

Managing Interlaced Footage

by Chris & Trish Meyer, CyberMotion

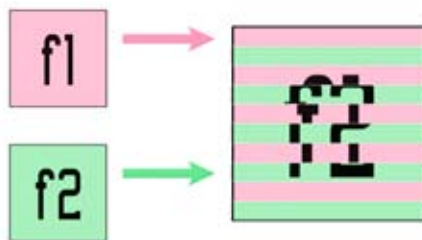
Keeping track of field order as you move between formats.

Most of the clips in the Artbeats stock footage library - be they captured on film, by a high definition video camera, or rendered from a computer - are delivered using the *progressive* scan format, which means each frame contains a whole image captured or created at one moment in time. This format makes it very easy to use and repurpose clips to other formats. Artbeats also offers V-Line collections which are primarily captured using standard definition video cameras, often employing an *interlaced* format where two individual fields are woven together to create a frame. In most cases, they are fine as is - but as you move between formats, situations will arise where you have to carefully manage those source fields. In this article, we'll cover the basics of fields and interlacing, then move onto how to correctly perform translations between similar formats.

A Matter of Timing

As hinted above, frames in interlaced clips contain two separate images - known as *fields* - that were taken at different points in time. Pairs of fields are combined into a frame by alternately taking a line from one field, then a line from the second field, then another line from the first field, and so forth until you reach the bottom of the final frame. When the first line comes from the field that was captured earlier in time, it is referred to as *upper field first* footage. When the first line of the resulting frame comes from the later field, it is referred to as *lower field first*. The result is known as the *field order* of the clip; you may also hear this (incorrectly) referred to as its *field dominance*.

Figure 1: An interlaced video frame consists of a pair of fields - each captured at a different point in time - which are woven together to create the final frame.



It is very important to know a clip's field order, and to keep it straight when it comes time to process or play back the clip: If you play the fields out of order, the result will be seriously staggered motion. When using an interlaced clip in a motion graphics program, you almost always want to separate the fields. Otherwise, you run the

risk of combining pixels from two different points in time, which can also cause serious motion artifacts. (You may also need to set one of the fields aside when preparing video for the web - we'll cover this subject in the next Tips N Tricks article, to be published January 2008.)

Most motion graphics and video editing programs have a way for you to set the field order for each clip. They usually set it for you ahead of time, but it is good to verify these settings. In Adobe After Effects, select the source footage and open File > Interpret Footage > Main and set the Separate Fields popup. In Apple Motion, open the Project panel and select the footage under the Media tab; then in the Inspector panel select the Media tab and look for the Field Order popup. Separating fields will effectively double the frame rate of your footage, as each field will be treated as its own mini-frame. Your software will fill out these sub-frames by interpolating the "missing" lines formerly contributed by the other field.

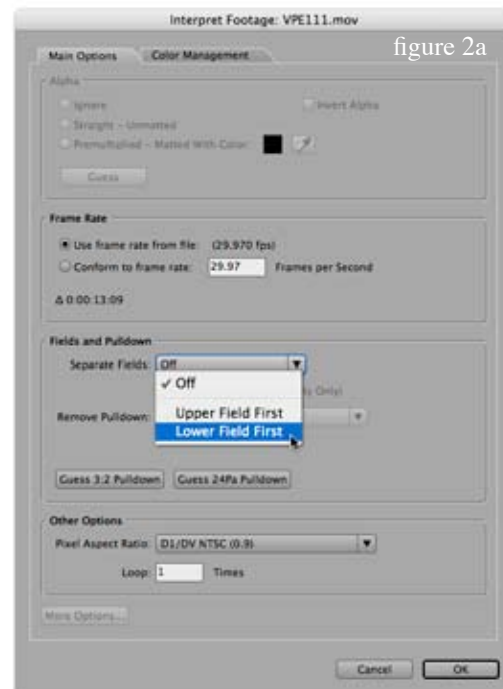


Figure 2: To verify or change the field order for a clip in After Effects, select it in the Project panel and open File > Interpret Footage > Main (a). In Motion (b), select the clip under the Project > Media tab and then set the field order under the Inspector > Media tab.



