Alt+Left arrow and Alt+Right arrow) to navigate backwards and forward through viewed topics.

You can also use the PDF text search option by selecting **Edit > Find** in the Adobe Acrobat® menu bar and entering the search term.

NOTE: This manual has offset left and right pages to allow for printing and binding, if you choose.

Conventions Used in This Manual

This manual uses the following conventions.

- First mention of individual program elements are in bold, like this: Select the **Home** tab.
- Where appropriate, the toolbutton icon appears in the left margin, like this: Select the **Step Forward** button.
- Menu and sub-menu choices are separated by an angle bracket, like this: **Workspace > Recording Manager**.
- Choices are separated by a vertical line, like this: **Workspace > Recording Manager > Use the default... | Use a custom... .**

Frequently, there may be more than one way to accomplish an individual task, such as by using a keyboard shortcut or a similar toolbutton on another tab. To avoid possible confusion, this manual explains the most straightforward approach. See Appendix B: Keyboard Shortcuts.

TIP: A tip contains useful information to make using StreamPix easier.

NOTE: A note contains information pertinent to the current task.

Caution

A caution contains an instruction that you **must follow** in order to prevent loss of data, damage to equipment, or network failure.

The content of a caution should be read and followed carefully.

Terminology: Grabbers and Cameras

Some cameras may connect directly to the computer, for example through an Ethernet port, while others may be connected through a “grabber” or acquisition board. For the purpose of simplicity, this manual uses the term camera to describe any video source, no matter how it is connected.

Terminology: Sequences and other video formats

You can save captured video in a variety of formats. For the purpose of simplicity, this manual uses the term Sequence to refer to any recorded video stream.

StreamPix Documentation

All StreamPix documentation is available in PDF format from the Help tab. StreamPix includes the following documents:

- *StreamPix User Guide*, this manual
- *Camera Installation Guide*, a guide to configuring your hardware and cameras
- *NorPix Sequence File Format*, a technical description of the structure of Sequence files (*.seq).

NOTE: See also any documentation provided by your grabber and/or camera manufacturer.

Feedback on the Documentation

Our Technical Publications group welcomes your feedback. Please help us improve future releases of this document by sending us your comments and suggestions by email to docs@norpix.com.

Commenting in documentation

You can add your own comments and notes, and even attach documents, to this PDF manual in Acrobat Reader™ by selecting the **View > Comment > Annotations** toolbar.

1.2 About StreamPix

StreamPix is a specialized application designed to provide real-time digital video recording to PC memory or hard disk. Providing the hardware is adequate, video may be streamed from a camera at full frame rate without dropping any frames.

Although StreamPix is a sophisticated program designed for high-speed image acquisition, the user-interface is designed to be as easy to use as possible, consisting of VCR-style controls, menus and dialog boxes.

Main features

- Real-time digital video recording to PC memory or hard disk in Windows Vista, 7, 8, & 10.
- Acquisition from a huge variety of IEEE 1394, Color RGB, NTSC, RS170, USB, CameraLink, GigE, 10GigE, USB3 Vision, and CoaxPress high resolution and high frame rate cameras.
- Uncompressed and compressed images capture directly to RAM or hard disk drive(s).
- Compressed image capture using Windows based codecs or StreamPix compression utilities.
- Capture/Export to common file formats like BMP, JPEG, TIFF, PNG, AVI, MOV and more.
- Easy browsing of captured sequences with VCR-style controls: Record, Play/Pause, Rewind, and Fast-Forward buttons

Visit the NorPix Website for a list of all ongoing supported cameras and frame grabbers: www.NorPix.com.

StreamPix Versions

There are two versions of StreamPix: Single Camera and Multi-camera.

- The **Single Camera** version is suited to applications that require a single camera. Multiple workspaces are not supported.
- The **Multi-camera** version can handle multiple Workspaces and cameras.

NOTE: Depending on which version of StreamPix, “Single Camera” and/or “Multi-Camera”, and which Module licenses you purchased, some features or commands described in this manual may not be present.

NOTE: Audio and/or DAQ recording require additional authorization codes to unlock the Audio and/or the DAQ Modules.

NOTE: If you recently updated StreamPix to use Audio and/or DAQ modules, and you do not see the Audio and/or DAQ tabs on the ribbon, you may need to update the configuration file as follows:
1. Go to **Settings > Interface > Customize Ribbons**.
2. Select **Restore Defaults** and **OK**.
3. Restart StreamPix.

Authorization codes

The authorization code determines which application, feature, module, as well as which grabber/camera(s) are authorized. You must obtain the appropriate authorization codes by contacting NorPix sales or support. You will be sent an authorization file (.npx) that includes the specific authorization codes. Either double-click the .npx file to register it or do it through the **Help > License Information** (SysInfo) utility.

See also the *How to License guide.pdf* document for details on authorizing the software.

Installing StreamPix

This manual assumes that StreamPix and your hardware configuration are already installed and operational. If this is not the case, carefully follow to the installation notes provided by NorPix for your particular video capture hardware.

Caution

When StreamPix is installed, several components need to be registered with the system. If a particular required "DLL" file is missing, the correspondent StreamPix driver(s) will not be registered. When attempting to load the hardware driver from within StreamPix, an error message: "The DLL of the desired hardware is not correctly registered," will be displayed.
Typically, re-installing StreamPix after the hardware driver is installed fixes this issue.

When purchased on a CD-ROM, StreamPix installation is started automatically by inserting the disk into the drive. Otherwise, to install StreamPix from the CD-ROM or from a Web file, select *streampix8-setup.exe* and follow the on-screen instructions.

Minimum System Requirements

The minimum system requirements to run StreamPix successfully depends on how you will use the program. Therefore, the following guidelines are recommendations only.

StreamPix has the following minimum system requirements:

- Minimum: Intel Core - 2nd generation CPU. Core i3 for single camera, core i7 for multiple camera configuration.
  Recommended: Intel core i5 4th generation or higher. AMD based CPU is supported, but performance is weaker.
- 8GB of RAM or higher.
- A supported IEEE, USB3, or GigE digital or analog camera and compatible frame grabber board.
- Windows Vista, 7, 8, or 10 in 32- or 64-bit versions.*
- Monitor supporting resolution 1024x768 or more.
- A graphic adapter with good 2D performances (PCI Express 16x or better recommended).
- For recording, from 7200 rpm hard disk(s) optimally with RAID-0 configuration, depending on the writing speed required,

  *Sequences in MOV format are supported in the 32-bit version only.

For sequences stored on hard disk, StreamPix will always assume sufficient bandwidth availability. If you are unsure of the capabilities of your system, contact NorPix technical support.

TIP: The **Tools > Disk Benchmarking** utility, installed with StreamPix, lets you verify HDD recording capabilities. By default, it is installed in the ...\Norpix\Tools folder.

For high speed cameras or multiple camera setups, check with NorPix for complete computer configurations.

Supported File Formats

StreamPix supports the following image file formats:

Image Format	Advantage	Disadvantage
Norpix Sequence File (.seq)	The best format to stream to disk without losing any frames at high frame rates. Uncompressed, so no image quality loss. Also supports several compression algorithms. NorPix Sequence File images can be exported to any supported format.	The .seq image format is supported only by StreamPix.

Table 1-2: Supported file formats

Image Format	Advantage	Disadvantage
Windows Bitmap (.bmp)	Uncompressed, so no image quality loss. Format is supported by a vast majority of image processing applications.	Raw images result in large file sizes. Supports 8 bit mono and 24 bit color images only, resulting in a loss of information for images using higher bit depth.
Tagged Image File (.tif)	Uses a lossless compression algorithm resulting in relatively smaller file size no loss of information. Supports mono and color images at any bit depth.	Compression algorithm is CPU intensive resulting in longer export times than with the Bitmap format.
Multipaged Tagged Image File (.tif)	Same as the non-multipaged tiff. Allows a full sequence of images to be stored in a single file.	Same as the non-multipaged tiff. Support for multipaged .tiff is scarce outside specialized applications.
Joint Photographic Experts Group (.jpg)	Good image compression. One of the most widespread formats on the Internet, meaning that almost anybody can view a .jpg image.	Supports 8 bit mono and 24 bit color images only, resulting in a loss of information for images using higher bit depth. The compression will result in image precision loss.
Lossless JPG 2000 (.jp2)	Moderate compression increases over standard JPG. Scalable resolution levels for display.	Complex and system intensive encoders/ decoders. May produce ringing artefacts near edges.
SMPTE Moving Picture Exchange (.dpx)	A world-wide standard for storing images for later processing, suitable for almost any raster imaging application. Extensive metadata capabilities.	Large file size due to uncompressed data.
Digital Negative (.dng)	Open source lossless format, viewable by most imaging software.	Some metadata may be lost when viewed from another platform/software. 8, 10, 12 and 16 bit per pixel is supported. However, the thumbnail included into the DNG file is always 8 bit.
Flexible Image Transport System (.fits)	Uncompressed, so no image quality loss. Supports both mono and color images at any bit depth. A .fits file is composed of 2 segments: a header, which contains image format information, and a table holding the image data. More about fits file format.	Color images are divided into 3 individual datafiles: red, green and blue. The color plan is appended to the file name.
Multipaged Flexible Image Transport System(.fits)	Same as the non-multipaged .fits. A full sequence of images is stored as a single file. The file contains multiple headers and data tables, one per exported image.	Same remarks as for non-multipaged fits.
Portable Network Graphics (.png)	Similar to .gif format. Excellent compression without any loss of quality.	Compression algorithm is CPU intensive, resulting in longer export times than with other formats. Supports 8 bit mono and 24 bit color images only, resulting in a loss of information for images using higher bit depth.

Table 1-2: Supported file formats

Image Format	Advantage	Disadvantage
Movie Clip (.avi)	Wide range of codecs available according to specific needs.	The supported image format varies from codec to codec. Some trial and error needed to find the right codec for a specific use. The same codec needs to be installed on all systems used for playback. (Except for the uncompressed AVI which comes bundled with Windows). Time stamp information for each frame is not available. Concurrent synchronous playback over multiple AVI files is not supported.
Quicktime Movie (.mov)	Requires Quicktime Player to be installed on the computer. Various codecs available. **Only works on StreamPix 32-bit.**	Some codecs might not be supported under Windows, or might not work or offer reduced functionality without a 3rd party license. Requires an external 3rd-party viewer for playback.
MPEG 4 (.mp4)	H.264 or MPEG4 compression, resulting in small file size.	High CPU load during recording unless some hardware acceleration is available. By default, time stamp information for each frame is not available. Concurrent synchronous playback over multiple MP4 files is not supported. Linear Time Code (LTC) can be added as metadata and decoded by nonlinear video editor application. Text such as closed captioning can be added for each frame.
MPEG2 (.ts)	H.264 compression, resulting in small file size.	Requires an external 3rd party viewer for playback. High CPU load unless some hardware acceleration is available.

Table 1-2: Supported file formats

Audio and DAQ File Types

StreamPix supports the following audio and DAQ file formats:

File Type	Description
Audio files (.aud)	A raw audio file supported by StreamPix and including time stamp information allowing random sync between audio, video and DAQ data.
NorPix DAQ file (.daq)	Data acquisition file for all the DAQ related data. Includes DAQ samples as well as some time stamp information.
DAQ Graph Settings (.display)	The DAQ Graphs settings associated to a specific DAQ file.

Table 1-3: StreamPix Audio and DAQ file types

1.3 StreamPix Interface

StreamPix uses the Microsoft® standard ribbon layout, where each Menu tab displays a ribbon with the most commonly associated tool buttons for that tab. The main features of the StreamPix interface are illustrated in Figure 1-1 and described in Table 1-4 below. A popup tooltip explains each feature as you hover the cursor over it.

The contents of the application menu and the ribbons can be fully customized from **Home > StreamPix Settings > Interface > Customize Application Menu... | Customize Ribbons...** . See "Controlling Multiple Cameras".

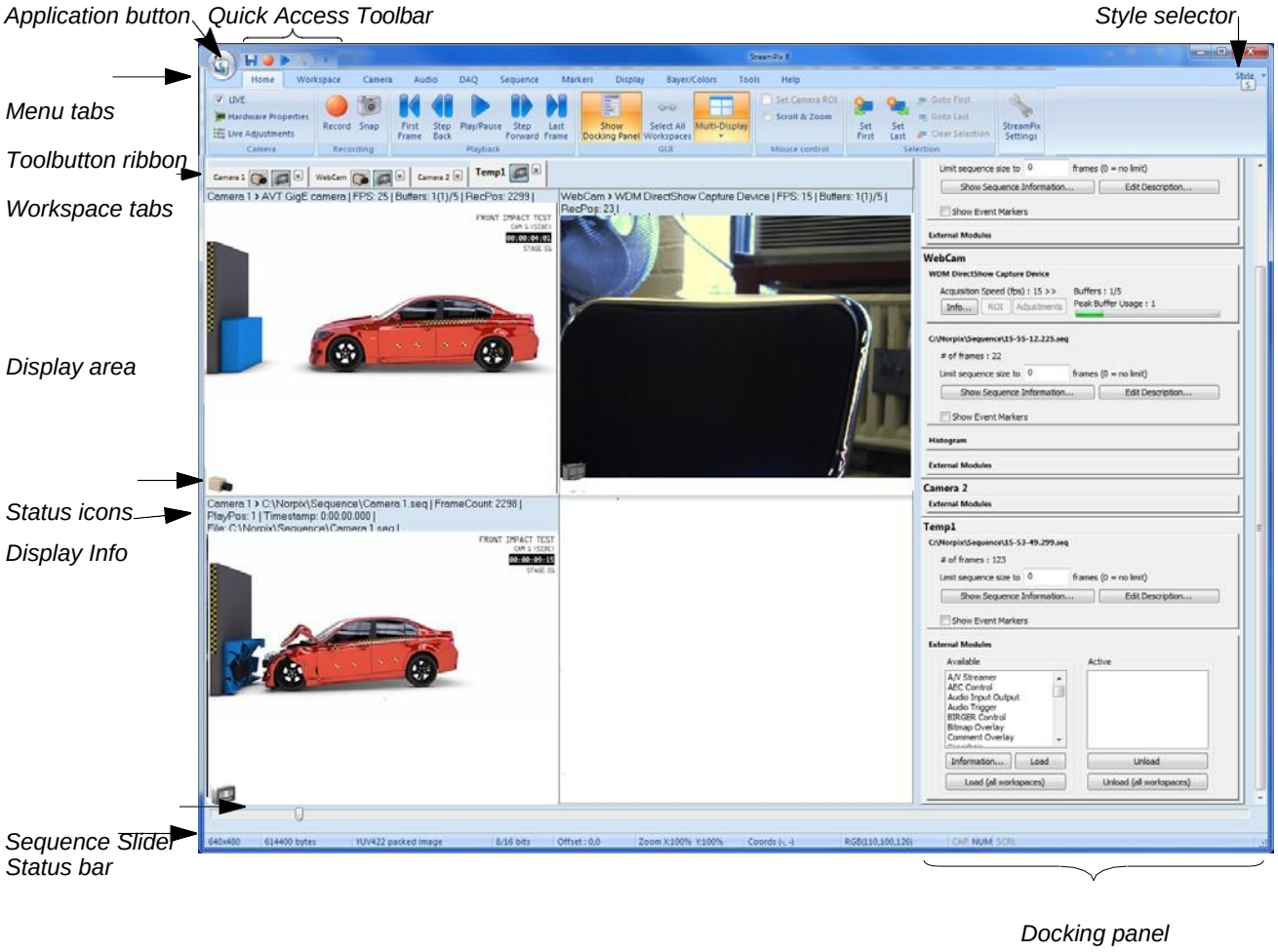


Figure 1-1: Main Interface, Home tab selected

Feature	Description
Application Menu button	Lists commands related to Sequence files: creation, opening, saving, closing and exporting. The menu content is different if multiple Workspaces are selected. See Figure 1-2.

Table 1-4: Interface main features

Feature	Description
Quick Access Toolbar	A toolbar where you can assign your most used toolbuttons to be accessible independent of the tab selected. See “Add buttons to the Quick Access Toolbar”. **TIP:** The Quick Access Toolbar right-click menu contains an option to relocate the toolbar bellow the Toolbutton ribbon.
Style selector	The color scheme used for the GUI. The following styles are supported: • Luna Blue • Obsidian Black • Silver • Aqua.
Menu tabs	Selecting a Menu tab displays the ribbon of toolbuttons for that tab. The buttons on each tab are fully customizable, and you can even add your own tabs. See “Interface settings”. **TIP:** You can double-click on any tab to minimize the ribbon display. When minimized, the ribbon only appears once a tab is selected and disappears once a toolbutton on the ribbon is selected. Double-click again on a tab to restore the toolbutton ribbon.
Toolbutton ribbon	Contains the toolbuttons associated with the selected tab.
Workspace tabs	The Workspace is a basic concept in StreamPix and can include a camera, a sequence, or an audio or a DAQ file. Every camera or Sequence must be accessed through a distinct Workspace. You can drag and drop a sequence file onto a Workspace tab to open it in that workspace. Commands are applied to the currently active Workspace, as indicated by the Workspace Status icon and by the highlighted Workspace tab. See “Workspaces” . Each Workspace also has its own section in the Docking panel. See Chapter 4: Managing Workspaces and Cameras.
Display info	Information about the display in this Workspace, mostly information about the current sequence, the frame rate of the Live feed, the grabber buffer usage. For the buffer usage, three values are shown: the current buffer usage, the peak buffer usage for the current session, and the total number of buffers available. The information to display and when to display it (live, playback or both) can be set from **Home > StreamPix Settings > Displayed Data**.

Table 1-4: Interface main features

Feature	Description
Quick Access Toolbar	A toolbar where you can assign your most used toolbuttons to be accessible independent of the tab selected. See “Add buttons to the Quick Access Toolbar”. **TIP:** The Quick Access Toolbar right-click menu contains an option to relocate the toolbar bellow the Toolbutton ribbon.
Style selector	The color scheme used for the GUI. The following styles are supported: • Luna Blue • Obsidian Black • Silver • Aqua.
Menu tabs	Selecting a Menu tab displays the ribbon of toolbuttons for that tab. The buttons on each tab are fully customizable, and you can even add your own tabs. See “Interface settings”. **TIP:** You can double-click on any tab to minimize the ribbon display. When minimized, the ribbon only appears once a tab is selected and disappears once a toolbutton on the ribbon is selected. Double-click again on a tab to restore the toolbutton ribbon.
Toolbutton ribbon	Contains the toolbuttons associated with the selected tab.
Workspace tabs	The Workspace is a basic concept in StreamPix and can include a camera, a sequence, or an audio or a DAQ file. Every camera or Sequence must be accessed through a distinct Workspace. You can drag and drop a sequence file onto a Workspace tab to open it in that workspace. Commands are applied to the currently active Workspace, as indicated by the Workspace Status icon and by the highlighted Workspace tab. See “Workspaces”. Each Workspace also has its own section in the Docking panel. See Chapter 4: Managing Workspaces and Cameras.
Display info	Information about the display in this Workspace, mostly information about the current sequence, the frame rate of the Live feed, the grabber buffer usage. For the buffer usage, three values are shown: the current buffer usage, the peak buffer usage for the current session, and the total number of buffers available. The information to display and when to display it (live, playback or both) can be set from **Home > StreamPix Settings > Displayed Data**.

Table 1-4: Interface main features

Feature	Description
Display area	The display area is the section of the Workspace where the camera feed or sequence displays. You can use **Display > Toggle Display** to turn off the display and alleviate some CPU load. You can also zoom the current display in or out by using **Display > zoom controls**. The current zooming values appear in the image status bar. Zooming increases CPU load compared to normal image (1:1) rendering. The color of the display area can be adjusted by using **Display > Set Background Color**.
Status icons	Icons showing whether the Workspace is active, if display is from a camera or disk, etc. See "Workspace Status Icons". **TIP:** Any Workspace can be designated as the active one by clicking within its frame.
Sequence slider	The sequence slider cursor indicates which image is currently shown in the playback display. The cursor can be dragged to jump to any frame of the sequence or used to scrub the timeline when a Sequence is paused. A red triangle appears under the slider to show where the next captured image will be stored in the sequence, which is normally at its end. See Record, Snap, and Playback Controls. **NOTE:** The oldest frame in a Sequence is highlighted on the Sequence Slider via this symbol: (Useful  for looped playback & pre-post recording). **NOTE:** The sequence slider is only used when working with sequence files (.seq) and AVI files (.avi). It is not used with Quicktime movie (.mov) or image files. StreamPix can record to .mov, but it does not load or playback Quicktime movie (.mov) or image files. **TIP:** The sequence slider can be placed at the top or bottom of the window from **StreamPix Settings > Interface.**

Table 1-4: Interface main features

Feature	Description
Status area	Along the bottom of the StreamPix window, the Status area displays information about the image in the currently active Workspace. The parameters are, in order: • Resolution, in pixels, shown as Width x Height • Image size in bytes • Image format (mono, color, bayer, etc) • Bit depth per channel / Total bit depth • Image offset in the display area (not the same as the offset on the camera CCD) • Image zoom in X and Y. Used to zoom the image in and out. • Pixel coordinates of the mouse cursor on the image. • RGB color value of the pixel at mouse cursor position.
Docking panel	An area where frequently used dialog boxes are displayed. See “Docking Panel”. **TIP:** You can increase the Workspace display area by toggling off the Docking Panel display through **Home > Show Docking Panel**.

Table 1-4: Interface main features

Application Menu

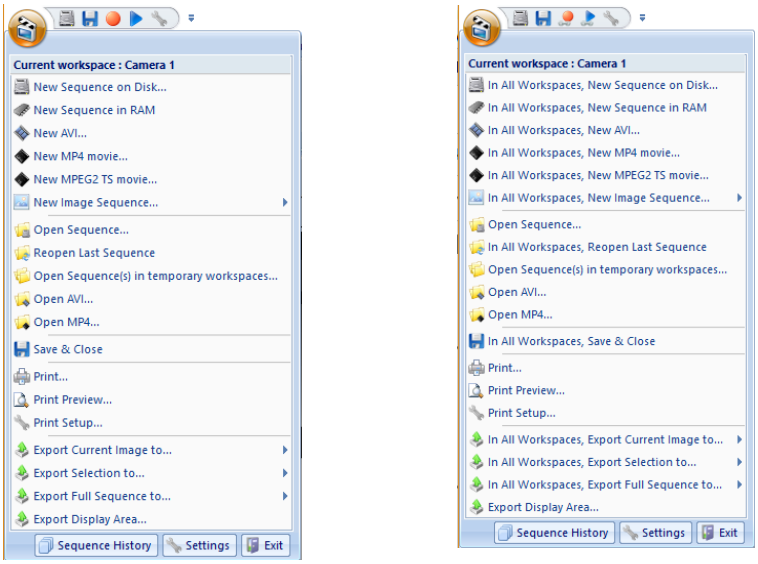


Figure 1-2: Application Menu contents

Option	Description
New Sequence on Disk	This creates a new sequence on disk. By default, the sequences on disk are not compressed and the frames are saved directly as they are received from the camera. This, may require special configurations for high frame rates or simultaneous use of multiple cameras (RAID, etc).
New Sequence in RAM	This creates a new sequence in RAM. Useful for short sequences with fast frame rates, as it allows for an higher transfer rate than a sequence on disk.
New AVI...	Creates an empty AVI that will be used to capture images. Once the AVI is closed, the generated AVI file can be played back using MediaPlayer or any compatible AVI player. You can also playback the recorded AVI directly in StreamPix (See Open AVI).
New Quicktime movie...	Creates an empty MOV that will be used to capture images. Once the MOV is closed, the generated MOV file can be played using Quicktime player. This is only available on StreamPix 32-bit.
New MP4 movie...	Creates an empty MP4 that will be used to capture images. Once the MP4 is closed, the generated MP4 file can be played back using MediaPlayer or any compatible MP4 player. Audio supported. MP4 container can also include Linear Time Code (LTC) is present during capture. MP4 container can also include close captioned text string (contact Norpix for further details).
New MPEG2 TS movie...	Creates an empty *.ts that will be used to capture images. Once the *.ts is closed, the generated *.ts file can be played back using any compatible player. You can also playback the recorded AVI directly in StreamPix. No audio supported.
New Image Sequence	Creates an empty Sequence file that will be used to capture images.
Open Sequence	Opens a previously saved Sequence file. Any currently active Sequence is closed in consequence. In the “Open” file dialog, there is also an option to load the sequence in RAM for faster playback/browsing. **NOTE:** If there is not enough RAM available, the sequence will only be partially loaded. Changes made to a sequence loaded in RAM aren't mirrored on the source sequence on disk.
Reopen Last Sequence	Reloads the last sequence used by the current workspace.
Open Sequence(s) in temporary workspaces	Allows you to open multiple sequence files at once. Each sequence will be loaded in a temporary workspace.
Open AVI	Opens an existing AVI file in playback mode. Recording can't be done in an AVI in playback mode. AVI files that were not created by StreamPix might not play. Clicking Play after an AVI has been recorded will save & close the AVI, then will reopen it for playback.
Open MP4	Opens an existing MP4 file in playback mode. Recording can't be done in an MP4 in playback mode. MP4 files that were not created by StreamPix might not play because of codec dependencies. Clicking Play after an MP4 has been recorded will save & close the MP4, then will reopen it for playback..

Save & Close	Closes the active project, sequence, movie or image sequence. RAM sequences are discarded when closed. As such, saving a RAM sequence is done by exporting it to a file on disk prior to closing it. There is also an option in **StreamPix Settings > Sequence** to prompt to save a RAM sequence upon closing it.

Option	Description
Export ...	While the .seq file format is very convenient within the StreamPix application, it is not widely supported by 3rd party software, and often needs to be converted to a more common format. Once the sequence is loaded, it can be exported to AVI movies, separate .tif images or any other standard file format. Sequence files and AVI files are the only exportable formats. The File formats available for export are as follows: • Sequence file format (.seq) • AVI Movie Clip (.avi) • Quicktime Movie (.mov) • BMP format (.bmp) • JPEG format (.jpg) • TIFF format (.tif) • PNG format (.png) • Flexible Image Transport System (.fit) • Lossless JPEG2000 (.jp2) • Digital Negative format (.dng) • Windows Media Photo (.wdp) **Current Image to..:** Exports the image aligned with the sequence cursor. **Current Selection to..:** Exports all images in the current selection. All images will be named based on the filename typed in the **Save As...** dialog box. **Full Sequence to..:** Exports all images of the sequence. All images will be named based on the filename typed in the **Save As...** dialog box. **Multi-Display area ..:** Same as the default action but applied to the current content of the image display area. (Not available in the Single-Camera version)
Recording History	Allows you to reload previous recording sessions. Sessions are sorted by dates and hours. Select the desired hour and the Workspaces/Sequences that were loaded at that time will be shown. From there, you can either reload all those sequences or a specific one using the corresponding button. If the file can't be found because it was moved or deleted, an error message will be shown. You should delete older or obsolete entries from the history from time to time (to reduce loading times).
Settings	Show the StreamPix Settings dialog.
Exit	Close StreamPix.

Table 1-5: Application Menu options

StreamPix Help tab

The StreamPix Help tab contains the following:

- **StreamPix User Manual**, this manual.

- **Camera Installation Manual** with detailed instruction on how to setup every camera supported by StreamPix.
- S**equence File Format Manual** provides information on the NorPix Sequence File format, useful if you want to extract image/data from a sequence file to process in a third party application such as Matcad.
- **License Information** displays all the authorization codes that are registered on the system for the current user.
- **About StreamPix** accesses theTechnical Support contact information and shows the credits for StreamPix. The **Enable DLL Registration** button sets the file association for DLL files to regsvr32.exe as the default application used to "open" them. It is sometimes used in tech support procedures but should not be needed otherwise.
- **Check for Updates** connects to the Norpix FTP to download a small version file. The newest available version number will be compared to the version number of the installed software, calling a prompt indicating if a new version of StreamPix is available for download.
- **Send Feedback to NorPix** to report a bug, make suggestions, or request specific features.

Selected buttons

When a toolbutton toggles an action, such as turning the display on or off, its color is highlighted when it is selected, as shown in Figure 1-3.

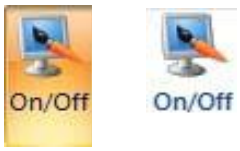


Figure 1-3: Toolbutton toggled On and Off

1.4 StreamPix Basic Concepts

Before you begin using StreamPix, you should become familiar with some StreamPix basic concepts.

Workspaces

Workspaces allow you to control multiple cameras. Every camera must be in a distinct Workspace, and a Workspace can contain only a single camera.

To view a captured sequence, it must also be loaded into a Workspace. A Sequence may be loaded into a separate Workspace or into the Workspace connected to the camera that generated the Sequence. See “Sequences”.

Only one Workspace can be active at a time. The Active workspace is the one containing the Active Status icon. Click in any Workspace to make it the active one. See “Set up Workspace(s)”.

NOTE: In the StreamPix Single Camera version, only one Workspace is possible.

Multiple Workspaces

Multiple Workspaces allow you to load multiple cameras and Sequences in a single instance of StreamPix. Every camera must belong to a distinct Workspace; however, the same camera may be assigned to different Workspaces, each with its own settings. Camera settings are saved and loaded in the Workspace to which the camera is connected. This way, when a Workspace is opened, the camera settings will be reloaded according to the settings.

Having multiple workspace configuration can be useful, even when running a single camera. For instance, if a camera is used to grab images both in a room with normal light and in a dark room, the exposure time can be adjusted from one condition to another.

To avoid having to adjust the exposure every time the camera is moved from one room to the other, the Workspaces can be used to save “presets”. This can be done by first naming the Workspace “Normal”, loading the camera and setting the camera to normal lighting. Then create a new Workspace named “Dark”, load the same camera and set the camera for the dark room.

NOTE: A camera may only be open in one Workspace at a time. In the above example, you would first close the “Normal” Workspace and then open the “Dark” Workspace.

As another example, you could create two Workspaces, named “Workspace A” and “Workspace B”. Each Workspace has its own tab. Workspace A would control camera A and the resulting sequence file A, while Workspace B would control camera B and sequence file B. Select the appropriate tab to make that Workspace active.

To access Workspace management, select **Workspace > Workspace Manager**.

Master, Linked, and Stand Alone Workspaces

By default, all commands are applied to the active Workspace, but the **Home > Select all Workspaces** and **Workspace > Master Workspace** commands let you control multiple Workspaces simultaneously.

- **Master Workspace:** synchronizes all playback and browsing with the Master Workspace time. Double click on a Workspace tab to set/unset it as the Master. There can be only one Master Workspace.

- **Select all Workspaces:** Designates a linked Workspace and applies any command marked by the **Link** icon to all selected Workspaces. The Select all Workspaces command automatically makes the active Workspace the Master.

- **Workspace > Stand Alone Workspaces** option lets you designate Workspaces to ignore when using the Master and Select all Workspaces commands.

See “Master Workspace and Select All Workspaces”.

Workspace Status Icons

The Workspace Status icons provide information about the current Workspace status. Use **Display > Overlays** to toggle the display of the Workspace Status icons.

The following table shows the possible Workspace Status icons

Icon	Description	Position
	Live view. The camera is streaming flawlessly.	Tab and Overlay
	Master workspace (used for synchronized browsing/ playback). Shown in Workspace	Tab
	Linked Workspace through **Home > Select All Workspaces**. Toolbuttons for affected commands also contain the **Link** icon.	Tab and toolbar icon

Table 1-6: Status Icons

Icon	Description	Position
	When doing a normal playback following the time stamps, this icon pops up when there is a lag of 100 ms or more between the timestamp of the frame being currently shown and the frame that should have been shown at this time. It indicates that the playback frame rate is slower than the recording frame rate. This could be caused by weak reading capabilities of the system.	Overlay
	The camera is dropping frames.	Overlay
	The camera streaming is stopped.	Overlay
	Recording.	Overlay
	Sequence view.	Tab
	Playback.	Overlay
	This workspace has the focus. The Interface commands are applied to it.	Overlay
	Timeshift mode.	Overlay
	The **Camera > Watchdog** is enabled and its timeout value was reached.	Overlay
	Pre/Post Recording mode.	Overlay
	Waiting for I/O trigger. I/O event is an event that can trigger something, like start or stop recording, or pre-post, or something else.	Overlay

Table 1-6: Status Icons

Record, Snap, and Playback Controls

The Record, Snap, and Playback controls are found on the Home tab.

Figure 1-4: Record and Playback controls for Stand Alone and Linked Workspaces

Record

The Record button allows you to start/stop recording according to the parameters set in the **Home > StreamPix Settings > Recording > Setting** fields.

Snap

The Snap button does the same as the Record button, except that it records a single frame. Multiple snaps can be done in the same Sequence file. Useful for capturing direct to an image file, such as .bmp.

Playback Buttons

The Playback buttons use common video control buttons to control playback options. The Play/Pause button plays back a Sequence according to its timestamps set in the **StreamPix Settings > Playback** page. See “Playback settings”.

The **Step Back** and **Step Forward** buttons move the display one frame at a time.

NOTE: If the **Show Manual playback slider** is enabled in **Settings | Playback Rate**, the appearance of the **Step back/Step Forward** buttons changes, and selecting the buttons will increase or decrease the playback speed. See Figure 1-5.

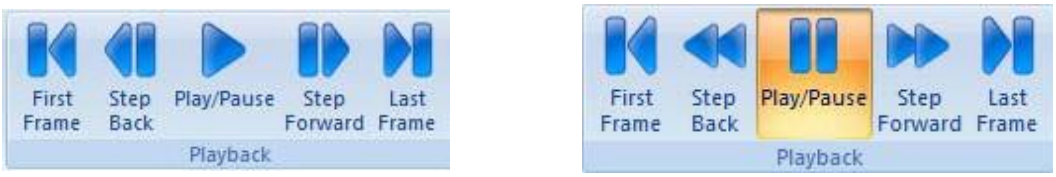


Figure 1-5: Change in Step Forward / Step Back controls

Additional Playback Options

Time Jump

The **Sequence > Time Jump** buttons jump the display according to the interval set in **Settings > Playback > General > Length of time jumps in MS** (milliseconds. The default is 1000 ms. See "Playback settings".

Figure 1-6: Time Jump buttons

Manual Playback Control

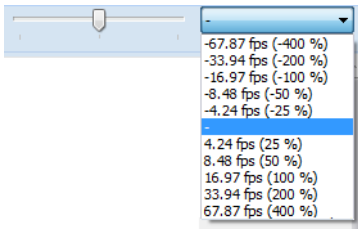


Figure 1-7: Manual Playback controls with dropdown menu

When enabled from the **StreamPix Settings > Playback** page, the **Manual Playback control** appears as a secondary slider to the right of the Sequence Slider. The Manual Playback control dropdown menu allows you to select a fixed frame rate to review the current sequence/AVI at without regard to the timestamps of each image. Dragging the Manual Playback control slider to the right will gradually increase forward playback speed, moving it to the left will increase backward playback speed. See "Playback Rate settings". See also the Note above.

Sequences

Before starting to record, you should specify the destination folder where and the captured images format. StreamPix offers several possible destinations: Sequence files (on disk or in RAM), image files (bmp, tiff, jpeg, etc.) and movie files (AVI, Quicktime, MP4, or TS).

Sequence Files, files with the ".seq" extension, (a NorPix proprietary format) are the StreamPix native format. Images are stored in their raw format, exactly as they were received from the camera, incurring no quality loss. A Sequence file can also include compressed frames, such as H.264, JPEG or HEVC format. StreamPix can export image(s) from an existing sequence to any other supported format (image or movie files). See *1.2.6. Supported File Formats*.

Docking Panel

The Docking Panel displays a box for each Workspace and its currently associated dialog boxes, including the current camera and sequence, the list of external modules, and any dialog boxes for currently active modules.

In a multi-display, you can toggle between showing the dialog for either the current Workspace or All Workspaces through **Home > StreamPix Settings > Interface > Docked Dialogs**.

> **TIP:** 1. Select **Workspace > Workspace Color** to color code Workspaces tabs and their associated dialogs.
> 2. You can increase the Workspace display area by toggling off the Docking Panel display through **Home > Show Docking Panel**.

Camera Docked Dialog

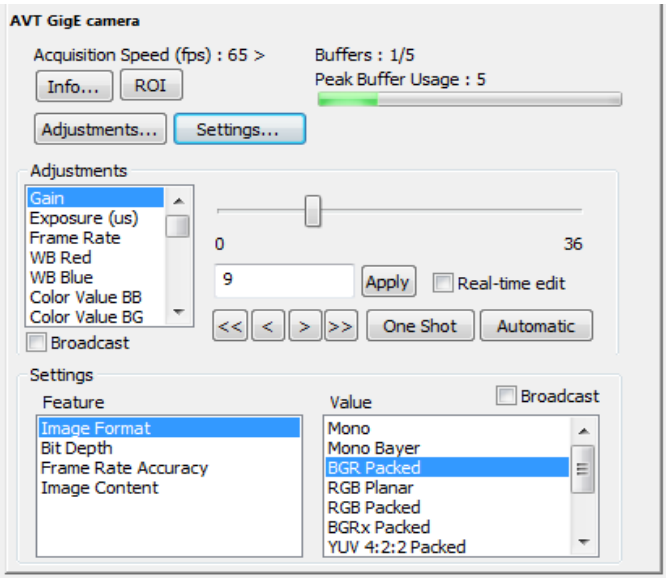


Figure 1-8: Camera docked dialog

When the camera is Live, the acquisition speed, in frames per second, is constantly updated. Clicking on **Info** will display information about the size and format of images captured by the camera.

The **ROI** allows you to define a region of interest for cameras that support this feature. Coordinate assignment is done by entering the desired offset (in X and in Y), width and height and clicking on Apply.

The **Adjustment** button, if supported by the camera, expands the dialog to show the available adjustments. (Same as **Camera > Live Adjustments**). If **Broadcast** is checked, changes here will be applied to all associated Workspaces with compatible cameras.

Changes to the **Adjustments** can also be broadcast to other linked Workspaces running another camera of the same model.

The **Settings** button, if available, expands the dialog to show the available settings. If **Broadcast** is checked, changes here will be applied to all linked Workspaces with compatible cameras.

Sequence docked dialog

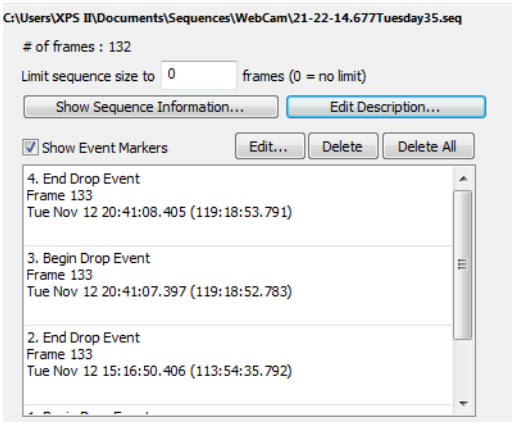


Figure 1-9: Sequence docked dialog

This docked dialog shows information related to the Sequence. Select **Show Sequence Information** to display detailed information such as the number of frames in Sequence, the average capture frame rate, and image format. Click on **Edit Description** to write a short text message to be stored in the Sequence header.

The number of frames the Sequence will hold can be adjusted in this dialog to make sure that, according to the chosen option in **StreamPix Settings > Recording**, recording will restart from the beginning of the Sequence or stop when recording position reaches this value. Default is "0" for standard, unlimited, recording.

Any browsing with the Sequence Slider is reflected in the thumbnails section. Select **Show Event Markers** to show each logged event. To avoid clogging the Sequence Slider only the very first 100 markers are displayed, Events are created by **Set Event Marker** I/O actions that can be configured from the I/O Manager Docked Dialog. See “HOWTO Trigger a Software Event from an external input line (I/O Manager)”.

Select any event to go to the associated frame in the Sequence. Click on **Edit...** to edit the selected marker description. You can also delete one or all events using the respective buttons.

Event Marker information is saved in a separate .xml file named after the Sequence name. For example, markers for c:\folder\test.seq will be in c:\folder\test.xml.

Pre/Post Trigger docked dialog

This allows you to set custom pre/post behavior for an individual Workspace. The behavior is identical to the **StreamPix Settings > Pre/Post Trigger** page. See “Pre/Post Trigger settings”.

I/O Manager docked dialog

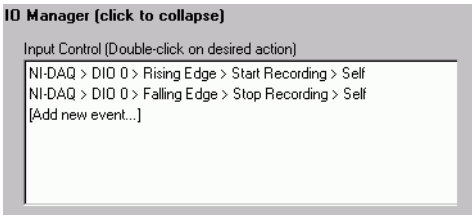


Figure 1-10: I/O Manager docked dialog

The I/O docked dialog shows information related to Input/Output actions. To create a new action, double-click on **Add new event...**. To edit or delete an existing action, double-click on the line describing that action. In both cases, the Input Action dialog will be shown. See “HOWTO Trigger a Software Event from an external input line (I/O Manager)”.

2

Getting Started

This chapter contains procedures to initially setup StreamPix to quickly get up and running. This chapter contains the following sections:

2.1 Set up Workspace(s)

See also:

- "Workspaces"
- "HOWTO Manage Multiple Workspaces/Cameras"
- "Managing Workspaces and Cameras".

Every grabber/camera must be in a distinct Workspace, and each Workspace can contain only a single grabber/camera.

To display a Sequence, it must be loaded into a Workspace as well. The Sequence associated with a camera may be loaded into the same Workspace, into a different Workspace, or into a temporaryWorkspace.

NOTE: In the StreamPix Single Camera version, only one Workspace is possible.

To Set up Workspaces:

1. Select **Workspace > Workspace Manager.**
   The **Workspace Manager** dialog box opens.

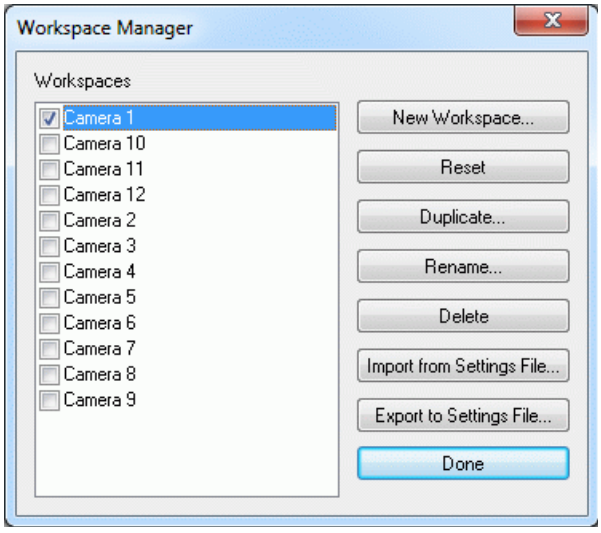


Figure 2-1: Workspace Manager

2. Select **New Workspace** and name the new Workspace.
3. The **Grabber Selection** dialog box opens, from where you can select the grabber/ camera to associate with this Workspace. To create a Workspace without a video

source, select **Cancel** when prompted to load one. See “Load Camera(s)”.

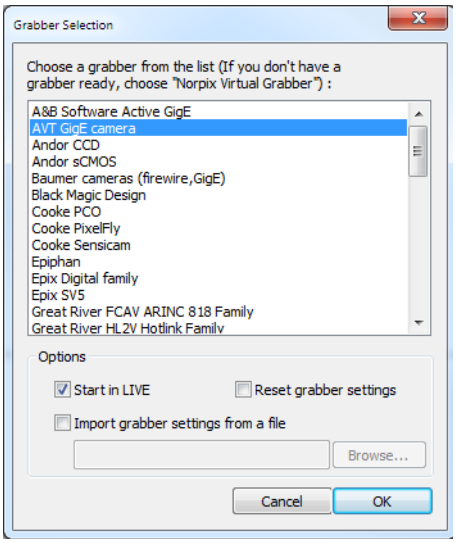


Figure 2-2: Grabber Selection dialog box

4. Repeat Steps 2 and 3 as necessary. As you create a Workspace, it is automatically selected for display.
5. Optionally, uncheck any Workspaces that you do not want to display currently.
6. Select **Done** when finished.
   The new Workspaces are created. The selected Workspaces are loaded into the display area and a Workspace Settings dialog box for each Workspace is added to the Docking Panel.
7. Select **Workspace > Workspace Color.**
   The Workspace color picker opens.

TIP: The assigned Workspace color will be applied to both the Workspace tab and the Workspace dialog box in the Docking Panel, making identification easier.

8. Assign a unique color to each Workspace.

2.2 Load Camera(s)

To get a live feed, you must load a camera driver into a Workspace. When you create a new Workspace, it automatically asks you to choose a camera. To load a camera into an existing Workspace, select the **Camera > Load** button. In either case, StreamPix prompts you to select the camera.

NOTE: The camera/grabber drivers available are dependent on your authorization codes from NorPix. For additional drivers, contact support@norpix.com.

StreamPix will check for the appropriate codes authorizing the use of the selected grabber and will attempt to load it. Once successful, the Workspace tab of the current Workspace will show a new display (a small camera icon) and the Live feed from the camera.

StreamPix supports a wide variety of grabbers and cameras. As many cameras have properties and settings that are unique to them, the parameters available are dependent on your camera manufacturer. However, you can adjust the settings of the loaded camera by accessing them using the **Hardware Properties** or **Live Adjustments** buttons from the **Home** or **Camera** tabs.

NOTE: Loading a camera can fail if it is not connected or if it is currently used by another application. The camera can be unloaded by clicking on Unload in the Camera tab.

Caution

Some frame grabbers may attempt to load a default configuration file incompatible with the camera, which could produce an error and might even crash StreamPix. To prevent a grabber from starting in Live mode, uncheck the **Start Live** box in the **Load Grabber** dialog box. You can then access the hardware properties and select the appropriate configuration before launching the LIVE camera streaming.

NOTE: If the keyboard scroll lock key is enabled, it will prevent StreamPix from starting a live stream.

Once loaded, the camera will automatically start capturing images, unless the camera is in a triggered mode or Scroll Lock is enabled. To toggle the Live feed on or off, for example to free some CPU resources for other processes, select **Home > LIVE**.

To Load a Camera

1. Select the **Workspace** tab.

2. Select **Camera > Load**.
   The **Grabber Selection** dialog opens

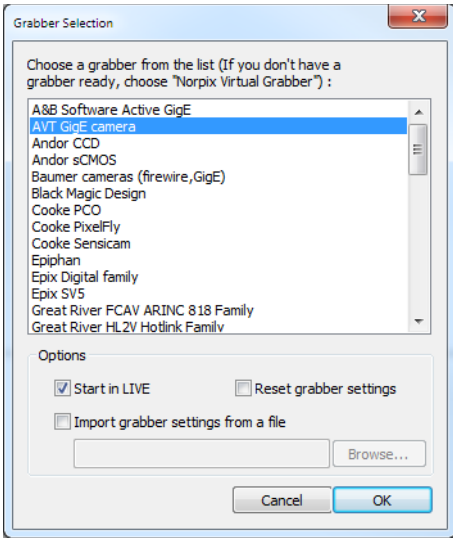


Figure 2-3: Grabber Selection dialog box

3. Select your camera from the list.
4. Three options are available, but for now you can accept the defaults.

   a. **Start in Live**, meaning that the camera will start streaming right away.

   b. **Reset grabber settings**, to restore the default settings.

   c. **Import grabber settings from a file**, to import camera settings from a previously saved file.

5. Select **OK**.
   The camera loads into the selected Workspace and begins streaming.
6. Adjust the camera settings as needed. Refer to the documentation for your camera if necessary. Camera settings are dependent on your camera manufacturer; however, they can be divided into two groups:

   a. **Hardware Properties:** Require that streaming is suspended while Hardware Properties are adjusted. For example, changing image format from 8-bit to 16-bit.

   b. **Live Adjustments:** Can be done while the camera continues to operate. For example, changing exposure time.

To Adjust the display:

1. Select **Display > Auto-Fill** to tile the open Workspaces in the viewing area.

TIP: Alternatively, you can use one of the other **Multi-Display Layout** buttons to set the display.

2. If necessary, select **Set Background Color** and choose a background color to make viewing easier.

TIP: The default background color is white; however, you can change this to make viewing easier. Red is often suggested when working in low light or outside at night.

To Set an ROI:

A Region of Interest (ROI) allows you to define a region of interest for grabbers that support this feature. Coordinate assignment is done by entering the desired offset (in X and in Y), width and height and clicking on Apply. If Broadcast is checked, the change will be applied to all currently selected Workspaces.

1. In the **Docking Panel**, select the camera dialog, and expand it if necessary.
2. Select the **ROI** button
   The ROI area opens.
3. Enter the **Offset X** and **Y** values and the **Width** and **Height**.
4. Optionally, select the **Center ROI** box to center the area.
5. Optionally, select **Broadcast** to apply the ROI to all currently selected Workspaces.
6. Select the **Apply** button to see the results in the display area.

To Click and Drag an ROI

NOTE: Before you can use the following instructions to set an ROI, the **Home > Set Camera ROI** box must be selected.

- Drag toward bottom-right to define an ROI.
- Drag toward top-left to restore full image display.
- Dragging toward the bottom-left or the top-right will abort the current ROI selection.

2.3 Select Destination File(s)

See also:

- "Sequences"
- "Managing Sequences and Markers".

Before starting to record, you should specify the destination where and how the captured images will be stored. StreamPix offers several possible destinations: sequence files (on disk or in RAM), image files (bmp, tiff, jpeg, etc) and movie files (AVI & Quicktime).

Sequence Files are files with the ".seq" extension, a NorPix proprietary format., are the StreamPix native format. StreamPix uses a high-speed write mode to transfer images to disk, in real-time, at the maximum speed allowed by the HDD.

Sequence files have several advantages:

- The number of images is limited only by available disk space.
- Images are stored in their raw format, exactly as they were received from the camera, incurring no quality loss.
- Sequences can be played back in StreamPix.
- StreamPix can export image(s) from an existing sequence to any other supported format (image files or AVI). See "Supported File Formats".
- Each image is time stamped with the precise time at which it was captured. This allows accurate playback for sequences captured at variable speeds.
- Sequence files can be post-processed with various image processing functions (ex: applying a Bayer conversion) and exported to any other format.
- Extra metadata can be also saved with the Sequence file, such as GPS positioning, without interfering with image data.

To create a sequence file to disk:

1. Select **Application Button > New Sequence on Disk**.
2. Choose a name for the sequence and the location to save it.

To create a sequence file in RAM:

1. Select **Application Button > New Sequence in RAM**.
   RAM sequences are limited in size to the amount of system memory currently available. When the sequences run out of memory, the recording automatically stops.

To create an AVI file

1. Select **Application Button > New AVI.**
2. Select the desired codec from the **Save As** file dialog.

To create a Quicktime file:

> **NOTE:** Available in StreamPix 32-bit versions only.

1. Select **Application Button > New Quicktime movie**.
2. Select the desired codec from the Save As file dialog.

To capture directly to image files:

1. Select **Application Button > New Image Sequence**.
2. Select the desired format.

To close the destination file:

1. Select **Application Button > Save & Close** command when the destination file is no longer needed.

2.4 Start/Stop Recording

See also:

- "Record, Snap, and Playback Controls"
- "HOWTO Set Recording Options".

Once the your grabber is loaded and the destination file is set up, you can start recording. You can either record manually or schedule a specific recording time.

NOTE: By default, only the currently selected Workspace records. However, if **Home > Select all Workspaces** is selected, then all Workspaces (except those excluded) will start recording.

Clicking once on **Record** will start saving frames coming from the grabber to the destination file (sequence, AVI, images, etc), while clicking a second time on it will stop recording. If the destination is a Sequence file, the recording will start at the Recording Position, usually located at the end of the sequence unless modified with the **Sequence > Set Recording Position** command.

Snap

The **Snap** button functions the same as **Record**, except that the recording will automatically stop after 1 frame has been captured.

To Record a Sequence Manually

1. Select a Workspace to make it the active one.
2. Select **Home > Record** to start recording.
3. Select the **Record** button again to stop recording.

To Change the Starting Point

While a Sequence file is recording, frames are saved starting at the Recording position. The default recording position is after the last image of the Sequence.

To change the recording position:

1. With the playback paused, for a Sequence file or Sequence file in RAM only, move the sequence slider to the desired position.
2. Select **Sequence > Set Recording Position**.
   The new starting position is shown by a red triangle under the Sequence Slider.

To Record Single Images:

- To record single-frame snapshots of the live feed manually select **Home > Snap**.

Scheduling a Recording:

Use the **Tools > Recording Scheduler** to setup recording sessions which can start and stop without user intervention. One-time, daily, weekly or monthly recordings are available.

NOTE: The Recording Scheduler uses the Windows Task Manager. Windows may prompt you for authorization before continuing to set up a recording schedule.

Once the recording mode is chosen, you can also either define a recording duration or tell StreamPix to keep recording until a stop condition is reached.

TIP: Most recording scripts offer various stop conditions. See **StreamPix Settings > Recording manager > Use a recording script**.

The Recording Scheduler allows one recording task to be defined. If you need more than one, you can use the Advanced Scheduling option to access the Windows Task Scheduler directly.

To Schedule a Recording:

TIP: Answer Yes to any Windows security prompts.

1. Select **Tools > Recording Scheduler**.
   The **Recording Scheduler** dialog opens.

Figure 2-4: Grabber Selection dialog box

2. Select the time interval and select **Next**.

3. Select the **Recording Duration** or Stop condition and select **Next**.
   The scheduled task is displayed in the **Last Action** area of the Recording Scheduler dialog box.
   The Recording schedule repeats until the task is completed or deleted, either by creating a new task or by selecting **Delete current recording task**.

Time interval choices are:

- **One-Time:** Configure a recording session that will occur a single time at the given date and time.
- **Daily:** Configure a recording session that will occur daily. The first recording will be done on the given date and repeat every day (or every X days) at the chosen time.
- **Weekly:** Configure a recording session that will occur weekly. One or more days of the week can be selected. The recording will then happen every X weeks after the selected date.
- **Monthly:** Configure a recording session that will occur monthly. Select one of more months on which recordings have to be made. Finally, select the repeat mode from the two available options:
  - On a specific day of the month (ex: 4th).
  - On a relative day of the month (ex: second Tuesday).

2.5 Play Back a Sequence

See also:

- "Sequences"
- "Managing Sequences and Markers".

To open a Sequence

A Sequence must be opened before it can be viewed. To open a previously captured Sequence, either:

- Select the **Application Button > Open Sequence** menu.
  The Sequence is added to the Display area right-click menu, from where it can be assigned to a Workspace.
- Select **Application Button > Open Sequence(s) in temporary workspaces** menu.
  The Sequence is displayed in a new Temporary Workspace.
- Drag-and-drop a Sequence file from Windows Explorer to a Workspace tab.

To assign a display

There are two ways to assign a display to a multi-display area:

- Click on an area to select it, then right-click on a display button in a Workspace tab.
  Or,
- Right-click in a multi-display area and select the display from the popup list.

NOTE: Multiple displays can be used to show any loaded StreamPix document, such as a Sequence file, or the output of a grabber, or DAQ file.

See "Multiple Workspaces" and "Managing Workspaces and Cameras".

NOTE: From the right-click popup list, you can also enable/disable the **Enable auto-switch between live and playback** option for the selected area. If enabled, the display will automatically switch between live and playback displays. For example, between grabber display (live) and sequence file display (playback). To see both live AND playback displays at the same time, disable this option to avoid auto-switching.

Once a sequence has been opened, you can go back and forth between live and playback displays by clicking the respective display buttons on the tabs.

Viewing a Sequence

The sequence can be reviewed at a fixed frame rate by using the manual playback controls. The following playback commands are available from the Home tab:

Icon	Name	Description
	First Frame	Moves to the first frame of the sequence.
	Step Back	Moves to the frame immediately before the current frame.
 	Play/Pause	Starts/stops the playback of the sequence, following the time stamp of every image. For instance, if there is a 5 second interval between two frames time stamps, the playback mechanism will actually wait 5 seconds before showing the next frame. This can be inconvenient for triggered captures or appended sequences, as two consecutive frames may be separated by a long time interval. In such a case, use the Step One Frame Forward to bypass the “time step”, or use the manual playback controls to playback at a fixed speed regardless of time stamps. **TIP:** You can also use **StreamPix Settings > Playback > Maximum Playback Interval** to get around this problem. **TIP:** Reading frames from the sequence file consumes as much bandwidth as recording them. As such, avoiding doing playback while recording is strongly advised if there are any doubts about the system's performance.
	Step Forward	Moves to the frame immediately following the current frame.
	Last Frame	Moves to the last frame of the sequence.

Table 2-1: Status Icons

You can browse the sequence timeline by moving the Sequence Slider. See “Manual Playback Control”.

3

HOWTOs

This chapter contains specific procedures (HOWTOs) for performing the following more common StreamPix tasks. For more information on any topic, consult the "Table of Contents", the Index, or follow the links in each topic.

NOTE: For the initial setup, see Chapter 2. Getting Started.

3.1 HOWTO Manage Multiple Workspaces/Cameras

See also:

- *"To Set up Workspaces:"*
- *"Workspace Manager"*.

To select which Workspaces to display

1. Select **Workspace > Workspace Manager**. The Workspace Manager dialog displays.
2. Select the Workspaces to display.
3. Select **Done**.
   A tab is created for each selected Workspace, and a dialog for that Workspace is added to the Docked Dialogs panel.

TIP: When you create a new Workspace, you are prompted to assign a camera or grabber to it. To bypass this step, select **Cancel**.

To Select all Workspaces

The **Select All Workspaces** command lets you control multiple Workspaces simultaneously. Commands, such as switching between Live and Playback and those associated with playback and recording, including the working folder, the customtoken and everything in **Workspace > Workspace Settings**, or assigning a custom recording script will be broadcast to all selected Workspaces, except for Workspaces designated as Stand Alone.

1. Select **Home > Select All Workspaces** to control multiple Workspaces simultaneously. Individual Hardware properties and Live adjustments are not broadcast.

NOTE: When **Select All Workspaces** is enabled, toolbuttons with actions that apply to all Workspaces change their icons to show the **Select All Workspaces** (**Link**) icon as part of their icons. The Workspace tab of selected Workspaces also contains the **Link** icon.

To designate a Workspace as Stand-Alone

1. Select **Workspace > Stand Alone Workspaces**. The Stand Alone Workspaces dialog lists all open Workspaces.
2. From the Stand Alone Workspaces dialog, select the Workspaces to designate as standalone.
3. Close the dialog when done.

To designate a Master Workspace

NOTE: Designating a **Master Workspace** forces all Workspaces to synchronize (by either time stamp or frame index) playback and browsing with the Master Workspace. When you select **Select All Workspaces**, the active Workspace automatically becomes the Master.

1. Enable **StreamPix Settings > Playback > Enable synchronization across workspaces**. See *"Playback settings"*.
2. Select **Workspace > Master**. The currently active Workspace becomes the Master.

TIP: Double click on a Workspace tab to quickly set/unset it as the Master.

To assign a Workspace color

TIP: An assigned Workspace color is applied to both the Workspace tab and the Workspace dialog box in the Docking Panel, making identification easier.

1. Select **Workspace > Workspace Color.**
   The Workspace color picker opens.
2. Assign a unique color to each Workspace.

3.1.1 Loading and Unloading Cameras

Normally you are prompted to load a grabber or camera when the Workspace is created. Use the procedure below to change the assigned camera, assign a camera to a duplicate Workspace, to restore the default camera settings, or to assign a saved camera configuration.

