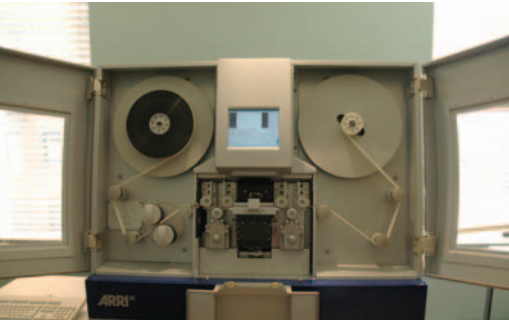


# How to do a Digital Intermediate



Digital Intermediates are the magical cauldrons in the newly renovated kitchens of film and digital production. Iron chefs blend film, video and digital ingredients, mix in secret sauces, and serve the platters of film, tape, DVD and hard drives. The following is based on a job we're doing at Goldcrest Post Productions. Almost every job is different, and your mileage may vary.

We're using an Arriscan on this 90 minute 35mm feature. The Arriscan can record 2K or 4K, linear or log DPX files from 3K or 6K scans. We've chosen to work in 2K, recording at 1 frame per second to 10-bit log DPX files. The scanner flashes each frame of film 3 times, with a red, blue and green light source, and the image is captured onto a custom CMOS sensor.

Once set up, using an EDL, the scanner records selects from each roll of film pretty much unattended. Conforming and color correcting happens later. On the other hand, a telecine, like the Spirit 4K, transfers film to tape or digital file with the colorist adjusting for exposure and color as needed.

DI is actually a 3-step process:

1. Scan or telecine the film, digitize the tapes, or copy your digital files onto hard drive.
2. Conform and color correct.
3. Record the finished show to film, tape or digital.

It starts with many boxes containing all the elements. Film, video dailies and EDL elements must be matched to each other and double checked.



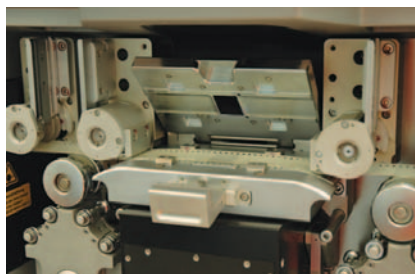
For this project, Tim Spitzer, above, makes a C Sort EDL from the Avid timeline sequence. The EDL is adjusted to provide an individual EDL for each flat of film to be scanned.

He loads the first EDL into the scanner. We use separate EDLs for each flat to minimize the negative handling; we only want to put each roll up once.



Cesar Mylo Hernandez threads up the scanner.

Next, he'll calibrate for the film stock being used. We shot with Kodak Vision2 camera negative: 200T and 250D.



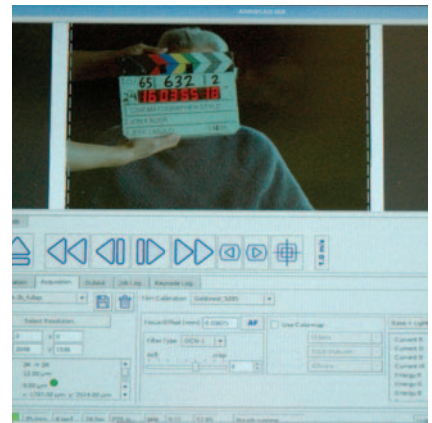
The gate is pin-registered for steadiness, just like most film cameras.

Use a Palm Pilot stylus to poke the input touch screen with information like A or B wind, size of cores, number of perforations per frame, and then close the gate. Touch "SCAN" to begin.



The Arriscan records the full dynamic range of the film—Dmin to Dmax. It's like a "raw" file and uncorrected. No lookup tables are needed, but they can be loaded.

The Arriscan comes with its own Linux computer, capable of storing 500 Gigabytes of data. But a feature requires more storage. We're sending our files to a large a Facilis Terrablock 7 Terabyte RAID array networked to the Arriscan.



