

# VGSync – Documentation V.3.29

changelog:

19.04.05 Optimizing encoder for Start-and Endcuts  
16.04.25: New “create mode”, street view and “sync all with video” option  
14.05.25 Add FullEncoder-Mode  
06.04.25: Set single gpx time in list editable  
02.04.25 – Changed to GPLv3  
15.03.25: Open-Elevations – fix license  
16.03.25: setHeigh(B2E)

## Introduction

VGSync is a tool that synchronizes a video with a GPX (GPS) file for later upload to the Kinomap platform. The primary goal is to trim the start, end, and various stops (traffic lights, roundabouts, breaks) from the GPX so that the corresponding image in the video accurately reflects the exact location on the road map.

## Modes

The program can be used in three different modes:

### GPX Mode

This is the default setting, where a pre-cut video (edited outside of VGSync) and its corresponding GPX file are loaded. In this mode, only the GPX file is modified.

- The start of the GPX can be synchronized, and pauses can be cut.
- Various manipulations of individual points or sections are possible, such as modifying time, altitude, or gradient.
- Errors in waypoints or timestamps are detected upon loading and marked in the diagram. These can be removed via the "More (...)" menu.
- Multiple GPX files can be loaded and appended with a 1-second gap (e.g., multiple GoPro GPX files).
- It is also possible to edit a GPX file without a video if needed, for example, to merge multiple GoPro files. However, GoPro files should be recorded with a 1Hz resolution.
- There are various tools available to extract data from GoPro metadata and prepare it accordingly, such as:  
<https://goprotelemetryextractor.com/free/#>  
In this tool, select:
  - Frequency: 1Hz
  - Altitude: corrected
  - Save as: GPX or Virb

### Video Mode

If you only need to merge multiple video files (e.g., from a GoPro) and optionally cut them, you can select “Edit Video” from the menu.

### Copy Mode:

The video is not re-encoded,  
but instead handled by LossLessCut – meaning it is simply *copied*.  
This may result in slightly abrupt transitions at cut points. However, these are negligible compared to the overall uncut video or, for example, waiting at a traffic light.

### Encoder Mode:

The video is re-encoded using the settings from the Encoder Setup!  
Options configured in the Encoder Setup, such as GPU usage, will be applied.  
Cuts will also be transitioned smoothly using a crossfade (xfade) effect.

