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preface

The making of a film is traditionally divided into three general areas of activity: pre-production, production and post-production. It is a common mistake to think of these as separate and discrete processes. They are, in fact, interconnected parts of the whole filmmaking enterprise.

Post Production includes editing, but it is much more than that. Post begins with the script and continues in the Pre-Production phase with the planning, scheduling and budgeting of finishing processes. During Production the Editor is syncing dailies and assembling a rough cut for the Director to view as the shooting progresses. Finally, there is the sound design, scoring, titles, visual effects, mix, printing and delivery that comprise the finishing process.

Students usually experience little difficulty with the Pre-Production and Production phase of filmmaking, but once principle photography is complete their projects tend to lose momentum and unravel. The primary reason for this is a failure to think holistically about all of the work involved in making a film. A movie is like a cake – you add the flour, the eggs, the sugar, but until it’s baked it’s not a cake.

Students also have a tendency to think linearly and sequentially about the steps involved in finishing a film. Just as Production requires that a number of activities occur simultaneously so does Post involve concurrent operations. Efficient Post Production requires serious multi-tasking.

Most importantly, Post Production has to be seen as an integrated part of the whole and approached with the same attention to planning and scheduling that is given to Production. No one plans to fail, but failure to plan can lead to disaster. Goals and deadlines have to be set and progress must be monitored continually if the film is to be finished – and after having spent thousands of dollars in Production – what a waste not to have a finished film to show for all that effort.

This handbook contains material that covers the broadest scope of post production – from small videos to feature films. Some of it may not be applicable to your project. You will have to choose the points that apply and adapt them to your resources.
planning
post production

post production supervisor

A post supervisor is normally brought on board during pre-production, and has the responsibility of locating the various individuals or companies needed during post. During production, the post supervisor coordinates with the production crew, the laboratory, and the editorial staff. In many respects, they are the counterpart to the Production Manager.

During post-production, he or she oversees the entire post process and delivers it all on a specific timeline, within the budget. The post supervisor should have a basic understanding of each of the different processes required during post-production (including the time each stage takes), and the ability to work with the different companies. The greatest error a post-production supervisor can make is assuming. Due to the number of different areas of post, and the level of coordination required among them, assuming anything can cause lost time and the sudden hemorrhaging of money.

scheduling

Post-production probably never enters the minds of filmmakers during pre-production, but it should. There are two big reasons for this:

Money. Not having a good plan for post-production can cost you dearly, or stop you completely. A good rule of thumb to remember is: the smaller the budget, the larger the percentage of that budget will be required for post production.

Quality. The best story, beautifully shot and brilliantly acted can be sabotaged by a poor post, and ruined for the audience. This can happen on both the creative and technical sides of the post-production process.

Traditionally, film schools have focused on the creative and technical side of production, without much emphasis placed on post beyond the editorial process. The student usually ends up with an edited workprint or
video, but little or no understanding of what is required to truly finish a film. For many filmmakers, this can spell future problems on projects that require the complete post process in order to present at festivals or sell their film.

Post-production is something akin to building a house. You, the producer/director/filmmaker, are acting as the general contractor. Just as the contractor hires the various trades to build the house (plumber, carpenter, electrician, etc.), you will hire the various individuals and companies you need to finish your film. Like the contractor, the more you understand the process, the easier it is to deal with potential problems, and the better the finished project. Also like the contractor, you should contact the people you will work with early, to both introduce yourself and educate yourself as to what they will require of you.

The first step is to create the postproduction schedule. Make sure every step you are going to perform is included. The type of project and your budget will help determine the amount of time it will take to complete postproduction.

If you are shooting at a distant location, you will have to arrange to ship your dailies to the lab or cutting room. This may add days between production and editing. It may also add days between the time production wraps and the time the final dailies reach the cutting room. These extra days will need to be included in your schedule.

Also keep in mind that some steps will take place simultaneously. For example, if you are shooting on film, principle photography and the transfer of film-to-tape dailies will overlap. And if you are finishing on videotape, color correction and the sound mix will often happen at the same time.

budgeting

The goal of most projects is to create a high-quality piece that either entertains or informs, or both. The bottom line for most projects is the budget. Unless you are making a high-profile feature, you will probably be required to stay within the budget allotted at the start of the project. At the start, your job will often be to put a detailed budget on paper. This can actually be much simpler than it sounds if you just follow a few steps.
• Make sure you have an accurate list of all of your delivery requirements.

• Know the shoot dates, when the picture must lock and the delivery dates.

• Meet with vendors to discuss your project. If these are people with whom you’ve worked in the past, all the better.

• Negotiate packages and volume rates based on the work each facility will be doing.

The areas you’ll likely include in your postproduction budget are:

- film processing
- editing room equipment
- telecine transfer
- titling and opticals
- sound editorial and design
- ADR and Foley
- sound mixing
- layback
- visual effects
- negative cutting
- delivery elements

If this is your first project, your vendors will be able to help out with budgeting time and costs.

the lab

If you aren’t shooting film, you can skip this section and move onto dailies. If shooting film does apply, you may want to investigate what really happens in a film laboratory.

In addition to processing your film, printing film dailies and prepping your dailies for transfer to videotape, the lab is also where you go to procure bags, cans and cores which go to the production set. When picking up these items, the lab needs to know the film’s gauge and what size “loads” you’ll be using. Your production manager can answer these and
other questions. Be sure to meet with your laboratory contact prior to the start of production. This will help you avoid expensive mistakes down the road. It will also assure that the lab is prepared to process your dailies when you need them.

Your lab contact will need to know the details of your shoot. This will include the amount of film you expect shot on a daily basis, if you have any night shoots or weekend shoots scheduled, and if you are cutting on film or videotape (or both).

Arrange a film lab tour for yourself prior to starting the postproduction process. This will give you a leg up on how film is processed and what information the lab needs to do the job correct and on time. Have someone show you what to look for on a camera report. There is vital information the lab needs from those reports to even begin your job. Understanding this information will allow you to properly communicate should information be missing. On a busy night, a lab may process 200,000 to 300,000 feet of film and yours will definitely go to the back of the line if there is any question on how to process it.

Labs usually process film at night (machines are started up and tested between 8pm and 10pm). Your lab contact will give you a cutoff time for dropping your film at the lab for processing. Unless arranged ahead of time, any film you drop off after this time may not be developed in time for your morning screening or transfer session. Special daylight processing can be arranged, but it must be done ahead of time. Before shooting begins there are usually camera tests shot and processed. You may be responsible for arranging this.

Most film laboratories offer a variety of services. They develop your film and prepare it for transfer to videotape, create prints, and repair damaged film. Some have optical departments where they create your film effects and titles, blow-ups and repositions. To fully understand and appreciate the work that goes on at the film lab, take a tour. Your salesperson or laboratory supervisor will be glad to arrange one for you.

dailies and telecine

In a film shoot, dailies, as the name implies, is the footage that is shot each day and rushed to the lab for processing. It then moves on to telecine or printing so you and your crew can view them, usually the next morning. The dailies from a tape shoot are still the footage that is shot each day; it just does not require processing.
If you are having your film dailies transferred to videotape (telecine), you will need to speak with the transfer facility prior to the beginning of your job. As with the film lab, they will have a list of questions for you to answer before they can schedule your job. The information they will need includes details about what type of film and sound you are shooting, how you plan to complete your project once shooting is finished, and what your time schedule is for your project. How much film is budgeted for each day, and how many days you will be shooting will also be important.

Some information must be taken directly from your film during the transfer process. Whether you plan to do a film and/or videotape finish will tell the facility what information they need to gather at the time of telecine. Not planning ahead and having to go back to get this information is extremely costly and time consuming.

**off-line editing**

Off-line editing indicates an electronic cut. This means that your processed negative shot each day will be transferred to videotape or to a hard drive. This videotape is then provided to the off-line editor to be recorded into electronic editing equipment for (non-linear) editing.

**on-line editing**

The on-line is where you do the final videotape assembly of your project. If you are not doing a videotape finish from videotape dailies, you can skip over this section.

Just like each earlier process (film processing and telecine dailies transfer), the on-line facility will have a list of details they will need from you before they can book your on-line session and complete this process. This will include questions about what videotape format your dailies are on, where the tapes will be coming from, what off-line system was used to create the editing list (called the edit decision list-EDL), and any instructions involving special effects. Sometimes the same facility that did your film processing and telecine will also be doing your on-line, sometimes not. Other steps that will take place as part of this process may be creation of special effects, titling and color correcting your picture.

**sound**

Sound for your project actually starts in dailies with your “production sound.” This is sound recorded right on the set at the same time your
picture dailies are recorded. Whether you are shooting on film or videotape, you will probably have some production sound. The exception will be a project that relies solely on voiceovers or sound and effects that are recorded later.

Production sound elements are delivered to sound editors to be used to help “sweeten” the sound that was married to the picture either in the film editing room or the off-line editing room. Once all of the sound edits have been agreed upon, production sound, along with any ancillary sound effects and music are mixed together. This is called mixing or “dubbing” (it is also called “audio sweetening in commerials and television). Mixing takes your production audio and finalizes it with enhancements, ADR, music, sound effects, and various clean-up procedures.

Once completed, the sound facility creates an element called an “optical track negative (OTN)” which the film lab then marries onto film to make release prints or onto videotape for broadcast or home video release.

### completion

Once you have the picture and sound elements nailed down, your delivery requirements will determine how you complete your project.

A film finish means that all of your work toward delivery will be done on film. This does not preclude making a videotape master from your film elements, but the videotape master will only be struck once the film’s picture and sound elements are completed. A completely finished film element must be created to satisfy your delivery requirements. The negative is cut once the show has been locked (final edits are approved) and opticals (fades, dissolves and titles) are ordered. The film lab creates the color-corrected print. The movie is color-corrected prior to striking release prints and can also be color-corrected for use as a telecine print master.

For a feature or movie-of-the-week, allow at least 10 days for your negative to be cut and spliced into a finished piece. Allow another week (or more) to arrive at the right color-corrected film element.

If your videotape is to be your only delivery format, and you will not be cutting negative prior to delivery, you have chosen what is referred to as a tape finish. A tape finish can also take place on a project that will ultimately be finished on film if materials for preview or advertising are required prior to the film finish being completed. A two-hour show can take at least one day to several days to complete. One-hour TV shows usually spend one to two days in color correction.
Videotape is electronically color-corrected scene-by-scene. Depending on the complexity of the look of the project and the evenness of the negative exposures, it can take from hours to days to color correct a videotape master. The facility can help you determine the amount of time necessary to complete this step.

If you are finishing on film, any formatting will be taken care of during the editorial process and incorporated into the film cut. If finishing on videotape, formatting will either be incorporated into the EDL or done “tape-to-tape” near the end of the process. Formatting can include adding logos, bars and tone (videotape) and commercial blacks (videotape), and closed captioning (again, videotape).

