2:3 Pulldown Explained

Now that we are working on a project that we need to finish up on film, we are working in a 24 frame environment/project. This introduces the issue of the pulldown, which is introduced in the telecine process.

Basically, the issue is this – film is shot on 24 frames per second and is projected at 24 fps. Video, which is what you need in order to get the footage into your Avid, runs at 30 frames per second. So, anything which is shot in 24fps needs to have 6 frames added each second in order to get put onto the video, and they need to be added in a way that isn’t noticeable to an audience.

The way in which this is done is by taking advantage of the fact that each video frame is actually made up of two separately scanned fields. By alternating the telecine so alternating frames are telecined to two and then three fields (adding one additional field for each pair of frames) we cleverly turn four film frames into six video frames. This works out to the additional six frames per second. The diagram below shows this better than I can explain it.

A digital non-linear editing machine, at this point in time, digitizes only one of each pair of fields to save hard drive space. NLEs that digitize the first, or odd numbered fields, are said to have Upper Field Dominance. Those that digitize
the second, or even numbered, fields (like the Avid DV and Meridian board based systems, like the Adrenaline) are said to have *Lower Field Dominance*.

That means that, on projection, the Avid (in a 30 frame project) would show the following fields – A2, B2, C1, D1, D3 (the next time you do a 30 frame project step through it frame and frame and you can see this happen, if the footage has burned-in time code). Note that this duplicates one of the film frames. If we cut in the 30fps mode some of the cuts would be on these *phantom frames*, frames which don't really exist on the film. This could create big problems when we went to match back the film for its completion.

The Avid's (and other) solution is to have a special 24 frame mode (called 24p in the Adrenaline) in which the machine will know – if it's been given the proper information – throw away the extra phantom frame so you will never make an edit on one of those non-existent frames.

Industry standard is to start each edit in the telecine session on an “A” frame with a time code that has a frame number of a multiple of five. For instance, at the time code 1:03:12:05 or 16:27:53:10. In that way, whichever system is doing the translation from 30 frame video to 24 frame film will be able to know exactly which frames to throw away.

Got it?