To Load a camera

1. Select the Workspace in the display area.

2. If the Workspace already has a camera loaded, select **Camera > Unload Camera.**

3. Select **Load Camera** and select from the **Grabber Selection** pick list.

To Make Live Adjustments

Live adjustments include things such as exposure, brightness, contrast, etc. They can be done while the camera is streaming. The video stream may be disrupted momentarily while the changes are applied.

NOTE: Live Adjustments can also be made from the Docked Dialog box.

1. Select **Camera > Live Adjustments**. The **Grabber Properties** dialog opens.

NOTE: The actual parameters available are dependent on your hardware. See your hardware documentation for details.

2. From the **Grabber Properties** dialog, make the necessary adjustments.
3. Select **Apply**.

TIP: Use the **Default** button to restore the camera default settings.

To Change Hardware Properties

NOTE: Changes to Hardware Properties can also be made from the Docked Dialog box.

Adjusting hardware properties require that the Live feed be stopped. They include things such as image size, ROI, bit depth, etc.

1. Select **Camera > Hardware Properties**. The **Grabber Properties** dialog opens and the Live feed is suspended.

NOTE: Parameters available from the Live Adjustments are also available from here.

2. Make the necessary adjustments.

NOTE: The actual parameters available are dependent on your hardware. See your hardware documentation for details.

3. Select **Apply**.

3.2 HOWTO Set Recording Options

To Simplify the Start Recording Procedure

1. Go to **Home > StreamPix Settings > Auto Naming**, and set up you auto-naming scheme. When enabled, you won't be prompted to chose a name for the destination file when doing a New Sequence On Disk, New AVI On Disk (etc). See *"Auto Naming Settings"*.
2. Go to **Home > StreamPix Settings > Recording** to set your Recording settings. Select an auto-created file (such as a "sequence file on disk") and enable the auto creation of the file when the record button is pressed. See *"Recording settings"*.
3. Set your recording manager. See *"Recording manager settings"*.
4. To Record, select **Home > Record**.

To Record on Multiple Cameras Simultaneously

1. Select **Home > Select All Workspaces**. The active Workspace becomes the Master, and all Workspaces are linked to it.
2. Select **Home > Record**. All linked Workspaces record synched to the time stamp of the Master Workspace. See *"Master, Linked, and Stand Alone Workspaces"* and *"Master Workspace and Select All Workspaces"*.

To Use a Recording Script

1. Select S**treamPix Settings > Recording manager > Use a recording script** and select **Edit Script**. The Recording Manager Editor opens, from where you can develop a script. See *"Recording Manager Editor"*.

See also *"Scheduling a Recording:"*.

To Record in a Loop

1. Go to **StreamPix Settings > Recording > Limits**.
2. Set the Sequence limit to the number of frames to be captured in each loop.
3. Enable **Loop recording when limit is reached.** Otherwise, the recording will simply stop when the given number of frames is reached.
4. Start recording.

To Playback a Sequence

See *"Play Back a Sequence"*.

3.3 HOWTO Export a Sequence

See also *"Home > Selection group"*.

To Export a Sequence

1. Open the Sequence.
2. Optionally, to export a part of a Sequence:

   a. Position the **Time Slider** at the first image of the part of the Sequence to be exported.

   a. Select **Home > Set First**.

   b. Position the **Time Slider** at the last image in the part of the Sequence to be exported.

   c. Select **Set Last**.
3. Select **Application Menu > Export Selection To...**
4. Select the export format.
5. Confirm the export format and file location.
6. If exporting to anything other than a .seq file, set any other parameters required.
7. Select **Save**.
   The Sequence is exported to the specified location and format.

NOTE: To export the contents of the visible multi-display areas instead of a single image, follow the procedure above, except in 3., select Export Multi-Display area and follow the prompts.

3.4 HOWTO Use Auto Naming Schemes

Auto Naming schemes are defined in the **StreamPix Settings > Auto Naming** page. See *"Auto Naming Settings"*.

> **TIP:** Enable **StreamPix Settings > Recording > Auto-create file** to automate file creation using the Auto naming scheme. See *"Recording settings"*.

3.5 HOWTO Configure Output File Formats

Output file formats are defined through StreamPix Settings.

- For Sequence files compression settings and more, see *"Sequence Settings"*.
- For AVI file settings (codec, audio, etc.), see *"AVI settings"*.
- For .MOV (Quicktime files) see *"MOV settings"*.
- For image files (bmp, jpg, tif, etc), see .*"More... settings"*.

3.6 HOWTO Trigger a Software Event from an external input line (I/O Manager)

1. Select **StreamPix Settings > More... > I/O.**
2. **Enable Input Control.**
3. Select **OK**. The I/O Manager dialog opens in the Docked dialogs area.
4. Set the IO Manager parameters as described below.

I/O Manager docked dialog

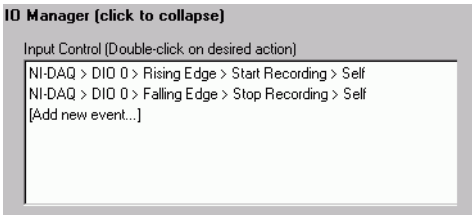


Figure 3-1: I/O Manager docked dialog

This docked dialog shows information related to Input/Output actions. To create a new action, double-click on the **[Add new event...]** line. To edit or delete an existing action, double-click on the line describing that action. In both cases, the **Input Action** dialog is displayed.

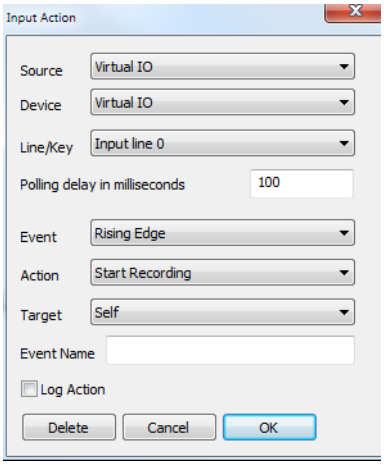


Figure 3-2: Input Actions dialog

The Input Action dialog displays the settings of a new or existing action. There are several parameters to set:

- **Source:** The general device name. All I/O devices detected by StreamPix are shown in this list. A source can either be related to the grabber (i.e: frame grabber with input lines) or an external IO device. A virtual I/O device is also available.

- **Device:** Where more than a single Source device exists, the device number. Typically, the device number is 0 (the first one).
- **Line/Key:** All available lines for the selected source are shown. Select the input line to monitor.
- **Polling delay:** This is the interval at which the input line will get polled. If the value is too low, non-stop polling will be implemented, needlessly consuming system resources. However, a very high value might miss an event. For instance, if the input signal goes from level-low to level-high and back to level-low between two polling actions, StreamPix would not notice that an edge occurred.

NOTE: For analog I/O devices that require it, you can set the debounce delay in milliseconds.

NOTE: Some devices use an interrupt, in which case the polling time is ignored. The device interrupts the software when a line level change is detected. Interrupt mode allows a faster response time since no polling is needed.

- **Event:** This is the event to monitor. The standard Level low, Level high, Rising edge & Falling edge are available. Typically, the software monitors the voltage on the input line. Input lines have 2 levels, low or high, i.e.: 0 or 1, physically usually 0V versus 5V. A rising edge is a transition from 0 to 1, or 0V to 5V. When a rising edge is required, the software waits for a transition from 0 to 5V, hence it must read at least once a value of 0V then a value of 5V. A Level low detection means that when reading the input line level, if the level is low the condition will be immediately asserted as true. It will not wait until a level change.
- **Action:** This is the action to take once the event occurs. The available actions are:
  - Start Recording to start recording
  - Stop Recording to stop recording
  - Toggle Recording starts recording if it is not currently recording and stops if it is.
  - Line Testing is a dummy action and does nothing unless it is used in combination with the Log Action described below to test the input lines.
  - Trigger Pre/Post Event triggers an event when in Pre/Post Trigger mode.
  - Set event marker sets a marker on the current frame.
  - Take Reference Time. See *"Edit Reference Time"*.
  - Clear Reference Time.
  - Snap Frame captures a single frame.

- Start/Stop the frame grabber pulse generator. See *"Frame Grabber Pulse Generator"*.
- Enable/Disable Live toggles the Live camera display.

NOTE: More actions will be added based on further developments and customer requests.

- **Target:** Can either be **Self** to apply the action to the current Workspace only or **All Workspaces** to broadcast the action to all Workspaces. **All Workspaces** allows you to synchronize multiple Workspaces without having to configure their I/O Manager panels separately.
- **Event Name:** Event name gives you the option to name a particular event rather than use the default name made as the name of the device followed by the related input line. For example, if the line is connected to a sensor that monitors a door, the event name could be "Front door open". The event name is used when the **Set Event Marker** action is selected. It is not used otherwise.
- **Log Action:** If this is checked, each time the event is detected, StreamPix sends a debug output to the system. The output can be displayed using **Tools > Debug Log**. Use it with the "Line Testing" action to check that the lines are working properly.

Select the **Delete** button to remove an existing action from the list. Select **Cancel** to abort action editing. Select **OK** to accept changes made to an existing action or create a new action.

Camera (Hardware) Trigger

To setup a camera trigger is different than to setup a software trigger action. A camera trigger is typically called a hardware trigger to differentiate it from a software trigger.

A camera trigger is typically an input on the camera back panel. This input triggers a single frame capture. For example, when a part goes in front of the camera, a sensor can trigger a frame capture, resulting in grabbing an image into the software. No part: no image.

Camera trigger is usually set via the camera hardware properties level where one can define the trigger in/out line (a camera may have multiple input lines), trigger level (rising edge, falling edge, etc...) and trigger delay.

For example, if running with multiple cameras, but you want all of them to capture right at the same time, you could send the same trigger signal to all the camera trigger inputs.

Audio Trigger

An audio trigger can be used to trigger a software event in StreamPix. For information on how to set an audio trigger, see *"Audio Trigger"*.

Output Actions

For information on defining output actions, see *"Enable Output Control"*.

3.7 HOWTO Store / Retrieve GPS data as metadata

This section describes how to store and retrieve GPS data as image metadata while recording or playback.

To Save GPS data as image metadata

1. Load the GPS/DMI module in a camera Workspace.
2. Setup the GPS communication settings, such as USB/RS232 port and speed. When the GPS delivers information, the decoded NMEA sentences will display in the GPS/DMI docking panel area. Depending the NMEA sentence, not all information may be available (e.g. Lat, Long, Alt, Speed, Time, Bearing, etc.)

> **NOTE:** During recording, the GPS data can be displayed in an image overlay or burned into image data, depending on the selected display mode option.

3. If in the GPS Device tab, you enable **Save GPS data to file**, a csv file is created during the video recording. The file is located into the same folder as the sequence file, using the save base name but with a .csv extension. The CSV file contains current GPS information for each captured frame, but is not, however, retrieved during playback.

To save GPS data as extra metadata to be retrieved and displayed during playback

1. Enable Metadata: **Tools ribbon | Metadata manager**
2. Select **Constant Size Calculator**. A dialog will pop up. Select **Extended GPS**, and **OK**.
3. Select **Register Norpix Metadata Types** to save the metadata information, and then select **Save** and **Close**.
4. Open **StreamPix Settings | Metadata**. Select **yes** for **Save metadata along with sequence file**.
   During recording, GPS data will be stored as extra metadata, in a file with the same name as the sequence file, with a .seq.metadata extension.

To view the recorded metadata during recording or playback

1. Load Metadata Overlay Module and adjust some of the options. For example:

   a. Overlay metadata **On displayed frames**

   b. Check **Extended GPS metadata**

   c. In the **Text** tab, select font and position for the metadata.

For more information about the usage of metadata, see *"Metadata settings"*.

3.8 HOWTO Modify the GUI

You can modify the StreamPix GUI to suit your work style.

StreamPix lets you modify the GUI to suit the way that is most convenient to how you work. You can also save different configurations for re-use later. For information on customizing the default GUI, see *"Interface settings"*.

Modifying the Quick Access Toolbar

The Quick Access Toolbar can provide one-click access to any command no matter which ribbon is displayed. You can create a shortcut to any command available in either the Application Button menu or the ribbon toolbars.

Add buttons to the Quick Access Toolbar

1. Right-click on any toolbutton on any ribbon to display the right-click menu.
2. Select **Add to Quick Access Toolbar**.

Remove buttons from the Quick Access Toolbar

1. Right-click on any toolbutton on the Quick Access Toolbar to display the right-click menu.
2. Select **Remove From QuickAccess Toolbar**.

Hide/Show buttons on the Quick Access Toolbar

1. Select the **Customize Quick Access Toolbar** button on the **Quick Access Toolbar** (last button on the right) to display the menu.
2. Select toolbuttons to have them show, or deselect buttons to hide them.

Customize Quick Access Toolbar

1. Right-click on any toolbutton on the Quick Access Toolbar to display the right-click menu.
2. Select **Customize Quick Access Toolbar**. The Options dialog opens, from where you can browse all StreamPix commands.
3. Browse to the command to add, highlight it, and select **Add >>**.
4. Repeat Step 3 for each command to add.
5. Select an added item and use the **Up** and **Down** arrows to order the toolbuttons.
6. When done, select **OK**.

TIP: The **Reset** button restores the StreamPix defaults.

Show Quick Access Toolbar below the Ribbon

1. Right-click on any toolbutton on the Quick Access Toolbar to display the right-click menu.
2. Select **Show Quick Access Toolbar below the ribbon**. The Options dialog opens, from where you can browse all StreamPix commands.

Customize Keyboard Shortcuts

1. Right-click on any toolbutton on the Quick Access Toolbar to display the right-click menu.
2. Select **Customize Quick Access Toolbar**. The Options dialog opens.
3. Select **Keyboard Shortcuts > Customize**. The **Customize Keyboard** dialog opens.
4. Browse the **Categories** and **Commands** until you reach the command to which to assign a shortcut. A brief description of each command is displayed when it is selected. If the command has a keyboard shortcut already assigned, it is listed in the **Current Keys** field.
5. Enter a unique value for the new keyboard shortcut. See "Keyboard Shortcuts".
6. Select **Assign** to make the keyboard shortcut assignation.
7. Repeat Steps 4 to 6 for each assignation.
8. Select **Close** when done.

To Remove a Keyboard Shortcut:

1. Right-click on any toolbutton on the Quick Access Toolbar to display the right-click menu.
2. Select **Customize Quick Access Toolbar**. The Options dialog opens.
3. Select **Keyboard Shortcuts > Customize**. The **Customize Keyboard** dialog opens.
4. Browse the **Categories** and **Commands** until you reach the target command. The assigned keyboard shortcut is listed in the **Current Keys** field.
5. Select **Remove** to remove the keyboard shortcut assignation.

NOTE: The Reset All tool buton restores the keyboard shortcuts to the StreamPix defaults. See "Keyboard Shortcuts".

Minimize the Ribbon

1. Right-click on any toolbutton on any ribbon to display the right-click menu.
2. Select **Minimize the Ribbon**.
3. Alternatively, double-click in any ribbon.

Saving your Configuration

Saving a configuration preserves all of the Workspaces, grabber and camera settings for later re-use.

TIP: It is a good idea to save the configuration before making dramatic changes to settings. That way, you can always go back to the saved version if some of your changes have unpredictable results.

To save customized configurations for later re-use:

3. Select **Tools > Save**. A **Save As** dialog opens to the StreamPix/Configurations folder.
4. Optionally, browse to a different folder.
5. Enter a meaningful name for this configuration and select Save.

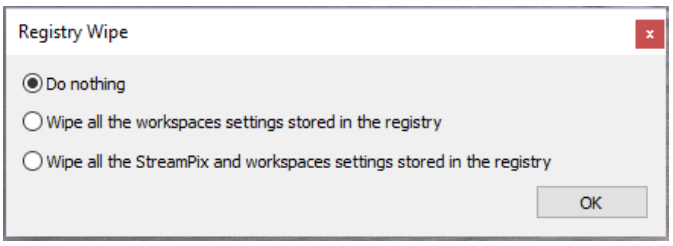
To re-use a saved configuration

1. Select **Tools > Load**.
2. Select the configuration file to use, and select **Open**.
3. A Message confirms that the selected configuration will be loaded the next time that StreamPix starts. Select **Yes** to restart StreamPix.
4. Answer **Yes** to any security prompts. StreamPix starts with the selected configuration.

TIP: There is no need to uninstall the software in order to reset the software settings. Uninstalling would also wipe the registration and licensing information. See *"HOWTO Restore Defaults"*.

3.9 HOW TO Restore Defaults

When starting the application, it is possible to force StreamPix to reset its settings to default values. Hold on **Ctrl – Shift** keys while starting StreamPix. This will pop up the following dialog:



- Select ***Wipe all the workspace settings…*** to clear settings related to workspaces, but keep all StreamPix related general settings.
- Select ***Wipe all the StreamPix …*** to reload the default configuration.

If, as you work with StreamPix, you find that you may have changed some critical setting, StreamPix offers several ways to recover settings:

- **StreamPix Settings > Session > Reset all workspaces...** will erase all the Workspaces while leaving the StreamPix settingsintact.
- **StreamPix Settings > Session > Reset all StreamPix settings to their default values...** restores StreamPix settings to their default values.

TIP: If you have developed a configuration that suits your needs, then it is a good practice to use the **Tools > Save Configuration** option to protect your settings. To Save and Reload a Configuration, see *"Load/Save Configurations" on page 208*.

Managing Workspaces and Cameras

This chapter explains how to set up and manage Workspaces and cameras in StreamPix. This chapter contains the following sections:

4.1 Overview

Multiple Workspaces allow you to load multiple cameras and Sequences in a single instance of StreamPix and to create and save preset settings for future use. Although every grabber/camera must belong to a distinct Workspace, and a Workspace can contain only a single grabber/camera, the same grabber/camera may be assigned to different Workspaces, each with its own settings.

Workspace settings, including the grabber/camera settings, are preserved in the Workspace from one session to the next. This way, when a Workspace is opened, the preset grabber/camera settings will be reloaded. See *"StreamPix Basic Concepts"*.

NOTE: In the StreamPix Single Camera version, only one Workspace is possible.

Workspace Manager

To open the **Workspace Manager**, do one of the following:

- From the Menu bar, select the Workspace tab, and then select the Workspace Manager button
  Or,
- Double-click in an empty space of the Workspace bar.

The **Workspace Manager** controls which Workspaces are loaded and unloaded by using the checkboxes. The Workspace Manager lets you create new Workspaces and, after selecting a Workspace from the list, you can:

- Reset it to factory settings
- Make a duplicate of it
- Rename or delete it.

NOTE: No two Workspaces can have the same name.

NOTE: When you create a new Workspace, you are prompted to assign a camera or grabber to it. To bypass this step, select **Cancel**.

4.1.2 Workspaces and Multi-displays

Although multiple Workspaces may be open at any time, only one Workspace can be active at a time. The active Workspace is the one containing the Active Status icon. Click in any Workspace to make it the active one. See *"Set up Workspace(s)"*.

When a workspace is opened, a tab for it is displayed in the Display Area and the associated Docked Dialogs, including any open modules, are displayed in the Docking panel.

> **Caution:** Don't confuse the Workspace with the contents of the Display Area. You can toggle the display on and off using **Display >On/Off**, and the display of the Docking Panel by selecting **Home > Show Docking Panel**, but the Workspaces will still remain open. See Chapter 6 Managing the Display.

Parameters set in **Home > StreamPix Settings** are always global and apply to every Workspace. Many of these settings can be overridden for the current Workspace (or group of Workspaces) from the Workspace tab. For example, you can change the working folder, the (customtoken) and everything in **Workspace > Workspace Settings**, or assign a custom recording script. If **Home > Select All Workspaces** is enabled, the command is broadcast to every Workspace.

To open or close a Workspace

1. Select **Workspace > Workspace Manager**.
2. Select the Workspace(s) to open, or deselect the Workspaces to close.
3. Select **Done**.

> **TIP:** Click the X button on the right of a Workspace tab to close the Workspace.

See also *"To Set up Workspaces:"* and *"Managing Grabbers and Cameras"*.

4.2 Master Workspace and Select All Workspaces

StreamPix provides two ways to collectively control multiple Workspaces:

- Designating a **Master Workspace** forces all Workspaces to synchronize playback and browsing with the Master Workspace, as long as **StreamPix Settings> Playback > Enable sychronization across workspaces** has been enabled. Synchronisation is done either on the frame index or on the time stamp, depending on the Playback settings. See *"Playback settings"*. If no Master is defined, playback is done independently for each Workspace.
- The **Home > Select All Workspaces** (CTRL+A) option is used to control multiple Workspaces simultaneously. Commands, such as switching between Live and Playback and those associated with playback and recording, including the working folder, the customtoken and everything in **Workspace > Workspace Settings**, or assigning a custom recording script will be broadcast to all selected Workspaces. Individual Hardware properties & Live adjustments will not be broadcast.

NOTE: When **Select All Workspaces** is enabled, toolbuttons with actions that will be applied to all Workpaces will change their icons to show the Link (Select All Workspaces) icon as part of their icons.

To set a Master Workspace:

1. Select **Workspace > Master Workspace**. The currently active Workspace becomes the Master, and the Master icon is added to its tab.
2. Double click on a Workspace tab to quickly set/unset it as the Master.

To Select All Workspaces:

1. Select **Home > Select All Workspaces**. All available Workspaces are linked, and the active Workspace becomes the Master.
2. Optionally, to exclude certain Workspaces from either type of group control, select **Workspace > Stand Alone Workspace**. (See below.)
   - Select the Workspaces to ignore in Multi-Controlled actions.

Stand Alone Workspace Control

The **Workspace > Stand Alone Workspaces** dialog lets you specify a list of Workspaces to ignore when using both **Master** and **Select all Workspaces** options. Regardless of Master Workspace and Select All Workspaces options, if a Workspace is included in the Stand Alone list, it will act as a stand-alone Workspace. It will neither respond to broadcast commands nor broadcast its commands.

For example: If you have Workspace1, Workspace2 and Workspace3, and Workspace 2 is set to Stand Alone, and Select All Workspaces is selected.

- If Workspace 1 is the current Workspace and you press Record, Workspace 1 and 3 will record.
- If Workspace 2 is the current Workspace and you press Record, only Workspace 2 will record.

4.3 Controlling Workspaces

NOTE: References to multiple Workspaces apply only to the StreamPix Multi-camera version. In this section, toolbuttons that do not apply to StreamPix Single Camera version are marked by an asterisk * and are unavailable in the GUI.

Workspace Control

Previous Workspace *

Sets the previous Workspace in the Workspace list as current/active.

Next Workspace *

Sets the next Workspace in the Workspace list as current/active.

Close Current Workspace *

Closes the current Workspace. This can also be achieved by clicking on the [X] button in the Workspace tab.

Customized Workspace

Working Folder *

Opens a file explorer dialog from where you can change the default folder used for saving files created by the current Workspace. If **Home > Select All Workspaces** has been selected, the change will affect all connected Workspaces. (See *"Workspace(s) settings." on page 198*).

Recording Manager *

When using a Recording Manager lets you specify a custom recording script for this Workspace. The default Recording Manager is defined in **StreamPix Settings > Recording Rate > Edit Script**. See *"Recording Manager Editor"*.

Workspace Color *

Sets the Workspace tab and Docked Dialog color associated with the currently selected Workspace to facilitate working with multiple workspaces. The tab font color will either be white or black depending on the chosen color.

Select Time Source

StreamPix image time stamping is typically performed when the image is received from the camera driver API. Because of that, it does not correspond to the exact time at which the camera sensor is exposed. The delay is typically equal to the sensor read out time plus the transfer time needed for all pixels to be received inside the computer memory plus the time the Windows Thread Scheduler needs to notify StreamPix that a new frame is ready. This total time is dependent on the capture media and some other parameters such as the pixel clock. At worst, when the media bandwidth is at its maximum, the time stamp can be off by up to 1/fps. The same time base is shared among each workspace. This allow all workspaces to work from the same time reference and makes sure all the time information is consistent.

By default, each captured image is time stamped using the current **System Time**. However, Streampix supports various other possible time sources, provided you have purchased the External Time Source option. You can then change from the default time source to some other supported time source.

You can also specify a time offset to be applied to the time stamp of each frame. If you capture DAQ data, the DAQ device will also use the Workspace selected time source.

NOTE: If **Home > Select All Workspaces** has been selected, changes here will affect all connected Workspaces.

External Time Source options

Select the **Time Source** button to open the **Time Source** dialog.

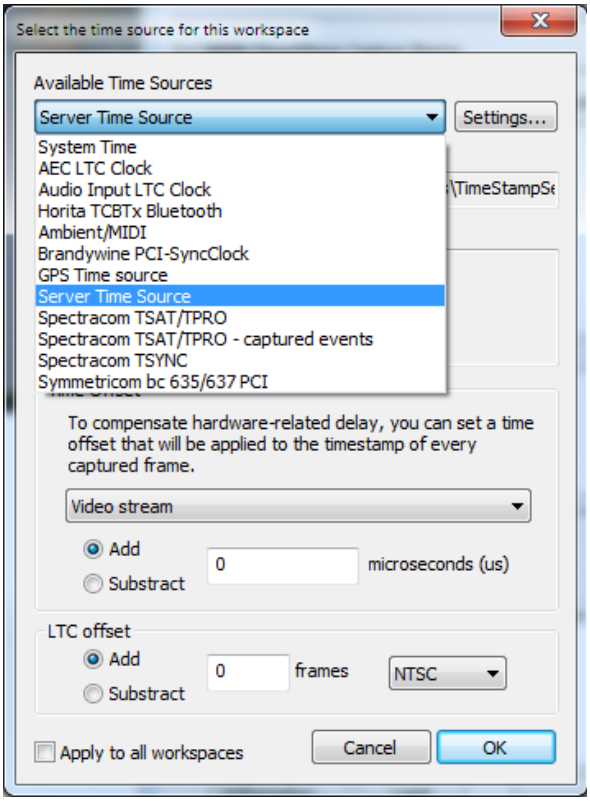


Figure 4-1: Time Source dialog

> **NOTE:** Besides **System Time**, all other options require the **Accurate Time Stamp** option.

The available time sources are:

System Time: Uses the computer local clock. The software can resynchronize its time reference to the computer clock on a regular basis to avoid time drifting. See *"Periodically resynchronize the timebase"*.

Linear Time Code (LTC): Used to identify frames individually by a unique frame number. The value is HH:MM:SS:FF, with FF being a frame number, from 0 to 23, 24 or 29 according current LTC mode with or without drop frame mode. When a LTC time source is selected, frames are still time stamp using ***System Time***, and LTC time code is stored as extra metadata. For accurate LTC frame tagging, it is important to discipline camera frame exposure with time code. Norpix provides different type of hardware to make sure the cameras stays in sync with LTC. Frame capture rate can be at x1 or x2 the LTC rate. The following 4 time sources are LTC related:

- **AEC-LTC Clock:** Uses system time for image time stamping, and appends for each frame. Requires an extra LTC reader PCIe card and append LTC.

- **Audio Input LTC Clock:** LTC being an audio signal, it can be fed to the computer audio input (left line-in or left mic-in). The module decodes the audio signal and uses it to tag each frame with current LTC information.
- **Horita TCBTX bluetooth:** Uses a Horita bluetooth-capable LTC receiver for wireless LTC decoding. Because of the Bluetooth latency, the LTC can be off by a few frames.
- **Ambient/MIDI:** LTC decoding from a MIDI-capable device.

GPS Time Source: Uses the GPS NMEA (National Marine Electronics Association) string messages containing time information as a time source. The precision of the reference time depends on the GPS devices, the type of NMEA string available and the communication baud rate.

- For best precision, the module expects the ZDA NMEA string. If no ZDA is available, it defaults to RMC, and eventually GGA. RMC and GGA string time information are less accurate than ZDA.
- Baud rate should also be set to the maximum possible rate to allow fast communication speed and better accuracy in between the real GPS time and the frame time stamping.

Information related to the GPS device (COM port, speed…) must be set via the Settings page.

This time source can be used in conjunction with the GPS/DMI Positioning module. In which case, both the time source and the module will share the received NMEA string. In the GPS/DMI module, make sure to select the NMEA Shared GPS device in the device list. See *"GPS / DMI Positioning"*.

A 10 Hz ZDA output typically includes 2-digit precision (10 milliseconds), but because it is sent through RS232 com port, the communication speed is not very fast, and it is asynchronously received at the computer level. Hence, once StreamPix interprets the string we have measured a possible accuracy jitter of 10 to 50 milliseconds. This means that by the time the GPS device outputs the NMEA string with the proper ZDA time information, the time is already past. The computer continues to pull characters from the serial com port at fairly slow speed. For instance, a 9600 bds takes a few more milliseconds to transmit each character. All this adds some variability in the accuracy of the decoded time.

Once the whole time is decoded, the time source compares the last received time with the current running time received from the previous messages. Two things can happen:

- The current running time is ahead of the received time: this time is ignored to avoid going backward.
- The current running time is late versus the received time: the running time is set to run at a faster pace to keep up with the received time.

All this leads to some small variability in the accuracy of the received time, especially because Windows is not a real-time OS and lacks predictable time slices allocated for running processes.

Server Time Source: The Server Time Source uses a new utility allowing for time handling with a much better accuracy than the previous Server Time Source. Please refer to the project www.windowstimestamp.com for further details.
When selecting that time source, the ***G_Kernel.exe*** utility will be started in the background when StreamPix starts and stopped when StreamPix quits. Since ***G_kernel.exe*** requires some low-level access, the Windows User Account (UAC) control dialog may pop up. You may want to lower the warning level of the UAC settings to avoid the prompt each time.
Server Time Source supports all of the features listed in the Windows Time Stamp project: NTP sync is possible from any internet NTP server, as well as time based synchronization. Simply start the ***G_GUI.exe*** utility provided from `the C:\Program Files\Common Files\Norpix\Timesources\WindowsTimeStamp` folder to browse for the various options.

Spectracom TSAT/TPRO/TSYNC: Uses an external PCIe device from Spectracom. The board can be either genlocked to a GPS signal or IRIG B timebase. Accuracy is within the microsecond. Upon receiving a new frame, StreamPix reads the time inside the device registers.

Spectracom TSAT/TPRO Event: Uses an external PCIe device from Spectracom. The time capture input of the board captures with precision when the frame was captured. External exposure signal must be provided to the board time capture input.

Meinberg Device: Uses Meinberg time receiver devices: GPS based, or IRIG B base. The device plugs into the computer as a PCIe card or a USB device. Accuracy is within the microsecond. Upon receiving a new frame, StreamPix reads the time inside the device registers.

Meinberg Device Event: Uses Meinberg time receiver devices: GPS based, or IRIG B base. The devices plug into the computer as PCIe cards. The time capture input of the board captures with precision when the frame was captured. External exposure signal must be provided to the board time capture input.

Symetricom Devices: Uses a Symetricom time capture device. The device plugs into the computer as a PCIe card. Accuracy is within the microsecond. Upon receiving a new frame, StreamPix reads the time inside the device registers.

Brandywine devices: Uses a Brandywine time capture device. The device plugs into the computer as a PCIe card. Accuracy is within the microsecond. Upon receiving a new frame, StreamPix reads the time inside the device registers.

For the latest list of supported time devices, see: http:**//www.norpix.com/support/compatibletimesource.php**

Use the dropdown list to assign to which stream the offset is applied. You can apply a different time offset to each stream (video, audio, DAQ).

Workspace Settings

The **Workspace Settings** button opens a dialog from where you can override the default AVI, Color Processing, Recording, and Sequence settings for the currently active Workspace. The **Advanced** tab lets you determine StreamPix Quick Save behavior when all Workspaces are selected.

By default, these settings are defined via StreamPix global settings and apply to all Workspaces unless they are overridden via this dialog.

To change the Workspace settings

1. Select **Workspace > Workspace Settings**. A dialog opens with tabs for **Workspace_Name Settings > AVI | Color Processing | Recording | Sequence | Advanced**.
2. Select the **Override StreamPix Settings** box.
3. Set the parameters that you want to change. See *"AVI settings"*, *"Color Processing settings"*, *"Recording settings"*, and *"Sequence Settings"*.
4. Select **OK**. The new parameters are applied to the current Workspace(s).

Advanced Workspace settings

The **Workspace Settings > Advanced** tab lets you set the behavior per Workspace when the **Home > Quick Export** button is selected. The options are:

- **Always QuickSave:** The default, the Sequence will always be saved according to the **Settings > More... > Quick Export** parameters. See *"Quick Export" on page 201*.
- **QuickSave if focussed:** The Workspace must have the keyboard or mouse focus for the Quick Export to be performed.
- **Never QuickSave:** The Quick Export command will be ignored for this Workspace.

Auto-Naming Tokens

Increment

Allows you to see and edit the current value of the (increment) token used in some auto-naming schemes. If all Workspaces are selected, the change is applied to every Workspace.

Custom Token

Allows you to set a value for the (customtoken) for the current Workspace. If blank, the Workspace will use the default token set in **StreamPix Settings > Auto Naming**. If all Workspaces are selected, the change is applied to every workspace. See *"Auto Naming Settings"*.

> **NOTE:** To be used, the (customtoken) must be included in the auto-naming scheme defined in **StreamPix Settings > Auto Naming.**

Edit Default Token

Edit the default (customtoken), as set in **StreamPix Settings > Auto Naming**. Every Workspace that uses (customtoken) in its filenaming schemes will use this value.

Recording Manager

If in **StreamPix Settings > Recording Manager** you enabled **Save one frame every x frames**, this slider is used to set how many frames are skipped between each saved frame. For example, if the camera frame rate is 30 fps, using a value of 1 in 15 will save 2 frames every second. See *"Recording Manager settings"*.

4.4 Managing Grabbers and Cameras

Camera/Frame Grabber

Load

Selecting the **Load Grabber** button lists all supported grabbers/cameras, allowing you to select the one to be used. You can also use this option to reload the camera with its default settings or load custom camera settings from an .xml file (created from **Export Settings**).

Duplicate Camera Stream

This will show a dialog with all Workspaces loaded. Select a Workspace to get a copy of every frame captured by that Workspace camera. This can be useful if you want to save a stream to two different formats at the same time. (Not available in the Single-Camera version.)

Unload

Unloads the current camera (or duplicate), if any.

Reload

Reloads the current camera. Use this after changing the buffer count for a camera. (Buffers are allocated when a camera loads.)

Settings and Adjustments

Hardware Properties

Settings shown in Hardware Properties require the camera to stop streaming, as they can cause modifications in the image format, requiring buffer reallocation and other profound changes in StreamPix. For instance, modifying the ROI (region of interest) and capture bit depth (8 bits / 16 bits) hardware settings will change the image format. As such, accessing Hardware Properties while the camera is in Live mode will automatically suspend Live to enable setting modifications.

Live Adjustments

Live Adjustments are grabber settings that can be changed while the camera is streaming, as they do not affect image format. For instance on most cameras, exposure, gain and brightness are adjustable in Live mode. Accessing Live Adjustments while the camera is not Live will automatically start the Live process. On most cameras, every setting in Live adjustment will be also available in Hardware Properties, although the opposite is not always true.

Advanced Settings

Advanced settings are available on some models of GigE cameras.

Export Settings

Export the current camera settings to an .xml file.

Buffers

Buffer count

Changes the number of buffers allocated by the grabbers in this workspace. If 0 is used, the grabber will use the default value set in **Streampix Settings > Workspace(s)**. See *"Default read-ahead buffers"*.

> **NOTE:** Reload the camera after changing the buffer count.

Miscellaneous

Show Image Information

This lists complete information on the format of the frames received from the grabber.

Watchdog

Here you can specify a timeout value in seconds. When the specified length of time elapses without a new frame being sent by the camera, a yellow warning sign is shown in the display area. Useful, for example, if you want to get a visual notification when a camera has been disconnected.

5

Using Audio and DAQ

This chapter contains information on working with Audio and DAQ files. This chapter contains the following sections:

NOTE: The Audio and DAQ modules each require a specific license.

5.1 Audio and DAQ Overview

StreamPix lets you record synchronized audio and/or DAQ data in conjunction with the video within a single or multiple Workspace. Recording video and DAQ can be suspended and resumed into the same DEQ+DAQ files.

StreamPix typically uses a Sequence file (.seq) for the video along with an audio and/or DAQ file. The audio file extension is .aud, and DAQ is .daq. The Audio and DAQ tabs are added to the menu bar once you have acquired the appropriate licenses.

Each Workspace can have (or not) Audio, DAQ, and video. The buttons in the Audio & DAQ tabs interact with the audio and DAQ files of the active Workspace.

The following lists the audio and video capabilities of StreamPix:

- Simultaneously recording video and audio to AVI
  Simultaneously playback video and audio from AVI
- Recording video to MP4
  Recording video to TS
- Simultaneously recording video to SEQ and audio to AUD
  Simultaneously playback video from SEQ and audio from AUD
- Simultaneously recording video to SEQ and audio to WAV/BWAV
  Simultaneously playback video from SEQ and audio from WAV/BWAV
- Simultaneously recording video to SEQ and audio to AAC
  Simultaneously playback video from SEQ and audio from AAC
- Simultaneously recording video to SEQ and audio to MP3
  Simultaneously playback video from SEQ and audio from MP3

NOTE: If you recently updated StreamPix to use Audio and/or DAQ modules, and you do not see the Audio and/or DAQ tabs on the ribbon, you may need to update the configuration file as follows:

1. Go to **Settings > Interface > Customize Ribbons**.
2. Select **Restore Defaults** and **OK**.
3. Restart StreamPix.

File Types

StreamPix supports the following audio and DAQ file formats:

File Type	Description
Audio files (.aud)	A raw audio file supported by StreamPix and including time stamp information allowing random sync between audio, video and DAQ data.
NorPix DAQ file (.daq)	Data acquisition file for all the DAQ related data. Includes DAQ samples as well as some time stamp information
DAQ Graph Settings (.display)	The DAQ Graphs settings associated to a specific DAQ file.

Table 5-1: StreamPix Audio and DAQ file types

Here is an example of the files generated for a Sequence named “Capture” that has both audio and DAQ.

- Sequence: Capture.seq
- Audio File: Capture.aud
- DAQ File: Capture.daq
- Graph Settings Files: Capture.daq.display.

5.2 Managing Audio

The Audio tab is added to the menu bar once you have acquired the appropriate license.

Audio tab

The Audio tab contains specific tools to manage audio. The settings in the Audio tab interact with the audio files of the active Workspace. You can set separate drivers for both the input (**Audio Driver** area) and the output audio (**Audio Output Driver** area). The contents of the **Audio Settings** dialog boxes are dependent on the selected driver.

Audio Driver and Audio Output Driver

Driver

Use the drop-down list to select the audio driver to use: ASIO, DirectX or Grabber. The DirectX driver is compatible with almost all sound cards supported by Windows.

The ASIO driver requires an audio input device that is ASIO compatible. The ASIO driver is limited only by the number of inputs on the external audio device. Most devices that support more than 2 audio inputs simultaneously have an ASIO driver. On the other hand, most devices that have a DirectX input driver can handle only 2 input channels (left and right).

Audio Settings

The **Audio Settings** dialog box lets you customize the audio format for the recording. In the dialog box for the DirectX driver you can set the input (recording) and output (playback) devices along with the input and output formats. The #Samples is the number of audio samples per buffer. Using a larger value may help reduce audible noise and “clicks” during playback.

By default, you should select the largest #sample available (this may be hardware dependant).

The audio synchronization with the video is “by buffer”: each buffer includes its time stamp information. Short buffers result in a smaller granularity for synchronization. For example, when sampling at 44.1kHz, there are 44.1k samples per second. Hence a 4096 buffer size will result in about 44100/4096 = 10 synchronization points per second of video. At 30 fps, that will result in audio synchronization with video at more or less 3 frames.

Recording

Target

Use the drop-down list to select the target file format for recording. The choices are:

- **None:** meaning that no audio file will be recorded.
- **AUD:** A NorPix proprietary format which stores raw/lossless audio.
- **BWAVE** **[definition needed]**
- **MP3** **[definition needed]**
- **AAC:** Advanced Audio Coding provides lossy digital audio compression similar to MP3, but with generally better sound quality at similar bit rates.

File Info

This shows some information about the current audio file, if any.

Audio Levels

Input Level

This shows the current volume level of the input device. You can use it to see if your device is hearing anything. You can use the drop-down list to select which channel(s) of the audio device to monitor.

Audio Output Driver

The Audio Output Driver area lets you select the output driver and hardware device.

Playback Position

The Playback Position displays the start and stop position for the current recording. You can edit the start position for playback.

Audio buffer usage monitor

When recording, audio buffer usage is monitored and displayed in the Docking panel. If buffers run out, an **Audio Packet Drop** event is generated and stored in an XML file and a warning pops up in the Information Bar.

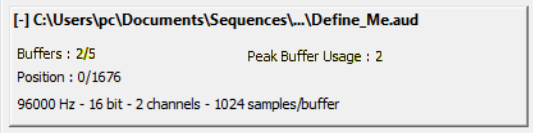


Figure 5-1: Audio buffer usage monitor

Volume

Output Volume

This slider allows you to adjust the audio volume for playback.

5.3 Managing DAQ

DAQ stands for Data Acquisition, which is a way of sampling information from the real world to generate data that can be manipulated by a computer. The DAQ tab is added to the menu bar once you have acquired the appropriate license.

Within StreamPix, DAQ is related to devices that perform analog to digital conversion for electric signals, like voltage, heat, temperature, pressure, etc.

For example, DAQ will allow you to monitor and collect the temperature of a device while also video recording it.

DAQ data are typically sampled at high frequency, like 1000 Hz, hence much faster than a video frame. So, there are multiple DAQ data sets to display per captured frame. Also, a typical DAQ application will sample multiple signals (lines) in parallel. DAQ can be sampled over 8 bit (256 values), or more typically 16 bit.

Audio is basically a DAQ data, typically sampled at 44.1 kHz, 16 bit. Stereo would be 2 lines of data acquired in parallel.

DAQ is typically captured via DAQ frame grabbers, either PCIe boards or via a USB interface. When exporting video with DAQ data, DAQ can be exported to DAQ/XLS/ CSV file container. Range selection is supported.

The DAQ global settings are set through the **Settings > DAQ** page.

When exporting, DAQ can be overlaid onto the image by using: **File | Export | Display Area.**

Time calibrating video and DAQ data

For aligning the DAQ data to the video, a time calibration must be done. Video frames are typically time stamped after exposing, readout and refer to the host, typically when the frame is received by the computer driver.

DAQ data are grouped into packets. Packets are also time stamped when received from the DAQ device streaming channel, following the digitization, buffering and streaming to host. Digitization frequency, number of channels, streaming speed and packet size are all factors that influence the time it takes for the host to receive the DAQ data.

Since the same time source reference is used for video, audio and DAQ, the latency between these different data channels may cause the data stream time stamps to be out of sync. At low fps, it may be unnoticed, however at high fps you might notice an alignment gap.

As a work around, you need to “time calibrate” one stream to the other by selecting **Workspace | Time Source** and adjusting the time offset for either the video or the DAQ channel.

Since the DAQ channel is usually the fastest sampling rate, it is recommended to offset the slowest (video) time stamp. For example, running a camera at 50 fps, frame time is 1/50=20 millisecond. The video time could be up to 20 ms late from the DAQ time stamp.

NOTE: It is important to recalibrate each time the DAQ parameters such as sampling frequency and video capture rate changes, because latency varies.

DAQ data are received as packets, i.e. a dataset. Each dataset is time stamped upon being received. Each DAQ sample time stamp is then calculated from its dataset time stamps, based on sampling frequency and sample position in the dataset.

When exporting video and DAQ, the granularity is based on a whole dataset. As an example, running a camera a 1000 fps, while the pooling delay is set at 10 millisecond, means a dataset will contain DAQ data for 10 frames. Exporting from frame 5 to 10, will still result in exporting the whole 10ms dataset. Post data processing will be needed to get rid of the unneeded DAQ.

When possible, we recommend setting the pooling delay close the camera sampling duration to allow better matching granularity.

The DAQ (Data Acquisition) tab

The DAQ (Data Acquisition) tab provides the following tools for working with DAQ.

DAQ Driver area

Driver

Use the drop-down list to select the DAQ driver to use. The **DAQ module** option is only used by 3rd party modules using DAQ. The **NorPix Virtual DAQ** driver can be used to simulate a DAQ device to generate simulated readings.

Device

Use the drop-down list to select the DAQ device to use. Selecting a different driver will change this list according.

Lines Configuration

NOTE: The Lines Configuration dialog is hardware specific.

The Lines Configuration dialog allows you to set up the DAQ device. The list shows one line for each input channel. Selecting a row in the **Acquire** column instructs StreamPix to

record data read from this channel. **Line** is the line ID. **Name** is an editable string used to label each channel. By default, if a channel has not been given a label, it will be labeled after its line ID value.

Often, the signal from a device will have a value between -1 and 1. StreamPix can apply a linear conversion to each channel to convert the original reading to an accurate value. The linear conversion use the Ax + b formula, with A/B being values in the "A/B" columns and "x" being the value read from the device. The **unit** column is used to specify the measurement unit (cm, km, kg, etc), this label is only cosmetic.

The dialog may also allow you to change the Analog Range.

The polling interval is the length of a single data set. A long interval will create larger data sets which reduce overhead while streaming data to disk. A shorter interval will allows greater granularity when browsing the data sets and a smother flow in the display graphs.

The sample rate of the DAQ device is specified in #reads per second.

NOTE: Some devices have additional settings accessible by selecting **More Settings**. For instance, MCC1208HS include a way to use an external clock for defining the sampling frequency. More setting button allows you to enable that operating mode.

Activate DAQ

This button toggles the DAQ acquisition on/off. If DAQ acquisition is enabled at the time a recording is started, a DAQ file will be created, and StreamPix will save the data received from the device to a .daq file.

NOTE: Double-clicking in a DAQ Graph area will open the corresponding Graph Settings dialog (Live or File).

DAQ Graphs area

Graph Settings (Live)

This dialog allows you to customize the display graph for each acquired channel. If **Hide Disabled Lines** is selected, the list will not show the channels which were not selected for acquisition in the **Line Configuration** dialog.

Each line of the list shows: the Line ID, the linear conversion it uses, the draw state and the drawing context. To change the display property of a line, click on it and use the controls below the list. To change the properties of several lines at the same time, select multiple lines using Ctrl-click (atomic selection) or Shift-click (range selection).

Draw line

If checked, StreamPix will draw the data line for this channel in the target display area.

Line Color

The color used to draw the line in the graphs.

Time Range (ms)

The length of the display graph in milliseconds (X axis). The time range is always shared by all lines.

If the time range is shorter than the total length of the recording (it usually is), the graph only show the values around the current position.

Target Display Area

By default, each channel has its own graph display. However, it can be hard to manage/ view a lot of displays when several channels are active at the same time. This option allows the user to regroup channels in a single graph display. To do so, use the drop-down list to select in which display area you want to plot the channel data.

Selecting multiple curves

CTRL-click in a graph to select another curve.

Left-side scale (Right-side scale)

Use this section to customize the scale of the Y axis. Selecting “Automatic” will let StreamPix dynamically adjust the scale to show the whole data lines. Selecting “Constant values” will allow the user to specify the minimal (bottom) and maximal (top) values for the Y axis.

There can be a scale on the left side of the graph and a different one on the right side. This is useful when you want to plot several data lines that don't share the same data range or don't use the same measurement units.

Chart Merge Settings

This section allows you to assign the data line to either the left-side or right-side scale of the graph. If the line uses a different display area than its own, the scale refers to the scales defined in the target display area. Selecting **Scale-free** will make the data line use the full range of the graph without any regard for the values of its Y-axis scales.

Plot the current image underneath the graph

Selecting this option will draw the sequence image at the current position underneath the graph. If you select this option, make sure to choose line colors that have a good contrast with the video images.

Restore default settings for the selected line(s)

Click on this to restore the default graph settings for the selected line(s).

Graph Settings (File)

This uses the same dialog as the **Graph Settings (Live)**. When recording from a DAQ channel, the current **Graph Settings (Live)** are saved along with the DAQ data file (in a .display file). When reloading a previous DAQ file, its graph settings are reloaded along with it. The **Graph Settings (File)** allows you to modify the existing graph settings. Any changes made are saved to the display file. Editing this won't change the graph settings of future DAQ recordings.

Playback Position area

Current Data Set

The index of the current data set. Using the edit box, you can change the current index and StreamPix will update the graphs accordingly. Left-clicking anywhere in a graph itself will change the current data set to the one located under the current mouse position.

Total Data Sets

The total number of data sets in the .daq file.

Time Range area

A pull-down menu allows you to directly select the wanted range. Or, you can type in the desired range. Values in the drop-down list are customizable from **Settings > DAQ** These will decrease or increase the time range of the currently selected graph by a fixed time length (see “DAQ settings”).

Export area

Export To .XLS

This allows you to export the content of a DAQ data file in Microsoft Excel® .xls format.

Export To .CSV

This allows you to export the content of a DAQ data file to a CSV (Comma Separated Values) text file. CSV files are simple text files that can be opened in Microsoft Excel®, Open Office Calc®, and many other 3rd party applications.

Export with Image

DAQ can be exported overlaid on the image by using: **File | Export | Display Area.**

Managing the Display

This chapter explains the display management tools available in StreamPix. This chapter contains the following sections:

6.1 Display Tools

You can use the display settings to customize the look and feel of StreamPix to suit your needs. The default display settings are set through the **StreamPix Settings > Interface** and **Displayed Data** pages. See "Interface settings" and "Displayed Data settings". The **Display** tab lets you customize settings for the active Workspace and, if **Home > Select All Workspaces** is selected, for any associated Workspaces. Other tools for controlling the display are located on the Home and Workspace tabs.

Modifying the GUI

You can modify the GUI to suit the way you work. You can even save alternate GUI configurations for re-use later. See "HOWTO Modify the GUI".

Display Tab

The Display tab contains the following groups of tools:

Display Group

Switch Display

In either single or multiple display mode, the **Switch Display** button brings to the front the next display area. A Workspace can have a several display areas:

- Live
- Sequence / AVI
- An audio file
- DAQ
- Other (typically added by an external module like LineScan viewer, SimulPix, Live Levels, Sequence Levels...

Toggle Display

Toggles the display of images on/off. On slower computers, it is recommended to disable the image display to alleviate some CPU load while recording.

Full Screen

Toggles the Full-screen mode on, causing the display area to cover even the Windows taskbar. Use the F12 key to toggle back to regular mode.

Overlays

Enables or disables the Workspace Status overlay icons (sequence, live, record, etc.). See "Workspace Status Icons".

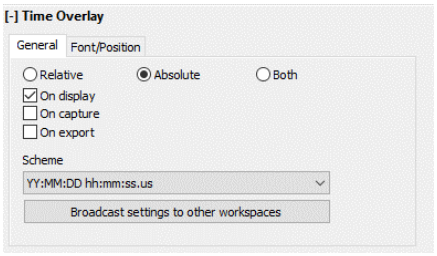
Set Background Color

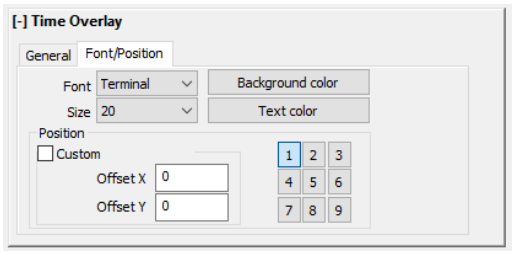
This allows you to change the color of the display area in which images are displayed. The display area is white by default, so if the captured images have white borders, changing the background color will help to clearly see the borders. For low light conditions, a dark red color is often preferred.

Time Overlay

The **Time Overlay** button pops up the time overlay dialog in the docking panel, replacing the old Time Overlay Module.

The Time Overlay allows you to "burn" the time stamp associated with each image directly on the image itself or have it overlay (no damage to the image data). This can be useful when capturing/exporting to AVI or image files because those formats don't have time stamp support.





The time can be written as absolute or relative to the first frame of the sequence. Various schemes can be selected for formatting the time stamp. Contact NorPix if a specific scheme is required. It can easily be added.

In the ***Font & Position*** tab, you can specify the font type and size. For best results, use fixed width fonts such as Terminal or Courier.

Use ***Change Font Color*** and ***Change Background Color*** to set the text overlay colors. If the text background color is the same as the font color, no background color will be used resulting in a transparent background. When working with monochrome images, no color is available.

The image location can be one of the 9 pre-defined positions or a custom position can be set by specifying a precise horizontal & vertical offset.

All settings can be broadcasted to the other workspaces.

Zoom Group

The Zoom group of tools let you enlarge or reduce the display of the active image. Individual Zoom tools let you zoom on the XY axes, X axis or Y axis only, and fit image to window or window to image. Mouse over an icon to see a description of what that tool does. The Zoom tools work by increments of 10%. Reset Zoom to 100% will reset the image size to 1:1 ratio. As having the zoom set higher or lower than 100% will use a bit of

CPU, it is recommended to leave the zoom at 100% while recording, to free as much CPU as possible for the recording process.

NOTE: Not all grabbers/cameras support all of the zoom features. If tools are unavailable, it is due to hardware limitations.

Multi-Display Layout

The **Multi-Display Layout** buttons allow to configure the multi-display rows and columns. The choices are 2x1, 1x2, 2x2, Custom, and Auto-Fill. Once the layout is done, you can assign a display to each area by right-clicking in each and selecting from the dropdown list.

The **Custom** button lets you click-and-drag to specify a specific number of rows and columns. It also contains a **Complex Layout** option where you can click-and-drag to draw your own custom layout.

The **Auto-Fill** button creates enough rows and columns to show the active display of every Workspace and automatically fills the areas.

- To add a Workspace, see “Set up Workspace(s)”.
- To add a camera to a Workspace, see “Load Camera(s)”.

Hybrid Mode

The **Hybrid Mode** lets you toggle the Hybrid display which is a mix of single & multi displays. In Hybrid mode, the display area is split in two. One side is the regular multi-display area, and the other side shows the currently selected display. The number of columns and rows in the hybrid multi-display area can be customized with the usual controls. You can also change the position and size of the hybrid display area. The multi-display area will be resized accordingly.

Thumbnails View

Thumbnails View lets you see the individual frames in a Sequence as thumbnail images. Select **Enable** to toggle Thumbnail View while the Sequence is in playback mode. The Plus and Minus buttons increase or decrease thumbnail image size. The table below describes Thumbnails View toolbuttons.

Toolbutton	Description
	Toggle Thumbnail View on/off. The dropdown list contains options to number the images in the Sequence and set a sub-sampling rate.
	Scroll thumbnail display one page up.
	Scroll thumbnail display one page down.
	Scroll thumbnail display one line up.
	Scroll thumbnail display one line down.
	Increase thumbnail image size.
	Decrease thumbnail image size.

Table 6-1: Thumbnails View toolbuttons

Select a thumbnail to move the playback position in the Sequence Slider to that image. Double-click a thumbnail to change the display back.

NOTE: Toggling between normal and thumbnail view may takes a bit of time, because the software must read a significant amount of data to generate the thumbnails before displaying them.

Refresh Rates

The **Single Display** and **Multi-Display Refresh Rate** let you adjust the refresh rates for the display areas. These sliders only affect the display refresh speed, meaning that there is no effect on the camera frame rate or the capture rate. If the StreamPix window has trouble redrawing itself, or if there is a noticeable command input lag, lowering the refresh rate should help responsiveness by reducing the CPU usage.

Other Display Controls

Not all of the display controls are on the Display tab. There are also the following tools.

Home > Show Docking Panel

Show or hide the Docking panel in which the docked dialogs appear.

Home > Multi-Display

(Not available in the Single-Camera version) Toggles between single and multi-display modes. Multi-display allows you to see multiple displays simultaneously. For example, you could display both the live feed and a sequence playback at the same time or see all of a Workspace sequences at the same time.

The **Home > Multi-Display** dropdown list contains the same display tools described in “Multi-Display Layout”.

Workspace > Workspace Color

Sets the Workspace tab and Docked Dialog color associated with the currently selected Workspace to facilitate working with multiple workspaces. The tab font color will either be white or black depending on the chosen color.

> **NOTE:** Do not confuse this with the **Display > Background Color** option. See “Set Background Color”.

Home > StreamPix Settings > Displayed Data

Used to determine the image information data to be displayed in overlays. See “Displayed Data settings”.

6.2 Controlling Multiple Cameras

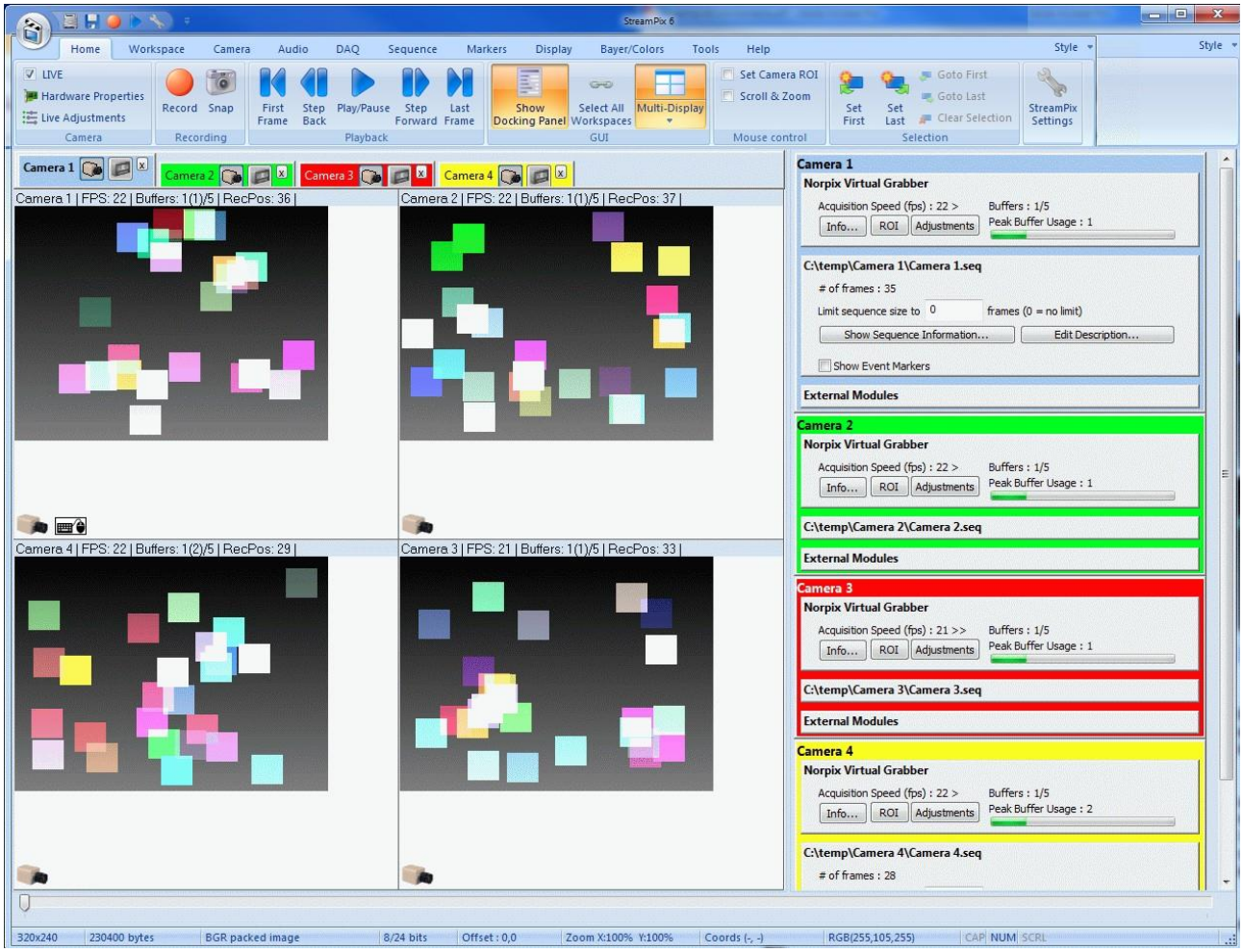


Figure 6-1: Multiple camera display

NOTE: Available in Multi-camera version only.

