A DI Workflow for Indie Film
Filmworksfx–DFL Delivers an Affordably High-End Finish For Splinter
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By now it’s no secret — the Digital Intermediate (DI) is the fastest-growing delivery standard in the history of Hollywood studio films. From the start, Hollywood filmmakers were served by a DI culture that was something of a closed, dark-art business. Most of that culture grew from demand created by A-list filmmakers who insisted on the creative control offered by a digital DI process and unavailable elsewhere. On the other side of the tracks, indie filmmakers have always walked the divide between pinched budgets and deeper ambition. Until recently, real DI and DI culture for true indies was a pipe dream. No longer.

Unable to budget for a traditional DI at studio costs for his Super 16 picture Splinter, director Michael Olmos contracted Filmworksfx–DFL, a Santa Monica company led by artist Ken Locsmandi, to perform a full and relatively compromise-free DI. From the beginning, Olmos had envisioned a color, graphic-novel feel. “The DI process brought an incredible edge to the story,” says Olmos. “It brought all film elements to a core psychological level.” Here’s a real-world overview of the independent-film DI implemented on Splinter:

To make it viable for Splinter, Filmworksfx–DFL boiled down the DI system to a shortlist of muscular desktop hardware and software tools. In the software contingent were Apple Final Cut Pro for creative editorial; Assimilate Scratch for DI coloring, management and effects; Rising Sun Research for pipeline color calibration; and Adobe After Effects for added effects and cleanup work. The critical hardware elements included Globalstor Data Extreme Stor for heavy-duty storage and tuned throughput needs, NVIDIA for graphics and real-time playback, and Gretag Macbeth solutions for hardware color-calibration.

Prep Work for the DI Conform
An effective DI begins with solid planning and organization. After Splinter was shot, a 24-frame offline QuickTime movie of the final project cut was provided along with a CMX 3600 EDL and a cut list. A master Microsoft Excel file was culled from matching film keycode and timecode with corresponding in and out points along with camera reels (reels put into the camera that are slated and telecined) and lab reels (reels spliced together for the chemical process — a lab reel usually contains three camera reels). The Excel file was sorted to make film reel order and keycode were stacked via consecutive numbers, allowing that the ingest operator could scan film in linear mode from first to last keycode number. The QuickTime was rendered out of After Effects as a JPEG movie (at the time, Assimilate Scratch could not import a QuickTime sequence, though it has since been updated), which was brought into Construct, the central control UI for managing and organizing projects in Scratch.

Scanning was performed on an Imagica XE Advance scanner at 2048 by 1280, allowing a conform to a Super 16mm 1:66 aspect ratio, although the film was framed at 1:85. The actual scans were DPX format with timecode embedded into the header (Scratch uses the embedded metadata to conform the film). All scans were match-named to the cut numbers on the EDL and, with Splinter containing a total of 1800 cuts, it was important that a naming scheme be developed that would make it easy to find any cut from videotape to lab reel. The scanning for Splinter took about three weeks to complete, and the scan operator stored scans in directories that were named after the tape reels that each scan came from.

Conforming in Scratch
Scratch took in raw scans as individual “constructs” by videotape reel name. With 27 telecined videotape reels, scanned data was imported into 27 organized directories with matched subtrees. As an example, when reel 019 was imported, its subdirectory 019_2-14-06 was also imported intact. When Locsmandi engaged Scratch to conform that reel, the program searched all of the subdirectories to find and gather the necessary footage. It took just minutes to autoconform the entire film. “Data management is possibly Scratch’s strongest characteristic,” Locsmandi says.
Once the footage was conformed, Locsmandi used a text-editable config file to create a custom setting for the desired 1.66:1 aspect ratio. Also helpful was a tray feature — colorists might call this a “still store” — that held reference clips and stills for color matching. An entire offline copy of Splinter was put in the tray to confirm the DI edit.

The LUT Process
Next, reliable color profiles had to be created to output proper color look-up tables, or LUTs. Rising Sun Research (RSR) supports an open, end-to-end color-management system for indie DIs — other systems are tied to costly proprietary hardware or pricey seat-based models that would be deal-breakers. In this case, RSR provided profiling-standard images to be recorded and printed to film. Filmworksfx-DFL recorded them to Fuji 4592 internegative stock and printed on Fuji 5111D print stock. The test strip was sent to RSR in Australia, within a day, RSR generated a profile for the print and emailed it back.

A monitor profile was created using an Eye-One Display 2 by Gretag Macbeth. First, a profile was generated using a high-end Dell 24-inch LCD monitor. Using the Cinecube tool in RSR’s Cinespace application, that profile was married to the print profile provided by RSR to create a 1D LUT for Scratch. The black levels on the LCD were unsatisfactory, so another profile and LUT were generated using a Sony Trinitron CRT.

A few sample shots were color-graded out of Scratch using the RSR LUT and printed to 35mm. Screened at the Filmworksfx-DFL DI theater, they exhibited fine grain and were a spot-on color match to the RSR calibrated monitor. Even though the primary LUT was designed for Fuji print stock, a test print for Kodak stock was also performed. Results were telling. While projected 35mm Fuji stock was identical in color and contrast to the DI calibration, Kodak stock was a near twin to the Fuji original in terms of color and quality — although with slightly more contrast (and, hence, grain). Either would have been acceptable. Since the film originated on Super 16 and grain was an issue, the team stuck with Fuji stock. (Clean-up on the Super 16 elements was handled by Tinderbox plug-ins, including Furnace Remove Dirt, as well as After Effects.)

Color-Grading and More With Scratch and Globalstor
Color grading is actually the easiest of the various tasks performed out of Scratch. Typically, clients brought in reference stills, art and other film sequences that could be stored in Scratch’s tray and matched in dual-screen view. Scratch is capable of working with a variety of colorist panels, though the one chosen for Splinter was a simple Tangent design. That meant an experienced telecine colorist was up and running on the Scratch DI system in a few hours.

A Globalstor Extreme stor unit loaded with 6 TB of intensive Hitachi Deskstar SATA2 raid storage, along with the NVIDIA Quadro FX 4500 card for HD-SDI output, were mission-critical components of the hardware solution. “With Scratch we did full color-correction at 2K data rates without rendering, and played through to HD-SDI on the card itself,” explains Locsmandi. “So an HD master could be generated directly from the 2K DI conform.”

A minor issue arose when the film LUT would not zero out blacks for HD output. RSR adjusted the film profile so that the blacks would reach zero on the scopes. Color-correction remained untouched — getting correct HD output was a matter of simply switching from the film LUT to the HD LUT. Without RSR’s tweaks, an entire second color-correction process would have been necessary.

Traditional colorists at Filmworks seemed to be less at ease with Scratch’s secondary color-correction tools — scaffolds and shapes. A scaffold offers customizable shapes via rotoscope masks for manipulating color in areas of an image (stock shapes are also included). Shapes were animated and occasionally tracked in ways quite familiar to visual-effects artists. Such techniques are very handy and were used repeatedly in Splinter to enlighten scenes and either reveal or obscure details. Revisions were easily made, remaining within the Construct to be timeline-swapped for convenient client viewing. Another useful option was the ability to add client notes directly on revisions.

But the peak feature by far was the result — a final DI finish that served the story, with a look and feel faithful to the filmmakers’ original vision. It was a 2K DI done at real-time client speed — and at a fraction of establishment DI costs.