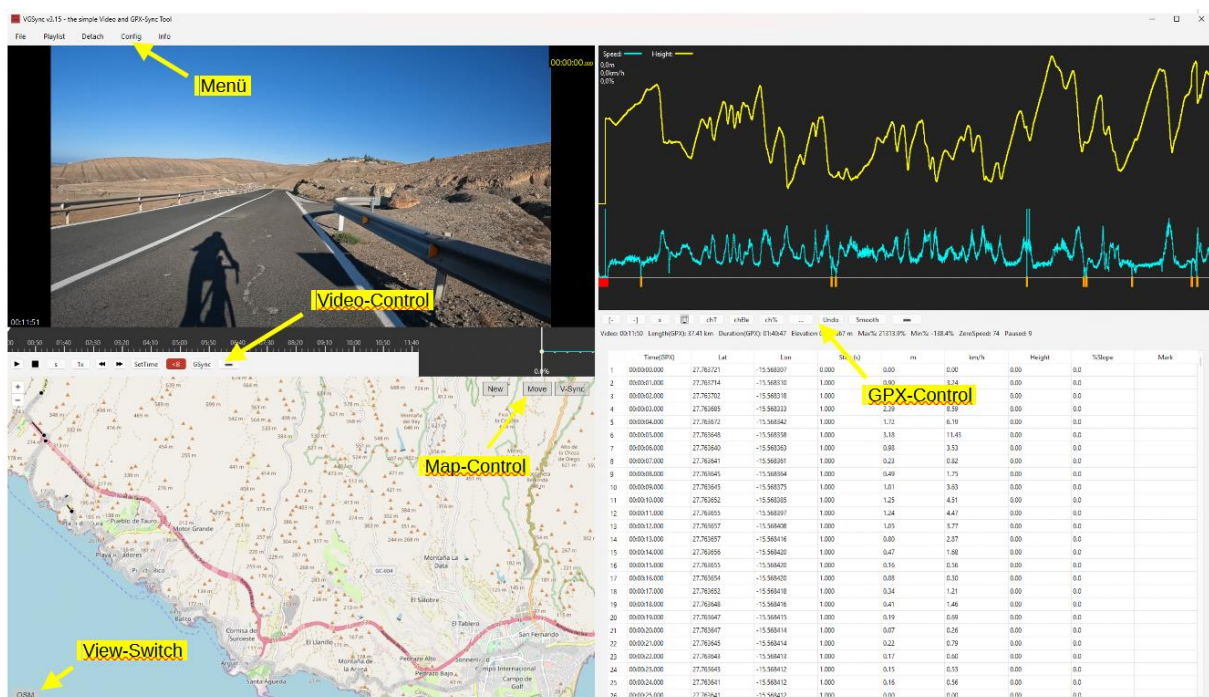
## AutoCut Video + GPX Mode

This setting, also found in the "Config" menu, trims the video and simultaneously removes the corresponding sections from the GPX file (traffic lights, breaks, etc.). The video is then already synchronized.

### Edit mode

To clarify the layout:

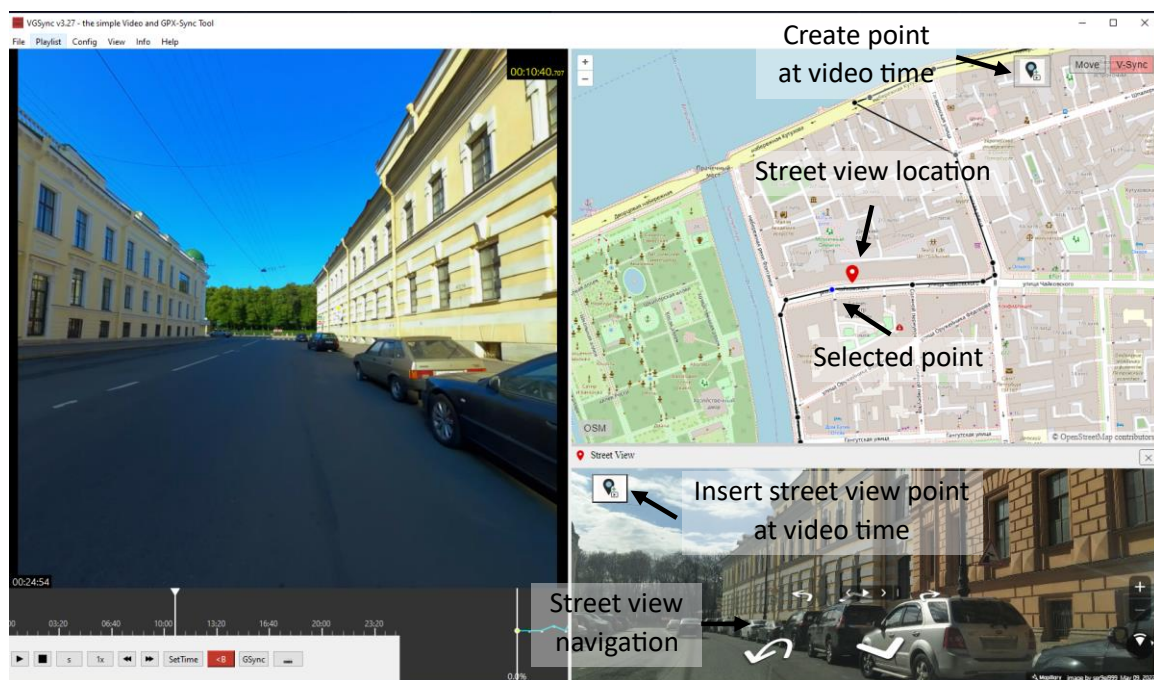
- At the top, as usual, there is the menu bar with options like File, Playlist, Config, etc., and their submenus.
- Between the video and the map, the video control buttons are located.
- In the map, the map control buttons are at the top right, and the switch for toggling between satellite view and terrain view is at the bottom left.
- Between the diagram and the GPX list, the GPX control buttons are placed.
- In the list, the time associated to gpx points can be edited by double click. This changes only a single point. If you need to shift all next points, see "chT" button (explained later).



## Create Mode

This mode is designed to help with the creation of missing gpx points. It can be activated via “View” menu. You can switch back to classic “Edit” mode anytime from “View” menu.

