VideoStitch Studio v2.2
User Guide

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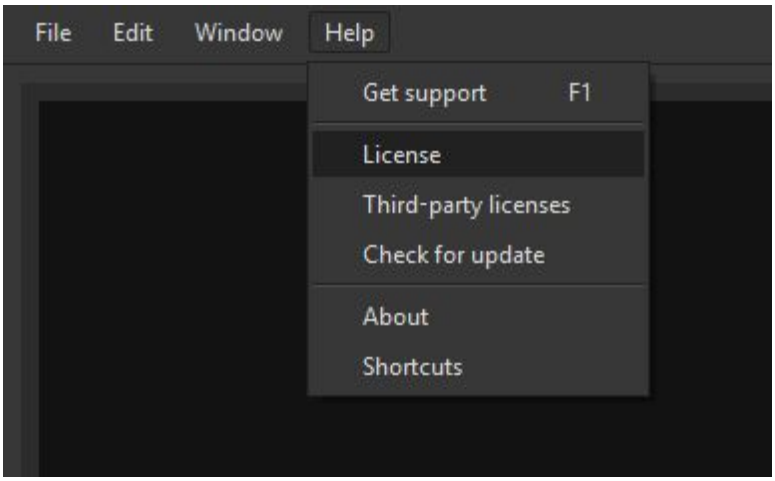
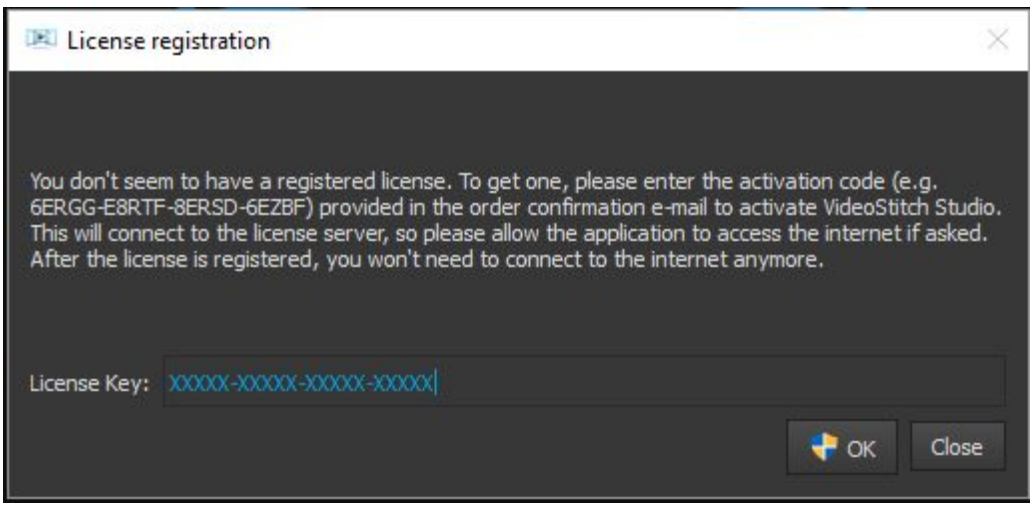
Starting with VideoStitch Studio

1. Software activation

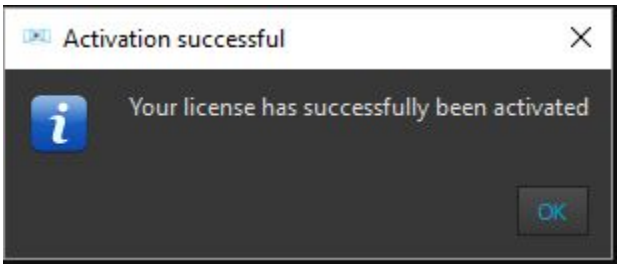
In VideoStitch Studio, click on Help > License



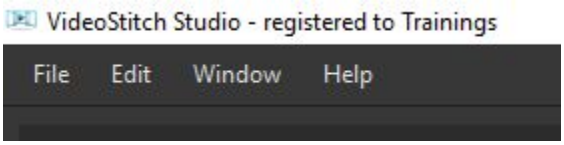
This will open a new window where you can enter your license code



Click “OK” to validate the activation



The software will appear as registered



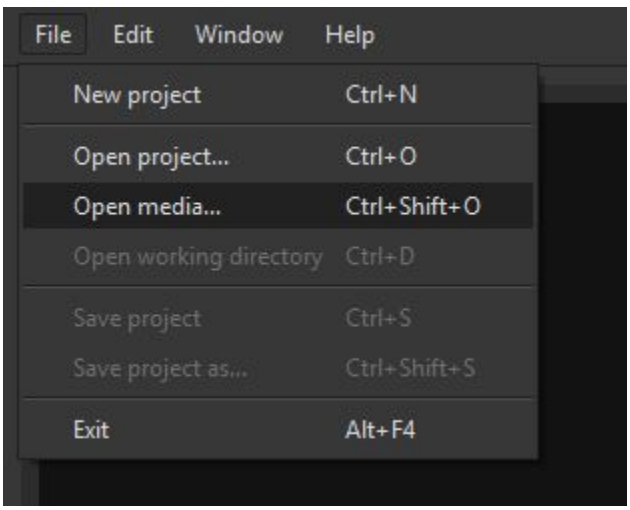
Note: You will need an internet connection to proceed with the activation

2. Starting a new project

There are two ways to start a new project:

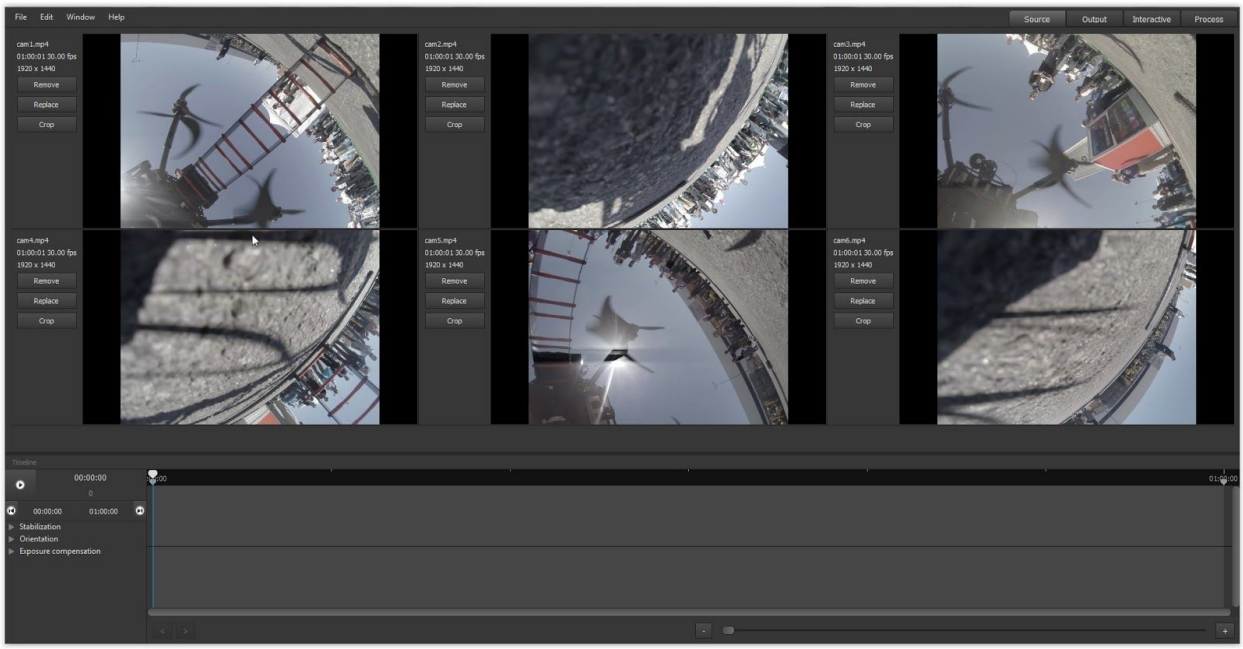
- Add media using the File menu
- Drag and drop your media from your file explorer to VideoStitch Studio user interface.

To add media through VideoStitch Studio File menu, proceed to the taskbar, click on “File” then “Open Media”



This will open a file explorer where you can select the videos you want to import.

After validating, the videos will appear in VideoStitch Studio:



VideoStitch Studio user interface

1. VideoStitch Studio panels

VideoStitch Studio user interface is composed of four panels:

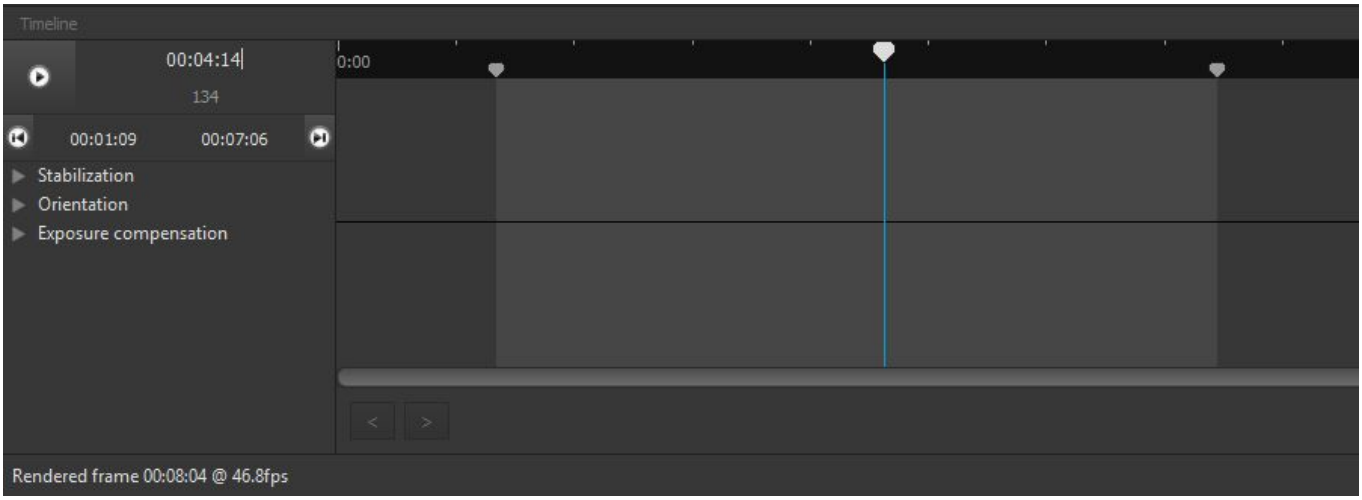
1. **Source** panel displays the input videos
2. **Output*** panel allows you to preview the stitched result
3. **Interactive*** panel allows you to preview the stitched video in an interactive viewer
4. **Process*** panel allows you to adjust your output video settings, and launch the processing

> * *Note: The Output, Interactive and Process panels will become available after a media or a project has been imported.*

The first three panels include VideoStitch Studio timeline.