When finishing on film, titles, credits, locales, legends, etc. are created optically. They are shot on film using the plain “textless” backgrounds. These backgrounds are matted together with titles creating a new piece of “texted” film which is then cut into the final-cut film negative. On videotape, these are done after all of the picture alterations are accomplished (such as special effects and color correcting). As with film, the “textless” pictures are mixed with text, making a new “texted” picture.

delivery

Delivery is completed successfully only when you have fulfilled all of the delivery requirements and the distributor has accepted the elements. The only way to safeguard against missing delivery materials is to get, read and understand the delivery requirements.

Delivery elements are best made along the way, at the steps where they are the easiest and most cost-effective to create. They often require paperwork and contracts drawn and signed. Collect delivery requirements at the start of your project. Make a checklist and keep it updated so you are not caught short and costing the producer unnecessary expenses.

There are five items which involve legal advice or involvement.

- stock footage purchases
- music clearances
- product clearances
- reference and inference clearances,
- film or video clip purchases
film to tape flowchart
digital to tape flowchart
a few tips

Work backwards and know what you want to deliver before you start shooting. Plan your post workflow (i.e. deliver on film? HD?). What do you want to end up with at the end of the day? Work from there.

In pre-production know what budget is for post and stick to it! Perhaps even account for more money in POST. Many producers end up spending 3x the money in post because they didn’t plan realistically.

Don’t just try to piece the workflow together. Make sure your NLE (Non Linear Editor — like Avid or Final Cut Pro) supports your camera and the formats that you are shooting in. Be sure that your offline edit will seamlessly make it to the online. Know how to get final product out of the system.

Have a realistic schedule from the get go. Know how many days you will need to shoot, how many weeks you’ll need to edit.

Know your story! If changes need to be made – make them on set, not in post. If the story isn’t coming together based on the shots – it can cause 2-3x increase in post production.

No role is unimportant in film. Even if your editing tools have a color application – you still need a “real” colorist to do the job.

Be sure to book the correct advanced edit suite for your offline, online or color correction session. The rooms have different equipment and you need to make sure that the room you’ve booked can actually do the work you want done.
scheduling post production

how long will it take?

The amount of time required for post production will vary depending on a number of factors. A documentary may need substantially more time in off-line editing than a fictional narrative.

When laying out your schedule, start with the first date of photography, which tells you when your first day of dailies will be. Then fill in the delivery date for your finished project.

Now that you’ve set the parameters for beginning and ending your project, you simply fill in the steps in-between. Each phase is dependent on the successful completion of the previous phase. Any interruption may cause a ripple effect throughout your entire schedule. Translation: your schedule needs to be flexible and you need to be very organized and possess a lot of patience.

Your post schedule will include a column for many, if not all, of the following:

- Dailies
- Pickups and reshoots
- Editor’s Cut
- Director’s Cut
- Picture Lock
- On-Line/Assembly Edit
- Spotting Music and Sound effects
- ADR/Looping
- Scoring
- Color Correction
- Titling
- Mix
- Layback
- Quality Control Screening
- Final Screening
- Delivery

Work expands to fill the time available for its completion.
Parkinson’s Law
# Sample Post Schedule

**Film Capture**
**Finish on Tape**

<table>
<thead>
<tr>
<th>Week One</th>
<th>process and Telecine film digitize and sync dailies screen dailies Editor’s cut begins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Two</td>
<td>Editor’s cut finished Director gives notes Director’s cut begins Interview Composers Interview Sound Designers</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Three</td>
<td>Director’s cut continues Start preparing credits Begin visual effects work</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Four</td>
<td>Continue Director’s cut Screen Director’s cut Continue visual effects</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Five</td>
<td>Begin Director’s cut #2 Continue preparing credits Continue visual effects Plan Pickups Deliver Director’s cut to Composer</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Six</td>
<td>Shoot Pickups Process and Telecine pickups Digitize and sync pickups</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Week Seven</td>
<td>Director’s cut #2 finished</td>
</tr>
<tr>
<td>Week</td>
<td>Activities</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| Eight   | PIX LOCK  
Cut in titles and effects  
Make dubs and Quicktime files for sound and music  
Export OMF files for sound  
Create EDL |
| Nine     | spotting sessions for music and sound effects  
Sound Designer begins editing dialogue and effects |
| Ten      | Foley session  
Scoring session  
ADR session |
| Eleven   | complete sound editing |
| Twelve   | MIX SESSION |
| Thirteen | ON-LINE  
Layback sound track |
| Fourteen | Color Grading session  
Prepare deliverables and documentation for delivery  
Quality Control screening |
| Fifteen  | FINAL SCREENING  
Deliverables presented |
Today’s video dailies are more than simply a way to evaluate the previous day’s work. The telecine session is an increasingly complex merging of technologies; film, video, audio and digital information. This technology can be a tremendous aid to the post production process, but if when a link in the chain is faulty, the telecine session can turn into a nightmare of exploding costs. At four to five dollars a minute for one light daily transfer time, even minor delays can add up to hundreds of dollars in a very short time.

By paying attention to a few simple details during production, many of these unexpected delays and expenses can be avoided. Here are some suggestions to help make the most efficient use of the telecine session while avoiding some of the most common pitfalls.

**Before the Shoot**

Much of the following information is critical to a successful and accurate transfer, and if the facility has to track down the proper specifications on the day of the session, stand by and waiting charges can accrue. Make sure things such as framing requirements, frame rates, edit specs, number and type of elements to be made, and any special technical issues, are clearly spelled out and relayed to the transfer company well before the session. In the case of unusual film or video formats, special equipment may need to be procured. Surprises and “By the way...” in telecine invariably lead to increased cost and delays.

**Camera Department**

Modern motion picture films have tremendous latitude and ability to withstand major over and under exposure. Photographic techniques and styles are pushing the limits of the new films to the extreme. The capability of digital telecine systems to alter the film image has increased dramatically the past few years. Often the Director of Photography does not communicate with the colorist, and the colorist has to guess what the DP is trying to achieve.
• The grey scale establishes a base exposure and color balance. Using the chip chart as a point of departure, the colorist can detect any unusual lighting, filters, or exposures and give the cameraman what he or she expects instead of trying to fix ‘mistakes’ that may actually be the intended effects. Of course nothing can replace effective communication between the DP and the transfer suite. Providing visual references (polaroids, tear sheets, magazine pictures, references to other movies, etc.) is tremendously helpful (remember 1 picture=1,000 words) and can pinpoint the look the DP and Director is trying to achieve.

• The framing chart insures that the cameraman’s critical framing will be exactly adhered to, and will alert the telecine operator to any unusual framing formats or discrepancies in the camera ground glass.

• We strongly encourage everyone to shoot a framing chart at the head of each day’s footage. A properly photographed framing chart can eliminate a host of frustrating problems and preserve the intent of the Director and Director of photography throughout the post production chain. In theory it is a very simple process: Align the frame lines of your ground glass with the drawn lines on the chart and burn off 20 or 30 feet of film. In telecine, we align and size the telecine to the chart we see on the monitor and presto-your critical framing is perfectly preserved. It is crucial, however, that the person shooting the chart knows exactly which ground glass markings are being used, and what they represent in terms of telecine.

Most ground glasses used for filming for television have at least two sets of markings; TV Transmitted and TV Safe Action Area. The TV Transmitted (Trans), usually represented by corner markings, is a larger area than TV Safe. When TV Trans is used for the framing chart, and we properly set up the telecine to reflect this, the photographed frame lines may not appear on every television. This is because most television sets can not display all the information transmitted to them. For this reason, TV Safe Action was developed inside the transmitted area. The area between TV Trans and TV Safe is called underscan. We often put the time code windows in the underscan area. On standard TV sets, the windows will not be visible. Most professional monitors have a setting called underscan that will display all the transmitted information.
In underscan, the editor can see the windows if necessary. In regular mode, they are not visible. Any thing within TV Safe will be displayed on 99% of all TV receivers.

• Standard 16 or Super 16. With the increase in production of 16mm for television, we have noticed a corresponding increase in confusion regarding these two formats. Standard 16, the “original” 16mm format, can use single or double perf film, and produces an aspect ratio of 1.33:1, perfect for television. It does not require a special gate for telecine transfer.

• Super 16 is a film format designed to use the maximum image area available on conventional 16mm film. A modified 16mm camera is used with single perforated 16mm film stock. Super 16 has an aspect ratio of 1.66:1. This is very close to the current HD standard of 1.78:1. It does require a special gate for telecine transfer. You can also put a standard TV ground glass in a Super 16 Camera causing potential confusion down the line. Always check with the rental house as to what the alignment is of the camera you are using, not just what ground glass you are using.

• When you shoot Super 16 for standard TV, there are two options. One is to letterbox the transfer so the entire negative area is used. If a “full screen” transfer is desired without letterbox bars, we must extract the 1.33:1 TV area from the center of the negative. This still requires the Super 16 telecine gate to avoid scratching the outside area of the negative and to be able to pan far enough over to achieve the correct framing. It is critical that you shoot a framing chart, and let the transfer house know in advance what you are doing. Otherwise, incorrect framing, scratched film and a costly retransfer may result.

• If you are shooting film that is to be letterboxed in the final form, it is important to know what aspect ratio the final frame will be, and whether you want the mattes put in in the telecine, or to leave it full screen and have the matte inserted in editorial. Many editors want the freedom to move the frame around before applying the letterbox, and many directors and directors of photography want to see the letterbox in the dailies.

• It is important to let the transfer house know what the intended transfer frame rate is. The transfer rate is not necessarily the same as the shooting frame rate. People routinely shoot at 30 fps, for example, to be transferred at 24 fps for the subtle slow down it provides. They may also shoot at 30
fps for transfer at 30 fps for the one frame to one frame relationship it provides. Similarly, footage shot at 6 fps will have a very different look when transferred at 24 fps than when transferred at 6 fps.

Sync Sound
LMUSFTV does not encourage students to have dailies synced during telecine. SFTV does not currently provide tech support for timecode field recorders.

Even in the professional world syncing dailies during telecine is an “option”, not a necessity. Syncing the sound in your non-linear editing software is a viable and more cost-effective choice.

Editorial
While at first glance, it seems the editorial process does not affect the cost of the telecine session, preparing today’s dailies for non linear editing can take significantly longer than those old one-lights. The editor may require Keykode, a simul audio DAT with address track time code, 2 or more simul 3/4” SP or Beta cassettes, (with or without up to three windows), digital FLEX files with floppy discs or print outs, Keykode logs, etc.

• Every time you turn on another machine in telecine, it takes longer and costs more. Logging every scene and take into a FLEX computer takes time. (A lot of time, and they charge you extra for the machine too.) Hooking up all these machines can add a half an hour or more to the initial set up. Many facilities can only make three video tape elements during the transfer session. If you need copies for production, the dubbing process can add time and additional costs.

