

## Editing Stereoscopic 3D Video in Vegas Pro 9

In addition to using one of the very capable third-party add-on tools — CineForm Neo3D (<http://www.cineform.com/neo3d/>), Medtron Make3D (<http://medtron.org/make3d.aspx>), and Pantarheon Bororo 3D (<http://www.pantarheon.org/Bororo3D/>) — you can also edit stereoscopic 3D (S3D) in Vegas Pro 9 without any add-ons or additional tools.

There are five basic steps to editing S3D in Vegas Pro 9: synchronization, preview, alignment, grouped editing, and final output. This document will explain each step in detail.

### Synchronization

When shooting S3D using a pair of cameras, it is important to record a synchronizing event. Some users clap or snap their fingers in front of the cameras; others use a flash from a still camera, a pet-training clicker, or a professional slate.


Add your media to the timeline using **Add Across Tracks** mode so the video for the left and right eyes is on separate tracks. In the following examples, the left-eye track is above the right-eye track.

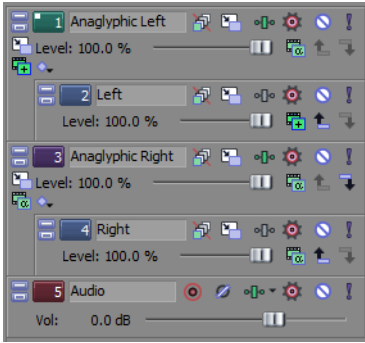
1. Use one of the following methods to align the audio and video so the video output is synchronized.
  - Aligning audio waveforms:
    - a. Roughly align the audio waveforms by dragging events in the timeline.
    - b. Zoom in so video frames are a few pixels apart.
    - c. Drag events to perform final audio waveform alignment. Leave **Quantize to Frames** enabled because you want video frames to be aligned even if the audio is a little off.
  - Synchronizing a video event:
    - a. Find a synchronizing event in one of the video events and add a project marker to that location.
    - b. Find the same event in the other video event (solo the track).
    - c. Drag the video event to align it with the marker.
      - d. If the cameras were not genlocked together (shooting at the same cadence) you may find one to be up to half a frame ahead of the other. Unless your scene has lots of fast motion, this is acceptable; just be sure to get them as close as possible on the timeline.
    - d. Trim the ends of the longer events so they all start and stop at the same time.
2. Delete one of the audio tracks (you don't want them both playing or there will be phasing effects).
3. Select both video events and the remaining audio event and choose **Edit > Group > Create New** (or press "G").


This puts the three events in the same editing group, which we'll use later during editing. It's important to keep everything labeled so we don't get confused later, so name the left-eye track "Left" and the right-eye track "Right."

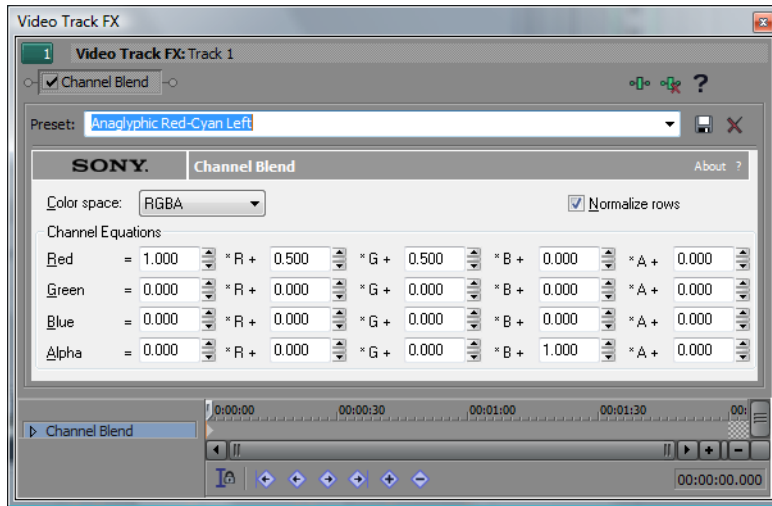
## Preview

Now we need to set up Vegas so we can preview S3D. We'll do it in a way that makes other types of S3D output easy.

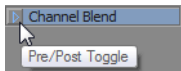
1. Create two new video tracks and place them above each of the two source tracks. Click the **Make Compositing Child** button  on the two tracks with content. The track headers should look like this:



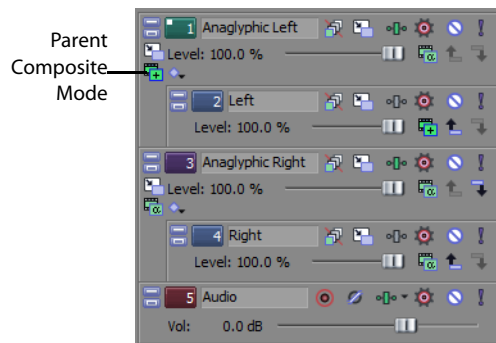
2. Set a filter for the left-eye parent track.
  - a. Click the **Track FX** button  on the left parent track and add the Sony Channel Blend plug-in. Create a preset using the following settings (including the **Normalize rows** setting) and save the preset as "Anaglyphic Red-Cyan Left."