2. Working with the timeline

VideoStitch Studio timeline allows you to play, pause, seek the videos and select the working area.



Seek frame

The playhead enable the user to seek a specific frame of the video. The preview of the selected frame is then displayed in the panel above.

Select working area

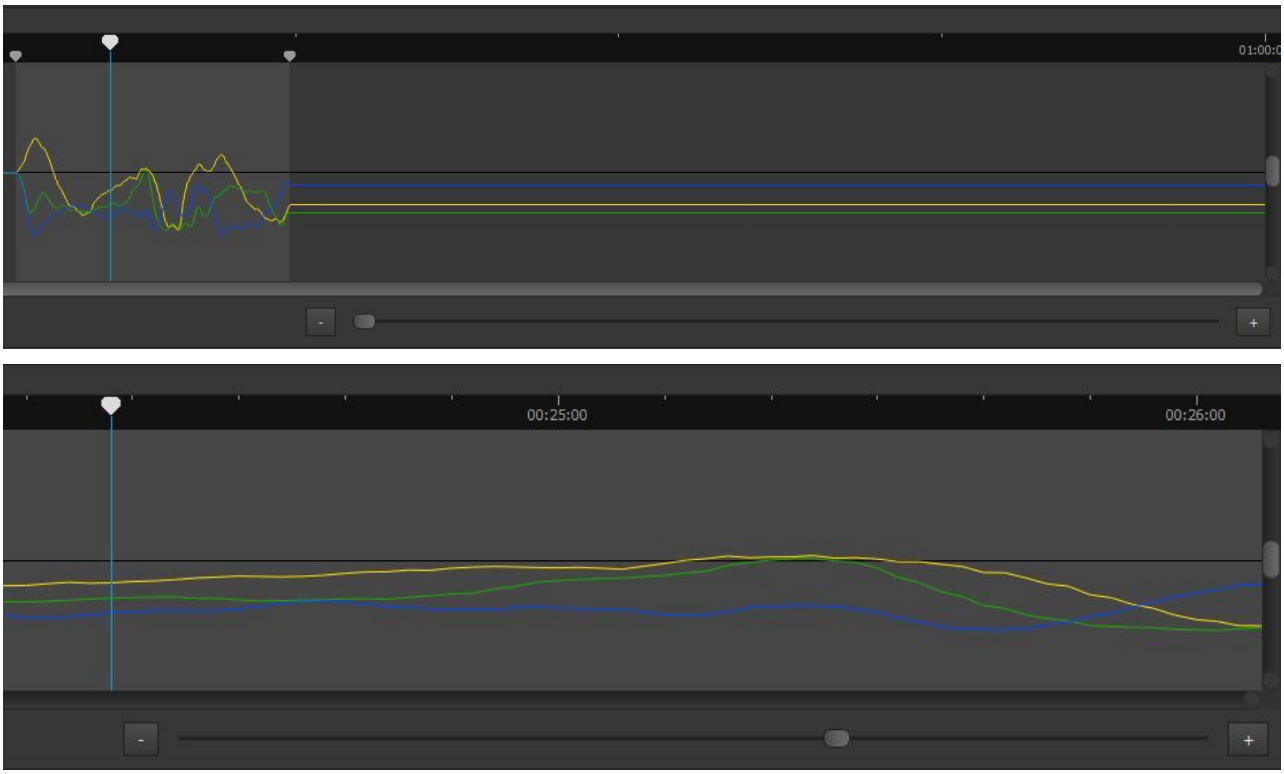
By dragging the marquees, the user can select a specific working area in the timeline. The selected working area is highlighted in light grey. Tools will use this selection as a working area when launched (synchronization, calibration, exposure...).

> *Note: You might want to use different sequences while processing your project: the sequence used for synchronizing the videos is usually not the one used for rendering.*

Zoom in and out the timeline

Some algorithms, like color correction, display their values on the timeline. To see these with more precision, or just to be able to precisely seek to a precise frame, you can zoom in and out of the timeline.

Use the slider at the bottom of the timeline to zoom in or out.

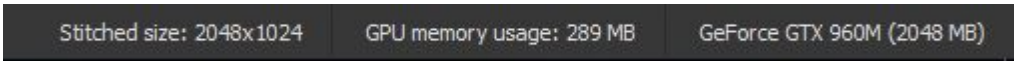


3. Project and system information

At the bottom of the software interface, you will be able to see 3 informations:

1. Current output and preview size (2048*1024 by default when creating a project)
2. GPU (Graphics Processing Unit) memory used by VideoStitch Studio

3. Your graphics card model and its GPU memory

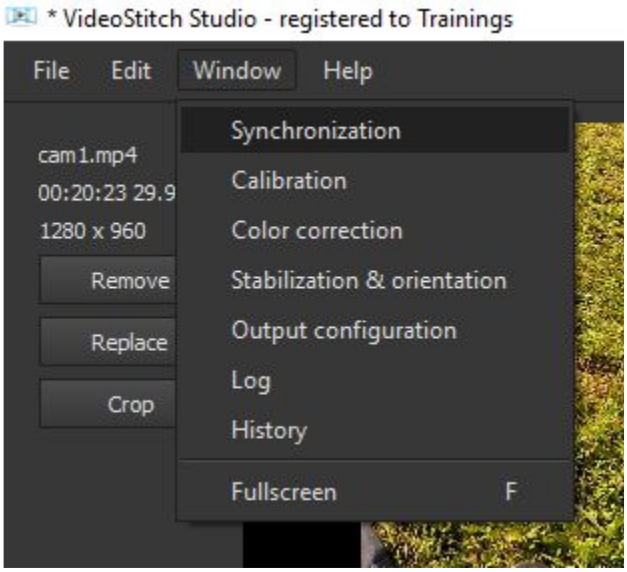


VideoStitch Studio workflow

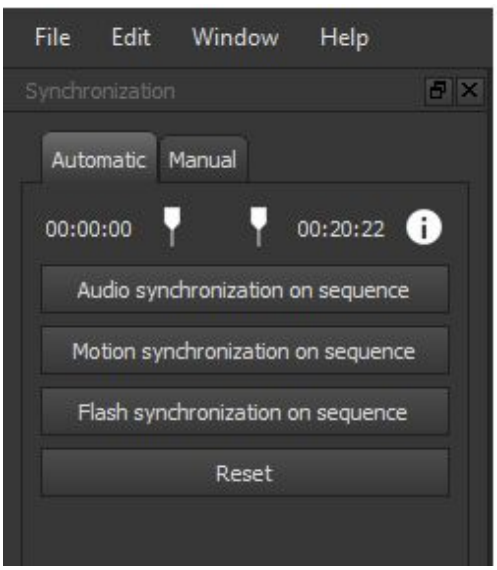
1. Source synchronization

Camera arrays are typically hard to start all together at once and need to be accurately synchronized for good stitching results. Furthermore, it is impossible to ensure that each frame set will be recorded from all cameras simultaneously. Synchronization is the first step in the stitching process.

To open the synchronization tool, proceed to the taskbar, click on “Window” and then on “Synchronization”



The synchronization tool appears on the left of the user interface.



Tips: There are a few things to keep in mind when dealing with synchronization issues :

- *Record with a **high fps** when possible*
- *Be aware that **rolling shutter** can be mistakenly identified as a synchronization error. This is especially true on footage that holds fast camera movements.*
- *Be aware of possible **audio/video synchronization issues** when using audio synchronization (a common example of this would be lips moving while the sound coming out of them seems to suffer from lag)*

1. Automatic synchronization

To ensure the best results and efficiency when using automatic synchronization algorithms, we recommend to run them on a sequence instead of the full video. Best sequence choices are described below.

There are three approaches to synchronize your video inputs.

1. Audio based synchronization

VideoStitch Studio audio-based synchronization analyses the videos' soundtracks to find out when they match and automatically adjust synchronization based on this analysis. If you must rely on audio to synchronize videos, you need to produce sound that is identifiable over the background noise, for all cameras. You can for instance clap your hands. This algorithm is not recommended if you are in a noisy environment (concert...).

When using the audio synchronization, make sure to select a working area that include a clap or loud sound.

2. Motion based synchronization

The motion algorithm looks for motion in all your input videos, and then align the start and end points of this movement. You can for instance sharply give a spin to your rig when starting to record.
Make sure to select a working area that includes your movement.

3. Flash based synchronization

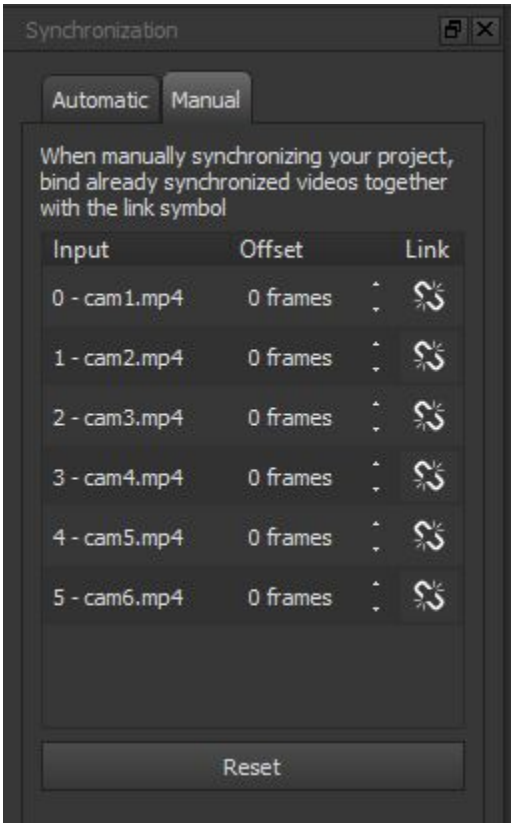
This algorithm will search for sudden change in lighting in your sources videos to synchronize them. The light from the flash needs to be visible from all your cameras' viewpoint. You can for instance:

- Add a bag on top of you rig and quickly remove it
- Light on the room you are working in
- Use synchronized professional flashes...

Make sure to select a working area that includes the flash

2. Manual synchronization

The automatic synchronization is selected by default. To use the manual synchronization, click on the "Manual" tab.



With VideoStitch Studio, you can define the synchronization offset manually and instantly review the result in the source or output panel. Next to each input a chain icon enables you to "link" videos together, so that they remain synchronized if you manually change other offsets. Audio and motion algorithm will use these values as hints.