• Each editorial house has its own unique specs, and if something is missing, you might have to re transfer everything. (Ugh!) Make sure the telecine facility is capable of providing what you need before you get there with your film, and double check with the editor as to his requirements. Clear communication with the editor before shooting starts is the surest way of avoiding expensive misunderstandings.
• Until now it has been the responsibility of the producer or production manager to orchestrate this ever expanding, highly complex meeting of technology, art, and logistics. Often the producer has thousands of things to deal with during preproduction and it is easy for something to fall through the cracks.
understanding frame rates and timecode

Frame Rates
The generally accepted frame rate for filming motion pictures, intended for theatrical projection, is a true 24fps. As black-and-white television developed, the frequency at which images were updated was locked to the rate of electrical line current (AC), which is 60Hz in the US. In order to conserve bandwidth, television developers adopted interlaced scanning techniques (two fields for each frame), so the signal was divided into 60 fields (30fps), corresponding to 60Hz.

So far so good, until color television came along. It was decided that the NTSC color TV signal could not have exactly the same rate as the electrical current. To facilitate this change, the TV signal was slightly “slowed down”, running at 59.94Hz (a rounded value), rather than a true 60Hz. Under this new NTSC standard, the video frame rate was also “slower”, running at 29.97fps (rounded) compared with the previous B&W rate of a true 30fps.

As HD evolved, it became evident that video equipment manufacturers were no longer totally locked into the frame rates dictated by the legacies of NTSC and PAL. The adoption of additional frame rate choices has filtered down into standard-definition video gear. Current equipment offers these choices:

1) progressive scanning at 23.98fps, 24fps, 25fps, 29.97fps, 30fps, 50fps, 59.94fps and 60fps;

2) interlaced scanning at 25fps (50 fields) and 29.97fps (60 fields).

Remember that these are all different ways to “slice” the same interval of time. Note, though, that some of these rates are “video-friendly” and some are not.

For instance, you can shoot HD video at a true 24fps or a “video-friendly” 23.98fps. The 24fps video can only be edited in HD and becomes difficult to downconvert and deal with in the standard-definition video world. It was intended for going out to film. On the other hand, if you shoot at 23.98fps, downconversions to SD come out correct and it is still easy to get back to film if you want to. Knowing the required end result will dictate the rate at which you shoot things in the beginning.

Timecode
The way editors and editing systems keep track of all of this is timecode. Timecode is an eight-digit clock signal which tracks hours, minutes, seconds and
frames. The numbers are consecutive and ascending, starting at 00:00:00:00 and ending at 23:59:59:29. Each and every frame has a unique numerical identifier, which makes timecode ideal for editing. Add a four-digit videotape reel number along with the timecode, and it would be possible to find ANY frame in 10,000 hours of tape - if one-hour reels were used – and even more for other tape lengths.

The timecode count is locked to the frame rate of the video signal, so the frame indicator will go from :00 to :29 in 30fps timecode, :00 to :23 in 24fps timecode, :00 to :24 in 25fps timecode and so on. Even though the video is actually running at 23.98fps or 29.97fps when compared to a very accurate clock, the count is still based on even frames and even numbers. There is no .03 frame!

Timecode started out this way, but immediately ran into some issues. Because of the cumulative timing errors caused by the 29.97 versus 30 issue, a duration of one hour, as indicated by standard timecode, was in fact 108 frames too long. This error of more than three seconds is unacceptable if you are timing a network show that has to be edited to an exact duration.

Drop Frame timecode was introduced to correct this. People frequently refer to 29.97fps timecode as “drop frame”, but this is incorrect. All NTSC timecode is referenced to a rate of 29.97fps. “Standard” timecode (called Non Drop Frame) and Drop Frame both run at the same rate and both number each and every frame. Drop Frame uses a scheme to skip certain numbers from the counting sequence to equal 108 frames in an hour. No frames are actually dropped – only numbers in the sequence. One hour of duration – as indicated by the drop frame timecode number – is exactly one hour.

Non drop frame timecode values are expressed with colons (00:00:00:00) and drop frame values use semicolons (00;00;00;00). Some software applications, like After Effects, also express timecode values with semicolons. They aren’t actually converting anything to drop frame values, but rather apply a drop frame counting scheme in order to express an exact duration. Drop frame timecode is generally used for broadcast television, while non drop frame timecode is used for nearly everything else. Modern editing system can easily mix and match and convert between both formats, so shooting field tapes in one code-base and editing in another is no problem.
Editing systems and editing software algorithms evolved around interlaced video. Consequently, editing HD formats with frame rates higher than 30fps poses certain challenges, because these systems aren’t set up to edit at the higher intervals. Video editing has always been frame and not field-based. As a result, producers who choose to work in the 720P format (1280×720 at 60fps progressive) have had some difficulties in finding systems which could be used for HD editing. Most of the NLEs don’t permit editing on a 60-frame timeline or controlling a VTR for edit-to-tape functions with 60fps timecode.

**Burnt-in timecode** is a human-readable on-screen version of the timecode information for a piece of material superimposed on a video image. Burnt-in timecode is sometimes used in conjunction with “real” machine-readable timecode, but more often used in copies of original material on to a non-broadcast format so that the copies can be traced back to their master tape and the original time codes easily located.

Videotapes that are recorded with timecode numbers overlaid on the video are referred to as window dubs, named after the “window” that displays the burnt-in timecode on-screen.

Timecode can also be superimposed on video using a dedicated overlay device, often called a “window dub inserter”. This inputs a video signal and its separate timecode audio signal, reads the timecode, superimposes the timecode display over the video, and outputs the combined display (usually via composite), all in real time. Stand-alone timecode generator / readers often have the window dub function built-in.
what is 3:2 pulldown

The term “pulldown” or “3:2 pulldown” originates from the method of converting film to video, a process called telecine. This is how 24 fps film is transferred to 30 fps NTSC video without there being an apparent change in the speed of the film.

A more accurate term for the method of conversion is “2:3 pulldown” as this is the most common pulldown used. Film in the U.S. is shot at 24 fps for theatrical release. NTSC video in the U.S. is played back at 30 fps (or more precisely, 29.97 fps). In order to convert the film to video without changing the apparent speed of the film, a pulldown is used which “extends” four frames of film across 5 frames of video, converting an original frame rate of 24 to 29.97. This method is also used to convert 24p video (SD or HD) to 29.97 fps (either SD or HD).

![24 fps (4 frames) → pulldown → 30 fps (5 frames)](image)

It’s important to understand the basic idea behind pulldown since today it has broader implications than just converting film to NTSC video. In the current state of video production and post production, we are straddling the fence between the standard definition and high definition worlds, and converting frame rates is now a big part of this process. 24p has become a commonplace term today, yet it does not expressly imply 23.98 or 24 fps- it could be either of the two rates.

Since its possible to shoot either of these two frame rates, it also means that many of us may be faced with the task of trying to convert 24p video to 29.97 fps for SD or HD and we could easily encounter problems if the “wrong” frame rate is used during production. We’ll look at the standard pulldown patterns in use today, and in the process hopefully clear up any confusion on how we convert between 24 fps and 30 fps (and the other way around).

In addition, many cameras (SD and HD) that shoot at 24 fps use a pulldown to record those frames to tape, converting 24 fps to 29.97 fps. Although some cameras photograph and record at 24 fps, the majority do not. HDV, DVCPRO HD and XDCAM HD are among formats that photograph at one rate, yet use a pulldown to record to tape. See 2:3:3:2 pulldown later in this article to see how Panasonic uses pulldown to add a pulldown as it records to tape.
2:3 Pulldown

Although usually referred to as a 3:2 pulldown, the standard pulldown uses a different cadence: 2:3:2:3, and would be more accurately labeled as a 2:3 pull-down. As mentioned earlier, 4 frames of 24 fps material are spread across 5 frames of 29.97 video.

This is accomplished due to the nature of NTSC video, which is interlaced (2 fields per frame). Frames of 24 fps film are recorded to video by duplicating certain frames to more than 2 fields of video (more than one frame). The cadence starts as follows: the first frame of film is recorded to the first 2 fields of video, creating a whole video frame. The next film frame is recorded to the next 3 fields of video, creating 1 1/2 video frames. The cadence then repeats, one frame goes to 2 fields, then the next frame goes to 3 fields, and the process continues over and over.
The Key To Success Is 23.98 fps
The above scenario sounds simple enough, except that the math doesn’t quite work: an exact frame rate of 24 doesn’t evenly convert to 29.97. In order to make the conversion with a traditional pulldown, the 24 frame source needs to be precisely 23.976 fps (typically referred to simply as 23.98) to convert to 29.97. This does work:

\[
23.98 / 29.97 = \frac{4}{5}
\]

How a 2:3 pulldown works with 24 fps film and 24p video
With 24 fps film: During the telecine transfer, the film is run through the film scanner slightly slower than 24 (by 0.1%), running at 23.98. The speed difference is not noticeable to the viewer.

With 24p video (SD or HD). There are two flavors of 24p: 23.98 and exactly 24. Most cameras that shoot 24p are set up to record at 23.98 by default. For the U.S., 23.98 is a must in most cases (for just this reason). For conversion to 29.97 via a pulldown, the 24p video should be 23.98.

Compatibility Between HD and NTSC
Since any HD video shot today for TV must still be down-converted to NTSC for the majority of U.S. households (remember NTSC is still the current standard in the U.S.), then HD video for TV should be shot at 23.98 or 29.97 (or 59.94p).

2:3:3:2 Pulldown
This modified pulldown cadence is used by Panasonic and other manufacturers to shoot 23.98 progressive video and lay it into a 29.97 interlaced video recording (or a 59.94 progressive recording). This is referred to as “advanced” pulldown”. This pulldown is employed as its easier for digital applications to remove or add this pulldown than the traditional 2:3 pulldown.

The pulldown can also be easily removed during capture into an editing system like Final Cut, which will return the footage to 24 fps (23.98).

For more information on how Panasonic recording works, refer to the Help menu in Final Cut Pro > choose the document HD and Broadcast Formats.pdf.

HD And Pulldown Recording
As we just saw with the Panasonic method of recording, the idea behind adding a pulldown before recording to tape goes to the nature of many recording devices. If a camera or deck is designed to have a fixed recording speed of 29.97 fps (59.94 Hz), then in order to achieve recording a different frame rate, manufacturers came up with an ingenious idea: photograph at one frame rate, but record to tape at another.
Therefore, during a 24p recording, the actual amount of frames photographed are 23.98 in one second. Then, in order to record those frames to tape, without changing the speed at which the camera operates, a pulldown is added to the 24p material to end up recording at 29.97 fps. Similar to film transferred to tape, extra fields are added to the original frames to end up at the new frame rate.

Because these new video fields are “extra”, certain video editing applications can remove these extra fields that were recorded, and the result is video that has returned to its original 23.98 frame rate. This process is often referred to as reverse telecine, which is covered next.

Several different recording formats employ a pulldown during recording, including:

- DVCPro HD
- HDV
- XDCAM HD (and EX)

**A Confusing Array Of New Terminology**

One of the issues that camera departments and post production staff face is they are now being given choices for video formats that seem contradictory in nature. Here’s an example of a choice on a Panasonic HD camera:

1080i/24p

This means that the line count is 1080. The photographed rate is 24 frames per second (23.98), progressive. The recording to tape or P2 card is 60i, in other words, 29.97 fps interlaced. A pulldown is added to the 24p video to end up with a final recorded video at 29.97 fps. This pulldown can be removed by various editing systems to return to the originally recorded 24p video. See Reverse Telecine next.

