Get a Lock on HD Timecode

by G. John Garrett, CAS

Mickey Mantle once asked Yogi Berra if he knew the time. Yogi replied as only he could: "You mean right now?" Sometimes I feel like that kind of exchange is happening when doing double-system HD recordings, and a recent problem job was the genesis for this installment of the tech column. I thought I had the right SMPTE timecode rate worked out for our job but called the editor on the day of the shoot just to make sure. He convinced me to change rates, but in the end, he was incorrect and had to ingest about six hours' worth of material X 2 cameras in three-minute increments, edit five frames out of the stream, back up, rinse and repeat. Thank goodness we figured out the problem and where we went wrong, and nobody was upset with the sound mixer!

With that in mind I spent a little time with Zbigniew "Zbyszek" Twarog, chief engineer at Rule Broadcast here in Boston, and we talked about how different HD cameras record different frame rates, and which SMPTE timecode works with which. We did this with three popular HD cameras: the Sony F900, the Panasonic Varicam and the Panasonic HDX900. Rule has HD XDCams as well, but the timecode question is still something of a mystery with that camera, as in-house models were showing some TC errors at the time of this article and we haven't figured them out just yet. The following chart is for shooting and finishing on tape, sending timecode from the sound mixer or jamming external TC generators.

Timecode at 29.97 is often available in DF or NDF but most HD production is done with NonDrop timecode. This is largely because in 24p, NDF timecode is the only option, and if the camera changes from 24p to 30p or 59.94i, for instance, it's not practical to change.

It seems that the Sony F900 may be a little trickier than the Panasonic cameras, insomuch as there really are different frame rates, where the Panasonic does image processing for a particular frame rate but the output to the deck is usually 29.97fps compatible. If you're still scratching your head, you're not alone. I'm going to make a laminated version of the table (right) for my own sound kit! •

Frames/Second Progressive (p)/ Interlaced(i) Frame size	Sony F900	Varicam	HDX900
23.98p 1920x1080 or 1280x720	23.98 Camera Frame Freq. set to 23.98PsF	29.97 (Camera System Freq. set to 59.94Hz)	29.97 ** Camera Mode 720/24P (Camera System Mode set to 720-59.94P or Camera Mode 1080i/24P or 1080i/24PA (Camera System Mode set to 1080-59.94i)
24p 1920x1080 or 1280x720	24 Camera Frame Freq. set to 24PsF	30 (Camera System Freq. set to 60Hz)	N/A
25p 1920x1080 or 1280x720	25	29.97 Camera Frame Rate** 25p (Camera System Freq. set to 59.94Hz)	29.97 Camera Mode 25P (Camera System Mode set to 720-50P)
29.97p 1920x1080 or 1280x720	29.97 Camera Frame Freq. set to 29.97PsF	29.97 ** Camera Frame Rate 30p (Camera System Freq. set to 59.94Hz)	29.97 ** Camera Mode 30P (Camera System Mode set to 720-59.94P) or Camera Mode 30P (Camera System Mode set to 1080-59.94i)
30p 1920x1080 or 1280x720	30 * Camera Frame Freq. set to 30PsF	30 & Camera Frame Rate 30p (Camera System Freq. set to 60)	N/A
50i 1920x1080	25 Camera Frame Freq. set to 50i	N/A	25 Camera Mode 50i (Camera System Mode set to 1080-50i)
59.94i 1920x1080	29.97 Camera Frame Freq. set to 59.94i	N/A	29.97 ** Camera Mode 60i (Camera System Mode set to 1080-59.94i)
60i 1920x1080	30 Camera Frame Freq. set to 60i	N/A	N/A
59.94p 1280x720	N/A	29.97	29.97 (Camera System Mode set to 720-59.94P)
60p 1280x720	N/A	30 Camera Frame Rate 60p (Camera System Freq. set to 60)	N/A
50p 1280x720	N/A	N/A	25 Camera Mode 50P (Camera System Mode set to 720-50P)

***Early F900s, up to and including the F900/3 did an actual 30- and 60-frame recording, for which 30fps SMPTE TC is indicated. The F900R and beyond make recordings that are called 30 and 60 frames, but are actually 29.97 and 59.94, for which 29.97 SMPTE TC is indicated. Confused yet?**

**** These frame rates have more to do with how the camera processes the image than any actual frame rate; Panasonic cameras want 29.97 timecode in almost every situation. The Varicam in 720/60 system frequency mode makes/takes 30fps timecode, and in HDX900 the 50-frame and 25-frame modes (1080-50i and 720-50P system frequency mode) take 25-frame timecode. The HDX900 60/30/24 frame rates (1080-59.94i and 720-60P system frequency mode) all use 29.97 timecode. This accounts for the distinction between camera mode and camera systme mode in the chart.**