It proposes a different visual layout by splitting the screen in 3 parts: video, map and street view to help you to find the correct position of missing points. When we switch to this mode the option “Sync all with video” is activated, meaning every time you select a point the video will seek to the corresponding frame, as if we would click at “V-Sync” button. That’s why V-Sync button stays in activated mode. The new points are automatically inserted in the list with timestamp corresponding to the video current position and in index corresponding to their timing order. Other points are not shifted, unlike it’s the case in classic mode. If Mapbox token is provided, “Direction mode” is activated and the “Close gaps (Direction)” function is called every time you create a point. This provides a very easy way to create a route from recognised places on map on street view. If you don’t want this, disable “Directions” in the menu.



You can use street view controls to navigate, the red icon on the map will move to the new location corresponding to photo’s gps. When you see a place matching between video frame and street view just click the “new point” button located at the top left of street view, a new point will be added to the list. If street view doesn’t make sense for you just click the close button and the map will be expanded.

### ⚠ Important:

**For better experience provide Mapillary token for Street View and Mapbox token for auto route creation when you create a new point.**

If you start creating gpx with an empty list, please start from the beginning of the video. For the moment the rule is to insert the first point with 0:0 time, no matters on which video time you are.

## ***Menu File***

### **Open GPX**

Loads a GPX file.

It will then be displayed on the map, in the diagram, the mini-diagram, and the GPX list.

If a file is already loaded and "Open GPX" is selected again, you will be given the choice to append it or load it as a new file.

If you choose to append it (which is useful for GoPro GPX files), the new file will be added to the previous one with a 1-second gap. This makes it easy to merge multiple GPX files of a route seamlessly.

If you choose "New," the old GPX file will be removed from the tool, and the new one will be loaded.

### **Open Video**

Loads one or more video files.

If multiple videos are loaded, they will be played sequentially in the player, and a blue marker will be placed between them in the timeline to indicate separation visually.

The total duration of all loaded videos is displayed at the bottom left of the player, while the current video time is shown in the top right during playback.

### **New Project**

Deletes the entire project, allowing you to start a new one.

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## ***Menu Playlist***

Displays the loaded videos.

Videos can be removed by clicking on them.

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## ***Menu View***

### **Edit mode**

Switch to the "classic" edit view composed of video, map, chart and gpx list (see before).

### **Create mode**

Switch to the gpx creation mode with a view composed of video, map and street view (see before).  
"Sync all with video" option is then activated.

### **Video (detach)**

The video window is detached from the tool and can be enlarged.

This is useful for comparing the exact gradient progression with the displayed video, as the mini chart (bottom right) always shows the elevation profile section corresponding to the current video position. It is especially recommended to check hilltops to ensure that the gradient change in the profile matches the video.

### **Detach (map)**

The map can also be expanded!

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## Menu Config

### Edit Video

If you want to cut the video, you need to activate one of the two modes (see below). This will enable additional buttons in the video control section.

On first activation, you'll be asked whether to index keyframes or not.

Indexing allows you to cut *exactly* at keyframe positions. While this is not mandatory, it can help produce cleaner cuts.

Once editing is activated, you'll see the overlay Edit: On in the video window.

### Edit Video / Copy Mode:

As mentioned earlier, this uses LossLessCut.

The advantage: The video is not re-encoded – it is built using the copy function only.

The downside: Transitions at cut points may be abrupt or hard cuts.

### Edit Video / Encoder Mode:

The entire video is re-encoded using the settings from the Encoder Setup.

Crossfades (xfades) – smooth transitions between clips – are applied.

You can also choose the video resolution, quality, and frame rate (FPS) during encoding.

#### Important:

Cuts and overlays must be at least 2 seconds apart – ideally 4 seconds.

This ensures proper transitions and prevents rendering issues.

Example: Cut 1: from second 10 to 22 - Overlay start: at second 24

### Encoder Setup *(Only active in Encoder Mode)*

This is where you configure the encoder:

- **Resolution:** Sets the output video resolution (16:9)
- **Container:** e.g., x265 (*Recommended: x265 – fewer issues with crossfades*)
- **Hardware:** Select the hardware (e.g., Nvidia or CPU ) to be used for encoding
- **Quality (CFR):** The lower the value, the higher the quality  
(*Tip: the value of 20 results in almost no visible quality loss*)
- **Preset:** Controls compression and encoding speed – the faster the preset, the larger the file
- **FPS:** Frames per second
- **XFade:** e.g., 2s – sets the duration of the crossfade between clips
- **Detect HW:** Automatically detects your encoding-capable hardware.  
After detection, only the supported hardware will be selectable – not "everything".