Another example is from Sony:

24p/60i

Again, this refers to photographing 23.98 fps progressive, but adding a pull-down to record to tape, disc or memory card at 29.97 fps interlaced.

**Reverse Telecine**

This term is used to describe converting 29.97 video back to an original frame rate of 23.98 (or 24). Called inverse telecine and pulldown removal as well. Useful for many purposes:
When film is transferred to NTSC compliant video, it takes on a 29.97 frame rate. When editing film digitally, where the film negative will eventually need to be cut for traditional film printing, it is advisable to do a reverse telecine (converting back to 23.98 or 24) so that when working, you have a 1 to 1 relationship between video and film frames, making sure that the negative cutting will be frame accurate.

When working with a 24p camera that records at 29.97i or 59.94p like Panasonic SD and HD camcorders are able to do. During capture into an editing system like Final Cut or Avid, if the advanced pulldown is removed, you will end up with 24p (23.98) video in the computer. This is helpful if you need to output directly to film or output to 24p DVD’s. Manufacturers of HDV video also use a similar technique of recording 24p video to 29.97i. Removing the pulldown not only returns the footage to 24 frames, but it de-interlaces the video, resulting in a progressive frame.

It should be noted that software and hardware can be used to convert telecine film assets from 29.97 to 23.98 or 24 (in Avid and Final Cut). When converting footage back to 29.97, software and/or hardware can be used to convert 23.98 or 24 back to 29.97. The main advantage of 23.98 is that there is an extremely easy out to monitors and decks (at 29.97) through a standard pulldown.

**Going From 30 to 24**

If film or video is shot at 24 frames, we already discovered how this footage can be converted to 29.97, as well as how to return it to its original frame rate via a reverse telecine procedure. But what about converting footage that is shot at 29.97 fps to 24 fps (or 23.98)? If the video is originally shot as interlaced 29.97 fps video, then converting the footage to 23.98 fps will create problems. Its doable, but there will be a quality hit.

When interlaced video is shot, each field is captured one after the other. In other words, an interlaced video frame is not really a complete picture from a single moment in time. As we saw earlier in the section Interlaced and Progressive Scanning, each field is captured slightly later in time from the previous field. If the footage is reverse telecine’d, then vital fields of information are removed from the video. The video will have motion artifacts as a result, a strobe-like effect. Remember, when a reverse telecine is done on footage originally shot at 24, then converted to 30, extra or redundant fields are added to the video. During the reverse telecine, only these extra fields are removed, so the final motion is as clean in the final 24 frame media as it was in the original 24 frame media.

**How To Work With Video Shot Video At 24 and 30**

If both sets of video footage need to be used in the same project, then one of these formats needs to be converted so all footage is at the same frame rate. Since converting 29.97i to 24p is going to create problems as we just discussed, it is preferable to convert the 24p footage to 29.97 and work with all the video at 29.97.
TELECINE REQUIREMENTS

Your Telecine Transfer Quotation will be based on a ratio of 4-to-1. To keep the ratio within the quotation please be aware of the requirements and recommendations listed below:

Use of Key Coded film negative stock in minimum lengths of 1,000 feet per 35mm or 400 feet per 16mm. There is NO SAVINGS in Electronic Dailies by purchasing “Short Ends” of film stock. The use of short ends will dramatically increase the transfer ratio and cost!

After processing do not have “B” negative physically removed from camera rolls as this destroys the key number continuity and increases transfer ratios and costs.

All negative must be exposed at 24 fps (frames per second). All negative will be transferred at 24 fps.

Use of A DAT Recorder or Time Code Nagra operating @ 30fps in Non-Drop Frame (NDF) format with a minimum 10 second pre-roll on each take. Scene/Take ID should be recorded on the tape as well.

Camera slates must reflect correct scene/take information and must be readable. A time code “Smart Slate” is suggested for easier syncing of the audio and visual identification of time code numbers.

Complete, detailed, legible and matching Camera and Sound Reports indicating the transfer of “ALL” negative or only “Selected Takes”. Please cross-reference camera and sound reports to eliminate the possibility of guess work on the part of our telecine staff. Guess work on our part increases your cost!

Color Charts and Gray Scales shot without filters are requested at the head end of each camera roll and/or major lighting set-up for correct video color balancing to maximize the “look” requested.

A “Framing /Focus or Ground-Glass Test” shot before we start transfers will confirm the screen ratio requested. Please use a 50mm lens for 35mm or a 25mm lens for 16mm. Contact us for additional information regarding this critical set-up test.

All transfer specifications must be requested in writing before the start of the telecine transfer session. This includes screen format, window placement, transfer of wild audio lines, etc.

A Production Schedule is required to confirm and reserve telecine transfer time and dates. Additionally, a laboratory pickup schedule is required so we may schedule your session accordingly.

Any Saturday, Sunday or Holiday transfer session must be scheduled 72 hours in advance of the requested session. Specific transfer session requests will depend upon the availability of the TC Bay.

Any changes or additions to the original transfer specifications must be requested in writing.

We highly recommend the Director of Photography and/or the Director and Editor attend the first transfer session to give their final approval for the transfer specifications and in the event that no camera test is supplied.

All transfers will be performed in the fastest possible time. If any serious problems arise that cannot be immediately resolved, the transfer session will be stopped until the problems can be resolved. You will be notified by phone and/or FAX as to the particular problem. A detailed “Problem Log” will be sent to you daily documenting any problems and the additional costs involved.
TELECINE PROJECT INFO

Client: ________________________________ DATE: ________________
Project: ______________________________ WORK ORDER #: ______________
CLIENT P.O.: _______________________

Session Set-Up Information

Elements
Film Lab: _____________________________ Film Delivery Info: ________________________________
☐ MFV Tape Stock ☐ Client Tape Stock ☐ Tape Delivery Info: ________________________________
☐ Database: FLX (TLC) ☐ ALE (AVID) ☐ Other: ________________________________

Camera Setup
☐ 35mm  ☐ 4 Perf  ☐ 4 Perf  ☐ Scope  ☐ Regular 35 Academy  ☐ Full Aperture
☐ 16mm  ☐ Regular 16 Academy  ☐ Super 16 Center 4:3  ☐ Super 16 Letterbox

Type: ☐ Negative  ☐ Print  ☐ Inter-positive  ☐ Lo-Con Print  ☐ Dupe Neg  ☐ Other: ________________________________

Telecine Setup

Transfer: ☐ 4:3  ☐ 16:9 Anamorphic  ☐ 1.66 Lbx  ☐ 1.78 Lbx  ☐ 1.85 Lbx  ☐ 2.35 Lbx Common Top
☐ 2.35 Lbx Center Frame  ☐ 2.40 Lbx  ☐ HD 16:9  ☐ HD 4:3 Windowbox  ☐ Other: ________________________________

Standard: ☐ NTSC  ☐ PAL  ☐ 1080/23.98 PsF  ☐ 1080/59.94  ☐ 720p/59.94  ☐ Other: ________________________________

Timecode: ☐ NDTC  ☐ DFTC  ☐ EBU  ☐ 23.98 PsF

Downconversion: ☐ 1.77 Lbx  ☐ 4:3 Center Extract  ☐ 16:9 Anamorphic

Audio Setup

Audio Source: ________________________________ Dolby: ☐ SR ☐ A  Ch. 1 _______ Ch. 2 _______
Other Info: ________________________________ Ch. 3 _______ Ch. 4 _______

MSXl  Project: ☐ 24  ☐ 25  ☐ 30  ☐ Windows: ☐ Visible ☐ Clean  ☐ Audio: ☐ 48k ☐ 44k
Avid Resolution: _________  ☐ Media Delivery: ☐ Data DVD  ☐ Firewire Xfer  ☐ Shuttle Xfer
Audio Configuration: Ch. 1 _______ Ch. 2 _______ Ch. 3 _______ Ch. 4 _______

Matchframe Specs (Standard)

VITC Placement
☐ (5-Line Standard) 16:9 Video TC/T-Keystone/16 Audio TC
Accept MFV Use ☐ Standard ☐ Other: ________________________________

Video Reel I.D.
(3 Letters, 2 Numbers) ________________________________ Accept MFV Use ☐ Standard ☐ Other: ________________________________

Matchframe Standard Window Placement

Window Placement (see below for MFV standard)

Audio: ________________________________ ☐ Inside Safe-Action  ☐ Outside Safe-Action

Video: ________________________________ Keycode: _______

Post-Prod. Contact ________________________________ Emergency Contact ________________________________
Phone ( ) _______ Pgr. ( ) ____________ Phone ( ) _______ Pgr. ( ) ____________
Editor ________________________________ Other Contact ________________________________
Phone ( ) _______ Pgr. ( ) ____________ Phone ( ) _______ Pgr. ( ) ____________
off-line editing

portable hard drives

You will need to buy your own portable hard drive.

The School does not endorse any one hard drive vendor, but students have had good success with LACIE and G-TECHNOLOGY hard drives. We recommend a minimum 500GB with FireWire 400 and 800 connectivity running at 7200rpm (or higher). The price (as of August 2008) is between $300 and $400.

Note: Even though USB-2 is supposed to provide even greater bandwidth, don’t use it for video editing on a Mac. It won’t work and you will constantly get dropped frames.

Once you have purchased your drive we recommend that you format the drive before you begin using it. This is true even if the drive comes preformatted. Use the Disk Utility in the Utilities folder of the computer to format your drive as Mac OS Extended.

Remember that all hard drives have the potential to fail, make sure to keep a backup of your important data. We recommend that you keep backup copies of your project files on a USB flash drive, on a CD-RW/DVD/disc, or by some other backup method.

FireWire Drives

FireWire disk drives can be effectively used to capture and edit projects using low data rate video clips, such as those captured using the DV codec. However, most FireWire disk drives lack the performance of internal Ultra ATA disk drives or of internal or external SCSI disk drives. For example, a FireWire disk drive may not be able to support real-time playback with as many simultaneous audio and video tracks as an internal Ultra ATA disk drive can. This can also affect the number of simultaneous real-time effects that can be played back.

Keep the following points about FireWire drives in mind:

• FireWire disk drives are not recommended for capturing high data rate material such as uncompressed SD or HD video.
• Certain DV camcorders cannot be connected to a computer while a FireWire disk drive is connected simultaneously.

• You may be able to improve performance by reducing the real-time video playback data rate and the number of real-time audio tracks in the General tab of the User Preferences window.

Care of the FireWire Drive
Statistics show that 25% of lost data is due to a failure of a portable drive. (Source: 2001 Cost of Downtime Survey Results) Contrary to its seemingly rugged appearance, your portable FireWire drive is a very delicate device that writes and reads data using microscopic magnetic particles. Any vibration, shock, and other careless operation may damage your drive and cause or contribute to the possibility of a failure.

Be careful with your portable FireWire drive. Never bang or jostle it, and when plugging into or out of your bay, be very gentle. If you damage your portable drive, you not only damage the equipment, but may lose all work on your own projects as well.

