

AUDIOTRENDS

L E A R N I N G C E N T R E

True HDTV - What Is It?

This is another one of those questions that does not have a simple Yes or No for an answer! Much debate and confusion abounds over what is 'true' HD. All new projectors and a lot of flat panel and DLP TV's claim to do be compatible with HDTV, but are they? What are the differences? We hope you find the following explanation on the 'number' game helpful.

Firstly, it would be good to understand that there are three common HDTV formats in use and they are referred to as 1080i, 576p and 720p. The "i" and "p" indicates whether the signal is interlaced or progressive, but more on that later. To begin with, let's look at the numbers.

The number 1080 refers to the number of horizontal lines, counted from the top to bottom of the screen, in each 'still' frame of picture. So in a 1080i signal, there are 1,080 lines per frame of picture and in a 576p or 720p signal there are 576 or 720 lines per frame. Well, that sounds like 1080i is the best? However, consider this. With an interlaced signal, all of the even numbered lines are transmitted simultaneously, followed by all of the odd numbered lines. So, only 540 lines are transmitted at one time – not 1080. With a progressive signal, all lines of the frame (576 or 720) are transmitted at once, not in an odds and evens sequence.

Now, for a HDTV signal to maintain a native 16:9 aspect ratio that matches the standard widescreen television format, it needs to have 16 pixels on each line for every 9 lines of picture in the frame. This is the same

whether the signal be either 'interlaced' or 'progressive'. Time for some maths.

Interlaced HDTV

So, a 1080i signal has 1920 pixels horizontally: $1920 \div 16 = 120$; $120 \times 9 = 1080$ and... $1080 \times 16 = 17280 \div 9 = 1920$. Occasionally, the actual resolution of the 1080i format is designated on some products as 1920 x 1080 which some say is true HD. Now that is definitely confusing to many folk!

Progressive HDTV

A 576p or 720p format signal has either 1024 or 1280 pixels on each line respectfully. So the physical resolution of the 576p format is usually referred to as 1024 x 576 and the 720p format 1280 x 720. The formula is the same as interlaced. Divide the higher number by 16 and multiply the result by 9. Now that wasn't too hard, was it?

Two Viewpoints

However, where things begin to hot up is with the definition of what constitutes true HDTV. Some people think that it is 1080i because it has the highest physical resolution, referring to 1920 x 1080 as true or 'full' HDTV, presumably to distinguish it from the 'less full' 1280 x 720. You know, the more is better argument!

Naturally, those in the 'progressive' camp find this difficult to swallow, arguing that progressive scanning produces a cleaner, higher resolution signal and that this is especially advantageous when a fast moving subject is in on screen. They argue



that a 1080i camera is really only capturing 540 lines at a time anyway – not 1080 – and that the resulting ‘fuzziness’ from the ‘interlacing’ process is a distraction to clean, crisp images.

The fact is that 1080i, 576p and 720p are all great HDTV formats so your projector, flat panel* or HD television needs to be able to display them if you want to view them. All products that state that they are HDTV compatible do in fact display these formats, but not necessarily on a 1:1 basis.



The question that needs to be addressed is..."does the projector or television need to re-scale or compress the information coming in through the HD feed to ‘fit’ the physical resolution of the projector or other video display? Usually it does. First though, it would be a good idea to re-visit the subject of resolution. All projectors, flat panel,* LCoS and DLP televisions have their own *native* resolution specification. A condensed version of this subject has been ‘lifted’ from our article “**Choosing a Big Screen Projector**” and although it uses the term projector, it applies equally to flat panel,* LCoS and DLP televisions. For more details, you can access this article from our Learning Centre Index.

Native Resolution

When speaking of a projector's resolution, it is common to refer to the term "native" resolution. If a projector's native resolution is say 854 x 480 or WVGA that means that the actual number of physical pixels on the display device is 854 multiplied by 480 or a total of 409,920 pixels.

