madVR Envy

Non-linear Stretch (NLS+)

Setup Guide

Revision 0.90

1.0 Introduction to Non-Linear Stretch (NLS+)

1.1 What is NLS+?

Non-linear stretch is typically used to fill a scope screen so there are no black bars when watching content with a smaller aspect ratio. For instance, you can use NLS+ to remove the vertical black bars when watching 16:9 content on a 2.40 screen.

1.2 What makes Envy's NLS+ Special?

Envy's NLS+ introduces several new NLS related features which aren't available elsewhere. It enables users to apply NLS not only horizontally, but also vertically. You can even apply horizontal + vertical NLS at the same time. Plus, Envy supports not only NLS expansion, but also NLS compression.

The addition of vertical stretch allows Envy to remove black bars for every combination of movie vs screen aspect ratio, without losing much (or any, if preferred) image content. For example, a 16:9 movie can be stretched to fit a scope screen, or a scope movie can be stretched to a 16:9 screen. Or a 2.76 movie can fit a scope screen, and so forth.

For every movie aspect ratio, you can choose whether to use horizontal NLS (either expansion or compression) or vertical NLS (either expansion or compression), or to combine both to "share the load" between all 4 image edges. Stretching all 4 image edges allows the "horizontal + vertical NLS" approach to trade in one thing (four stretched image edges instead of two) for another (much less stretching at the horizontal image edges), while the center section of the overall image is still not stretched at all.

NLS+ uses a special visual setup assistant with built-in test images for 14 different commonly known movie aspect ratios, which allows the user to easily create custom NLS+ settings for each movie aspect ratio. And of course, Envy detects these aspect ratio changes automatically, and usually instantly, and will then apply your preferred NLS+ settings automatically in any given situation.

By combining Envy's instant (or nearly so) black bar detection, Envy can be configured to fill the screen 24x7, regardless of the aspect ratio of the screen and content, and largely without you noticing as the content you are watching changes aspect ratios – such as when going to and from the movie selection screen, or even as the aspect ratio changes back and forth within the same movie.

1.3 Basic Example

In the image below is content with an aspect ratio of 16:9 shown on a 2.37 screen, as displayed without using an NLS solution. This results in vertical black bars on each side of the image, because the content has an aspect ratio narrower than the screen.

16:9 content as displayed on a 2.37 screen. Image courtesy of Spears and Munsil, "HDR Benchmark" 4K Blu-ray.

Many users, however, dislike black bars, and want to enjoy a greater sense of immersion by filling their full scope screen. To do this, the user can turn on the Envy NLS+ function, with several controls to customize the amount of stretch and how it is applied. Below is how the image looks with NLS+.

Same image and screen as shown above, except with Envy's NLS+ feature applied.

2.0 Configuring NLS+

2.1 How to Access the NLS+ Settings

In the Settings Menu there is a "Custom Zoom" menu page, where you can activate "Custom Zoom" for the current aspect ratio of the movie content. "Custom Zoom" enables you to choose how much Envy zooms the image (and in which directions), how much it stretches it, and how much (if any) non-linear strength applies. Anything you change here (and then save) is stored in the configuration, for the current video aspect ratio. This can be later accessed in the "Custom Zoom Configuration" menu, discussed next.

In the Configuration menu there is a "Custom Zoom Configuration" menu page, which offers the same settings as discussed above, but here you have the same options available for each possible video aspect ratio (14 different ones). There are special test images for each of those 14 video aspect ratios, so you do not have to search for movies that have all those aspect ratios in order to configure each one to your liking. Instead, you can just setup your preferred "Custom Zoom" configuration for each possible movie aspect ratio just by using the test images.

For easy understanding, we recommend ignoring the "Custom Zoom Configuration" page when you first experiment. Instead, simply play some 16:9 (1.77) content on a scope screen. Then in the Settings menu, open the "Custom Zoom" page and experiment with the various options. When you find the settings you like, press the Menu button to close out of the configuration screen. Then save your changes to the Base Settings (Green button), where they will then be applied automatically for that aspect ratio in the future, and available to modify (or remove) in the Custom Zoom Configuration menu.

Tip: The use of Profiles is a powerful way to apply NLS only when desired, or to apply it in different ways. For example, you may wish to apply NLS+ only when watching sports. Or you may want to apply different settings for baseball than hockey. For more information about Profiles and how to use them, see the Introduction to Profiles guide on www.madvryenvy.com.

2.2 Understanding the NLS+ Settings

The use of NLS+ is very much a matter of personal taste. Although there are no right or wrong NLS+ settings, there are techniques you can use to easily dial in NLS+ to your liking.

Next, let's look at the available NLS+ settings and talk about guidelines for configuring each.