Connecting a portable FireWire drive
Be particularly careful with the FireWire plugs, they are the most common source of problems with portable FireWire drives.

   Note: FireWire Drives use a 6 Pin FireWire Cable that can only be plugged in one way (one side is slightly rounded). If you force the plug in the wrong way you will damage both your hard drive and the computer!

Never disconnect a FireWire disk drive prior to unmounting it from the Finder. Drag and drop the drive icon to the trash icon (notice it changes into an eject icon). The drive should disappear from your desktop.
aspect ratios

dv and widescreen video formats
Almost every DV Camcorder has the option to shoot in a 16:9 format, but unless the camera has a 16:9 CCD, the Anamorphic process vertically squeezes the image to fit in the 720x480 space. This is done by either using the camera’s wide screen option (found in the menu) or by using an anamorphic lens.

Videographers and editors must bear in mind that when shooting “widescreen” video using standard definition DV camcorders, the recorded DV video frame is still 720x480 pixels. Shooting 16:9 visuals and recording them to a 4:3 frame size is referred to as shooting Anamorphic video. An anamorphic image is created when a wide frame is stretched into the same space as a normal frame, with the result being visible horizontal distortion (a “squished” look) in the video frame.

What is Aspect Ratio?
Aspect Ratio is the horizontal width of a television or projection screen in relation to its vertical height. For example, a traditional analog television has a screen aspect ratio of 4x3, which means that for every 4 units in horizontal screen width, there are 3 units of vertical screen height. HDTV’s have a an aspect ratio of 16x9, which means that for every sixteen units in horizontal.

A typical frame of DV video is 720 pixels wide and 480 tall giving it an aspect ratio of 3:2. This width to height “ratio” refers to that of a standard frame of film or video. The aspect ratios of DV (3:2), standard NTSC (4:3), are “less wide” than that of a widescreen ratio.

What is 16:9?
With widescreen television, like that of HDTV, the aspect ratio is roughly 16 parts wide by 9 parts.
Widescreen Aspect Ratio as seen in the Canvas and the Viewer

image Anamorphically Squeezed into a 3:2 Aspect Ratio
A 16:9 Letterbox image as viewed on a Pro Monitor or in many Camcorder’s Viewfinders or on a Consumer TV after you distort and render your entire Nested Sequence to adjust for the offset.

**Can I view Anamorphic Video in 16:9 on my NTSC Monitor?**

Typically, it is not possible to view Anamorphic Video on a standard NTSC Television monitor. However, with more expensive, professional NTSC monitors there is a 16:9 feature that will resize the Anamorphic frame on the fly, lending it the proper dimensions of the widescreen format.

**Capturing Anamorphic Video**

In order for Final Cut Pro to use Anamorphic video, you must first know how the footage was acquired.

If you used the 16:9/widescreen setting found on your camera, there is a good chance all you will have to do is capture the footage following the standard Log and Capture process. This may work for you because many DV cameras will embed this information in the captured footage. Final Cut Pro recognizes data stream and will automatically set the footage as anamorphic.
If the Anamorphic footage was acquired using an Anamorphic lens, Final Cut Pro will only see the footage as 4:3, even though it is stretched vertically (the camera data tag is not there). When you open the Log and Capture window, go to the Capture Settings tab and change Capture/Input to include Anamorphic.

**Working with Anamorphic Video**

After you capture your footage, you can check and see if Final Cut Pro tagged the footage correctly by scrolling right in the Browser window to the Anamorphic column. If the footage has been recognized correctly, you should notice a check mark next to the clip.

If it appears that the clip has not been captured correctly, you can turn on the Anamorphic setting by doing the following:

**Step 1:** Select the clip in the Browser and then from the Edit menu select Item Properties>Format.

**Step 2:** Place a check in the Anamorphic row if your footage is 16:9.

You can also change the format settings by placing a check in the Browser Window Anamorphic column. This will correct the data tagging/interpretation mistake.

When you open a clip, the Viewer Window will display the clip in the correct aspect ratio.
However, if you wish to view your footage on a video monitor as you work, you will need to have a monitor that has an option to switch between 4:3 and 16:9. Most new professional monitors have this capability.

Anamorphic Sequences
There are a couple of ways you can use 16:9 footage in Final Cut Pro. The first is to simply place the 16:9 clip in a 4:3 sequence. Final Cut Pro places this clip in the Timeline in letterbox format meaning you will have black bars at the top and bottom of the screen.
The advantage of following this workflow is you can view the sequence on a standard monitor, or use Print to Tape for viewing on a consumer set.

The disadvantage is your letterboxed sequence will be a lower resolution than the original footage because you are only using 360 lines instead of 480. The other disadvantage is you must render all 16:9 clips in the 4:3 environment. If you have a lot of footage, this could take a while.

![Image of sequence settings](image1.png)

Because of these issues, you should only letterbox your 16:9 footage if you are delivering for viewing on consumer equipment.

The other method of editing your footage is to use a 16:9 sequence. An Anamorphic sequence is created like any other. In the Sequence Settings window, the frame size settings should be set at the video frame size (720x480 for DV), but you want to place a check in the box for Anamorphic 16:9.

![Image of sequence settings](image2.png)

The advantage here is you will continue to use the full resolution of the format. You also do not have to worry about rendering your clips in the Timeline.
You need a monitor that is able to display 16:9

In displaying 16:9, Final Cut Pro will show the full widescreen frame, both in the Viewer and the Canvas on the computer monitor. However, recall that the display on a standard NTSC “consumer” monitor will likely be distorted. Viewing the computer monitor(s), if you set the drop down menus in your Viewer and Canvas to: “Show as Sq. Pixels” the widescreen image will display 16:9 properly.

You can also put your windows into “16:9 Mode” using the window menu.

**Outputting 16:9 to tape**

When outputting an edited sequence using Anamorphic 16:9 video to tape, you have two options, depending on what kind of equipment you want to play your Show to play back on:

**Option 1: Letter box to 3:2**

Most People want to just output to letterbox for two reasons.

a. You or your clients require outputting for a standard consumer monitor.

b. You do not have a monitor to view the 16:9 footage in “native” widescreen, and want to enjoy playback as you see in the Canvas.
In either case, you will have to render your entire Sequence to display your show in widescreen format on any standard television.

In the case of wanting to see your playback in your Canvas and your standard NTSC monitor after rendering, and want to continue editing your piece, I would suggest that you export a Final Cut Pro Reference Movie first, and then reimport it, working on the Reference Movie instead. That way, you won’t have to re-render after each small change is made.

**Option 2: Leave the footage as is**
Most folks don’t want to do this, but some do. There are, however, very good reasons to leave it looking distorted, which are:

a. Outputting for a DV Tape to Film Transfer
b. Outputting in mind for hardware that will display 16:9, such as Pro Monitors or Widescreen Televisions.
post sound

Audio Post Production is the process of creating the soundtrack for moving images. Ever since the once silent movies developed a prerecorded track, filmmakers have been looking to control and improve the quality of the sound of their visions. As soon as moviemakers realized there was a way to control and enhance the sound of their pictures, Audio Post was born and has been a fact of life ever since.

What is involved in Audio Post?
Audio post usually consists of several processes. Each different project may need some or all of these processes in order to be complete. The processes are:

* Production Dialogue Editing
* ADR (Automated Dialogue Replacement or Looping)
* Sound Effects Design and Editing
* Foley Mixing and Editing
* Music Composition and Editing
* Mixing (also called Re-Recording)

What does all that mean in English?
Production Dialogue Editing - In order for the production audio recorded on the set or on location to be properly mixed, a Dialogue Editor needs to prepare it. This means locating the takes used by the Picture Editor from the recorded production audio, checking sync (so the audio works with the picture properly), and eliminating extraneous noise so the Dialogue Mixer has clean dialogue to use during the mix.

ADR [Automated Dialogue Replacement] - In cases where the production audio is too noisy or otherwise unusable (bad line reading, airplane fly-by, etc.), or where the filmmakers want to add voice over narration or simply add dialogue that was never recorded, the line will be programmed or “cued” for “looping” or ADR. This process takes place on the ADR Stage, a specialized recording studio where the actor
can record while watching the edited picture, matching the sync of the original line or fitting the new lines with the actions.

After a loop lines have been recorded, the ADR Editor will check the sync carefully, modifying the take if necessary to precisely match it to the picture, and prepare it for the Mixing Stage.

Sound Effects Design and Editing - Sound Effects Editors and Sound Designers are the craftspeople who add the computer beeps, gunshots, laser blasts, massive explosions; and more subtle sounds like background ambiences such as air, rivers, birds, and city traffic. Sound Designers use a variety of technologies from bleeding edge to tried & true to create unique sound effects that have never been heard before, or to artistically create specific “mood” sounds to complement the filmmakers’ vision of the visuals. Sound Effects Editors put those sounds in sync with the picture as well as selecting from libraries of hundreds of thousands of prerecorded sounds; and organize them so the FX Mixers can “PreDubb” those sounds efficiently.

Foley - Taking its name from Jack Foley, the Hollywood sound editor regarded as the “father” of these effects, Foley effects are sounds that are created by recording (usually) everyday movement while watching the edited picture. Different from the environmental backgrounds (“BGs”) and hard effects (FX), Foley effects are sounds like footsteps, object handling, the rustling of clothing, etc. The people involved in this process are the Foley Walkers or Artists who perform those sounds and the Foley Mixer who records them. After the Foley Effects are “shot,” the Foley Editor will use his/her craft to polish those sounds to ensure that they are exactly in sync with the final picture.

Music Composition - Music for motion pictures falls into two general categories: Score and Source. The Composer is the individual hired to prepare the dramatic underscore. Source music is what we hear coming from an on screen or off screen device like stereos, televisions, ice cream trucks, and so on. Source music may be original or licensed from a number of libraries that specialize in the creation of “generic” music. Songs (music with vocals) may occupy either function, depending on the dramatic intent of the director. For “Pulp Fiction” for example, Director Quentin Tarantino hired a Music Supervisor (Karyn Rachtman) to “score” the picture using period music of the 1970’s almost exclusively. Most contemporary films use a combination of score and source music.
Music Editing - The Music Editor assists the Composer in the preparation of the dramatic underscore. Frequently working also with the Music Supervisor, the Music Editor will take timings for the Composer during a spotting session in order to notate the specific locations in the film where underscore or source music will punctuate the narrative. Once the underscore is recorded and the source music gathered, the Music Editor would be the person who edits or supervises the final synchronization of all music elements prior to the mix.

Mixing (also called Dubbing) - The Mixers have the responsibility of balancing the various elements, i.e., the Dialogue & ADR, Music, Sound Effects, and Foley Effects, in the final mix. The Dialogue Mixer, (also called the Lead Mixer or Gaffing Mixer) commands the mixing stage; his/her partners in the mix traditionally were the Effects Mixer and the Music Mixer. As of now, the Lead Mixer commonly does the Music mixing as well, reducing the traditional mixing team by a third.