2. Calibration

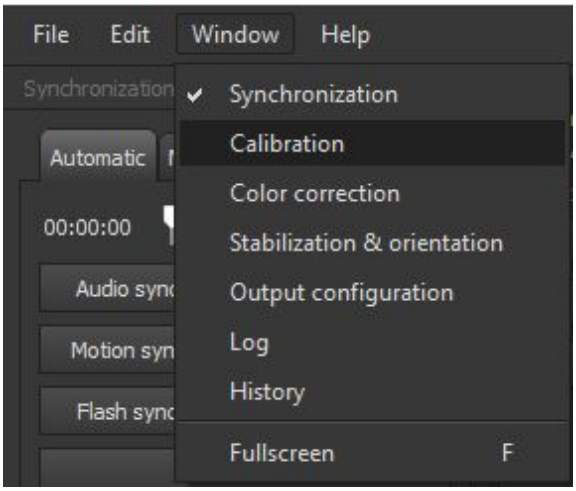
What is a calibration?

A calibration is a set of parameters that define how the input videos relate to one another so that they can be rendered in a 360 panorama.

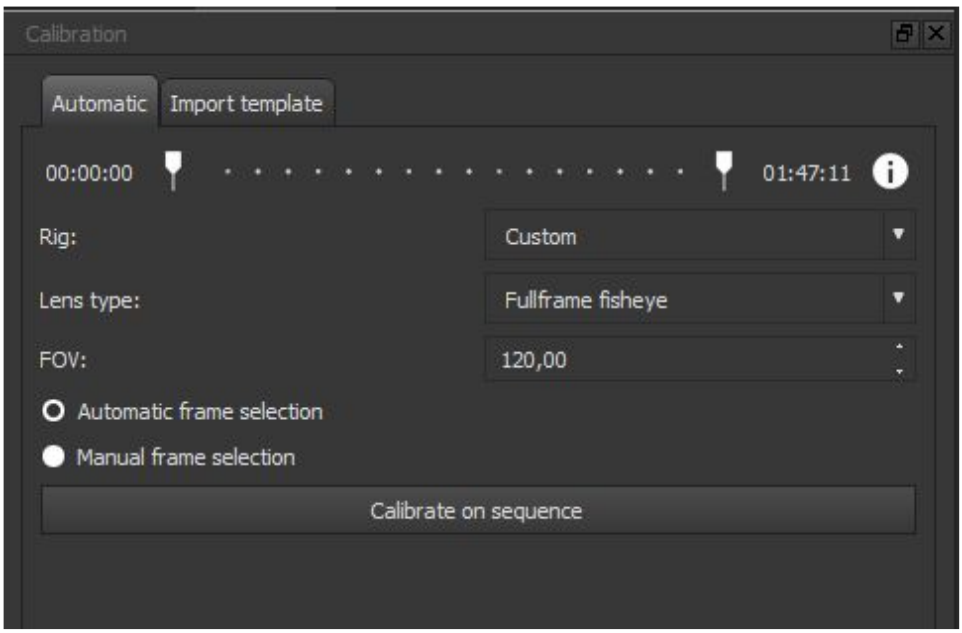
VideoStitch Studio provides you both an automatic calibration tool - that will optimize your camera geometric setup - and enable you to use your own calibration templates from PTGui or Hugin.

Note: The first step is always to synchronize your input videos. You will not get a good calibration if your videos are not synchronized.

To open the calibration tool, proceed to the taskbar, click on “Window” and then on “Calibration”



The calibration tool appears on the left side of the user interface.



1. Automatic calibration

VideoStitch Studio can automatically calibrate your footage using rig presets or custom camera parameters.

Tips:

Pre-processing recommendations

- *Do not use the camera zoom feature, or the GoPro4 Superview mode*
- *Choose the correct lens parameters when calibrating (for unmodified GoPro cameras, the FOV is 120)*
- *Shoot using 4:3 video format*
- *Check the crop to make sure it is correct*

Calibration sequence choice

To optimize calibration results we recommend to choose a sequence where the camera overlap areas respects the following rules:

- *No object close to the camera (e.g less than 2m from the cameras) to avoid introducing parallax errors*
- *Camera overlapping areas contains enough details (no camera pointing to a blank wall or the sky for example). Else the calibration algorithm will not be able to find control points*
- *The camera rig and the scene as are static as possible to avoid blur motion or rolling shutter issues that can introduce image distortion*

To set the calibration working area see the **Working with the timeline** section.

1. Rig presets calibration

Depending on your footage characteristics (resolution, number of videos), VideoStitch Studio will suggest a preset in the rig dropdown that you can use as starting point for the calibration.

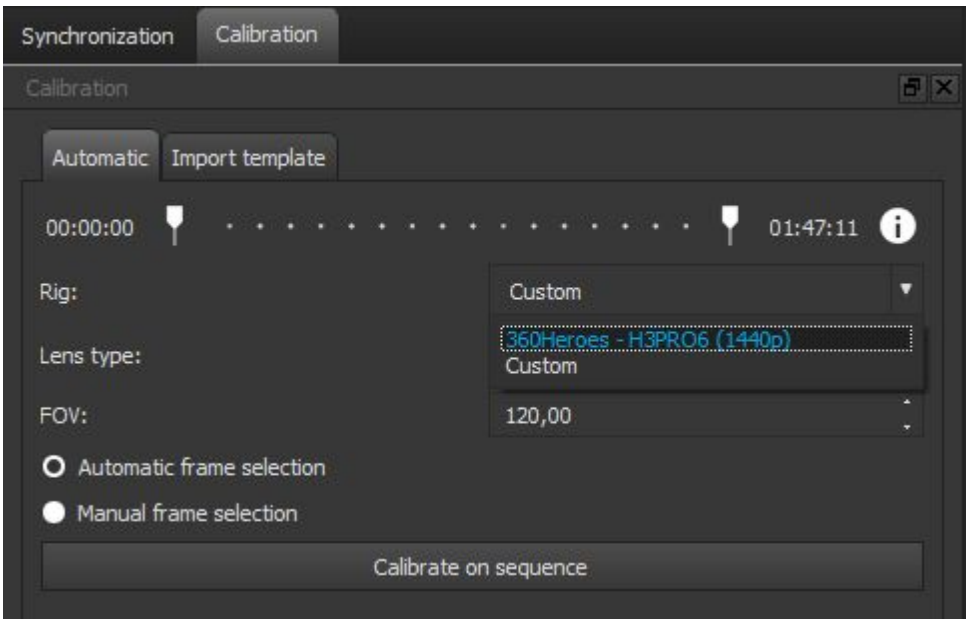
Note:

Currently supported rigs and configuration are :

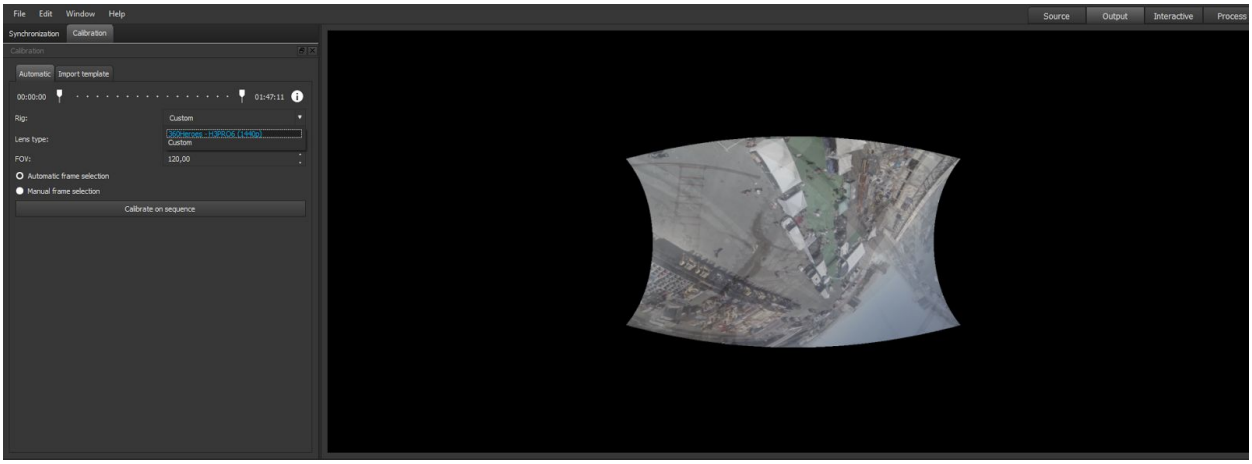
- ➔ *H3PRO6 in 1440p and 960p*
- ➔ *H3PRO7 in 1440p and 960p*
- ➔ *H3PRO10HD in 2.7K and 1440p*

Your camera will need to be ordered as specified by the rig manufacturer for the preset to be correctly applied

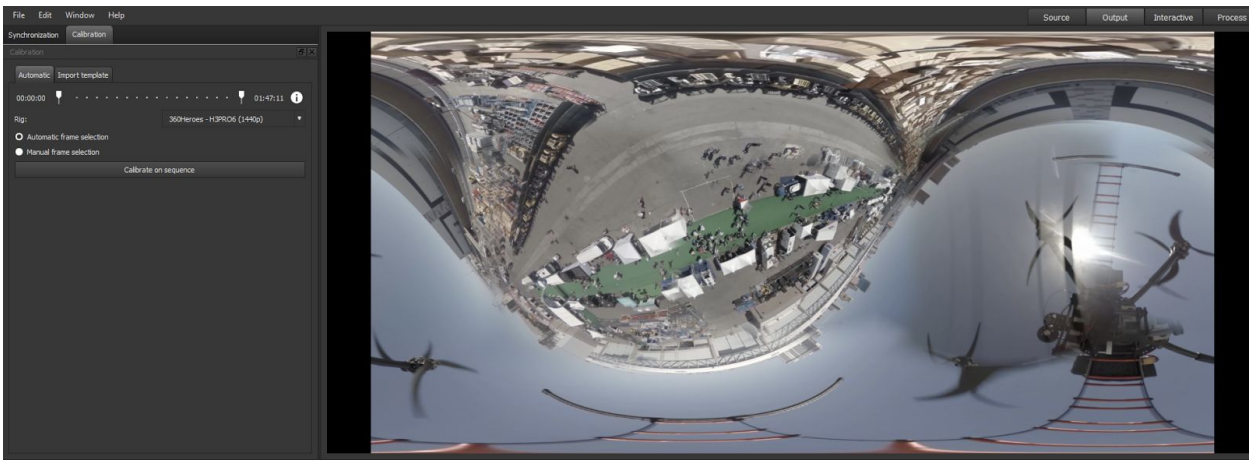
When clicking on the preset available in the rig drop down list, VideoStitch Studio will apply the preset and update the output preview.