To control multiple cameras at once, a separate Workspace needs to exist for each one. Once your cameras are loaded, StreamPix Multi-Display capabilities can display multiple feeds simultaneously. Multi-Display mode is toggled from **Home > Multi-Display** (which also has a drop-down menu for the most common Multi-Display options).

There are two options for viewing the Live feed and the associated Sequence file:

- **Live feed and Sequence share a display area:** If, from the display area right-click menu you select **Enable Auto-switch between Live and Playback**, you can select either the **Live** or **Sequence** icon from the Workspace tab to toggle betweenthe

two modes. If both the Camera and Sequence have been loaded, the **Display > Switch Display** toolbutton has the same effect.

- **Live feed and Sequence use separate Workspaces:** If, from the display area right-click menu you deselect **Enable Auto-switch between Live and Playback**, you can see both the Live feed and the Sequence at the same time in separate viewing areas.

NOTE: If, while using two separate Workspaces, you select the **Display > Switch Display** toolbutton, both displays toggle in the sameWorkspace.

NOTE: Two areas can not show the same display at the same.

To color-code the Workspace tab and the associated docked dialogs, see “Workspace > Workspace Color”.

7

Controlling Light and Color

This chapter describes how to control light and color in StreamPix. This chapter contains the following sections:

7.1 Bayer Conversion and Color Correction Primer

A Bayer filter mosaic is a color filter array for arranging RGB color filters on a square grid of photo sensors. The term derives from the name of its inventor, Dr. Bryce E. Bayer of Eastman Kodak, and refers to a particular arrangement of color filters used in most single-chip digital image sensors used in digital cameras, camcorders, and scanners to create a color image.

Bayer conversion is the process by which raw images from a Bayer camera are color-converted using a Bayer interpolation algorithm. Some cameras equipped with a Bayer filter will perform the color interpolation process before images are sent to output. However, most cameras do not do this, leaving interpolation to applications like StreamPix.

The filter pattern is 50% green, 25% red and 25% blue, and hence is also called BGGR, GBRG, GRBG or RGGB depending on the color of the first pixel in a 2x2-pixel square.

Bayer's patent called the green photo sensors luminance-sensitive elements and the red and blue ones chrominance-sensitive elements. He used twice as many green elements as red or blue to mimic the human eye's greater resolving power with green light.

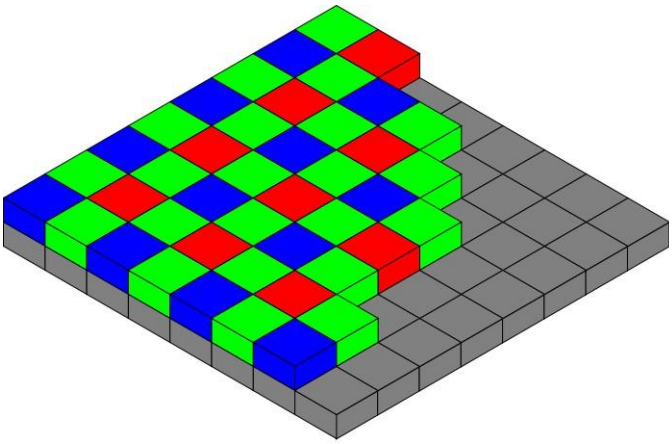


Figure 7-1: Bayer Color Remapping

The raw output of Bayer-filter cameras is referred to as a Bayer pattern image. Since each pixel is filtered to record only one of three colors, two-thirds of the color data is missing from each. To obtain a full-color image, various demosaicing algorithms are used to interpolate a set of complete red, green, and blue values for each pixel. Different algorithms requiring various amounts of computing power result in final images of varying quality.

StreamPix includes Bayer conversion functionality as well as strong color balancing and grading. Color balance can be applied independently to any supported image format, i.e. raw images, color YUV or RGB. Changes to the color balance, saturation and contrast, plus specific adjustments to shadows and highlights can all be performed using these various tools.

Since a raw image contains all of the color information, StreamPix typically records images from cameras as raw data. Because of the computational requirements, Bayer conversion and color grading is normally performed only when needed, namely when an image is being displayed, exported to an AVI movie or exported to an individual image file.

This has two advantages: raw image size is 3 times smaller than color images, and CPU resources are conserved (Bayer rendering and color grading are quite computation-intensive).

7.2 Applying Processing

StreamPix provides both Bayer Color Conversion and Color Correction settings that may be applied separately, or used in conjunction. Bayer and Color Correction settings are automatically saved and restored when reloading.

- **Bayer Conversion Settings** must always be done on an individual Workspace basis, and based on the camera type. Different types of cameras may require different Bayer patterns.
- **Color Processing** settings may be set through either:
  - **Home > StreamPix Settings > Color Processing** page for settings that will apply globally,
    or,
  - **Workspace > Workspace Settings > Color Processing** and **Sequence** pages for settings that will apply to the current Workspace. You must select the **Override StreamPix Settings** option for local changes to become effective.

NOTE: If All Workspaces are selected (CTRL+A), Bayer and Color balance will apply to all Workspaces.
If all Workspaces are not selected, Bayer and Color balance will apply to current Workspace only.

The Color Processing and Sequence parameters available are identical in either case. See “Color Processing settings” and “Sequence Settings”.

NOTE: Although it may be possible, there is no need to set the Bayer Conversion format at the hardware level. Best results are achieved by making sure that the camera delivers a raw image.

TIP: Multiple identical cameras may still require individual Color Processing settings to compensate for local conditions, etc.

NOTE: Changing the camera ROI may change the Bayer pattern, depending where the top left corner of the image is set.

Processing Levels

Both Bayer Conversion and Color Processing can be applied at the following levels:

At Grab Level: The selected processing will be applied on images as they are received from the camera. As this is the earliest time at which image processing can be done, the frames will already be processed before being streamed to disk, displayed or exported. This method requires significant processing power and typically triples the required streaming bandwidth. All incoming frames from the video source are processed.

On Displayed Frames: the selected processing will be applied on images before they are drawn in the display area. The processing will only be done if the frame is actually drawn on screen. This process takes place at the end of the process chain and thus, doesn't affect frames before they have been recorded. Checking this will have no effect if **At Grab Level** or **On Exported Frames** is also selected because the processing won't be done twice.

On Exported Frames: the selected processing will be applied on images before they are exported to another format. The source images remain unchanged.

Bayer Pattern

Chose the Bayer pattern corresponding to your camera. Consult your camera documentation if necessary.

> **NOTE:** The Cayer Bayer pattern specified in **StreamPix Settings > Sequence > Compression** must match the Bayer pattern set in **Bayer/Colors > Bayer Pattern**.

Accuracy

The Bayer conversion accuracy algorithm is only used when applying Bayer conversion on exported frames. By default, StreamPix always uses the **Accurate** mode. **Fast** is used for all sample factors other than 1:1.

- **Fast:** bilinear forward interpolation (quickest, less accurate).
- **Accurate (IPP):** full bilinear algorithm using Intel IPP library. Somewhat slower, but more accurate.
- **Adaptive HDDA:** Adaptive Homogeneity-Directed Demosaicing Algorithm (images with bit depth greater than 8 bit will first be converted down to 8 bit in order to apply this interpolation). Takes a lot of computing power, hence it is the slowest, but also produces the best results.

Sample Factor

Only affects Bayer conversion done on displayed frames. Choosing 1:2, 1:4 and 1:8 will reduce the CPU usage required for display at the cost of a smaller rendered image. For example, this could safely be used when working with multiple cameras and where the image resolution is much larger than the actual monitor resolution.

For example, using 4 HD 1920x1080 cameras and a single HD monitor in a 2x2 quadrant display mode, the software would have to Bayer process 4 full images then shrink them down to match the screen resolution. Using a 1:2 sampling will reduce the Bayer Processing and final image size without impacting the display quality.

There is also the option of a dynamic Bayer sample factor, depending on the available display space.

Recalculate Lookup Table

Recalculates the Lookup Table based on the next frame that will be processed using the currently defined color balance algorithm. This command should be run following enabling a LUT file in the **Color Grading Processing > 1D | 3D LUT setup** areas or when lighting conditions of the image area have changed.

Export LUT

Lets you save the current LUT to a file so that it can be re-used later. By default, it is saved in the same folder as the files for this Workspace.

TIP: Current Bayer and Color Processing settings are automatically saved and reloaded from session to session.

7.3 Non-linear Remapping via ASC CDL Formula

The American Society of Cinematographers Color Decision List (ASC CDL) has defined a format for the exchange of basic primary color grading information. A 3 parameters formula can be used to define most possible remapping and color correction.

The formula for ASC CDL color correction is:

$$out = (i * s + o)^1$$

where:

- *out* is the color graded pixel code value.
- *i* is the input pixel code value (0=black, 1=white).
- *s* is slope (any number 0 or greater, nominal value is 1.0).
- *o* is offset (any number, nominal value is 0).
- *p* is power (any number greater than 0, nominal value is 1.0).

The formula is applied to the three color values for each pixel using the corresponding slope, offset, and power (gamma) for each color channel.

When ASC CDL is enabled, the Color Remapping dialog opens in the Docked dialog panel, from where you can adjust the color balance in real time.

1. Select **All Channels** to apply the same formula to all 3 channels, or select each color in turn.
2. Use the sliders to adjust the Gamma, Offset, and Gain.

NOTE: The **Reset** button resets the default values: Gamma(1), Offset(0), Gain(1).

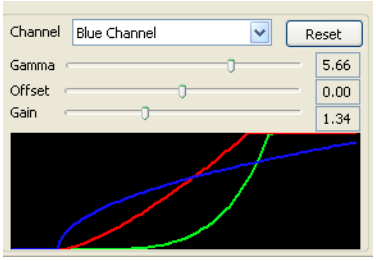


Figure 7-2: Color Remapping dialog

Changing the default range values for the ASC CDL remapping parameter

A registry key can be set to change color ranges:

All key type are DWORD

key path: HKEY_CURRENT_USER\Software\Norpix\Streampix\Admin

Key name: GainRange: Set Gain range, default value: 8

Key name: GammaRange: Set Gamma range, default 8 (0,8)

Key name: OffsetRange: Set Offset range, default 2 (-2,2)

Key name: RealOffset = 1: Enable display real pixel intensity offset value, default: 0

Managing Sequences and Markers

This chapter contains information the following sections on working with sequences:

8.1 Sequences - Global Settings

A number of StreamPix Settings control how Sequences are captured and displayed. For best results, it is a good idea to familiarize yourself with the following topics before setting up to record Sequences:

- **StreamPix Settings > Autonaming:** See "Auto Naming Settings" to see how to set up automatic naming for captured files.
- **StreamPix Settings > Sequence:** See "Sequence Settings" for Sequence behavior and compression settings.
- **StreamPix Settings > Recording:** See "Recording settings" for information on how to use automated files, set Sequence limits, and record in a loop.
- **StreamPix Settings > Recording Manager:** See "Recording Manager settings" to set recording manager levels.
- **StreamPix Settings > Playback:** See "Playback settings" to set playback and synchronization options.

8.2 Sequences - Individual Tools

As well as the global settings, StreamPix also has the following tools for working with individual Sequences.

Application Menu > Recording History

The **Recording History** allows you to reload previous recording sessions. Sequences are sorted by date and time.

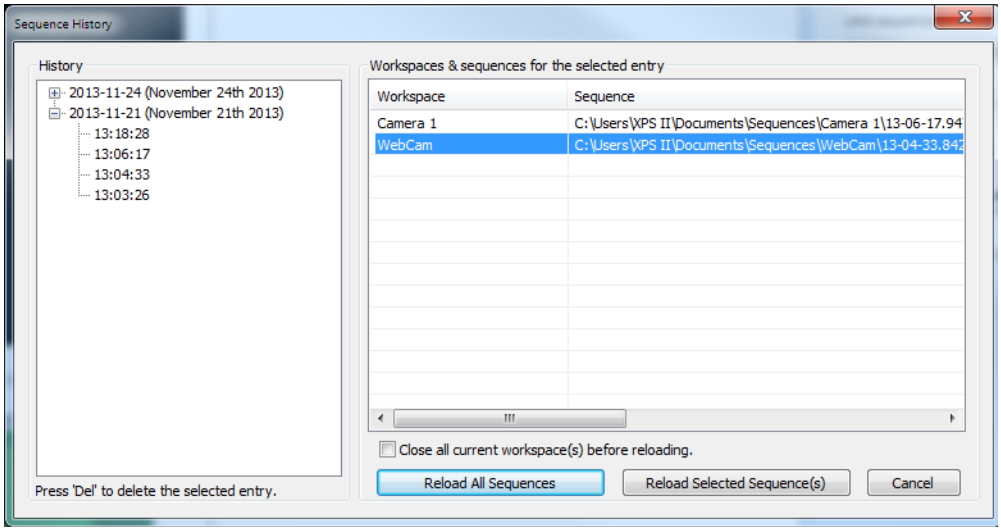


Figure 8-1: Recording History dialog

The time stamp shown in the Recording History dialog is the actual time that the Sequence file was created. Select the desired time stamp on the left, and all Workspaces/Sequences that were loaded at that time will be shown. From there, you can either reload all Sequences or a specific one using the corresponding button. If the sequence can't be found because it was moved or deleted, an error message is shown. An option lets you select to close all open Workspaces before proceeding.

TIP: It is recommended to delete older or obsolete entries from the history from time to time (to reduce loading times and clutter).

The Sequence Tab

Go to

Goto Frame

Allows you to input a frame number (index in the Sequence file) to jump to a specific image. Also works with AVI files.

Goto Time Stamp

Allows you to input a time stamp in order to jump to the frame closest to it. The dialog either asks for an absolute or relative time depending of the time mode selected in **StreamPix Settings > Playback**. Also works with AVI files.

Goto Reference Frame

The Goto **Reference Frame** button moves the playback position to the Reference Frame. The Sequence reference frame can be set by various actions, such as the **Set Reference Frame** buttons, or by a Trigger pre/post event command.

Goto Reference Time

Moves the display to the Reference Time, if any.

Reference Frame

Set at Recording Position

This will set the current recording position as the reference frame. The reference frame time stamp is used to deduce the relative time of every other image. By default, the first frame of a Sequence is used if no reference frame is chosen.

Set at Playback Position

This will set the current playback position as the reference frame. The reference frame time stamp is used to deduce the relative time of every other image. By default, the first frame of a Sequence is used if no reference frame is chosen.

Reference Time

Take Reference Time

Read the current system time and set this time as the reference time of the current Sequence. The relative time of each image of the Sequence will be computed using this time instead. This can be useful to set a reference time occurring before a recording starts. Using a reference time overrides the current reference frame (if any). It is also possible to

do this automatically. See **"Recording settings"**.

> **NOTE:** The Take Reference Time action is a software event that can be triggered also via the I/O Manager. See "HOWTO Trigger a Software Event from an external input line (I/O Manager)".

Edit Reference Time

Lets you edit the reference time associated with the current Sequence. The new reference time will be applied to the first frame of the Sequence. Set the desired time in the HH:MM:SS:MS:MS format. A calendar picker lets you set the date.

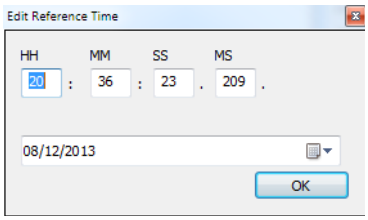


Figure 8-2: Edit Reference Time dialog

Clear Reference Time

Remove the reference time associated with the current Sequence. The time of the Sequence first frame will become the new reference.

Manual Playback

Time Jump

The **Sequence > Time Jump** buttons jump the display according to the interval set in **Settings > Playback > General > Length of time jumps in MS** (milliseconds. The default is 1000 ms. See "Playback settings".

Figure 8-3: Time Jump buttons

Step by Step

The **Step Back** and **Step Forward** buttons move the display one frame at a time.

Decrease or Increase Playback Speed

If the **Show Manual playback slider** is enabled in **Settings | Playback Rate**, the appearance of the **Step back/Step Forward** buttons changes, and selecting the buttons will increase or decrease the playback speed. See Figure 8-4. and "Playback settings".

Figure 8-4: Change in Step Forward / Step Back controls

See "Playback Rate settings"

Time Jump

The **Sequence > Time Jump** buttons jump the display according to the interval set in **Settings > Playback > General > Length of time jumps in MS** (milliseconds. The default is 1000 ms. See "Playback settings".

Figure 8-5: Time Jump buttons

Manipulation

Trim Sequence

This will trim (cut out or edit) the active sequence, keeping only the current selection. This operation can take a long time for big sequences as StreamPix exports the selection to a new Sequence file, deletes the original Sequence, and finally renames and reopens the new Sequence file.

Append a Sequence

A file-open dialog will allow to select a Sequence of frames to append at the end of the current Sequence. Both Sequences must share the same image format (resolution, bitdepth, etc).

Sort Images in Chronological Order

When StreamPix is recording in a loop, the resulting Sequence frame order might not be properly arranged. For instance, the oldest frame might not be at position 1 in the Sequence. The sort action will fix that by creating a new Sequence file in which the frames are sorted according to their respective time stamps.

> **NOTE:** Sequence Sort can be a lengthy operation on large Sequence files.

Other Tools

Trigger Pre/Post Event

If the Pre/Post Trigger is enabled, it will trigger the related event. See “Pre/Post Trigger settings”.

Toggle Timeshifted Playback

Activate or deactivate the timeshifted playback mode. See “Timeshifting settings”.

Copy Image to Clipboard

Copies the current image to the Windows clipboard, from where is can be pasted into a third-party application.

Export Timestamps

Export the selection or full sequence time stamp metadata into an Excel compatible .CSV file. The time stamp information is formatted according the current setting of the time stamp overlay. User will be prompted for entering a file name.

Trigger Module

Some modules can be triggered by clicking on this button instead of using their docking panel interface. Refer to the module help to see if it supports this trigger button. This button is used only in some custom applications.

Focus Slider

Sets the keyboard/mouse wheel focus back to the main Sequence Slider. For instance to use the arrow keys to browse in between images.

Show Sequence Information

Shows various information on the currently loaded Sequence or AVI file.

Navigating Markers

The Markers tab provides the following specific tools for navigating within Sequences:

Goto

Previous Marker

The Goto **Previous Marker** button moves the playback position to the previous marker relative to the current playback position.

Next Marker

The Goto **Next Marker** button moves the playback position to the next marker relative to the current playback position.

Browse

Marker List

Displays a dropdown list of all Markers. Select an item to move to that Marker.

Edit Marker...

Select to add or edit a Marker, including a Marker description.

Add Marker at

Current Recording Position

This will add an event marker on the last frame captured. This command is typically used to mark a frame while a recording is taking place. A blue arrow will be displayed on the sequence bar to show the locations of the marked frames. The bottom of the display area also shows a marker icon overlay when a marked image is shown. You can use the event markers viewer in the Sequence docked dialog to manage or quickly browse the marked frames.

NOTE: Only the first 100 markers will be display on the Sequence Slider, this to avoid clogging the user interface.

Current Playback Position

This will add an event marker on the frame at the current playback position. This command is typically used to mark a frame while reviewing a recorded Sequence. A blue arrow will be displayed on the Sequence bar to show the locations of the marked frames.

Navigating the Sequence from marked event (docked dialog)

To navigate markers from the Sequence docked dialog

1. Select **Show Event Markers** and select a marker to move the Sequence display to that position.
2. Optionally, select **Show Event Markers > Edit** to annotate a marker.

Home > Selection group

The **Home > Selection** group contains the following tools for preparing a Sequence for export:

Set First: Sets the first frame to be exported.

Set Last: Sets the last frame to be exported.

Goto First: Moves the display to the first frame to be exported.

Goto Last: Moves the display to the last frame to be exported.

Clear Selection: Clears all export markers. Other markers, if any, remain.

To Export a Sequence see “HOWTO Export a Sequence”.

Managing Settings

This chapter explains how to manage StreamPix settings. The following Settings control StreamPix default behaviors.

9.1 Auto Naming Settings

Auto Naming allows StreamPix to generate file names without requiring user input each and every time a file is created. Automatic File Naming can be enabled for recording/ exporting movies and images files. The **Reset** buttons restores the default naming scheme.

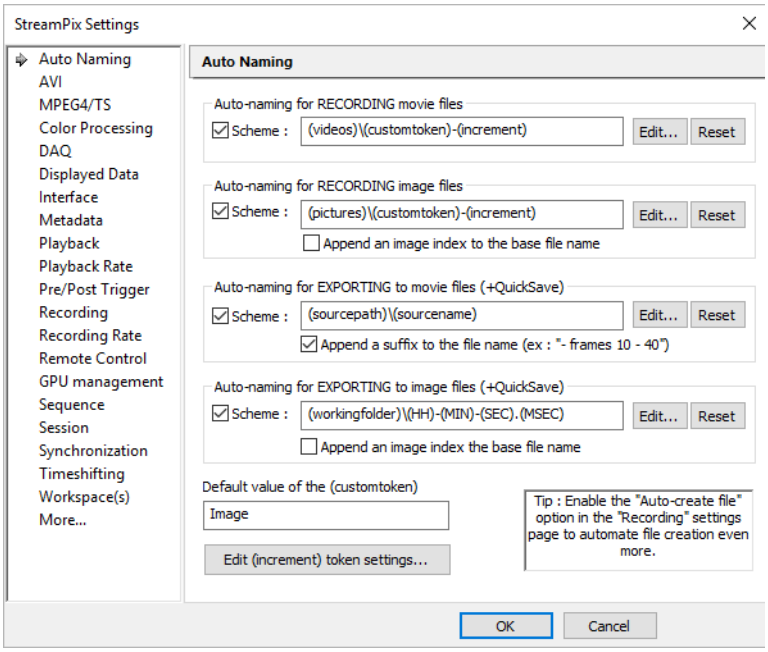


Figure 9-1: Auto Naming settings

The **RECORDING** schemes are used when directly recording from the live stream, while the **EXPORTING** are used when exporting from a Sequence file. “Movies” are .seq, .avi and .mov. “Images” are .bmp, .jpg, .tif, etc.

As two Sequences can not be saved in the same file, make sure that every Sequence created has a unique name. With successive recordings, using the (time) token will prevent the “samefilename” overwriting problem. A good scheme could be: (workingfolder)\(workspace)\(date) at (time), as this could generate a sequence filename like this one: “C:\Camera 1\12-31-05 at 23-59- 59.999.seq”. This means that a folder would be created for each workspace and that every sequence from this workspace would be uniquely identified by the date/time part. It is recommended that you test each naming scheme on a short recording before applying it to a complete recording session.

When creating a new image sequence (BMP, TIFF, etc), it is possible that the automatic naming scheme may not contain enough dynamic tokens (i.e. tokens that can help prevent generating the same file name twice). In which case, select the **Append an image index** checkbox. When this is checked, a base name will be generated for the first image, and StreamPix will automatically reuse the same name for every other image, appending an index value to differentiate them (-1, -2, -3, -4, etc...).

The following is a description of all available tokens. Some are not available in every scheme.

- Insert Path button: can be used to browse the computer hard disk to select the full path of a specific folder into the auto-naming scheme.
- workingfolder: This token will be replaced by the working folder of each Workspace.
- pictures: This token will use the User Pictures default folder as defined by Windows.
- videos: This token will use the User Videos default folder as defined by Windows.
- workspace: This token will be replaced by name of the Workspace.
- prompt: This will prompt for a specific string to use for each file created. This string will then replace the (prompt) token.
- customtoken: This token will be replaced by a user-defined string value.
- increment: This token will be replaced by an incremental numerical value.
- time: This token will be replaced by the current system time.
- date: This token will be replaced by the current system date.
- YYYY, MM, DD, HH, MIN, SEC, MSEC: These tokens will be replaced by the related time parts extracted from the timestamp of the current image. Mostly used for image files, they can also be used when creating sequences, AVI and MOV. In which case, the current system time will be used.
- input-line: This token can use when an input line triggers an event. The input-line # will be used as part of the naming scheme.
- input-event: This token can use when an input line triggers an event. The input-event will be used as part of the naming scheme.
- output-line: This token can use when an output line is driven following an event. The output-line # will be used as part of the naming scheme.
- LTC: The Linear Time Code token will be replaced by the LTC time code in the image (if any).
- index: This token will be replaced by the image index in the sequence (when exporting from sequence to image files).
- pindex: Same as the “index” token, but the value will be padded using the padding specified in the “Images” settings page.
- firstframetime: This token is mostly used when working with RAM sequences saved to disk (or exported). The token will be replaced with the time of the first frame of the sequence.
- sourcepath: The path of the source file.
- sourcename: The name of the source file (without the extension)
- AB: Alternate between “A” and “B” for each image. Mostly used with PIV-style acquisition. In a PIV application, frames are typically captured by group of 2 in a very short interval, then this is repeated after a short interval, for example: frame

1 and 2, wait, frame 3 and 4, wait... So when using a PIV naming scheme, frames are exported with the A-B suffix to highlight the fact they are grouped together:

- frame1-A
- frame2-B
- frame3-A
- frame4-, etc.

NOTE: When using auto-naming, the default settings for each format are used. The default settings are set in the following **Settings** pages: **AVI**, **Sequence** and **More... > Images**.

To set an auto naming scheme

1. Select a **Scheme** by checking the check box.
2. Select the **Edit** button to open the list of available tokens.

   a. Double-click on a token to append it to the current naming scheme. Each token gets replaced by an actual value at the time a file is created.

   b. Select **OK** to accept the new Scheme definition and return to the Auto Naming settings dialog.

3. Optionally, if you have included (customtoken) in the naming scheme, enter a **Default value of the (customtoken)** to specify a custom token.
4. Optionally, select **Edit (increment) token settings...** to define how to increment token values. .

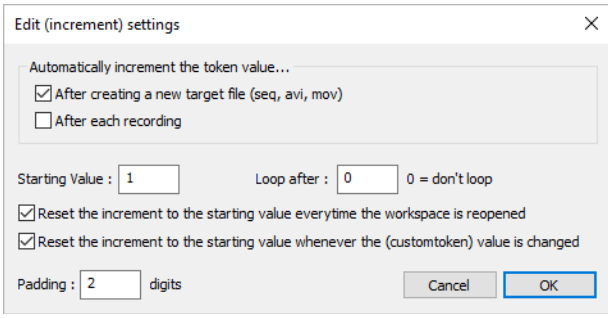


Figure 9-2: Edit (increment) token settings... dialog

a. Specify when the increment is to take place, either after each new file and/or after each recording, select the appropriate checkbox. The default is **After creating a new target file**, which should cover most needs. **After each recording** is convenient for certain recording scenarios.

b. Enter a Starting Value. This value is normally reset every time the workspace is reopened (ex: every time StreamPix launches).

c. Optionally, deselect the **Reset the increment...is reopened** checkbox to have the starting value be the last value used in the previous session.

d. Optionally, select the **Reset the increment... (customtoken) value is changed** checkbox to have the starting value restarted when the custom token value is changed.

e. Optionally, specify the increment **Padding** (in digits).

f. Select **OK** when done to return to the Auto Naming settings dialog.

5. Optionally, for image files and exporting files, select the **Append ... file name** checkboxes.
6. Select **OK** to accept your Auto Naming schemes.

TIP: Enable **StreamPix Settings > Recording > Auto-create file** to automate file creation using the Auto naming scheme. See "Recording settings".

9.2 AVI settings

AVI Settings page is used to set the codec options used when creating a new AVI file. Available Video and Audio Codecs and audio sources are listed on a dropdown list. The Settings button will show any associated Codec or Source parameters in a dialog box.

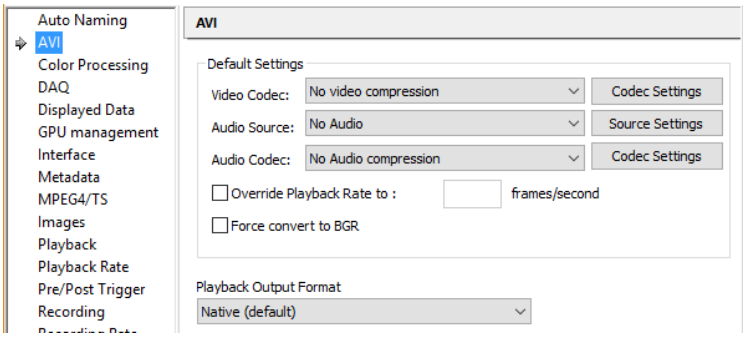


Figure 9-3: AVI settings

The AVI Settings page is where all the AVI default values can be set. These settings can always be overwritten via the Save As dialog, provided this dialog pops up (usually not because of the autonaming scheme).

The **Override Playback Rate** option allows you to override the frame rate of the capture. This means that the AVI can be made to play slower or faster than the actual capture rate.

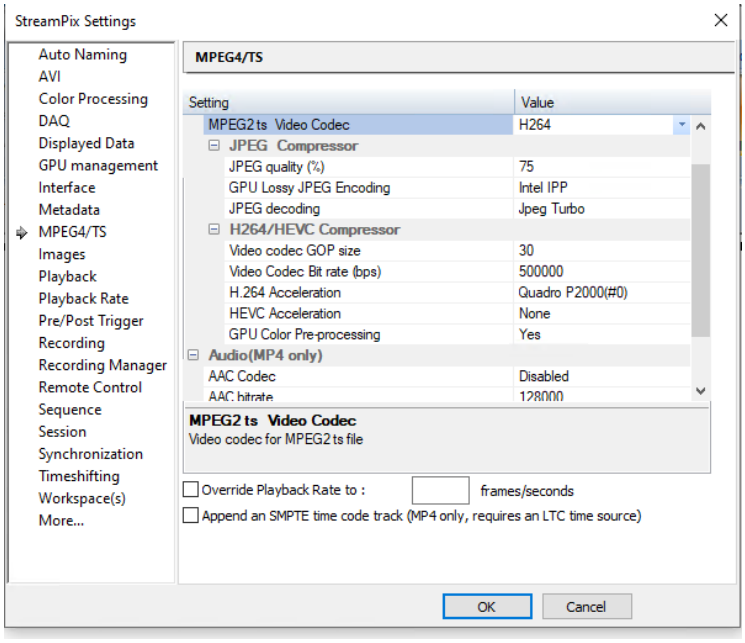
NOTE: The Override Playback Rate option does not alter the camera's capture rate. The file header is overwritten with the playback frame rate. The recording manager is still using the incoming frame rate from the camera.

The playback output format can be converted from Native to **BGR** if needed. (Some external modules require the BGR format).

The AVI settings here (as well as the Auto Naming settings) are used when a new AVI is created using the **Application Button > New AVI** dialog.

9.3 MPEG4/TS settings

Video



MP4: That type of media container can contain video that can be compressed with a few different types of compression: H.264, MPEG4, JPEG, HEVC. Furthermore, video can also be saved uncompressed. Only a few pixel-format are then supported: RawRGB, YUV422 and YUV444. MP4 container requires the creating of an index at the end of recording, or when the file is closed. That re-indexing can take significant time on large file.

MPEG2 TS: is an older container, designed for MPEG2 video encoding. Since MPEG2 is an obsolete compression scheme, frames stored in a .ts container are now H.264 compressed and compatible with all media players. Contrary to MP4, the TS format was designed for continuous streaming. This container is recommended for in the fly recording, as there is no need for a file re-indexing at the end of the recording.

NOTE: Playback of .TS video are not supported by StreamPix.

JPEG Compressor defines the settings related to the way the software will perform the compression or handle the decompression during playback:

- **JPEG Quality:** Defines the JPEG quality, from 100% (close to lossless) to 0%. 75% is typically considered Visual lossless.
- **GPU Lossy JPEG Encoding:** Defines how compression is performed, either a discreet GPU (Nvidia) or via some software library.
- **JPEG decoding:** Select the decompression library used during playback.

H264/HEVC Compressor defines the settings related to the way the software will perform the compression:

- **Video codec GOP size:** Defines the Groupe of Frame Size. Default is 30 frames.
- **Video codec bit rate (bps):** Defines the bit rate in bits per second for the

generated compressed video stream.

- **H.264 acceleration:** Define the library use to perform the compression: it can be via software only or with the help of a GPU. Intel GPU as well as Nvidia and AMD GPUs are supported.

- **HEVC acceleration:** Define the library use to perform the compression: it can be via software only or with the help of a GPU. Intel GPU as well as Nvidia and AMD GPUs are supported.

- **GPU Color Pre-processing:** For raw Bayer images, the Bayer interpolation and white balance correction is by default performed by the CPU before the image is pushed to the GPU for compressing. When enabled, this can be achieved rather by the GPU. This results in a higher load on the GPU, but a lower load on the CPU, allowing some load balancing.

Audio

When recording to MP4 or TS container and audio is also captured, the audio track can be added either uncompressed or AAC encoded. You can adjust the AAC quality by defining the bitrate.

Override Playback Rate to: By default, the playback rate into the MP4 header is set to match the camera incoming frame rate. When recording at high frame rate (>60 fps), some media player application may not be able to play back frames at the proper rate. This parameter can be used to set a specific playback rate into the file header.

Append an SMPTE time code track: If Linear Time Code is available, it can be added.

9.4 Color Processing settings

This page allows you to manage the global parameters applied during color processing.

NOTE: For general information about color processing and Bayer conversion, see "Controlling Light and Color".

StreamPix Settings > Color Processing parameters set global parameters for all Workspaces. To set Color Processing parameters per Workspace, see "Workspace Settings".

As you select an option, a description of it appears in the information panel at the bottom of the Color Processing page.

Camera

Automatically enable color processing when loading a Bayer camera: This applies only when first loading a Bayer camera. The camera Bayer pattern (if available) will be automatically used.

Bit Depth Management

Image bit depth while exporting: By default, 10, 12, 14 or 16-bit images are forced to an 8-bit image. Select **Maintain image bit depth** to maintain the original bit depth.

NOTE: Make sure the export image format can handle the image bit depth. For example, BMP handles only 8-bit.

NOTE: The Bayer Accuracy "Adaptive HDDA" ignores this feature since it only supports 8 bit.

Color Processing

Look-up table type: The choice is either a 1D or 3D LUT. This defines the type of look-up table (LUT) applied during color processing. 3D LUT requires significantly more RAM and initialization time, but allows better rendering. Selecting a 1D or 3D LUT has no processing overload (except when exporting 10-bit images with a 3D LUT).

Look-up table calculation: To speed up the color grading, Bayer interpolation, and white balancing image rendering, a global look-up table taking into account all the parameters is calculated and saved to an XML file. By default, this LUT is recalculated each time StreamPix is restarted. To avoid the recalculation on start-up select **Reload look-up table** (from file).

Color Balance

Color balance is the adjustment of the RGB channels intensity of an image to match the color temperature of the illumination present at capture time. As it changes the overall mixture of colors in an image, color balance is used for generalized color correction.

Color balance (also referred as white balance) can be adjusted and applied to real time (Live) display and when exporting. Color balance can be manually adjusted or automatically calculated on any captured color image, either RGB or YUV format. Color balance algorithms can be applied in conjunction with the Bayer rendering.

In Automatic mode, one of six color balancing algorithms can be selected:

- **Mean equalization:** calculates the mean value of each channel and then adjusts each so that the mean value of the blue and red channels are equal to the green channel.
- **Gray world:** the sum of the red, green and blue channels is calculated and then adjusted so that the sum of the blue and red channel equals the green channel.
- **Standard deviation:** calculates the standard deviation of each color channel and then readjusts each to be 70 (on a 256 value scale).
- **Mean & standard deviation (Slowest):** Adjusts the mean value of each channel to be 128, and sets the standard deviation of each channel to be roughly 70 (on a 256 value scale).
- **White World:** Will search for the whitest area in the image and assume this is real white to recalculate the WB by normalizing each channel and set the maximum value to “white”. To get good results, make sure there are no saturated pixels on the image. (Use short exposure time for instance.)
- **Scale by max:** calculates the max value of each channel and then rescale each channel to the maximum dynamic range.

Mean equalization, Gray World, Standard Deviation, Mean & Standard Deviation, White World and Scale by Max algorithms use the first incoming image to calculate the balance coefficient. This is a one time operation that is not redone for each incoming image. To force a recalculation, use the shortcut ALT+R or select **Bayer/Color > Recalculate look-up table**.

In manual mode, you can enter red, green and blue offset values to be applied to each color channel. The correction factor will be added (or subtracted) for each pixel intensity. The parameter value is in percent of the total dynamic range: a +10% will add a constant of 25 grey level for an 8-bit (256 levels) image.

Color Grading Processing

Image color grading can either be performed using 1D or 3D look-up table. These tables are calculated via 3rd party software and can be loaded within StreamPix. All the file formats are supported, both 1D or 3D. Check each section for further details.

1D look-up table setup

1D Look up table mode: Enable the usage of a 1D LUT for color grading. Beside the ability to load a LUT file, a predefined transform LUT is also available to apply a negative conversion.

1D look-up table File: Specifies the 1D look-up table file that can be loaded for processing. Current supported formats:

- Norpix 1D Text 1D LUT file(*.txt,*.nlt)
- Flame and lustre(*.3ld)file
- ColorCorrection(*.cc)
- ColorCorrectionCollection(*ccc)
- Cinespace file(*.csp)
- Houdini file(*.lut)
- Iridas_cube file(*.cube)
- Iridas_itx file(*.itx)
- Iridas_look file(*.look)
- Spi1d file(*.spi1d)
- Truelight(*.spi1d)

A NorPix 1D LUT file can be generated manually for basic correction and grading by creating a CSV text file, say in Excel®. In the text file, syntax is: Each line contains 4 entries, Level value to be remapped, followed with corresponding Blue, Green and Red values.

- There is no need to specify all the LUT values and entries. Only the needed value must be specified. All missing values will be interpreted as “Leave as is”
- Level can be specified as range using [-] characters
- # comment a line
- Out bound values are ignored.

Example

#Index, Blue, Green, Red Remapping value

0, 255, 0, 0: gray level 0 will be remapping as pure blue,

1, 10, 10, ,: gray level 1 will be remapping as Blue =10, Green =10, Red default (1),

[200-255], 255, 255, 255: gray levels 200 to 255 are remapped to pure white.

3D Lookup table setup

3D lookup table mode: Enable the usage of a 3D LUT for color grading. Only a 3rd party LUT file can be imported.

3D lookup table File: Current supported file formats:

- Flame and lustre(*.3ld) file
- ColorCorrection(*.cc)
- ColorCorrectionCollection(*ccc)
- Cinespace file(*.csp)
- Houdini file(*.lut)
- Iridas_cube file(*.cube)
- Iridas_itx file(*.itx)
- Iridas_look file(*.look)
- Pandora_mga(*.mga)

ASC CDL adjustment: Enable the American Society of Cinematographers Color Decision List (ASC CDL) basic primary color grading adjustment. This can be used to apply basic gain, offset and gamma connections. See “Non-linear Remapping via ASC CDL Formula”.

Color Matrix correction

The color filter arrays used on all image sensors do not exactly match the response of the human eye. As such, a final level of tuning known as color correction or color saturation correction is required. The most commonly used form of color correction is a 3 X 4 matrix operation.

Without correction, coefficients are:

B =	[100%]	[0%]	[0%]	[0.00%]	Bo
G =	[0%]	[100%]	[0%]	[0.00%]	Go
R =	[0%]	[0%]	[100%]	[0.00%]	Ro

Commonly, the sum of coefficients for a channel equals 100%. You should refer to the sensor color transfer function to determine the right coefficients to use.

See the following example:

B =	[142%]	[-32%]	[-10%]	[0.00%]	Bo
G =	[-15%]	[140%]	[-25%]	[0.00%]	Go
R =	[-14%]	[-22%]	[136%]	[0.00%]	Ro

Miscellaneous LUT Processing

Pseudo Color: This can be used for remapping monochrome images to pseudo color. Currently, six predefined look up table functions are available. Contact Norpix if you feel more LUTs should be added.

> **NOTE:** Pseudo-color cannot be used with true color RGB or YUV images.

Available predefined LUTs are:

- Rainbow
- Inverted rainbow
- Hot
- Cold
- Saturated 3 level
- Saturated 5 level.

Saturated level LUTs are used to help figure out the camera exposure and gain settings. Those LUTs display in false color saturated pixels (red) and under exposed pixels (green):

Saturated 3 level (256 colors):

- Grey level from 0 to 3 are display as green
- Grey level from 252 to 255 are display as red

Saturated 5 level (256 colors):

- Grey level from 0 to 5 are display as green
- Grey level from 250 to 255 are display as red

Monochrome image processing: Depending on the need for data integrity, one may need to maintain across the 1D LUT processing the monochrome image format (default) or accept the image to be converted first as a color RGB image.

By default, all monochrome images are converted first to an RGB 24-bit color images before a LUT can be applied, since the LUT include components for RGB channels. However, when working with a 10 or 12 or 16-bit monochrome images, the conversion will downgrade the pixel resolution down to 8 bit. This is something that sometimes is not suitable.

By selecting the Monochrome image processing option, you can make sure the true bit depth is maintained, with only a single 10, 12 or 16-bit channel being processed

Window leveling: Linear window leveling can be performed for pixel depth greater that 8 bits. By default, StreamPix always displays the 8 most significant bits of captured images. Window leveling can highlight specific bit ranges on the images.

As an example, a 10-bit image can be leveled in 3 ways:

- 8 most significant bits (bit 2 to 10, default StreamPix setting)
- 8 middle significant bits (bit 1 to 9)
- 8 least significant bits (bit 0 to 7).

9.5 DAQ settings

NOTE: You must have a specific license to enable the DAQ module.

This page is used to change the various settings related to DAQ Graphs.

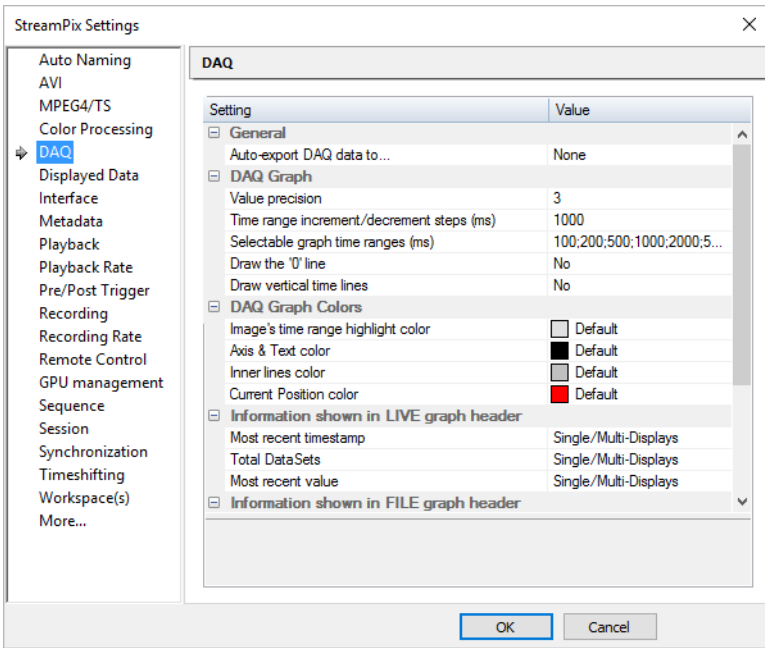


Figure 9-4: DAQ settings

General

Auto-export DAQ data to: Allows you to automatically export the DAQ data when exporting a video file. The destination choices are: None, *.xls, or *.csv.

DAQ Graph

Value precision: This is the number of decimal places used when displaying DAQ values.

Time range increment/decrement steps (ms): This is the value used when incrementing or decrementing the time range of a graph.

Draw the '0' line: If the 0 value is in the range of the Y axis of the graph, the graph will trace a full horizontal line on it.

DAQ Graph colors

Image's time range highlight color: the color used to highlight the time range occupied taken by the current sequence image.

Axis & Text color: The color used to draw the graphs axis and text.

Inner line color: The color used to draw the step lines inside the graph.

Current Position color: The color used to draw current position lines in DAQ graphs.

Information shown in LIVE graph header

Most recent timestamp: Show the time stamp of the last data set received from the DAQ device.

Total Data Sets: Show the total number of data sets captured.

Most recent value: Show the most recent value read by the DAQ device.

Information shown in the FILE graph header

Current timestamp: Show the time stamp at the current position in the DAQ Graph.

Total DataSets: Show the total numbers of data sets in the DAQ file.

Current DataSet: Show the current data set index.

Current value: Show the value at the current position in the DAQ Graph.

9.6 Displayed Data settings

This page allows you to customize the information displayed in the colored band above the image in a Workspace. You can select which information to show when in single display or in multi-display, in live or in playback.

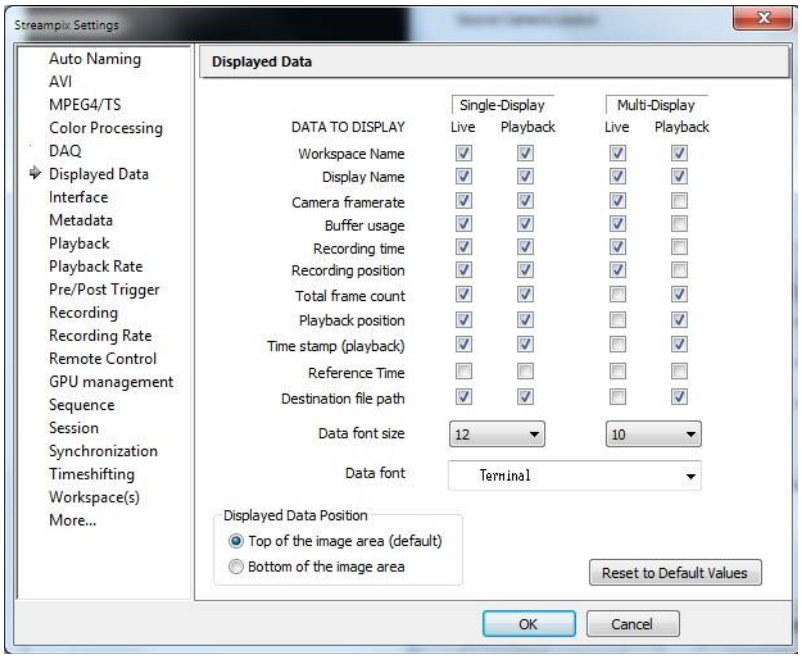


Figure 9-5: Displayed data settings

You can also choose the font type and size used. Only fixed-width fonts are available as it keeps the text easy to read even when being updated. Using a larger font size will make text easier to read at the expense of having a smaller area left to display the image itself.

9.7 Interface settings

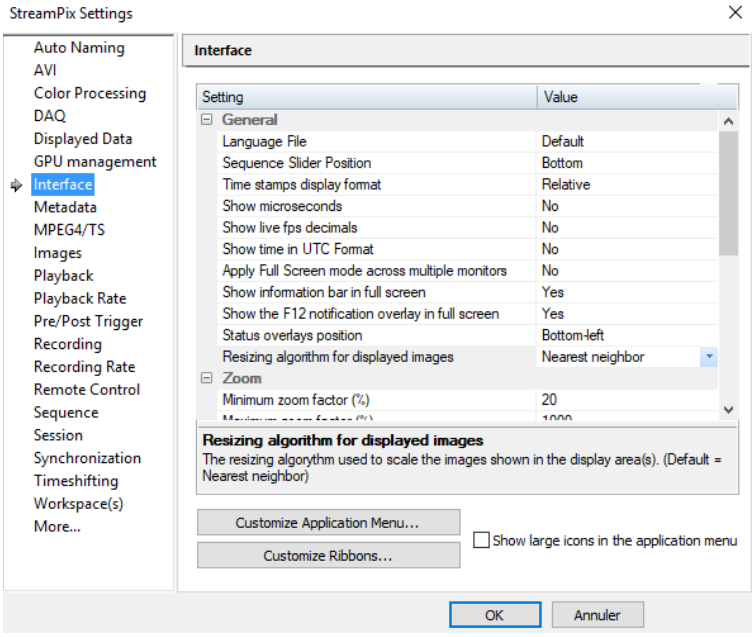


Figure 9-7: Interface settings

General

> **NOTE:** StreamPix may need to be restarted for some changes to take effect. If it does, you will receive a prompt with the option to restart immediately or later.

Language File: Allows you to change the default language used in the display. The language file is an XML file located at: *C:\Users\[username]\AppData\Roaming\Norpix\StreamPix\Languages.*

> **NOTE:** Language files are XML text editable files. Should you find the translations are incorrect, do not hesitate to forward your changes to support@norpix.com.

Sequence Slider Position: Allows you to change the default placement of the Sequence Slider bar, either at the top (just below the ribbon bar) or at the bottom of the window (default).

Time stamps display format: The time format used in the interface. It can either show the relative time (relative to the first frame of the sequence) or the absolute time (actual date + time).

Show microseconds: Display the timestamp's microseconds in the interface, although it should only be used with a precise hardware time source. Default timestamping uses the OS time, which has a precision of ~ 1 millisecond. You can select a different time source than the default system clock provided you have a supported device. Use Select Time

Source from the Workspace tab to select a different time source.

Show live fps decimals: display the fps in real time. The fps is always displayed, but this option shows it with 2 decimal places, instead of being rounded to the nearest integer.

Show time in UTC format: Make the absolute time stamps appear in Greenwich standard. (No time zone adjustment)

Apply Full Screen Mode across multiple monitors: Does what it says.

Show Information bar in full screen: when disabled, while in full screen mode, the information bar will not pop up. Messages that are posted to this dialog will be buffered, and when exiting full screen mode, the messages will be displayed.

Show the F12 notification overlay in full screen mode: when disabled, the F12 text message will not by display while in full screen mode.

Status Overlay Position: Select where the status overlay will be drawn. Default is bottom left.

Resizing algorithm for displayed images: different algorithm can be used for calculating the image to be displayed. Nearest-neighbor is allowing the fastest rendering and lower CPU load. On very large images, this algorithm may generate artefact. In such a case select other options. This will result in increased CPU load.

Zoom

Minimum zoom factor (%): The minimum zoom factor allowed when zooming out.

Maximum zoom factor (%): The maximum zoom factor allowed when zooming in.

Zoom in/out steps (%): The zooming steps. For example, 10 means that each zoom in/out action, will change the zoom by 10%. Zoom steps are achieved using numeric + and – keypad.

Only 'Fit Image to Window' if image too large: Fit image to window mode will only be applied if the image is too large to fit the display area. Otherwise, a zoom factor of 1:1 will be applied.

QuickZoom

QuickZoom allows you to quickly browse image content. Two different zoom levels can be preset to zoom in or out of the image. Set the **Full View** value to the zoom factor at which the whole image is visible in the display area.

QuickZoom Level 1: Set the zoom factor to a specific value when holding "Ctrl" while clicking in a display. The zoom will be centered on the pixel under the mouse.

QuickZoom Level 2: Set the zoom factor to a specific value when holding "Ctrl-Shift" while clicking in a display. The zoom will be centered on the pixel under the mouse.

QuickZoom Full View: Set the zoom factor to a specific value when using the "Ctrl-*" key combination. The zoom will be centered on the pixel under the mouse.

ROI QuickZoom minimum size: Set the minimum size allowed for the Zoom ROI. The ROI QuickZoom allows you to make a zone of the image or use the full display area. If it is smaller than the minimum size, the ROI size will be increased accordingly.

NOTE: If the ROI is smaller than 4x4 pixels, the ROI action will be ignored.

Docked Dialog

> **NOTE:** (Not available in the Single Camera version)

Automatically show/hide the docking panel: When selected: When enabled, shows the docking panel when the mouse moves to the right-most part of the StreamPix window (when maximized) and hides it when the mouse move elsewhere.

When clicking on a docked dialog, select the matching workspace: Toggles the selection of the matching Workspace when a docked dialog is selected.

Docked Dialog shown (Single/Multi Display): Determines which Workspaces are shown in the docking panel for each mode, Single or Multi-Display. The choices are Current Workspace, or All Workspaces.

Customizing the Application menu

Settings > Interface > Customize the Application menu ... opens a dialog from where you can select which items to include in the Application menu. Uncheck items to hide them. By default, the menu uses small icons. On a HD screen (> 1024x768) you might want to select **Show large icons in the application menu** for better visibility.

> **NOTE:** StreamPix will have to be restarted for changes to take effect.

Customizing the Ribbon interface

Settings > Interface > Customize Ribbons... opens a dialog from where you can change the layout and content of the ribbon toolbars and design your own custom toolbars.

NOTE: StreamPix will have to be started for changes to take effect.

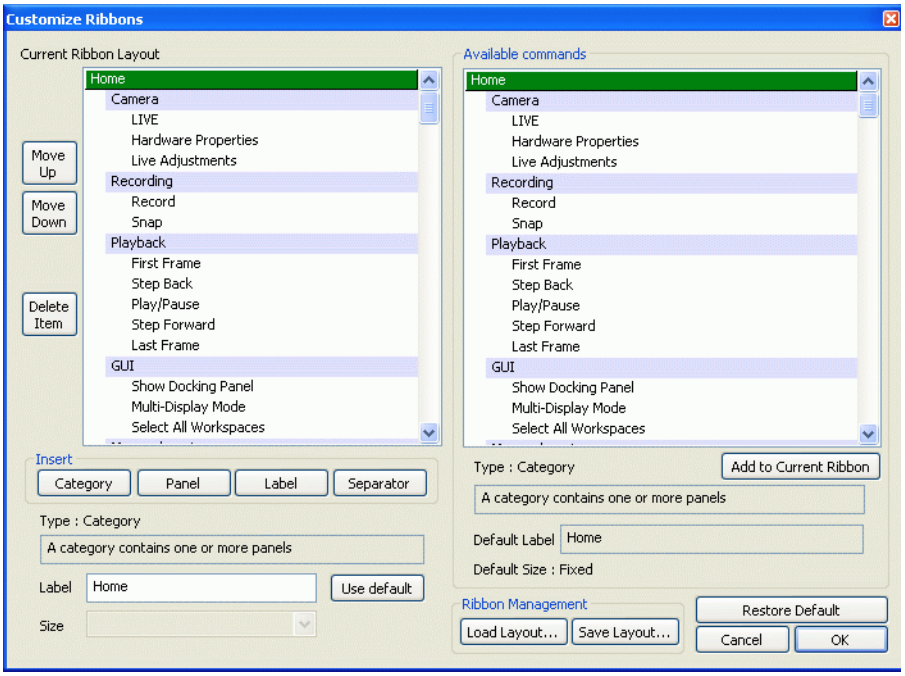


Figure 9-7: Customize Ribbon settings

The **Current Ribbon Layout** is on the left, and all the **Available commands** are on the right. Dark blue represents categories ("tabs"), light blue the panels ("groups") and white the individual controls. All items are displayed in dark green when selected.

To add an item to an existing tab or group

1. Double-click (or click **Add to Current Ribbon**) on an item in the **Available commands** list to insert it in the **Current Ribbon Layout** list.
2. Use the **Move Up** and **Move Down** buttons to reorder the items in the list.
3. **Delete item** removes the item.

TIP: As an item is selected in either list, a brief description is displayed in the information area below.

To create a new item

1. Use the **Insert Category**, **Panel**, **Label** and **Separator** buttons to define your own custom tabs, groups, and buttons.
2. Enter a name for the new item in the **Label** edit field.

3. Use the **Move Up** and **Move Down** buttons to reorder the items in the list.
4. Select OK to save your changes. They will take effect the next time that StreamPix is launched.

TIP: You can save/load your ribbon configuration in case you need to switch between different layouts.

TIP: **Restore Default** restores the default ribbons.

See also "HOWTO Modify the GUI".

9.8 Metadata settings

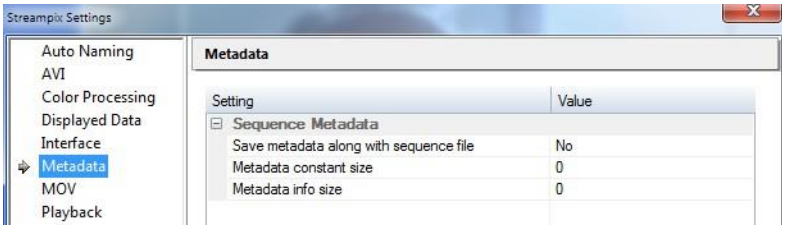


Figure 9-8: Metadata settings

Save metadata along with sequence file: If enabled, when streaming to a Sequence file, Streampix will also save the metadata bundled with the saved frames. The metadata is saved in the same folder as the Sequence in a file with the same name as the Sequence with an added ".metadata" extension. Ex: "Capture123.seq.metadata"

To view the metadata, use the **Metadata Spy** module and/or the **Metadata Overlay** module. See "Metadata Spy" and "Metadata Overlay".

Metadata constant size: If 0, the metadata will be stored with a dynamic size for optimal file usage. However, if you require recording in loops, or pre/post (i.e. rewriting over old images & metadata), then you need to set a constant value for the size. This value can be computed using the **Metadata Spy Module** which will monitor the live feed to estimate the minimum size needed. You can also use **Tools > Metadata Manager**.

Metadata info size: If you use a 3rd party module that uses a custom metadata type, StreamPix needs to save some information about this custom type to the metadata file. Use the **Metadata Manager** to compute the required metadata info size.

9.9 Images settings

Images

NOTE: Settings changed in the **Save As** dialog will override these settings.

JPEG Quality: Quality for the JPEG files. Higher quality results bigger files and higher CPU usage.

JPEG EXIF: When enabled, EXIF metadata will be inserted into the JPEG header. If GPS data are available via metadata, they will be included within the EXIF header.

TIFF Format: Normal or multi-paged (i.e. all images are saved in a single file).

TIFF Date Time Tag content: chose the format of the DateTime tag in the tiff file.

- **Standard Time [YYYY:MM:DD HH:MM:SS]:** the tiff specification format.
- **Full Time [YYMMDD HHMMSSmmmuuu]:** includes milliseconds and microseconds.
- **Raw Time [time_t.mmmuuu]:** include the standard UNIX 32-bit time_t value and the milliseconds/microseconds.
- **LTC Time [HH:MM:SS-FF]:** The source frames must have been captured with the support of an LTC timing device.
-

TIFF EXIF Support: When enabled, EXIF metadata will be inserted into the TIFF header. If GPS data are available via metadata, they will be included within the EXIF header.

NOTE: Artist, Copyright, Aperture and Focal Length metadata can be inserted into the EXIF header. Some registry keys must be set properly to document those fields:

Key Path: `HKEY_CURRENT_USER\Software\Norpix:`

Key Type: `String values`

Key Name: `EXIFArtist, EXIFCopyright, EXIFAperture, EXIFFocalLength`

Key value: `These they are created when Streampix or any other Hermes based application runs for the first time. They are empty by default. EXIFAperture and EXIFFocalLength values will only be used if there is no information about the aperture and focal length in the CameraInfo metadata.`

TIFF LZW Compression: When enabled, applies LZW compression to TIFF images.

DNG Bayer Pattern: Enter the image Bayer pattern to be stored in the image file header.

DNG Camera Profile: Enter the camera profile file name if available. When no profile is provided, default values are used for light settings and an identity matrix correction is

applied. Use for instance Adobe's DNG Profile Editor (http://www.adobe.com) to create a profile file.

