



Preparing Subtitles for High Definition, and subtitle presentation in HD

Introduction

With the introduction of HD transmissions by many broadcasters, questions arise about the preparation of subtitle files specifically for HD, and about how subtitles should be presented for HD.

Subtitle presentation will be covered first, and then the relationship with existing SD files and SD preparation systems will be explored.

Finally, subtitle presentation on SD versions of HD channels will be touched on, noting that this can affect subtitle preparation decisions.

Scope

This white paper will try to answer some of the more common questions about subtitle presentation, subtitle files and HD transmission, whilst retaining focus on real-world scenarios and the impact of HD on existing workflows and equipment.

Important aspects covered are font, size, position, use of media, and presentation style.

This paper is limited to Burnt-In or DVB Bitmap subtitling in HD, where the broadcaster has full control over subtitle position and style. Teletext and Closed Captions are largely limited to the same capabilities as in SD.

This paper will cover the use of existing SD focused preparation equipment for the preparation and QC of subtitles for HD



Subtitle Presentation in HD

Subtitle presentation includes the choice of font, style, size, aspect ratio and position. The information presented here is the result of detailed discussions and analysis with a number of broadcasters. Although 1920 x 1080 (1080i) is specifically discussed, the same principles can be applied to other HD resolutions.

Font Style:

The parameters for choosing font style are not greatly affected by the move from SD to HD. It is true that in HD, a more complex font style can be used as the characters can be of a larger in terms of the number of pixels, and so more detail can be displayed, however the overriding driver in font choice should always be readability. Subtitles are for conveying information, preferably in a style which is unobtrusive to the viewer.

Font Size:

The choice of font size is a compromise between readability and the picture area covered. In consultation with broadcasters running 1920x1080 signals, the current thought is that the HD font should be about 80% of the relative size of the SD variety. This is based on the assumption that HD sets are generally larger than SD sets, and the fact that as the resolution is higher so the character quality is higher and so easier to read.

As a starting point the following guide can be used.

If a 28 scan line high font is in use on a PAL SD service then the following font sizes should be used on an HD service:

For 720p the scaling factor is $720/576 * 80\% = 1$ – so the same 28 line font is suitable for a 720p service.

For 1080i the scaling factor is $1080/576 * 80\% = 1.5$ – so a 42 line font should be used for a 1080i service.

However font size is a very subjective issue and adjustments may be required once the subtitles are viewed on typical receivers.



Subtitle Position:

Horizontal position: HD is always has a 16:9 aspect ratio. Although the picture is wider, the viewer's focus is effectively on the centre 4:3 section of the screen. The recommendation here is to restrict the subtitles to the centre 4:3 region of the screen to limit the amount of focus deviation from the centre of the screen when reading the subtitles. In theory subtitles with line lengths of up to 80 characters can be displayed in HD but very long lines are difficult to read and distract the viewer's focus from the program content. Long line lengths will also have implications if HD signals are down converted to SD, see below.

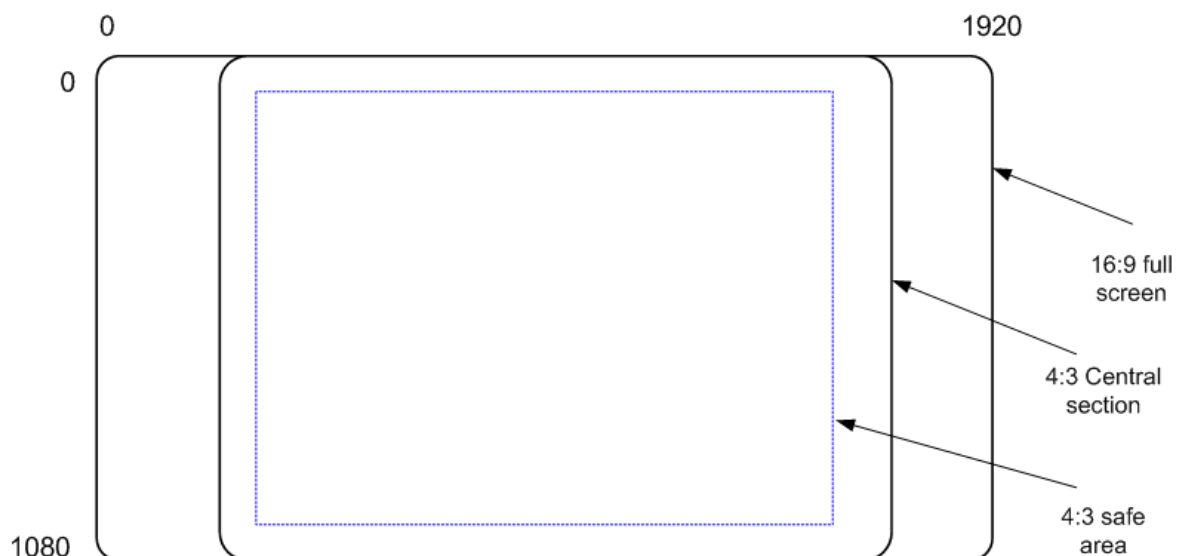
Vertical position: HD sets generally have a larger safe area, and so the subtitles can be closer relative to the bottom of the video than in SD.

Font Aspect ratio:

For SD, many fonts are condensed horizontally to fit more onto the screen. With the decrease in the relative size to 80% whilst retaining the use of a 4:3 'page' for subtitling, the HD varieties could be uncondensed or less condensed, whilst still being able to display the same or a slightly greater amount of information.