- b. Click the **Pre/Post Toggle** button to the left of the plug-in name in the keyframe timeline so this effect is applied after the child track compositing.

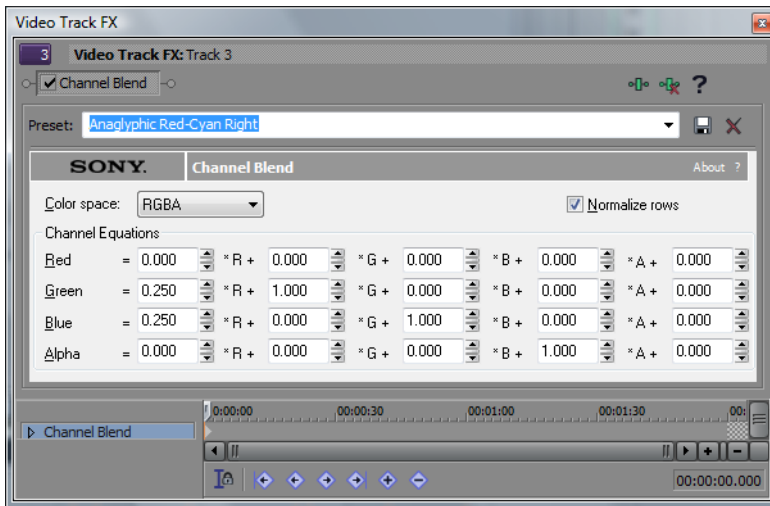


- c. Click the parent track **Parent Composite Mode** button and choose **Add**.

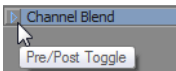


3. Set a filter for the right-eye parent track.

- a. Click the **Track FX** button  on the right parent track and add the Sony Channel Blend plug-in. Create a preset using the following settings (including the **Normalize rows** setting) and save the preset as "Anaglyphic Red-Cyan Right."



- b. Click the **Pre/Post Toggle** button to the left of the plug-in name in the keyframe timeline so this effect is applied after the child track compositing.




When previewing your project wearing a pair of red/cyan anaglyphic glasses, you should now see only the left eye video in your left eye, and right eye video in your right eye, which will produce a stereo effect:



## Alignment and horizontal offset

It is very important that S3D have differences between the views only in horizontal displacement. Any vertical misalignment or rotational misalignment will detract from the viewing experience and may even cause headaches or nausea. Also, it is important to limit the amount and direction of horizontal offset to create comfortable depth.

For example, when shooting with parallel-axis cameras, all of the depth is usually in front of the screen, and you need to use horizontal image translation to push most of it behind the screen. It is beyond the scope of this whitepaper to go into more detail, so please refer to a good book on the subject, such as *3D Movie Making: Stereoscopic Digital Cinema from Script to Screen* by Bernard Mendiburu.

Use the Event Pan/Crop tools in Vegas Pro 9 to perform vertical alignment and horizontal image translation, and if necessary, rotation correction. For most adjustments, turn off **Size About Center**  and move one of the handles on an edge of the image. For full-frame video, you'll typically be cropping off part of the image in order to do this alignment and translation. Later, if you're working on titles or overlay graphics with alpha transparency, you can just do translation without cropping.

Use the 3D glasses in combination with viewing the output without the glasses to create good alignment and depth settings. You usually want all of the depth behind the screen plane, only crossing the screen plane for dramatic or special effect. However, make sure never to create divergence, where the left-eye picture would appear more than 2.5" to the left of the right-eye picture on the largest screen your movie will ever be shown on. For example, if the largest screen to be used is 16:9 with a 106-inch diagonal, the width is 87% of the diagonal, or about 92 inches. With 1920x1080 content, 2.5 inches is only 52 pixels, so make sure your distant objects are never more than 52 pixels apart.

## Grouped editing

Because you grouped the two video events with the audio event after you aligned them, they will stay synchronized during any editing operations as long as **Ignore Event Grouping** is not enabled. Edit your project as you would any other.

Use the anaglyphic glasses to view in S3D, or solo the left-eye parent track and bypass the anaglyphic filter to edit in 2D with just one view.



Unsolo the track and re-enable the FX to return to anaglyphic preview editing.


You can add as many tracks as you need inside each child track grouping set in order to do title overlays, keying, or multiple layers of 3D video. The parent tracks handle all of the 3D output conversion.

