

# VHS

# Aspect ratios

## Things to consider

The VHS system was developed for standard definition (SD) television in the days before widescreen and the later high definition (HD) formats.

Whilst the native VHS format has an aspect ratio of 4:3 - which uses all available picture lines and the entire screen width (equivalent to 720 x 576 pixels in the PAL digital SD format), there are essentially two ways by which other widescreen formats may be copied to VHS.

The choice of method depends on the needs of the target audience.

## 16:9 material on VHS

Productions in the 16:9 widescreen format can be copied to VHS in one of two ways.

## Letterboxing

This is the traditional way in which most feature films and widescreen TV productions are released on VHS - reducing the 16:9 material so that it fits completely into the width of the screen, inside a "letterbox" - giving a 16:9 image size of 720 x 405 pixels.

This method reduces the vertical resolution of the active image area to 405 pixels (instead of 576 pixels), but preserves the original aspect ratio. Copies made in this way may be played back normally using a VHS player and a 4:3 television or monitor.

The drawback of this method - which has become more relevant in recent years since the advent of 16:9 DVD productions and widescreen broadcasting, is that viewers using a VHS player with a 16:9 or similar widescreen format television, will have to set their screen to 4:3 to achieve the correct aspect ratio. Otherwise the picture will be too wide, resulting in "fatter" vertical subjects such as people.

The illustration on the left below shows a 4:3 letterboxed 16:9 image on a 16:9 screen set to 4:3 - which gives added black vertical bars to the left and right of the picture (shown grey here for illustration only).

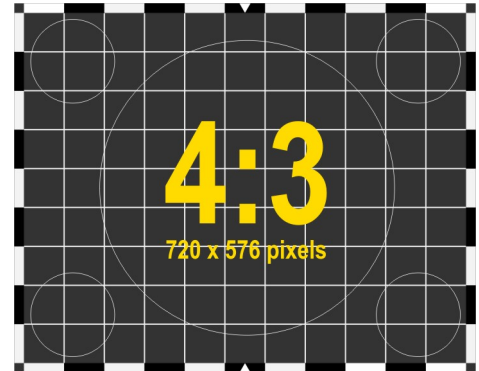


Figure 1  
Standard 4:3 aspect ratio 720x576 pixels



Figure 2  
16:9 letterboxed picture from 4:3 SD tape format on 16:9 screen set to display 4:3



Figure 3  
16:9 letterboxed picture from 4:3 SD tape format on 16:9 screen set to display 4:3



Figure 4  
16:9 letterboxed picture from 4:3 SD tape format on 16:9 screen - zoomed to fit

Most 16:9 televisions - particularly newer LCD and LED models, have the ability to zoom the 4:3 image to fill the entire screen - as shown in the right image above. The vertical resolution is lower, as the 405 vertical pixels have been re-enlarged to fill 576 pixels. Newer HD televisions and monitors have an even higher vertical resolution, but may be better at enlarging 4:3 SD material with less quality loss.

Note that not all widescreen televisions are true 16:9 format - they may be 14:10 or some other ratio, in which case the screen itself will add a black border - usually above and below - as required. This is beyond the control of the duplication facility.

## Widescreen or anamorphic VHS

An alternative is the "**Widescreen VHS**" or "**Anamorphic VHS**" method - which is essentially the same approach as that used in widescreen (16:9) standard definition broadcast production environments using formats such as Digital Betacam.

This method still uses the same 720 x 576 pixels picture area, though the monitor itself (and other widescreen compatible professional equipment) recognises the signal as a widescreen format, and adjusts the vertical height of the monitor display accordingly - to reduce the height of the active picture area to preserve a 16:9 aspect ratio.

In anticipation of this process, the originating camera and production equipment "squeezes" a wider image into the time domain of the 720 pixels wide signal - the electronic equivalent of cinematographers using an anamorphic lens to squeeze a wider picture into a standard film frame. The image height remains unaltered during recording.

This approach gives the best possible standard definition quality - in that it uses the all television lines and available screen pixels - from origination to broadcast or playback.

But there is also a drawback with this method - it requires that the end-user has a television or monitor capable of 16:9 viewing. Whilst many consumers have upgraded to widescreen LED/LCD or plasma screens - most of which are capable of "zooming" 4:3 source material such as VHS up to 16:9, there are many users who still rely on older 4:3 screens.