The default source light settings (21) can be changed by editing the following registry key:

```
Key Path: HKEY_CURRENT_USER\Software\Norpix
Key name: DefaultDNGSourceLight
Key Type: DWORD
Key Value: 21 (default)
```

Other possible recommended values are:

```
0 = Unknown
1 = Daylight
2 = Fluorescent
3 = Tungsten (incandescent light)
4 = Flash
9 = Fine weather
10 = Cloudy weather
11 = Shade
12 = Daylight fluorescent (D 5700 - 7100K)
13 = Day white fluorescent (N 4600 - 5400K)
14 = Cool white fluorescent (W 3900 - 4500K)
15 = White fluorescent (WW 3200 - 3700K)
17 = Standard light A
18 = Standard light B
19 = Standard light C
20 = D55
21 = D65 (Default-Neutral Sun Light)
22 = D75
23 = D50
24 = ISO studio tungsten
```

File Name Padding: Useful to facilitate browsing the image files, as sorting them alphabetically will show them in capture order. Without padding, “image12.bmp” would be shown before “image2.bmp”. Type the minimum number of digits to include in the file name.

Do Bayer conversion on snapped images: allows you to do a Bayer conversion only on snapped images (Snap button) and leave the other images in raw (B&W) format.

Separator character: The character to use to separate elements in a file naming scheme. The default is a hyphen “-”.

NOTE: **StreamPix Settings > Image** settings apply globally. To set Image parameters for individual or linked Workspaces, see “Workspace Settings”.

9.10 Playback settings

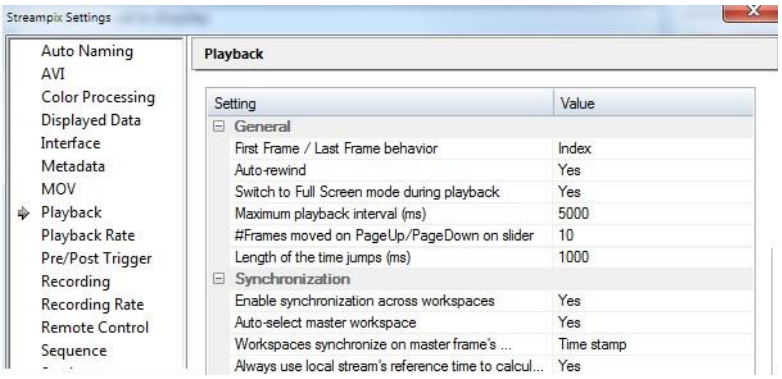


Figure 9-10: Playback settings

General

First Frame / Last Frame behavior: Configure the way the **|<** and **>|** playback buttons behave.

Normally, they will move to the first and last frame of the Sequence file. However, you can have them move to the oldest or most recent frame (according to their time stamps). The second option is useful if you do loop recording or pre/post triggering.

Auto-Rewind: If enabled, StreamPix will continue playback from the start when the end of the sequence is reached (instead of stopping).

Switch to Full Screen mode during playback: If enabled, StreamPix will make the display area extend to the full screen while playing back a Sequence or .avi.

Maximum playback interval: During playback, the display follows the time stamps. So if two successive images are 10 seconds apart, StreamPix will wait 10 seconds between showing each image. This can be a problem if the recording is not continuous, for example, if you start a recording, stop it, then restart it later. To work around this problem, StreamPix uses a maximum playback interval value. For example, if you set this value to 1000 ms, the playback will proceed with, at most, a one second interval between each successive frame. Default value is 5000 ms.

#Frames moved on PageUp/PageDown on slider: When the Sequence Slider is selected, the PageUp/PageDown buttons can be used to move X frames forward or backward.

Length of the time jumps in MS: Sets the time interval that the **Sequence > Time Jump** buttons jump the display in milliseconds. The default is 1000 ms.

Synchronization

NOTE: The following features are not available in the Single Camera version.

Enable Synchronization across Workspaces: Allows you to customize the behavior of the slider's cursor when moved while StreamPix is in Select All Workspaces mode. It is only relevant if every Sequence in each Workspace was captured at the same time. A Master Workspace must also be defined for the synchronization to be maintained.

Auto-select master workspace: When enabled, allows StreamPix to automatically choose a workspace to be the master when all Workspaces are selected. If no Workspace has been designated, then the left-most Workspace becomes the default Master. The master can always be changed manually by double-clicking on the desired Workspace tab.

Synchronize on master frame > index. Used if all used cameras have the same frame rate and started recording at the same time, as in hardware-triggered recording. For instance, moving one sequence to frame # 45 will bring every other sequence to frame #45.

Synchronize on master frame > timestamp. The linked sequences will show the frames that were captured at the same time as the current frame. If a frame with the exact same time stamp cannot be found, the sequence will show the frame captured before the requested time.

Synchronize on master frame > time value. The linked sequences will show the frames that have the same time value as the current frame. If a frame with the exact same time value cannot be found, the sequence will show the frame captured before the requested time. A time value is an absolute value in nanoseconds, read from a hardware counter. This feature is only supported on some specific cameras.

Always use local stream's reference time to calculate relative time: If No, then the master stream reference time will be used to calculate the relative times.

9.11 Playback Rate settings

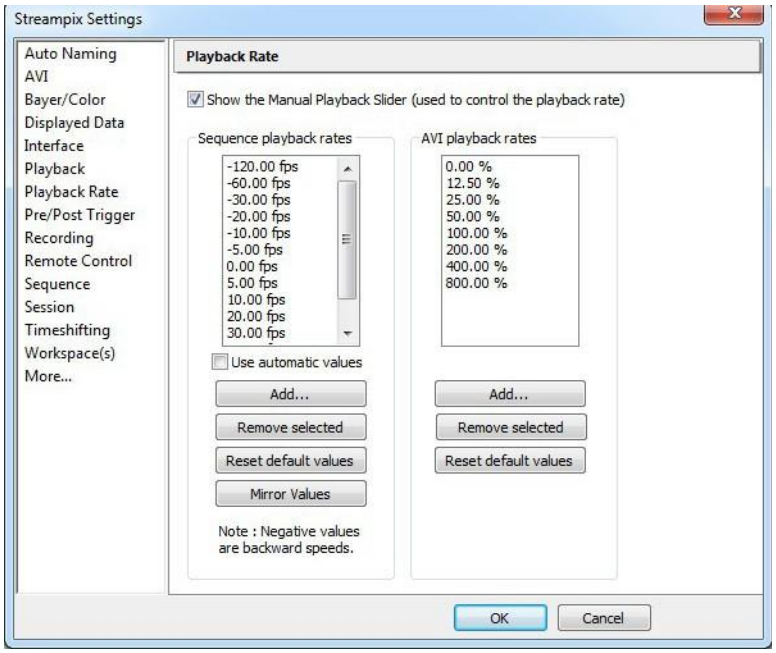


Figure 9-11: Playback settings

Show Manual Playback Slider: allows you to playback sequences and AVI files at variable speeds (slower & faster, forward & backward). See "Manual Playback Control".

Sequence playback rates

Sequence playback rates control the speed steps used by the **Manual Playback Slider**.

To add a new value

1. Deselect the **Use automatic values** checkbox.
2. Select **Add** to add a new fps value to the list.
3. Enter a new value in the **Enter a fps value** dialog, and select **OK**.
   - A negative FPS value indicates a backward playback and a positive value is a forward playback.
   - **Remove selected** erases the currently selected value.
   - **Reset default values** returns the list to default values.
   - **Mirror Values** duplicate the values in the opposite direction. For example, if your list consists of 0, 10, -20, 30, **Mirror** will add -10, 20 and -30.

The zero (0.00 FPS) value is mandatory and is used as the **Paused** value and will be automatically added when the **OK** button is selected.

If **Use automatic values** is selected, StreamPix will dynamically build a custom list of FPS values based on the “Suggested frame rate” specified in the current Sequence header.

AVI playback rates

AVI playback is handled differently as the values are percentages of the AVI normal speed. Compared to the regular playback speed, 50% will playback at half-speed and 200% will playback twice as fast.

- Selecting **Add** allow you to add a new % value to the list.
- **Remove selected** erases the currently selected value
- **Reset default values** returns the list to default values.

The zero (0% speed) and normal (100% speed) values are mandatory. New values will be automatically added (as needed) when the OK button is selected.

9.12 Pre/Post Trigger settings

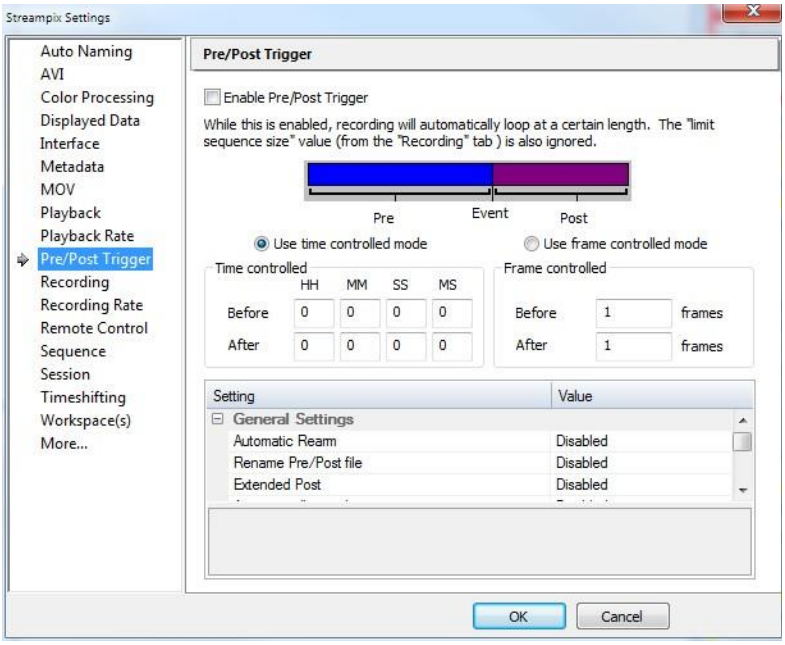


Figure 9-12: Pre/Post Trigger settings

Pre/Post Trigger is a special recording mode used only with sequence files (on disk or in RAM), as the other formats (AVI, bmp, tiff, etc) do not support loop recording.

The Pre/Post Trigger ignores the loop settings and always loops. Pre/Post Trigger also ignores any sequence limit.

First define a duration for the “Pre” and the “Post” length.

In **Use time controlled mode**, when record is initiated, StreamPix will sum the two durations and factor in the current capture fps of the grabber, to compute the maximum number of frames in the sequence. When the maximum number of frames is reached, the recording will continue from the beginning, overwriting the oldest images.

In **Use frame controlled mode**, you specify how many frames must be kept before the event and how many after. When the Pre/Post event is triggered, either from an IO action (see “I/O Manager docked dialog”) or from the Trigger Pre/Post Event command, StreamPix will continue recording for the “after” duration and stop automatically once that preset time has elapsed. The resulting sequence will include what happened before and after the event.

When the Pre/Post event occurs, the next frame to be captured is marked as the reference frame. This means that when browsing the sequence and displaying the time stamps as relative instead of absolute, each frame's time will be relative to that reference frame instead of the first frame of the sequence. Since the frame "Event" will be marked as time 0, frames captured before it will present a negative time and those captured after will be identified by a positive time.

Settings

Automatic Rearm: The current target file (the Sequence file) will automatically be saved and closed before StreamPix restarts recording. Using this with the **Settings > Recording Auto-Create file** option will automatically create a new sequence file every time the Pre/Post Trigger event occurs.

Rename Pre/Post file: The Sequence file will be renamed with the absolute time stamp of the reference frame. The file will be in the same location, but renamed to something like “Fri May 09 14-03-47.22.seq” which show the date and time of the reference frame.

Extended Post: Ensures that if another pre-post event is triggered while recording a post duration, the post duration is extended, using the last pre-post event as the new zero. All Pre/Post events are still marked for easy retrieval.

Automatically sort the sequence: At the end of recording, automatically sort the images according to their time stamps.

If **Don’t overwrite the ‘before’ section if more than one event are triggered** is selected, multiple triggered events that overlap will generate a single Sequence file containing both events.

Use Individual Configurations: The Pre/Post triggers must be defined per Workspace in the associated I/O Manager docked dialog. See “Pre/Post Trigger settings”.

9.13 Recording settings

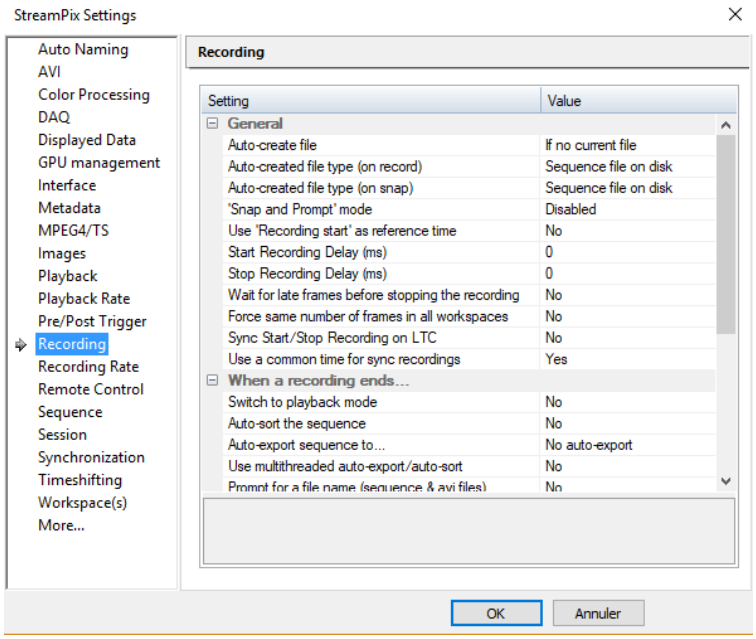


Figure 9-13: Recording settings

General

Auto-Create File: Define StreamPix behavior when a recording or snap is initiated.

- **Never** Won't create anything when the record button is pressed.
- **If no current file** will automatically create a file if there are none. If a sequence file is already open (from “New/Open Sequence on Disk” action or from a previous recording), the recording will be done in that file.
- **Always** will close the current Workspace file (if any) and create a new target file for the recording. The created files are named using the auto-naming scheme defined in **Settings > Auto Naming**. The naming scheme is applied for all auto created files.

Auto-created file type (on record): Set what type of file is created when a recording triggers the auto creation of a target file.

Auto-created file type (on snap): Set what type of file is created when a snap triggers the auto creation of a target file.

Snap and Prompt mode: If enabled, user will be prompted for a file name after each snapped image file.

Use 'Recording start' as reference time: The default is **No**, StreamPix uses the first captured frame timestamp as the reference time. Selecting Yes means that when a recording starts, the current time that the Record operation starts is used as the Sequence reference time. This can be useful to get accurate relative times where you need the reference time to be

exactly the time at which the recording started, for example when the recording is manually started, but the image capture is controlled by a hardware trigger.

Start Recording Delay (ms): Allows you to specify a wait period in millisecond between the time the Record button is pressed and the time at which the recording will actually start. Start Recording Delay reads the current time when the record button is pushed, and then adds the delay value to calculate a “future start time”. This new start time is then compared with each incoming image time stamp to figure out if the frame must be kept or discarded.

Stop Recording Delay (ms): Allows you to specify a wait period in millisecond between the time the Record button is pressed (to stop the recording) and the time at which the recording will actually be stopped. Stop Recording Delay reads the current time when the record button is pushed to stop recording, and then adds the delay value to calculate a “future stop time”. This new stop time is then compared with each incoming image time stamp to figure out if the frame must be kept or discarded.

NOTE: Start and Stop Recording Delay allow a better start and stop recording synchronization between multiple cameras.

Wait for late frames before stopping the recording: If enabled, the recording continues on a camera until late frames are captured, to match the timestamp.

Force same number of frames in all workspaces: If enabled when recording from multiple cameras at the same frame rate, recording continues until the same number of frames are captured from all cameras so that the number of frames synchronize. This setting will override any stop recording delay.

Synch Start/Stop Recording on LTC: special mode to synchronize start/stop recording on current time code received from an LTC reader board. If enabled, the current time code is rounded up to the second 0-frame time code (up to 2 seconds delay) and used to determine the exact time code value in the future when start/stop recording will occur. The same value is provided for all workspaces to ensure time and number of frames synchronize.

Use a common time frame for sync recordings: If enabled, the current time code is rounded up to the second 0-frame time code (up to 2 seconds delay) and used to determine the exact time code value in the future when start/stop recording will occur. The same value is provided for all workspaces to ensure time and number of frames synchronize.

When a recording ends...

Switch to playback mode: The Workspace display(s) will automatically switch to the playback mode. The Playback position is set to the last frame recorded.

Auto-sort the Sequence: Automatically sort the images according to their timestamps.

Auto-export sequence to...: Choose a format (SEQ, AVI, BMP, JPG, etc) to export to according to the naming scheme defined in **Settings > Auto Naming**.

Use multi-threaded auto-export/auto sort: When recording from multiple Workspaces, StreamPix will post-process all Sequences simultaneously.

Caution

When **Use multi-threaded auto-export/auto sort** with some codecs for frame compression (AVI, MP4...), make sure the selected codec supports concurrent instances. Failure to do so may result to some software and/or system instability. In which case, disable this option.

Prompt for a file name (sequence & avi files): Lets you set whether to be prompted for a file name.

Auto-close file: Automatically close the current file when the recording stops.

NOTE: When **Auto-close file** is enabled, if the recording was to a RAM sequence, and neither **Auto-export Sequence to...** nor **Save Using autonaming on close** has been set, the file is discarded. Otherwise, RAM sequences are saved according to the auto-naming set for exported files.

Buffer usage monitoring

Maximum buffer usage allowed (%): StreamPix can trigger an action if the buffer usage gets too high. Too high buffer usage can result in dropped frames.

If maximum buffer usage is reached: StreamPix can either do nothing or stop the recording on the current Workspace (or on all Workspaces).

Limits

Limit sequence on disk/RAM to X frames: Specify the default number of frames to be captured in a sequence on disk or in RAM.

Loop recording when limit is reached: Define StreamPix behavior when the frame limit is reached. If the Loop option is enabled, the Sequence will continue recording from the start. Otherwise, the recording will stop when the limit is reached. These settings can be overridden at the Workspace level, in the Sequence docked dialogs.

9.14 Recording Manager settings

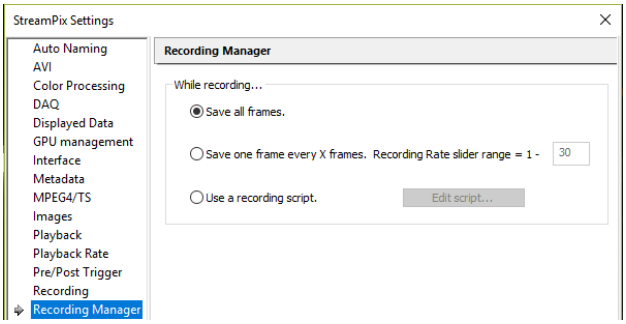


Figure 9-14: Recording manager settings

While Recording...

While recording... offers the following options:

- **Save all frames** is the default behavior. Every acquired frame is saved to the target file (Sequence, AVI, etc.).
- **Save one frame every X frames** lets you reduce the recording manager. Enter an upper range, in fps, for your camera. The **Workspace > Recording manager slider range** field lets you specify the actual capture rate.
- **Use a recording script** offers an even finer control of the recording process. With it, clicking on the record button will start running a predefined recording script. Select Edit Script to open the Recording Manager Editor, described below.

TIP: You can also access the **Recording Manager Editor** through the **Workspace > Recording Manager** button for the current or all selected Workspaces.

9.15 Recording Manager Editor

The Recording Manager Editor allows you to build your own recording scripts. When opened from a Workspace tab, the script applies only to the current workspace. If opened from StreamPix Settings, the script will be used by every Workspace (except the ones that use their own).

NOTE: This dialog can be brought up from either **Settings > Recording manager > Edit script** or **Workspace > Recording Manager**.

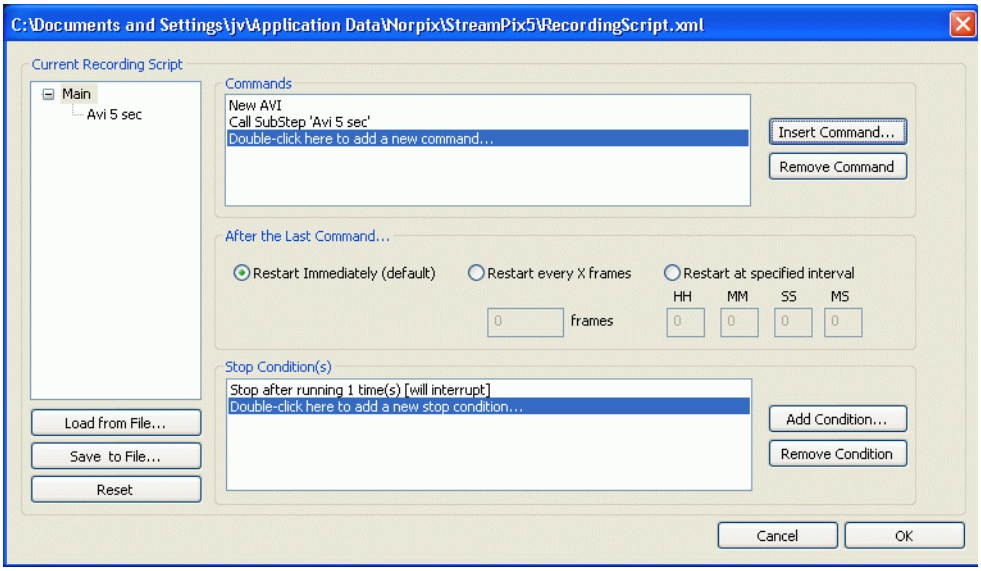


Figure 9-15: Recording Manager Editor

The current script (if any) is shown. **Save to file** prompts you to save the current script to an XML-format file.

Reset clears the current recording script.

Load from file allows you to reload script from a previously saved script file.

Each recording script is made of one or more steps. Each step can be made of any number of commands and/or substeps. The script is always run sequentially starting when a recording begins.

Understanding how to make a complex script can be a steep learning curve, but once you grasp the mechanics, the flexibility of the Recording Manager engine can cover most recording needs.

Click on a step in the tree on the left hand side to show/edit this step. To delete a sub-step, delete the associated 'Call Sub-Step' command in its parent step. Don't forget that you can always ask support@norpix.com if you ever need help building a script.

Commands

Commands are instructions given to StreamPix. Whenever StreamPix acquires a new frame, the Recording Manager is queried to know what to do with it.

Grab Frame: This command instructs StreamPix to save the frame to the current target file (sequence, etc). When encountering this command, the script execution will stop until a query is made by StreamPix.

Skip Frame: This command instructs StreamPix to discard the frame. It will not be saved. When encountering this command, the script execution will stop until a query is made by StreamPix.

Loop Recording: This command will loop the current sequence. i.e. The next saved frame will overwrite the first frame of the sequence and recording will continue from there.

New Sequence: Close the current sequence and create a new one based on the settings in **StreamPix Settings > Auto Naming**.

New AVI: Close the current sequence and create a new AVI file based on the settings in **StreamPix Settings > Auto Naming**.

New Images: Close the current sequence and create a new image sequence based on the settings in **StreamPix Settings > Auto Naming**.

Wait For Query: This will stall the execution of the script until a new query is made by StreamPix.

Call Sub-Step: Will create a new sub-step which will be ran. Once the sub-step completes, execution of the script will resume.

Execute: Will run a shell command line instruction of your choice.

After the Last Command

Once the last command of a step as been processed, you can define what will happen using this section.

Restart immediately: Will immediately continue running the step from it's first command

Restart every X frames: The step will loop every X frames acquired.

Restart at specified interval: The step will loop at the specified time interval.

Stop Condition(s)

A step will continue running indefinitely until one of its stop conditions occurs. Every step will also stop when the recording stops (For example, you click on the Record button a second time to stop the recording). Most of the time, every sub-step should have at least one stop condition, otherwise the control will never be passed back to its parent step. When a step reaches one of its stop conditions, the step terminates and control is passed back to its parent step. If the Main Step reaches one of its stop conditions, the recording automatically stops.

Every stop condition also has a property named **Can Interrupt**. If it is enabled, the stop condition(s) will be evaluated after each command. If it is disabled, the stop condition(s) are only evaluated when the step reaches its end.

Do X Times: The step will stop after it has been run X times.

Until X Frames: The step will stop once X frames have been captured by the step (and child steps).

For Time X: The step will stop after a certain time.

Until Time X: The step will stop when the system time reaches a predefined time.

Until IO: The step will stop when a specific IO event occurs (ex: Rising Edge).

Until Timed IO: The step will stop after the input level has been high or low for the specified amount of time.

Recording Manager - Script Examples

To grab at half the frame rate (Complexity: low)

```
* Main Step *
Commands: Grab Frame, Skip Frame.
After the Last Command: Loop Immediately.
Stop Conditions: None
```

Capture one minute every hour (Complexity: medium)

```
* Main Step *
Commands: Call SubStep "GrabFor1Min".
After the Last Command: Loop Every 1:00:00 (1 hour).
Stop Conditions: None.

* GrabFor1Min Step *
Commands: Grab Frame.
After the Last Command: Loop Immediately
Stop Conditions: For Time X = 1:00 (1 minute)
```

Pre/Post recording - Create a new sequence, capture in a 1 minute loop until Rising Edge, then capture for 10 seconds, then start anew. Stop after 10 sequences have been captured this way (Complexity: High)

```
* Main Step *
Commands: New Sequence, Call SubStep "Pre", Call SubStep
"Post".
After the Last Command: Loop immediately.
```

```
Stop Conditions: Do 10 Times.

* Pre Step *
Commands: Call SubStep "GrabFor1MinLoop", Loop.
After the Last Command: Loop immediately.
Stop Conditions: Until Rising Edge on IO device (can
interrupt).

* GrabFor1MinLoop Step *
Commands: Grab Frame.
After the Last Command: Loop immediately.
Stop Conditions: Do For 1 minute.

* Post Step *
Commands: Grab Frame.
After the Last Command: Loop immediately.
Stop Conditions: Do For 10 seconds.
```

9.16 Remote Control settings

This page is used to connect Workspace(s) to the StreamPix Remote software.

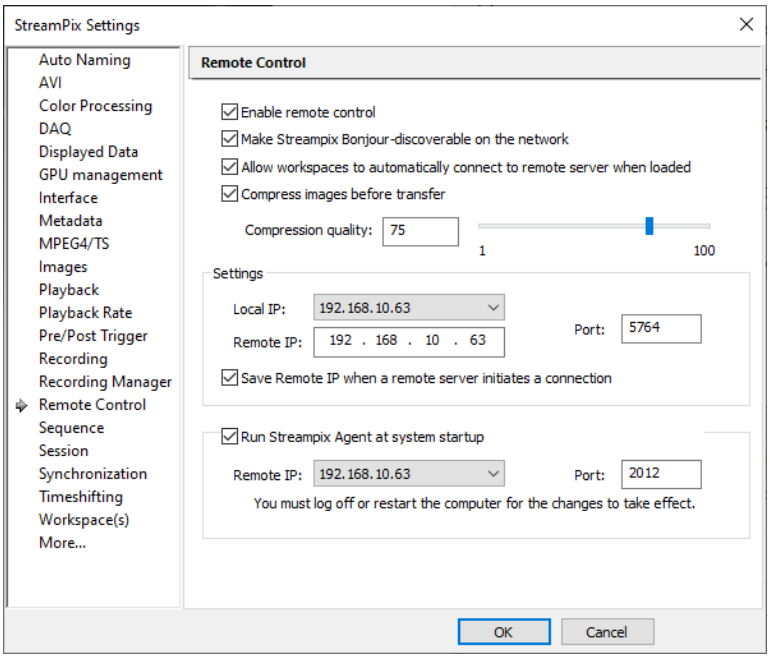


Figure 9-16: Remote Control settings

StreamPix Remote is an external application that allows the user to remotely view, control and monitor multiple workspaces running on one or more computers on the local network. It is distributed separately from StreamPix.

To configure StreamPix to connect to StreamPix Remote:

1. Select **Home > StreamPix Settings > Remote Control**.
2. Select the **Enable remote control** check box to enable network communication.
3. Optionally, select **Make StreamPix Bonjour discoverable on the network** to allow StreamPix Remote to discover StreamPix computers on the network.
4. Optionally, select **Allow workspaces to automatically connect to remote server when loaded**.
5. Enable **Compress images before transfer** and set the compression quality. This is the recommended setting. Compression increases the local CPU load somewhat, but the transmitted image to StreamPix Remote is of small size, saving network bandwidth. When the network bandwidth usage is high, this option can reduce the network traffic considerably.
6. To get connected select a local IP address and supply the same IP address and port number you specified when you configured StreamPix Remote to accept new connections. The connection will be possible only if both IP addresses are reachable.
7. If more control over a remote computer is needed, select **Run StreamPix Agent at system startup** to enable StreamPix Agent. This tool will allow StreamPix Remote to:
   - Shutdown or restart computer
   - Log off user
   - Launch StreamPix
   - Forcibly quit StreamPix (in case of crash or frozen GUI).

NOTE: StreamPix Agent is a separate application that runs in the background. Once enabled and running, it launches at user login time. A small icon displays in the system tray.

8. Select **OK** to save the changes and close the StreamPix Settings dialog.

When remote control is enabled. a new dialog will show up on the StreamPix docking panel interface for each workspace.

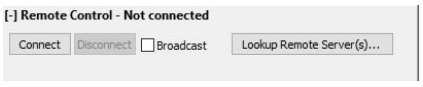


Figure 9-17: Remote Control docked dialog

NOTE: Make sure you configure the firewall to allow StreamPix to access the network.

Select the Connect or Disconnect buttons to manually connect or disconnect the current workspace to StreamPix Remote. Selecting the Broadcast check box will send the command to all other Workspaces so you won't have to click Connect or Disconnect for

each Workspace. See also the *StreamPix Remote Manual*.

A connection may fail if:

- StreamPix Remote is not running or accepting new connections.
- The address and port number are not the same as those StreamPix Remote is listening to.
- A firewall blocks the port that StreamPix Remote is listening to.

Click on the Lookup Remote Server(s) button to scan the local network, looking for any running instances of StreamPix Remote. If any are found, a list will be shown and the default server to connect to can be selected.

9.17 GPU Management

Depending on GPU brand and capability, GPU Management Settings give a better overview of the GPU capabilities for video compression. Supported GPU are Nvidia, AMD, and Intel. This interface allows you to enable or disable GPU acceleration. Changing these settings requires a StreamPix restart.

List capabilities for:

- H264 (AVC)
- H265 (HEVC)
- JPEG compression.

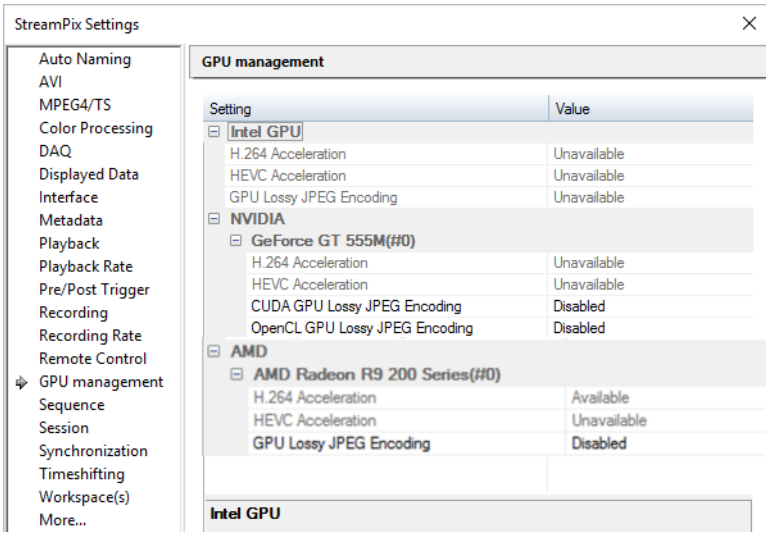


Figure 9-18: GPU management settings for Intel, Nvidia, and AMD GPUs

9.18.1 Special Registry Keys

Single versus multi-threaded JPEG compression:
On some rare occasions when using real time JPEG compression, for images larger than 3 Mpx size, the multithreaded algorithm will return a corrupted image. To avoid that, force a single threaded operation.

To ENABLE or DISABLE multithreading processing while software JPEG compressing:

Path: HkEY_CURRENT_USER\Software\Norpix
Key type: DWORD
Key name: JTMode
Default value: 0: multi-thread mode, 1: single thread mode.

MSB or LSB Alignment into TIFF container:
Most 3rd party software properly handles 16-bit tiff images provided the bits are MSB aligned. However, some 3rd party software requires the bits to be LSB aligned.

Path: HKEY_CURRENT_USER\Software\Norpix
Key type: DWORD
Key name: MSB
Default value: 0: aligned on the most significant bit, 1: aligned on the less significant bit.

Launching an application upon StreamPix crash:
It is sometime desirable to launch a specific application following a StreamPix crash, for instance to reset a camera to a known state. The following registry key allows to document the application to be launched after the crash report dialog is closed.

Path: HKEY_CURRENT_USER\Software\Norpix
Key Type: string
Key Name: CrashExecute
Key Value: full path and file name to be executed (exe)

9.18 Sequence Settings

Sequence Settings allow you to set the default behaviors for Sequences saved to the hard drive or to Ram, and to set the compression parameters for new and exported Sequences.

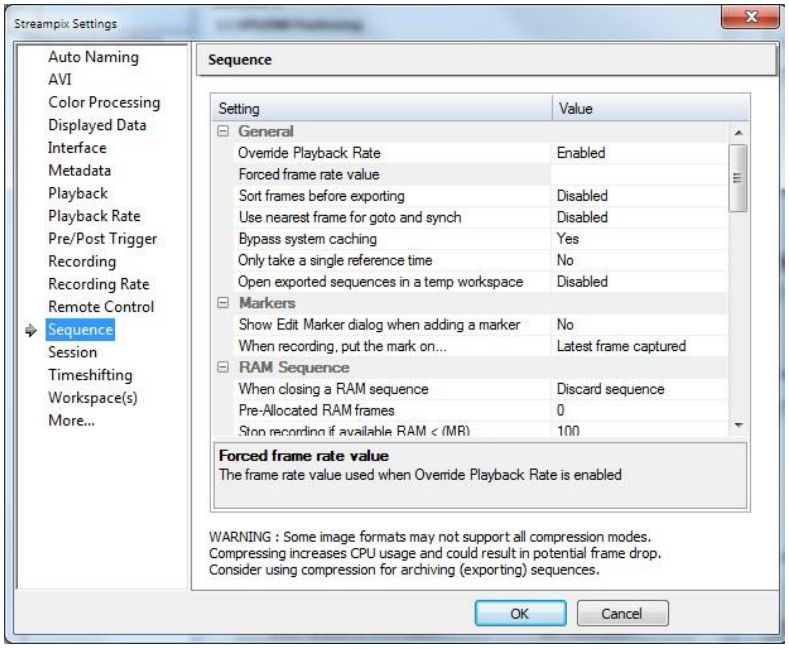


Figure 9-19: Sequence settings

General

NOTE: StreamPix Settings > Sequence settings apply globally. To set Sequence parameters for individual or linked Workspaces, see "Workspace Settings".

Override Playback Rate: Override the calculated frame rate of recorded sequence by a fixed value.

NOTE: The Override Playback Rate option does not alter the camera's capture rate. The file header is overwritten with the playback frame rate. The recording manager is still the incoming frame rate from the camera. To set the recording manager, see "Recording manager settings".

Forced frame rate value: the fps value used if Override Playback Rate is enabled.

Sort frames before exporting: If you do loop recording or use the pre-post trigger, you might want to enable this. This will make sure that the frames in the sequence will be exported in their chronological order. This is especially important when exporting to AVI or MOV.

Use nearest frame for goto and synch: When disabled (default), StreamPix uses the last frame to have been captured at the requested time. Enabling it will seek the closest frame (in time).

Bypass system caching: For uncompressed sequences, when bypassing is enabled (default), StreamPix sends the buffers directly to the HDD, bypassing the system cache. For most disks, this mode offers the best performance, especially when using external storage devices, like USB 3.0 disks. However, some disks perform better with system caching.

Only take a single reference time: When enabled, StreamPix uses the reference time when the first recording begins. When disabled, each sequence begins with a new reference time. The default is disabled.

Export subsampling (1/X): When enabled, exports onf frame per N frames. The default is 1, or every frame.

Write StreamPix version in the sequence description: When enabled, the StreamPix version number is included in the sequence meta-data.

When opening a sequence, show the oldest frame: When enabled, StreamPix displays the oldest frame first. When disabled, the sequence opens with the last recorded frame.

Open exported sequences in a temp workspace: If you want to automatically open sequences exported in a new temporary workspace for immediate viewing. This applies to every Export (current image, current selection & full Sequence) to a Sequence file (.seq).

Export

By default, when exporting sequences from multiple workspaces, StreamPix will do the exporting sequentially, one sequence at the time. The following options allow to enable multithreaded exports for each type of files. If enabled, StreamPix will export the sequences in each workspace in parallel. Consider enabling this option if the export's bottleneck is the CPU/GPU instead of the Hard Disk Drive's writing speed.

Use multithreaded export to sequence files: Enables the multithreaded exports. The default is No.

Use multithreaded export to AVI files: Enables the multithreaded exports. The default is No.

Use multithreaded export to MP4 files: Enables the multithreaded exports. The default is No.

Use multithreaded export to MPEG2 TS files: Enables the multithreaded exports. The default is No.

Use multithreaded export to image files: Enables the multithreaded exports. The default is No.

Markers

Show the Marker list: Show the list of Markers. The default is No.

Show Edit Marker dialog when adding a marker: Show the Edit Marker dialog when adding a marker. The default is No.

When recording, put the mark on ...: Places the marker on either the Latest frame captured, or on the Next frame captured.

Delete Markers associated with overwritten frames: Automatically delete markers when a frame is overwritten. The default is No.

Update the Marker file every time a marker is added: Automatically update the Marker file when adding a marker. The default is No.

NOTE: By default, markers are kept in RAM until the recording ends. Then an XML marker file is saved. When large number of markers are set, it is recommended to enable this option, to avoid clogging the memory.

RAM Sequence

When closing a RAM sequence: to set what happen when a RAM sequence is closing. The choices are:

- Discard the sequence
- Ask if the sequence is to be saved
- Automatically save the sequence using the auto-naming scheme for exports. See "Auto Naming Settings".

Pre-allocated RAM frames: Pre-allocate the memory for uncompressed RAM sequences. Try this if the normal capture to RAM drops frames (burst recording).

Stop recording if available RAM is < (MB): When recording to a RAM sequence, StreamPix can become unresponsive if the system runs out of RAM. To avoid this, every second or so, StreamPix will check the amount of RAM available and if it reaches the critical value specified here, the recording will automatically be stopped.

Compression for new and exported Sequences

By default, Sequence files don't use compression, images are captured and recorded as is from the camera delivery pixel format, resulting in lossless quality and superior recording performance. You may choose to use compression if you have the computing power and if disk space is a concern.

NOTE: Index information for compressed sequence files is saved as a separate .idx file. For all recording to a Sequence file with compression on, a new index stream file is created (with the .idx extension) in the same folder and with the same name as the Sequence file. This index stream file speeds up the reading and playback process. It can be deleted, but it will be rebuilt the next time the Sequence file is accessed. On large file, the rebuild process will take time.

There are two sections: one **Compression for new Sequences** (i.e. Sequence files used for direct recording) and **Compression for exported Sequences**. Both sections offer the same parameters. This allows you, for example, to record in uncompressed format, then later, export the Sequence to a compressed format for archiving or distribution purposes.

Compression Types

NOTE: Compression settings can be set globally or per individual Workspace. From the **Settings > Sequence** tab, the settings are global. When done from the Workspace ribbon, they are per Workspace.

Compression algorithms can be divided into “Lossless” and “Lossy”. With Lossless compression, all of the original data are preserved, but with lower compression rates, typically about 3:1. Lossy compression results in greater compression ratios, typically from 10:1 or greater, resulting in much smaller file sizes, but with a loss of data, and a potential loss of image quality. The challenge with lossy compression is to find a balance between maximum compression while maintaining acceptable image quality.

TIP: Lossy compression doesn’t work well with raw Bayer images, as the color pattern tends to get damaged. The workaround is to first convert the images to color RGB, then compress.

Lossy compression algorithms can further be divided between **Temporal** and **Spatial**.

Temporal compression is a technique of reducing compressed video size by not encoding each frame as a complete image. The frames that are encoded completely (like a static image) are called key frames. All other frames in the video are represented by data specifying the change since the last frame.

Spatial Compression is reducing digital video image size by compressing the pixels within each frame independently. Also known as the "intraframe" method.

For example, H.264 compression is mostly temporal: in a group of 30 frames (GOP=30, default), frame 0 is spatial compressed, and 2 to 29 are temporal compressed. You need to reconstruct all the frames to get access to frame 29. This is much more CPU intensive but allows better compression.

The type of compression to use is dependent on both your hardware and on your expected results. The parameters that are available depend on which compression type that you choose. StreamPix provides the following compression types:

Compression Type	Comments
No compression (raw)	Best data preservation, lowest processing overhead. Images are recorded unchanged from the camera output format.
Lossless JPEG	Works on all images, Spatial, CPU-intensive, low compression (2:1), compression level dependent on image texture.

Table 9-1: Supported compression options

Compression Type	Comments
Lossy JPEG	Works on all images, Spatial, CPU-intensive, compression level dependent on image texture, compression adjusted as a quality percentage, or using the slider. Can use GPU acceleration. The following compression factors are provided for information only. To get an accurate estimate, you should do some benchmarking. Typical compression factors: • Very light compression (95%) • Light compression (80%) • Medium compression (65%) • Heavy compression (40%) **Related parameters:** ***JPEG Quality, Use fixed image size, Fixed image size in byte, GPU Lossy JPEG Encoding, Bayer and Color Processing method.*** **NOTE:** The default is 75%, which is usually considered as visually lossless, with a compression of about 15:1. **Note:** External module Compression Estimator can be used to determine the compression factor.
Lossless RLE	Works on all images, Spatial, CPU-intensive, compression level maximum 3:1. If image texture is very complex, compressed image size may be larger than uncompressed. Works well for images with a lot of identical constant pixel intensity.
Lossless Huffman	Works on all images, Temporal, CPU-intensive, compression level maximum 3:1.
Lossless LZ	Works on all images, Temporal, CPU-intensive, compression level maximum 3:1.
H.264	Temporal. Works on most images and pixel format. Compression performed by the CPU or GPU. Image horizontal must be multiple of 16 and vertical size must be multiple of 8. **Related parameters:** ***Video Codec GOP Size, Video Codec Bit Rate, H.264 Acceleration*** • **Intel Quick Sync:** If present, an Intel Quick Sync enabled GPU is used for compression. Image size limited to 4k. Larger image will switch to CPU mode. • **NVIDIA GPU:** If an NVIDIA® series 7 or higher GPU is detected, the NVIDIA® GPU will be used to H.264 compress the video in real time. Maximum of 2 workspaces can use the GPU for compression simultaneously on consumer based GPU. Most Quadro model have no limitation related to the number of workspace. Image size limited to 4k. • **AMD GPU:** If an AMD series 9 GPU or higher device is detected, the AMD GPU will be used to accelerate the compression. Image size limit is 4K resolution. **NOTE:** See also "H.264 Decompressor".
H.264 Loop	H.264 compression, with same functionalities as above plus loop recording. File size may be a bit larger. Looping can only occur on the boundary of the GOP size. **Related parameters:** ***Video Codec GOP Size, Video Codec Bit Rate, H.264 Acceleration, Use Fixed image size, Fixed Image size in bytes.*** **Note:** In order to determine the right value for ***Fixed Image size in bytes,*** *use the external module* ***Compression Estimator***

Compression Type	Comments
Cayer Compressor	Used exclusively on Bayer images. Codec optimized to compress raw Bayer non-interpolated image without degrading the Bayer pattern. Can be set as lossy or lossless. Compression rate goes from 3:1 to 8:1 depending on setting. **Note:** The Cayer codec provided with StreamPix is a demo version, single threaded (compression speed is limited). Compressed images are watermarked. Contact Norpix to purchase a complete codec license (About $150.00). **Related parameters:** ***Cayer Compressor*** (lossy, 10:1, lossless, 3:1), ***Bayer and Color Processing method.***
HEVC	Temporal. HEVC (h.265) is supported on nVidia GPU generation 9, and Intel generation 4 or higher CPU/GPUs. HEVC does not support loop (overwrite in place) recording. **Related parameters:** ***HEVC Acceleration, Video Codec Bitrate, Video Codec GOP size.***
MPEG4	MPEG4 compression equivalent to DIVX. **Related parameters:** ***Video Codec Bitrate, Video Codec GOP size.***
No Compression (async mode)	Same as uncompressed raw. Expect that the write process to the disk is performed asynchronously to allow a slight gain of performance on certain type of recording media. When selecting this mode, no simultaneous playback is possible.

Table 9-1: Supported compression options

NOTE: GPU-accelerated JPEG compression is license-based and uses the GPU for processing. Current GPU support is for AMD, Intel, and NVIDIA®. When compressing a raw Bayer image using the accelerated GPU based algorithm, a Bayer interpolation and white balancing are performed first by the GPU. Make sure to set the proper Bayer pattern.

NOTE: The Cayer Bayer pattern specified in **StreamPix Settings > Sequence > Compression** must match the Bayer pattern set in **Bayer/Colors > Bayer Pattern**.

Fast Compression Using IPP: Enable the usage of Intel Pixel processing Library to accelerate the compression while using RLE, Huffman and LZ compression

Use Fixed Image Type: during loop recording, each image (JPEG) or group of images (H.264) will use a fixed size in bytes, allowing being overwritten. This will result in slightly larger file size than when using non loop mode.

Fixed Image Size In Bytes: Define the size for each image (JPEG) or group of images (H.264) during loop recording. Use External Module ***Compression Estimator*** to help

determine what should be the ideal image size.

Index: For all recording to a SEQ file with compression, an index stream file is created (with idx extension) in the same folder and with the same name as the Sequence file.

This index stream file speeds up the reading and playback process. It can be deleted, but it will be rebuilt the next time the Sequence file is accessed. On large file, the rebuild process will take time.

- The index by default is saved as a separate file
- NTFS Stream: the index is stored in a sub section of the name file as a NTFS stream. During copy to some external disk, depending on formatting, the secondary stream may be lost.

Cayer Compression: select compression quality when using CAYER compression.

JPEG Compressor defines the settings related to the way the software will perform the compression or handle the decompression during playback:

- **JPEG Quality:** Defines the JPEG quality, from 100% (close to lossless) to 0%. 75% is typically considered Visual lossless.
- **GPU Lossy JPEG Encoding:** Defines how compression is performed, either a discreet GPU (Nvidia) or via some software library.
- **JPEG decoding:** Select the decompression library used during playback.

H264/HEVC Compressor defines the settings related to the way the software will perform the compression:

- **Video codec GOP size:** Defines the Groupe of Frame Size. Default is 30 frames.
- **Video codec bit rate (bps):** Defines the bit rate in bits per second for the generated compressed video stream.
- **H.264 acceleration:** Define the library use to perform the compression: it can be via software only or with the help of a GPU. Intel GPU as well as Nvidia and AMD GPUs are supported.
- **HEVC acceleration:** Define the library use to perform the compression: it can be via software only or with the help of a GPU. Intel GPU as well as Nvidia and AMD GPUs are supported.
- **GPU Color Pre-processing:** For raw Bayer images, the Bayer interpolation and white balance correction is by default performed by the CPU before the image is pushed to the GPU for compressing. When enabled, this can be achieved rather by the GPU. This results in a higher load on the GPU, but a lower load on the CPU, allowing some load balancing.

9.19 Session settings

This page lets you set the default behavior on start-up.

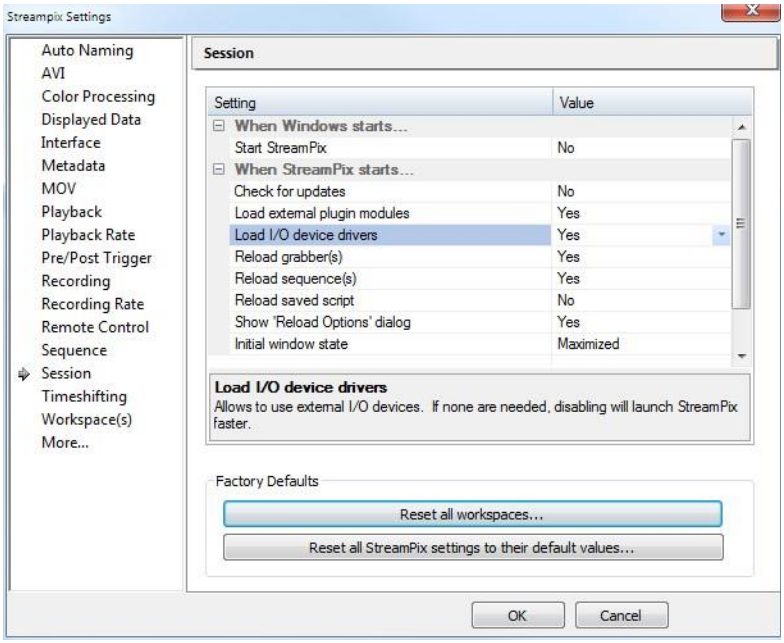


Figure 9-21: Session settings

When Windows starts...

Start StreamPix: Lets you specify whether to start StreamPix automatically when the system starts.

When StreamPix starts...

Check for updates: Automatically check if a new release of StreamPix is available. The check is done once per month.

Load external plugin modules: If you don't use any modules, skipping loading them will make StreamPix launch faster.

Load I/O device drivers: If you don't use the I/O manager, skipping loading the IO drivers will make StreamPix launch faster.

Reload grabber(s): Automatically reload the camera / frame grabbers used in the last session.

Reload sequence(s): Automatically reload sequences that were open in the last session.

Reload saved script: Reload the saved script. Don't enable this option unless needed.

Show 'Reload Options' dialog: If a crash occurs, the reload dialog will allows you to select which grabber/sequence to reload (or none at all). If disabled, everything will be reloaded as if nothing happened.

Initial window state: Initial window state when StreamPix is launched (Normal, Minimized, Maximixed, Full Screen (F12 to toggle)).

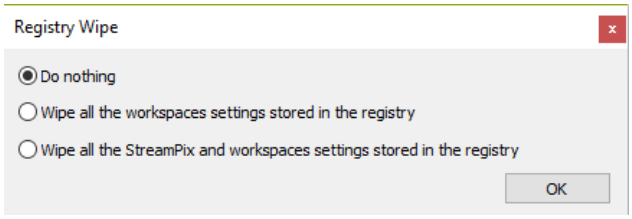
Run NpxDebug in background: Run the NorPix debug utility in the background, typically minimized in the system tray.

Factory Defaults

In general, there is no need to un-install the software to get everything reset. The Reset All options let you restore default values:

- **Reset all workspaces** will erase all the Workspaces while leaving the StreamPix settings intact.
- **Reset all StreamPix settings to their default values...** after confirmation, will do exactly what it says.

NOTE: It is also possible to get a prompt to reset StreamPix to its default configuration by holding down both ***SHIFT + CTRL*** keys while double click on the software to start the application:



The popup dialog will allow you to select the level or reset needed:

- Select ***Wipe all the workspace settings*** to erase information related to workspaces and cameras settings
- Select ***Wipe All the StreamPix and workspace settings*** to reset completely the software to factory settings.

9.20 Synchronization settings

Synchronization Settings let you set the priority used to synchronize Audio, Video, and/or DAQ streams. Streams are listed with the highest priority at the top of the list.

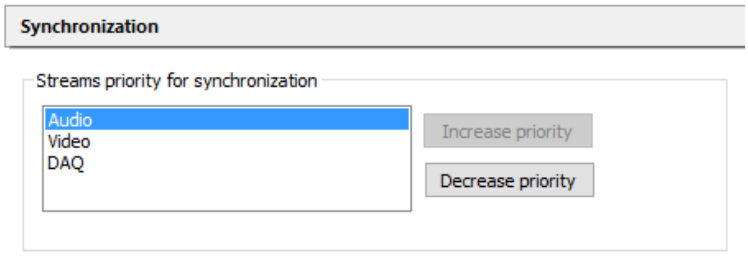


Figure 9-22: Synchronization settings

9.21 Timeshifting settings

This page is used to configure the timeshifted playback function. You can specify the timeshift mode to be either based on a time delay or on a frame delay.

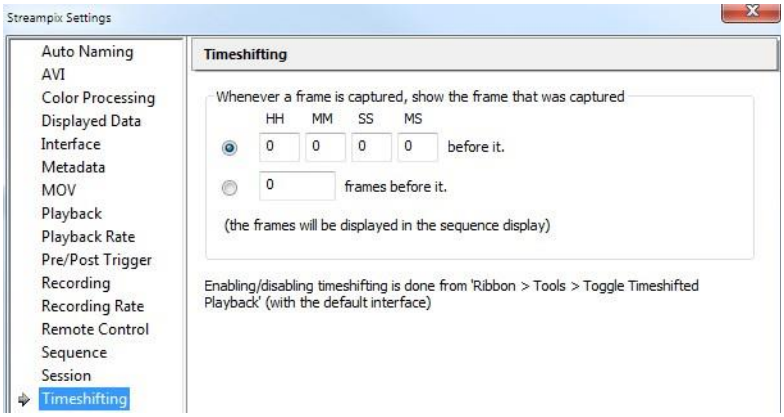


Figure 9-23: Timeshifting settings

With timeshift enabled, StreamPix stores information about the antecedents to each frame captured. Every time a frame is captured, the Sequence display is updated with the frame that was captured X time or X frames before it. Then, you can use **Sequence > Toggle Timeshifted Playback** to start/stop the playback.

Caution: Timeshifted playback requires twice as much bandwidth as a standard recording (because StreamPix has to fetch the old frames from the Sequence file). If StreamPix drops frames, the computer might not have sufficient bandwidth to perform the simultaneous read/write operations.

TIP: One way to reduce bandwidth usage is to do a loop recording in a RAM sequence. See "Recording settings".

NOTE: Regular playback actions do not work while a timeshifted playback is in progress.

9.22 Workspace(s) settings.

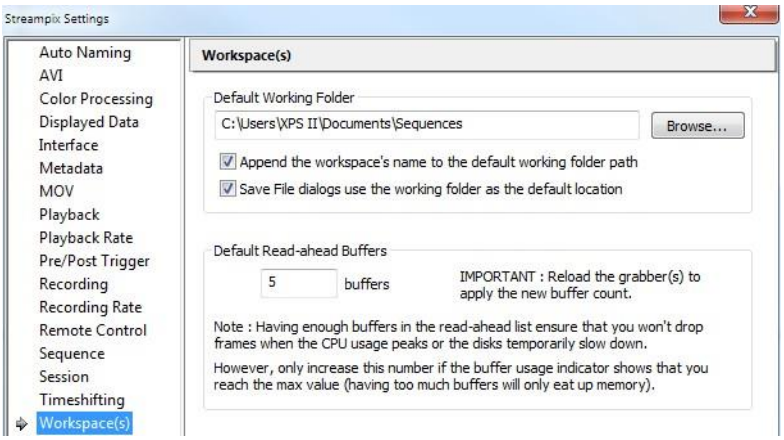


Figure 9-24: Workspace settings

Default Working Folder

This page is where you set the default Working Folder to use for newly created workspaces. The default is “my Documents\Sequence\”, but it can be set to any valid path. It is also possible to automatically append the Workspace name to the working folder path, making it easy to store files related to each Workspace in its own folder.

By default, file dialogs (**Save As / Open**) start in the Working Folder. To override this and start in the last used folder instead, deselect **Save File dialogs use the working folder as the default location**.

> **TIP:** To assign a custom working folder to an individual workspace, select **Workspace > Working Folder**.

Default read-ahead buffers

The Default Read-ahead Buffers is the buffer count that will be used by each grabber. For example, if the camera runs at 30 fps, using 150 buffers means that you have a 5 seconds buffer in case the system experiences a lag at some point. Having enough buffers means that the system will be less likely to drop frames when CPU or disk usage peaks; however, too many buffers only eats up an excessive amount of memory.

Recommended value is to allocate about 1 second of incoming frames. So at 30 fps, 30 buffers is typically enough. Lower values can be set for RAM recording.

NOTE: Reload the camera after changing the buffer count.

9.23 More... settings

General

Automatically open folder after exports

If enabled, this will automatically open the folder in Window Explorer where the files were exported.

Automatically close current file when needed

If disabled, you are prompted every time the current sequence, avi, etc is closed.

Prompt before overwriting an existing file

If enabled, when a file name generated from an autonaming scheme would overwrite an existing file, StreamPix will show a prompt to confirm that the user wants to overwrite. Of course, it is recommended to avoid using this setting if files are automatically created when the record button is clicked as it would delay the recording start time.

Periodically resynchronize the timebase

When using system time as the time source, StreamPix reference time if read during camera initialization. Then an internal high-performance counter is used to calculate elapsed time between frames.
If enabled, StreamPix will resync its internal time base with the computer clock on a regular basis. This feature is useful when the computer clock is updated by an external application or service, since by default StreamPix will not be aware of that. By default, the resync is performed every 5 minutes. A registry key can be defined to overwrite the default update interval:

```
Key path: H_KEY_CURRENT_USER\Software\Norpix\StreamPix\General
Key Type: DWORD
Key name: "SynchInterval".
Key value: 300 (default). The value is the synchronization
interval in seconds. Default is equivalent to 5 minutes.
```

During recording, the reference time will be updated only if it is a forward update in time. Backward update is not possible because of the risk of getting a negative time stamp offset between 2 consecutive frames, a NO GO in StreamPix. When not recording, backward and forward updates are possible.

Notifications

Frame drop / Audio drop notifications: Disable the notification shown in the notification bar when frame drop or audio packets drop is detected. You can still see if there were frames dropped by looking in the grabber docked dialog.

Quick Export

The parameters described here affect the behavior of the **Home > Quick Export** button. See "Advanced Workspace settings".

Source: What to export, i.e. the current image, selection, Full Sequence, or Automatic Range.

Destination format: The output format. Select from the list.

Automatic Range parameters

Mode: Frame count or timestamp.

Number of frames before / after: Leading and trailing frames to include.

Time length before / after (ms): Leading and trailing length to include by timestamp value.

Auto-Copy

Auto-Copy: Enable or disable the auto-copy feature.

Suspend Auto-Copy tasks while recording: Suspending auto-copy tasks will make sure all the available bandwidth can be used for the recording process. Auto-copy tasks will automatically resume when StreamPix stops recording.

Maximum concurrent copy jobs: The maximum number of auto-copy jobs that are processed simultaneously.

Keep history: Enable to keep an history of successful and failed transfers.

Manual Auto-Copy transfer mode: Indicate which copy mode is used when starting an auto-copy manually (from the Auto-Copy dialog).

Robocopy copy settings

Auto-Copy after recording: If enabled, StreamPix will auto-copy a sequence file after it finishes recording. Uses Windows Robocopy to copy files locally or on a local network.

Auto-Copy after exporting: If enabled, StreamPix will auto-copy the export target file after it finishes exporting. Uses Windows Robocopy to copy files locally or on a local network.