Before applying preset

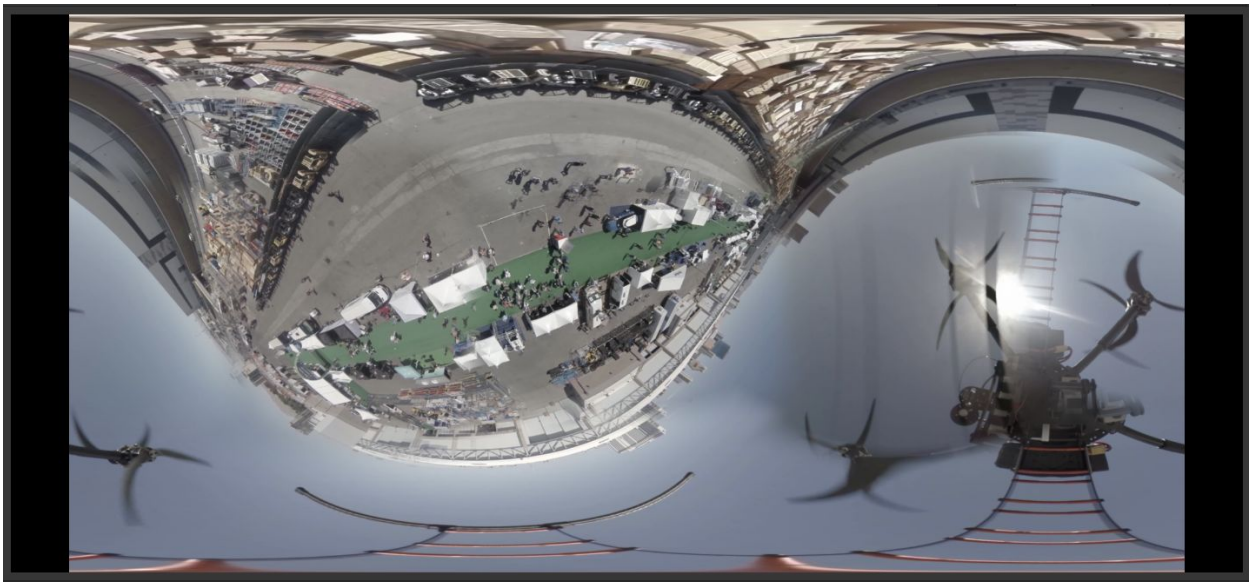


After applying preset

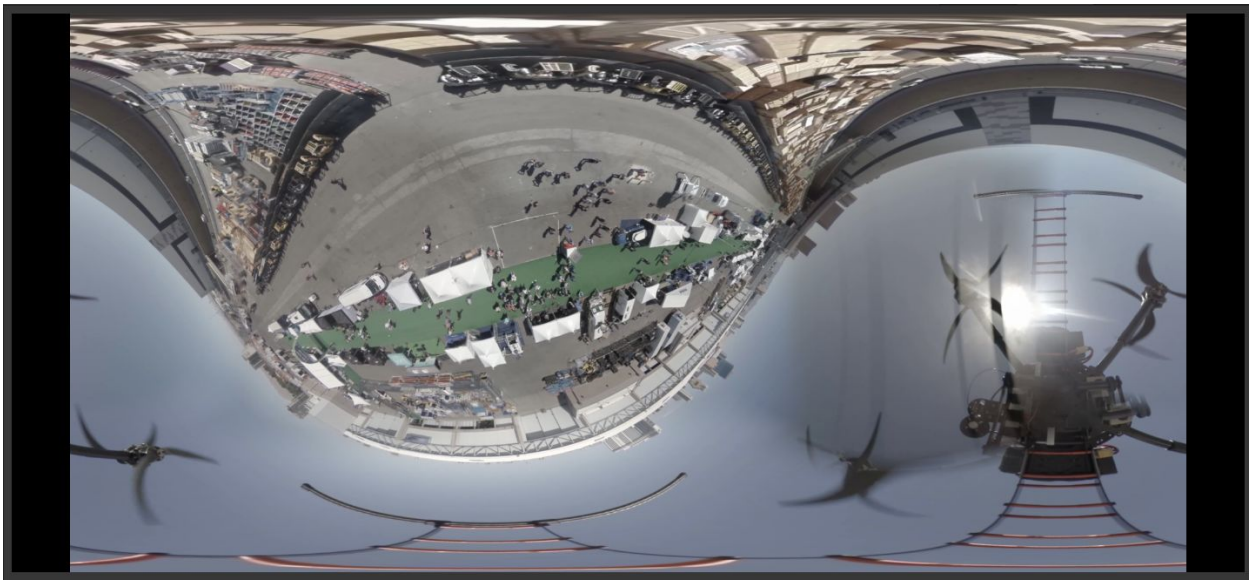


This will be taken as a starting point for the calibration algorithm. You can then launch the calibration algorithm by clicking on “Calibrate on sequence”

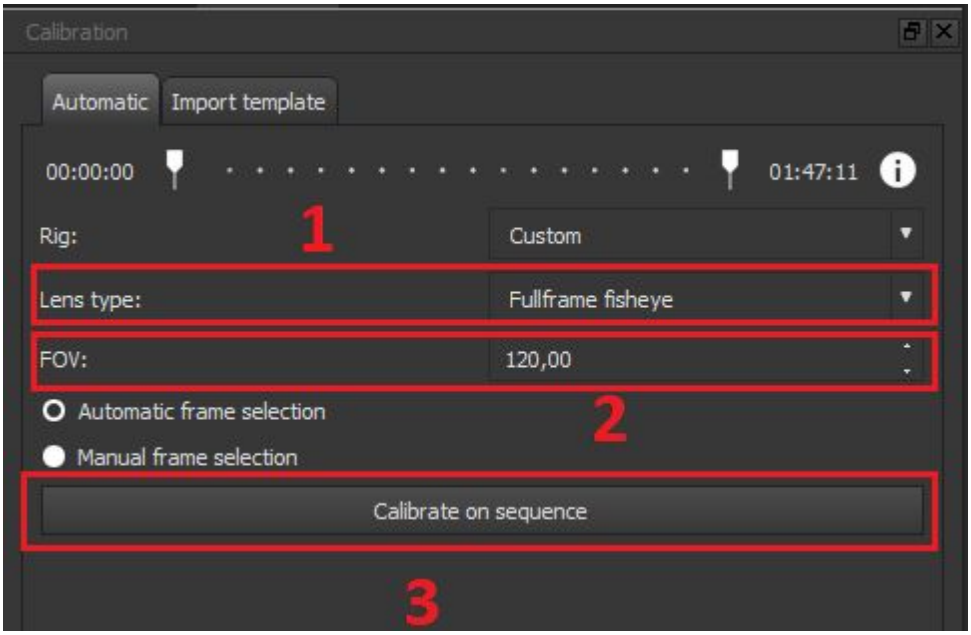
Before applying calibration



After applying calibration



2. Custom parameters calibration



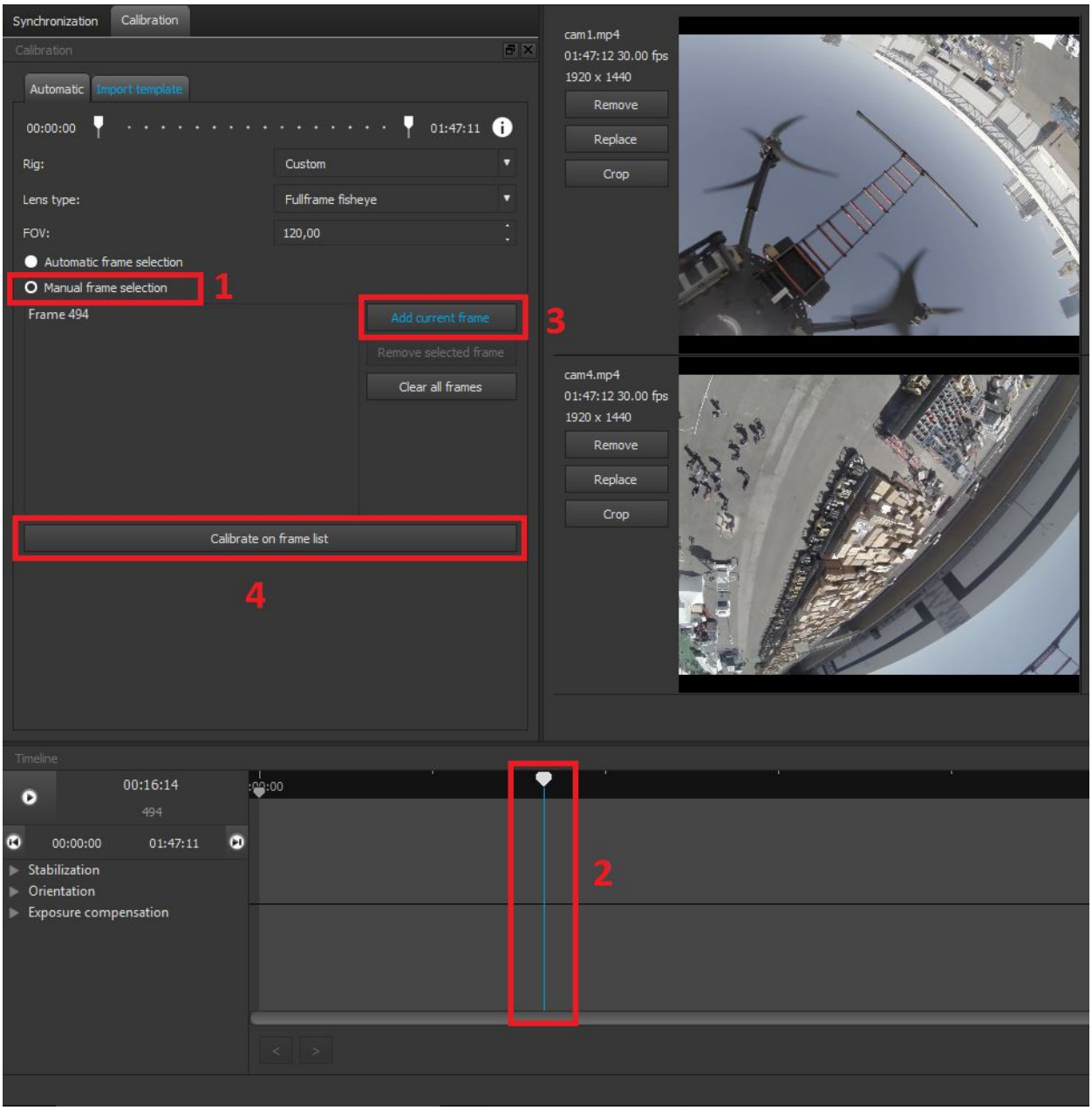
By default the rig selected is ‘“Custom”.

To create a custom calibration :

1. Select your lens type (e.g Fullframe fisheye for GoPro)
2. Input the FOV of your cameras (e.g 120 for unmodified GoPro)
3. Click on “Calibrate on sequence”

By default, VideoStitch Studio will automatically select frames from the calibration sequence you defined. If you want total control on the calibration, you can calibrate on a list of frames you select yourself.

