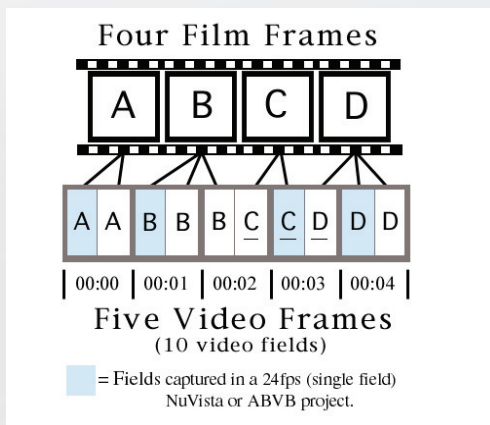


2-3 Pulldown Explained

An NTSC video image consists of 525 horizontal lines of information. The electron gun scans top to bottom, left to right, odd numbered lines first, then the even numbered lines. Each full scan of even numbered lines, or odd numbered lines constitutes a "field". Each field scan takes 1/60th of a second, therefore a whole frame is scanned each 1/30th of a second. (literally 29.97 frames per second).

Film is generally shot and projected at 24 frames per second (fps), so when film frames are converted to NTSC video, the rate must be modified to play at 29.97 fps. During the telecine process, twelve (12) fields are added to each 24 frames of film (12 fields = 6 frames) so the same images that made up 24 frames of film then comprise 30 frames of video. Video plays at a speed of 29.97 fps so the film actually runs at 23.976 fps when transferred to video. In the end, what was running at 23.976 fps is running at 29.97 fps.

The first frame of video contains two fields of the 1st (A) frame of film.
 The second frame of video contains two fields of the 2nd (B) frame of film.
 The third frame of video contains one field of the 2nd (B) and 3rd (C) frames of film.
 The fourth frame of video contains one field of the 3rd (C) and 4th (D) frames of film.
 The fifth frame of video contains two fields of the 4th (D) frame of film.



The graphics above shows how four frames of film become five frames of video; repeat that process six times and 24 frames of film become 30 frames of video. (Technically, 23.976 frames of film become 29.97 frames of video, but it is easier to speak in whole numbers.) What is described above is exactly the same as if playing a tape machine at 23.98 fps with a frame rate converter capable of inserting a 3:2 sequence giving 29.976 fps.