Default Auto-Copy Folder: Set the folder where auto-copy files will be copied.

Auto-Copy Inter Packet Gap (in ms): The IPG is a parameter used by robocopy to throttle the transfer speed and avoid overloading the network. Use 0 for the fastest transfer speed.

FTP copy settings

Auto-Copy after recording: If enabled, StreamPix will auto-copy a sequence file after it finishes recording. Uses the FTP to copy files to a remote FTP server.

Auto-Copy after exporting: If enabled, StreamPix will auto-copy the export target file after it finishes exporting. Uses the FTP to copy files to a remote FTP server.

Host name or IP address: The address of the FTP server. Can either be a host name (ex: ftp.mysite.com) or an IP address (ex: 199.244.77.121)

Auto-Copy directory: The directory on the FTP server where the files will be copied. (ex: /backup/video)

FTP username: The user name used to connect to the FTP server.

FPT password: The password associated with the user name.

FPT connection mode: Active or Passive (default).

I/O Settings

The **Settings > More > I/O** options toggle the display of the **Input Control** and **Output Control** panels in the docked **IO Manager** dialog.

See also "HOWTO Trigger a Software Event from an external input line (I/O Manager)".

Enable Input Control

When **Enable Input Control** is enabled, the **IO Manager > Input Control** docked dialog is shown in each Workspace allowing you to monitor various input lines to trigger a recording, add a marker, etc.

To create a new action, double-click on the **[Add new event...]** line. To edit or delete an existing action, double-click on the line describing that action. In both cases, the **Input Action** dialog opens.

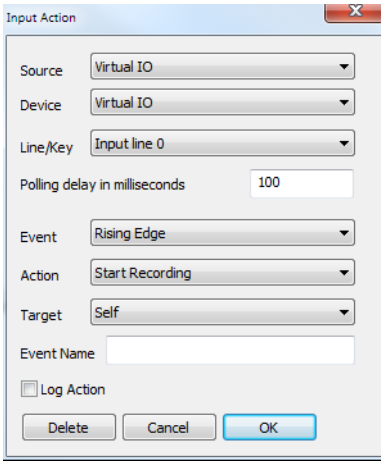


Figure 9-25: Input Action dialog

The **Input Action** dialog fields are:

- **Source:** The general device name. All I/O devices detected by StreamPix are shown in this list. A source can either be related to the grabber (i.e: frame grabber with input lines), an external IO device, or a **Virtual IO**.
- **Device:** Where more than a single Source device exists, the device number. Typically, the device number is 0 (the first one). If a Virtual IO was selected as the source, the Device is automatically selected as Virtual IO.
- **Line/Key:** All available lines for the selected source are shown. Select the input line to monitor.
- **Polling delay:** This is the interval at which the input line is polled. If the value is too low, non-stop polling will be implemented, needlessly consuming system

resources. However, a very high value might miss an event. For instance, if the input signal goes from level-low to level-high and back to level-low between two polling actions, StreamPix would not notice that an edge occurred.

NOTES:

- Some devices may require under the very first usage to be initialized via their proprietary application first. Then, they will be properly detected by the IO Manager.
- Some devices use an interrupt, in which case the polling time is ignored. The device interrupts the software when a line level change is detected. Interrupt mode allows a faster response time since no polling is needed.
- When using National Instruments devices with change detection notification (interrupt) the rate of interrupt notification may be too high for the operating system to cope with the number of request, resulting in incorrect IO event management. For NI devices supporting change detection, an extra registry key can be used to turn off the change detection operating mode and rather use a more conventional polling mode:

  Key Path: H_KEY_CURRENT_USER\Software\Norpix
  Key Name: ForcePolling
  Key Type: DWORD
  Key Value: 1 to force polling operation, 0 to use change detection mode if hardware supported.

- **Event:** This is the event to monitor. The standard Level low, Level high, Rising edge & Falling edge are available. Typically, the software monitors the voltage on the input line. Input lines have 2 levels, low or high, i.e.: 0 or 1, physically usually 0V versus 5V. A rising edge is a transition from 0 to 1, or 0V to 5V. When a rising edge is required, the software waits for a transition from 0 to 5V, hence it must read at least once a value of 0V then a value of 5V. A Level low detection means that when reading the input line level, if the level is low the condition will be immediately asserted as true. It will not wait until a level change.
- **Action:** This is the action to take once the event occurs. The available actions are:
  - Start Recording to start recording
  - Stop Recording to stop recording
  - Toggle Recording starts recording if it is not currently recording and stops if it is.
  - Snap Frame to save a single frame
  - Line Testing is a dummy action and does nothing unless it is used in combination with the Log Action described below to test the input lines.
  - Trigger Pre/Post Event triggers an event when in Pre/Post Trigger mode.
  - Set event marker sets a marker on the current frame.
  - Take Reference Time. See “Edit Reference Time”.
  - Clear Reference Time.

- Start / Stop Pulse will control the pulse generator using an Arduino or a frame grabber pulse generator module
- Enable / Disable Live will control the image capture from the grabbing device

NOTE: More actions will be added based on further developments and customer requests.

- **Target:** Can either be **Self** to apply the action to the current Workspace only or **All Workspaces** to broadcast the action to all Workspaces. **All Workspaces** allows you to synchronize multiple Workspaces without having to configure their I/O Manager panels separately.
- **Event Name:** Event name gives you the option to name a particular event rather than use the default name made as the name of the device followed by the related input line. For example, if the line is connected to a sensor that monitors a door, the event name could be “Front door open”. The event name is used when the **Set Event Marker** action is selected. It is not used otherwise.
- **Log Action:** If this is checked, each time the event is detected, StreamPix sends a debug output to the system. The output can be displayed using **Tools > Debug Log**. Use it with the “Line Testing” action to check that the lines are working properly.

Select the **Delete** button to remove an existing action from the list. Select **Cancel** to abort action editing. Select **OK** to accept changes made to an existing action or create a new action.

Enable Output Control

When **Enable Output Control** is enabled, the **IO Manager > Output Control** docked dialog is shown in each Workspace allowing you to send out signals in reaction to various events. Double click on an event to modify it. The **Output Action** dialog opens.

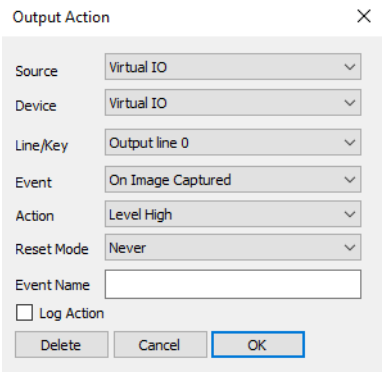


Figure 9-26: Output Control Manager dialog

The **Output Action** dialog fields are:

- **Source:** The general device name. All I/O devices detected by StreamPix are shown in this list. A source can either be related to the grabber (i.e: frame grabber with input lines) or an external IO device.
- **Device:** Where more than a single Source device exists, the device number.

Typically, the device number is 0 (the first one).

- **Line/Key:** All available lines for the selected output are shown. Select the output line to use.
- **Event:** Select the event which will trigger the output action. More than 18 different events have been predefined. More event can be added upon customer request.
- **Action:** Level High: when the output condition is reached, the specified output line is set to a level high. Level Low: when the output condition is reached, the specified output line will be set to a level low.
- **Reset Mode:** Select the output trigger reset mode. The choices are:
  - **Never:** The output line level will be set to the pre-defined level and will hold that state.
  - **Normal:** The output line level will be set to the pre-defined level for a short time and will return to the default initialization level.
  - **Auto-Reset:** the line level will toggle to the default initialization level after a user programmable delay. A pop up dialog to enter the delay value will open when selecting this option.
  - **Toggle:** When the condition is true, the output line will toggle its level (high to low, or low to high).
- **Event Name:** Event name lets you name a particular event rather than use the default name, which is the name of the device followed by the related output line.
- **Log Action:** If this is checked, each time the event is detected, StreamPix sends a debug output to the system. The output can be displayed using **Tools > Debug Log**. Use it with the "Line Testing" action to check that the lines are working properly.

Select the **Delete** button to remove a selected existing action. Select **Cancel** to abort action editing. Select **OK** to accept changes made to an existing action or to create a new action.

Event Markers

I/O markers are stored in an XML file with, for each event, in the following fields:

- **Name:** The name of the I/O event as named when the I/O was configured.
- **Description:** The event that occurred (rising edge, falling edge, etc) and the device & line on which it occurred.
- **FrameIndex:** The index of the last frame to have been recorded when the event occurred.
- **Timestamp:** The timestamp in seconds (in time_t format) of the last frame.
- **TimestampMS**: The millisecond part of the timestamps.
- **TimeString:** The timestamp, formatted in a readable string.
- **Valid:** 1 for valid, 0 for invalid. When loop recording, if a marked frame gets overwritten, the associated event will still be kept but will be marked as invalid because the related frame no longer exists.

Tools

This chapter describes the following tools available in StreamPix:

10.1 Tools Menu

Recording Scheduler, see “Recording Manager Editor”.

Load/Save Configurations

All StreamPix settings are saved in the Windows Registry. When you save a configuration, a Registry file (.reg) is created that holds all current content of the StreamPix registry branch. The **Save Configurations** option can be used to save a specific setup to be reused later, or to alternate between different setups.

Reloading a configuration requires a StreamPix restart. You will need Administrator privileges, as Windows will ask for permission to write the file content to the Registry.

StreamPix can be started and forced to always load the same configuration file. See “Command Line Arguments”.

Auto-Copy Queue

Click on this button to open the Auto-Copy jobs queue dialog.

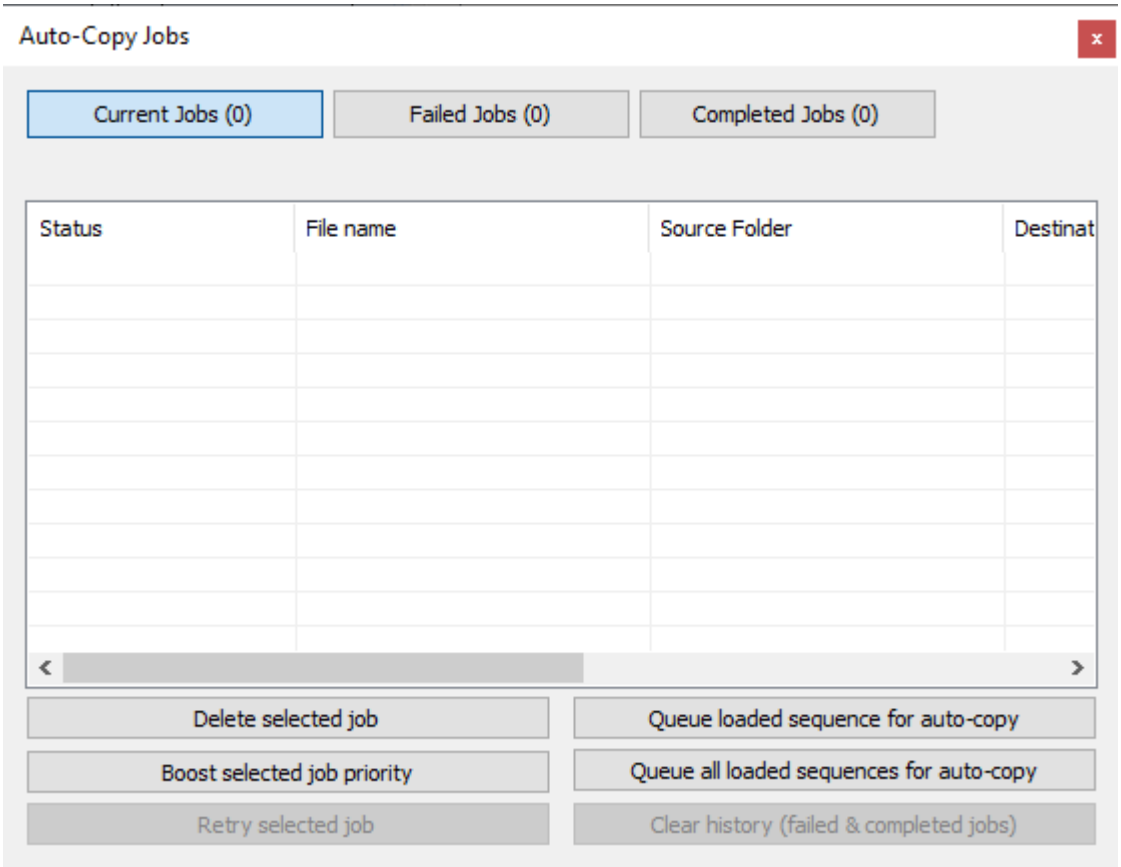


Figure 10-1: Output Control Manager dialog

The buttons at the top are used to show the current and queued jobs, the failed jobs and the successfully completed jobs. For each jobs (file), you can see its status (or transfer progress), the file being transferred and the source and destination folders.

Click on a job to select it and use the bottom buttons to…

Delete selected job: Remove the selected job from the list.

Boost selected job priority: Move the selected job higher in the list of transfer priority.

Retry selected job: Retry the transfer of a failed job.

Queue loaded sequence for auto-copy: Manually add an auto-copy job for the sequence in the active workspace.

Queue all loaded sequences for auto-copy: Manually add an auto-copy job for the sequences each workspaces.

Clear History: Clear all job entries in the Failed Jobs and Completed Jobs lists.

Metadata Manager

The Metadata Manager button launches the NorPix Metadata Manager utility that comes bundled with StreamPix. This tool is used to configure the metadata allocation in Sequence files. You will need to restart StreamPix for the new settings to be applied.

Disk Benchmarking

The Disk Benchmarking tool button launches the NorPix Disk Bench utility that comes bundled with StreamPix. Use this tool to evaluate your system capacity for streaming frames to the Sequence file format.

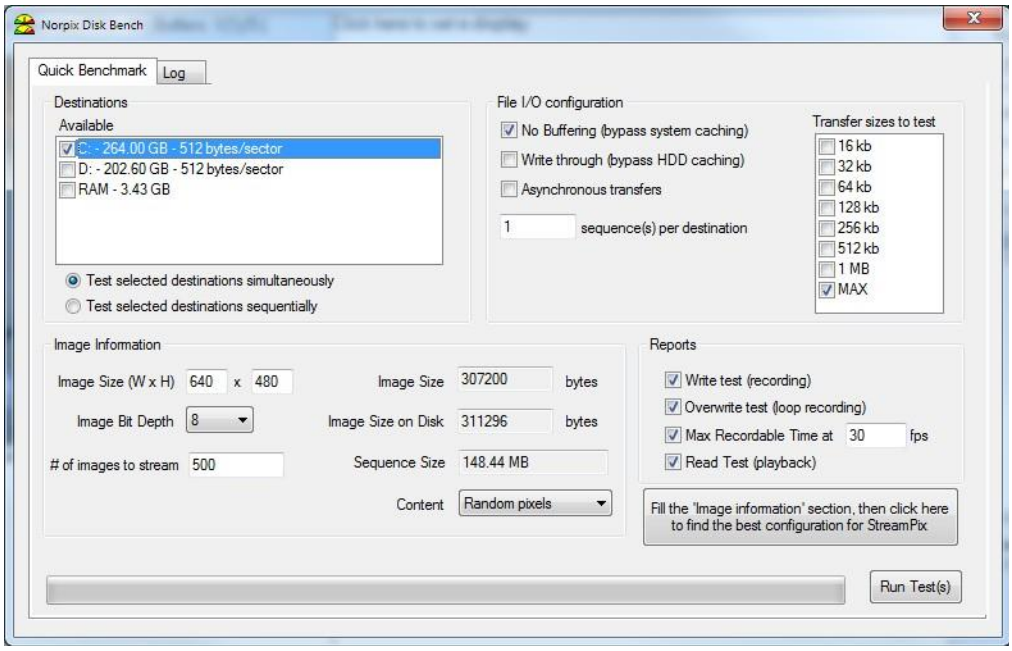


Figure 10-2: Disk Benchmark utility

To Evaluate System Capacity

1. Select the Disk Benchmarking tool button. The utility dialog opens. See Figure 10-1.
2. Select the drive(s) to test, and optionally the RAM.
3. Specify either **Test selected destinations simultaneously** or **sequentially**.
4. Set the **File I/O configuration** and **Transfer sizes to test.** If in doubt, accept the defaults.
5. Set the **Image Size** and **# of images to stream.** If in doubt, accept the defaults.
6. Select the **Reports** to generate.
7. Select **Run Test.**
8. The results are displayed in the utility dialog **Log** tab.

NOTE: Results provided with this utility should be considered as the best possible case.

Windows Task Manager

This launches the standard Windows Task Manager. The Performance tab can be used to monitor CPU usage in order to analyze any frame drop that might occur.

Debug Log

The Debug Log allows you to see the internal status messages. This can be useful for solving various types of crashes. For instance, if StreamPix is unable to load the desired grabber, reviewing the log as StreamPix attempts to load the grabber might give an indication about the cause of the problem.

Performance

Tools > Performance shows an estimate of the:

- CPU Usage: as a percentage used by StreamPix of overall capability.
- Memory Usage: Memory used by StreamPix as a percentage of memory available for this process.
- Network Usage: as a percentage of capability used by StreamPix when communicating with StreamPix Remote.

10.2 Command Line Arguments

StreamPix supports a few command line arguments.

StreamPix8.exe -r

Starts a recording as soon as StreamPix finishes launching. If all Workspaces were selected last time StreamPix was closed, every Workspace will start recording. Configure **StreamPix Settings > Recording** and **Auto Naming** settings to setup the destination files.

StreamPix8.exe -config "C:\Users\User\Documents\StreamPix8\Configurations\config.reg"

Will overwrite the current configuration with the configuration in the specified file. You can save your current configuration from **Tools > Save Configuration**.

StreamPix8.exe "C:\temp\sequence.seq"

Will load the specified sequence file in a temporary workspace.

10.2.1 Audio Exporting utilities

There are 2 audio exporting tools available.

- Exporting to WAV media container: use **audioexport.exe** utility.
- Exporting to MP3 or AAC media container: use **Audio2mpa.exe** utility.

AudioExport.exe is a command line utility to export a .AUD file to .WAV uncompressed audio format.

```
*************************
Command Line Audio Export Copyright 2013 (C) NorPix inc.
*************************
Synthax: AudioExport -X -Y -Z
-i      Input wav or aud file.  Ex : -i "c:\Program Files\test\audio.aud"
-o      Output wave file name.  Ex : -o c:\test\audio_out.wav
-r      Remove bwav specific header information. Output file is wav
        compatible only.
-d      Print out audio file header and content infomation (informative
        only, input file only).
-co     Specify the number of audio track in the destination file.
        If it is Specified, -ch# ## must also be defined.
-ch# ## Specify the audio track mapping: # input track position, ##
        output track position
```

Audio2mpa.exe is a command line utility to export .AUD file into either .MP3 or .AAC compressed audio file. It supports any bitrate, and up to 2 channels (stereo). When exporting to MP3, the maximum input bit rate is CD quality, 44.1kHz.

```
*************************
AAC and MP3 audio Export Copyright 2014 (C) NorPix inc.
*************************

Syntax: Audio2Mpa -X -Y -Z
-i Input wave file. Ex: -i "c:\Program Files\test\audio.wav
-o Output audio file name. Ex: -o c:\test\audio_out
-aac Output aac audio.
-mp3 Output mp3 audio(default).
-b Bitrate. default 128000
-d Printout audio file header and content information (informative only,
   input file only).
-co Specify the number of audio track in the destination file.

If it is Specified, -ch# ## must also be defined:

-ch# ##: Specify the audio track mapping: # input track position, ##
         output track position.
```

10.3 SendRM Support

SendRM.exe (Send Registered Message) is a command line application that allows you to send registered messages to any application.

The command line syntax is: SendRM “Window Name” “Message”

The first parameter of the SendRM is the Windows title of the application which will receive the message. SendRM must use the windows title of the StreamPix instance that is currently running, usually “StreamPix”.

StreamPix is able to process external messages that will start recordings, stop recordings, etc. More messages will be added with time and as users request.

You can call SendRM directly from the command line, the "Run" prompt, the Windows Scheduler, etc.

NOTE: StreamPix must be running at the time the messages are sent.

Here is the syntax for StreamPix messages currently supported.

```
SendRM.exe "StreamPix" "WM_CLOSE"
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_START_RECORDING"
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_STOP_RECORDING"
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_SNAP_FRAME"
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_MARK_FRAME"
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_SAVE_AND_CLOSE"
SendRM.exe "StreamPix" "WM_COPYDATA" "..."
```

The following commands can be used to change camera settings:

Here is some C++/Win32 code in case you want send messages directly from your application.

```
HWND targetWindow = FindWindow(NULL, _T("StreamPix"));
if(targetWindow)
{//Do a snap in workspace 3
UINT registeredMessage =
RegisterWindowMessage(_T("STREAMPIX_MESSAGE_SNAP_FRAME"));
SendMessage(targetWindow, registeredMessage, 3, NULL);
}
```

`STREAMPIX_MESSAGE_START_RECORDING`, `STREAMPIX_MESSAGE_STOP_RECORDING`, `STREAMPIX_MESSAGE_SNAP_FRAME` and `STREAMPIX_MESSAGE_MARK_FRAME` also have an optional argument identifying the target workspace index. For example, this command will start the recording in the third workspace:

```
SendRM.exe "StreamPix" "STREAMPIX_MESSAGE_START_RECORDING" 3
```

The WM_COPYDATA is used for more complex messages. Its string consists of several values, separated by the # character.

Here are the supported commands and their syntax. NorPix can add more commands on request.

10.3.1 Recording Format

Syntax:

```
#recording_format#(ID)#
```

The format parameter specifies the target format. Use this table to find the desired format value.

Format	ID for StreamPix 32-bit	ID for StreamPix64-bit
Sequence on disk	0	0
Sequence in RAM	1	1
AVI	2	2
MOV	3	(Not available)
BMP	4	3
JPG	5	4
TIFF	6	5
PNG	7	6
FITS	8	7
JPEG 2K	9	8
DPX	10	9

Table 10-4: Recording Formats IDs

Example:

```
SendRM.exe "StreamPix" "WM_COPYDATA" #recording_format#3#
```

Grabber Adjustments

Grabber Adjustments change a specific value for a grabber adjustment. You can see the list of every adjustment supported by the grabber by clicking on the [Adjustments] button in the grabber Docked Dialog.

The first syntax example sends the command to every Workspace. The second form sends the command to a specific Workspace.

Syntax:

```
#grabber_adjustment#(AdjustmentName)#(value)#
```

or

```
#grabber_adjustment#(AdjustmentName)#(value)#(Workspace Name)#
```

Example:

```
SendRM.exe "StreamPix" "WM_COPYDATA" #grabber_adjustment#Frame rate#10.0#
```

Will set the frame rate of the virtual grabbers in every workspace to 10 fps. (works because the virtual grabber has an adjustment named "Frame rate").

Grabber Settings

Grabber settings use a similar syntax to Grabber Adjustments.

Syntax:

#grabber_setting#Format#BGR#

Or

#grabber_setting#Format#BGR#Workspace1#

Export Full Sequence

Syntax:

```
#export_full#(ID)#
```

```
#export_full#(ID)#Workspace1#
```

```
#export_full_to#(ID)#Workspace1#FilePath#
```

The first does an "export full sequence" on every Workspace.

The second does an "export full sequence" on a specific Workspace only.

The third one does an "export full sequence" on a specific Workspace using the provided file path as the target destination.

The (ID) parameter specifies the target format. Use the following table to find the desired format value.

0 = Project (StreamPix Studio Only) **NOTE:** Obsoleted in StreamPix. 1

= Seq

2 = Avi

3 = Mov (StreamPix 32-bit only)

4 = Bmp

5 = Jpeg

6 = Png

7 = Tiff

8 = Dpx

9 = Fits

10 = JP2K

11 = Dng

12 = JpegXR

Example:

```
SendRM.exe "StreamPix" "WM_COPYDATA" #export_full#2#
```

10.4 Time Stamp Corrector Utility

This utility can be used to fix possible corrupted or incorrect time stamp on a sequence file. It updates some information in the file header as well as fixing each frame time stamp information.

For example, this utility could be used to fix backward time stamping created when using a GPS time source and travelling west to east in between time zones while recording images. At some point, when recording with local time zone settings, time will change backwards.

This command line utility sets the sequence file header frame rate to a value of your choice, reads the time stamp for the first frame and calculates from there the time stamp for each following frame based on the set frame rate. It will replace broken or corrupted time stamps with the calculated one based on the specified frame rate.

Syntax

```
> tscorrector -i -r

-i Input sequence file full path name. Ex : -I "c:\test\sequence.seq"

-r Frame rate for Input sequence. Ex for 29.97 fps: -r 2997
```

For example:

```
tscorrector -i E:\test.seq -r 4000
```

NOTE: If the acquisition frame rate is not constant, this utility will not fix time stamps properly.

NOTE: This utility does not currently support compressed sequences.

10.5 Time Source Admin utility

The Time Source Admin utility (found at *C:\Program Files\Common Files\NorPix\TimeSourceAdmin.exe*) allows selecting the source for:

- LTC time source when using audio input
- GPS configuration when using a GPS device as a time source,

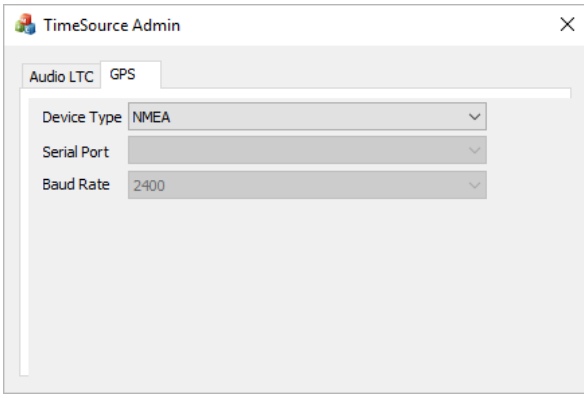


Figure 10-2: Time Source Admin utility dialog

10.6 Editing StreamPix Scripts

> **Caution:** **Editing StreamPix internal scripts will change StreamPix behavior and is reserved for very specific cases.**
> **FOR EXPERIENCED USERS ONLY**

Tools > Script Engine > Reload Saved Scripts: Loads the most recently saved scripts from the registry (if any).

Tools > Script Engine > Save Current Scripts: Saves the current scripts, including any modification to the scripts made from Edit StreamPix Scripts. The saved script can then be reloaded from Reload Saved Scripts or using the **Tools > StreamPix Settings > Session > Reload Scripts** option.

Tools > Script Engine > Edit Scripts: Lets you edit the internal StreamPix scripts.

StreamPix scripts control the internal StreamPix workflow and the interaction between StreamPix and any loaded plugin modules. This is the main dialog used to browse and edit events by Workspace. Each workspace has at least one module, the StreamPixCore module, and may include additional modules if any plugins have been loaded in it.

Once a Workspace and sub-module are selected, the list box in the middle of the dialog will show all events for the module.

Clicking on an event displays detailed information in the Event Description box and also lists all parameters available to the submodule.

You can save your current scripts with **Tools > Save Current Scripts**. Next time you launch StreamPix, reload them using **Tools > Reload Saved Scripts**.

When an event is selected, the bottom box shows what actions are taken when it is called, each line of a script calling a specific command. Using the buttons to customize the script for an event:

- **Insert New Command:** Will make the Select a command dialog pop-up. The selected command is automatically appended at the end of the script.
- **Remove Command**: This will remove the currently selected command.
- **Reset to Default**: Should an event differ from its original behavior, clicking on this button will reset it to the default script.
- **Move Up / Move Down**: Use this to change the order in which commands are called when the event occurs.
- **Indent Command / Unindent Command:** If one of the commands is a conditional statement, the line(s) that are indented below it will be called if the parameter becomes true. When the parameter is false, the script will simply jump to the next

unindented line. Thus, indenting a script command line will make it conditional to its related event.

Double-clicking on a script line shows the current script command and its parameters.

This dialog allows you to select a command to add to the script of the event selected in the Customize StreamPix dialog. Normally, the command should only be chosen from the commands available to a module of the current workspace. It is possible to select a command from another Workspace, although it will fail if the other Workspace is not loaded.

Selecting a command from the list will show the command description along with the parameters required by the command. Once a command is selected, select **Insert New Command.**

Select a command dialog allows you to allocate parameters for the command. A description of the parameter in the dialog title and a list of the variables compatible with it is displayed. Selecting a variable will also display a description of its contents.

The Local Variables tab displays the list of compatible variables local to the event, which are only accessible while the event is being executed. Clicking on the Global Variables will display variables that are always available, regardless of what event is being called. Finally, the User-creates Variables panel is used to create your own variable, for example: a constant for a function that requires a numerical value. Such as ScriptControl's “Sleep” command.

This dialog works in the same way as the Local Variables tab, displaying the compatible variables available on a global scale and not only for a specific event. The Workspace and Module drop-down lists allow to access the global variables of any loaded workspace.

This dialog is similar to the last two. You can select an existing variable or create a new one, edit its value or delete it. Not all types of variable can be user-created. For example, the VarImage can't be user-created. However, VarBool and VarUINT can. If the buttons are disabled, then the requested type can't be created.

Plugin Modules

This appendix lists the available StreamPix modules. StreamPix modules are divided into two groups:

- *Free Modules, which contain plugins available to any StreamPix user*
- *Premium modules, which require a specific license from NorPix Inc.*

All modules are a part of StreamPix. If a module is unavailable to you, it is because your system lacks the specific license. Contact NorPix Technical Support for authorization.

This Appendix contains the following sections:

Loading & Unloading Plugin Modules

This docked dialog is used to load and unload external modules named or plugins.

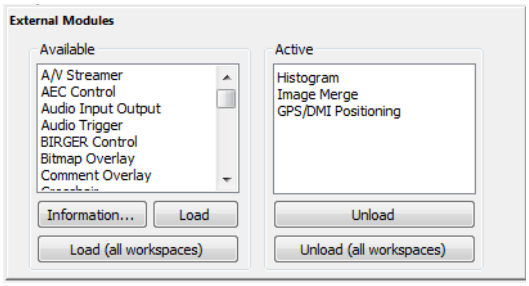


Figure 1-1: External Modules dialog box

Captured or playback images can be processed by modules. Various processing is applied, depending on the module.

If multiple modules are loaded simultaneously, it is important to understand that images will go through each module sequentially. The module order may have some importance, for example, you may want to apply an image rotation before adding a text overlay.

A module can be loaded multiple times. For instance, to apply 2 text areas, load the module twice.

To load a plugin:

1. Select a plugin from the **Available** list on the left and click on **Load**.
   The module is added to the Active list on the right.

To unload a plugin:

1. To close an external module, select its entry in the **Active** list and click **Unload**.

TIP: Double-clicking also works to load/unload.

TIP: The two buttons at the bottom allow you to load/unload a module to/from all Workspaces in a single click.

Free Modules

Adimec Q2HFW Mapping

The Adimec Q2HFW Mapping module maps the image of an Adimec Q2HFW camera so that it can be displayed properly. Instead of sending image lines consecutively, the camera sends them in this order: line 1 (first line), line 1440 (maximum height), line 2, line 1439, line 3, line 1438 and so on. These lines need to be reordered, to display the right image.

The module converts the image for live streaming, sequence playback and export. Currently there is no GUI in this module, all these conversions are done automatically once the module is loaded.

AEC Control

The AEC Control Module (AEC LTC time code generator or reader) provides the ability to configure and control an AEC (Adrienne Electronics Corporation) time code generator board. The module can also be used to read and display the current time code from a board that doesn't have time code generation capability.

The time code reader is enabled automatically each time the module is loaded. The current time code is displayed in the Reader field along with Drop Frame (DF) state, as shown below.

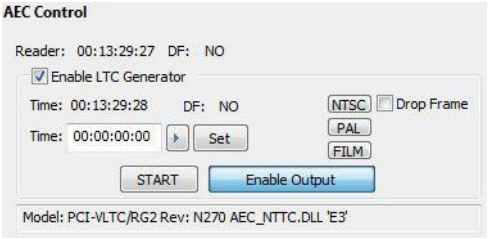


Figure 1-2: AEC Control dialog box

To enable the time code generator, select the Enable LTC Generator check box. Generated time code is displayed in the Time field along with Drop Frame (DF) state. The time code generator can be configured to:

- Generate a NTSC (with or without frame drop), PAL or FILM time code
- Start from a specified time (using computer clock)
- Reset time.

To run the time code generator, select the **START** button. To turn it off, select the **STOP** button, as shown below. To leave the time code running but temporary disable the output select **Disable Output**.

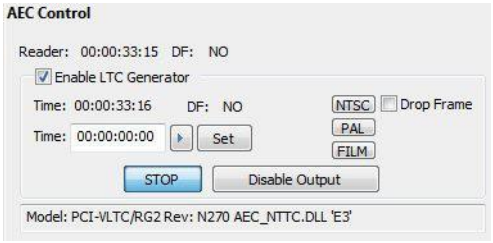


Figure 1-3: AEC Control dialog box usage

The Model status box on the bottom of the module window displays information about the AEC hardware and driver version.

Auto Gain Exposure Iris

The Auto Gain Exposure Iris module monitors image grey level intensity and compares it to your defined target value. It then tries to adjust camera gain and/or exposure and/or iris (if available) to maintain the image grey average level within the target value.

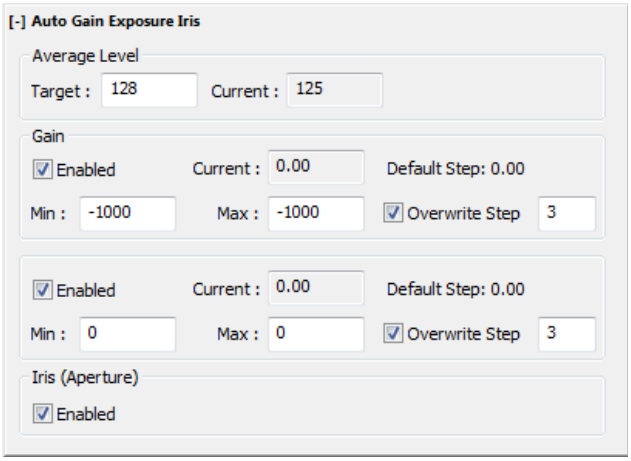


Figure 1-4: Auto Gain Exposure Iris dialog

Gain and Exposure changes increase or decrease by automatically calculated step values (Default Step).

Sometime, on cameras with a very wide range of gain or exposure, the auto calculated step is too large and prevents the algorithm from convergence. In which case, you can overwrite the step value by entering a different (typically smaller) step value.

The module gives priority to gain, then exposure, and finally the iris. Minimum and maximum gain and exposure ranges can be set, to keep things within values.

This module requires incoming frames to be able to operate. On cameras with a low frame rate, the response time for the module may be slow, since it needs new frames to perform its calculations.

This module tries to maintain an average grey level based on a target value by adjusting either camera gain, exposure or iris. Gain and exposure are usually camera parameters, while iris will require a motorized lens with remote control capabilities for the iris. The module can either operate with all 3 controls when available or only a subset.

The module calculates some image statistics (minimum, maximum and average grey level) over the whole image area for all pixels (raw pixel directly out of the sensor with no color interpolation).

The module will adjust gain/exposure/iris so that image average grey level is kept around a target value.
Target value is true pixels average value. For an 8-bit image, dynamic range goes from 0 to 255. Mid grey would mean a target value of 128.

For each of the control, a minimum and maximum range can be set, so that for instance, large exposure value would not reduce camera frame rate.

The module works individually per workspace. So, when using multiple cameras, the module must be loaded within each workspace.

By default, the module calculates a new analysis every 100 millisecond (10 times per second, or a 30 fps every 3 frames). A registry key can be set to set the elapse time between 2 calculation for instance to reduce system load.

```
Key  Path:  H_KEY_CURRENT_USER\Software\Norpix\StreamPix\Setup\[workspace
name]\Auto Gain Exposure Iris\
Key Name: WaitTime
Key type: DWORD
Key Value: the interval duration between each calculation in millisecond
(default 100)
```

The module correction algorithm may need a few runs to reach the right exposure value, since the step increment is constant. So, a large lighting change may request 2 or 3 steps.

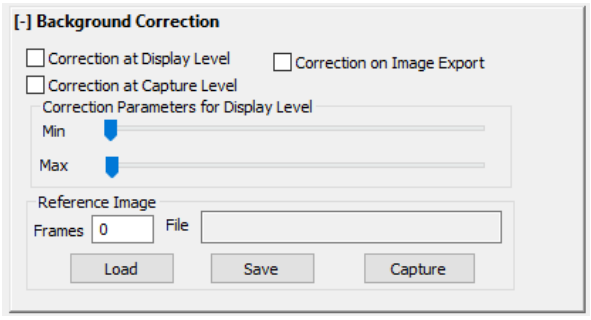
Basler Camera Link

This module allows accessing and controlling Basler Camera Link based camera parameters. The camera must be GenIcam compatible. Parameters such as exposure time, gain, trigger mode can be adjusted. In order for the module to be loaded, the latest Basler Pylon driver and viewer must be installed.

The module can control a single camera, or if multiple Basler cameras are connected, the same command can be set simultaneously to all connected cameras.

Background Correction

This module is still under development. Not all feature may be available nor properly functional.



This module performs image background correction using a reference image. The module supports any image size, monochrome only, 8, 12 and 16 bits.

Once a reference image has been captured or loaded, the module will provide the capability to run the background correction processing either:

- At grab level (on all captured frame),
- At display level (on all frame display on screen),
- Apply correction while exporting frame.

A reference image use for the background correction can be captured and then saved or reload.

Frames: Enter the number of frames to be captured and average together to generate the background image

Capture: Click capture to begin the capture process of the reference images. At the end of the capture the Frames are average together.

Save: Click Save to be prompt for a file name when saving the reference image to disk. Image is saved with the .ftd extension.

Load: Click Load to reload an already saved image.

Background processing: (the same processing is applied whatever the bit resolution is 8/12/16 bit):

1- Reference image is float converted and normalized between 0 and 1, performed by a division by 255/4096/65535.

2- Captured image is normalized between 0 and 1 for each pixel: Output = (float) Input / 255.0 (Pixels with intensity at 0 will be set to 1 before normalization)

3- Corrected Image = Output / Reference (floating operation)

4- Corrected Image is converted back to 8/12/16 bit after the dynamic range is computed, and where minimum pixel intensity level is remapped to 0, and maximum pixel level intensity is remapped to 255/4096/65535, other pixels intensity levels are linearly

remapped in between.

When the correction is applied at display level, correction parameters can be adjusted to select the pixel intensity range to be corrected. The ranges of max and min are from 0 to 255/4095/65535. max is always larger than min.

Min and Max parameters are used to define the remapping:
(L-min)/(max-min)*255 for 8-bit
(L-min)/(max-min)*4095 for 12-bit
(L-min)/(max-min)*65535 for 16-bit
where L is the pixel value.

If L < min, then set L = min; If L > max, then set L = max.

BIRGER Control

The BIRGER Control Module allows lens control via a BIRGER unit.

Adjustments Tab

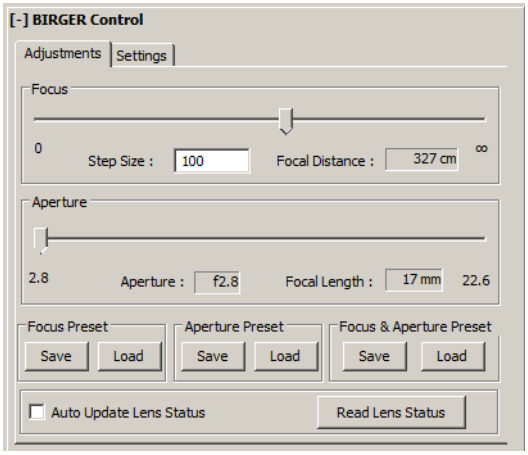


Figure 1-5: Birger Adjustments tab

This page allows changing the focus and the aperture. Also, you can save/load focus and aperture presets. When the zoom changes, the aperture and aperture range values are updated. Also, when the focus changes, the focal distance is updated.

Auto Update Lens Status

You can enable or disable auto updates on the lens status. Monitoring the lens status requires sending and receiving status information to the lens control unit, which adds traffic between the computer and the camera. Under certain conditions, this added traffic can lead to dropped frames. In which case, it is highly recommended to disable the continuous status update. When status is needed, select **Read Lens Status** to retrieve current lens parameters.

Settings Tab

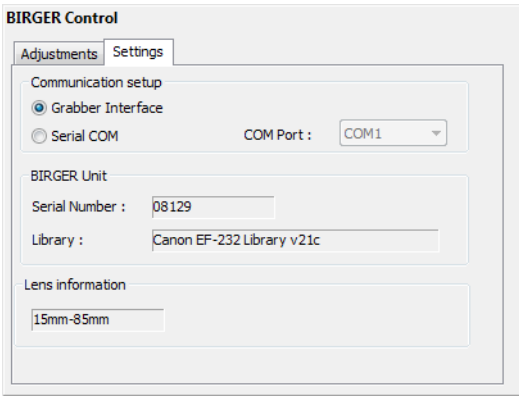


Figure 1-6: Birger Settings tab

This tab is used to set up the communication with the BIRGER unit. If the unit is connected directly to the camera, the Grabber Interface should be used. For this, the serial communication should be already set up in the camera settings. If the unit is connected to a COM port, then the Serial COM option should be selected. If the module established a successful connection, it will display some information about the lens and the BIRGER unit.

Bitmap Overlay

The Bitmap Overlay Module provides the ability to “burn” a bitmap file (*.bmp) into each captured image. It supports all bitmap file formats (monochrome, 16 color, 256 color, 24-bit color). The bitmap file can be applied to all StreamPix supported image formats. The Bitmap Overlay Module can be used, for instance, when some constant information needs to be applied on images, such as a logo or reticule.

General Tab

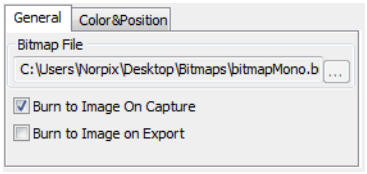


Figure 1-7: Bitmap Overlay tab

This includes general settings for the module.

- **Bitmap:** Specify the bitmap File to be used.
- **Burn to Image on Capture:** Bitmap is burned in place of image pixels for each image at capture time.
- **Burn to Image on Export:** Bitmap is burned in place of image pixels for each image while exporting.

Generally, it is not necessary to check both options. For instance, if Burn to Image On Capture is selected, the resulting image will include the bitmap. Upon export, there is no need to re-process the images again.

Color & Position Tab

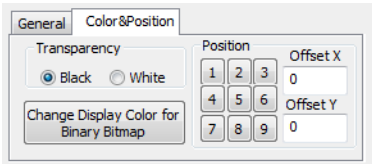


Figure 1-8: Bitmap Color and Position tab

This tab can be used to define the transparency color as well as the position where the bitmap will be burned to the image.

- **Transparency:** All .bmp files must include either a white or black background color. That background color is used as a transparency color to display normal image pixels. All the colors, except the transparency color in the bitmap, will be displayed in the captured image.
- **Change Display Color for Binary bitmap:** Set display color for binary bitmap.
- **Position:** Select a position to overlay the bitmap on the captured image.

Selecting **Broadcast settings changes to the other workspaces** will broadcast any changes made to the module settings (except for the crosshair position) to every other workspace which also has the crosshair module loaded.

Camera White Balance

The Camera White Balance module allows you to set the ROI used to compute the white balance in the camera driver. Note that this feature is not supported by most cameras.

To use it, load the module, then open the "Modules" tab in the ribbon menu. Click on Set WB ROI. Then using the mouse, left-click and drag in the live display to define an area. Upon releasing the mouse button, the new white balance will be applied.

Command Line

The Command Line module allows you to trigger external commands when a given event happens in StreamPix. The module displays a list of every event available to which the module can react.

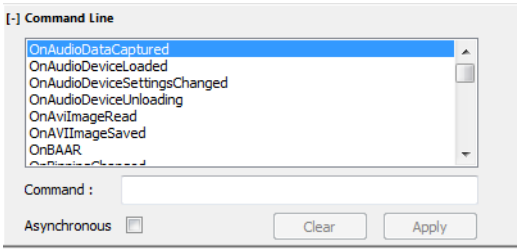


Figure 1-10: Command Line module

Select an event from the list and then type a line to be executed in the **Command** field. If the Asynchronous checkbox is checked, the command execution will be done in parallel. If the box is unchecked, the Workspace will wait for the command execution to complete before going on.

WARNING: When not in Asynchronous mode, StreamPix may drop frames while recording if the response and execution times are significant.

Select **Apply** to save and enable the currently selected event. Select **Clear** to disable the currently selected event.

The Command Line module is mostly intended to trigger .exe, bat or similar files. However, any type of file is supported. Command line parameters are also supported. Don't forget to use the complete file path (not just a file name) and use "" to enclose the path if there are any spaces in it.

NOTE: Make sure your Command runs correctly if pasted in a DOS command prompt (cmd).

Comment overlay

The Comment Overlay Module allows users to overlay or burn directly to the image data multiple lines of text. The module settings are performed via 2 separate tabs described below.

General Tab.

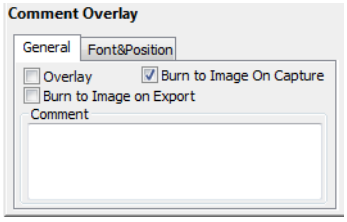


Figure 1-11: Comment Overlay module

This includes general settings for the module.

- **Overlay:** text is overlaid within the image viewer area.
- **Burn to Image on Capture:** text is burned in place of image pixels for each image at capture time.
- **Burn to Image on Export:** text is burned in place of image pixels for each image while exporting.
- **Comment:** Type multi-line text to be overlaid or burned.

Font & Position Tab

This tab can be used to adjust font and position for comments in an image.

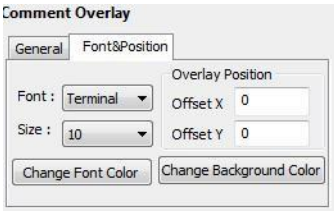


Figure 1-12: Comment Position

The font and position rendering may be different for overlay mode versus burn mode:

- **Overlay mode**: font and position are applied only on the final image render bitmap for display. Hence, zoom factor has no effect.
- **Burn to image:** font and position are applied directly to the image pixels. Hence, zoom factor applied for display purpose may change the way the image and text are rendered.

The Font & Position tab contains the following fields:

- **Font:** Select what font to use.
- **Size:** Select what font size to use.
- **Overlay Position (OffsetX and offsetY):** Set where to overlay Text.
- **Change Font Color:** Set overlay text color.
- **Change background Color:** Set overlay text background cover.

Compression Estimator

This module can be used to tweak image compression parameters in StreamPix Settings | Sequence.

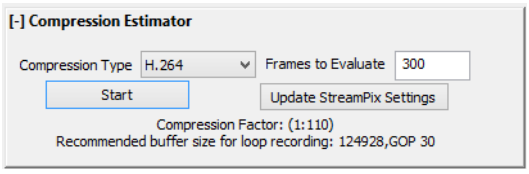


Figure 1-13: Compression Estimator module

When analyzing frames, the module uses StreamPix current compression settings (**StreamPix Settings | Sequence | Compression for new sequence**). It then reports the following:

- The size of resulted compressed image
- The number of frames per second that can be compressed
- An estimated compression factor (ratio between the compressed size versus the full uncompressed image size).
- For JPEG compression, it reports the average size in bytes of each compressed frame.
- For H.264 compression, it reports the average size in bytes for each Group Of Frames (GOP). Typically, a GOP contains 30 frames.

This tool is useful to determine the needed buffer size when doing loop recording into a Sequence file. During loop recording, the ring image buffers will be over-written during the loop process. Choosing a buffer size too short will not allow the software to store all the frames as compressed frames may be too large to be stored in place.

Select **Start** to begin analyzing incoming frames.

Select **Update StreamPix Settings** once the analysis is done to see the recommended values to be used for updating StreamPix current compression settings (**StreamPix Settings > Sequence > Compression for new sequence**).

Crosshair

The crosshair module allows you to burn a crosshair on your images.

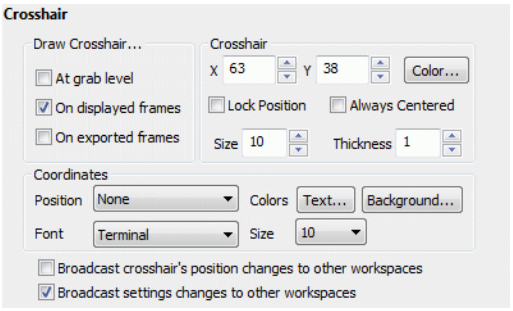


Figure 1-9: Crosshair module

Draw Crosshair...

This section determines when the crosshair burning happens.

- **At grab level** the crosshair will be written on the images as soon as they are received from the camera.
- **On displayed frames** will show the crosshair on image received from the camera but after any saving process occurs. It will also show a crosshair on images read from a sequence file.

- **On exported frames** applies the crosshair to any images exported from a sequence, regardless of the destination format (seq, avi, bmp, jpg, etc.)

Crosshair

Crosshair shows the current X and Y pixel coordinates of the crosshair in the image.

To move the crosshair, enter in new values, or use the mouse to place the crosshair on the current image by left-clicking anywhere on it (dragging is also supported).

> **NOTE:** Moving the crosshair with the mouse cannot be done while in multi-display mode.

Selecting **Lock Position** will prevent accidentally changing the crosshair position. While locked, mouse control of the crosshair is disabled, and the X and Y boxes are read-only.

The **Size** is the number of pixels shown on each side of the center pixel. For example, selecting 5 will result in a crosshair made of two 11-pixel lines. **Thickness** allows you to change the crosshair thickness, as specified in pixels.

Crosshair Color lets you to change the color of the crosshair. Default color is grey.

Center moves the crosshair position to the exact center of the current image.

To burn the Crosshair pixel coordinates:

> **NOTE:** The coordinates are shown as an (X,Y) string.

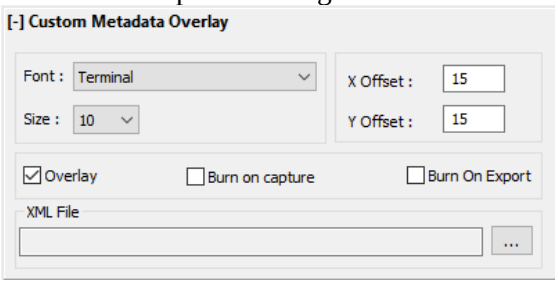
1. Select the coordinates **Position** on the image. Choose from: None, Topleft, Top, Top-right, Bottom-left, Bottom, Bottom-right.
2. Select the overlay colors: **Text** for the text color, **Background** for the text background color. If the text background color is the same as the text color, no background color will be used resulting in a transparent background.
3. Select the “Font” and “Font Size” to use to draw the string. For best results, use fixed width fonts such as Terminal or Courier.

Broadcast

If **Broadcast crosshair position changes to other workspaces** is checked, changing the crosshair position in this workspace will also change the crosshair position in every other workspace which also has the crosshair module loaded.

Custom Metadata Overlay

Custom metadata overlay is a module that can interpreted some pixels values stored in the image buffer as metadata. Certain cameras replace a few lines of pixels by extra information related to the camera status. The modules allow to overlay those metadata as clear text on top of the image.



Overlay font and font size can be defined as well as the XY offset coordinate of the overlay into the image.

An XML file can be used to specify exactly the nature and position of the metadata and the way it can be interpreted.

Contact Norpix support for further details on how to fill in the XML file.

DAQ Trigger Module

This module monitors DAQ input data and state changes to trigger events to StreamPix.

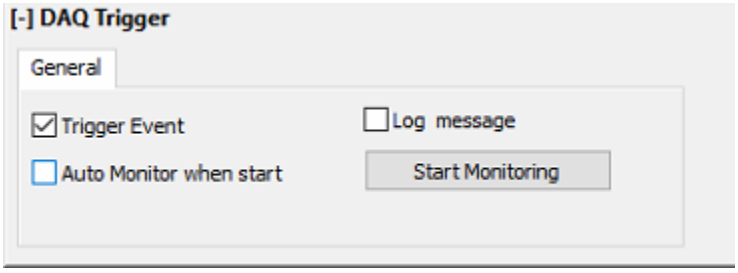
Only one instance of the module can be loaded. However, it can trigger events globally in StreamPix and/or specifically to designated workspaces.

The current implementation supports only a limited number of features. Do not hesitate to contact support@norpix.com to request add-ons or changes to the module to implement your specific needs.

Basic module configuration is setup via a user interface while further details must be done via a XML configuration file located in a specific sub-folder and file name. The specific folder is in ***%AppData%\Norpix\ DAQTrigger***, and file name must be ***config.xml***

A default configuration file is available in %AppData%\Norpix\ DAQTrigger\config.xml

When the module is loaded, its user interface in StreamPix is the following:



Trigger Event: When checked, the module will trigger the defined event in the config file. This check box allows disabling the module functionality without the need to unload it.

Log message: When checked, all received messages will be logged to a file, located in %AppData%\Norpix\DAQTrigger. This can be useful for troubleshooting.

Start/Stop monitoring: Turn on/off monitoring of the daq acquisition from DAQ device.

Auto Monitor when start: When checked, upon loading and StreamPix starting, the module will automatically begin listening and processing messages.

The XML configuration files include a few configuration entries:

action: A string, describing the action that will be triggered in StreamPix. Select from the following list:

- pre/post
- start record
- stop record
- start playback
- stop playback
- mark frame
- create new sequence
- create new image sequence
- create new avi
- create new mp4
- create new ts
- create new sequence and start recording
- create new image sequence and start recording
- create new avi and start recording
- create new mp4 and start recording
- create new ts and start recording
- start pulse
- stop pulse
- close video file

channel: The DAQ input channel that will be monitored. Channels are listed from 0, and u to the maximum number of channels the DAQ device can handle.

value: This defines what value to monitor. Value is handled as a full 16 integer. If the DAQ device digitize only to 8 or 12 bit, make sure to set a value in the device range.

- General value that must be monitored (integer mode): When the monitored value matches that entry, the action will be triggered. By default, the module retriggers the action every time the condition is raised.

- If the value syntax is defined as “(z,y)”, then a range of values is monitored. The action will be triggered when the value is in the defined range of values. As syntax as “(,y)” means the range is from negative infinite to y. A syntax as “(x,)” means the range is from x to positive infinite.

onload: “true” or “false”. At startup, or when the module is loaded, the module will compare the digitized value with the defined **“value”**. If onload is true, the software will trigger the defined action. This condition is evaluated only once, when the module is loaded or software started.

workSpace: Blank or specified workspace name. If this entry is not populated, the action will use current StreamPix workspace selection settings: Single selection will apply to current workspace. If all workspaces are selected, the message will be broadcast to every workspace. When a workspace name is set, the action is forwarded to the named workspace only.

mode: ***“change”*** or ***“always”***

- **“change”**: The module will keep in memory a copy of the last read value and compare the current reading with it. The action is triggered only when the read value is changed from the specified value,
- **”always”**: The action is triggered every time the read value matches or in in range of the specified value set in the configuration file. This means every pooling time, the action is triggered if the value is a match.

- **param:** an optional parameter, depending on the selected action: For command such as “Create New Image Sequence”, param will define the target image file type: **“jpg”, “jp2”, “bmp”, “dng”, “dpx”, “wdp”.**

Examples of XML config file:

```
<?xml version="1.0" ?>
<config filetoken = "-%register%-%value%" >
 <proc>

<!--Stop Recording when channel 1 read value is egal to 2 in all
workspaces -->
   <item channel = "1" value = "2" workSpace = "" mode =
"change" onload = "true" action = "Stop Record" param = "">
</item>

<!--Generate Pre-Post when channel 2 read value is in range 3-8
in all workspaces -->
   <item channel = "2" value = "3,8" workSpace = "" mode =
"change" onload = "true" action = "Pre/post" param = ""> </item>

<!--Generate Pre-Post in WS Cam3 when channel 3 read value is
higher than 7.6 -->

   <item channel = "3" value = "7.6, " workSpace = "Cam3" mode =
"change" onload = "true" action = "Pre/post" param = ""> </item>

 </proc>
</config>
```

Dead Pixel Correction

This module corrects dead pixels values using one of the available algorithms.

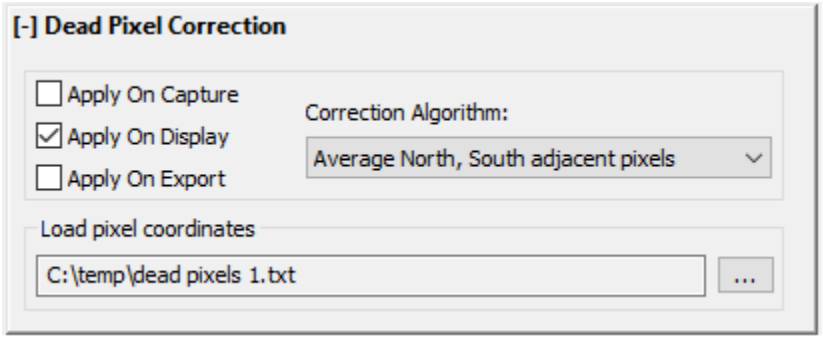
First, the user needs to load a text file with the dead pixels positions. In the text file, the position for each pixel should be written on a separate line, with x and y values separated by comma. Example:
10,10
30,50

The pixel position value should be between 0 and maximum image width/height – 1.

Once the pixel positions are loaded, the algorithm can be selected. The available options are:
- Average all 8 adjacent pixels
- Average North, South, West, East adjacent pixels
- Average West, east adjacent pixels
- Average North, South adjacent pixels

The correction can be applied on capture, display or export.

When the module is loaded, its user interface in StreamPix is the following:



Exposure Time Reader

The Exposure Time Reader module can be used to read the current exposure time value directly from the camera registers and display it in the image as a text overlay message.

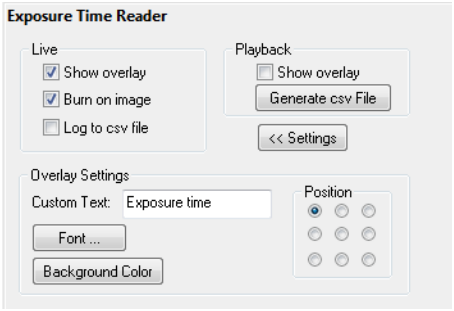


Figure 1-14: Exposure Time Reader

In order to use the module, the related camera must include an exposure register which is accessible from StreamPix **Home > Hardware Properties** dialog.

Exposure time values can be displayed on Live and/or Playback streams and can become a permanent part of the images or stored in a .CSV file. Text overlay settings (font, position, background color) are also configurable.

NOTE: Upon receiving an image from the camera, the module reads the current camera exposure value and overwrites the first 4 pixels of the image with the binary coded value of the exposure.

File Automatic Deletion

The File Automatic Deletion module can automatically delete old files, making it a great tool for unattended systems, where disk space must be monitored and maintained properly.

The module monitors a predefined computer file folder. Two criteria are used to monitor disk space and delete outdated files:

- A maximum number of files can be defined (oldest file is deleted).
- A Time out (in hours) can be defined so that all older files will be removed.