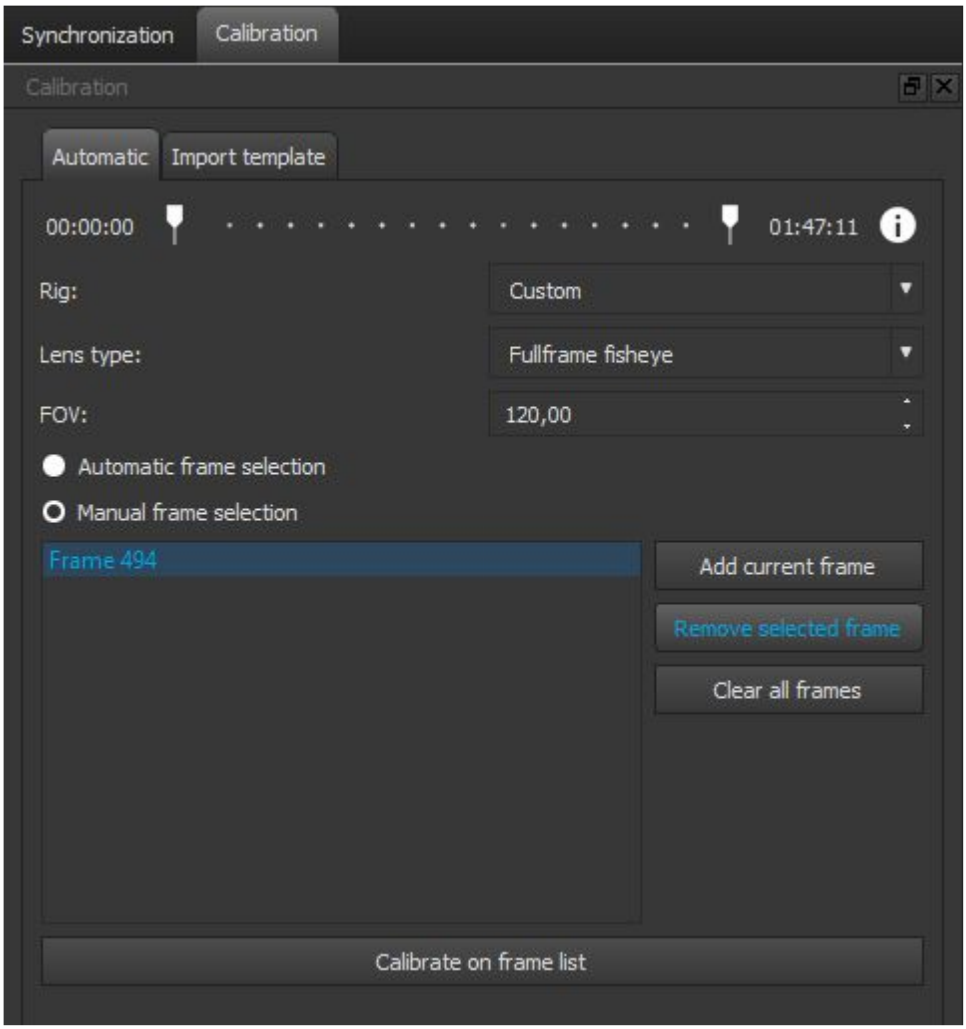
3. Manual frame selection



To calibrate on a frame list:

1. Click on “Manual frame selection” checkbox
2. Select a frame using the playhead
3. Click on “Add frame” and repeat steps 2 and 3 until satisfied of your frame list
4. Launch the calibration by clicking on “Calibrate on frame list”

Managing your calibration frames:

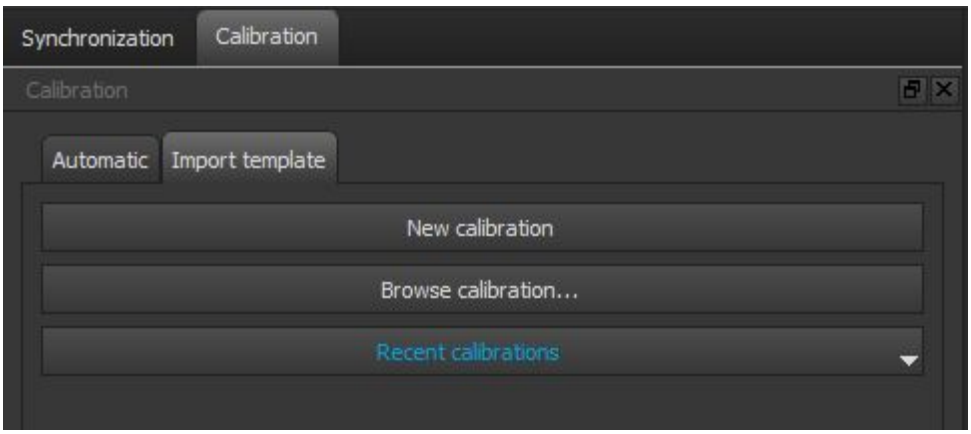


- To remove a frame from the list select the frame and click on “Remove selected frame”
- To remove all the frames from the list, click on “Clear all frames”

2. Manual calibration

You may sometimes want to improve the automatic calibration (when your scene doesn't have enough details, or has close objects for instance). VideoStitch Studio is compatible with PTGui and Hugin software solutions, that can stitch together still images.

To access the manual calibration menu, click on "Import template" in the calibration tool

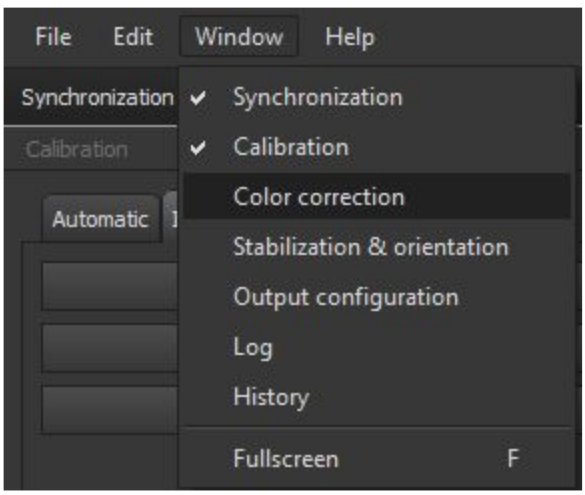


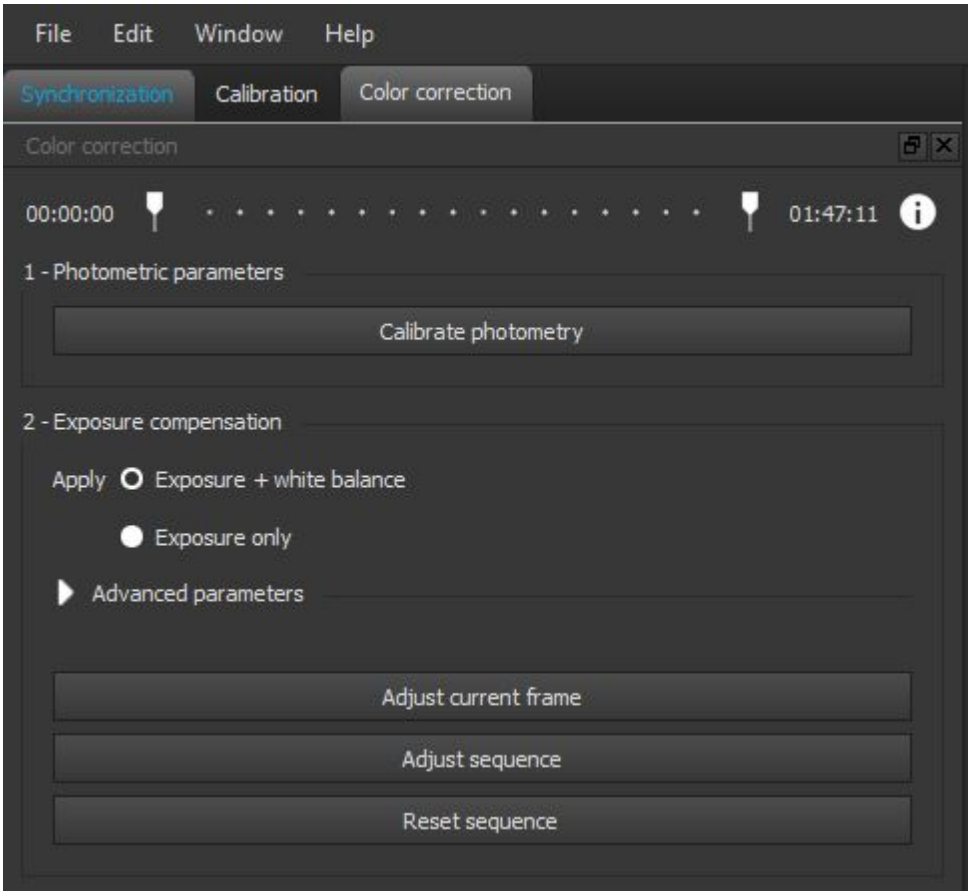
After having created your template in PTGui or Hugin, you can import and apply it by clicking on "Browse calibration...".

To reuse a calibration you previously created and imported, you can click on the "Recent calibration" dropdown list. This will list the last few files you imported. Click on the template name to import and apply it.

3. Color correction

To open the color correction tool, go in Window > Color correction





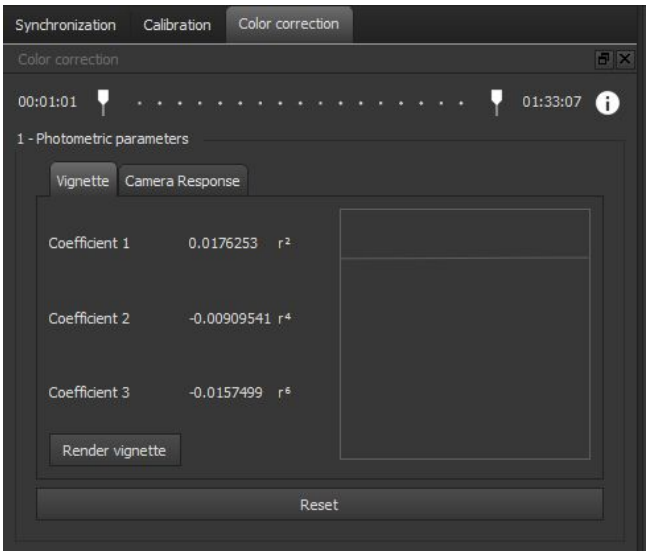
1. Photometric parameters

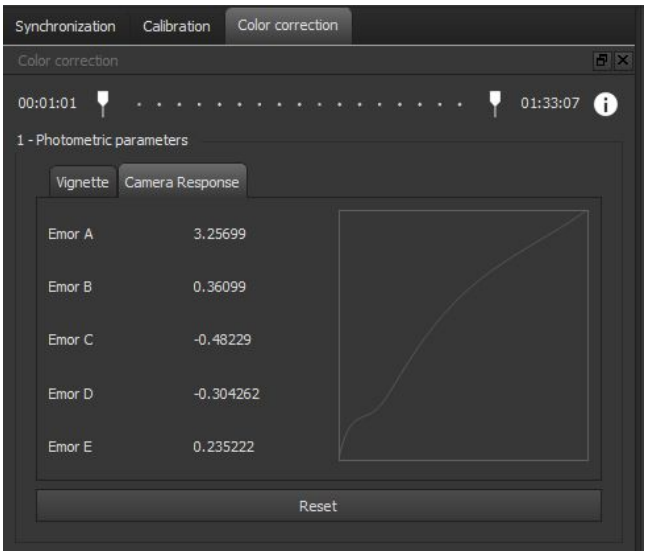
The photometry algorithm automatically computes your cameras' response curve and vignetting to improve your output quality. Vignetting is a lens distortion effect that affects all the optical lenses. This effect is more visible close to the images edges, that tends to be darker at the center.

