

Conversion FAQs - Aspect Ratio Conversion

Introduction to Aspect Ratio Conversion

With film and TV programmes produced in an increasing number of different formats and aspect ratios, careful consideration of the method of Aspect Ratio Conversion (ARC) is essential to maintain the quality of the final output. This paper provides information on the different aspect ratios used in broadcast production and distribution, and describes options for video aspect ratio conversion using FrameFormer from InSync Technology.

Aspect Ratio Conversion, where the aspect ratio of a film or TV production is altered to suit the user's display, is a well-known concept; originally used to convert movies shot in wide-screen formats for viewing on 4:3 TVs, or later to convert material shot 4:3 to be viewed on 16:9 displays.



Figure 1: Example content shot at 2.35:1 and aspect ratios which may be derived from it

Figure 1 shows an image typically shot on film or UHD with an aspect ratio of 2.35:1. The superimposed lines represent the cropping of the picture to three different aspect ratios – **1.85:1** an alternative film production format, **16:9** the standard for HD display and **4:3** originally used for film and most widely used for SD programmes (and still a requirement for some displays in airline entertainment systems).

Pixel, Storage and Display Aspect Ratios (PAR, SAR and DAR)

The aspect ratio most often referred to is Display Aspect Ratio (DAR). DAR is the ratio of the width to the height of the display; examples being 4:3 and 16:9. When film or video material is recorded as a file, it may be stored at a different ratio, known as the Storage Aspect Ratio or SAR. For example, for video shot at 1280x720 pixels, the SAR is 16:9. Similarly with 1920x1080 the display and storage aspect ratios are the same i.e. SAR = DAR. Many HD storage formats such as DNxHD, AVC HD, and ProRes 422 store HD video as 16:9 such that SAR=DAR ("square pixels"). However there are a number of frame sizes for which the SAR is not the same as the DAR. These are known as anamorphic frame sizes. Examples include 1440x1080 and 1280x1080. In these cases, a third type of aspect ratio, Pixel Aspect Ratio (PAR), is defined. The relationship between the three ratios is

$$\text{DAR} = \text{SAR} \times \text{PAR}$$

For HD storage formats, such as ProRes 422, which store HD video in their native frame size, the display aspect ratio is the same as that for storage, i.e. SAR = DAR so the Pixel Aspect Ratio is 1:1. Other formats, e.g. DVCPRO-HD, which do not store video in native 16:9 format, may store video in formats such as 1280x1080 or 1440x1080. These formats therefore use non square pixels e.g. a PAR of 4:3. In this case, in order to display this 'anamorphic' material correctly, pixel aspect indicator flags in the metadata are used to adjust the picture data to achieve the correct DAR.

Options for Aspect Ratio Conversion

A typical movie mastered at UHD resolutions (or above) needs downconverting to HD for typical TV transmission. If the movie master is not 16:9 then ARC is additionally required. Conversion to 16:9 from common film aspect ratios 1.85:1 and 2.35:1 for TV transmission may be achieved by cropping, as illustrated in Figure 1 above, but this removes content from the image.

An alternative presentation may be via addition of black bands ("letterboxing") to preserve the entire original content see Figure 2, but this may not be suitable for small screen displays (e.g. airline seat-back screens or mobile phones) where the picture height would become quite small.

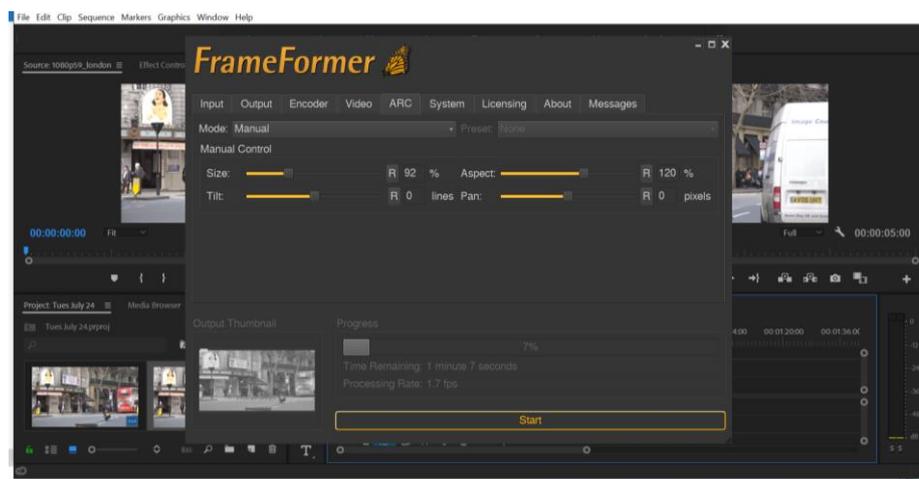
Although letterboxing maintains the original artistic intent of the director, some viewers find the black bands objectionable and prefer to watch a full screen presentation. Therefore a third option is to pan and scan the material, or select segments which can be zoomed out, to produce a full screen presentation.



Figure 2: Example 2.35:1 image letterboxed for display on a 16:9 screen

FrameFormer from InSync Technology

FrameFormer, InSync's motion compensated standards conversion solution, offers sophisticated custom aspect ratio controls in the Professional Edition, making it a valuable tool for all repurposing applications. Users can control the output picture size and aspect ratio to meet the required display characteristics. In addition, time-saving presets are available for common ARCs.



FrameFormer is available as a plug-in for popular edit software such as Final Cut Pro X or Adobe Premiere Pro, or can be customised for integration into your bespoke workflow.

Visit www.frameformer.com for more information or contact InSync: enquiries@insync.tv