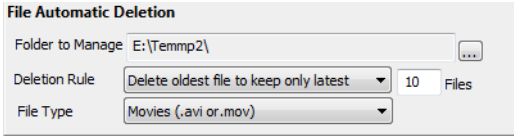


Figure 1-15: File Automatic Deletion module

The File Automatic Deletion dialog box contains the following fields:

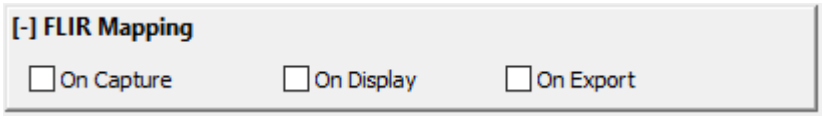
- **Folder to Manage:** The folder that will be monitored.
- **Deletion Rule:** The operating mode for removing old files:
- **Time Out:** Delete files older than "XXX" Hours.
- **Number of file:** Delete oldest file to keep only latest "XXX" Files.
- **File Type:** File type to monitor. It is possible to specify a file type extension to be monitored.
  - Sequence: Sequence file only
  - Movies: .avi or .mov
  - All Files: any files.

FLIR Mapping

This module is used to remap, in real time, high dynamic range images (10, 12 14 or 16 bit per pixel) into an 8 bit dynamic range suitable for image display.

The module will analyze, in real time, the image dynamic range and determine the minimum and maximum pixel intensity. It will then calculate a remapping table (LUT) so that each pixel within the dynamic range is linearly remapped into an 8 bit image between 0 and 255.

That 8 bit image is then displayed by StreamPix.



The remapping can be applied on live images or a previously recorded sequence. For live images it can be applied on capture or only on display. For a previously recorded sequence it can be applied on display and on export.

Figure 1-16a: Non remapped 16 bit image from a hermal camera where only the 8 SB are displayed:

Figure 1-16b: Same image, remapped for display:

Focus Assist

The Focus Assist module provides a quick means to adjust focus. A red curve appears on the image upon loading the module.

The line represents the average sharpness per pixel column. A flat line means the image is out of focus. A line marked with spikes means the image is in focus. Adjust the camera focus to have the steepest spikes:

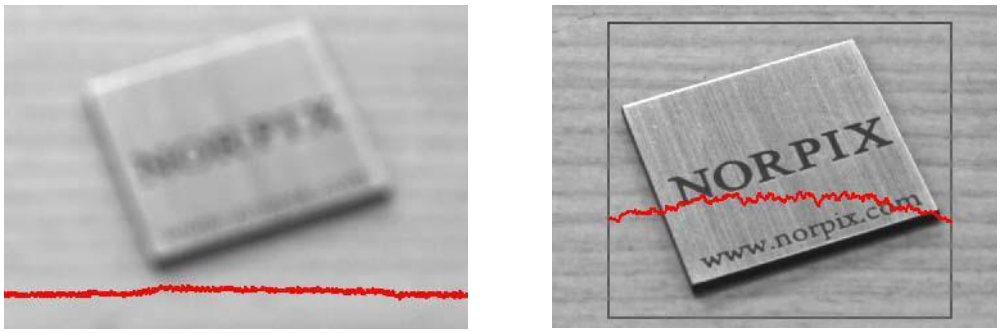


Figure 1-17: Focus Assist image

An ROI can increase efficiency. The ROI can be set either manually, through the ROI Define field, or using the **Interactively click and drag to define ROI** button.

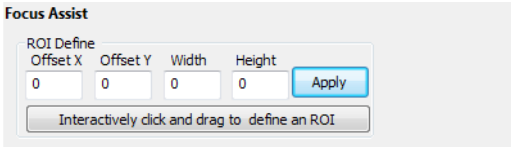


Figure 1-18: Focus Assist dialog

GRT Header Data

This module displays in real time the header data captured via Great River Technology Matrix frame grabber.

Header data are transmitted along with the images.

This module supports various display templates, depending on the header format transmitted with the images.

To select the template, browse the header format file template (.hfd extension) needed.

Press the **Show Header Data** button, which opens a dialog that displays the header data according the template format.

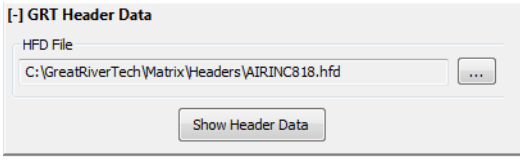
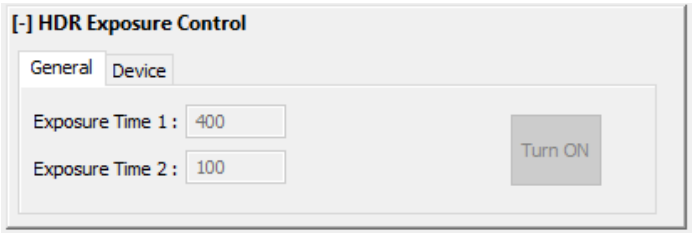


Figure 1-20: GRT Header Data module

HDR Exposure Control

High Dynamic Range Exposure control. This module controls an Arduino UNO microcontroller. The micro-controller is receiving a single trigger pulse and will output a double exposure signal to drive camera exposure. The Arduino controller will output 2 trigger pulses each with pre-programmed duration to allow capturing consecutively 2 different images at 2 different exposure. This allows performing High Dynamic Range exposure, as both exposure duration can be precisely pre-programmed.



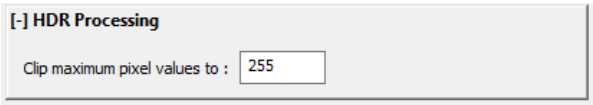
Duration for both exposure time are in microsecond.

Contact Norpix support to acquiring the firmware needed to program the Arduino UNO microcontroller.

Captured frames can then be rendered using the HDR Processing module

HDR Processing

High Dynamic image processing: This module can be used in conjunction with the HDR Exposure Control Module. Once a Sequence file has been captured with double exposure, captured images can be post processed by the module.
The module processes each pair of frame, combining a low exposure (high intensity areas of the image) with a long exposure (low intensity areas of the images) to render a perfect dynamic. The module can process 8, 10 or 12 bit pixel resolution. A maximum clipping intensity can be defined.



Histogram

This module computes the image histogram in real time. It supports monochrome, raw Bayer and color image format.

- For monochrome and raw Bayer images, only the red channel is relevant.
- For color images, the red, green and blue channels are calculated.

The X-axis represents the intensity of each channel while the Y-axis shows the percentage of pixels in the image that have this intensity.

The Histogram module works on images, live stream, or a sequence.

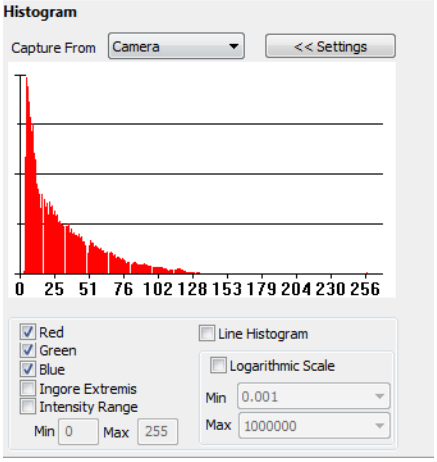


Figure 1-19: Histogram module

Histogram > Settings lets you:

- Display only specific channels (ex: only green).
- Show the histogram as a series of lines or a bar graph.
- Ignore extreme intensities.
- Plot the histogram using a logarithmic vertical scale.
- Plot only within a specific intensity range for better rendering.

The histogram is a powerful tool to adjust the brightness, contrast, offset, gain or exposure of the image to help obtain the best image quality for post-processing.

TIP: To conserve CPU resources for time-critical operations, unload the Histogram plugin when recording.

Histogram Equalization

This module performs a standard histogram equalization in real time. It supports monochrome and raw Bayer image formats.

The Histogram Equalization module works on live images or a previously recorded sequence. For live images it can be applied on capture or only on display. For a previously recorded sequence it can be applied on display and on export.

TIP: To conserve CPU resources for time-critical operations, unload the Histogram Equalization plugin when recording.

H.264 Decompressor

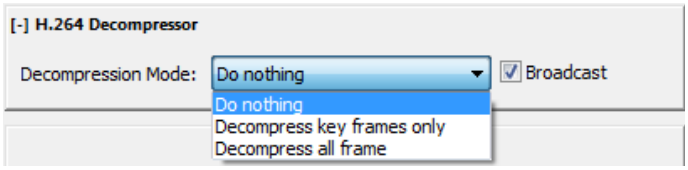


Figure 1-60: H.264 Compressor module

When capturing an H.264 compressed stream from a camera or a Web video source, the H.264 decoding can make heavy demands on the CPU. When multiple H.264 streams are processed simultaneously, the CPU load can be overwhelming, resulting is inconsistent behavior.

Since decoding is mostly used for image display, this module allows you to reduce the CPU load with a few options for frame decoding and display. The module can be loaded and the decompression rate set per Workspace. The options are:

- **Do nothing:** No frames are decoded. StreamPix will display a black frame. Can be used when recording is needed without display.
- **Decompress key frames only:** The key frame for each H.264 group of frames is decompressed. Typically, this will allow the display of 1 frame every 30 frames, with a moderate CPU load, and the ability to serve multiple Workspaces.
- **Decompress all frames:** All received frames are decompressed (CPU intensive) and are made available for display.

This module processes received frames at the grabber level as well as during export. It reduces the CPU load since frames received from the frame grabber do not need to be all decoded earlier in the pipeline.

IDT Mx Camera Control Tool

This module allows you to control and adjust some of the most important IDT M3 camera features by sending specific commands to the camera using the MVX SDK, the camera API. Therefore, before loading the module, the communication with the camera must be set up properly and tested in the MVX Control application. For this module, the frame grabber that connects to the IDT M3 camera must disable the serial communication. Otherwise, the module will not be able to connect to the communication port.

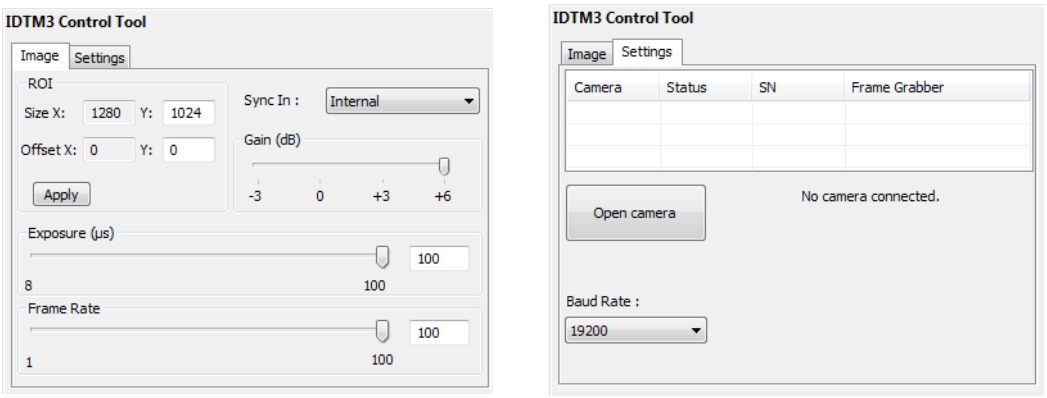


Figure 1-21: IDT Mx Camera Control module

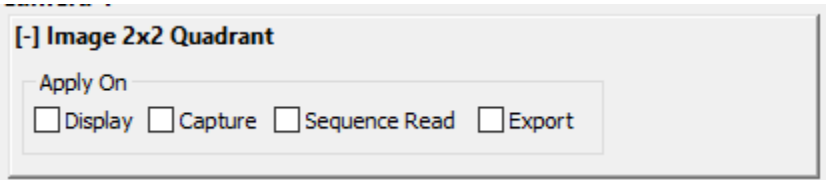
The Image page of the interface lets you adjust the ROI (on X only), Sync In, Gain, Exposure Time, Frame Rate. Setting the ROI defines a new range for available frame rates. Changing the Frame Rate sets a new range for available shutter times.

The Settings page allows you to open the camera you want to use. The available cameras are displayed in the list only after choosing the proper Baud Rate. Then, select the camera and press Open camera.

NOTE: When the camera is configured in 10 taps, use the STP4Admin application (found in the same folder as StreamPix.exe) to set the IDT M3 Control Tool module: 10 taps mode setting to Yes.

Image 2x2 Quadrant

This module converts a single image buffer into a 2x2 quadrant image.



The processing applies “In Place”, meaning the image buffer is replaced by the result of the processing. Spatial resolution for every quadrant is ¼ of the original one.

Apply On:
Display: to get this processing applied only for images to be displayed on screen,

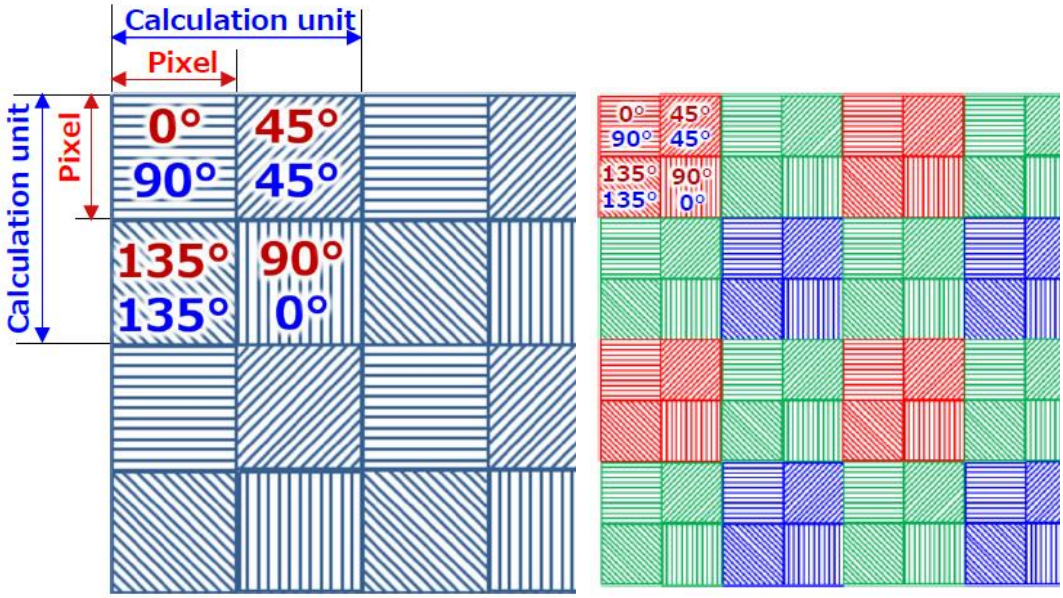
Capture: to get this processing applied right after the image is received from the camera: captured image will be recorded / streamed out and display as the result of the processing,

Sequence Read: to get this processing applied during a playback from a SEQ file,

Export: to be applied only when exporting a non-processed SEQ file to a 3rd party file format.

Note that is you ***Apply On Capture*** and simultaneously ***Apply On Display***, the processing is performed twice, resulting in a 4x4 quadrant erroneously rendered image.

This module can be used to generate a 2x2 quadrants images. It could be applied for extracting in each quadrant the 4-polarization direction when using Sony IMX250MZR or IMX250MYR sensor. On the color MYR sensor, the processed image can then be Bayer interpolated to retrieve a color rendering of the transmitted light:



The top left quadrants include pixels from the top left 2x2 pattern in the camera sensor (90 degrees transmitted polarization direction, 0 degrees polarization direction),

The top right quadrants include pixels from the top right 2x2 pattern in the camera sensor (135 degrees transmitted polarization direction, 45 degrees polarization direction),

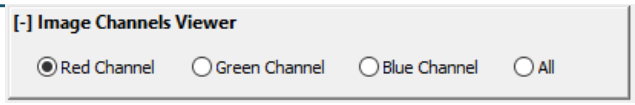
The bottom left quadrants include pixels from the bottom left 2x2 pattern in the camera sensor (45 degrees transmitted polarization direction, 135 degrees polarization direction),

The bottom left quadrants include pixels from the bottom left 2x2 pattern in the camera sensor (0 degrees transmitted polarization direction, 90 degrees polarization direction).

This processing is multi-threaded for optimum performance and allowing real time rendering. A fast multithreaded CPU is recommended. If the CPU is not capable of real time rendering, reduce camera frame rate and or resolution.

Image Channel Viewer

This module can extract a specific channel from an RGB color image for display.



Select the color channel that you want to be display in place of a regular color RGB 24 bit image.

Image Alpha Blending

The Image Alpha Blending module is used to blend the image from the current workspace with either:

A. The image from a secondary workspace,
or,

B. A reference frame from the current workspace.

When the first option is used, the secondary workspace has to be loaded before the Image Alpha Blending module. The secondary workspace can then be selected from the drop down list.

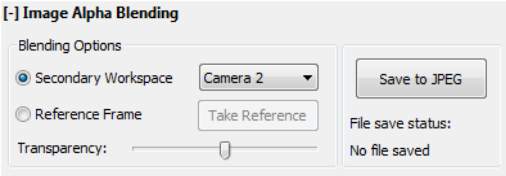


Figure 1-22: Image Alpha Blending module

When the second option is used, a reference frame is taken from the current workspace by default when the module is loaded, if there is a live image. The reference frame can be changed at any time by selecting the **Take Reference** button.

The level of blending transparency can be adjusted between 0 and 100 percent.

The current blended image can be saved as a JPEG using the **Save to JPEG** button. There is also an info field that indicates the status of the file saving.

NOTE: For now only monochrome and BGR packed image formats are supported. Contact Norpix technical support if other image formats are needed.

Image Binning

The Image Binning module is used for applying software binning. This module is not supported in StreamPix single camera version.

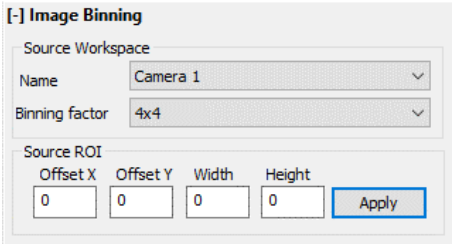


Figure 1-22: Image Binning module

The module needs to be loaded into a separate workspace, since it produces a different image stream.

The supported binning factors are: 1x1, 2x2, 4x4, 8x8, 16x16.

The algorithm used is averaging the pixels on the binning area.

The supported image formats are monochrome, 8 bit and 16 bit.

Source ROI options can be used to crop the original image.

Image Resize And Crop

The **Image Resize And Crop** module provides the ability to resize or crop the images from a camera to any desired size. This module is not supported in StreamPix single camera version.

The module needs to be loaded into a separate workspace, since it produces a different image stream. It can be used while recording or during live display.

TIP: To crop or resize a Sequence, use the Batch Processor utility.

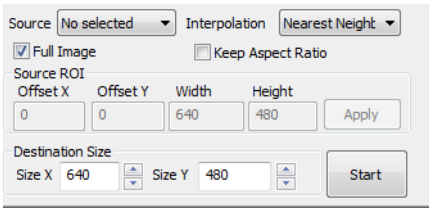


Figure 1-23: Resize and Crop module

- **Source:** Enter the Workspace name from the corresponding video stream you want to resize.
- **Interpolation:** Select the interpolation scheme to use when resizing. Schemes are sorted by inverted speed and quality. Nearest Neighbor is the fastest algorithm, lowest quality.
- **Full Image:** Check if you want to resize the complete source image.
- **Keep aspect ratio:** Check if you want the maintain the original image aspect ratio.
- **Source ROI:** The Full Image box must be unchecked to define a Source ROI. This can be used to crop an original image.
- **Destination Size:** Allows to set the destination image size.
- The **Apply** button instantly apply the ROI changes to the destination resized images.
- The **Start** button enable the resizing process.

NOTE: When resizing a raw Bayer image, the Bayer interpolation will be applied before the resizing to make sure the bayer pattern is not damaged during the resizing process. Also the image will be converter to color BGR 24 bit. Bayer settings are applied according the current workspace settings. Click the **Start/ Stop** button to get the parameter reloaded.

Image Rolling Averaging

The Image Rolling Averaging module can be applied on live captured frames from a camera or grabber device. It supports all image formats with the exception of pixel pack, BGR555 and 565.

The module can be used 2 ways:

- Rolling average mode: When loaded in the same Workspace as the grabber device, the calculations are performed and applied “in place” to the images received from the grabber device. A rolling average is performed over the specific number of frames received last. The input and output frame rate are identical.
- When the module is loaded into a separate Workspace than the grabber device, the operating mode can either be a rolling average or a standard frame averaging. In standard frame averaging mode, the output frame rate is the input rate divided by the number of frames to be averaged.

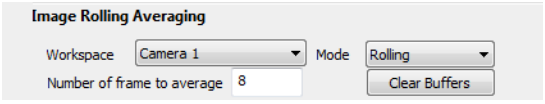


Figure 1-23: Image Rolling Average module

- **Workspace:** The Workspace of the video source or grabber device from where the image will be processed.
- **Number of frames to average:** The depth size for the averaging calculation.
- **Mode:** The available mode are automatically determined by the module, depending on its loading context.
- **Clear Buffers:** Empty the average buffer. Any accumulated frames are lost.

During rolling average, output frames are unchanged until the module average buffer is filled.

Image Rotation

This module can be used to rotate the image shown in the display area in real time. Pixels in the destination image that do not have any corresponding pixels in the source image are zeroed. Rotated pixels that do not fit in the destination image are clipped.

The module has the following parameters:

- X and Y Position of the center of rotation point (COR). The COR can be defined outside of the image boundary. By default, COR is the image center point.
- Rotation angle, from 0 to 360 degrees, with decimal increments.
- Destination image size: The rotated image can keep the same image size as the source, or you can specify the X and Y size. Useful for 90 degree rotation. By default, image size is identical.

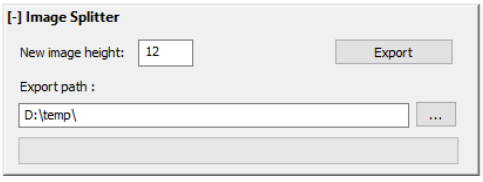
- Interpolation algorithm: Nearest pixel (faster), bilinear or bicubic (slower, more CPU intensive).
- Because edges are typically degraded during image rotation, one can enable edge smoothing.
- By default, the module uses the camera/grabber as the image source, but can be configured to perform a rotation using a source image, a playback sequence, or a displayed image.

Most image formats are supported with the exception of all compressed image formats and pixel packed image formats as well as a few color image formats such as RGB555 and RGB565.

Image Splitter

When capturing at a very high frame rate, the frame grabber can combine a series of frames together into a single image buffer. This reduces the number of interrupts and events to be processed per frame. For instance, when capturing an image with a small vertical size such as 16 pixels, a very high frame rate can be achieved such as 20000 frames per second. This is usually generating too many events for being reliably processed by the operating system. Combining 10 frames into a single image buffer will reduce the event rate to 2000 per second, something easily manageable.

This module allows exporting the captured buffer into a new sequence file, where the original captured buffer is split into individual frames.



New Image Height: The module will use that information to split the captured buffer into images of that size.
Export: Select export to begin the export process.

Image Statistics

The Image Statistics module shows the Minimum, Mean, and Maximum per image channel in real time. The Settings tab lets you display the statistics, including Standard Deviation, as an image overlay. The ROI lets you retrieve statistics for an ROI by either entering the coordinates or by clicking and dragging in the image. The Font & Position tab lets you define the appearance of the overlay.

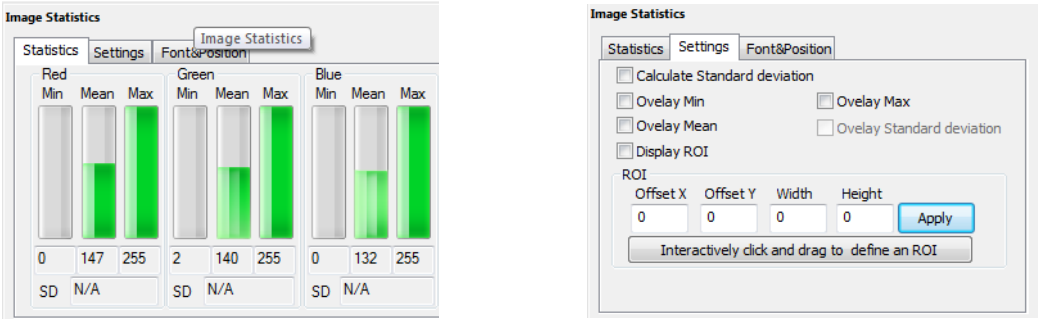


Figure 1-24: Image Statistics module

The module can be applied to a Live display, a Sequence, or to an image. When applied to a Live display and then recorded, the overlay information is saved in the Sequence.

Once the module is loaded, the docked dialog stays open until unloaded. If the minimum and maximum for one channel reads as 0 or 255, this could mean that one or more pixels of the image are underexposed or saturated.

The module usefulness is reduced when working with a high-contrast image and, as the color levels are remapped for each image, it should be unloaded to lower CPU usage.

JVC Sequence Splitter

The JVC Image Splitter module has been ported from StreamPix 3.*n*. The JVC camera has 2 modes of operation when outputting video:

- 640x480 @ 30 fps
- 320x240 @ 120 fps.

The 320x240@120 is a custom output: 4 images 320x240 packed together into a 2x2 quadrant delivering a 640x480 images @ 30 fps. The module splits the four quadrant images from the 640x480 into four 320x240 images, making it 120 fps. This module works only for color RGB24-bit format.

Kinect

The Kinect for Windows sensor includes cameras that deliver depth information, color data, and skeleton tracking data.

The Kinect module is designed for Kinect for Windows devices (Kinect for XBOX360 devices are not supported) and renders depth, video and skeleton data, presenting the result as image overlay. It can be configured to trigger various actions in StreamPix,

based on data received from the Depth stream.

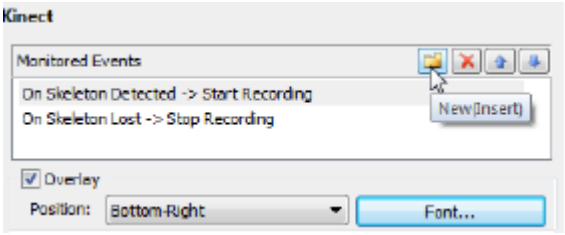


Figure 1-24: Kinect module

When you load the module, you can see the following:

- Red-green-blue (RGB) color image from the Kinect sensor, if the color stream is selected in current Workspace.
- Background in gray scale and different people in different colors, if the depth stream is selected in current Workspace. Darker colors indicate objects that are farther from the camera.
- Tracked skeletons of up to two people who have been detected within the frame.

If moving figures are too close to the camera, unreliable or odd images might appear in the skeleton and depth views. The optimal range is 2.6 to 13.12 feet (0.8 to 4 meters). The module detects people only if the entire body fits within the captured frame.

NOTE: Enabling any image processing on a Depth stream image will alter depth information as each pixel within the image contains depth data.

The following events can be detected on the color stream:

- On Skeleton Detected - when Kinect starts tracking at least one skeleton
- On Skeleton Lost - when Kinect stops tracking all skeletons

The following events can be detected on the depth stream:

- On Skeleton Detected - when Kinect starts tracking at least one skeleton
- On Skeleton Lost - when Kinect stops tracking all skeletons
- On Distance Closer Than - when depth is less than a certain value
- On Distance Farther Than - when depth is greater than a certain value
- On Distance Within - when depth is within a certain range

The following actions can be triggered:

- None (testing mode) - outputs a message in debug log
- Start Recording - starts recording if possible
- Stop Recording - stops recording if possible
- Pre/Post - triggers a Pre/Post event (to be used with the Pre/Post module)

- Mark Frame - marks current frame
- Set Reference Time - sets current time as “reference time”

Additionally the module provides the ability to display some useful data as an image overlay:

- Tracking Skeleton - shows current tracking state
- Color Timestamp - shows current Color frame timestamp
- Depth Timestamp - shows current Depth frame timestamp
- Skeleton Timestamp - shows current Skeleton frame timestamp
- Closest/Farthest Depth - show the minimum and maximum depth values within a frame for all tracked skeletons.

For a complete documentation for the Kinect for Windows device, visit http://www.microsoft.com/en-us/kinectforwindows/

Lens Control

The Lens Control module allows controlling some lens parameters as Iris, Focus and Zoom. The sent command will execute the function for the value of the Duration adjustment. Only one command can be sent at a time.

NOTE: The module is supported only for some AVT Prosilica GigE, GigE Vision compatible, and Dalsa Genie TS, Pleora eBUS driver interface, and Matrix Vision cameras.

Lens Control IOI

The Lens Control IOI module allows controlling some lens parameters such as Iris and Focus when using a Birger lens adapter with IOI Flares CXP cameras.

This module behaves the same ways as the BIRGER_Control module but does not need information regarding the RS232 control channels as it will be using the CXP frame grabber communication channel with the camera.

Live Levels

The Live Levels histogram monitors every frame captured by the grabber, computes the grey level averages and plots them in real time. The radio boxes enable selection of the histogram display, either in the docked dialog, in a new display in the Workspace, or both.

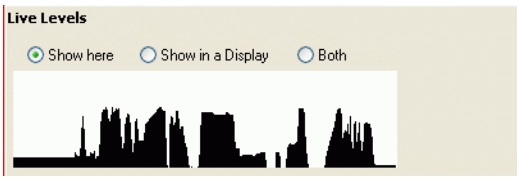


Figure 1-25: Live Levels module

TIP: Use a multi-display configuration with the Show in a Display to allow viewing of the image and histogram at the same time.

LTC Overlay

The LTC Overlay module shows the LTC value stored in the first 32 bits of each image (requires an supported LTC source device). The module has no docked dialog when loaded. However, it has a few settings that can be changed through the STP4Admin application (found in the same folder as StreamPix.exe).

The settings are: “LTC Overlay Module show frame number” and “LTC Overlay Module font size”.

Lynx IPX Camera Control

This module allows you to control and adjust the Shutter Time (also known as exposure time), Gain and Frame Rate of some Lynx ImperX cameras by sending specific commands via serial communication. An ImperX camera must be loaded and the serial communication must be enabled before loading the module into the current Workspace.

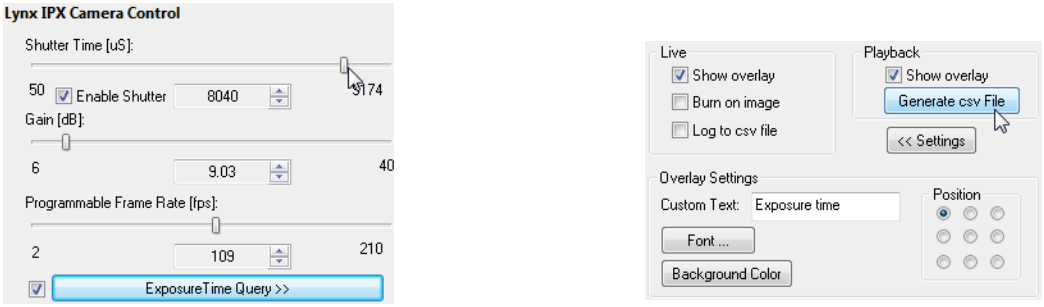


Figure 1-26: Lynx IPX Camera Control

Optionally, the exposure time reader can be used to read the current exposure time value directly from the camera and display it as an image overlay. Exposure time values can be shown on Live and/or Playback streams with the possibility to permanently write the values on the images or store them in a .CSV file.

Text overlay settings (font, position, background color) are also configurable.

Matrix Switch

The Matrix Switch module allows you to program a Smart-AVI 4x4 DVI Router device to work on two different modes:

- Capture mode:
  - Set video INPUT1 to OUTPUT1 and OUTPUT3
  - Set video INPUT2 to OUTPUT2 and OUTPUT4
- Playback mode:

- Set video INPUT3 to OUTPUT3
- Set video INPUT4 to OUTPUT4.

NOTE: another DVI matrix configuration can be added at the user's request.

Metadata Overlay

The Metadata Overlay module can be used to display the metadata of an image as a string overlaid on the image. The first tab allows you to set which metadata types to display, if present. Some metadata types might not show if they can't be represented as a string (i.e. some metadata are stored in binary formats).

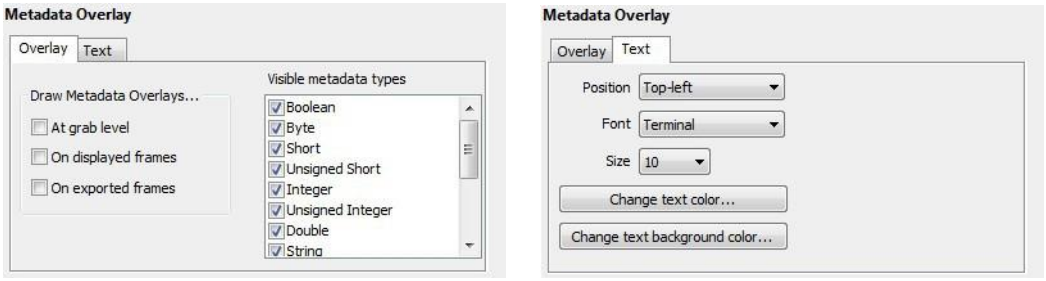


Figure 1-27: Metadata Overlay module

The Overlay tab is used to tell the module at which point(s) the metadata strings should be burned on the image.

The second tab allows you to configure the text appearance. The text position, font, size and color can be set from here. If the text and background color are the same, the text background will be transparent.

Metadata Spy

The Metadata Spy module can be used to setup metadata acquisition in StreamPix. **Monitor > Monitor Live metadata** monitors the metadata of the live feed, useful to set the metadata size when using the constant metadata size mode. The largest metadata size seen will be shown as the **Recommended Metadata Size**. Once the largest size is determined, you can select **->** to copy this value to the edit box, then select **Set new size** to write the value to the registry.

The **Current Metadata Size** is the maximum amount that can be stored after each image in a sequence file. It needs to be large enough to accommodate the largest metadata size that could come with an image. If you set the size to '0', the metadata will be stored with a dynamic size.

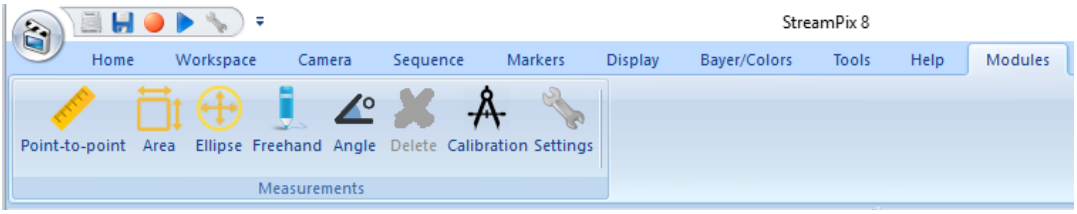
> **Caution:** Keep in mind that you can't record in a loop when using dynamic storage.

The **Inspect** tab displays the metadata information for the currently shown image (either from the Live or from the current Sequence).

In both tabs, the lists display the metadata name, the space (in bytes) required to store it, and its content (if formatable to a string). Each metadata value, regardless of its length comes with an 8-byte header. (This is why storing a single byte of metadata takes 9 bytes.)

Measurements

This module allows quick measurements on an image by drawing some small overlays. Once loaded, this module does not have any user interface on the docking panel. Rather, a series of buttons are added into the Modules ribbon area.

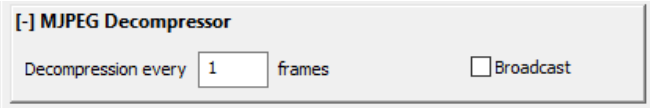


Use ***Calibration*** to define a specific scale for the measurements. Multiple scale and calibration an be definided,

- Use ***Point-to-Point*** tools to measure the distance in between 2 points in the image,
- Use ***Area*** to measure and estimate a rectangular shaped area
- Use ***Ellipe*** to measure and estimate an ellipsoid shaped area,
- Use ***Freehand*** tool to measure and estimate any custom area shaped area,
- Use ***Angle*** to measure angle in between 3 points defining an angular segment,
- ***Settings*** can be use to define various parameters for the overlays, such as color, font, and text size.

MJPEG Decompressor

When capturing an JPEG or MJPEG compressed stream from a camera or a Web video source, the MJEG decoding can make heavy demands on the CPU. When multiple MJPEG streams are processed simultaneously, the CPU load can be overwhelming, resulting is inconsistent behavior.



Since decoding is mostly used for image display, this module allows you to reduce the CPU load for frame decoding and display. The module can be loaded and the decompression rate set per Workspace.

- **Decompression Every:** Enter the skip rate for frames to be decompressed.
- **Broadcast:** Since this module can be loaded for each workspace, parameters settings can be broadcasted to all workspaces in a single step.

Mikrotron Control Tool

This module allows you to control and adjust some of the most important Mikrotron camera features by sending specific commands to the camera via serial communication. The frame grabber that connects to the Mikrotron camera must be loaded and the serial communication must be enabled before loading the module into the current workspace.

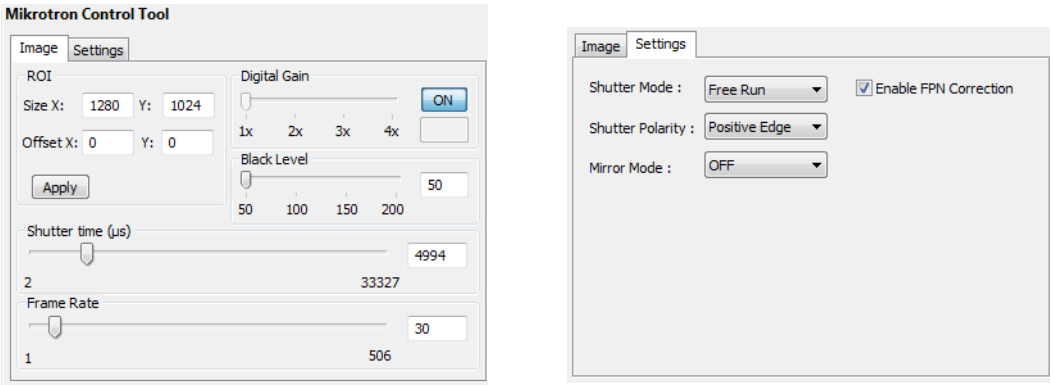


Figure 1-28: Mikrotron Control Tool module

The Image page of the interface lets you adjust the ROI, Digital Gain, Black Level, Shutter Time, Frame Rate. Setting the ROI defines a new range for available frame rates. Changing the Frame Rate sets a new range for available shutter times.

On the Settings page, the available features are: Shutter Mode (Free Run, PWC, Timer), Shutter Polarity (Positive or Negative Edge), Mirror Mode (OFF, X Only, Y Only, X and Y) and FPN correction (enabled or disabled).

NOTE: When the camera is configured in 10 taps, use the STP4Admin application (found in the same folder as StreamPix.exe) to set the Mikrotron Control Tool module: 10 taps mode setting to Yes.

Monochrome Conversion

This module allows to convert a color image or 16 bit monochrome image into an 8 bit monochrome image.

Figure 1-29: Monochrome Conversion module

YUV Color images are first converted to RGB. A monochrome component is then calculated from the RGB as an average of red, green and blue component: M = (R+G+B)/3.

This process can be applied real time if CPU permitting.

Object Overlay

This module is deprecated. It is now replaced by Quick Overlay Module.

Optronis Camera Control Tool

This module allows to control and adjust some of the most important Optronis camera features by sending specific commands to the camera via serial communication. The frame grabber that connects to the Optronis camera must be loaded and the serial communication must be enabled before loading the module into the current workspace.

The Image tab of the interface lets you adjust the ROI, Sensitivity (Gain), Black Level, Shutter Time, Frame Rate. Setting the ROI defines a new range for available frame rates. Changing the Frame Rate sets a new range for available shutter times.

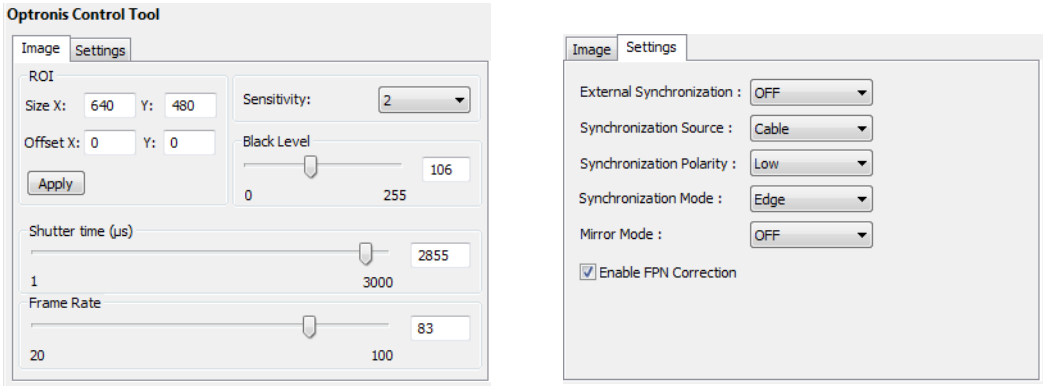
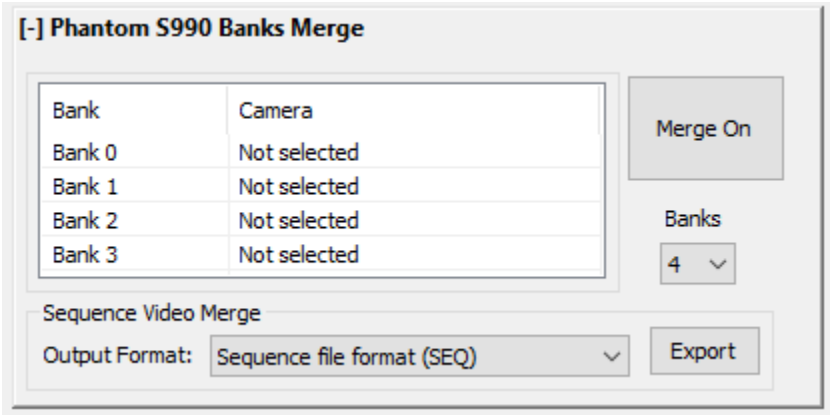


Figure 1-29: Optonis Camera Control Tool module

On the Settings tab, the available features are: External Sync (OFF, ON), Sync Source (Cable, Grabber), Sync Polarity (Low, High), Sync Mode (Edge, Level), Mirror Mode (OFF, X Only, Y Only, X and Y) and FPN correction (enabled or disabled).

Phantom S990 Banks Merge

This module allows merging real time multiple video streams generated from a Phantom S990 camera. As this camera is controlled via 2 to 4 frame grabbers, it delivers either a 2 half or 4 quarter images (2 banks mode or 4 banks mode). Each banks stream can be merged together using this module for either a live preview or generating a merged file during an export process.



Output format are SEQ, AVI, MP4, or a series of individual images, stored into JPEG, TIFF or another supported file container.

Photon Focus Camera Control Tool

This module lets you adjust the Photon Focus camera features via serial communication, using the PFRemote API. Before loading the module, the communication with the camera must be set up properly and tested in the PFRemote application. For this module, the frame grabber that connects to the Photon Focus camera must disable the serial communication. Otherwise, the module will not be able to connect to the communication port.

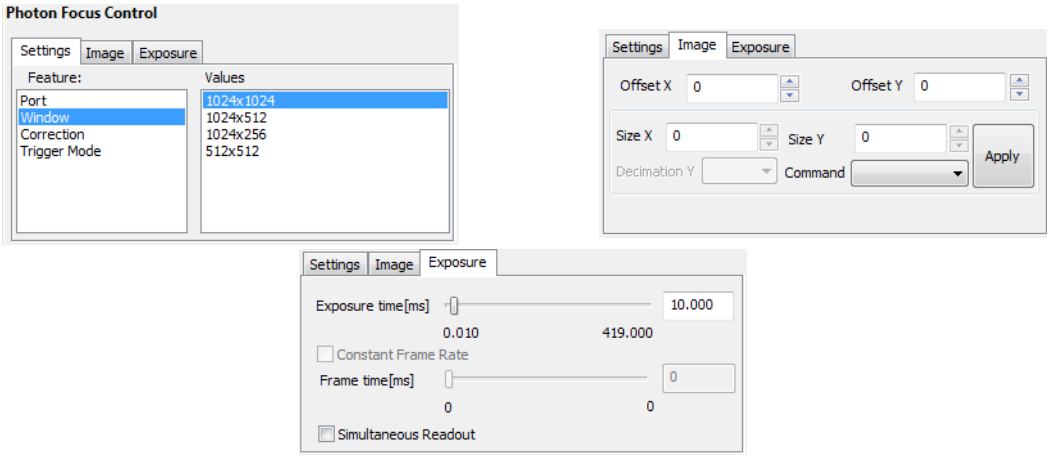


Figure 1-30: Photon Focus Camera Control Tool module

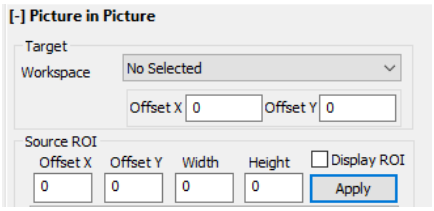
After a valid communication port has been selected in the Settings tab, the module connects to the camera and Image, Exposure and Adjustments tabs become available,

depending on the features supported by the camera model. If a feature is not visible or not accessible, it means that it's not supported. The adjustable features might include ROI, Shutter Time, Frame Time, Trigger Mode, Correction, Simultaneous Readout.

Picture in Picture

The Picture in Picture module provides the ability to combine image from a video source into another video source live display. This module is not supported in StreamPix single camera version.

The module needs to be loaded into the workspace where the picture must be extracted. It can be used while recording or during live display.



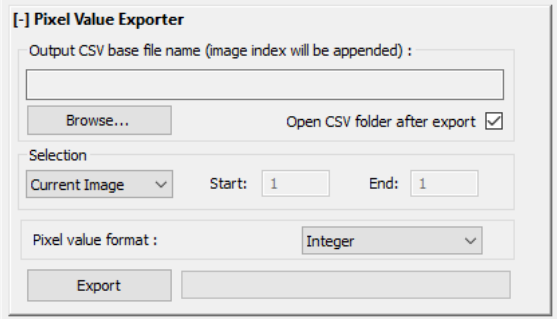
Picture in Picture *module*

- **Target workspace:** Select the target workspace where the picture will be send.

- **Target Offset X:** Horizontal offset in pixels for the position of the picture into the target workspace.
- **Target Offset X:** Vertical offset in pixels for the position of the picture into the target workspace.
- **Source ROI:** The Full Image box must be unchecked to define a Source ROI. This can be used to crop an original image.
- The **Apply** button instantly apply the ROI changes to the destination resized images.

Pixel Value Exporter

Pixel Value Exporter module can be used to export pixel intensity values of captured images into a series of CSV Excel compatible files.



A default base file name is extracted from the current loaded sequence file. When multiple images are exported, each CSV file includes the base file name and an index corresponding to the image position into the sequence file.

Single image, a range selection or the full sequence can be processed.

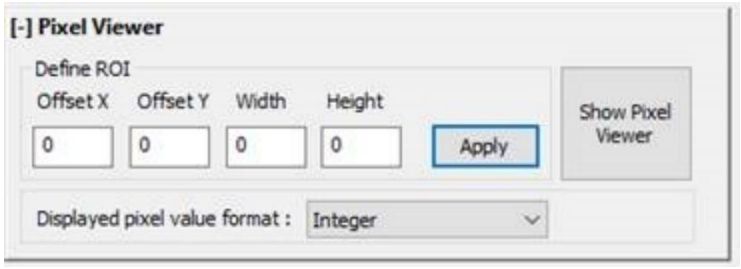
Pixel intensity values can be exported with a decimal or hexadecimal formatting.

Click Export to generate the CSV files. On very large files, this process can take significant time.

Pixel Viewer

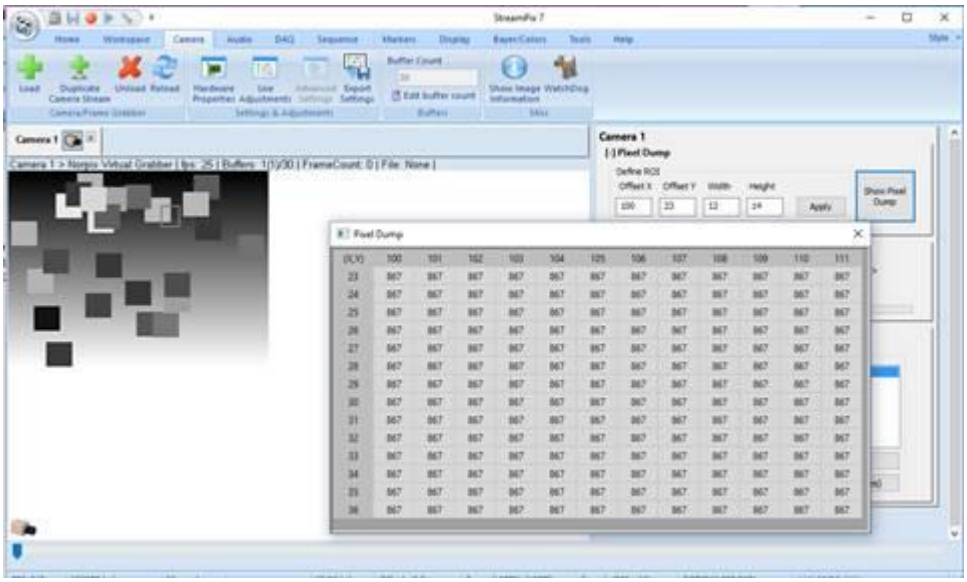
The Pixel Viewer module allows the user to print out the pixel intensity values. Press the Show Pixel Viewer button to open a new dialog with the printout data. Pixel intensity values are updated real time.

The displayed values can be either formatted as integer or hexadecimal numbers. This module can be applied to both live and recorded images.



An ROI can be selected to narrow the area of interest. Mouse area selection is also supported directly into the image viewer area. On a very large ROI, the refresh rate can be significantly slower because of the large number of information to be printed.

The module supports the following image formats: BGR, BGRx, RGB, YUV, monochrome (8, 10, 12, 14 and 16 bits). Pixel packed image formats are not supported.



Point-To-Point Caliper

The Point-To-Point Caliper module lets you make point to point measurements on the current image. To find the distance between two points, left-click on the first point and drag the cursor to the second point. The module will draw a line between them, and the measured length will be shown. The line will remain visible until a new measurement is made, you click without dragging, or click the Clear button.

> **TIP:** For measurements to mean anything, you must of course calibrate the module first, as explained below.

Measure tab

In the Measure tab, the options under Draw Overlays determine the circumstances in which overlays are drawn:

- Select **At grab level** for overlays to be drawn on images as they are received from the camera.
- Select **On displayed frames** for overlays to be shown regardless of image source (camera or sequence file) and regardless of whether overlays will be saved. Select **On exported frames** to apply overlays to images exported from a sequence, in all file formats (seq, avi, bmp, jpg, etc.).
- Select **Lock Overlay** to make the module ignore mouse actions.

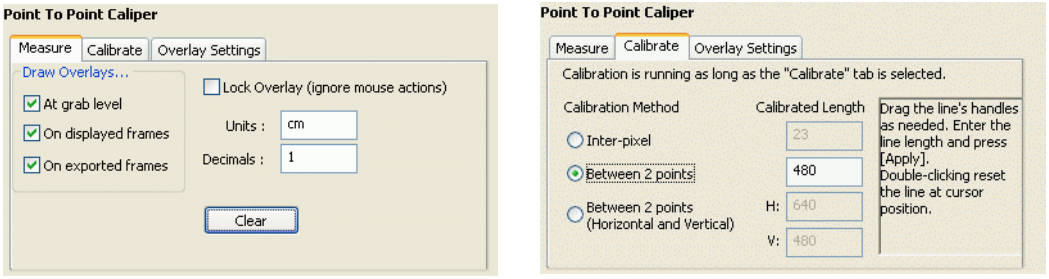


Figure 1-31: Point-to-Point Caliper module

In the Units box, enter the unit of measurement desired (pixels, mm, m, cm, km, %, etc.).

In the Decimals box, enter the number of digits to show after the decimal point.

Select the **Clear** button to erase the current measurement line.

Calibrate tab

When you switch to the **Calibrate** tab the module enters calibration mode, which is used to set reference values. When you subsequently draw a measurement line, those values will be used to compute the line's real length. Switching to any other tab puts the module out of calibration mode.

To calibrate, start by selecting one of the three calibration methods available:

- **Inter-pixel** is the simplest method. It assumes that you know the exact distance between adjacent pixels on the image. To calibrate, enter that distance under

Calibrated Length. The current calibrated length will appear as an overlay at the bottom of the image.

- **Between 2 points** is the standard method. This method requires you to left-click and drag the calibration line's handles to make a line of known length on the image. Enter that length under Calibrated Length. Note that if you subsequently redraw or remove the calibration line you will have to adjust the Calibrated Length value accordingly. For the best accuracy, use a longer calibration line.
- **Between 2 points (Horizontal & Vertical)** is an advanced method. It is only used for cameras that do not have square pixels, i.e. where the CCD inter-cell distance is not the same horizontally and vertically. The calibration procedure is the same as for the previous method, except that you have to do it twice, once with a horizontal line and once with a vertical line. Both must be done for measurements to be accurate.

When calibration is completed, switch to the **Measure** tab and do a couple of test measurement lines to see if everything is correctly calibrated. If not, return to **Calibrate** and readjust the calibration.

Overlay Settings tab

This tab controls how the various overlays are drawn.

Style lets you select between two ways of displaying a measurement line: as a **Simple line**, with a **T at each end** or with **Handles**. T-end lines are the default.

InfoText lets you determine where and how to display the text indicating the length of the measurement line. You can position it to any corner of the image and select the font and font size. For best results, use a fixed-width font such as Terminal or Courier..

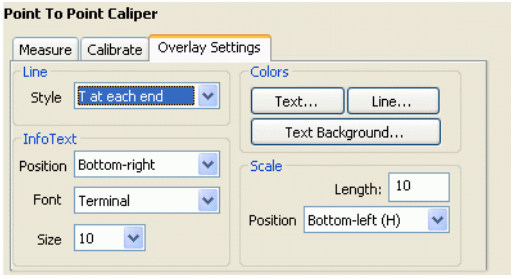


Figure 1-32: Point-to-Point Caliper Overlay Settings

In the **Colors** box, select **Text** to change the color of text overlays (default is white on black). Select **Line** to change the color of the measurement line (default is pink). Under **Text Background**, if you select the same color as that used for text the background will be transparent to the image.

In the **Scale** box, enter the **Length** of the scale using the unit of measurement you selected in the **Measure** tab. From the pull-down list, select the corner of the image in which to position the scale, along with its orientation (H = horizontal, V = vertical). To hide the scale, select “None”.

NOTE: When working with a line with “Handles”, the line is moved by dragging its handles (the small circles at each extremity). At any time, double-clicking on any part of the image will move the handles near the mouse pointer. The precise start and end points of the line are in the exact middle of each handle.

Configurations tab

This tab allows you to switch between various configurations (i.e. calibrations).

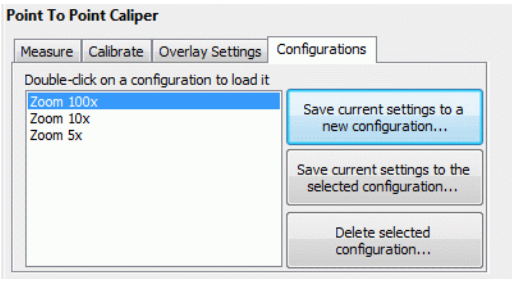


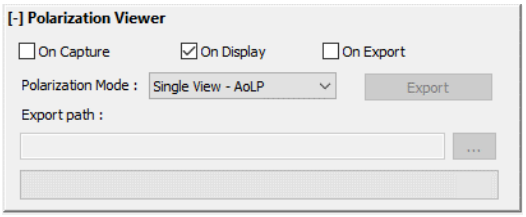
Figure 1-33: Point-to-Point Caliper Configuration tab

To create a new configuration, first define a calibration in the **Calibrate** tab. Then, click on **Save current settings to a new configuration**. The module will prompt you for a name which will then be shown in the list of available configurations. Repeat for as many configurations as needed.

Once you have created different configurations, you can switch from one to another on-the-fly by double-clicking on the required configuration from the list. You can also overwrite an existing configuration with **Save current settings to the selected configuration**. Delete unneeded configuration with **Delete selected configuration**. For both of these, the “selected configuration” refers to the configuration highlighted in the list and not the one currently loaded.

Polarization Viewer

This module is used with polarized image formats. There are different viewing modes available: single view of the degree of polarization/angle of polarization/image intensity or multiple views of all these three. In single view mode, the processing is applied on image capture, on display or on export. In multi view mode, 3 new display tabs are created, allowing all three views and the source image to be displayed simultaneously.



When multi view mode is selected, the custom export option is enabled. This will export the source image to 3 separate sequences corresponding to the 3 view modes. If there is no path selected for the export, the path of the source sequence will be used. The exported sequences will have the same name as the original sequence plus the corresponding suffix

(DoLP, AoLP, intensity).

The “Stokes-Parameter” is used to determine the polarization state from the intensities of the different polarizers of a four-pixel block. In the case of linear polarized light, the parameters are calculated as follows:

$$S_0 = I = P_0 + P_{90}$$
$$S_1 = Q = P_0 - P_{90}$$
$$S_2 = U = P_{45} - P_{135}$$

The degree of polarization, Π, indicates the ratio of the intensity of the polarized to the intensity of the unpolarized part of the light:

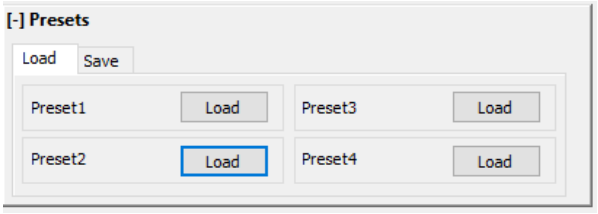
$$\Pi = \frac{\sqrt{{S_1}^2 + {S_2}^2}}{S_0}$$

The angle of linear polarization (direction of the maximum polarization) is defined by:

$$\theta = \arctan\frac{S_2}{S_1}$$

Presets

This module can be used to store and restore a series of camera presets. Camera frame rate, camera gain and camera exposure are queried, saved and can be reloaded. The camera must be GenICam compatible, and expose its adjustments with the specific gain, exposure and frame rate name. Up to 4 different group of presets can be stored.



Select the tab ***Save*** in order to first save some presets.
Select the tab ***Load*** to restore into the camera registers the saved presets.

PTG Overlay

(This module is specific to Point Grey cameras)

Point Grey cameras include some specific time stamp information that can be added with each captured image. The PTG Time Overlay module allows you to decode that information and have it properly overlaid when the captured image is displayed.

It includes the support for the following 2 extra meta information fields provided by the Point Grey camera API:

- **PC system clock**
- **Embedded image timestamp.**

To enable the feature on the camera, open hardware properties, select Settings tab, and set “Time Stamp” to ON (default is OFF).

When the feature is on, the embedded image timestamp will overwrite the first 4 pixels of

an 8-bit image (32 bit). The same mechanism is used for the PC system clock: next 4 pixels (32 bit) includes the epoch time in second, and next 4 pixels (32 bit) include the epoch microseconds.