The input cameras' response curve and vignetting can then be used to blend more smoothly the images. When applying exposure compensation later, it will also improve the color correction by minimizing color and exposure differences between the inputs.

To launch the photometric calibration, click on "Calibrate photometry"

You will then see a "Vignette" and "Camera response" tab appear where the result will be displayed





2. Exposure compensation

VideoStitch Studio automatic compensation algorithm analyzes the input videos and computes exposure adjustments. It can be applied to a sequence or on the frame currently selected.

If the calibration is done on a sequence it creates keyframes at a specified frame interval (60 frames by default). A new compensation value will be estimated for each keyframe. Between the keyframes, the parameters are automatically interpolated so that all the frames are corrected without major discontinuities.

To calibrate on a single frame

1. Select the frame you want to adjust
2. Click on “Adjust current frame”

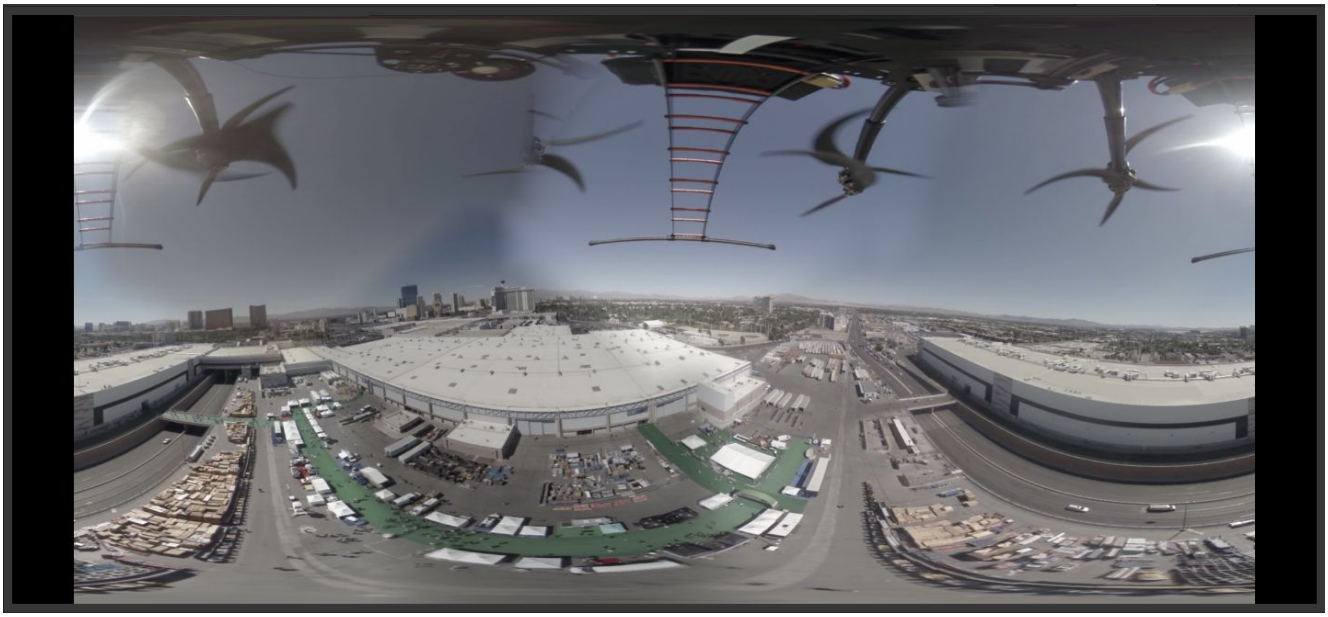
To calibrate on a sequence

1. Set the working area
2. Click on “Adjust sequence”

Clicking on “Reset sequence” will erase the exposure compensation.

Example

Before exposure compensation

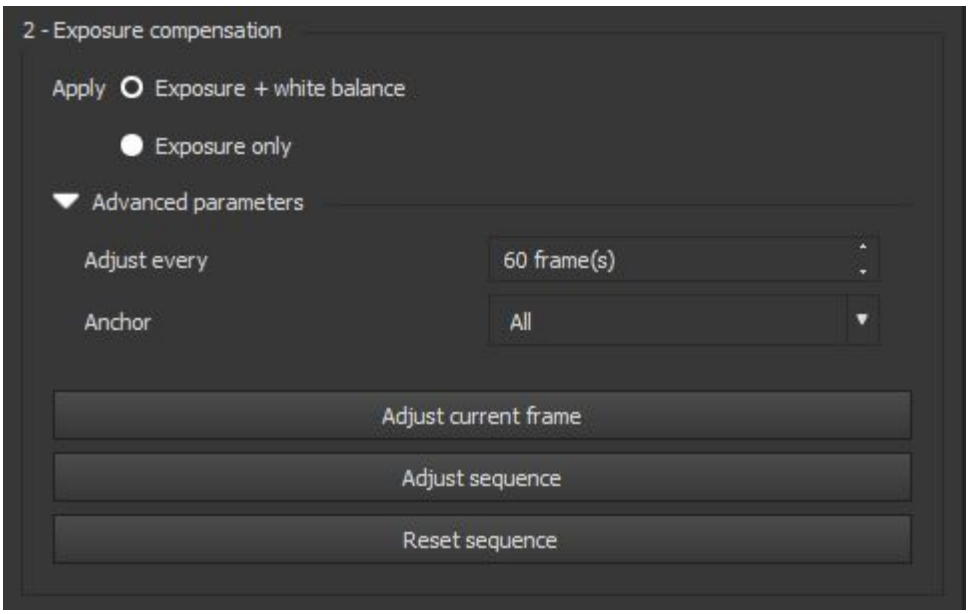


After exposure compensation + white balance

After exposure compensation only

Advanced parameters

You can access exposure compensation advanced parameters by clicking on “Advanced parameters”



Adjust every : interval between each adjustment, a keyframe will be created for each input exposure parameter. Lower values process slower but give better results.

Note:

- *If light condition change frequently in your project, use a lower interval (eg: a value of 1 will generate exposure for each frame in your video).*
- *Use higher interval values if lighting conditions don’t change in your videos.*

Anchor

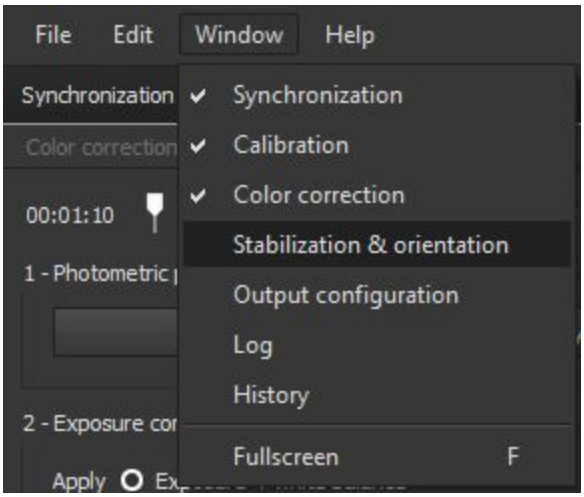
You can anchor the exposure to a source that you think will have the correct color correction (not pointing the sun or a flash light). This source will be the color reference for the algorithm. If you don't know which one to pick, select "All".

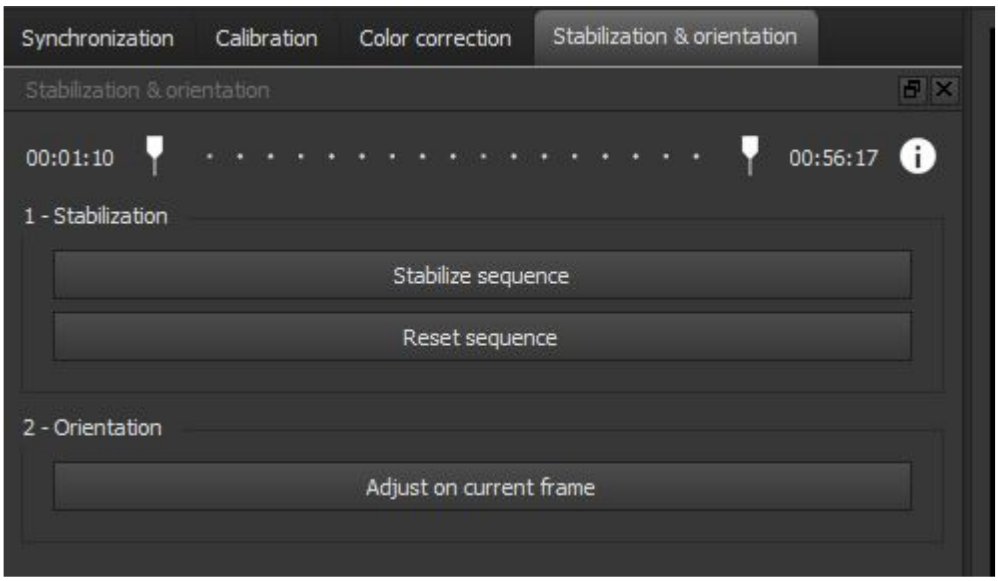
4. Stabilization & orientation

Stabilization is useful if your camera has shaken during the video shooting (typically when the camera is in movement). It will smooth down the vertical bumping.

Orientation adjustment will help you to flatten the horizon.