Some 4:3 televisions and professional monitors are able to switch between 4:3 and 16:9 aspect ratio - by adding black letterbox bars above and below the 16:9 picture, but many will display widescreen material as in the example - figure 6.

For the viewer with a traditional 4:3 standard definition television or monitor, this method will result in a picture that is too high - where all vertical objects such as people and buildings are unnaturally tall or thin.



Figure 5  
16:9 native SD widescreen tape format on 16:9 screen



Figure 6  
16:9 native widescreen SD tape format on an uncompensated 4:3 screen

## Duplication methods

From the point of view of the duplication facility - these two approaches must be handled quite differently.

The **letterbox method** requires that the duplication master is essentially a 4:3 aspect ratio master - complete with the letterbox and the programme material in the correct aspect ratio for 4:3 viewing.

If the material is delivered on a SD widescreen aspect ratio formatted videotape - such as 16:9 on Digital Betacam or Betacam SP - the material must first be converted to true 4:3 aspect ratio - otherwise the resulting picture on VHS will resemble that in figure 6 above. The same problem arises with any wider aspect ratio material letterboxed on a 16:9 SD videotape.

The best approach, especially when mastering from a wider than 16:9 aspect ratio HD or SD non-linear edit system or dubbing from a HD format, is to prepare the duplication master with the correct letterbox. If letterboxing is to be left to the duplication house, the duplication master can be produced using the full SD 576 pixels image height, so that the material only needs to be "squeezed" once. Instructions about the target aspect ratio must accompany the duplication master. Some VHS duplication facilities offer "on-th-fly" aspect ratio conversion, though since the advent of DVD this is less common. Channel 6 Television Denmark does not offer this option, occasional aspect ratio tasks are handled via digitisation and rendering to the desired target aspect ratio.

For the **widescreen or anamorphic VHS duplication method**, the process for 16:9 is simpler in that no aspect ratio conversion takes place prior to or during copying - although other aspect ratios within a 16:9 frame can still be handled via a 16:9 letterboxed duplication master copy.

The widescreen or anamorphic method is only suitable for VHS copies for users with televisions capable of switching the display aspect ratio between 4:3 and 16:9, and is therefore not recommended for VHS copies for general distribution.

## Other widescreen aspect ratios

Cinematographic aspect ratios such as 1:1.66 and 1:1.85 are sufficiently close to the 16:9 television standard that - for most situations, the material may be tele-cine scanned or edited to 16:9.

The relatively wider "Cinemascope" format, with an aspect ratio of 1:2.35 is more problematic - whilst it may be reduced in the same manner as 16:9 material, this results in a lower vertical resolution of 308 pixels for the active picture height on a SD 4:3 screen.

The choice of method for any widescreen format is essentially the same as for 16:9 - here we illustrate the two options for the 1:2.35 Cinemascope aspect ratio.



Figure 8  
1:2.35 material letterboxed to a 4:3 SD tape format viewed on an uncompensated 16:9 screen



Figure 7  
1:2.35 material letterboxed to a 4:3 SD tape format viewed on a 4:3 screen



Figure 9  
1:2.35 material letterboxed to a 4:3 SD tape format viewed on a 16:9 screen set to 4:3 mode



Figure 10  
1:2.35 material formatted in a 16:9 widescreen letterboxed SD tape format, viewed on a 16:9 screen



Figure 11  
1:2.35 material formatted in a 16:9 widescreen letterboxed SD tape format, viewed on an uncompensated 4:3 screen



channel 6 television denmark

Foerlevvej 6, Mesing,  
DK-8660 Skanderborg, Denmark  
telephone +45 86 57 22 66  
e-mail: teknik@channel6.dk  
www.channel6.dk

Unless otherwise specified by our customers, Channel 6 Television recommends letterboxing to 4:3 for all widescreen aspect ratios when copying to VHS - this approach gives the greatest compatibility with both old 4:3 and new widescreen screens.

Masters for widescreen duplication should be formatted in the 4:3 format, with the desired letterbox in place, when viewed on a 4:3 monitor. Masters supplied as SD PAL 16:9 widescreen will be digitized for aspect ratio conversion prior to duplication, for which there will be an additional charge.