Where does post-production sound begin?
If you haven’t shot your film yet, it begins before you shoot - by selecting the finest production dialogue mixer you can afford. The little bit extra paid to a great production mixer can save you tenfold later in post production.

What does the production sound mixer do?
The production mix team are the individuals charged with recording your live dialogue in sync with the camera team. The production mixer will have a Boom Operator, who handles the boom mikes; and usually a cable person, who will be in charge of wrangling the audio cables needed to mike the set appropriately.

We are done shooting... now what happens?
The editor has been synching dailies all during shooting, choosing which scenes should begin to form the final cut. During the next several weeks, the process of editing will continue as the decisions are narrowed down to final choices. It is at this time that the final form of the film begins to take shape. Although the film editor may have been assembling the “editor’s cut” during the shooting period, the first formal edit period is generally referred to as the director’s cut, and it is when the first full assembly of the film is refined.
What happens once the cut is locked?

The real job of audio post has now begun. In the next weeks or months, the sound editors will locate and synchronize all of the sound effects needed in the film. If necessary, they will create Field Recordings of new sound effects needed for the film. The Foley supervisor will cue all of the Foley effects that will be needed; they will be recorded by the Foley Mixer and the Foley Walkers; the ADR supervisor will cue all of the Automated Dialogue Replacement lines that need to be recorded during the ADR sessions, and the Music Editor will begin providing for the needs of the Composer and/or music supervisor. The Dialogue editor(s) will begin preparing the production audio for final mixing, and the ADR editors can commence editing in the ADR lines, once they have been recorded.

The Director will be checking on the various aspects of the sound job as time progresses, to be sure that his vision is being realized. Usually, there is provision for one or more “effects reviews” where the effects are listen to and approved. The same goes for Foley, Dialogue, ADR, Sound Design and Music. When everything is completed and approved, the next step is Mixing (also called ‘dubbing’ or ‘re-recording’).

What happens during the mix?

During the mix, the edited production dialogue and ADR, sound effects, Foley and Musical elements that will comprise the soundtrack are assembled in their edited form, and balanced by a number of mixers to become the final soundtrack. In New York, single-mixer sessions are more commonplace than in Hollywood, where two-mixer and three-mixer teams are the norm.

The mixers traditionally divide the chores between themselves: the Lead Mixer usually handles dialogue and ADR, and may also handle music in a two-person team. In that case, the Effects mixer will handle sound effects and Foley. In three-person teams, they usually split Dialogue, Effects and Music; sometimes the music mixer handles Foley, sometimes the effects mixer covers it.

To keep the mix from becoming overwhelming, each mixer is actually creating a small set of individual sub-mixes, called STEMS. These mix stems (dialogue, effects, Foley, music, adds, extras, etc.) are easier to manipulate and update during the mix.

When mixing is done, what then?

After the mix is completed and approved, films generally require a last step called Printmastering, that combines the various stems into a final composite soundtrack. When this is completed, an optical or digital sound track can be created for a feature film release print.
It is also usual at this time to run an ‘M & E’ (which stands for Music and Effects) track. This is essentially the film’s soundtrack with the English language dialogue removed. This allows foreign language versions of the project to be dubbed easily, while preserving the original music, sound effects and Foley. During the M & E, effects or Foley that are married to the production dialogue tracks are removed along with the dialogue. To “fully-fill” an M & E for a quality foreign release, those effects and Foley must be replaced.

Television movies usually do not require print masters, unless they have been created using SURROUND SOUND techniques. In most cases, the final stems are combined during a process called LAYBACK, at which time the soundtrack is united with a final edited master videotape for ultimate delivery.

What about optical soundtracks?

Optical soundtracks (we mentioned them earlier). Almost all of the release formats, including the digital ones have provision for some kind of optical soundtrack, even if only as a backup. The optical soundtrack refers to the two-channel soundtrack that is carried on the optical track of the film release print.

How do I get an optical soundtrack?

Once your surround sound format has been selected (see the paragraph below for more), you need to order an optical soundtrack negative for the film. In the case of LCRS mixes, a traditional two-channel Printmaster track is created, and this is sent to an optical sound house for the creation of the optical negative. The optical sound house will record the soundtrack onto 35mm film using a special camera, and some will also develop their own soundtrack masters. Once the optical negative is shot and developed, it can be incorporated into your answer printing process, and a composite answer print containing your complete soundtrack can be printed or “shot” at your film lab. This usually happens during the first or second trial answer print phase.

What about: THX - Dolby - Ultra*Stereo - DTS - SDDS?

This is a BIG question. This one point alone causes much confusion amongst filmmakers. Please take a moment and read this paragraph carefully. If you need more information after that, please contact either Gnome Productions or Magnolia Studios and we will help you out.
THX.

THX is not something that you DO to your soundtrack, it is just a set of sound reproduction or mixing conditions that optimize the sound of your film’s soundtrack in exhibition. Simply put, the THX standards that many dubbing stages and movie theaters adhere to are a way of being certain that “what you mix is what you get”, so to speak. You may choose to mix in a stage that is THX certified, and you may not. If you do, your soundtrack should sound reasonably the same in THX theaters all around the world. It is this standardization that THX brings to the filmmaking community.

You may want to visit the THX Web Site for further information. They can be found at http://www.thx.com/thx/thxmain.html.

To make sense out of the rest of the names, we need to know about Film (and Television) Surround Sound. Film sound tracks (and some television ones) go beyond just Left-Right Stereo; there is a Center Channel for the dialogue, and at least one “Surround Sound” channel. The Surround channel is used to project the sound out into the theater, to “surround” the audience. This is to enhance the illusion of being “in the picture”. This four-channel format is called LCRS (for the Left, Center, Right and Surround channels that the soundtrack contains). Although the technical means behind this process is beyond the scope of this discussion, suffice it to say that it works well enough to have become a standard format for release prints for many years.

LCRS

You’ve probably already figured out that you cannot reproduce a four-channel soundtrack from a medium that only plays back two tracks. You are very right. In order to reproduce the LCRS soundtrack from a traditional film optical soundtrack (more on opticals later) you need a way to encode the channels.... the Matrix

The Surround Sound Matrix Encoder (or, how to put FOUR into the space where TWO should go!)

The solution is to use an encoding device that can fold the four channels of audio down into the two channels available on the film’s optical soundtrack. When the audio tracks have been processed this way, they are labeled Lt/Rt [Left Total/Right Total] in order to distinguish them from ordinary Left/Right Stereo soundtracks. The Surround Sound Matrix Encoder is a necessary piece of hardware that the audio post house must have available during your film’s mix, in order to create the surround soundtrack.
The Licensing of Surround Sound formats

Now we’re really getting into the heart of the matter. Dolby Labs, UltraStereo Labs, DTS (Digital Theater Systems) and Sony [SDDS] all have technologies available for the encoding of film surround soundtracks into film release prints. Although these processes vary somewhat as to their method, they essentially accomplish similar things. Additionally, some of these vendors offer Digital Encoding formats (Dolby Digital, DTS and SDDS currently, and UltraStereo soon to come).

The Differences in Surround Sound formats

In the most basic form, Theatrical Surround Sound consists of LCRS: Left, Center, Right, and mono Surround. A soundtrack can be encoded into this format by using a Dolby or UltraStereo encoding matrix during the film’s Printmastering session. DTS also has a process called DTS Stereo that can create a typical LCRS film soundtrack (check with DTS directly for more on their specific processes...).

Surround Sound formats beyond L-C-R-S

Some of the surround sound encoding processes can create different, more complex soundtrack formats; Dolby SR/D and DTS, for example, can create six-track soundtracks for release, and Sony’s SDDS is an eight-track format. In the case of six tracks, you get Left, Center, Right, Left Surround, Right Surround and a Sub-woofer channel (for enhanced low-frequency response). The split surrounds (as they are called) make it possible to move sounds around in the surround speakers, or to use stereo background sounds for even more impressive film soundtracks (Jurassic Park comes to mind, here). And if you heard Jurassic Park in a good THX theater with a DTS Digital soundtrack, you know what the sub-woofers are there for! That T-Rex really gave the sub woofers a run for their money, as well as Jeff Goldblum... Six-track sound reproduction has been with us for a while, since 70mm film releases have had the ability to deliver a six-track soundtrack that was magnetically encoded on the release print. This, unfortunately, was very expensive to produce, and problematic to control quality.

Sony’s SDDS (Sony Dynamic Digital Sound) uses an eight-track delivery configuration that adds two speakers in between the Left/Center and Center/Right positions in the front speaker wall. Known variously as InterLeft, InterRight or LeftCenter and RightCenter, these channels allow for additional separation of music, effects and dialogue in the front speaker wall, while preserving the split surround format.
The Differences in Digital Sound delivery methods

The three digital systems (Dolby, DTS and SDDS) use proprietary methods to deliver the digital audio to the theater; two of these methods (Dolby, SDDS) encode the digital soundtrack onto the release print.

DTS uses a different method, that of encoding a “timing stripe” onto the release print, and synchronizing a digital audio playback from an accompanying CD-ROM that carries the encoded soundtrack. In either case, the digital audio is reproduced in the theater with the same fidelity it was recorded at during the encoding process. This system neatly bypasses the traditional limitations of optical soundtracks:

- noise, bandwidth limitations, and headroom (transient peak) limits.

Soundtracks sound cleaner, clearer and louder as a result. Please don’t take this as a condemnation of optical soundtracks. A well mixed movie can (and they still do) sound great with a well produced optical soundtrack.

To summarize this difficult topic

THX specifies a set of standards that affect how sound is recorded and reproduced in a movie theater.

You get the benefits of the THX standard whenever you mix in a THX certified mixing stage.

There is NO additional fee required.

You may display the THX logo in your film’s credits if you sign a simple one-page form.

Dolby Surround is a 4-channel optical surround format; this format is encoded in the optical soundtrack

You must license this format from Dolby Labs; There IS a license fee for this service

Ultra*Stereo is a 4-channel optical surround format; this format is encoded in the optical soundtrack

You must license this format from Ultra*Stereo Labs; There IS a license fee for this service

DTS is a 6-channel digitally-encoded surround format; this format is encoded on an external CD-ROM, but the timing and other information in encoded on the film release print;

You must license this format from Digital Theater Systems (DTS); There IS a license fee for this service

Dolby Digital is a 6-channel digitally-encoded surround format; it is encoded on the film release print;
You must license this format from Dolby Labs; There IS a license fee for this service

SDDS is an 8-channel digitally-encoded surround format; it is encoded on the film release print;

You must license this format from Sony Corporation - SDDS division; There IS a license fee for this service
spotting

Once the cut has been locked, the film can be spotted for the placement of sound effects and music. The Supervising Sound Editor, the Director and possibly the Film Editor and Composer will gather at one or more spotting sessions to determine the film’s audio post needs.

“Spotting for music” is the process of viewing the locked cut and deciding where the music score will be, and where the source music will be needed. “Spotting for sound” is the process of determining:

- if and where any dialogue problems may exist, so that ADR can be recorded
- where sound effects are needed and what kind
- what Foley effects will be needed in the film, and where
- If Sound design (the creation of special sound effects), will also be needed.