Therefore, any HDTV signal that a projector with say a (WVGA) 854 x 480 resolution receives, whether it be 1920 x 1080i, 1280

x 720p or 1024 x 576p must re-scale or compress the input signal into the *native* resolution of 854 x 480 before feeding it to its internal display. No 854 x 480 projector can display any HDTV signal without ‘scaling’ or compressing it. A very small part of the image detail will be lost and the image will look a little fuzzy when compared to a projector with a higher *native* resolution capability. This same principle applies to all resolutions. If the input signal is higher than the *native* resolution, then the image will be re-scaled or compressed.

Higher Resolution

However, an ever growing number of new home cinema projectors have a higher *native* resolution than (WVGA) 854 x 480. Now very popular are products with either (WSGA) 1024 x 576p or for more money (WXGA) 1280 x 720p. These products can display information in their appropriate *native* resolution of 576p or 720p HDTV without the need to re-scale or compress the signal. Therefore, can we conclude that 1280 x 720p, the best available progressive signal is true HD? Some adamantly say yes, while others very determinedly take the opposite viewpoint! They argue that when a 1080i signal is fed into these projectors, the 1920 x 1080i input must be ‘scaled’ or compressed to fit into the native 1280 x 720p display and that therefore this is not ‘true’ HDTV.

Just to complete the picture, there is of course a small range of projectors with a native resolution of (WSXGA) 1920 x 1080i. These products will display 1080i without any ‘scaling’ or compression. Price is \$30,000 plus (there are several products over \$100,000!) and yet these projectors need to still reformat 720p signals, scaling them up to fit their native 1920 x 1080i resolution. Technically, then, you could say that even these units are not true HDTV when it comes to 720p format! The only answer seems to have at least two projectors – or is it?

Scaling

We have mentioned the term ‘scaling’ often through out this article and indeed in our other articles. 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. They all do standard digital television, they will all do DVD and almost all of them will do HDTV 1080i, 576p and 720p as well. When it comes to HDTV, there are only two circumstances where scaling is not required: 1080i for a projector with 1920 x 1080i resolution and 720p for a projector with 1280 x 720p. In every other circumstance, scaling is always required. Other than having one world standard for transmission, which probably will happen in the future, 'scaling' 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 the compression. And let's not forget about the size! It's a lot bigger than your old 68cm set. In conclusion we need to be honest and set priorities and getting uniformly better image quality is for most usually more desirable and beneficial to our overall viewing pleasure than the question of whether the HDTV image is scaled or not.

Price

So how much are you willing to spend on a projector? The old saying you get what you pay for is certainly appropriate here. Projectors with native (WVGA) 854 x 480 resolution cost about \$2500 which is considerably less than a projector with native (WSGA) 1280 x 720p. These are typically in the price range of \$8000 for a basic unit to around \$30,000 for something exceptional. Higher resolution has other benefits – smoother, cleaner, more film-like image and reduced pixilation.

HDTV Broadcasts

Here is another subject where there are more questions than answers! Presently, Channel 2, 7 and SBS transmit in 576p, whereas Channels 9 and 10 transmit in 1080i. The interlaced 1080i signal can look spectacular on a 1280 x 720 projector, even though the 1080i signal is compressed and not "true" 1080i. Likewise, a 720p broadcast will also be very acceptable when displayed on a 1920 x 1080i projector or appropriate television.



Digital HD Projection TV

We hope that the above information has been helpful and hopefully simplified matters in relation to HDTV.

Flat panel Television displays refers to Plasma and LCD panels. Most of these units even though they are sold as a television are based on computer industry specifications and do not usually have the same **native resolution as the projectors mentioned in the above article. This means that they all have to 'scale' the signal up or down. For example, an LCD panel which states the **native** resolution as 1280 x 768p will scale or expand a 720p program to 768p.*

AudioTrends Showroom

10 Argent Place, Ringwood, VIC 3134

Phone 9874 8233

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