◄ 1.77:1 ►

Active	◄ Yes ►
Left/Top Crop	◄ 15 ►
Right/Bottom Crop	◄ 15 ►
Center Stretch	◄ 0 ►
Horz NLS Area	◄ 33 ►
Horz NLS Strength	◄ 100 ►
Vert NLS Area	◄ 33 ►
Vert NLS Strength	◄ 100 ►

1. First, notice that the title bar shows the aspect ratio of the content which you are currently configuring settings for. As discussed in Section 2.1, you can configure NLS+ settings for up to 14 different aspect ratios.

    For aspect ratios in between any defined aspect ratios, Envy will automatically interpolate the differences. For example, if you have defined NLS+ settings for 2.35 and 2.40, Envy will automatically calculate and use settings for 2.39. When in the Custom Zoom settings, the adjustments apply only for the aspect ratio of the content currently being viewed and the title bar cannot be changed. When in the Custom Zoom Configuration menu, however, you can use the title bar to move from AR to AR.

2. Next is the "Active" setting, which you can toggle between Yes and No. Toggling back and forth is a good way to test your settings. You can also exit the menu and watch content, returning to the menu to make changes. Just remember to save your settings to Base before the next HDMI signal change, or the settings will revert (by design).

3. Next are the Left/Top Crop and Right/Bottom crop, which control how much zoom to apply, without adding any stretch. These controls are important because the more image area you can zoom off the screen without it bothering you, the less distortion will be required to fill the screen.

For example, usually for 16:9 content you can use "15" for these settings, without cutting off any important information from the screen. As the aspect ratio gets larger, however, less cropping may be needed to prevent cropping off important information.

Often for sports or other viewing where there are tickers at the bottom of the screen, you can significantly increase the Bottom/Right cropping to make the image much larger without cropping important a meaningful portion of the screen. This enables you to get a nice head start on filling the screen, so that less non-linear stretch is needed. We explore this in the next section of this guide.

4. Center Stretch controls how much stretch is applied globally throughout the image. If you use zero then Envy will not stretch anything inside of the section defined by the Horizontal and Vertical areas, discussed next. The Center Stretch can provide a nice compromise if you find the stretching toward the edges of the screen to be too strong or causing odd artifacts during panning. We discuss the use of this section further in the guide as well.

5. The Horizontal Area defines the right and left sections of the screen that the horizontal stretch is applied to. On-screen guides show you what portions of the screen this covers as you adjust in real-time. Similarly, the Vertical Area defines the top and bottom sections that vertical stretch is applied to.

6. The Horizontal Strength defines how much stretch is applied within the Horizontal Area. You will need to add Horizontal Strength to close the gap between the edge of the content and edge of the screen (or partway, if you prefer to use less stretch and not fill the screen completely). The amount of Horizontal Strength needed is a function of how much Cropping you have used (see #3), the aspect ratio of the content, the aspect ratio of your screen, the size of your Horizontal Area, and the amount of the Vertical Area and Vertical Strength. Don't worry – it's very intuitive when you play with the controls. Vertical Strength is the same as explained for Horizontal Strength, except for the vertical areas.

    Important Tip: Envy automatically limits the Horizontal and Vertical Strength to the maximum amount needed, if you exceed it in your settings. For example, if you only need a horizontal stretch of 25 to fill your screen horizontally, but enter a value of 100 for the strength, Envy automatically will limit the use of the strength to 25. In other words, Envy will not stretch the image beyond what is necessary to fill the screen, even if you add too much strength. Use this to your advantage! If you wish to fill the screen, we recommend using a Strength of 100 for both Horizontal and Vertical, leaving the Cropping and Areas adjustments as the only ones that need your attention. The only time not to use 100 is if you want to minimize the distortion and any artifacts by filling only part of the black bars. For instance, stretching 4:3 to 2.0, or stretching 16:9 to 2.2.

2.3 General Guidelines for Optimal NLS+ Settings

Used properly, NLS+ can provide a very enjoyable, more immersive experience, especially for those who are less sensitive to stretch and occasional artifacts that may be experienced from time to time. Note that there is no "free lunch" when it comes to stretching images with NLS+. You will likely find it necessary to tolerate some occasional artifacts in exchange for filling your screen.

If you are like most people, you will find settings that offer a balance, where there are usually no artifacts, and when there are, that they are tolerable. Some people, however, may find the artifacts distracting. In which case there are options to apply less aggressive settings to fill some, but not all, of the screen. Depending on your tolerance for NLS and the type of content you are watching, you may find it desirable to watch with the original aspect ratio, or to watch only certain types of programs, like sports, with NLS+ while watching other types like movies without it.

The following are general guidelines to help you quickly find the best NLS+ settings to suit your taste:

1. Cropping is your friend! As discussed elsewhere, the more cropping you use, the less stretch will be needed, the less distortion from stretch and artifacts there will be from NLS+. Therefore, use Left/Top and Right/ Bottom cropping to your advantage.