**Tip:** Try encoding a short 1-minute video with different settings to see what works best for you.

### **AutoCutVideo+GPX**

To activate this option, Edit Video must be enabled first.

This is one of the most important features of the program!

- When this option is activated, selecting a section of the video for cutting (e.g., a stop at a traffic light or the start of the video) will automatically cut the GPX file as well!
- This allows you to remove breaks from both the video and GPX with minimal effort, ensuring the project remains synchronized.

### **Time: Global/Final**

The timer at the top right of the video, which shows the current video time, can be switched between Global and Final mode.

#### **What is the difference?**

- Global time: The total duration of all videos before editing.
- Final time: The total duration after cuts have been applied.

For example, if a video originally lasts 10 minutes and you cut out 2 minutes, then:

- Global = 10 min
- Final = 8 min

Why is this useful?

If you're editing a long route with multiple stops and breaks, it's best to review all videos quickly in an external player and note down break times.

Example:

- The first video has a break at 4:31
- The second at 2:20 and 4:40
- The fifth at 7:10

When you load all videos and cut the first break, it becomes difficult to calculate the exact position of the next break.

Using Global time, the second break remains at (length of video 1) + 2:20, making it easier to locate without extra calculations.

This is especially useful for GoPro files, which usually have the same length (unless manually stopped).

### **FFMPEG / libmpv**

These two menu options ensure compliance with the GPL license requirements for FFmpeg and libmpv.

- Here, users can specify their own FFmpeg or libmpv files by entering the file paths.

- If the entered files are incorrect, the default LGPL-compliant version included with the software will be used automatically.
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## Chart Settings

### Limit Speed

Adjusts the maximum peak in the speed curve.

It is not uncommon for a GPX point to show an unrealistic speed (e.g., 240 km/h) due to recording errors, signal loss, or faulty cuts. If the speed limit is not set (e.g., to 70 km/h), the curve would be flattened by extreme peaks. This setting ensures that speeds above the limit (e.g., 240 km/h) are capped at 70 km/h (or your chosen value).

### Zero Speed

Marks GPX points with a downward orange line in the diagram when the speed drops below a set threshold. The default threshold is 1 km/h. If a GPX point falls below this speed, an orange marker is displayed. This helps quickly identify pauses in the GPX file.

### Mark Stops

Another function for identifying breaks. GPX points with a time gap greater than the specified value (e.g., >1s) will be marked in the diagram.

## Map Setup

### Directions:

If you have a Mapbox key/token set up, you can use the Directions function to draw a route that follows known roads and paths, just like a route planner. Two new buttons will be added to the map, allowing you to choose whether the route should be drawn for cars, bicycles, or pedestrians. Additionally, the "Close Gaps" function (see below) will also change accordingly.

### Map Keys

You can enter API keys for different tile providers (terrain maps).

Without a valid key, terrain maps cannot be displayed.

Most providers offer a large number of free tiles per month. At the time of this software's release, Mapbox provided 50,000 free tiles per month—a limit that most users will never exceed.

### Size & Color of Points:

The size of GPX points on the map can be adjusted.

This is useful when points are closely clustered together.

## Overlay Setup

### First of all: What are overlays?

An overlay is an image that is displayed *on top* of the video at a specific time and for a set duration. For example, you can show a short logo at the beginning of the video, or a quick intro screen.

Recommended: Use .jpg images for overlays.

Within the menu, you can preconfigure up to three overlays, so you don't have to reconfigure them every time.

This makes it easy to automatically show your logo at the beginning and/or end of a video.

You need to set the image path, and optionally scale it if the image is very large (e.g., choose 0.5 or 0.1 to reduce its size).

You can also choose the corner in which the overlay should appear, and use dx and dy to shift it slightly inward from the edge, so it doesn't appear "crammed" into the corner.


How to insert an overlay:

Use the Ovl button in the Video Editor Control panel.

When pressed, it inserts the overlay at the currently selected point in the timeline.

In the menu, you can:

- Choose one of the predefined overlays
- Load a custom overlay ad hoc
- Set display duration
- Optionally set fade-in and fade-out times (if the overlay supports transparency)

 **Important:** Overlays can be shown for a maximum of 30 seconds.

Note: Platforms like Kinomap generally discourage the use of overlays – so it's best to limit them to a brief logo only.

## Sync all with video

When activated, many actions are synchronized with video:

- New points inserted at current video time. If Directions is activated and Mapbox provided, a route is created to the new point (after ask transport mode).
- When we select a point the video and street view (if visible) jump to the corresponding time

## Use software OpenGL

Disables OpenGL hardware acceleration.