Determining Field Order

The field order is clearly defined for several video formats; it is not so clear for others. DV is always lower field first, whether it employs the NTSC or the PAL video standard. If high definition footage was shot with fields (note that a lot of it is shot using progressive scan mode), all but the rarest experimental formats will be upper field first. Professional D1-format PAL footage is also upper field first (the opposite of PAL DV!). Professional D1-format NTSC footage is often - but not always - lower field first. Making life even more interesting, D1 NTSC footage has a different number of lines than DV NTSC footage (486 versus 480). As a result, you can get into trouble when moving between PAL D1 and DV, between NTSC D1 and DV, and even between different NTSC D1 formats. But once you identify what field orders you have and need, you can translate between them.

If you don't know the field order of a particular clip, first view it before fields have been separated in an application such as Apple QuickTime Player. Look for the tell-tale "comb teeth" pattern where alternating lines seem to be offset from each other whenever an object is moving in the frame. If you don't see these artifacts, then the clip is probably progressive scan, and you don't need to worry about fields.



Figure 3: The "comb teeth" pattern around the moving penguin on the right tells us this clip is interlaced. Note that since the penguin on the left is not moving, we don't see the comb teeth pattern; you need motion to actually determine if a clip is progressive or interlaced. Clip VPE111 from the Artbeats Penguins V-Line collection.

If you do see the offset lines of this comb teeth pattern, you then need to determine the field order. This may require some trial and error. For example, in Adobe After Effects select the clip in the Project panel, select File > Interpret Footage > File, and make an initial guess for the Separate Fields popup. Close the Interpret Footage dialog, hold down Option on Mac (Alt on Windows), and double-click the clip to open it in its Footage panel, which shows it after it has been processed using the settings in the Interpret Footage panel. Then press Page Down to step through each field of the footage. If

moving objects seem to animate in a smooth, predictable fashion from frame to frame, you guessed correctly. If moving objects seem to stagger back and forth, you guessed wrong. No problem; just go back into Interpret Footage and choose the other option for the field order. You can perform a similar test in other programs such as Motion.

If some fields appear to be progressive while others appear to be interlaced, you have footage that was saved using *pull-down* - a common technique used to bring film-originated footage up to a video rate. In this case, you want to undo the effects of pull-down to get back to the original source frames. For more details, read the earlier Tips N Tricks article we wrote on this subject: *Getting Down with Pull-down* (<http://www.artbeats.com/community/article.php?id=77>).

Fortunately, Artbeats carefully labels all of their clips. You can determine a clip's format by finding the clip in question on their web site, clicking on the "i" (More Information) icon next to it, and looking



Figure 4: If you are using an Artbeats clip, find it on the web site, click its "i" icon (a), and look at the Field Rendering section (b) to quickly determine if it is progressive, interlaced, or has pull-down.

Clip VPE111

Price: \$199 [Buy Clip](#) [Back to Search Results](#)



Title:	VPE111 (Penguins 111)
Collection:	Penguins (V-Line)
Category:	Animals
Collection Code:	VPE
Seamless Looping:	No
Matte Provided:	No
Includes Sound:	No
Downloadable:	Yes
Source:	Mini DV Tape
Standards Available:	NTSC
Length:	13:09
Number of Frames:	399
Frame Rate:	30
Field Rendering:	Interlaced
File Size:	46.8 MB

Short Description: Close view of two penguins

Long Description: Seen in a close-up view of their upper bodies, two adult king penguins stand together in the Antarctic sunshine with the colony behind them. One at a time three other penguins pass by in front of them. A grassy meadow and vertical rock wall are in the background.

Keywords: Antarctic, Antarctica, South Pole, aquatic bird, aquatic birds, bird, birds, flightless bird, flightless birds, king penguin, king penguins, penguin, penguins, polar, polar region, polar regions, sea bird, seabird, seabirds, wildlife

at the Field Rendering specification for that clip; if you have one of their packaged collections, look at the Specifications section at the end of the printed card of thumbnails. If it says the Field Rendering is Progressive, the frames are not interlaced - you don't need to separate the fields (indeed, you shouldn't), and you won't have any problems moving between formats. If it says Interlaced, then you need to separate the fields.