   Therefore, start your NLS+ configuration by finding the maximum amount of cropping you can use without feeling like you've cut off too much of the image. And if there is a ticker or other information at the bottom of the screen, which isn't of interest to you, crop that off too using Bottom/Right. We will walk through an example of this in the next section. Generally, a value of 15 for the Cropping options is a good starting point for 16:9 content. You may need to reduce this as the AR gets larger. For example, with 1.85 you may find it necessary to use 12 instead of 15, and so on.

2. Next, set the Horizontal and Vertical Areas to 33, and the Horizontal and Vertical Strength to 100. See the Tip in Section 2.1.6 for information on why a value of 100 is special. At this point your image will be zoomed and stretched to fill your screen.

3. Now it's time to evaluate your settings. If you find the image is to your liking, watch some content this way and see if it has any undesirable artifacts, such as people looking too stretched, or a warping or uneven sensation when the camera pans left/right and or up/down. It is recommended to keep the Horizontal and Vertical Strength at 100 as you try to adjust the image further, per the following steps, if necessary.

4. If you find the image looks too stretched for your liking, trying to increase the Cropping values, per Step 1. The more you Crop, the less you stretch. Of course, you will reach a point where you cannot crop any further, without cutting off important parts of the image.

5. If you still find the image is not to your liking, try increasing the Horizontal and Vertical Area. Doing so this will spread out the stretch over a wider area. This brings the stretch more toward the middle of your image, adding stretch in the area your eyes are most focused on, in exchange for a more gradual stretch through the remaining image.

6. If you feel the image is still too stretched, try increasing the Center Stretch. This adds global stretch to the image, lessening the strength that is needed toward the edges. This can greatly reduce panning artifacts and lessen distortion near the edges, but in exchange for adding some stretch in the center of the image. Remember, no free lunch…

7. If you still find after all these changes that the artifacts and distortion are not to your liking, it is possible that your settings are too aggressive. For instance, if you are trying to fill a 4:3 image to a 2.40 screen, there's no doubt you will have strong artifacts as a result. Or, if you are very sensitive to stretch and these artifacts, you may have to compromise some by using less aggressive settings and not filling your screen.

    For instance, if you cannot find settings to stretch 16:9 to 2.40, try stretching it to around 2.2, roughly cutting your black bars in half. This can go a long way toward increasing the level of immersion by going wider than 16:9, while at the same time not being distracted by the artifacts. Note that if you want to make this compromise by not filling your entire screen, you will need to reduce your Strength from 100 to something significantly lower, at which point you will see the black bars come partially back, and you can suit to taste from there.

3.0 Advanced NLS+ Example

In this example we'll use NLS+ to watch a football game at 2.37 instead of the broadcasted 16:9 aspect ratio. Please pardon the how the left/right sides of these images are slanted and how the images are a bit uneven – this is due to the camera, and not actually present on the screen. Here's our starting image.
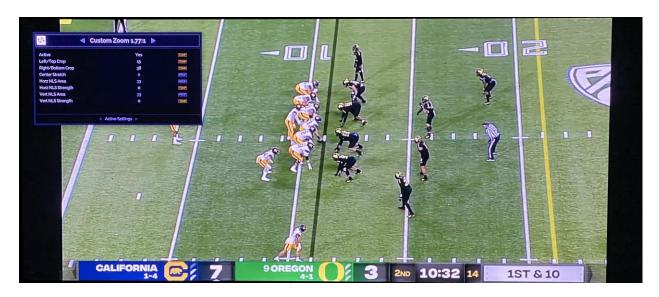
In the above image, no zoom or stretch has been applied yet. This is our starting, normal 16:9 image. First thing we do is change the Left/Top Crop to 15. Comparing this image to the one above, you can see that while some area of the top of the field is cut off, there's no real downside to this, as you can still see the yard markers just fine.

Next, let's focus on the Right/Bottom Crop adjustment. If you've been paying close attention, you'll recall that this situation is a goldmine for NLS+ adjustments. That's because it allows us to make the image significantly bigger without yet introducing any stretching. Have a look at ticker at the bottom of the screen, outlined in red. We still want to see the score, but maybe the information in the ticker is not desired, especially since removing it allows us to go bigger without introducing stretch. Let's take care of that now.

With a Right/Bottom Crop of 38, we have removed the ticker, and zoomed off roughly half the black bars, without yet introducing any stretch. Now its time to finish the job, using Horizontal and Vertical stretch.

Using our special value of 100 for Horizontal Vertical strength, you can see from the above that this finishes off the job nicely! For a quick comparison, here's the original image again, below.

4.0 Conclusion

In this guide we demonstrated how NLS+ is the only solution to use both Horizontal and Vertical stretch to fill your screen regardless of the screen and content's aspect ratio. We also covered how simple it is to set up NLS+ in just a matter of minutes. NLS+ is not for everyone, as some people prefer to watch with the original aspect ratio. However, many people prefer to watch with their screen filled, for the most engaging and immersive experience. NLS+ is yet another innovation by madVR Labs and we're thrilled to bring this exciting new feature to our Envy customers.