May help if the map is not visible but Mapillary viewer won't display anything if activated.

## Reset Config

Resets all settings to factory defaults. App restart required!



## Menu Info

### Copyright

Displays copyright information and the installed version.

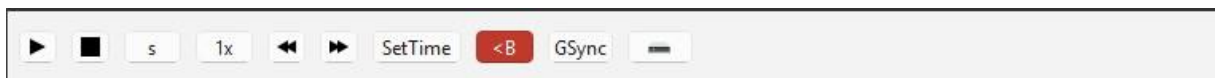
## Video Control Buttons

**Note:** Depending on the mode, not all buttons are visible.

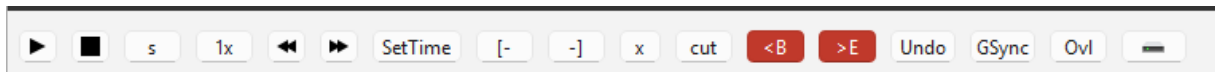
Some buttons only appear after Video Edit is enabled, while others change functionality when AutoCutVideo+GPX is activated.

Here are the two different views:

### Edit Off:



### Edit On:



## Video Control Buttons

The buttons from left to right:

Play/Pause – Stop – Step-Value – Multiplier Stepper – Step Left – Step Right – SetTime – MarkB – MarkE – Deselect [x] – Cut – CutBegin [<B] – CutEnd [>E] – Undo – GSync – Save

### Play/Pause

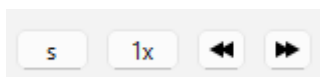
Starts and pauses the video.

### Stop

Stops the video and resets it to the beginning.

### Stepper

The stepper consists of the following buttons: Step-Value – Multiplier – Step Left – Step Right



### Stepper

With Step-Value, you can select the type of step: seconds (s), minutes (m), keyframes (k), or frames (f). Important: Keyframes can only be used if you selected "Yes" when asked about Indexing Keyframes.

The Multiplier determines the size of each step, e.g., 1 second (s 1x) or 8 minutes (m 8x).

Left (←) and Right (→) indicate the direction in which the step should move (forward or backward).

**Important Note:**

*Jumping backward is often slightly less accurate than jumping forward.*

*When synchronizing and moving to an exact point, it is recommended to first jump a bit further back and then use the forward step button to fine-tune the position.*

**SetTime**

Manually enter the exact time the player should display.

**MarkB [-**

Only available when Video Edit is ON!

Marks the beginning of a cut point in the video.

***If AutoCutVideo+GPX is also activated:***

Marks the beginning of a cut point in both the video and the GPX file.

**MarkE -]**

***Only available when Video Edit is ON!***

Marks the end of a cut point in the video.

***If AutoCutVideo+GPX is also activated:***

**Marks the end of a cut point in both the video and the GPX file.**

**Deselect [x]**

Clears the selection for MarkB and MarkE.

**Cut**

Deletes the marked section.

If Video Edit is ON: Only the selected section in the video is removed.

If AutoCutVideo+GPX is ON: The selected section in both the video and the GPX file is removed.

*Note:*

*In the video, the removed section is black-marked and will be skipped during playback.*

*In the GPX file, the section is completely removed and no longer visible.*

**CutBegin <B**

This button has two functions:

***If AutoCutVideo+GPX is OFF:***

We synchronize the start of the video with the GPX file. Only the GPX file will be cut. If the exact start of the video cannot be identified, you can align it with a distinctive point such as an intersection, pedestrian crossing, or roundabout that also appears in the GPX data. Important: There must be no break between this point and the actual video start! Example: If the video is set to 10 seconds, aligning with a distinctive point: Find the matching location in the map view. Select that point in the

map. Press CutBegin <B, and the start of the GPX file will be trimmed. The first 10 seconds of the video remain intact for correct alignment.

***If AutoCutVideo+GPX is ON:***

Same marking process as above, but now both the video and the GPX file will be trimmed at the exact point. In the example, the first 10 seconds of the video would also be cut, and the GPX file would now start exactly at the marked point.

**CutEnd >E**

*Only available when Video Edit is ON!*

***If AutoCutVideo+GPX is OFF:***

Since finding the exact end of a video can be difficult due to invisible frames at the end, this button ensures a precise cut. Steps: First, place a MarkB at the desired cut point. Press CutEnd >E to set the end. Use Cut to remove the section.

