

## Pixel Aspect Ratio, Part 2

### Keeping your work in perspective – as well as in the right aspect ratio.

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As discussed in the previous article, digital video has a quirk that many of its formats employ “non-square” pixels. This means its pixels are supposed to be stretched or squashed by a specific amount when played back on a television or a video monitor. In contrast, computer monitors have square pixels. As a result, much digital video looks odd when viewed on a computer. Therefore, it is essential that you understand these pixel aspect ratio (PAR) issues when creating graphics. Otherwise, client logos may look out of round, and your talent may look fatter or thinner than they are in real life.

In the previous article, we dug deep into the math behind non-square pixels. To reinforce this concept, we’ll review how different video formats look on the computer, and how to correct for this. Then we’ll dive into the correct way to create additional images in companion programs such as Photoshop and Illustrator that will mix properly with your non-square video.

#### The Many Faces of Bonnie

Those who have subscribed to the Artbeats newsletter received the Lifestyles Solo clip F319-01 free in February 2007. It features a head and shoulders shot of a woman. We’ll call her Bonnie.

(By the way, the Artbeats website includes numerous “solo” clips for purchase and download that are not in their disc collections – make sure you always use their online search engine to chase down all available clips for a given subject!)

In the accompanying figures, ‘A’ shows how Bonnie looks in real life. The ‘B’ image shows how she looks in NTSC D1 or DV footage displayed on a computer – a bit wider in the face! The ‘C’ image shows the PAL version of the clip displayed on a computer – a bit thinner, by contrast. You

can imagine that if this was an image of your client (or their logo), they may be a bit disconcerted if they viewed it on your computer rather than on television.

Many programs such as Adobe After Effects and Apple Final Cut Pro have display options for “pixel aspect ratio correction” or to “display as square pixels.” These compensate for the PAR mismatch between

computer and video displays (sometimes at the cost of image quality). Even better is to view your work using a Video Preview or Video Output option through a

video card or DV converter and on a real video monitor.

As noted in Part 1, these distortions are more extreme when you work in common widescreen formats. For example, most widescreen standard

definition cameras and televisions work their magic by squeezing a 16:9 widescreen image into a normal 4:3 video frame on tape. Image ‘D’ shows Bonnie properly framed for widescreen (Artbeats clip F319-01H); ‘E’ shows what the uncorrected “anamorphic” image looks

like on a computer monitor. This issue exists in most high def formats as well: Image ‘F’ shows an HDV or HDCAM 1080-line image as displayed on a computer; image ‘G’ shows a DVCPRO-HD 1080-line image. So make a mental note: If someone looks abnormally thin on your computer, double-



Figure 1a



Figure 1e



Figure 1b



Figure 1f



Figure 1c



Figure 1g

check to see if the footage was shot in widescreen mode so that you can handle it accordingly!

The secret to handling non-square pixel digital video is to make sure the PAR tag is set correctly for each clip. In After Effects, you do this in the File > Interpret Footage > Main dialog for each clip. In Final Cut Pro, you do this in the Browser window by scrolling over to the Pixel Aspect and Anamorphic fields and right-clicking in these respective entries for each clip. Other programs will hide this vital information in other places; make sure you seek it out and verify it.

## Square Pixels and Still Images

In contrast to video, most digital still images – such as photos and scans – have square pixels. Same goes for most artwork created from scratch in programs such as Adobe Photoshop and Illustrator.

Many users get themselves in trouble when combining stills with video by thinking too hard about video frame sizes, outsmarting themselves in the process. For example, you might be tempted to think “an NTSC D1 video frame is 720x486 pixels; I should crop my photos to this size as well.” However, a program like After Effects will see that document and think “720x486 pixels; it must have non-square pixels.” As a result, the software may scale the image improperly to compensate! Another case of being too smart is when someone imports a still image and thinks “I’m working in a project with non-square pixels; I need to tag all of my sources as having non-square pixels as well” – and as a result improperly changes the interpretation of these sources from square pixels to something else.

Whenever you see a logo on television that should be a perfect circle (think AT&T globe or the center of the CBS eye) and it isn’t, it’s because the graphics person made one of these mistakes. The two rules that follow from this are:

- Don’t try to outsmart your software. Always truthfully tag the pixel aspect ratio of your sources.
- Don’t create still images at the same size as a non-square PAR video frame unless you really, really know what you’re doing.

Speaking of knowing what you’re doing: Later versions of Adobe Photoshop do have the ability to take non-square pixels into account. When creating a new file, twirl down the Advanced section to reveal the PAR options. You can also change a file’s PAR tag after the fact by using the menu item Image > Pixel Aspect Ratio. However, be warned that changing the PAR tag on a file does not re-scale an image in Photoshop CS2; it just changes the tag! To give an example: If your photo started out with square pixels, changing the PAR tag to DV will not give your photo non-square pixels – it will just give your photo an incorrect tag.

Therefore, many advise creating all of your non-video elements

using square pixels. Rather than try to match any particular size, the safest approach is create the element 25–100% larger than you need it to be; that way, you can also scale it down or reposition it as needed in your video program.

If you insist on creating an element at “video size” but with square pixels, you will want to pick a size where one of the image’s dimensions is the same as the video frame, meaning the other dimension will ultimately be scaled down to compensate for non-square video pixels.