Each frame is recorded to hard drive as a separate file, sequentially numbered. One 10 bit log DPX file is about 12 Megabytes. A 90 minute feature will take up about 4 Terabytes scanning at 2K.

Depending on whether you have a night shift, it takes a week or two to scan a 90 minute feature. This time will surely shorten as scanning speed increases in the future.

The next step is conform, final edit, dust-bust and color correct. Goldcrest is using a Quantel IQ for edit and conform, and then color correcting with Quantel's Pablo.



John Dowdell is our digital gaffer...er... colorist (above).

Using lookup tables (LUTs) that match the digital projector and the final print stock, he corrects each scene. The random access allows us to go back and jump forward the way we're accustomed in a nonlinear editing environment.



The original files from the scanner stay on the Terrablock. Our new, corrected and conformed files are stored on the Quantel.

Finally, the digital files will be used for all high definition deliverables, and DVD mastering and, using an Arrilaser, "laser printed" back out to film.

What if we had shot on HD, or wanted to mix film with HD, HDV, DigiBeta, BetaSP and DV?

You'd play back the tapes, digitizing into the Quantel (or whatever box and software you're using).

Convert to a common color space. The Quantel IQ can mix and match different files and formats.

Prepare your files.

Do your film-out.

## John Dowdell on DI, Conform, Film-Out and Super 16

*by John Dowdell, Director of Imaging Technology at Goldcrest Post Productions*

The Arriscan strobes the LEDs twice. The first exposure is optimized to digitize the shadow portions or D-Min of the negative. The second exposure of RGB LEDs is ten times as bright and is optimized for the Highlights or D-Max of the negative. Software stitches the two scans together to produce a true 16 Bit Linear file capturing the entire film density and color range.

You can quote me that the scans are nothing short of amazing. The Arriscan offers me, in a non-linear world, far more imaging options than if I had the negative on a telecine. It has a natural sharpness with no enhancement. The new film stocks that have a tighter grain structure, so Super 16 can compete with 35mm image capture. We're scanning the Super 16 at 3K, downsampling to 2K.

Our Digital Projector is a Dark Chip DLP Digital projector. Color Timing to a projected image is less fatiguing, since you are not staring at a CRT monitor refreshing its scan 60 times a second.

The color gamut exceeds a CRT display, thus allowing LUTs to be applied to simulate a projected film print. The large image will alert you to image problems that a CRT might blur over. The large screen offers the director a better perception of the film's pacing.



## Tim Spitzer's 10 Commandments of D.I.

*by Tim Spitzer, Managing Director of Goldcrest Post Productions*

1. Thou shalt insist lab always puts timecode, user bits, roll number and date on the outside of each box of each flat of negative.
2. In telecine dailies, advance timecode in 15 minute increments for each flat of film. For example, flat 1 is 1:00, flat 2 is 1:15, flat 3 is 1:30. Flat 4 is 1:45. If you're shooting (rare) 2000' loads, advance it in 30 minute increments.)
3. Transfer no more than 4 flats per video tape for dailies.
4. Each tape starts with a new hour of timecode.
5. Punch each flat of negative at the head. Hole punch must be transferred and visible at keycode and ideally at head slate. (not in a needed scene)
6. Head slate each roll if possible. It really helps at lab.
7. Be sure to burn in the following visible information onto the video dailies: lower left= Keycode, lower right=Timecode, upper left=Audio Timecode, upper right=User Bits.
8. User Bits should be set for Tape Number. That way, when timecode repeats (because you only have 24 times before it does), you'll be able to sort out tape/roll number by userbit.
9. Do telecine dailies to Digibeta or DVCAM with audio at 48 KHz. That way, final audio can come off the Avid.
10. If the camera's magazine has been removed and replaced, sometimes the frameline shifts. When the video dailies operator rethreads, be sure to maintain continuous 3:2 sequencing of timecode.