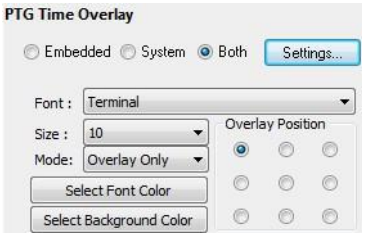


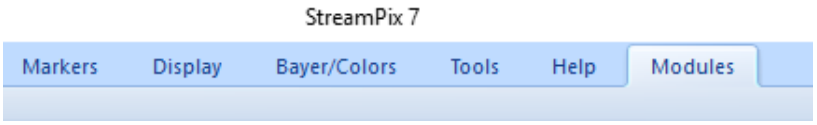
Figure 1-34: PTG Time Overlay Module

The PTG Time Overlay Module allows you to “burn” or “overlay” the time stamp associated with each image directly on the image itself. You can specify the font type, size, position and location on the image. The overlay information can include Cycle time (embedded image timestamp) and/or Epoch time. This can be useful when capturing/ exporting to AVI or image files, because those formats don't have time stamp support.

Quick Overlay

This module allows drawing various overlays into an image.

When loading the module, a new Modules ribbon is inserted at the end of the ribbon bar:



Select Modules | Quick Overlays to access the object controls:

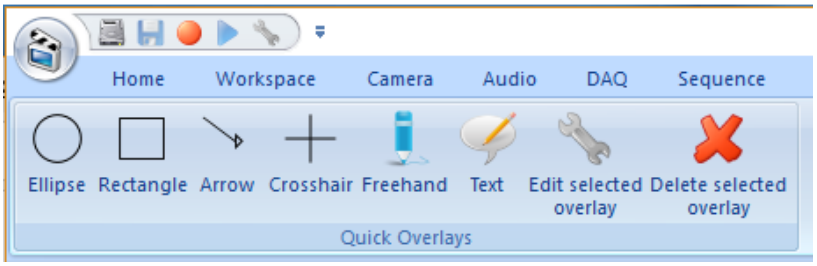


Figure 1-35: Quick Overlay Ribbon

Ellipse, Rectangle, Arrow, Crosshair, Freehand and Text are available.

Each object drawn as an overlay is merged and overwrites pixel values into the image data. Object thickness, as well as its drawing color, can be adjusted by selecting Edit selected overlay.

Select Delete selected overlay to delete the overlay.

Handles around object edges are available to select, resize and drag each object.

There is no persistence of the quick overlays when quitting the application.

Note: When using multiple workspaces, the Quick Overlays module must be loaded into every workspace where its usage is requested.

Raptor Photonics Control Tool

This module works with both OWL 640 and OWL 320 Near IR and IR cameras from Raptor Photonics.

By default the module displays the interface for the OWL 640 camera. To switch between the 2 supported camera models, in the module dialog, select to the **Info** tab, then select the desired camera, and then press the **Initialize** button.

To communicate with the camera, a Camera Link frame grabber has to be loaded in the current Workspace and the serial communication needs to be set up under **Hardware properties->Settings**.

These are the settings for the OWL cameras:

- Data Length -8 bit
- Stop Bits -2
- Parity -None
- End Character -None
- Text Mode -Hexadecimal
- Communication Type can be set either via clserxxx.dll (select CLSER Port and also set CLSER Baud Rate to 115200) or via COM Port.
- To set the Communication Type via COM Port, the COM Port has to be selected first. Also, for COM Port, the UART Baud Rate setting has to be set to 115200.

Various camera specific parameters can be adjusted via the module tabs:.

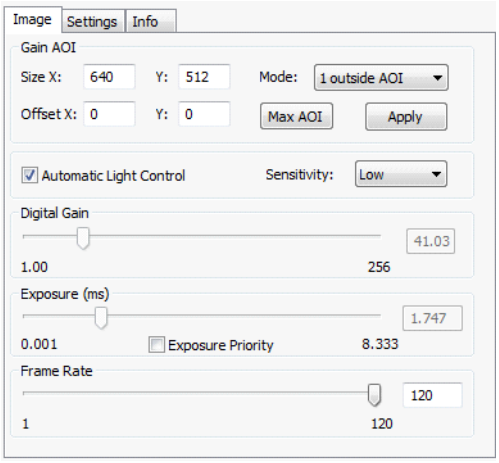


Figure 1-36: Raptor Photronics module Image tab

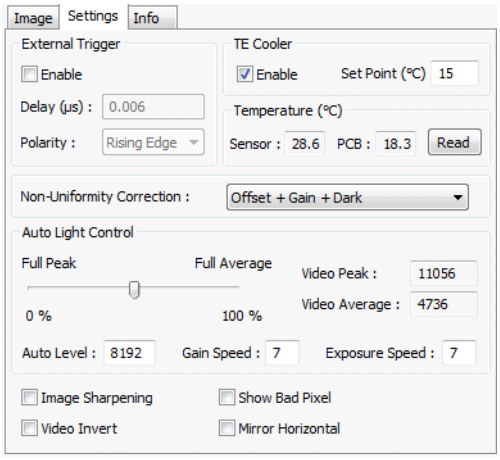
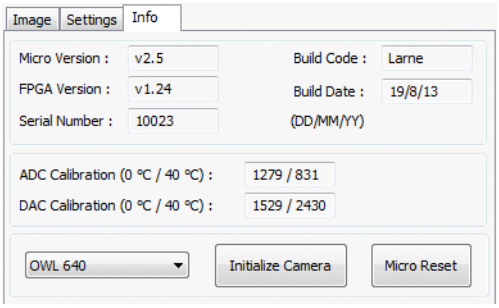


Figure 1-37: Raptor Photronics module Settings tab

.*Figure 1-38: Raptor Photronics module Info tab*



Sequence Disk Space

The Sequence Disk Space module calculates the available space for recording on a disk or in RAM. The module uses the disk selected by the working folder option.

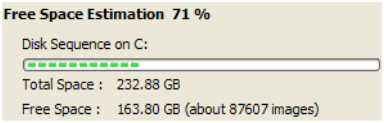


Figure 1-39: Sequence Disk Space module

Sequence Levels

The Sequence Levels histogram monitors every frame in a Sequence, computes the grey level averages and plots them in real time. The radio boxes enable selection of the histogram display, either in the docked dialog, in a new display in the Workspace, or both.

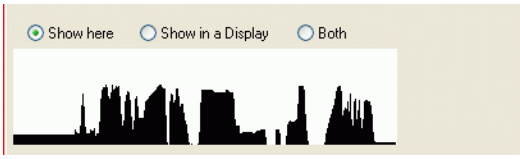


Figure 1-40: Sequence Levels module

TIP: Use a multi-display configuration with the Show in a Display to allow viewing of the image and histogram at the same time.

TIP: Browsing through the Sequence with the Sequence Slider provides a quick survey of general levels, while pressing Play will read each frame in the Sequence.

TOF Viewer

The TOF Viewer module provides the ability to display range and confidence data captured from a Basler Time Of Flight (TOF) camera. It can be used while playback a recording or during live display.

The module can display current selected pixel intensity, range data and confidence data. Double click in any displayed item to change current selected pixel. Current selected pixel is highlited as a red crosshair in all image displayed area.

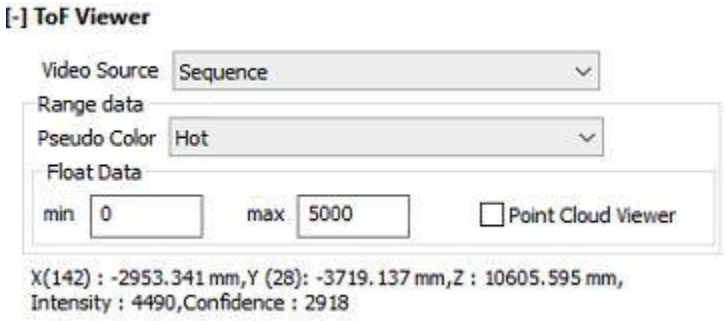


Figure 1-41: TOF Viewer module

Video source: target source to use for seking data to be displayed. This can be applied onto the live feed or an already recorded sequence file.

Range Data Pseudo Color: allows to select the false color rendering LUT method.

Range Float mix value: Scaling minimum factor when using a floating-point type for the range data.

Range Float max value: Scaling maximum factor when using a floating-point type for the range data.

Point clound viewer: When enabled, an extra viewing dialog pops up, offering a 3D display renderring of the point cloud data. This option only works when the camera is setup to provide floating-point range data.

T.S. Sync Monitor

The Time Source Sync Monitor Module can be used in conjunction with StreamPix accurate time source devices. The module monitors the time source receiver devices and reports in real time synchronization status information. Supported hardware devices are:

- Meinberg (GPS and IRIG)
- Spectracom (GPS and IRIG)
- Myricom 10GigE network adapter with Emergent technologies cameras.

Description of the various status modes:

1) The current time source does not implement sync status.

2) An error occurs while querying sync status from the time receiver.

3) The time source receiver is in sync with the reference time source (IRIG B or GPS world time).

4) The time source receiver is not in sync with the reference time source (IRIG B or GPS world time).

5) The time source receiver is no longer in sync with the reference time source (IRIG B disconnected or GPS satellite tracking lost), but the board internal clock is still accurate enough to deliver good time information.

Time Stamp Monitor

This is a watch dog utility that can be used to monitor in real time the incoming frames time stamp. It computes the difference between 2 consecutive incoming frames and compares the value with an expected reference value + or - a tolerance.

As an example, at 10 fps, a new frame is expected every 100ms. if the difference is 150ms, the module will flag the frame assuring tolerance is below 50ms (or 50%).

Flagging is achieved by either marking the frame, outputting debug information or both. This module is useful for detecting and troubleshooting possible dropped frame issues.

LTC-based Time Source

If an LTC based time source is in use, the module will also display an LTC check box.

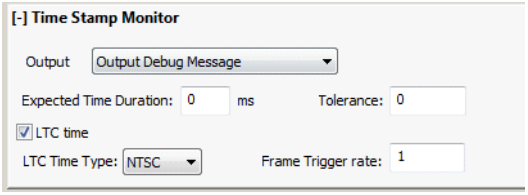


Figure 1-41: Time Stamp Monitor module

When selecting the LTC option, this module will monitor the frame Linear Time Code (LTC) increment.

Select the time code timing via the **LTC Time Type**, either **NTSC** or **PAL** (drop frame mode is not supported).

Select the camera triggering rate: Depending on your hardware configuration, frames may be captured at the same time code increment rate, at twice the rate, or 4 times the rate.

The module will monitor time code increment. If the time code increment continuum is broken, the module will output and/or mark suspicious frames.

UDP Trigger

This module can be used to send notifications to StreamPix, using Ethernet UDP messages. These messages will be decoded by the module and trigger various StreamPix actions.
In conjunction with the UDP Trigger Module, a .NET C# sample application is provided. It can be used to generate and send messages to the module. The sample files and code are installed with StreamPix in the folder:

```
C:\Program Files\Norpix\Streampix8\UDPTrigSender.
```

This module can only be loaded once. Hence, when used in a context of multiple Workspaces, the module is loaded only once, but can forward messages to specific Workspaces.

If the module is used for receiving text to be overlaid into the images, it must be used in conjunction with the **UDP Overlay** module.

The current number of decoded messages is limited. Upon demand, we can add more messages and implement further functionality. Contact support@norpix.com.

The message is formatted as a string with the following tokens:

Action#Number#[EventName(Workspace)]:User defined message

Action: Keyword. The module always checks messages by searching for this keyword.

#Number#: This is a number that can take any value. It will be retrieved by the module into a 32-bit integer and is currently reserved for future usage.

EventName: The StreamPix event you want the module to trigger.

Possible values are (without the quotes):

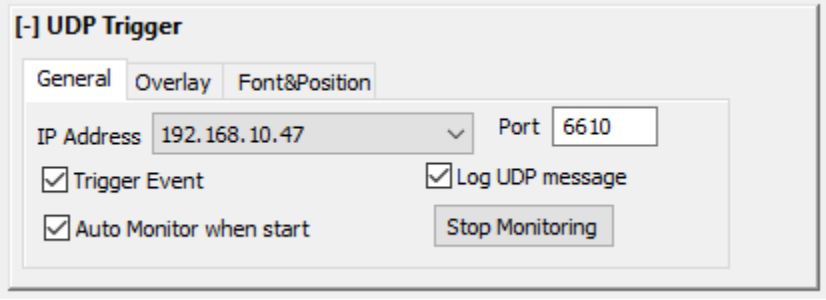
```
"Pre/post"
```

```
"Start Record"
"Stop Record"
"Start Playback"
"Stop Playback"
"Mark Frame"
"create new sequence"
"create new image sequence"
"create new avi"
"create new mp4"
"create new ts"
"create new sequence and start recording"
"create new image sequence and start recording"
"create new avi and start recording"
"create new mp4 and start recording"
"create new ts and start recording"
"create new sequence and start pulse trigger recording"
"stop recording, close sequence and export"
"Set customToken"
"start pulse"
"stop pulse"
"close video file"
"Overlay" -> Load UDP Overlay Module
"Test"
```

Arguments are explained on the sample code project. Have a look at the action.xml file, close to the end of the file.

Workspace: The target workspace name. If workspace name is empty, target is current workspace or, if Selected All Workspace is active, target will be all workspaces.

User defined message: Any string the user wants to send. It can be retrieved by specific the module for some specific usage.



IP address: The IP address that the module will be listening from. This must be one of the computer network IP address.

Port: The port number the module will be listening from.

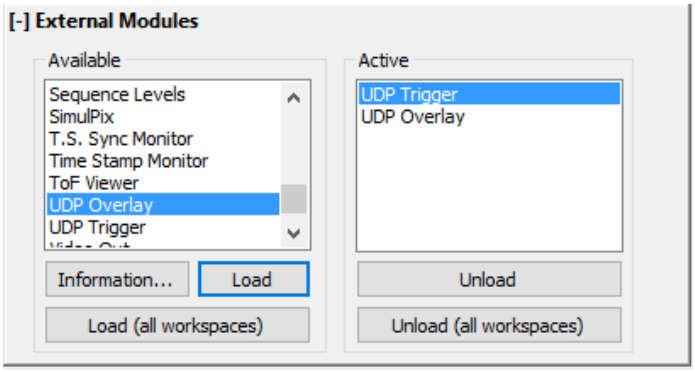
Trigger Event: Enable/disable the module. When enabled, the module will forward received events to StreamPix and workspaces.

Log UDP message: All received messages will be log to a file, located in `%AppData%\Norpix\UDPTrigger`

Start/Stop monitoring: Turn on/off monitoring and listening of the UDP messages from the network adapter.

Auto Monitor when start: When checked, upon loading and StreamPix starting, the module will automatically begin listening for messages.

When text is needed to be Overlay, adjust overlay style via the ***Overlay*** and ***Font&Position*** tabs. Make sure also to load the ***UDP Overlay*** module in every workspace that needs to overlay test into the images. ***UDP Overlay*** module has no user interface, but must be loaded for overlays to operate.



Video Out

The Video Out module allows you to view multiple StreamPix real time camera feeds or stored video sequences simultaneously. The module can send video to any monitor output from a VGA adapter, meaning that the only limit to the number of concurrent video displays is the number of monitors available.

NOTE: For a single camera video out, see "Second View".

This module supports multiple VGA adapters, making it possible to use one VGA output per workspace for image display in addition to the standard display found in the main StreamPix user interface.

Each of the devices and monitor(s) driven by the module are labeled Video Out, in order to help differentiate them from the main display area where StreamPix is running.

The module can also be loaded using a single monitor configuration. The Video Out window will appear on top of the main StreamPix display area. Double click the image area to return to the main StreamPix window.

The Video Out module makes use of accelerated Microsoft DirectX 3D routines. Because of the usage of DirectX routines, the module has a low impact on the main CPU. Instead, it draws extensively from the GPU processing and display capabilities of the computer it is installed on.

By default, the module will push a new frame to be displayed every 25 ms, or 40 times a second. A faster frame rate can be set if needed. Frame display can also be synced with the monitor refresh rate to avoid possible frame tearing effect.
A Registry key can be set to adjust the refresh rate:

```
Key Path:
HKEY_CURRENT_USER\Software\Norpix\Streampix8\Setups\[Workspace]\TVOut\
Key Type: DWORD
Key Name: RefreshDurationTime
Value: refresh interval in millisecond. Default value:25ms
```

The Video Out module includes several configuration tabs.

General Tab: Basic Settings

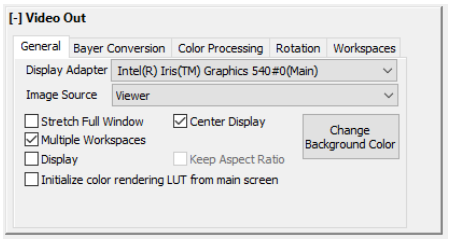


Figure 1-42: Color Processing tab

- **Display Adapter:** Select which Video Out monitor to drive. The monitor number corresponds to the identified display detected by the graphic adapter driver.
- **Image Source:** Select which video source to display, which can be either a live camera or a video sequence.

- **Stretch Full Window:** Stretch the displayed image so that it fits the entire Video Out monitor area. When source image resolution is larger than monitor resolution, the aspect ratio is maintained on output monitor.
- **Center Display:** Center the displayed image on the monitor (image is displayed in the top left corner when left unchecked).
- **Multiple Workspaces:** Enable/Disable Multiple Workspaces mode. If Multiple Workspaces mode is enabled, a Workspace tab is added. Enabling Multiple Workspace allows for the display of more than one workspace's content on the secondary monitor.
- **Display:** Check this option to activate the secondary display.
- **Change Background Color:** Opens a color picker so that you can assign a specific background color to the secondary display.
- **Initialize color rendering LUT from main screen:** By default, the module calculates its own white balance tables. When this is enabled, the Video Out module will rather retrieve color balancing look up table (LUT) from StreamPix settings. If white balance settings are set to automatic, then the module will use what has been calculated within StreamPix main display area. If the white balance settings require to load a LUT from a file, then the file content is also used by the Video Out Module. Using a file allows consistent operation between sessions.

Bayer Conversion Tab

Use the GPU to Compute the Bayer Rendering

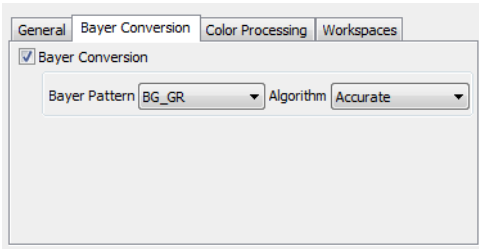


Figure 1-43: Color Processing tab

- **Bayer Conversion:** Enable/Disable conversion. Only useful if displaying a raw Bayer image.
- **Bayer Pattern:** Select the Bayer pattern matching your sensor.
- **Algorithm:** Select the Bayer conversion algorithm (Fast or Accurate).

Color Processing Tab

Use the GPU to White Balance or ASC CDL Color Correct Images

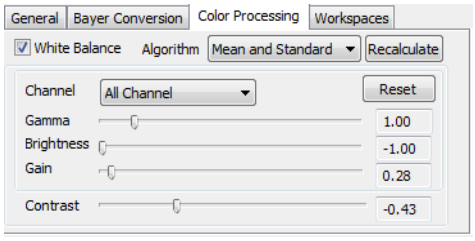


Figure 1-44: Color Processing tab

- **White Balance:** Enable/Disable auto white balance.
- **Algorithm:** Select the auto white balance algorithm:
  Mean Equalization
  Gray Word
  Standard Deviation
  Mean and Standard Deviation

When an algorithm is selected, the Video Out module recalculates white balance with the next incoming frame.

- Recalculate: Force the software to recalculate white balance using the next frame.
- The Video Out module supports ASC CDL grading color correction with revised contrast.

The Channel pull down menu allows you to select which color channel to control. Select **All Channels** to apply the same formula for all 3 channels, or select each individual color plan you want to work with.

The **Reset** button allows you to reset the default values: Gamma (1), Brightness (0), Gain (1) and Contrast (0).

Rotation Tab:

The display image on the secondary monitor(s) can be rotated before being displayed. 90, -90 and 180 degrees rotation is possible.

Workspaces Tab: Working with Multiple Workspaces

This tab is available only when the Multiple Workspaces check box is selected on the General tab. The Video Out display area can then be shared amongst selected Workspaces.

- Two display modes are available:
  - **Hybrid:** Where one Workspace is displayed full screen and others are displayed as thumbnails.
  - **Equally Split:** Where the Video Out area is equally split among the various Workspaces. In split mode, the layout is defined using Video Layout X and Y parameters.

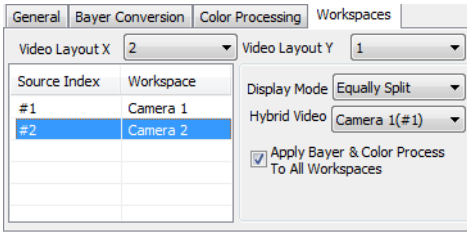


Figure 1-45: Video Out Workspaces tab

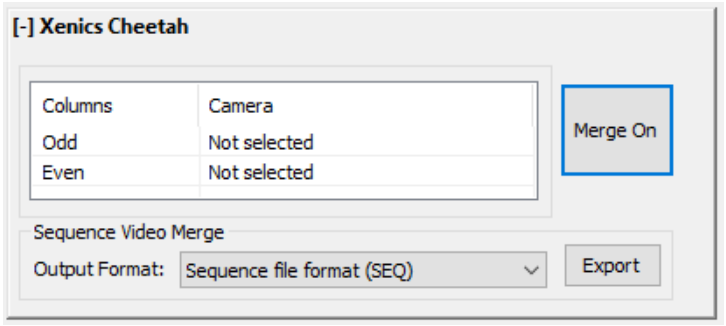
- **Video Layout X or Y:** Set row and column count.
- **Display Mode:** Select between the available display modes:
  - Hybrid with thumbnails on the right.
  - Hybrid with thumbnails on the bottom.

- Equally Split between Workspaces.

- **Main Hybrid:** Select the main Workspace source to display.
- **Apply Bayer & Color Process to All Workspaces:** Set to apply Bayer settings or color processing settings to all Workspaces or the main video.

Xenics Cheetah

This module allows real time merging of multiple video streams generated from a Xenics Cheetah camera. As this camera is controlled via 2 frame grabbers, it delivers 2 half images. Each image stream can be merged together using this module for either a live preview or generating a merged file during an export process.



Output format are SEQ, AVI, MP4, or a series of individual images, stored into JPEG, TIFF or another supported file container.

Premium Modules

Arduino Pulse Generator

Each Norpix DSA (Digital Signal Amplifier) box includes an Arduino microcontroller which is typically used to generate synchronization trigger pulses at a predefined frequency to synchronize exposure over multiple cameras.

The cameras have to be configured in external trigger mode, using either StreamPix via Hardware Properties or their own software, to receive the exposure trigger from the Arduino device.

When there are multiple Arduino devices connected, you can select from the Device tab via the COM port the device that is needed to be controlled. Only one module is needed per DSA.

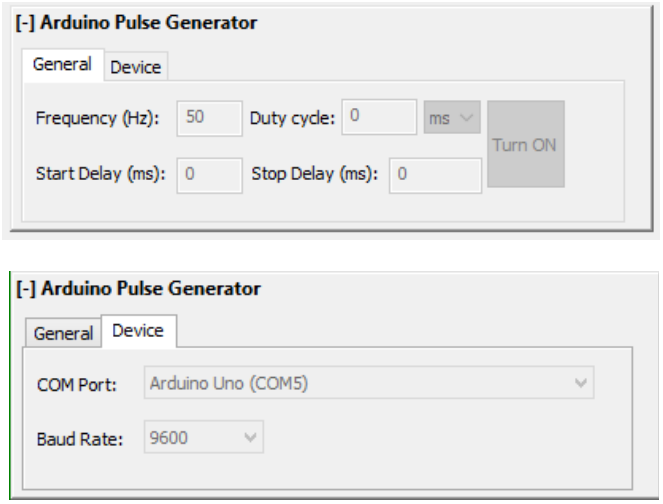


Figure 1-46: Arduino Pulse Generator dialog

General

Enter the desired pulse frequency and use the **Turn ON** button to toggle the pulse generator on and off. Since the pulse train triggers the camera exposure, the pulse frequency will determine the exact camera frame rate. The frequency precision can be set up to 2 decimals.

You can also specify a Start Delay (generator will start X ms after clicking the **Turn ON** button) and a Stop Delay (generator will stop X ms after clicking the “Turn OFF” button).

By default, the duty cycle is 50%. By adjusting the duty cycle, all connected cameras can have their exposure controlled by the shape of the trigger signal out of the DSA. Cameras must support pulse width exposure control mode. The duty cycle applies on the level high section of the generated pulse signal.

Audio Trigger

This plugin monitors an audio input line and notifies StreamPix when the audio level is higher than a certain value (threshold).

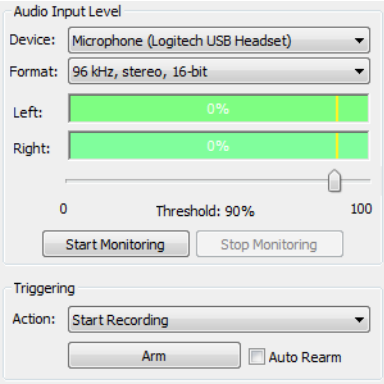


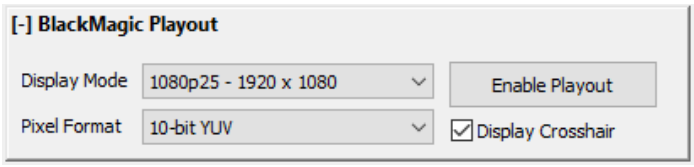
Figure 1-47: Audio Trigger dialog

To set an audio trigger:

1. Select the capture audio device and sound format.
2. Set a threshold value and start monitoring the audio line.
3. Watch the audio level indicators and adjust the threshold value.
4. Select an action to be executed by StreamPix when noise is detected. Available actions are:
   - None (Testing Mode)
   - Start Recording
   - Stop Recording
   - Pre/Post
   - Mark Frame
   - Set Reference Time.
5. When done, click on the Arm button to arm the trigger. If the Auto Rearm option is checked the trigger will rearm itself automatically.

BlackMagic Playout

This module will use the video output available on certain Black Magic Design frame grabbers to output captured or playback video from StreamPix.



Display Mode: Depending on the frame grabber, different output resolutions can be selected. If the source image resolution is different than the output resolution, the source image is automatically resized, while keeping the aspect ratio. If the source image is raw Bayer, the output image will be converted to color based on the current workspace settings from the Bayer/Color section.

Pixel Format:
8-bit YUV – image source: monochrome and raw Bayer images, 8, 10, 12, 14, 16 bit
10-bit YUV – image source: 10-bit YUV (YUV422 10 bit packed)
8-bit BGRA – image source: all image formats
10-bit RGBXLE - image source: monochrome 14 bit

Display Crosshair: Option to burn a crosshair on the output image.

Enable Playout: By default the playout is disabled. Select Enable to turn it on. When reloaded, the module will automatically use the last playout state.

DAQ Capture

> **NOTE:** This module is provided for backwards compatibility with StreamPix 5. It is not recommended to use this module with StreamPix. With the appropriate license, StreamPix already contains everything necessary for DAQ capture.

The DAQ Capture Module allows you to capture analog and digital data from various A/D converters and TTL input devices. This kind of data is generally described as one dimension data type (1D) in opposition to images that are two dimension data (2D).

Each 1D data reading is defined as a dataset. Each dataset includes one reading from a single or multiple A/D converter and/or single or multiple digital input.

1D dataset are recorded and stored into separate files (with a .daq file extension) from the image Sequence file. The module supports reading from multiple A/D converters and digital inputs at once, provided this is from the same adapter. A single dataset is performed per received image.

Only one module can be loaded per workspace. Each module requires full and exclusive access to the A/D adapter. When using multiple cameras, if A/D reading needs to be separated per camera, multiple adapters are required.

Each dataset can be displayed on the image by either overlaying or burning to image.

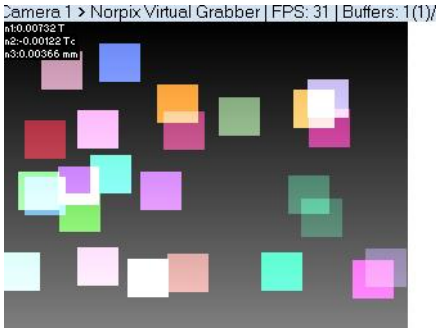


Figure 1-48: DAQ Capture tab

Module features include:

- Per Workspace implementation - one DAQ device per Workspace.
- Auto DAQ file naming and generation while recording (.daq file is created with the same name as the video sequence file).
- Synchronization with start / stop recording event.
- Synchronous playback with video.
- Automatic integration with file handling commands:
- File | Sequence Close will close both video and .daq files.
- File | Sequence Open will open the sequence file and the corresponding .daq file if it exists (provided the module is loaded into the Workspace).

General Tab

This includes general settings for the module.

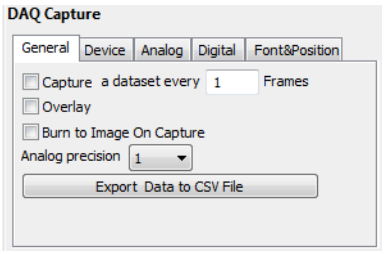


Figure 1-49: DAQ General tab

- Capture: Enables dataset capture. By default, when loaded, the module does not perform capture until fully configured. During capture, the configuration cannot be changed. Maximum capture rate is one dataset per image; however, you can reduce the capture rate.
- Overlay: Enables overlay of the DAQ dataset on the screen.
- Burn to Image on Capture: DAQ dataset is burned in place of image pixels for each image. Useful when exporting images to other file formats where the .daq file cannot be reloaded for simultaneous playback.
- Analog DAQ data are printed as decimal numbers. Click the precision dialog to specify the number of digits to be printed.
- Export Data to CSV File: The .daq file contains binary information. You can export current .daq files to an Excel compatible comma separated text file (.CSV file).

Device Tab

The device tab allows you to select a DAQ device to be used, and configure its hardware properties, and overwrite the destination folder for the dataset .daq file.

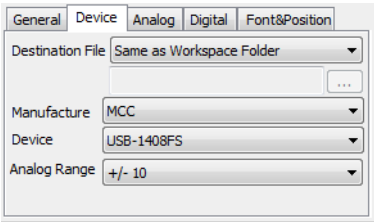


Figure 1-50: DAQ Device tab

- **Destination File:** By default, the .daq file is stored in the same folder as the video seq file. However, if disk bandwidth is not sufficient to handle it, an alternate storage path can be specified.
- **Manufacture:** Select a device provider which is supported by StreamPix.

- **Device:** Select what device will be used.
- **Analog Range:** select what analog range will be used. It's only available for analog line (this is hardware dependent, and may not exist for all supported modules).

Analog Tab

This tab allows you to configure each A/D reading and conversion. Only first degree linear conversion is possible: Y = A X + B:

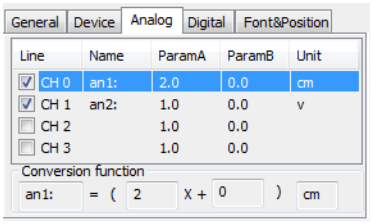


Figure 1-51: DAQ Analog tab

Where:

- Y = printout value
- A = conversion slope
- X= A/D reading
- B= possible offset
- Line: Analog line name from device, read only.
- Name: Printed display name.
- ParamA: Type to set conversion function parameter A.
- ParamB: Type to set conversion function parameter B.
- Unit: Unit name to be printed.

Font&Position Tab

This tab can be used to adjust the font and position when overlaying or burning to the image.

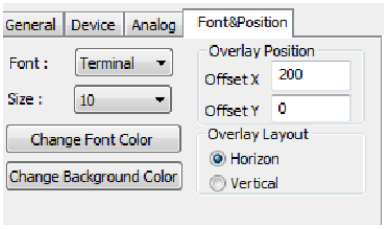


Figure 1-52: DAQ Font & Position tab

- **Font:** Select what font to use.
- **Size:** Select what font size to use.
- **Overlay layout:** Set how to overlay DAQ data horizontal or vertical mode. In horizontal mode, all analog readings are displayed on a single horizontal line. In vertical mode, all analog readings are displayed one per line. Digital data is displayed on a separate column.
- **Overlay Position (OffsetX and offsetY):** Set where to overlay DAQ data.
- **Change Font Color:** Set overlay text color.
- **Change background Color:** Set overlay text background color.

Frame Grabber (FG) Pulse Generator

This module is used to set up the internal timing generator, available on certain frame grabbers, to trigger camera exposure at a specified frequency. The cameras have to be configured, using their own software, to receive the exposure trigger from the frame grabber and not from another external source.

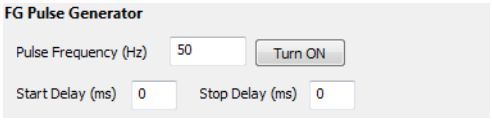


Figure 1-53: Pulse Generator dialog

Enter the desired pulse frequency and use the **Turn ON** button to toggle the pulse generator on and off. The frequency precision can be set up to 2 decimals.

You can also specify a Start Delay (generator will start X ms after clicking the **Turn ON** button) and a Stop Delay (generator will stop X ms after clicking the “Turn OFF” button).

NOTE: Please check with Norpix for the up-to-date list of frame grabbers that support this feature.

GPS / DMI Positioning

This module can be used to decode external GPS device messages and tag captured and recorded images with the GNSS / GPS information as metadata.

When the DMI (Distance Measuring Interval) mode is activated, travel distance information from a Pulse Distance Interval (PDI) device can be taken into account to control when cameras need to capture a frame. Image capture is then driven by a travel distance rather than a periodic capture rate. Multiple cameras can be controlled together via a single GPS+DMI module.

Besides the current GNSS / GPS readings, current milepost information can also be gathered during the image capture and embedded with each image metadata.

Depending on purchased license, either the GPS, DMI, or both sections of the module will be available in the user interface. Once loaded, the module needs to be set up.

Configuring for usage with a GNSS / GPS device

GNSS related information is setup via the GPS Device tab. Selection of collected GPS information is made via the GPS tab. Overlay information, font and position in the image are setup via the Font & Position tab.

Configuring the Module

6. Select the **GPS Device** tab to configure information related to the GNSS source device:

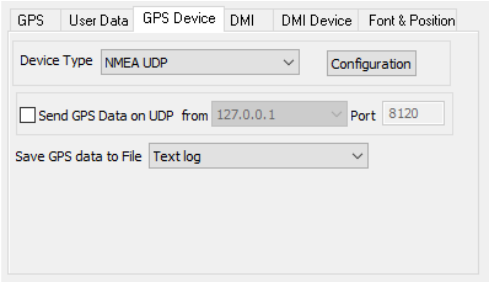


Figure 1-54: GPS Device tab

7. Select from the **Device Type** list what is the GNSS source. Various type of devices are supported:
   - NMEA and NMEA Shared for devices interfaced with COM port,
   - Garmin and Garmin USB for Garmin type devices,
   - SIRF or TSIP for USB type GNSS devices,
   - NMEA TCp or NMEA UDP for devices using a ethernet type connection,
8. Select **Configuration** to access the configuration panel for the specitic type of devices. Configuration can include COM port settings, source IP addresses and port

NOTE: If no GPS device is currently available, selecting **None** prevents the module from searching for a device.

NOTE: **NMEA Shared** makes sure the GPS received NMEA strings can be shared between the GPS module as well as the GPS Time Source.

NOTE: The current NMEA Strings decoded by the module for Glonass, Beidou, or GPS satellite constellation are the following:

- DBT: Depth below transducer,

-GGA: global positioning system fix data,

-GLL: geographic position latitude/longitude,

-GSA: GPS GOP and active satellites (for data validity),

-GSV: Satellites in view (for data validity),

-HDT: Heading True,

-OSCAM: Proprietary (timestamp of navigation, lat, long, heading, roll, pitch, depth, altitude, speed),

-RMC: Recommended minimum navigation information

-SHR: pitch and roll,

-TLL: Target Lattitude and Longitude from a way point

-VTG: track made good and ground speed,

-ZDA: time and date (UTC) and local time zone,

-ZZU: time (UTC),

More strings can be added on request. The module does not currently perform any speed nor bearing calculations or interpolation. Therefore, if the RMC string is not complete, i.e.: missing the speed and bearing information, that information will not be available.

NOTE: When there is redundancy on the sentences, there is a hierarchy order. During initialization, the module will wait until 20 sentences have been received to decide which sentence to use.
For **time stamping**:
1- ZDA, if not available
2- ZZU, then RMC,
3- GGA.
For **Positioning**:
1- RMC, then
2- GGA.

9. To forward the GPS data to UDP, select **Send GPS Data to UDP,** enter the IP address and port number.

10. To create a comma separated text file (*.csv*) that stores the selected GPS information along with the index of each image during recording, select **Save GPS data to file** with Text Log (other file format will be available soon).

    The file is created in the same folder as the recorded sequence, AVI, MOV or image files and uses the recorded file name with a *_gps.txt* extension. If the destination media for recording is RAM rather than disk, the file is created in the *C:\temp* folder and is called *RAM sequence_gps.txt*. If a **File Name Padding** value is specified in the **StreamPix settings > More...> Images** page, then that padding will be applied to the image index in the GPS text file.

11. Once the GPS communication related parameters are properly configured, switch to the **GPS** tab, where the latest received GPS information will be displayed.

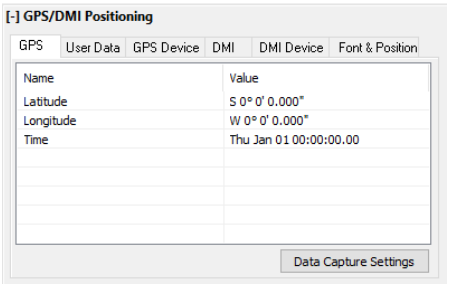


Figure 1-55: GPS tab

12. Select **Data Capture Settings** to choose which information will be decoded and stored from the NMEA string sent by the GNSS device. Latitude, longitude, altitude, speed, bearing, time and more can be decoded. Depending on the GNSS device, not all information may be available. Check with your GNSS provider in case some information cannot be displayed.

NOTE: Overlay data panel is refreshed with new GNSS information in real time. Hence, a 10 Hz GPS will refresh about 10 times per second. Therefore, all frames received between 2 messages will be stamped with the same information. When using high frame rate cameras, a couple of consecutive frames can have the same GPS information.

13. Use the **Font & Position** tab to specify the font type, size, position and location in the image. The data can be "burned" on each image or overlaid (no damage to the image data).

NOTE: The font size may look different when using the Overlay mode versus the burn to image mode. In overlay mode, zoom factor applied on the image display has no effect on the display font.

NOTE: When the module is loaded, 2 additional naming scheme tokens are available:

- If the naming scheme includes the token {GPSData}, the module will replace this token by the current overlaid data.
- If the naming scheme includes the token {GPSTime}, the module will replace this token with current GPS time scheme.

User Data tab

The **User Data** tab includes 3 lines where extra text can be entered. The information is stored in the **.csv* log file with the GPS related coordinates.

DMI (Distance Measurement) functionalities

The DMI option includes additional hardware components:

- An electronic counter device (usually plugged into the image recording computer) or via a USB link
- A Synchronization box that allows connecting various input and output signals
- An external Pulse Distance Interval signal usually provided by wheel motion encoder (not provided).

DMI Synchronization Box:

The DMI (Distance Measure Interval) module requires the usage of some internal electronic counter devices directly plugged into the computer. Supported devices are the Measurement and Computing 4301LS, the National Instruments NI6601 or NI6320 devices and USB Arduino Uno microcontroller which includes some counters and IO control.

The synchronization box needs to be connected to the host computer via the provided cable. The box also includes some output, typically a Hirose 4 pin output connector to power the cameras and forward the synchronization exposure pulses to each camera.

DMI sync box includes 2 BNC connectors:

- **DMI Input:** That connector must receive the PDI (Pulse Distance Interval) signal from the wheel encoder. The PDI signal must be a TTL (0-5V) square wave signal. Pulse rates depend on the motion speed of the vehicle.
- **Camera Sync Output:** That auxiliary output can be used as a repeater signal to provide a similar pulse that is used to trigger the cameras.

DMI sync Box includes LEDs that can be used as tools for testing the behavior of the device:

- **Green PC Link LED:** When on, that indicates the sync box receives appropriate power from the computer.
- **Red DMI LED:** The LED will be flashing at the rate of the PDI. No motion will generate no pulse.

NOTE: For the pulse to be visible, you may need to adjust the duration of the pulse via the configuration of your DMI device. The LED is directly connected to the input line. If the PDI pulse duration is very short (a few milliseconds for instance) you may not see the pulses: PDI pulse duration may be too short for the naked eye. However, the counting devices are still able to properly handle pulses with durations as short as 100 nanoseconds.

- **RED Camera LED:** The LED will be flashing each time a capture signal is sent to each camera. When the LED is off, no image is captured.

Setup for the DMI control and camera synchronization is set via the **DMI Device** tab. Current DMI information is reported via the **DMI** tab, and to a log file if you select that option on the **DMI** tab.

DMI device tab

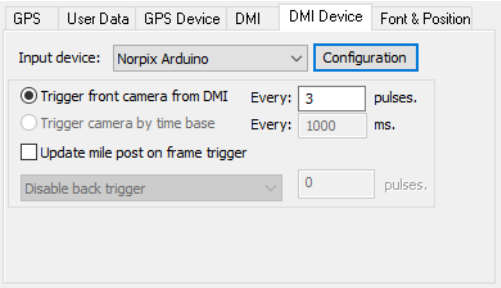


Figure 1-56: DMI Device tab

Input device: Select the device used to count PDI pulse and manage camera synchronization. Depending on your hardware configuration, various devices may be listed:

- MCC4301 (USB, supported but obsolete)
- NI6601 or 6320 (PCI/PCIe)
- Ardiuno Uno (USB).

Configuration: This will give you access to settings related to the DMI input device used with the software. Depending on the device, the following may be or not relevant:

Edge: This defines the edge sensitivity of the counting device: Typically, the device will increment the pulse count every rising edge. It can also be set to falling edge.

COM port and Baud rate: These two parameters are only for the Arduino Uno device. Usually Arduino devices are installed over a virtual COM / USB port to communicate with the host computer.

Trigger camera from DMI pulse: Synchronize camera exposure with the PDI pulses. Select the number of required pulses between each captured image. This is depending on your installation, number of pulse per revolution your encoder delivers and other parameters like the wheel diameter.

Trigger camera by time base: Alternatively. image capture can be driven by a time base. in which case, images will be captured every such time (in milliseconds), independently from the travel distance. No PDI signal is needed for this setup. This mode can be used to trouble shoot the camera control circuitry interdependent from the PDI circuitry. By setting a time mode, frames from the camera should be delivered based on that period.

Update mile post on Frame trigger: By default, mile post is updated when an image is received from the camera driver. Enabling this mode makes the frame tagging with mile post and GPS information more accurate since the tag information is stored at the camera exposure time rather than when the frame is received by the computer (delay is typically exposure time + camera read out time). This feature is only supported with AVT Gige camera for now.

Delay 2nd pulse: Define the pulse delay for the 2nd pulse should you need to trigger exposure for a different rig or cameras, for instance, between a front looking and a back looking camera rig.

DMI tab: This tab presents current DMI information.

Initial Miles: This allows you to define the initial mileage position when the campaign starts. At the beginning of a data logging campaign, an initial mile post value can be entered. MilePost will increment / decrement according to the received DMI pulses starting from that initial value.

Miles per Pulse: parameter defines the PDI incremental distance between each pulse. Refer to your wheel encoder or DMI device documentation to enter the right value. An incorrect value will affect the MilePost calculation.

Increase: Miles Post value will increment when this is checked (default). Uncheck to get the mileage decreasing.

DMI pulses are directly linked to the travel distance of the vehicle. Image capture is synchronized with DMI pulses. Adjusting the Trigger camera every N Pulses value allows to define the camera capture rate according to travel distance. Make sure to enter a proper value, compatible with the campaign image sample rate, maximum vehicle speed and maximum camera capture rate.

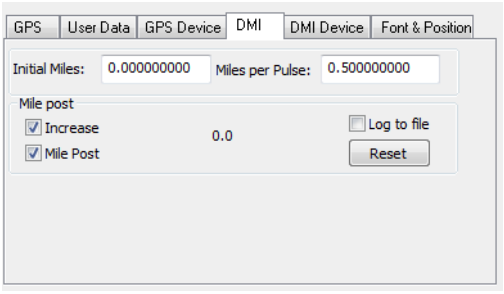


Figure 1-57: DMI tab

Log to file: Append the current mile post to the GPS .csv file for each captured image.

Reset: At any time, the MilePost value can be reset to the initial mile.

Although the Module can store GPS and mile post data to a .csv file during a recording, that data can also be stored in a metadata file. See “Metadata settings”.

GPS Time Card

This module is useful for displaying GPS data received from certain time source boards that have also GPS positioning capabilities.

The module allows you to choose which information will be decoded (latitude, longitude, altitude). Depending on the board, not all information may be transmitted.

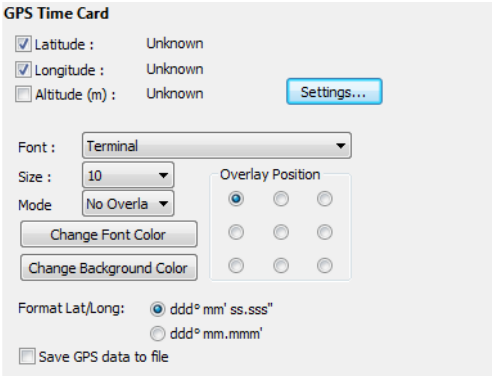


Figure 1-58: GPS Time Card dialog

Since GPS boards usually deliver a new message every second, this information is refreshed every second. As a consequence, all frames received between 2 messages will be stamped with the same information.

The GPS data can be “burnt” on each image or be overlaid (no damage to the image data). You can specify the font type, size and position on the image.

The **Save GPS data to file** can be used during recording. It will create a comma separated text file that stores the selected GPS information along with the index of each image. The file is created in the same folder as the recorded sequence, AVI, MOV or image files and is using the recorded file name with a “_gps.txt” extension. If the destination media for recording is RAM rather than disk, the file is created in the working folder and is called “RAM sequence_gps.txt”.

NOTE: Check with Norpix for the up-to-date list of time source boards that support this feature.

GRT Playout

The GRT Playout module provides the ability to drive the play-out capability for supported Great River Technology frame grabbers.

Figure 1-59: H.264 Compressor module

Using this module, you can playback a recorded sequence to both StreamPix Image Display Area as well as sending the frame back to the frame grabber play out buffers.

NOTE: This module requires a GRT Play-out license.

The GRT frame grabber has to be loaded in StreamPix to be able to use the GRT Play-out module.

Also, a sequence file has to be loaded in the same Workspace as the module.

To enable the play-out, start the sequence playback and press the Enable Play-out button. The board will be automatically configured to transmit images currently played-out.

The module is compatible with all the playback functions of StreamPix: Pause, frame-by-frame, go to a certain frame. Drag the playback slider, and it will always transmit the current playback image.

To set the board back to receiving mode, press Disable Playout or unload the module.

NOTE: This module replaces the GRT Play-out Reader utility.

Image Merge

NOTE: This module requires a specific license. Contact Sales@NorPix.com.

This module is typically loaded into its own workspace, with no grabber device for better flexibility. This module can combine multiple video sources to create a larger image. It can be applied while live, recording or exporting images.

During recording, merge stream is recorded according the recording settings.

By default, there is no alignment check, nor frame time stamp synchronization. The module only waits to receive all frames from each source and then combines images into a single new image. Sources should be the same image format, but can have a different image size.

NOTE: Current implementation does not support all image formats. Image formats hat includes pixel pack are not supported. For other image formats, contact Norpix tech support for an updated module.

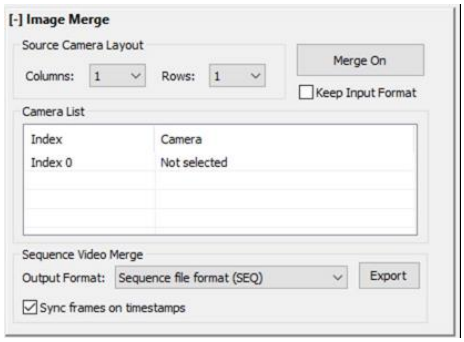


Figure 1-61: Image Merge module

- **Source image layout:** set output image layout. Maximum is an array of 4x4.
- **Keep input Format:** by default, output image format will be BGR. You can check this option to force output image format to be the same as the source format.
- **Camera list:** Select the different Workspace names containing the source video streams. The quadrants are populated based on the index order, from top left to bottom right.
- **Merge On:** Enable / Disable the merge processing. The module can also be used to merge pre-recorded sequences.
- **Output Format:** The result is then exported to various output formats, such as SEQ, AVI, series of images...

During live or recording operation, the frame rate for the merged sequence is defined by the frame rate of the last item in the list. When merging frames from cameras running different frame rates, it is recommended to list the workspace with the fastest frame rate

last.

- **Sync frame on time stamp:** (export only) This will merge and export frames from multiple workspace using time stamp for synchronization: This feature is useful when recording from different cameras that have different frame rate, and you want to generate a merge composite video by keeping the frame and time stamp synchronized. The synchronization is performed according a master workspace. If there is no master workspace, then the first workspace will be considered as the master. The Merged frame is using every frame of the Master workspace as a time reference and for other merged Workspaces the module uses the frame from each source that is closest in time to the current time stamp of current frame of the Master workspace. That way, the module will automatically drop frame (if the other camera is faster) or duplicate frames (if the other camera is slower).

LiDAR Logger

This module connects to a Sick Bulkscan LMS 511 device. It allows you to configure some of its parameters and to retrieve the data sent by the device.

First, you need to establish the connection with the device by filling in the corresponding IP address and port in the **IP Connection** tab. These settings should be previously configured with the Sick SOPAS Engineering Tool available on the manufacturer's Website. The connection can be initialized manually, by pressing the **Connect** button or automatically, if the **Reconnect at Startup** option is selected.

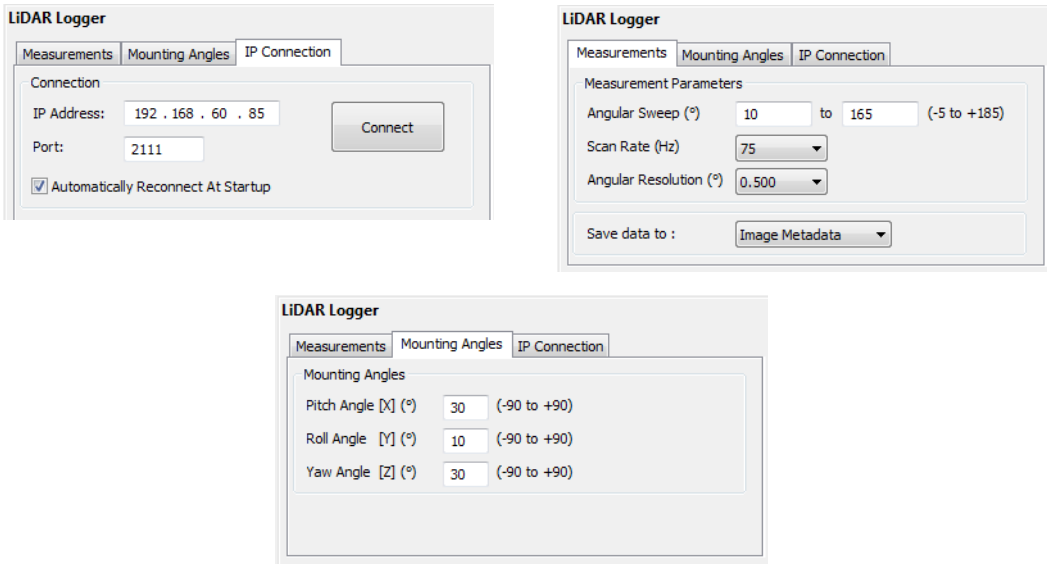


Figure 1-62: LiDAR Logger module

Then, in the **Measurements** page, several parameters can be adjusted: **Angular Sweep**, **Scan Rate** and **Angular Resolution**. Each time one of these parameters is changed, the new configuration is sent automatically to the device. Sometimes, reconfiguring the device might take a few seconds.

The data captured from the device can be saved separately in a log file and/or as metadata, embedded in each recorded image.

When saving to a log file, the module creates a text file in the same folder as the recorded sequence, AVI, MOV or image files and is using the recorded file name with a "_lidar.txt" extension. If the destination media for recording is RAM rather than disk, the file is created in the working folder and is called "RAM sequence_lidar.txt".

The **Mounting Angles** tab allows you to fill in the angles at which the device is mounted. These parameters are also saved along with the data received from the device.

The data structure of the LiDAR output is detailed below.

Sample entry:

```
1|2012/07/05 16:53:50 314|30,20, 35|DATA_PKT_DISTANCE1_MEAS,
3500,23826,1|2500,0.000000,4294917296,761|405,3058,...
```

Image index in the sequence	1
(group delimiter)	|
Date	2012/07/05
Time	16:53:50
Milliseconds	314
(group delimiter)	|
X orientation	30 deg
Y orientation	20 deg
Z orientation	35 deg
(group delimiter)	|
Measurement type	DATA_PKT_DISTANCE1_MEAS (Distance measurement)
Scan Rate	35 Hz
Scan Count	23826 (unique scan line index for this device, will always increase by 1 with each scan line)
Scale Factor	1
(group delimiter)	|
Angular Step Width	2500 = 0.25 deg (in 1/10,000 deg units)
Scale Offset	0
Start Angle	4294917296 = -5 degrees = (2^32 - 50000) = max long value - 50000 (in 1/10,000 deg units)
Number of Data Points	761 (190 deg sweep / 0.25 deg step + 1)
(group delimiter)	|
Data	< 761 Data Values ...> in millimeters from unit

Line Scan Viewer

This module has been designed to display and export to various format images from a line scan source. Contrary to area scan sources, line scan sources deliver a single line of pixels. Viewing a single line image where the line is replaced at a high rate is too challenging and of little interest. The Line scan display module allows a waterfall like display, where new lines to be displayed are appended to the previously displayed ones. Older lines eventually get removed.

Line scan cameras are used to capture web-type data and can be seen as one-dimension devices, delivering one-dimension images. The typical output of these cameras implements displaying multiple lines at the same time so that the viewer can picture what is happening under the camera. Also, line scrolling is required as the older scanned lines need to be discarded to make room for the newer ones.

Some line scan camera devices or frame grabbers can combine a set of lines together to build a kind of area scan line image. The line scan viewer module can also accommodate those devices, and still present a waterfall like image display.

Page size and image size:

For line scan cameras, we define a page as the number of lines delivered by the camera within a single image. So a page is basically equivalent to an image. Except that the viewer will combine multiple pages to generate an image for display. Usually, the page size is 1 line. However, the line rate can be very high, sometimes delivering 20 000 lines per second, or 20 000 pages/images per second.

Managing 20 000 lines a second could be challenging for most software. However, combining those lines within, for instance, a single page made of 100 lines, allows StreamPix to deal with more sedate 200 images per second.

The line scan viewer module can also be used to export acquired lines into various formats:

- Combine consecutive lines into a single area scan like image (export to still images).
- Convert to an equivalent area scan movie.

Once the module is loaded, you will notice a new tab in the workspace display area. This tab gives access to the linescan viewing pad, while you can still access the usual live camera pad and sequence pad.

Figure 1-63: Line Scan Workspace icon

The module includes 3 tabs to allow configuring various display and referring options.

General tab: display options

The line scan pad can display images from 2 sources: Direct from the camera or from the recorded sequence file.

When **Number of lines** is set to **Automatic**, the number of lines in the waterfall display is adjusted to the viewer window size. When set to **Manual**, one can define how many lines

will be simultaneously displayed.

Depending on the scan direction of the web in front of the camera, adjust image orientation: Forward (most recent page is added at the end of the current set of lines) or Backward (most recent page is added at the beginning of current set of lines).

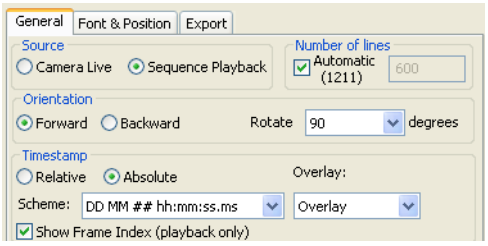


Figure 1-64: Line Scan dialog

Depending on camera orientation, it is also possible to have the waterfall display vertically (0 or 180 degrees), or horizontally (90 or -90 degrees).

Below is a one-page 100 line display of a rotated Pepsi® pop can in front of a monochrome linescan sensor:

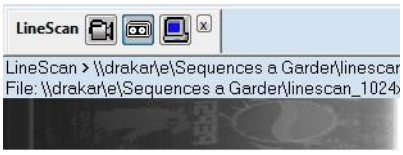


Figure 1-65: Typical Line Scan view

Figure 1-66: Waterfall view, vertically and horizontally oriented

The module also includes an option to overlay a captured time stamp for each page. When displaying an image from the camera source, the module will overlay the timestamp of the last page. In playback mode, three timestamps are overlaid: The oldest page, the middle of the view page and the newest page. The overlay position depends on the image orientation.

Several timestamp display schemes are available. Also, time can be overlaid as absolute or relative to the first captured page. You can also overlay the page index.

Font & Position tab

This allows customization of the timestamp overlay (position, font, text size, color and background color).

Export tab

Exporting line scan pages can be done via the regular StreamPix export command. However, the module can be used to export the waterfall like display images.

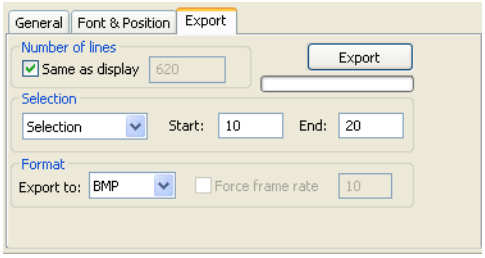


Figure 1-67: Export tab

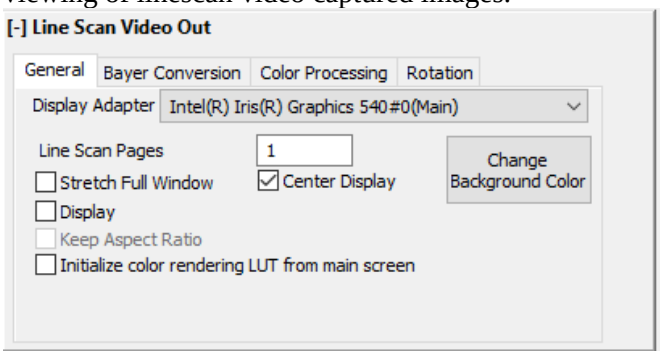
Consecutive lines in a page can be exported as an area scan-like image. Set the number of lines to the desired size of the image to be either identical to the display area or to your own choice.

Supported export formats can be one of the following: BMP, JPG, TIFF, PNG, FIT, JP2, DPX, for still images, or AVI, MOV (32 bit only) and SEQ for movie-like rendering.

When exporting to a movie format, a custom frame rate can be set. By default, the frame rate of the original sequence will be applied.

Line Scan Video Out Module

Line scan video out module allows controlling a secondary monitor and have a water fall viewing of linescan video captured images.



LineScan Pages entry allows to define how many pages are used to build the waterfall images.
A page correspond to the number of lines combined together into a frame. When selecting a number for the Line Scan Pages, make sure that (number of lines per page) * (number of pages) is not larger than the monitor resolution for optimum performance.

Refer to the Video Out module documentation for further details.

MCC Pulse Generator

The MCC Pulse Generator module allows to control the image acquisition speed of your camera or frame grabber and synchronize the acquisition between multiple workspaces. The cameras have to be configured to receive the exposure trigger from an external source (i.e. the MCC device).