On the following page is a Pull List for sound effects. You can use similar forms for spotting music as well.
<table>
<thead>
<tr>
<th>timecode</th>
<th>FX ID#</th>
<th>description</th>
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<tbody>
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<td>06:32</td>
<td>D36-015</td>
<td>chair squeak 1</td>
</tr>
<tr>
<td></td>
<td>D36-019</td>
<td>chair squeak 2</td>
</tr>
<tr>
<td></td>
<td>D17-032</td>
<td>wood smash 1</td>
</tr>
<tr>
<td></td>
<td>D17-033</td>
<td>wood smash 2</td>
</tr>
<tr>
<td>06:42</td>
<td>AU02-16</td>
<td>small bottle break</td>
</tr>
<tr>
<td></td>
<td>AU02-19</td>
<td>glass shatters</td>
</tr>
<tr>
<td></td>
<td>AU02-25</td>
<td>plate glass smash</td>
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<td>06:58</td>
<td>ED15-142</td>
<td>camera crane</td>
</tr>
<tr>
<td>07:03</td>
<td>HT01-15</td>
<td>1/4 &quot; tape running</td>
</tr>
<tr>
<td>07:09</td>
<td>HT01-26</td>
<td>kloig lite switch</td>
</tr>
<tr>
<td></td>
<td>TH02-136</td>
<td>kloig lite hums</td>
</tr>
<tr>
<td></td>
<td>TH02--139</td>
<td>hiss on/off</td>
</tr>
<tr>
<td>07:15</td>
<td>TH02-12</td>
<td>cases open/shut</td>
</tr>
<tr>
<td></td>
<td>TH01-120</td>
<td>hammers</td>
</tr>
<tr>
<td></td>
<td>TH01-105</td>
<td>electric saw</td>
</tr>
<tr>
<td></td>
<td>TH01-06</td>
<td>alarm bell</td>
</tr>
</tbody>
</table>

sample Pull List for sound effects
Motion picture music falls into three basic categories:

**underscore** (James Horner’s score to Titanic, John Williams’ score to E.T., or Randy Newman’s score to Toy Story 2);

**pre-existing song** or song and original master recording (Bruce Springsteen’s “Hungry Heart” for The Perfect Storm, Steve Miller’s “Fly Like An Eagle” for Space Jam, the Guess Who’s “American Woman” in American Beauty);

**song written specifically for the film** (Diane Warren’s “I Don’t Want To Miss A Thing” for Armageddon, Phil Collins’ “You’ll Be In My Heart” for Tarzan)

**THE PRE-EXISTING HIT SONG USED IN A FILM**
A film producer who wants to use an existing song in a motion picture must secure the permission of the music publisher to use the composition in the film.

Once an agreement is reached as to a fee, the producer will sign a synchronization license, which will give the producer the right to distribute the film theatrically.

**Determining How Much To Charge For A Song.**
There are a number of factors that must be considered in determining how much to charge for the inclusion of a song in a film, including:

- How the song is used (i.e. vocal performance by an actor on camera, instrumental background, vocal background)
- The overall budget for the film, as well as the music budget
- The type of film (i.e. major studio, independent, foreign, student, web)
- The stature of song being used (i.e. current hit, new song, famous standard, rock n’ roll classic)
- The duration of the use (i.e. one minute, four minutes, 10 seconds) and whether there are multiple uses of the song
The term of the license (i.e. two years, 10 years, life of copyright, perpetual)

The territory of the license (i.e. the world, the universe, specific foreign countries)

Whether there is a guarantee that the song will be used on the film’s soundtrack album

Whether the producer also wants to use the original hit recording of a song, rather than re-recording a new version for use in the film

Whether the motion picture uses the song as its musical theme as well as its title

Actual Fees Paid For Existing Songs.
The synchronization fees charged by music publishers for major studio films are usually between $15,000 and $60,000. There are no hard and fast rules as the fees are negotiated in the context of each individual film; the same song may be licensed at very different rates for different projects (i.e. major studio release, independent film, foreign film, film festival license only, web production, or student film).

Opening And Closing Credits.
Because the songs used over the opening credits of a motion picture many times reflect the theme or ambiance of the film, they are many times more important to the film than other songs used for background.

Student-Produced Films.
Because student-produced films have limited chances for commercial success and small budgets, many music publishers will license their songs for substantially reduced fees. In such cases, most publishers recognize the importance of assisting young filmmakers, since they are an integral part of the future of the entertainment industry. Most publishers, however, will provide that if the project has any type of commercial success or secures more than just film festival distribution, an additional fee or fees will be paid.

Duration Of License.
The term of the license is virtually always for the entire copyright life of the song.

 Territory.
The territory of the license is normally the universe or world.

A “film festival” license may give the producer the right within 18 months after the initial showing of the film to extend the territory and the duration of the license for an additional fee.
THE UNDERSCORE
The underscore is the music that makes up the majority of music used in film. It is the music you hear under dialogue, in chase scenes, in romantic settings and throughout the picture.

Screen Credit.
The type and placement of screen credit for a composer is a negotiable item.

MUSIC CUE SHEETS AND THEIR IMPORTANCE
After a motion picture has been produced and a final version has been edited, the producer will prepare a music cue sheet. The cue sheet is used to determine fees and payments. It is a written record of the music used in the film and is used to determine that all necessary rights and permissions have been granted.

The cue sheet lists:
   All of the music used in the film
   How the music was used
   Its timing in seconds
   The identity of the writers and music publishers
   Writers’ and publishers’ performing rights affiliation
   If pre-existing master recordings have been used, the identity of recording artists and record companies
how to acquire music for films

Frequently Asked Questions For Student and Independent Filmmakers

Q: WHAT LICENSES MUST I GET TO USE A SONG IN MY FILM?

A: If you are using a pre-recorded song or another pre-recorded piece of music in your film, there are two rights you need to clear; that is to say, you need to get two different licenses to use the music.

**Synchronization License:** This is the right to synchronize a song or a piece of music with your visual image. It must be obtained from the copyright owner of the music, which is usually the publisher. You can find out who the publisher is by using ASCAP’s Clearance Express (ACE) at www.ascap.com. Songs that are not represented by ASCAP might be found at the National Music Publishers’ Association “Songfile” website (www.nmpa.org). You will be provided with a contact at the publisher’s Business Affairs or Licensing Department.

**Master Use License:** This is the right to reproduce a specific recording of a song in your film. You clear this right with the record label who owns the specific recording you would like to use; see the liner notes of the recording to find out which company this is. Alternatively, you can get contact information for record labels by calling ASCAP’s Film/TV Department. You will be provided with a contact at the record label’s Business Affairs Department.

Q: WHAT DO LICENSE FEES COST?

A: License fees are determined based on various factors, including how the music will be used, the duration and number of times the music will be used and where the film will be performed. In all cases, the fees are negotiable and not all publishers and record labels charge the same amount.

Students working on films that are only shown within an educational environment can often negotiate reduced fees. Independent filmmakers planning to show their films at film festivals can also often negotiate a reduced fee called a Festival Use License. These reduced rates are based on limited screenings of the film. Once the film has been sold for theatrical release, the fees will increase based on the significant increase in viewership and potential increased revenues.
Q: WHAT INFORMATION SHOULD I INCLUDE IN MY REQUEST FOR MUSIC RIGHTS?

A: Submit a synopsis of the film and the film’s budget.

Provide as much detail as possible on how you intend to use the song: main title (opening credit) or end title (closing credit); feature (song is the main focus of the viewers attention) or background (song plays in the background of a scene); number of times the song is used, duration and placement for each use.

Specify where your film will be screened. For example, is your film a student film being viewed solely in an educational environment? Or is your film an independent film, which will screen at festivals?

Ask how the fee will increase in the event of possible future performances in different types of media.

If you are planning on securing soundtrack rights at the same time, ask how that affects your fees.

Q: WHAT ARE THE CONSEQUENCES OF SCREENING THE FILM WITHOUT SECURING MUSIC RIGHTS?

A: U.S. Copyright Law provides that you can be sued by a music publisher and/or record label, for using their property without their consent.

Clearing the rights and having step deals in place will also help you in the event that a distributor is interested in buying your film. If your rights are not cleared, the distributor is looking at an unknown expense tied to your film, and this can be a deterrent in a distributor’s interest in acquiring an independent film.

Q: HOW DO I FIND A COMPOSER TO WRITE ORIGINAL MUSIC FOR MY FILM?

A: Music that is composed specifically for a film, as opposed to pre-recorded music placed in a film, is the film score. You can hire a composer to write this music for you. ASCAP works with film composers and composer agents at every level of experience and can help you find a composer appropriate for your film at your budget.
Students can also find composers at the following locations:

www.mandy.com (click on “production jobs”)
www.ifp.org/jobs
www.losangeles.craigslist.org/tfr

Q: WHAT DO I PAY A FILM COMPOSER?

A: You will be paying a composer an up front fee for writing and recording the music for your film. You will negotiate this fee based on your film budget, the amount of music required, and the film composer’s experience in the industry. Again, fees vary significantly, case by case.

Q: WHO OWNS THE FILM SCORE?

A: Based on your negotiations with the film composer, your Composer Agreement will spell out who owns the filmscore (that is, who retains the publisher share of the music). This will either be the production company or the film composer.

If the production company pays the appropriate composer’s fee up front, it usually retains the publisher share of the music while the composer retains the writer share. If the production company is unable to pay the composer an appropriate fee up front (as happens often with independent films but never with major releases), a composer will often negotiate to keep the publisher’s share of the music. Regardless, as a filmmaker, if your film will have a broader release than at film festivals, you need your Composer Agreement to give certain Broad Rights to the production company: these may include worldwide synchronization; worldwide free, pay, cable and subscription television; in-context and out-of-context television advertising and film trailer use, including promos on other film videos; theater distribution outside the United States; videocassette and videodisc rights; all future technology rights whether now known or not.
getting clearance for music

To play a song in any medium, you will need synchronization rights from the publisher of the song. If you want to use a particular recording of a song, you will also need master rights from the record label who released the recording.

You must always contact the publisher for any song use. Here's how:

1. Look at the label copy for the song and get the names of the songwriters. You can also frequently get songwriter information at the All Music Guide (www.allmusic.com) or CDNow (www.cdnow.com).

2. With the songwriters noted, take the EMG research link to ASCAP and/or BMI and enter the song title. You may find that there are many songs with the same title, but using the writers will help you zero in on your title. If the song is not found at ASCAP, try BMI next, or vice versa.

3. ASCAP and BMI will provide information on the publisher owning the song. Copy the address information for the publisher.