To open the stabilization and orientation tool, go in Window > Stabilization & orientation





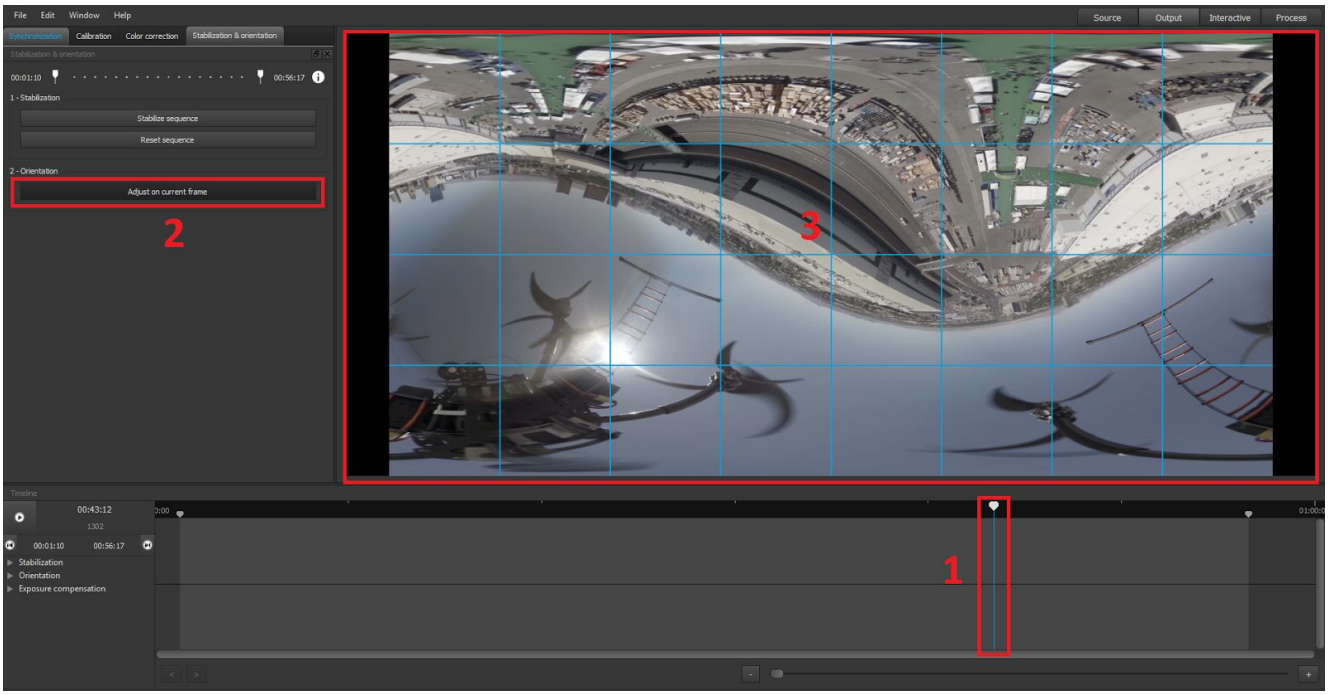
1. Stabilization

To stabilize your footage:

1. Select the working area you want to stabilize
2. Click on “Stabilize sequence”

Clicking on “Reset sequence” will erase the stabilization

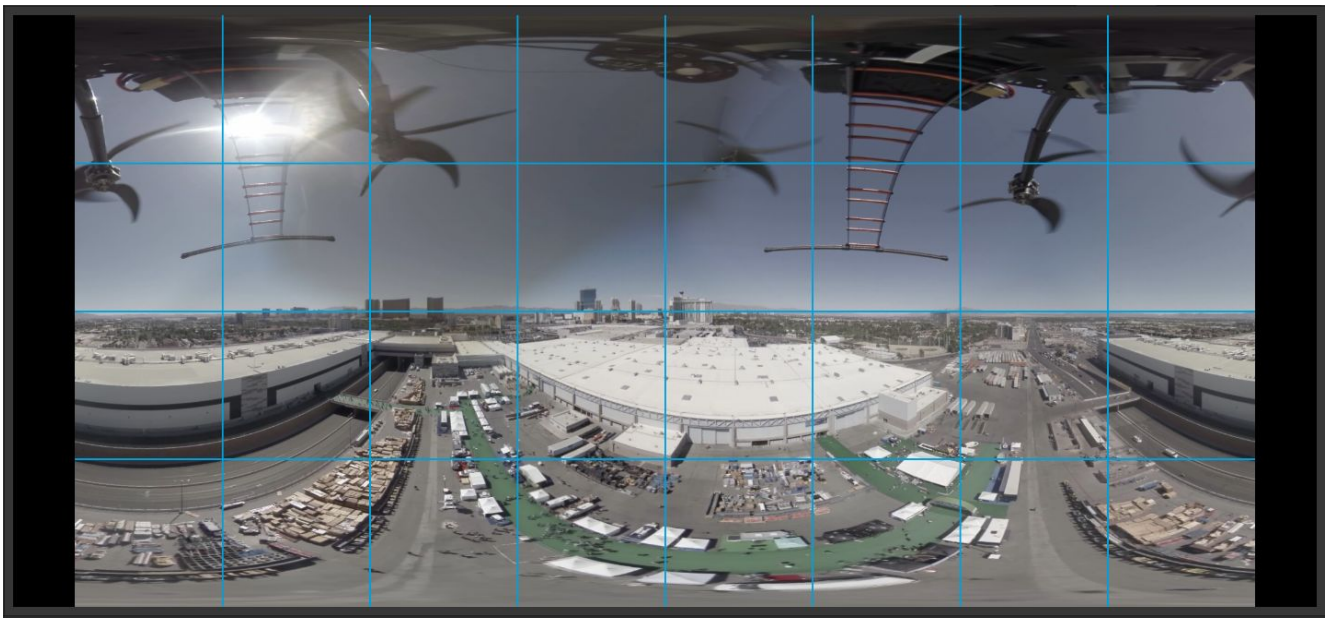
2. Orientation



To change the orientation:

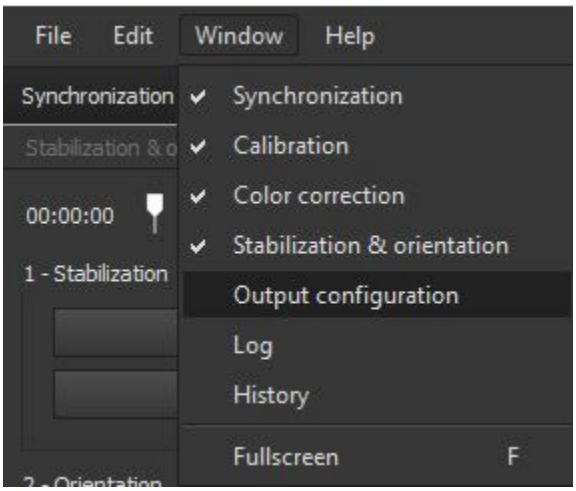
1. Select the frame on which you want to change the orientation
2. Click on “Adjust on current frame”
3. Click and drag your mouse on the output to change the orientation

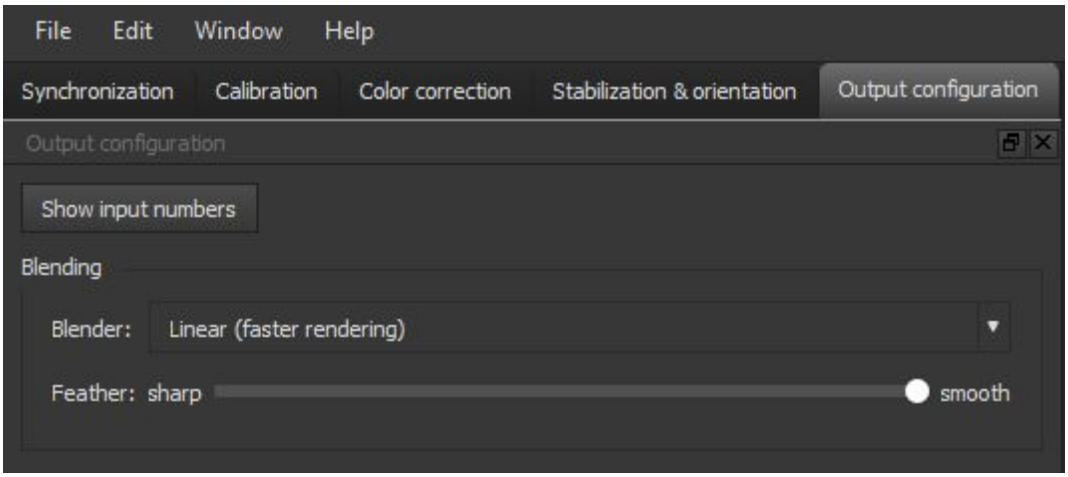
After orientation modification



5. Output configuration

To open the output configuration tool, proceed to the taskbar, click on “Window” then “Output configuration”





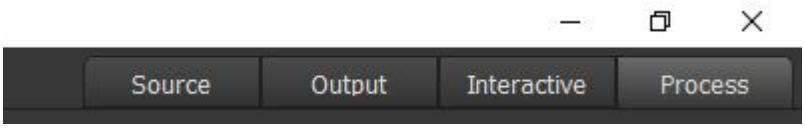
If you click on “Show input numbers” you will be able to see how your input videos are arranged in the panorama

The blender dropdown list lets you select the blending method (linear or multiband). Linear will be faster to compute while multiband will give a better quality result.

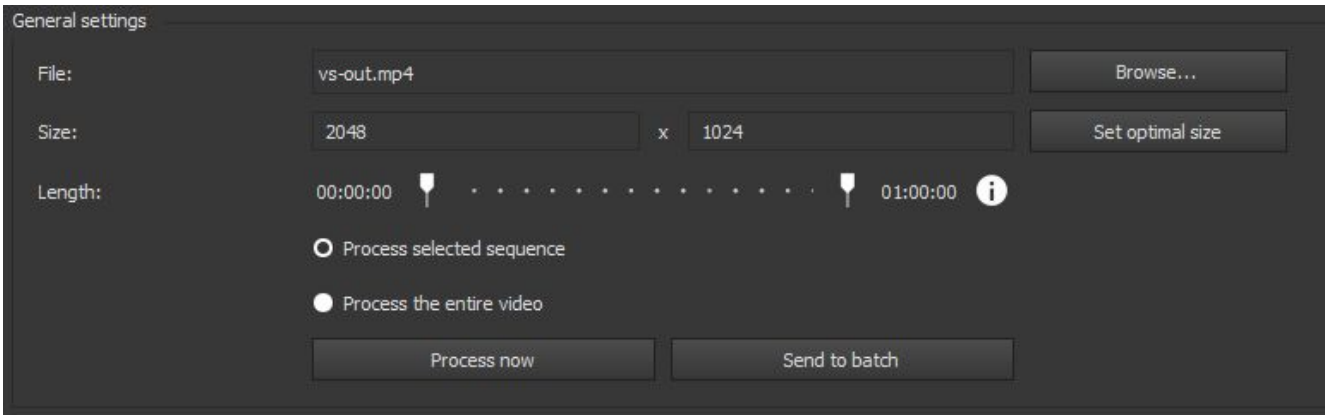
The feathering slider will let you select a sharp or smooth blending. A smooth blending will give smoother transitions by using both images but will create ghosting where there is parallax. A sharp blending will give a quicker transition on short distances and look more natural but will still look imperfect when there is parallax.

6. Output rendering

To render your 360 video output, switch to the output panel on the right of the interface. You will be able to configure the output size, video and audio encoding parameters.



1. General settings



File

Output name and path. By default the output file is created in the same directory than your input videos. To change the output path, click on “Browse” and select where you want to video to be created

Size

Resolution of the output. As a 360*180 output, the resolution ratio will be 2:1. Updating one of the values will automatically update the other one.