## Final output

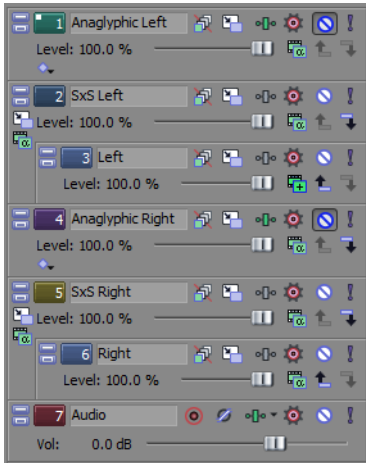
If you need to deliver two full-resolution masters, render the left- and right-eye video separately. For each render, solo the appropriate parent track, bypass the anaglyphic filter, and then render.

## Side-by-side, half-resolution mastering


If you need to deliver a side-by-side, half-resolution master (such as for YouTube 3D), follow these steps, which take advantage of how we set up the parent tracks earlier in order to quickly switch a project between anaglyphic preview and side-by-side output.

1. Create two new video tracks and position them so they are each directly above the left and right source tracks. If necessary, click the **Make Compositing Parent** button  so they are the parent track of the sources.

2. Mute the anaglyphic parent tracks. Your track headers should look like this:



3. Perform the following steps for each side-by-side parent track:

- a. Click the **Parent Motion** button  to display the Parent Track Motion dialog.
- b. Set **Width** to be half as large as the starting view. For a 1920x1080 project, use 540.
- c. In the **Position** controls, set **X Center** so the output is on the left for the left eye and on the right for the right eye.

The math is complicated by the project frame aspect ratio. For a 16:9 project, divide the frame aspect width of 16 by the frame aspect height of 9, then multiple by your adjusted **Width** of 540 and divide by 2. Negate the sign to move it left (the right view would stay positive to move it right). For a 1920x1080 project, **Position X Center** should be plus or minus 480.

You should now see side-by-side output in the Video Preview window, and you can render to the format of your choice.



To create content for uploading to YouTube 3D, render to a compatible format (such as Windows Media Video, MainConcept MPEG-2, or XDCAM EX) and upload using the YouTube upload page. Be sure to set the appropriate tags so YouTube plays your video in 3D. Add "yt3d:enable=true" to enable 3D viewing, add "yt3d:aspect=16:9" (or "yt3d:aspect=4:3") to set the viewing frame aspect ratio, and finally add "yt3d:swap=true" because the views are in left/right order instead of right/left order.

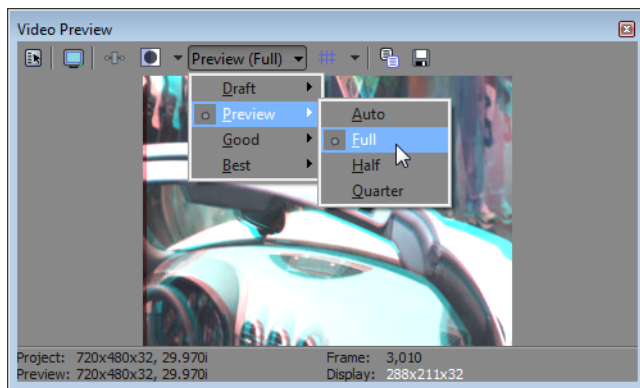
Use a similar technique if you need to create top/bottom style S3D delivery (use Parent Track Motion parameters with half the height and with Position Y that is plus or minus half that).

## Line-alternate mastering

1. To create line-alternate output for viewing on a compatible S3D monitor, again add new parent tracks and place a line-alternate mask on the top track with the event stretched to match the length of the project.

**Tip:** You can create a line-alternate mask by hand by creating an 8x8 line-alternate mask in Windows Paint, saving it as a BMP file, setting it as your desktop background in "tile" mode, and then capturing a screenshot. You will have to trim it to the right size and edit out any desktop icons by copying a clean part of the image over them. Save it as a PNG file to prevent compression artifacts.

2. Add the Mask Generator effect to the event using the default settings (you can use the **Invert** check box to swap the left and right eyes).
3. Set the compositing mode for the track to Multiply (Mask).
4. Configure the Video Preview window:
  - a. Click the Preview Quality button and choose **Preview (Full)** mode:



- b. Right-click the Video Preview window and turn off the **Scale Video to Fit Preview Window** command.

You should see line-alternate output in the Video Preview window. If you have a line-alternate S3D monitor attached, you could edit in this mode. Below is a cropped portion of line-alternate output:



To quickly switch between any of the output modes you've created (anaglyphic, side-by-side, top/bottom, or line-alternate), drag the desired parent tracks so they are directly above the related source track and click the **Make Compositing Parent** button. Then mute the unused parent track, and unmute the desired parent track.

## Conclusion

You now have all the tools necessary to synchronize, preview, align, edit, and output stereoscopic 3D in Vegas Pro 9. We look forward to seeing your 3D project!