Here is a table of common square pixel sizes:

	video frame size	preferred square pixel size
NTSC DV 4:3	720x480	720x534
NTSC D1 4:3	720x486	720x540
PAL DV & D1 4:3	720x576	768x576
NTSC DV 16:9	720x480	864x480
NTSC D1 16:9	720x486	864x486
PAL DV & D1 16:9	720x576	1024x576
HDV & HDCAM 1080	1440x1080	1920x1080
DVCPRO HD 1090	1280x1080	1920x1080
DVCPRO-HD 720	960x720	1280x720

If you create still images at these sizes, and tag them as having square pixels in a program like After Effects, After Effects will automatically adjust them to be the same size as their corresponding video frame. The exception is the NTSC 4:3 sizes; you will need to scale them down to 90% to match their respective video frames.

(By the way, scaling down an image is better than scaling up, which will soften it plus potentially introduce other unwanted artifacts. But scaling down may cause thin lines to become thinner, and possibly vibrate with field flicker when displayed on an interlaced video display. A slight amount of vertical blur will cure this.)

## Square Pixel Compositions

In most cases, we like to create our compositions and timelines using the same frame size and pixel aspect ratio as our intended output format, and then let our software do the pixel aspect conversions for us under the hood. However, there are occasions – such as working in anamorphic widescreen – where the differences between the computer display and video reality may be too large to make you feel comfortable.

If that’s the case, create your compositions using the square pixel sizes listed above. Make sure you tag these comps as using square pixels, and the software will stretch your properly-tagged sources

to fit. In the case of NTSC DV or D1, you will need to scale video assets up 111% to fit; make sure you have separated fields on any interlaced sources before doing so!

When you're done, scale down these oversized comps to the video format's correct size at the output stage – either by nesting them into a final comp set to the video size and PAR (if you're field rendering), or by scaling them down in the Output Module in After Effects (if rendering progressive). (The Output Module scaling is post-render, and you never want to scale field-rendered material in the vertical dimension; this will mess up your fields.)

## A Gotcha: Effects

There's one more good reason to work with square pixel elements, and that's effects plug-ins. Not all effects know how to compensate for non-square pixels. In many cases, this doesn't matter: For example, you don't need to know the PAR of an image to shift its hue. However, effects that have a shape associated with them – such as twirls, or even blurs – can accidentally create unintentionally distorted results if they are applied to a non-square pixel image, and don't adjust accordingly. This is a problem, for example, with radial gradients in Photoshop CS2: They end up looking like ovals and eggs rather than perfect circles.

When in doubt, run a test: Apply an effect to a non-square pixel image, then view it with pixel aspect ratio correction and see if it looks correct. If it doesn't, then use it on a square pixel version of the image instead. If you are applying an effect to a generic solid in After Effects and the result is incorrect, open its Solid Settings and set its PAR to square.

## Zooming Out

Widescreen is certainly the future of video production, whether it be corporate videos to be played back on standard definition plasma screens, or high def feature television work. Unfortunately, many widescreen formats use noticeably non-square pixels, so you will have to master this subject as you go forward. But PAR is not the only special issue widescreen has; there's also the issue of IAR – Image Aspect Ratio – and how to move your production flow from 4:3 images to 16:9. We'll discuss that in our next article.

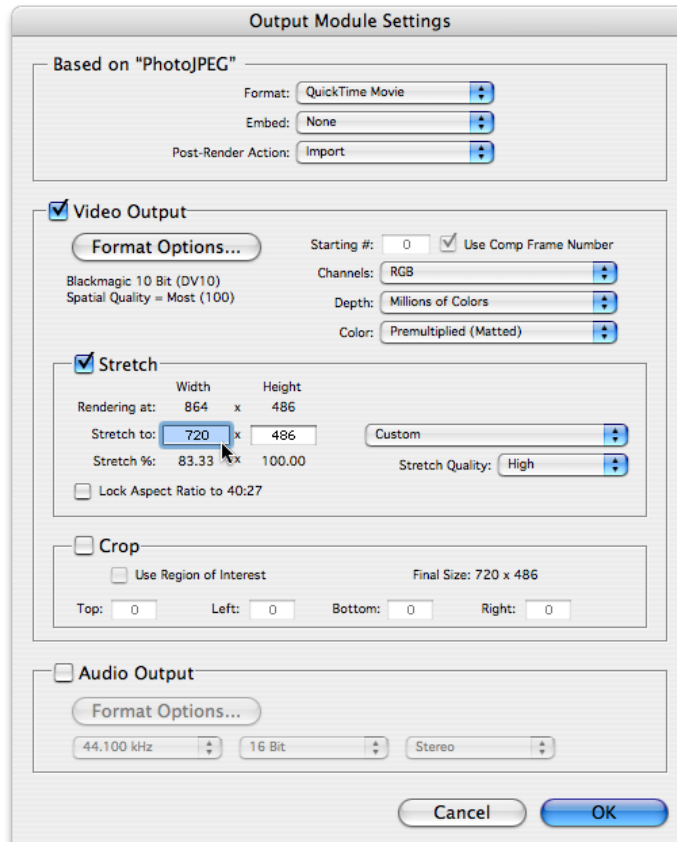


Figure 2: In After Effects, you can scale down oversized square pixel comps to the correct video format size in the Output Module. Here we are scaling a progressive standard definition widescreen comp for analog video output. (If you need to field render in Render Settings, than scale down in a final comp, not the Output Module.)

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