The button “Set optimal size” will pick the maximal resolution your camera rig can handle, without interpolation.

Length

By default the length of the output is defined as the whole video. To process only the current working area, check the “Process selected sequence” checkbox.

After the configuration of the video encoder settings and audio settings, you can render your video.

- Click on the “Process now” button to start rendering your video immediately
- Click on “Send to batch” to send the project to the batch stitcher queue to be processed later

2. Encoder settings

Format

You can render your content as **mp4** or **mov** for video output and **jpeg**, **png** and **tiff** for image sequence output

Codec

You can encode your output using **ProRes**, **H264**, **MPEG2** and **Motion JPEG**

Note:

- *ProRes is available for **mov** output only*
- *Maximum output resolution with H264 is 4096*2048*
- *Maximum output resolution with MPEG4 is 8192*4096 and the resolution must be a multiple of 8*
- *MPEG2 does not support resolutions multiple of 4096*2048*

Bitrate mode

You can choose between VBR and CBR.

Bitrate

File size = bitrate (kilobits per second) x duration

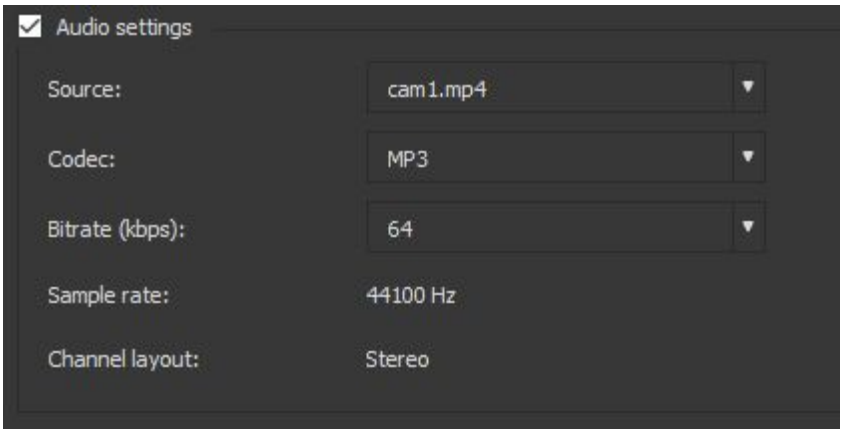
Picking the bitrate is doing a compromise between video quality and file size. The optimal bitrate depends of the video player you are using to display your video, please check its specification.

Advanced settings

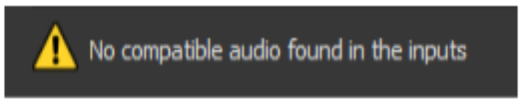
You can display advanced settings by clicking on the down arrow.
You will be able to customize the GOP and B-Frames number

3. Audio settings

By default the audio settings are disabled, to activate the settings, click on the “Audio settings” checkbox



Note: If your inputs do not have audio or have unsupported audio, the settings will not be available and you will see the following warning



Source

Let you select which audio input (from your video inputs) you want to use in the output

Codec

You can encode your audio in **mp3** or **aac**

Bitrate

You will be able to select between 64/96/128/192kbps

Sample rate

The sample rate will be 44100Hz for **mp3** output and 48000Hz for **aac**

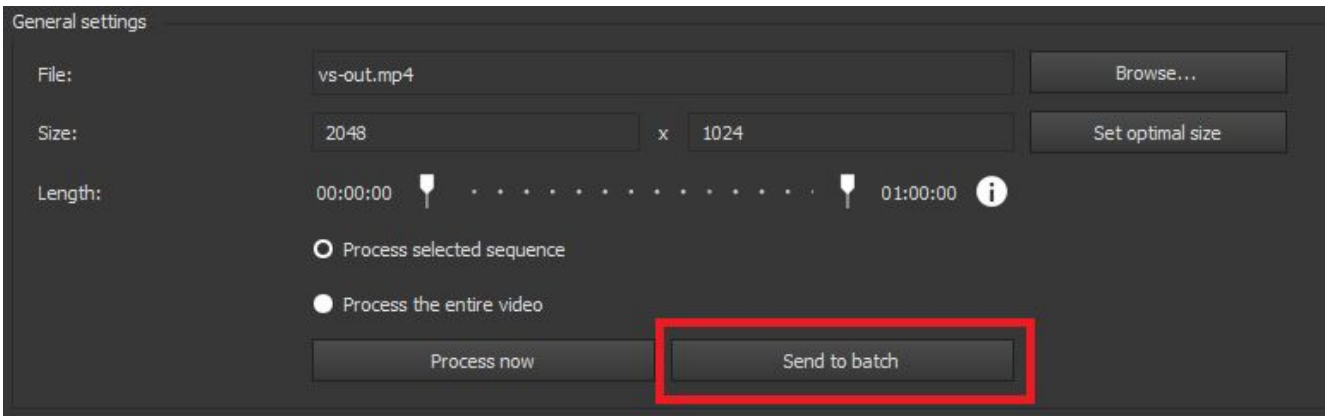
Channel layout

VideoStitch Studio uses stereo layout for the output audio

4. Batch stitcher

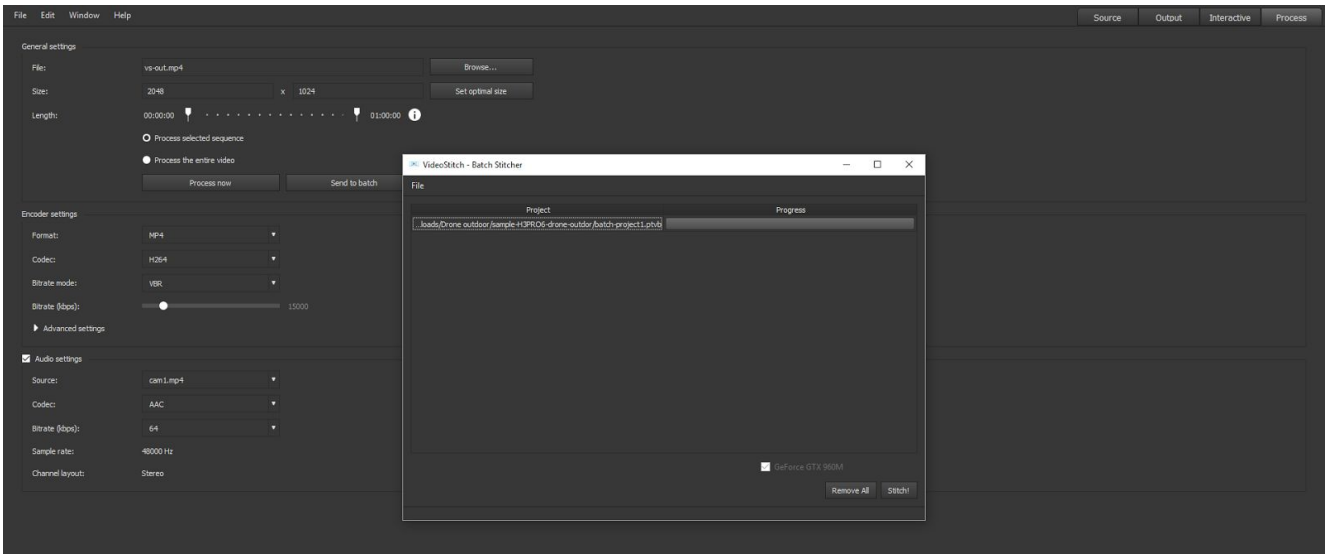
The batch processing tool allows you to prepare multiple VideoStitch projects and process them all at once later.

To add projects to the batch stitcher, click on "Send to batch" button



You will then be able to create a copy of your project that will be sent to the batch so that you can continue editing your project.

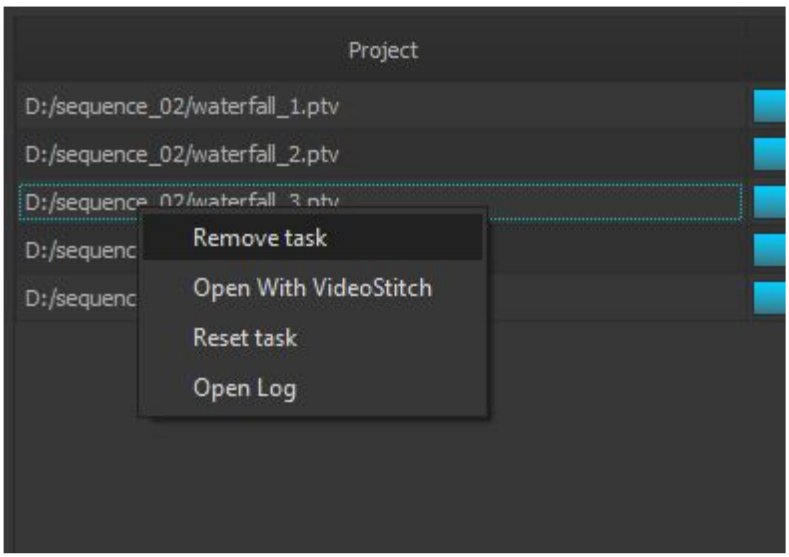
This is especially useful if you need to process the same sequence with multiple calibrations for advanced post-processing in a third party software.



To launch the batch stitching click on”Stitch!”

Tips: When launching the batch stitcher, it is highly recommended to close the projects that are already opened in VideoStitch Studio. We designed VideoStitch Studio to use the best balance of system resources. However video stitching is a resource intensive task, keep in mind that editing a project and stitching in batch will perform rather slow on some systems

If you want to remove, reset or edit a project, right click on the project name in the batch stitcher:



You are now ready to enjoy creating amazing 360 content!

Appendix

List of keyboard shortcuts

Shortcut	Description
Space	Play / Pause
Ctrl+J	Jump to frame X
Ctrl+A	Select all the video as working area
Shift+Home	Set the first frame of your working area
Shift+End	Set the last frame of your working area
Ctrl+Alt+Shift+Backspace	Restart VS
Left	Previous frame
Right	Next frame
Ctrl+K	Add a keyframe at the current frame
K	Next keyframe
J	Previous keyframe
O	Set 'Edit orientation' mode
Ctrl+1	Source tab
Ctrl+2	Output tab
Ctrl+3	Interactive tab
Ctrl+4	Process tab
Alt+F4	Exit
Ctrl+O	Open project...
Ctrl+S	Save project
Ctrl+,	Preferences
Ctrl+Shift+E	Extract stills to...
Ctrl+N	New project
Ctrl+Shift+S	Save project as...
F1	Get support
Ctrl+D	Open working directory
Ctrl+E	Extract stills
F	Fullscreen
Ctrl+Shift+O	Open media...
Ctrl+Z	Undo Orientation edited
Ctrl+Y	Redo
F5	Last opened project
F4	Last applied template