***If AutoCutVideo+GPX is ON:***

The GPX file is also trimmed at the same point.

**Undo**

Reverts the last action. Usually only affects the video. If AutoCutVideo+GPX is ON, it also affects the GPX file.

**Ovl:**

Add an Overlay on the marked Timeline-Position. A Window will open and ask which Overlay you want to add from the pre-configured one ( you can add a new one too).

Set the Duration (max 30s) and the fade-in and fade-out time.

Please use jpg-files only.

**GSync**

Displays the corresponding GPX point for the current video position. This is useful for checking synchronization after making a cut. Set the video to a distinctive point (e.g., after a cut) and press GSync. The matching GPX point will be highlighted, allowing you to compare them. Recommendation: Check multiple points throughout the video to ensure that no pauses were missed during synchronization.

**Save**

Saves the video with all cuts applied using the LossLessCut method.

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## Map Control Buttons



### New point:



: icon in edit mode

Adds a new GPX point on the map, either at the beginning or end of a route. Alternatively, you can place it precisely on the line between two existing points.

- The route will automatically be extended by 1 second.
- Before adding the new point, you must select the point where it should be connected.



: icon when “Sync all with video” activated

Adds a new GPX point on the map synchronized with the video

- With timestamp corresponding to the current video position.
- Inserted in the list in the according position, based on its time

### Move

Activates the "Move GPX Point" mode. This allows you to freely move a GPX point on the map. Useful for adjusting the route to align with roads if the recorded path is incorrect.

### V-Sync

Displays the video frame corresponding to the selected GPX point. For example, if the GPX position is at 10 seconds, pressing V-Sync will show the frame at 10 seconds in the video. It is recommended to press the button multiple times to ensure the correct frame is displayed, as system performance may cause delays. Keep in mind that not every exact frame can be displayed—only the nearest displayable frame. There might be a slight millisecond discrepancy, as some frames are not directly accessible due to GOP (Group of Pictures) encoding.

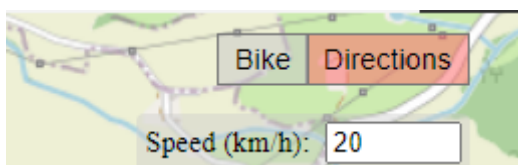
In “Sync all with video” mode this button is visually activated and triggered at any point selection.

### View-Switch

Toggles between different map display modes: OSM (OpenStreetMap) - Various satellite views

**Note:** If no API key is entered for services like MapBox, only OSM will be displayed. To access terrain maps, you must request an API key from the respective service provider.

## Directions-Control-Buttons:



### For Experts ONLY!

The "Bike" button toggles between Bike, Car, and Foot. Depending on the selected mode, the route will be requested and calculated accordingly via Mapbox.

### Function:

First, you need to select either the first or the last point of the route by clicking on it. Then, activate the Directions function (its color will change). Using "Speed," you can define the spacing between points, and with the crosshair, you can set the target point where the route should lead. This can only be done at the beginning or end of a route!

It is crucial not to select excessively large "steps" but to create the new route in small increments instead. Additionally, always verify the connection to the existing route, as the "old" point often needs to.

If you want to recalculate a section of an existing route—for example, if your GPS device did not record anything due to a lost signal or any other reason—you can use the **Close Gaps** function while Directions is active.

The functionality is the same as **Close Gaps**, but instead of drawing a direct path, the route will be adjusted to follow the road.

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## GPX Control Buttons



The buttons from left to right:

markB – markE – Deselect [x] – Delete – chTime – chElevation – chSlope – More (...) – Undo – Smooth – Save

### markB

Marks the beginning of a cut in the GPX list. The marked section will be highlighted in red in both the GPX list and the map. The button turns red when activated. To delete a single point, simply mark it with markB.

### markE

Marks the end of a cut in the GPX list. The entire section between markB and markE will be highlighted in red in both the GPX list and the map.

**Deselect [x]**

Deselects a marked section or a single selection.

**Cut (scissors)**

Deletes an entire marked section. To prevent a gap, the time between the two surrounding points is adjusted to 1 second. Points next to deleted section will have their time shifted back by the amount corresponding to the deleted section length.

**Remove (minus button)**

Also deletes the marked section, but the next points time will not be shifted. We can see this as a route simplification, with less points.

