

Projector Resolution: Native Vs. Maximum

Look at the specifications of any projector and you will see two specifications – Native which has a lower a number and Maximum with a higher number. Why two different specifications and what is the difference, if any? The following article will give the answers in a simple, straight forward way.

When we started selling projectors for the first time some years ago, there was a whole new world of language and terms to learn. Looking back, it is easy to see that the early LCD and DLP projectors were really only data projectors. But, it was a start even though the images were in a standard 4:3 or TV aspect ratio. Since then, their have been incredible advances in technology and most importantly, picture quality. Of course, we now have a 16:9 aspect ratio available, which is essential to view any widescreen material accurately. The following information is based on criteria for projectors with a *native* 16:9 aspect ratio, although the principles are the same for those older data or projectors with a 4:3 aspect ratio.

▪ **Resolution:** However, one thing that still causes much confusion is the fact that every projector has two separate specifications for resolution: *native* and *maximum*.

For example, let us look at the current 'hot buy' on the market – The ScreenPlay 4805 DLP projector. It has an aspect ratio of 16:9, a *native* resolution of 854 x 480 pixels and a *maximum* resolution of 1024 x 768 pixels. If you do your maths correctly you will see that the *maximum* resolution here is based on a 4:3 aspect ratio! So why the two numbers?

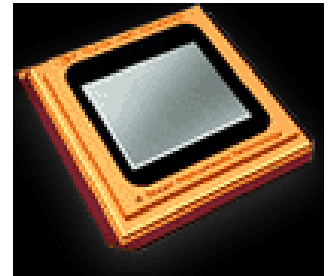
The answer is actually pretty simple. Every projector that uses a micro-display, whether they are flat panel sets, DLP or LCOS chips, has a 'fixed array' of pixels on the micro-display. In the case of our ScreenPlay 4805 this is 854 x 480 or a grand total of 409,920. This 'fixed array' of pixels is known as the *native* resolution of the projector. So, *native* resolution is the actual or 'true' physical resolution of the projector. Logically, it is not

possible for the projector to display more pixels than it has on its *native* panel or chip.

So then what is maximum resolution? To begin with, that number has nothing to do with the projector's *native* display! Rather it has to do with the signal formats that it can process. Computer and video (including TV broadcasts) signals come in a wide variety of resolution formats (576i, 1080i, 576p and 720p) and nearly every projector is programmed to 'recognise' most of those different signals, but not necessarily display them in its *native* resolution. Therefore, *maximum* resolution is the highest resolution signal that the projector has been programmed to process and display. How does it achieve this? Simple! If the input signal is higher than the *native* resolution, then the image will be re-scaled or compressed to fit in so to speak.

▪ **Scaling:** The facts are that absolutely every modern projector is built to 'scale' a wide variety of incoming signal formats into their one *native* display – up and down. All projectors will display standard digital television, they will all display DVD and many of the newer projectors will do HDTV 1080i, 576p and 720p as well – at least when they are connected to the appropriate set top box. To summarise then, if the *native* resolution **is not** equal to the incoming signal, then 'scaling' or compression will occur.

When it comes to HDTV, there are only two circumstances where scaling is not required: 1080i for a projector or television with 1920 x 1080i resolution and 720p for a projector or television with 1280 x 720p. In every other circumstance, including our ScreenPlay 4805 projector, 'scaling' will always be required – in this case down or compressed. Other than having one world standard for transmission, which will probably happen in the future, 'scaling' or converting the signal to 'fit' in is the simple answer to the problem.



Technology has progressed a long way in a very short time and 'scaling' circuitry is so good that even basic 16:9 projectors deliver amazing HDTV quality for the money, even after 'scaling' or compression. Overall, the scaling engines have gotten to be very accurate with video these days. Quite often a scaled video image looks just about as clear and crisp as it would if displayed in its own native format.

Let's now summarise different projector *native* resolutions and see how and when they 'scale'. These *native* resolutions are all based on projectors with a widescreen or 16:9 aspect ratio.

WVGA or usually "854 x 480i" - WVGA projectors are the absolute minimum resolution acceptable for a home cinema projector. Our ScreenPlay 4805 for example will have to compress every digital signal, both SD and HD to make them 'fit' in the display panel. A HD STB would be of no additional benefit.

WSVGA or usually "1,024 x 576p" - WSVGA products are high resolution, and notably more expensive than WVGA. These products are targeted for very good home cinemas and are capable of reproducing HDTV broadcasts in 576p without 'scaling'. Currently, the ABC, SBS and 7 broadcast digital in 576p. With 720p or 1080i HD broadcasts, these projectors will 'scale' or compress the signal to 'fit' the display panel. A HD STB is required.

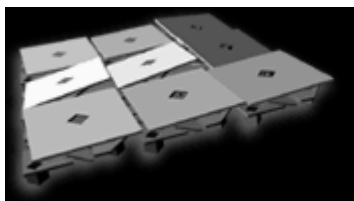
WXGA or usually "1,280 x 720p" - WXGA is for very high resolution applications that are detail or information intensive. These products are targeted for high end home cinemas and are capable of reproducing HDTV broadcasts in 720p without 'scaling'. Prices range from \$8000 to around \$30,000. Currently, no one transmits HD in 720p. A 576i or 576p broadcast will be 'scaled' or expanded, whereas a 1080i program transmitted by either Channel 9 or 10 will be 'scaled' down or compressed to 'fit' in the display panel.

It can do this because it has been programmed to do the compression from 1920 x 1080 to 1280 x 720. Therefore, if 1920 x 1080 is the highest resolution that this projector has been programmed to recognise and compress into its native display, then 1920 x 1080 is known as the *maximum* resolution of that projector. A HD STB is required.

WSXGA or usually '1920 x 1080i' – These projectors are designed for reproducing 1080i HDTV without 'scaling' or compression. They are very expensive projectors with prices going from around \$30,000 and upwards. (Quite a few cost over \$100,000) But wow, what a picture! These projectors will reproduce the 1080i HD broadcasts from Channels 9 and 10 without any scaling, but with all other standards (except 1080p*) will have to scale-up or expand the signal to fit the display panel.

■ **Summary:** The conversion of a non-native signal to a native resolution is a process of approximation. In essence, what the projector is doing is estimating what the pixel information would have been if the signal had originally been created in the projector's native resolution. In doing so, the projector cannot add new information to the original signal. The best it can hope to do is make a close approximation and hopefully not lose much picture detail the process. The quality of the scaler determines this process. So contrary to what you might hope, when for example, a WXGA projector scales or expands a television signal up from 854 x 480 to 1280 x 720, it does not add detail or sharpness.

Which brings us to a familiar point. Look at what your needs are, how far you intend to sit from the screen and what will satisfy those needs. If you are looking for perfection, then you will just have to wait...and a long, long time!



AudioTrends Retail Store

10 Argent Place, Ringwood, VIC 3134

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