Subtitle Style:

The requirements in terms of presentation style for fonts in HD differ little from the SD domain. HD does give higher quality images (and higher quality is expected by the audience), so the overall quality of the subtitles will be a notable aspect of perceived channel quality. When using outline or drop shadow fonts, the thickness of the outline should be larger relative to SD to retain the same look and feel of the SD varieties.





Technical calculations:

Here we will work through some examples in terms of font size and positions.

For a broadcaster who runs a font with 30 lines in an upper case character in PAL SD, the equivalent HD font size for 1920x1080 would be:

$30 * 1080 / 576 * 80\% = 45$ lines in an upper case character.

The centre 4:3 of a 1920 x 1080 screen is:

$(1920 / (16 / 9)) * (4 / 3) = 1440$ pixels wide

Hence this regions starts at $(1920 - 1440) / 2 = 240$

(example Polistream positions (relative to edges) would be Left:240, Centre:0, Right:240, Bottom Line:50, equivalent to absolute positions of 240, 960, 1680)

If the original aspect ratio of the font is retained, then you may expect to fit 25% more characters on a line in the HD font, but first consider the implications highlighted in the 'Subtitling a down-converted HD channel' section below.



Subtitle Preparation with HD

The question 'can we use our existing SD files for HD transmission?' has been asked many times. Referring to the presentation recommendations above, it is noted that in HD slightly more information can be displayed. This means that files prepared in the equivalent SD font are suitable for reuse in an HD environment. So by using an anamorphic conversion of HD material to SD unmodified SD preparation equipment can still be used.

i.e. for 'normal' preparation of files for HD, where the exact horizontal and vertical position are less important than the text and timing content, standard preparation practice does not need to change.

In cases where the position and style is more important, e.g. in a QC environment, the existing SD preparation equipment can be used with some minor configuration changes to ensure that subtitle characters appear at the correct position in the video.

Preparing HD media for use in subtitle production

In the simplest scenario, the original HD material can be down-converted to anamorphic SD with VITC timecode, and dealt with using the broadcaster's existing subtitle workflows and equipment.

Newer scenarios involve the direct generation of browse material from the HD media (e.g. WM9 with timecode), and the use of this browse copy in compatible preparation equipment, or even the direct use of the high res HD in the preparation equipment (although this implies high processor and possibly network loading).

Implications of using existing unmodified SD preparation workstations

As most subtitles are one or two lines at the bottom of the screen, it is rare for positional information to be highly important at the point of translation and timing, where most effort is required in the subtitling process. Since the font size for HD supports roughly the same number of characters per line (or slightly more), there is no risk of the subtitles from an SD workstation causing technical problems later in the chain. Therefore the majority of the subtitling workflow remains unchanged, with a final adjustment/QC occurring if required.



Implications of using existing SD preparation workstation to QC HD files

A suitably adjusted SD workstation can be used to QC HD subtitle material.

In order to accurately portray the HD subtitles, the SD workstation may be loaded with a suitably created font, which represents the HD font size, but with SD dimensions. I.e. so that characters on the preparation display would be positioned as if the subtitled HD material were down-converted to SD anamorphic.

To create this font, the original HD font is scaled in the same way as the HD down-converter scales - by 720/1920 horizontally, and 576/1080 vertically. This is effectively represented by a font scaled vertically by 0.53, and with an aspect ratio modified to 0.71 of the original.

e.g. for our 45 line font above, to make a font suitable for reproduction of the HD positions, you would create a font of 23 lines in an upper case character, and with an aspect ratio modification of 0.71. When this font is used on the preparation workstation, the characters would be the same size relative to the anamorphic video as the HD font relative to the HD video.

Positions on the workstation need to be adjusted to position the subtitles at their relative HD positions.

The workstation needs to be adjusted to:

$$X_{WS} = X_{HD} * 720/1920$$

$$Y_{WS} = Y_{HD} * 576/1080.$$

i.e. If the HD position settings were:

240, 960, 1680, bottom line 1030

then the workstation values would need to be:

90, 360, 630, bottom line 550.

With the font and positions adjusted, the HD material and subtitles may be correctly displayed, edited and QCed on an existing subtitle workstation.



Subtitling a down-converted HD channel

Possibly a more important questions in the near future will be 'how do I subtitle my HD channel in a way that is suitable for a down-converted SD broadcast or re-broadcast'. The focus of many broadcasters is on the HD aspects of their new channel, but undoubtedly these channels will appear in SD form, either converted at headends which have no HD support, or for DTH broadcast to consumers who only have SD capable STBs.

It should be noted that the subtitles inserted into the HD signal are not normally directly suitable for SD versions of the channel without compromising on the perceived quality of the HD channel. Although the source files can be the same (with a little care - and hence this should be considered from the start), the actual rendered subtitles benefit greatly from being tuned to the output format.

In the case of burnt in subtitles, it would be advisable to have separate subtitle inserters for the HD and SD versions of the channel. These inserters would use different fonts and positions to present the subtitles in a suitable way for each format.

In the case of DVB Bitmap subtitles, two streams may be produced; one for HD and one for SD. This gives far better results, including options for re-multiplexing the SD DVB Bitmap stream into down-converted SD streams in a downstream head-end.

Summary

- **HD subtitle preparation is not significantly different from SD.**
- **You don't need to have HD video on the workstation to create subtitles for HD.**
- **Use a font of about 80% the real size of the font used for SD.**
- **Keep subtitles within the 4:3 center section of the HD Screen.**
- **Subtitle lines can be longer but don't go above about 125% of the size used for SD**
- **Keep in mind that the video may get resized at some point in the transmission.**