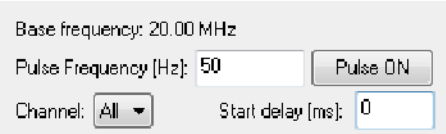


Figure 1-68: MCC Pulse Generator dialog

To get started, enter the pulse frequency to be generated. Since the pulse train triggers the camera exposure, the pulse frequency will determine the exact camera frame rate.

The MCC board can be programmed to generate a single pulse train by selecting a single channel, or multiple synchronized pulse trains if all channels (counters) are used.

Optionally, the MCC board can be programmed to start the pulse(s) with a certain delay.

Use the **Pulse ON** button to toggle the pulse train on and off.

Modbus Remote Control Module

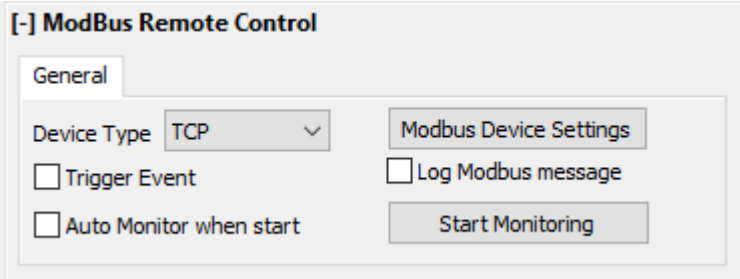
This module adds Ethernet ModBus interoperability within StreamPix. The module can monitor messages and variable state changes to trigger events to StreamPix.

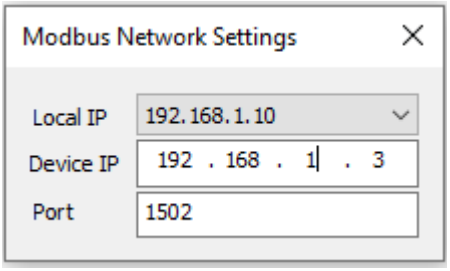
Only one instance of the module can be loaded. However, it can trigger events to StreamPix and/or specific workspaces.

The current implementation supports only a limited number of features. Do not hesitate to contact support@norpix.com to request add-ons or changes to the module in order to implement your specific needs.

The messages and variables can be defined via an XML config file. The file must be located and named as follows:

```
%AppData%\Norpix\ModbusTrigger\config.xml
```





Selecting the ***Modbus Device Setting*** allows you to enter Modbus Network Settings specific configuration:

Local IP: The local IP address that the module will be listening from. This must be one of the computer network IP addresses.

Device IP: The IP address of the Modbus device to monitor.

Port #: The port number the module will use.

Trigger Event: Enable/disable the module operation. When checked, the module will start monitoring ModBus events and forward them to StreamPix and workspaces.

Log Modbus message: When checked, all received messages will be logged to a file, located in `%AppData%\Norpix\ModbusTrigger` to allow for troubleshooting.

Start/Stop monitoring: Turn on/off monitoring and listening of the Modbus messages from the network adapter.

Auto Monitor when start: When checked, upon loading and StreamPix starting, the module will automatically begin listening for messages.

The XML configuration files include a few configuration entries:

- **pooling**: A value in milliseconds that the module will use to examine Modbus device register changes: A value or 100 means every 100ms, the software will read the value.

- **action:** A string, describing the action that will be triggered in StreamPix. Select from the following list:
  - pre/post
  - start record
  - stop record
  - start playback
  - stop playback
  - mark frame
  - create new sequence
  - create new image sequence
  - create new avi
  - create new mp4
  - create new ts
  - create new sequence and start recording
  - create new image sequence and start recording
  - create new avi and start recording
  - create new mp4 and start recording
  - create new ts and start recording
  - start pulse
  - stop pulse
  - close video file

- **register:** The Modbus register index that should be monitored in decimals.

- **value**: The decimal value that must be monitored into the register: When value matches that entry, the action will be triggered. The action is triggered when the specific bits are raised. When the bits are cleared, no action is triggered. This allows retriggering the action for every time the condition is raised.

- **workSpace: blank or specified workspace name.** If this entry is not populated, the action will use current StreamPix workspace selection settings: Single selection will apply to current workspace. All workspaces selected, the message will be broadcast to every workspace. When a workspace name is set, the action is forwarded to the named workspace only.

- **param**: the parameter for the action (see below):

  Depending on the selected action, extra parameters can be added to the XML file.

  For the command **"*Create New AVI and start recording":***

- **appendRegisterIndex: "true" or "false"** : When true, the register index number will be appended to the file name defined with the auto-naming scheme, preceded with an "_". Example: my_AVI_file_name_0.avi for register index 0.

- **appendRegisterValue: "true" or "false"** : When true, the register read value will be appended to the file name defined with the auto-naming scheme, preceded with an "_". Example: my_AVI_file_name_1.avi for register value set to 1.

For command **"*Create New Image Sequence":***

- **param: "jpg",** target image format is jpeg. Other formats, such as tiff, bmp can also be used.

Examples:

XML config file

```
<?xml version="1.0" ?>
<config polling = "30">
<item register = "0" value = "1" workSpace = "" appendRegisterIndex =
"true" appendRegisterValue = "false" action = "create new avi and start
recording" param = ""> </item>
<item register = "0" value = "2" workSpace = "" appendRegisterIndex =
"true" appendRegisterValue = "true" action = "create new image sequence"
param = "jpg"> </item>
<item register = "1" value = "3" workSpace = "Camera 1" action = "start
pulse" param = ""></item>
<item register = "1" value = "4" workSpace = "Camera 1" action = "stop
pulse" param = ""></item>
</config>
```

Motion Detection

The Motion Detection module is designed to perform real time image processing (IP) on incoming images and upon detecting significant motion or change in the image, it can generate an event to StreamPix.

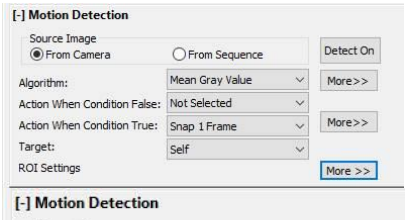


Figure 1-69: Motion Detection module

At load time, the module does not perform any detection. Push the **Detect On/Off** button to turn on/off the monitoring.

The Module can perform the analysis on the whole image area, or on a defined region of interest (ROI).

Three different image processing algorithms are available, depending on the nature of the scene or image to be monitored:

- **Mean Gray Value:** The module will calculate the average gray level in the defined ROI and upon a change from a reference value, will trigger the event.
- **Absolute Difference:** The module will calculate the pixel to pixel difference from a reference image and trigger the event when the difference reaches above a certain threshold.
- **Max absolute Difference:** The module will calculate the pixel to pixel difference from a reference image, search for the maximum difference value and trigger the event when the difference reaches above a certain threshold.

The Module can generate any of the six following StreamPix action event, whether the condition is asserted true or false:

- Start Recording.
- Stop Recording.
- Pre/Post Continuous: Continuously generate pre/post events until the condition resets.
- Pre/Post Reset: While waiting until the condition resets before generating a new pre/post event.
- Snap 1 frame.
- Mark Frame.

Configuring Motion Detection Module:

The following parameters must be configured:

Image Source: The module can be applied on an incoming stream of images from a camera or for tune up purposes, it can be applied while playing back a sequence. During playback, no events are generated since there is no point in managing recording status while playing back.

Algorithm: Choose among three available algorithms, according to what you think will best suit your needs. Depending on the algorithm selection, some extra specific parameters need to be adjusted.

- **Mean Gray level:** Set the conditions for when the event should be triggered:
  - Above Threshold,
  - Below Threshold.
  - Adjust the threshold value..

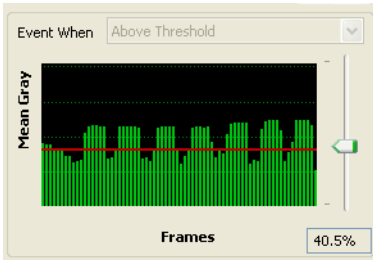


Figure 1-70: Mean Gray Value

- **Absolute Difference:**
  - The percentage Mean Gray defines the minimum value in pixel intensity that must be encountered before an event is triggered.
  - The percentage ROI specifies a minimum number of pixels where the change must occur.
  - Since **Absolute Difference** performs an image subtraction between the last received image and a reference image, you need to define the reference image. It can be the previous captured image or an image that is defined as the

reference. Use the capture button to capture and save the reference image to disk.

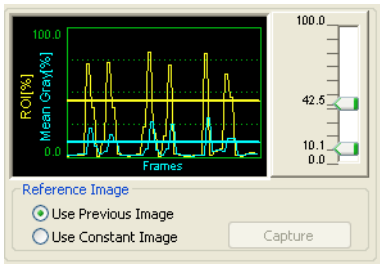


Figure 1-71: Absolute Difference

- **Max absolute Difference:**
  - The percentage grey defines the minimum value difference in pixel intensity that must be encountered before an event is triggered.
  - The difference can be calculated between the current and last image or with a reference image (constant) that you need to define. Use the capture button to capture and save the reference image to disk..

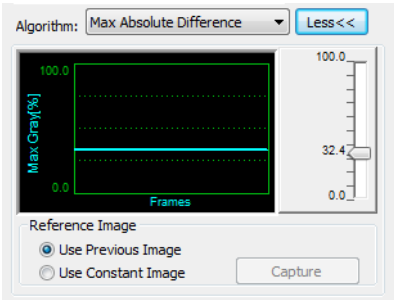


Figure 1-72: Max Absolute Difference

Select StreamPix event to be triggered: There are five possible StreamPix events that the module can trigger:

- Start Recording
- Stop Recording
- Pre/Post Continuous
- Pre/Post Reset
- Mark Frame.

To make the module less sensitive to false detection, it is also possible to enable event triggering only after the condition was detected continuously for a specific number of consecutive frames.

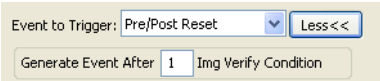


Figure 1-73: Event trigger

Select ROI

Motion Analysis can be performed either on a full image size, or using a specified region of interest (ROI). ROI can be defined by either manually entering the coordinate of the region in the image, or by interactively clicking and dragging an ROI on the display area.

If multiple ROIs are needed, load the module multiple times.

Caution: Beware of the added CPU load, since this module is performing extended image processing.

If the total processing time takes longer than the frame time, the module will not process the next incoming frame. It will finish processing the current frame, then wait for the next one.

NI Pulse Generator

This module can be used to trigger camera connected to a National Instruments Legacy device. The module is quite simplistic. Enter the desired pulse frequency and use the [Turn ON] button to toggle the pulse generation on and off.

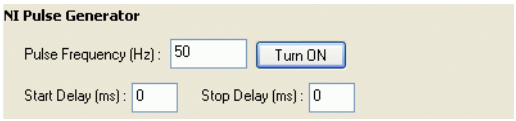


Figure 1-74: Ni Pulse Generator

You can also specify a Start Delay (generator will start X ms after clicking the **Turn ON** button) and a Stop Delay (generator will stop X ms after clicking the **Turn OFF** button).

NI-DAQmx Pulse Generator

Similar to the NI Pulse Generator plugin, the NI-DAQmx Pulse Generator module is used to program a National Instruments board to generate continuous pulses with a specified frequency. The I/O board must be compatible with NI-DAQmx drivers and support pulse generation.

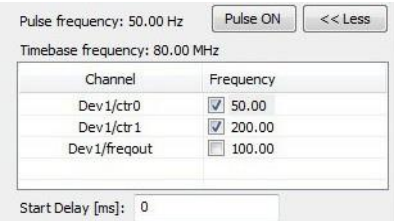


Figure 1-75: NI-DAQmx Pulse Generator

Simply enter the pulse frequency and use the “Pulse ON” button to toggle the pulse train(s) on or off.

If multiple channels are selected, the pulse trains will start/stop in synch.

The pulse train triggers the camera exposure and so, it controls the camera frame rate. Assuming the board is programmed to generate multiple pulse trains having the same frequency, all the cameras will be synchronized, since the pulse trains are synchronized.

You can also specify a Start Delay (generator will start X ms after clicking the “Pulse ON” button).

Note: Depending on the device, the user might need to modify the PFI Terminal (default is 31) and the DO Line (default is 31). This is done using the STP4Admin application that can be found in the same folder as StreamPix.

NI Pulse Divider

The NI Pulse Divider module provides a way to divide a pulse train frequency. The National

Instruments I/O board must be compatible with NI-DAQmx drivers and support pulse generation.

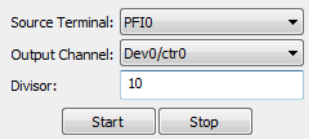


Figure 1-76: NI Pulse Divider

14. Specify the terminal where the input pulse that needs to be divided is present.
15. Select the output channel and enter a divisor.
16. Use the Start and Stop buttons to start or stop the pulse train respectively.

Limitation: the divisor must be greater than 4.

NPX OPC Remote Control Module

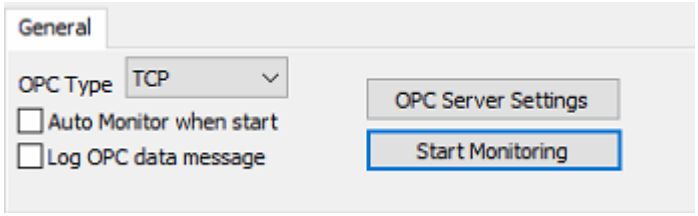
This module adds OPC Server interoperability within StreamPix. The module can monitor messages and variable state changes to trigger events to StreamPix.

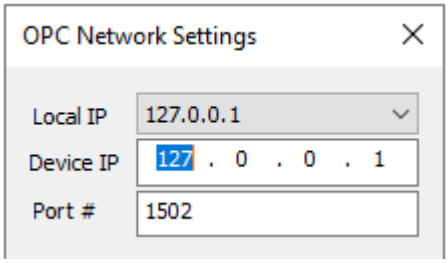
Only one instance of the module can be loaded. However, it can trigger events globally to StreamPix and/or specifically to designated workspaces.

The current implementation supports only a limited number of features. Do not hesitate to contact support@norpix.com to request add-ons or changes to the module in order to implement your specific needs.

Basic module configuration is setup via a user interface while further details must be done via a XML configuration file located in a specific folder and file name.

A default configuration file is available in %AppData%\Norpix\ OPCRemoteControl\`config.xml`





Select ***OPC Server Setting*** to enter network settings related to the OPC server to be contacted by the module:

Local IP: The local IP address that the module will be listening from. This must be one of the computer network IP addresses.

Device IP: The IP address of the OPC Server to contact,

Port #: The port number to sue for IP communication.

Log OPC data message: When checked, all received messages will be logged to a file, located in `%AppData%\Norpix\` OPCRemoteControl. This can be useful for troubleshooting .

Start/Stop monitoring: Turn on/off monitoring of the OPC variables from the server.

Auto Monitor when start: When checked, upon loading and StreamPix starting, the module will automatically begin listening for messages.

The XML configuration files include a few configuration entries:

- **pooling**: A value in milliseconds: this defines the rate the module will use to examine changes on the variable on the OPC Server: A value or 100 means every 100ms, the software will read and examine the value.

- **action:** A string, describing the action that will be triggered in StreamPix. Select from the following list:
    - pre/post
    - start record
    - stop record
    - start playback
    - stop playback
    - mark frame
    - create new sequence
    - create new image sequence
    - create new avi
    - create new mp4
    - create new ts
    - create new sequence and start recording
    - create new image sequence and start recording
    - create new avi and start recording
    - create new mp4 and start recording
    - create new ts and start recording
    - start pulse
    - stop pulse
    - close video file

- **variable:** The OPC variable name that should be monitored.

- **value**: This define what value to monitor. Value can be handled either as a full 16 integer or as boolean.

    - General value that must be monitored (integer mode): When the monitored variable value matches that entry, the action will be triggered. The action is triggered when the specific bits are raised. When the bits are cleared, no action is triggered. This allows retriggering the action for every time the condition is raised.

    - If the value syntax is defined as "xby", where x is the bit (range 0~15) and y is the value (0,1), this works as bit monitoring mode. As an example, "2b1" means to monitor bit 2 and value l.

    - If the value syntax is defined as "(z,y)", then a range of values is monitored. The action will be triggered when the value is in the defined range of values. As syntax as "(,y)" means the range is from negative infinite to y. A syntax as "(x,)" means the range is from x to positive infinite.

    - If the value syntax is defined as "true" or "false" rather than as an integer, the module interprets the value as a "boolean". "true" meaning the module will react with the value switches to Boolean true and vice-versa.

- **onload:** "true" or "false". At startup, or when the module is loaded, the module will compare the read value in the server with the defined **"value"**. If **onload** is true, the software will trigger the defined action.

- **workSpace: Blank or specified workspace name.** If this entry is not populated, the action will use current StreamPix workspace selection settings: Single selection will apply to current workspace. If all workspaces are selected, the message will be broadcast to every

workspace. When a workspace name is set, the action is forwarded to the named workspace only.

- **mode: "change"** or **"always":**

    - **"change":** The module will keep in memory a copy of the last read value, and compare the current reading with it. The action is triggered only when the read ***value*** is changed from the specified ***value***,
    - **"always":** The action is triggered every time the read **value** matches the specified value set in the configuration file. This means every pooling time, the action is triggered if the ***value*** is a match.

- **param**: the parameter for the action (see below):

  Depending on the selected action, extra parameters can be added to the XML file.

  For command **"*Create New Image Sequence":***

    - **param: "jpg", "jp2", "bmp", "dng", "dpx", "wdp":** This defines the target image file format.

  ERROR section:
  The error section in the configuration file defined behavior when network error occurs, such as time out:

  reading-error retry: This section defines the number of times the module will retry accessing the OPC server device before declaring a lost connection issue.

  lostconnection: This section defines the action to be taken upon a lost network connection situation.

  action:

  - **"" or "manual":** The module will stop monitoring. A user action is required to restart the monitoring process,

  - **"auto-reconnect":** The module will try to reconnect with the OPC server device,

  - **retry:** Number of auto reconnect retries. Enter a large number to avoid having the software to escape from retrying.

  - **interval:** Interval time in milliseconds in between retries,

  - **workspace**: Blank or specified workspace name to execute the command,

  - **command**: A string, describing the action that will be triggered in StreamPix upon a lost connection is detected:

    - "StopRecording": Software will stop the current recording, and resume polling registers
    - "": software will continue in whatever state it is in: recording, pre-post, playback…

  - **param**: a possible parameter for command to be executed.

Examples of XML config file:

```
<?xml version="1.0" ?>
<config polling = "30" username = "" password = "" timeout = "5000">
 <proc>
<!-- Start Recording When DINT bit 7 is high for all WS-->
   <item variable = "DINT_IO_OneInt" value = "7b1" workSpace = "" mode = "change" onload =
"true" action = "Start Record" param = ""> </item>

<!--Stop Recording when value Cam1.Measures.Angle.Double is egal to 2 -->
   <item variable = "Cam1.Measurements.Angle.Double" value = "2" workSpace = "" mode =
"change" onload = "true" action = "Stop Record" param = ""> </item>

<!--Generate Pre-Post when value Cam1.Measurements.Angle.Double is in range 3-8 -->
   <item variable = "Cam1.Measurements.Angle.Double" value = "3,8" workSpace = "" mode =
"change" onload = "true" action = "Pre/post" param = ""> </item>

<!--Generate Pre-Post in WS Cam3 when value Cam1.PointToPoint.Length.Double is higher than
7.6 -->

   <item variable = "Cam1.PointToPoint.Length.Double" value = "7.6, " workSpace = "Cam3"
mode = "change" onload = "true" action = "Pre/post" param = ""> </item>

<!—Start recording for all WS when value Channel1.Device1.TagBool is true -->

<item variable = "Channel1.Device1.TagBool" value = "true" workSpace = "" mode = "change"
onload = "true" action = "Start Record" param = ""> </item>

  </proc>
<error>
   <reading-error retry = "3"></reading-error>

   <lostconnection action = "auto-reconnect" interval = "30000" retry = "3" workSpace = ""
command = "Stop Record" param = ""></lostconnection>
  </error>
</config>
```

NPX OPC Server module

This module adds OPC interoperability within StreamPix. The module currently implements limited functionalities and will evolve in the future. Do not hesitate to contact support@norpix.com for request of features that need to be added.

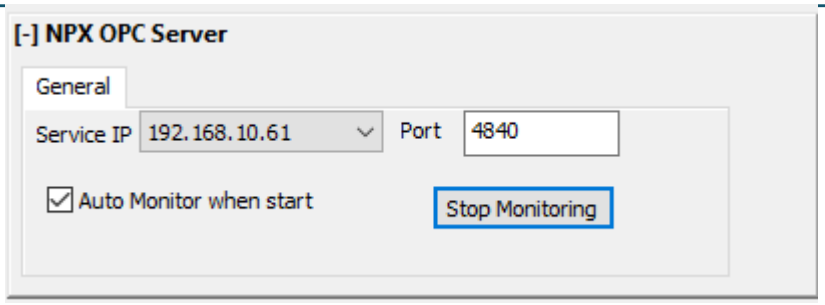
The current implementation of the module allows the NPX OPC Server module, within StreamPix, to make available the 2 following measurements on an OPC UA network layer:

Angle value measurement (from the Quick Measure Module),

Point 2 Point value measurement (from the Point2Point Module).

Also, please note that the current version of the module does not implement auto discover protocol. Client application needs to enter the server IP address and port number manually.

For the module to publish the values over OPC UA, the modules producing the measurement must be loaded ahead of the NPX OPC Server Module. Make sure that in the list of loaded modules, NPX OPC Server is the very last one loaded. Only a single instance of the module needs to be loaded.



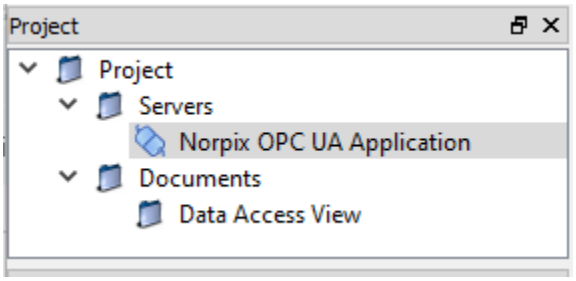
Service IP: The IP address that the module will be listening from. This must be one of the computer network IP addresses.

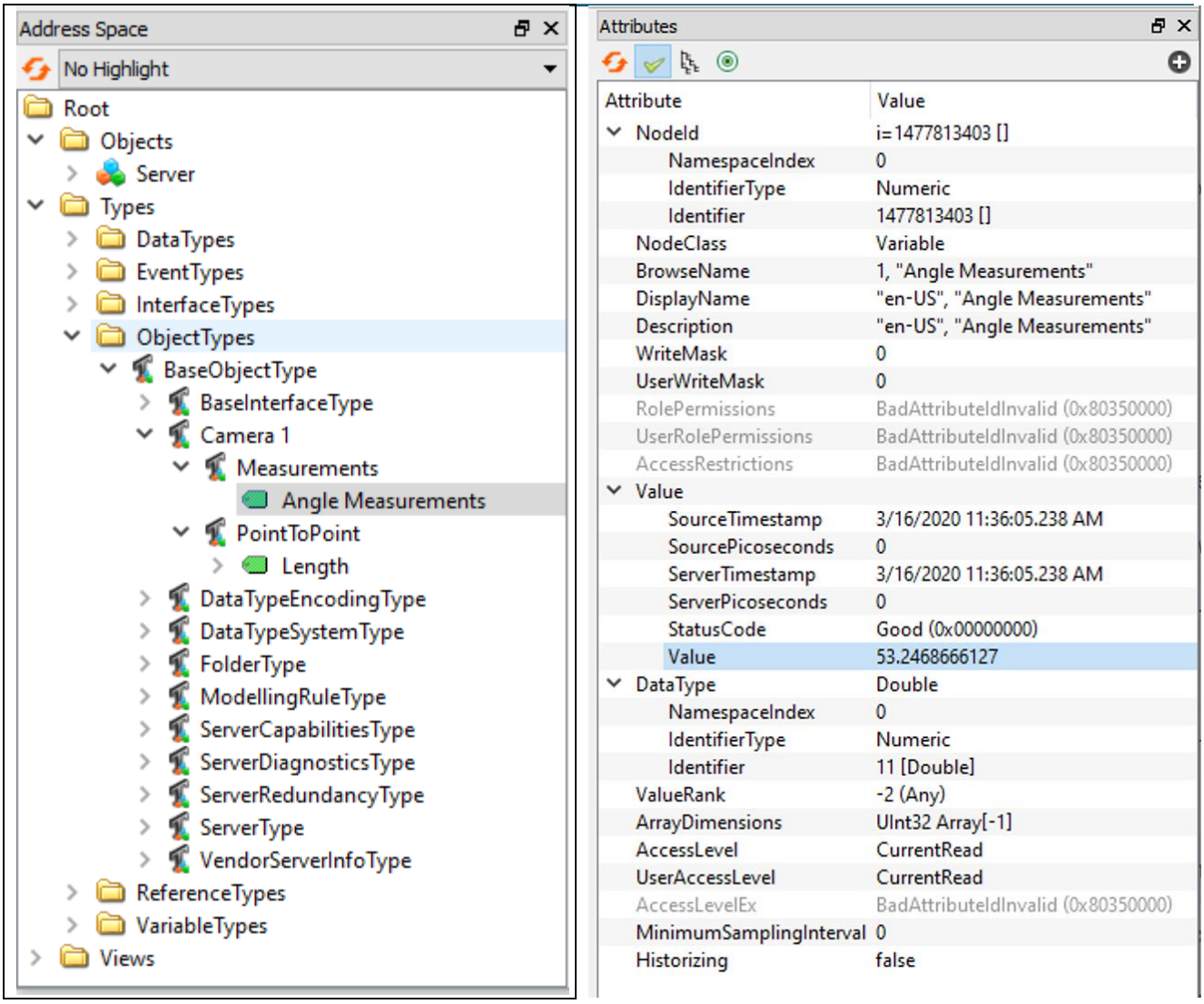
Port: The port number the module will be listening from.

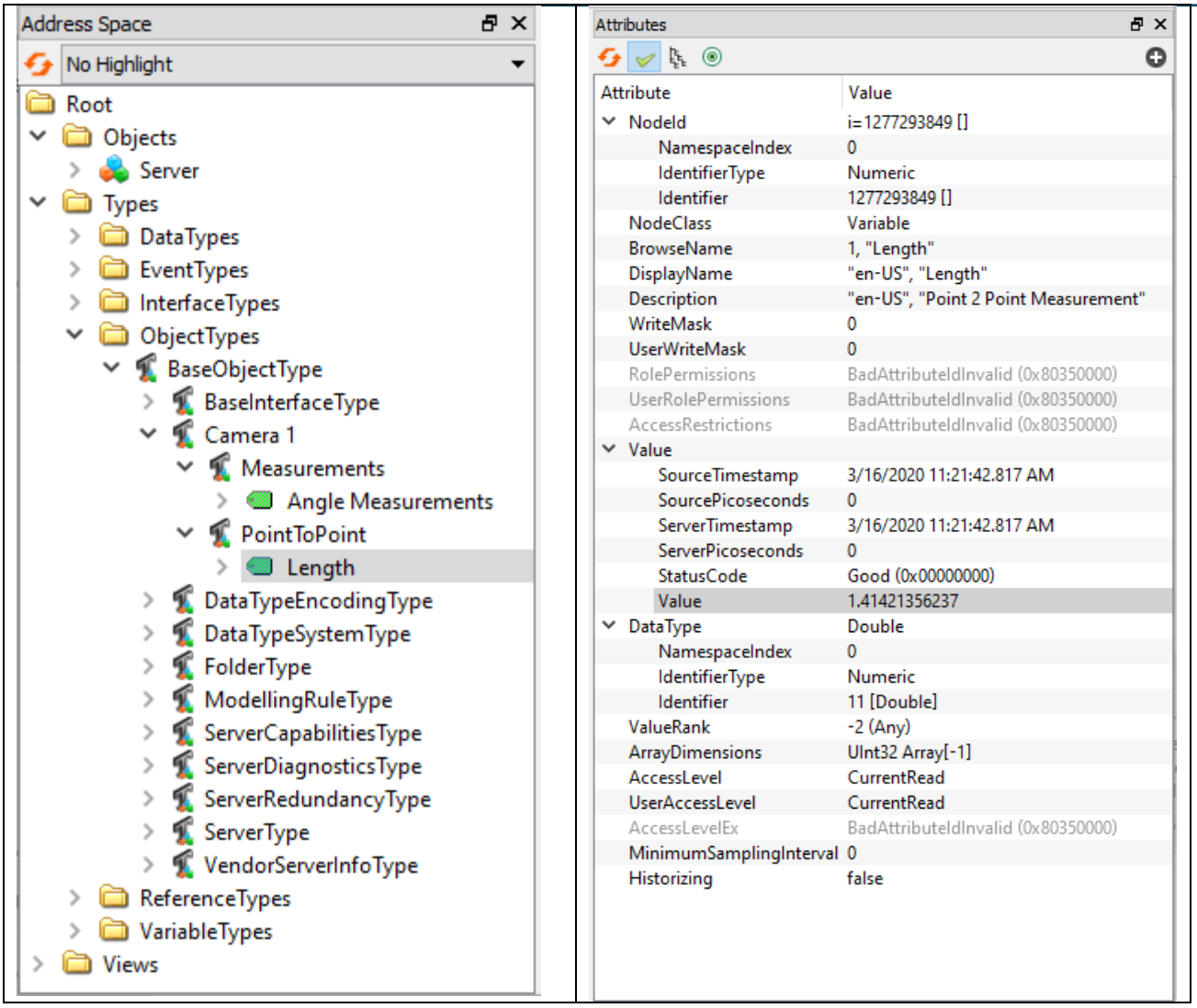
Start/Stop monitoring: Turn on/off module monitoring and updating operation.

Auto Monitor when start: When checked, upon loading and StreamPix starting, the module will automatically begin updating information.

Below is an example of the available measurement from an OPC Client Viewer application UaExpert that can be downloaded from (https://www.unified-automation.com/):

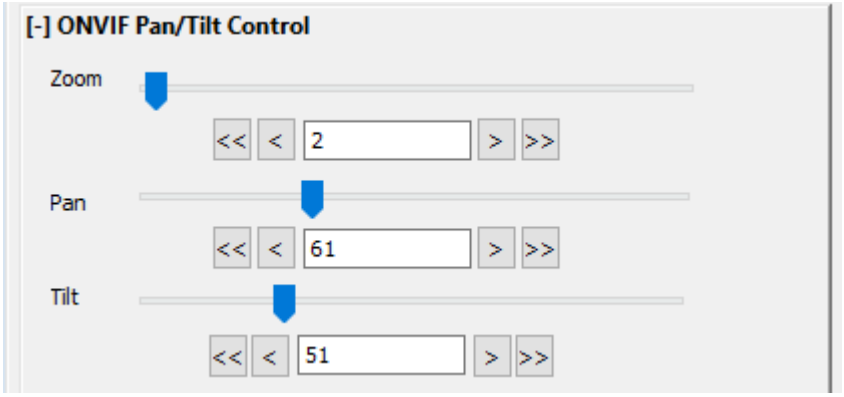



Address Space
No Highlight
Root
Objects
Server
Types
DataTypes
EventTypes
InterfaceTypes
ObjectTypes
BaseObjectType
BaseInterfaceType
Camera 1
Measurements
Angle Measurements
PointToPoint
Length
DataTypeEncodingType
DataTypeSystemType
FolderType
ModellingRuleType
ServerCapabilitiesType
ServerDiagnosticsType
ServerRedundancyType
ServerType
VendorServerInfoType
ReferenceTypes
VariableTypes
Views
Attributes
Attribute
Value
NodeId
i=1477813403 []
NamespaceIndex
0
IdentifierType
Numeric
Identifier
1477813403 []
NodeClass
Variable
BrowseName
1, "Angle Measurements"
DisplayName
"en-US", "Angle Measurements"
Description
"en-US", "Angle Measurements"
WriteMask
0
UserWriteMask
0
RolePermissions
BadAttributeIdInvalid (0x80350000)
UserRolePermissions
BadAttributeIdInvalid (0x80350000)
AccessRestrictions
BadAttributeIdInvalid (0x80350000)
Value
SourceTimestamp
3/16/2020 11:36:05.238 AM
SourcePicoseconds
0
ServerTimestamp
3/16/2020 11:36:05.238 AM
ServerPicoseconds
0
StatusCode
Good (0x00000000)
Value
53.2468666127
DataType
Double
NamespaceIndex
0
IdentifierType
Numeric
Identifier
11 [Double]
ValueRank
-2 (Any)
ArrayDimensions
UInt32 Array[-1]
AccessLevel
CurrentRead
UserAccessLevel
CurrentRead
AccessLevelEx
BadAttributeIdInvalid (0x80350000)
MinimumSamplingInterval
0
Historizing
false



ONVIF Pan/Tilt Control

The ONVIF PAN/Tilt/Zoom control module provides a way to remotely control a camera PTZ unit. The camera must support ONVIF and the PTZ unit connected to the camera (or built in).



This module requires that an ***ONVIF Compatible IP Camera*** is loaded as the video source (See Grabber Selection).

Second View

The Second View module is similar to the Video Out module, but displays a single Workspace and automatically switches the display to the Workspace that has the current mouse focus. You can zoom, pan and scroll using mouse gestures. See “Video Out”.

SimulPix

The SimulPix module provides the ability to combine the output of two cameras into a single image. The resulting image looks like the 2 images are superimposed. Currently, two algorithms can be applied for combining the 2 images:

- Merge 2 images together from the 2 separate sources (Alpha blending)
- Image division: any source can be divided by the other source.

The module provides registration functionality: the 2 images can be horizontally and vertically offset or rotated. In Alpha blending mode, each source image can be displayed with a separate color. The module performs the calculation in real time (less than 10 ms with an Intel Core 2 duo processor T7200), providing real-time visual feedback in single or multiple display mode.

The SimulPix module works with cameras that acquire synchronously or not. SimulPix will wait until it receives an image from each camera before performing the rendering. If the 2 cameras are not capturing at the same time (synchronized or Genlock), this may result in a short delay.

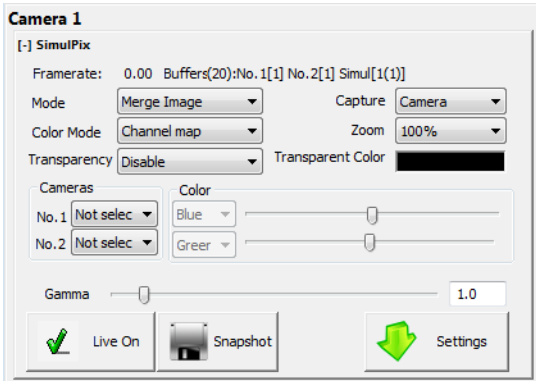


Figure 1-77: SimulPIx module

Each camera can have a different image size and ROI, but must have the same bit depth. Image format should be monochrome, 8, 10, or 12 bit.

All parameters except source cameras can be changed during runtime and are saved automatically. If you want to change the source cameras, you should stop the merging process.

The SimuPix Module can operate either on a live feed from 2 cameras, or it can also operate on a set of Sequence files. Use the **Capture From** parameter to select the operating mode. To record the resulting image into a Sequence, make sure to select all Workspaces (CTRL+A), and from the file menu, select “In Every WorkSpace, New Sequence...”

Configuring the SimulPix Module.

17. Select the Operating **Mode** (Merge or Division).
18. Select the **Capture** source, either Camera or Sequence.
19. Select the **Color Mode** you want to be applied. Depending on the Color Mode selected, different coloring schemes are available:
    - **Channel Map:** Each camera image is represented with gray levels from back to white. Individual image intensities can be adjusted using the sliders. The **Transparent** option lets you assign which image will appear as a transparent layer. The **Transparent Color** option lets you assign a color to the transparency.
    - **Primary Color:** Only the basic primary color of the color wheel are available: red, green, blue, and combination of those like magenta, cyan and yellow.
    - **Any Color:** Any color can be used, (more CPU demanding). Select the color bar to the right of the camera to choose from a color picker. Use the sliders to adjust the intensities.
20. Optionally, select the **Transparency** source, either **Disable**, **No. 1** (for camera 1), or **No. 2** (for camera 2) and the transparent color to be used.

NOTE: **Transparency** can be applied on color or monochrome images. For color the transparency color is the corresponding RGB triplet, on monochrome, only the red channel of the color RGB triplet is used.
Transparency can only be applied when operating the module in Merge Mode with Channel Map color mode.
For example, when No.1 is selected, all pixels of the image issues from the source No.1 that have the specific transparency color intensity will be processed as transparent.

21. Select the two Workspace sources within the Cameras area.

Once the parameters are selected, you can turn on the processing by selecting the **Live on** or **Snapshot** button.

NOTE: On a slower computer, since the calculation requires significant CPU, the overall computer response time may become slower. If this is the case, possible work arounds are:
-Reduce image ROI of the process
-Reduce camera frame rate
-Turn off merge mode when not needed
-Disable rotation mode if not needed (see below).

Fine tuning SimulPix registration parameters

Select the **Settings** (green arrow) button to access the **Registration** and **Resize** parameters.

Registration parameters

- **Mirror** allows second source to be either vertically or horizontally mirrored.
- **Rotation** allows for optical geometric correction. The center of the rotation point can be overlaid into the merge image to allow better tune up. Center point color can be selected by double clicking the color pad.
- **Alignment:** second source image can be horizontally or vertically offset.

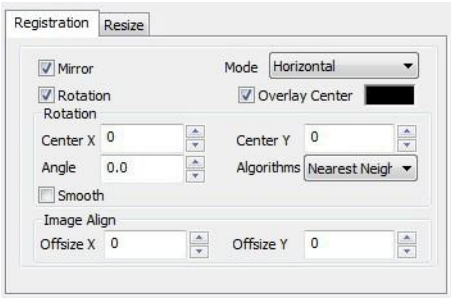


Figure 1-78: SimulPix registration parameters

Resize parameters

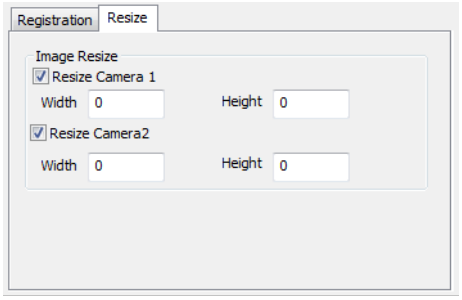


Figure 1-79: SimulPix resize settings

You can resize either camera image. To resize an image, select the **Resize Camera** checkbox and enter the new size in pixels.

Using SimulPix module in image division mode

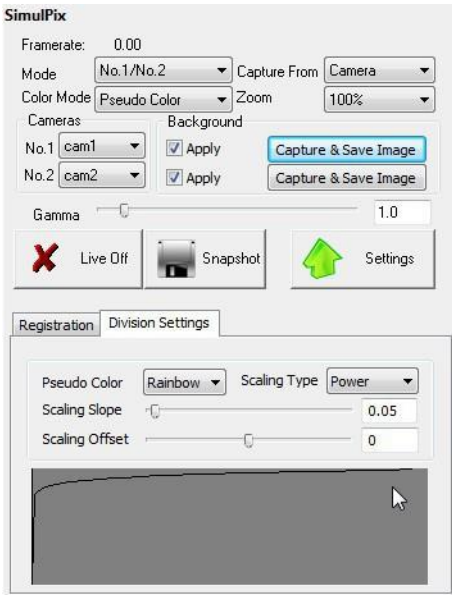


Figure 1-80: SimulPix Division Settings

When running with image division mode, the following calculations is performed:

SimulPix = (Image camera1 - background) / [registration correction (Image camera2 - background)]

Background images can be acquired any time, by enabling and clicking the corresponding button. Background images are saved to disk and are always used when Apply is checked.

SimulPix includes an extra setting tab that allows the selection of various pseudo-coloring display to allow better representing the calculation result.

Result image can be pseudo colored with 2 different pseudo coloring LUT (rainbow or invert rainbow) and two scaling scheme can be applied.

Frame dropping issues:

By default, the SimulPix module is assuming both cameras deliver images at a constant rate and identical frame rate. It will monitor the incoming image rate to make sure none of the cameras are dropping frames. Frame dropping from one camera would result in miss-synchronization of the 2-captured series of images, and incorrect image superimposition.

When an expected incoming frame timed out, the module will suspect a dropped frame and will make its best to drop an equivalent frame from the other camera. Monitoring is performed based on the time stamp given to each incoming frame at the image capture level.

When dropped frames are detected, SimulPix will log a message in the general log dialog. Dropped frames imply the removing of a corresponding frame from the other camera on

the SimulPix stream Sequence file. The 2 sequence files from both cameras are unchanged. Hence, the number of images in each sequence may not be identical.

Example:

- Recording of a 100 frames sequence:
- Camera 1 dropped frame #25 and 76
- Camera 2 dropped frame #50

Sequence file from camera 1 will include 98 frames. Time stamp difference between frame 24 and 25, as well as 75 and 76 will show twice the expected duration, Sequence file from camera 2 will include 99 frames. Time stamp difference between frame 49 and 50, will show twice the expected duration, Sequence file from SimulPix will include 97 frames. Time stamp difference between frame 24, 25, as well as 48, 49 and 73, 74 will show twice the expected duration.

When the 2 cameras do not run at the same frame rate, the monitoring function will prevent the module from operating. A registry key can be set to disable the frame drop monitoring process (default if no key exists: frame drop monitoring is on):

Key Path: HKEY_CURRENT_USER\Software\Norpix\Streampix\Admin

Key Name: SyncChecking

Key Type: DWORD

Key Value: 1 enable, 0 disable monitoring

The **Export** button lets you export selected alarm data to a CSV (Comma Separated Values) text file, from where it can be imported into a spreadsheet program, such as Microsoft Excel®.

Video Scopes

When digitizing film stock, color rendering can shift over time, resulting in less realistic output requiring further color correction downstream. The Video Scopes module can dramatically improve workflow by providing real-time feedback on the color space during the conversion process, reducing the need for further color correction later.

The Video Scopes module includes a **Waveform Monitor**, **Vector scope**, **Histogram** and **YUV/RGB parade.**

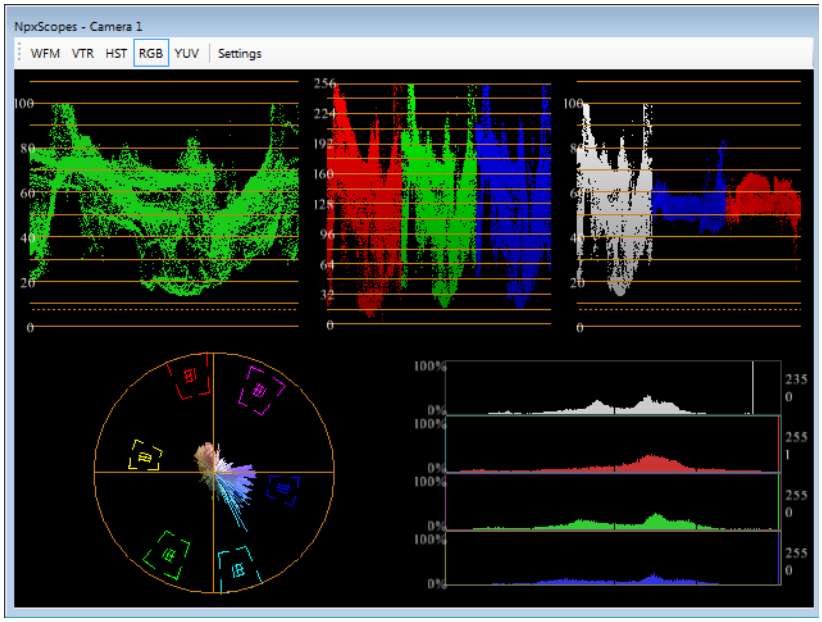


Figure 1-81: Video Scopes module

The **Waveform Monitor** is an industry-standard video calibration instrument that measures video luminance and chroma components. For SD and HD video displays, the RGB values are converted to YCrCb for display.

The **Vector scope** shows Hue and Saturation levels. It is a great tool for indicating white balance, as shifts in hue are readily visible when offset from the white (255) and black (0) center of the scope. Layout rings help the visualization, with mini-targets are at 2.5 IRE and at 2.5 degrees, and outer targets are at 20 IRE and 10 degrees. Chrominance may be isolated by converting the RGB color space to YCrCb, and using the CrCb component to calculate the necessary vector (angle and magnitude) from the color data. Rendered data can be displayed as Percent, IRE or RGB values.

The **Histogram** displays pixel depth from 0 to 255 is on the X axis, with the number of occurrences per pixel on the Y axis.

RGB parade shows individual RGB color values and intensities. There are two settings: RGB (Tri-mode) or luminance and RGB (Quad-Mode). The **YUV parade** shows the luminance and chrominance values. Data display for both is in Percent, IRE or RGB.

The color space conversion for each instrument follows industry video standards of BT.610 for SD and BT.709 for HD. Originating color space is pure 24-bit RGB with full gamut and converted to limited gamut YUV or YCrCb depending on the instrument setting, with appropriate 8-bit scaling and IRE level limits. Settings can be saved and re-used.

Video Scope Settings

The **Settings** tab lets you set the display parameters for each Scope. Changes made to the parameters exist for the current session only. Tool buttons let you save any changes to a Scope as the default, or restore the factory defaults.

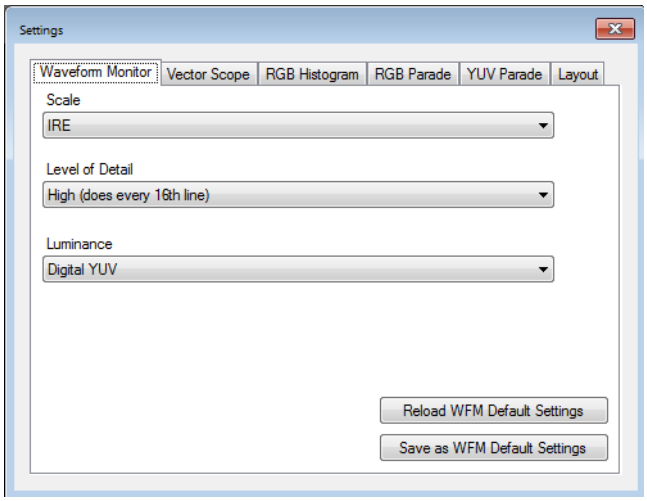


Figure 1-82: Video Scopes Settings tab

The **Settings > Layout** tab let you decide which Scopes and to display and how..

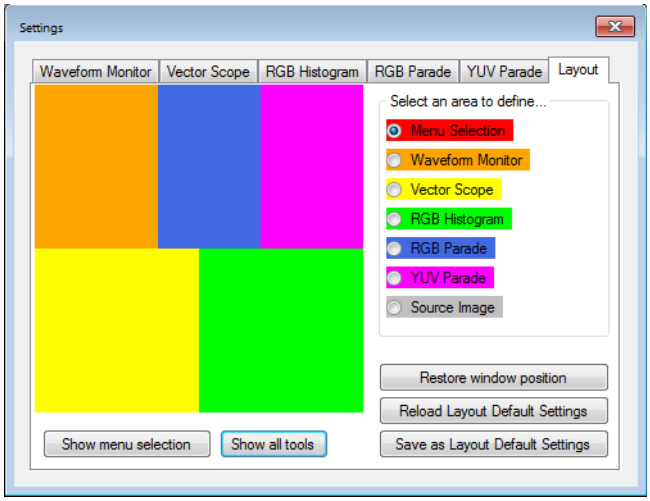


Figure 1-83: Video Scopes Settings > Layout tab

RTSP Streamer

The RTPS Streamer module can stream in real time video and audio captured with any StreamPix supported grabber/camera to a LAN or WAN (Internet). A wired or WIFI connection can be used. Video stream is real time H.264 compressed and streamed to clients viewer application. Latency is minimized.

This module behaves the same way as the Web Streamer module but include a few specific features to improve performance when used with multiple workspaces simultaneously.

Specific features:

- No support for HLS or HTTP Live Streaming
- Usage of a specific and different port number for each workspace/instance.
- Individual streaming threading implementation for each workspace compared to the Web Streamer Module that uses a common streaming thread for all workspaces. Therefore, this module is recommended for usage with setups using a large number of workspaces that requires simultaneous streaming output.

Refer to the ***Web Streamer*** module documentation for general information.

Web Streamer

The Web Streamer module can stream in real time video and audio captured with any StreamPix supported grabber/camera to a LAN or WAN (Internet). A wired or WIFI connection can be used. Video stream is real time H.264 compressed, and streamed to clients. Clients receive the video stream using one of two different protocols:

- HTTP Live Stream (HLS)
- Real Time Streaming Protocol (RTSP).

The protocol choice is automatic and depends on the client's media player. HLS is requested for all Apple based product, while RTSP is supported by a wider range of media player, such as Android devices, Window's Media Player, VLC, etc.

Mobile Devices and smart phones can receive a live video stream anywhere they have a connection.

This module must be loaded into every Workspace where video streaming is required.

The module will allow streaming video and audio from multiple workspaces. The **Start** button launches all configured Workspace streams simultaneously, or you can select **Auto Start when StreamPix Launches**. The **Copy URL** button copies the URL to the clipboard.

NOTE: Audio is possible from RTSP streams only. HLS audio is not yet supported.

The module will real time H.264 compress the video, which is demanding on the CPU. Nvidia, AMD or Intel based GPU can be used to perform real time H264 compression. Otherwise, it is recommended to use an Intel Quick Sync capable CPU. In which case, the video can be compressed using the GPU, freeing the CPU. Maximum image resolution

supported by the module for GPU compression is HD (1920x1080). Larger resolution will require the CPU for compressing each frame. The compression codec can be selected individually for each Workspace, allowing for load balancing.

In order for the module to operate, a live stream must be received from the camera.

The module can also be used to stream an already locally recorded video. Make sure StreamPix is playing back the video before any client connects to the playback stream.

The module supports an unlimited number of clients. Limitation comes from the available output bandwidth provided by the network adapter and infrastructure. Each stream bandwidth can be estimated as the stream bitrate multiplied by the number of simultaneous clients.

General tab

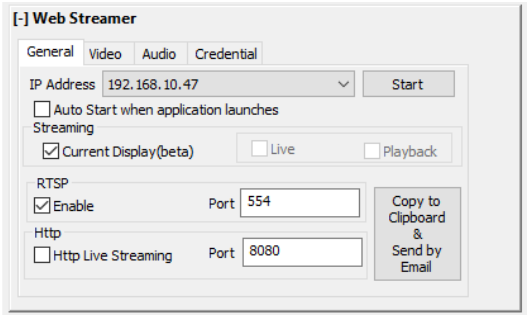


Figure 1-84: Web Streamer General tab

IP Address: This allows you to select the network interface to be used for streaming the video. The selection is made via the NIC IP address.

Start: Enable the video streaming service. Until the service is started, the module will not listen to clients' connection requests.

Auto Start when StreamPix Launches: Automatically starts **Web Streamer** when StreamPix starts.

Streaming Current Display: This is the default selection. By default, the module will stream the content of the display screen. This allows to stream either the live feed or the playback feed continuously over the same URL. Typically: http:// [computer NIC IP Address]/[Workspace Name].

Streaming Live: Select for Live streaming the camera video feed. This defines the live streaming URL address for the live stream. Read Only. The client uses this URL to stream video. Typically: http:// [computer NIC IP Address]/[Workspace Name]/streaming/live.

Streaming Playback: Select for streaming in Playback mode. This defines the streaming URL address for the playback stream. Read Only. The client uses this URL to access the video under playback. Typically: http://[computer NIC IP Address]/[Workspace Name]/ streaming/playback.

RTSP: By default, the module streams using RTSP. Apple HLS protocol is optional. Enable RTSP Server to also include RTSP streaming, should you use an RTSP compatible media player client.

Port: RTSP default streaming port number is 554.

Http Live Streaming: The streaming port number used for streaming the video.

Http port: Default port is the Web port interface, 8080.

Copy URL to clipboard and Send by Email: Copies the URL to the clipboard. This is the URL for the broadcaststream. It multiple stream have been selected, all URL addresses will be copied, you can paste it to any compatible media player. For example, in a VLC Player, select **Media > Open Network Stream** and paste the URL.

To verify that the Web Streamer module is operating correctly:

1. Select Copy URL for the RTSP stream.
2. Create a new workspace, naming it for example “WebStreamerCheck”.
3. When prompted for grabber selection, select **Web Ip Compatible Cameras**.
4. Select **Hardware properties | Ip Camera Settings.**
5. Select **ADD URL** and paste the copied URL.
   A live stream should appear in the selected display area for the Workspace.

Video tab

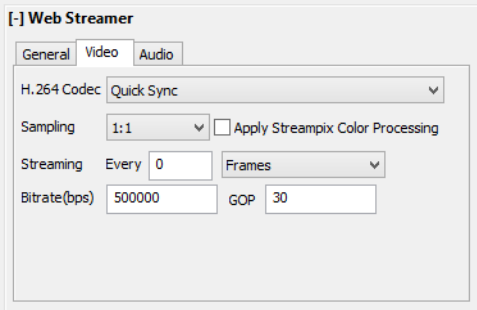


Figure 1-85: Web Streamer Video tab

Compression: The compression codec can be selected individually for each Workspace. This allows you to select whether the CPU or GPU will perform the compression. Software uses the CPU, while selecting QuickSync will use the Intel GPU. For CPU/GPU load optimization, it is possible to select for each Workspace either using the GPU or the CPU.

- **Software**: This will use the CPU for compressing the video.
- **Quick Sync**: If listed, the CPU is Quick Sync capable, and compression can be accelerated via the Intel GPU.
- **nVidia [#]**: If listed, an nVidia GPU is available for accelerated compression. Each GPU can compress up to 2 streams. Multiple GPUs are supported.
- **AMD [#]:** If listed, an AMD GPU is available for accelerated compression. There is no limit on the number of streams that can be processed simultaneously. Performance will degrade when there are too many frames to be processed. Muliple GPUs are supported.

Sampling: It is possible to reduce the image resolution before this one is encoded, which reduces the CPU/GPU load and the required streaming bandwidth. Sub-sample the video 1:2 is half the resolution, 1:4 is one quarter of the resolution, while 1:1 is full resolution.

Apply StreamPix color Processing: The settings set in Bayer / Color ribbon for display will be applied. This is useful for raw Bayer images that need to be color interpolated and color balanced before being compressed.

Streaming Every: Most media players are not able to handle video rates higher than 30 frames per second. When using high frame rate cameras, the module will by default stream at 30 fps. This setting allows you to override the default behavior. Select either Frames or Milliseconds.

- **Every X frames:** A new frame is pushed every specified number of received frames. Use a value of 0 for pushing all the frames.
- **Every X milliseconds:** A new frame will be pushed to the encoder every specified number of milliseconds. Use 0 for pushing all frames.

Bitrate: This defines the output bit rate in bits per second. This defines a maximum output bitrate, assuming 30 frames per second rate and a GOP size of 30. If you force the module to push for instance 60 frames per second, the bit rate per second will be twice the set value. For an HD image (1920x1080 @ 30 fps) a typical bit rate for good quality is 4 to 5 megabits per second, or 4000000. For other resolutions and frame rates, a good rule of thumb is to start with a calculated equivalent value. For example, for VGA resolution, 640 x 480 @ 30 fps: Estimate the compression factor for HD and apply to the resolution: (1920x1080x30x8)/4000000 = 125. (640x480x30x8)/125 = 590000 bps.

GOP: This defines the size for each group of frames (GOP). H.264 compressed streams are made of a combination of key/A frame and D frame. A GOP of a size set to 30 means each group is made of 30 frames, 1 key frame and 29 D frames. A smaller GOP size increases bandwidth, but makes the quality and decoding easier.

Audio tab

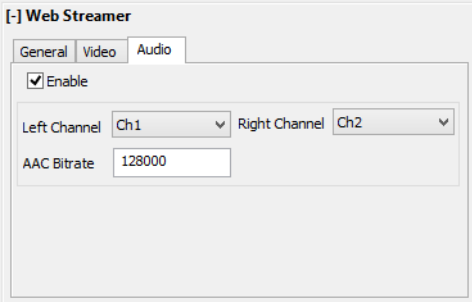


Figure 1-86: Web Streamer Audio tab

Stereo audio is streamed compressed using Advance Audio Codec (AAC) and is only available for RTSP streams (not supported for any HLS stream).

When using a multichannel audio source, left and right channel can be user selected.

Bitrate allows you to define audio quality.

Credential

Some credential can be added to the URL. Without the right user name and password, the web Streamer module will not access a new client.

The new URL must include the credential information. A typical URL where user is definded as ***root*** and password as ***pass*** will be:

rtsp://root:pass@[IP address]/[workspace name]

Possible error messages

- **Workspace name contains a space character (i.e. "Camera 1")**. Rename the Workspace to a name without any spaces (i.e.: "Camera1").

- **RTSP port in use:** Port #554 is the default streaming port for RTSP streams. Even if no program is running on your computer, some background process might still be using the current RTSP port (Citrix, NI web server, etc.). Enter a different port # within the [1024:49151] range.

Keyboard Shortcuts

This Appendix describes the default keyboard shortcuts available in StreamPix.

TIP: You can define your own custom keyboard shortcuts through the **Quick Access > Customize Quick Access Toolbar** option. See "Customize Keyboard Shortcuts".

Command	Keyboard shortcut
Toggle Bayer conversion on displayed frames	Ctrl-B
Bayer conversion Sample Factor 1:1	Ctrl-1
Bayer conversion Sample Factor 1:2	Ctrl-2
Bayer conversion Sample Factor 1:4	Ctrl-4
Bayer conversion Sample Factor 1:8	Ctrl-8
Close current workspace	Ctrl-F4
Toggle Display	Ctrl-D
Full-screen mode	F12
Go to Frame #	Ctrl-G
Select all workspaces	Ctrl-A
Next Workspace	Ctrl-Tab
Toggle Recording	Ctrl-R

Table A-1: Keyboard shortcuts

Command	Keyboard shortcut
Snap a single frame	Ctrl-Space
Reset Zoom level	(numpad *)
Zoom in	(numpad +)
Zoom in (X axis only)	Ctrl - (numpad +)
Zoom in (Y axis only)	Alt - (numpad +)
Zoom out	(numpad -)
Zoom out (X axis only)	Ctrl - (numpad -)
Zoom out (Y axis only)	Alt - (numpad -)
Trigger Pre/Post event	Ctrl-P
Show/Hide docking panel	Alt-P
Show Window Task Manager	Ctrl-Alt-T
Help	F1
Clear Markers	Ctrl – F9
Close Current Workspace	Ctrl – F4
Bring Keyboard focus the sequence slider	Ctrl – Arrow Down
Goto End Selection	Ctrl – F8
Goto Begin Selection	Ctrl – F7
Mark As Selection Start	Ctrl – F5
Mark As Selection End	Ctrl – F6
Toggle single versus multi-display	Ctrl – M
Next Workspace	Ctrl – Tab
Previous Workspace	Ctrl- Shift – Tab
Quick Save	Ctrl – S
Reset Quick Zoom	Ctrl - *(numeric keypad)
Reset Zoom	*(numeric keypad)
Snap	Ctrl – SPACE
Zoom IN	+ (numeric keypad)
Zoom IN X direction	Ctrl - + (numeric keypad)
Zoom IN Y direction	Alt - + (numeric keypad)

Zoom Out	-(numeric keypad)
Zoom Out X direction	Ctrl - -
Zoom Out Y direction	Alt - -

Table A-1: Keyboard shortcuts

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