**chT (chTime)**

Modifies the time or step of a single point or all points in a marked section. Useful for fine-tuning synchronization. This button allows to edit the step of the selected points in the list. Note that next points will be shifted by the time difference. For example if you set 2s instead of 1s on a single point all the next points will be shifted to +1s. If you don't want the following points to change edit the time value directly in the list (by double click).

**chEle (chElevation)** Changes the elevation of a single point or an entire marked section. This is useful when there is a sudden elevation shift due to a GPS restart after a break. If the GPS records a different elevation after restarting, the entire section can be shifted so that: The first point after the restart has the same elevation as the last point before the restart.

**ch% (chSlope)**

Adjusts the slope (gradient) of a single point or a marked section. Used to correct elevation recording errors or smooth transitions after a cut.

**Undo**

Reverts the last action.

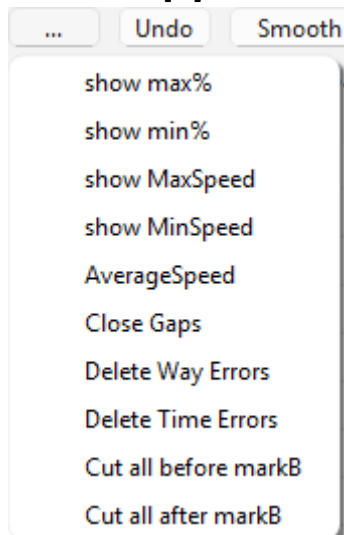
**Smooth**

Opens a smoothing settings window, where adjustments can be made to smooth the elevation profile. Default settings usually provide a good result. If the result is not satisfactory, the options can be adjusted: Box-Smoothing: Number of GPX points included in the smoothing process. Flatten-Value: Maximum slope difference between points.

**Save**

Saves the GPX file with all applied changes.

#### More-Menü [...]:



**Check the following values to ensure your GPX file has no unusual peaks:**

**show max%:** Displays the GPX point with the highest slope.

**show min%:** Displays the GPX point with the lowest slope.

**showMaxSpeed:** Displays the GPX point with the highest speed.

**showMinSpeed:** Displays the GPX point with the lowest speed.

#### Average Speed

Calculates the average speed of a selected section. This can be helpful if a speed peak cannot be corrected in another way.

#### Average Slope

Calculates the average slope of a selected section.

#### Close Gaps / Close Gaps (Directions)

Fills in missing GPX points. Example: You drive through a tunnel or an area without GPS coverage. The GPX file shows an unusually large time step, and the chart displays it as a pause (since the step is greater than 1s). Cause: GPS signal failure. **Solution:** Using Close Gaps, the missing section is filled with GPX points at 1-second intervals. No changes are made to time or distance—it simply looks better in the visualization. If necessary, the new points can be adjusted to match the road.

**Important:** markB must be set before the gap. markE must be set after the gap.

#### Close Gaps (Directions):

When Directions is activated, GPX points are no longer simply connected in a straight line from markB to markE. Instead, you can let Mapbox draw the route along the road.

### **Delete WayErrors**

When loading a GPX file, you will receive a warning if WayErrors are found. These errors are also highlighted in red in the chart. This button fixes these errors automatically. What are WayErrors? These are GPX points that have identical latitude/longitude but a 1s time step—a recording error. Fixing the error recalculates the second point: It is moved to the middle between the previous and next point while keeping the same latitude/longitude.

**This should always be executed!**

### **Delete Time Errors**

This issue is rare, but some GPX points might have a 0s time step. These points are simply deleted.

**This should always be executed!**

### **Cut all before markB**

Deletes all GPX points before and including the markB point.

### **Cut all after markB**

Deletes all GPX points after and including the markB point.

### **SetGPX2VideoTime**

For Experts Only!

Synchronizes the GPX time (range) with the video time (range).

This function aligns a marked time range in the GPX list with the corresponding marked time in the video editor.

Requirements:

- Video Edit = ON
- AutoCutVideo & GPX = OFF

Instructions:

1. Set the start point markB in Video\_Control using markB.
2. Use GSync to select the corresponding GPX point with markB in GPX\_Control.
3. Navigate the video to a second clearly identifiable point and mark it with markE.
  - This range will now be highlighted in yellow.
4. Find the corresponding point on the map and mark it with markE.
  - Now, both the video and the GPX list have a marked range.
5. Click SetGPX2VideoTime to adjust the GPX time range to match the video time range.
  - Every point in the GPX section will be recalculated.



- The marked section in the video will now have the same duration as the marked section in the GPX list.

