Film recording machines that go 'bing'

By
JAMES D. TOCHER
Owner/Cinematographer
Digital Film Group
(www.digitalfilmgroup.com)
Vancouver,BC
james@digitatfilmgroup.net

There is a seemingly backward step of our evolution away from the promised land of the pure digital pathway that is gaining a surprising amount of attention these days. Why is this mysterious methodology drawing such a curious crowd of geeks and freaks? Well, if you believe the recent hype of the digital intermediate (01) process you might want to know more.

Digital mastering for a feature film usually implies an output to film. This potential is causing more post people than ever to wonder what it is that makes one film recording process different (and possibly better) than another. The truth is, the verdict is still out on which is better (the never-ending laser vs. CRT debate, for example), but one thing never changes - the machine that goes "bing" is still only as good as the people who run it.

On one hand, film recording isn't rocket science, but on the other hand it is a science — with a little bit of voodoo thrown in. There are many people involved in making it all work, from the film stock manufacturers to the film recorder makers to the people who have to deliver perfect looking film every time. And of course there's a history...

Lasergraphics' P2 records a 2K image in under one second per frame.

THE GOOD OL' DAYS

Believe it or not, film recording pre-dates videotape. In a way, it was the first form of videotape because it was the only means of recording live TV shows before the invention of videotape. Video images were successfully recorded to magnetic tape around 1952 by RCA and Crosby ("Bing") Enterprises. Before that the only way you could record a program was by synchronizing a funkified shutter on a film camera to the oscillations of an on-air program monitor during a live broadcast - a Kinescope recorder. Eventually the cost of film archiving all that television propelled magnetic videotape recording technology forward, and the Kinescope was used less and less.

Later developments in film recording included the EBR processes (Electron Beam Recorders) developed and used by companies such as Four Media Company and Sony. The EBRs shot a beam of electrons directly onto the 16mm or 35mm film plane with very good results. The now-defunct Sony High Definition Center's years of R&D into the processes and techniques of film recording, scanning, digital remastering and archiving educated all of us as to the possibilities of the digital/film hybrid future we all live in today.

Kodak also made advancements in the early '90s in the 01 world through its creation of the Cineon file format and its integrated Cineon Lightning scanning and recording systems. This was the first serious attempt to produce a color and resolution matching workflow of film-to-digital-to-film imagery; from scanning to digital manipulation to output on film again.

Kodak successfully demonstrated enough color and resolution control to feasibly match-back digital imagery to original camera negative for visual effects and ultimately paved the way for digital mastering. The Kodak Lightning Laser recorders are still in use in a few facilities to this day. Similar to the modern ArriLaser recorder; the Cineon Lightning Laser uses three color lasers (red, green and blue) to expose the digital image onto the three separate color layers of the film. Although Kodak stopped production of their laser recorder in '97, rumor has it that they are re-entering the film recording fray with a new LCD-based recording technology.

Although truly measurable 2K and 4K resolution on film was succes!iully achieved over the last few years by the few manufacturers who stayed in the game (namely Lasergraphics, Arri and Celco), it is only recently that many of them could map the color gamut of the RGB digital realm to that of the analog logarithmic response of film with a high degree of accuracy. Many of the LUTs (look up tables) were not standardized and operators were left to figure it out themselves.

FAST CHANGES

In the late '90s, high-res film recorders were still extremely slow, taking as much as 30 seconds to one minute to record one single frame of film. The beam control necessary to accurately reproduce the minimum acceptable resolution for 35mm (2K), as well as the brightness required to achieve proper film densities, were two of the main reasons for slowness. If you do the math, for an average feature film of 90 minutes (130,000 frames) at 30 seconds per frame, the time to complete the negative would have beer over 45 days -- and that's running 24/7.

Kodak's Lightning and others were on the right track with brighter and faster laser technology, but the cost of the machines made the price too high to justify full digital mastering and output to film. Currentlysome very high quality CRT recording systems are every bit as bright as lasers, with arguably equal resolution when compared on the same film stocks.

The ArriLaser uses three color lasers to expose the digital image onto the three separate color layers of film.

Machines like the affordable Producer 2 by Lasergraphics can record a 2K image in under one second per frame _ so cost is reduced from dollars to only pennies per frame. It's part of why the digital intenmediate process is finally taking hold and will eventually be available to almost all filmmakers.

AHHH... CONTROL

Both Lasergraphics and Arri recently released their color management systems that can accurately re-map the color of the digital file to the logarithmic response curve of the film. Now prints from the negative can be made that represent exactly what the DP and director did in the digital color timing suite. Lasergraphics has developed an intuitive color management interface called PrintView, which takes the operator to a whole new level of input and output color control, allowing for not only unprecedented matching capability but the ability to make on-the-fly changes. Arri also introduced its own 3D Color Management Module this year; which supposedly accounts' for previous anomalies of color gamut mismatching between video/digital imagery and film.

So it would seem we have successfully gene-spliced calculus and chemicals in film recordingto a point where 01 is not only possible, but affordable and predictable. Other aspects ofthe 01 post process, like HD and 2K scanning, HD and 2K online and color correction, need to come "up to speed"and down on price _ hopefully before the pure digital promised land arrives. POST