Accurate Translation

The reason for learning these technical details is to better prepare you for occasions when you may need to change the field order of footage, or convert footage between similar formats. To ensure the sharpest, most in-focus results and to avoid potential motion artifacts, you need to make sure the pixels in each field of your sources are placed on the correct lines in your composition for output.

For example, interlaced NTSC DV clips are 480 lines tall and lower field first; most interlaced NTSC D1 clips are 486 lines and lower field first. If you want to take an interlaced Artbeats V-Line D1 NTSC clip and use it full-frame in a DV timeline or composition, you may be tempted to just center it in the final frame, chopping 3 lines off the top and bottom. However, remember that fields come in pairs! Cutting an odd number of lines means you threw away one member of a pair and kept the other, which will reverse the effective field order of the clip. If you remembered to separate the clip's fields on input, the result would be a softer image (as the "wrong" interpolated input field would be used for each line of output); if you didn't separate fields, the result would be staggered motion. Even worse would be scaling a 486 line clip to fill a 480 line frame or vice versa: You may combine lines that originated in different points in time, causing other motion artifacts.

Therefore, to maximize quality when using an NTSC D1 clip full-frame in an NTSC DV composition, you want to remove 4 lines from the top and 2 lines from the bottom; you can accomplish this by offsetting it up 1 line (1 pixel in the Y dimension). When using an NTSC DV clip in an NTSC D1 composition, you want to add 4 lines to the top and 2 lines to the bottom; this is done by offsetting it down 1 line.

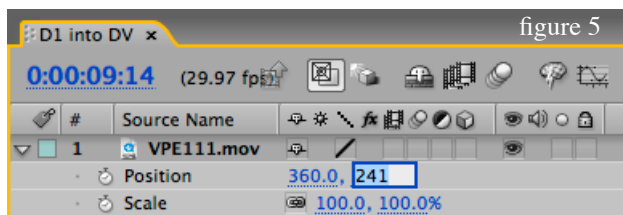


Figure 5: To best place a lower field first NTSC D1 clip with 486 lines into a 480-line DV composition, move it down 1 pixel in the Y dimension. Don't scale it to fit!!!

Some NTSC D1 video cards - such as the old Aurora Igniter - are upper field first. To best play a full-frame interlaced Artbeats V-Line D1 NTSC clip through a card such as the Igniter, move it up one line to realign the fields. If you need to use upper field first NTSC D1 footage with other lower field first footage, move the upper field first clip down a line.

PAL DV and D1 has a similar issue: These two formats have the same number of lines, but their field orders are different. To use a PAL D1 clip full-frame in a PAL DV composition, move it up one line; to use a PAL DV clip in a PAL D1 composition, move it down one line.

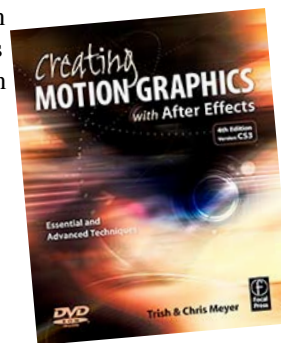
Zooming Out

Dealing with the technical details surrounding digital video is never fun, especially since you quite often will find more than one "standard" for each general format you need to use. However, ignoring these issues can cause problems that will make you look bad - so it's good to understand them, and to solve them as soon as possible.

If you want more even information on the subjects of interlacing and pulldown, we've created a pair of in-depth online training modules on these subjects; they are available to www.lynda.com subscribers or for individual purchase and download. For more details, peruse our web site: <http://www.articles.cybmotion.com>.

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Chris and Trish Meyer are the founders and owners of CyberMotion (www.cybmotion.com), an award-winning motion graphics studio in Los Angeles that has created a wide variety of work for film, broadcast, corporate events, and special venues. They were one of the original development sites for *After Effects*, wrote the highly-acclaimed books *Creating Motion Graphics* and *After Effects Apprentice* (2007), and are long-time Artbeats users.



For even more tips and tricks, Chris and Trish Meyer have just released the fourth edition of their book *Creating Motion Graphics with After Effects*. Most of the examples use Artbeats footage at full D1 size. To learn more, visit: <http://www.books.cybmotion.com>.