### GetElevation from Open-Elevations

Retrieves elevation data from Open-Elevations for the selected area and stores it.

**Important:** Open-Elevations imposes query limits! If you select an area that's too large, not all points may be retrieved. In that case, wait a moment, mark the missing area, and retrieve data for that newly marked section. Typically, 100 points are "fetched." If there are more, you may run into limitations—so don't overdo it!

### Set Height(B2E)

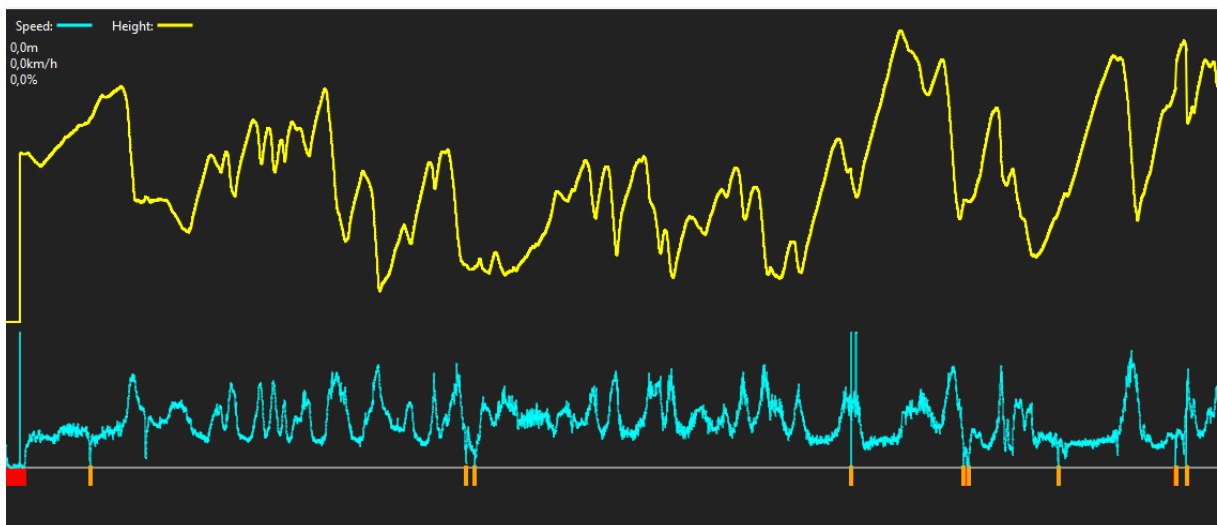
Change the final height ( markE) in a selected area.

We select an area, markB and markE, and now we can change the final height, markE.

All points are increased evenly, and the subsequent points are adjusted accordingly.

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## The Chart:



you will see:

- The elevation profile at the top.
- The speed profile at the bottom.

Below the speed profile, you will notice red and orange markers. These indicate errors in the GPX data, as explained earlier.

Navigation Controls:

- Zoom: Use CTRL + Mouse Wheel.
- Pan: Hold the right mouse button and drag to move the chart.

## ***Timeline:***



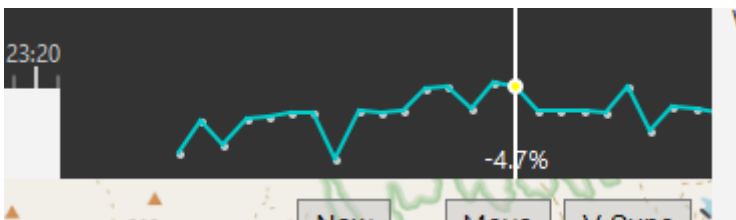
### **Visual Representation of Video Time**

- Blue Marker: Indicates the separation between two videos.
- Black Area: Represents an already deleted section.
- Yellow Area: Marks a selected section.

**Controls:**

- Zooming: Use CTRL + Mouse Wheel.
- Panning: Hold the right mouse button and drag to move the timeline.
- Clicking on the timeline: Moves the white marker (which indicates the current time) to that position and updates the video accordingly.
- Scrubbing: The white marker can also be dragged to scrub through the video.

## ***Mini-Chart:***



The mini-chart, located at the bottom right under the video, is used to check the gradient at locations such as hilltops.

After smoothing, this chart provides a clear visualization of whether the video aligns correctly with the gradient changes.

This helps ensure that elevation changes in the GPX file match what is visible in the video.

## ***Youtube-Tutorials:***

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