4. Prepare a brief letter or fax (1 to 1½ pages maximum) to the publisher - be sure to say Independent Film Request or Low Budget Film at the top of the letter. Reference the title of the song and songwriters, then the name of your production. Tell them briefly about the production how the song fits in, as well as:
   a. The timing or duration of the song;
   b. The visuals accompanying the song;
   c. Where your production will be seen and for how long (1-time, 1 year, etc)
   d. The titles of other songs you plan to use, particularly if you have already gotten permission.
   e. If you have no budget for clearance, say so in your letter. However, publishers will often give priority to requests that offer a token fee ($25.00 to $100.00 per song) because it shows respect for the value of the copyright.
   f. Provide the publisher with an address, phone fax or e-mail so they can reply quickly.
g. Remember, student requests will only be considered as such if they remain in the realm of the school, or school-related exhibitions. Productions for sale are NOT student films.

h. Fax or mail your request to the publisher. Wait at least 10 days before following up.

To contact the record label:

1. Find the name and address of the record company on a copy of the CD or recording you plan to use. If you don’t have a copy, try to find the recording on www.cdnnow.com www.amg.com, or at your local record store. Most record stores keep a copy of Phonolog, which lists all records in release and has addresses of most current record labels.

2. Prepare a brief letter similar to the publisher letter above.

A few things to keep in mind:
1. Music belongs to the publishers and labels and they have no obligation to give you permission, or even respond to your request (although most do).

2. If someone doesn’t respond, it doesn’t mean you’ve been given permission.

3. In most cases, you cannot change a song’s lyrics for use in production without permission. In other words, you can’t clear the melody and substitute your own words with the publisher’s OK.

4. Permissions take time (especially those being sought for free). Be sure you allow at least a few weeks for copyright owners to respond.

5. Finally, only the owners of the music copyrights you are seeking can grant you a license. Receipt of this reply does not in any way constitute a clearance or agreement by our firm to represent you in getting rights for this music use.

Good Luck!

EMG MUSIC CLEARANCE
4181 Sunswpt Drive, 2nd Floor,
Studio City, CA 91604
Phone: 818-762-9656
Fax: 818-762-2624
E-mail: emginc@clearance.com
Most people are going to see your project on a television screen – either Standard Definition or High Def – so you need to be aware of some very important things.

**What does “Title Safe” mean? (and Action Safe)**

A certain amount of the picture area will get cropped off along the edges of almost all television screens and digital projectors. This is called overscan. Zero percent overscan means that the entire picture is visible, but this is hardly ever the case.

A CRT TV may have more than 10 percent overscan. An HDTV will have about 5 percent or more overscan.

For these reasons, you should not place anything that you want to be sure that the viewer sees outside an area covering 80% of the full picture. This is called the “Title Safe” area. Similarly, everything you would like to be visible should be within 90% of the picture. This is referred to as the “Action Safe” area.
Using Title Safe
You should use the Title Safe overlay when you are creating titles. Final Cut Pro displays the entire raster of the video image. This means that it displays the entire recorded image from your tape, top to bottom and side to side. Many older television sets can crop up to 10% of the actual recorded picture all the way around. Final Cut Pro supplies the Title Safe overlay so that you can be positive that all titles will be seen on all television sets.

To use the Title Safe overlay, select Overlays from the View Options pop-up menu in the Canvas window. Then, with Overlays checked on, select Show Title Safe to be checked on as well, as shown in in the figure below. You then see the Title Safe overlay.

Activating the Title Safe overlay
The Title Safe overlay is composed of two boxes, as shown in the figure. The outer box, called the action safe, is set 5% in on all four sides of the image. The second and inner box is drawn a full 10% in on all four sides of the image. You can rest assured that if your titles are set within this smaller area, they will be seen on all television sets. Remember too that this is a guideline. If you fudge a bit and place titles between the two boxes, they usually will be seen on all sets, but to be absolutely certain, you should stay within the inner box. Don’t worry; this Title Safe overlay isn’t recorded into your program. It’s there to help you make sure that your titles will be seen and won’t be cut off by a television set’s cowling, which covers some of the picture tube.

The Action Safe box gives you a guide as to what will be seen on TVs as far as picture goes. On many TV sets, the curved tube might distort titles a bit, causing a small amount of geometric distortion, so it’s best to keep titles a bit away from this edge of the area. Modern TV sets with flat screens don’t cause this error at the edges of the viewable picture.

**What are the best typefaces to use for credits?**

Bold and simple is best. You would also be well advised to stay away from highly decorative fonts with small details, especially at smaller sizes.

Generally, you should avoid mixing typefaces unless you have some training in graphic design.

**What is a good line space to use?**

It all depends on whether you want your credits to be readable (by non-speed readers) or not. If you care about readability, it depends on a couple of factors. If your scrolling speed is very slow, you can use inter-line spacing that is relatively tight - a line-height multiple of 1.0 (single line spacing) or even less. If your scrolling speed is fast, you will need to space your lines out more. A good idea might be to get someone else to read the credits as they scroll by. If you do it yourself, you might unintentionally choose a line space value that is too small because you already know what your credits say.
What are TV-Safe colors and why use them?

Very strong colors and TV don’t get along together. Such colors, particularly pure reds, will look blocky and the colors will bleed on television. Use slightly grayed-down colors, or pastels instead. Similarly, large areas of pure white are a no-no; use light gray instead.

Here’s a more technical answer without getting too technical. When choosing colors for your titles you should:

- Avoid colors saturated over 80%
- Color combinations where the hues are very far apart should use even lower saturation values.
- Avoid "Pure White" backgrounds, as they can cause some television screens to "bow"
- Avoid using pure colors — those that have a non-zero value for only one of the RGB components.
- Avoid selecting any R, G, or B value that is larger than 204. Some even say to set color values no higher than 180.
- Set your Black values no lower than 16, 16, 16
- Set your White values no higher than 235, 235, 235

Your titles may look dull and dark on your computer monitor but using these suggestions should help them look better on a TV.

NOTE: Even if you follow these guidelines, and all your colors are TV safe, it may not be safe to watch some combinations of colors without sustaining permanent eye damage. You probably already know that you should not put MAGENTA text on a CYAN background.

Last, but certainly not least, remember to CHECK YOUR SPELLING - ESPECIALLY PEOPLE’S NAMES.
When the offline edit is complete, the picture is re-assembled at full or ‘online’ resolution. An edit decision list (EDL) or equivalent is used to carry over the cuts and dissolves from the offline. Projects may be re-captured at the lowest level of compression possible- ideally with no compression at all. This conform is checked against a video copy of the offline edit to verify that the edits are correct and frame-accurate. As well, this cutting copy provides a reference for any video effects that need to be added.

Imu hd online

(23.98 example – substitute your specific frame rate as needed)

BEFORE YOU BEGIN IT IS CRITICAL THAT YOUR REEL NUMBERS ASSOCIATED WITH YOUR MEDIA ARE CORRECTLY LABELLED.

Connect your external drive to the Mac Pro via Firewire (800 preferred)
Turn on master power switch.
Turn on Mac Pro.

Log into the Mac Pro as OTHER using your assigned XSAN Username / Password.

Open Final Cut Pro. In Final Cut Pro Tab select System Settings and Set the Scratch Disks for Video Capture, Video Render, and Audio Render to your folder on the SFTV XSAN Hard Drive.

***LEAVE THE WAVEFORM CACHE, THUMBNAIL CACHE, AND AUTOSAVE VAULT OPTIONS SET TO MACINTOSH HD:USERS...***

Power on your external drive. Open up your final Rough Cut (Picture Locked) sequence.
Click on the Final Cut Pro Tab and select:

**Easy Setup – Use: AJA Kona LH- 1080 psf 23.98 Apple Pro Res 422**

Click “Setup”.

In Applications Folder: Open **AJA Control Panel**.

In the Presets Tab **select 2398**.

In the Final Cut **Browser Window**: “Right Click” on your Final Rough Cut Sequence and select **Media Manager**.

In **Media Manager** select:

- Create Offline
- Set sequences to: AJA Kona LH- 1080 psf 23.98 Apple Pro Res 422
- Delete unused media from duplicated items.
- Use handles: 1 second.
- Base media file names on existing file names.
- Click OK. Then, Save as “New Project Online Name” in your XSAN Folder.

The newly created project will appear in the Browser, which will have a **Master Clips folder** containing your offline media and a **new offline media Sequence**.

Append the new Sequence title with the **Suffix ONLINE**.

Power On Sony HDW-1800 HDCam deck.

Ensure that the HDCam deck is set to **23.98 System Frequency**.

**Right Click** on the new **ONLINE Sequence** and select:

- Batch Capture.
- Capture: Offline items only
- Add Handles 1 second

**Capture Preset: AJA Kona LH- 1080 psf 23.98 Apple Pro Res 422**

Select “OK”.

Select “continue”.

**Insert Reel window** pops up: **Click on the reel** you want to load first.
Load the tape into the HDCam deck.
Select the 1(9)p remote button on the HDCam deck.

Click continue in the insert reel window in Final Cut.

(IF YOUR REEL NUMBERS ARE WRONG - PREPARE FOR TROUBLE NOW)

The VTR will begin searching for the appropriate timecode numbers and loading your footage.
When finished with the current tape the insert reel window will return and you can select the next reel to load, load the tape into the VTR and select continue.
Repeat process as necessary until all media has been loaded.

Once all your media is loaded you can Color-Correct, render titles and effects, and tweak as normal.
Make sure you render your entire sequence and then you can proceed to layoff to HDCAM tape as you would normally layoff to tape.

See LMU HD Layoff Guide for more details on outputting to HDCAM Tape.

If you plan to do Color-Correction at an outside facility layoff a clean Non Color-Corrected Submaster to take with you along with an EDL.

You should layoff to a Black and Coded tape*.

*Black and Timecode your blank tapes in the correct frame rate before outputting your project to tape. Timecode should begin at 58:00:00.

100% QC (quality control) check your new Master.

**Project should be archived upon completion onto Post-Production provided Hard Drive for SFTV archives – see Post-Production Dept**

When finished, power off the HDCAM VTR, MAC PRO Tower, and all Monitors.
Turn off Master Power Switch.
Imu hd layoff guide

(23.98 example – substitute your specific frame rate as needed)

Power On Sony HDW-1800 HDCam deck.
Ensure that the HDCam deck is set to 23.98 System Frequency.
When your project is complete with Final - Audio, Color-Correction, Visual Effects, Titles, End Credits, etc., you are ready to layback to tape.
You should layoff to a Black and Coded tape*.

*Black and Timecode your blank tapes in the correct frame rate before outputting your project to tape. Timecode should begin at 58:00:00.
Set up Bars/Tone, Slate, Countdown, 2 Pop and your Program in your Final Sequence.
Check to be sure that the AJA Control Panel in Applications is set to the correct frame rate and the reference is set to Video In.
Use the Edit To Tape option in Final Cut Pro to output your Final Sequence.

- Insert Color Bars & 1KHZ Tone from: 58:30:00 - 59:30:00
- Insert Slate from: 59:35:00 – 59:45:00
- Insert Countdown from: 59:50:00 – 59:58:00
- Insert Sync mark and pop 2 from: 59:58:00 – 59:58:01
- Insert Program @: 1:00:00:00 - end.

100% QC (quality control) check your new Master.

**All Final Projects should be archived upon completion onto Post-Production provided Hard Drive for SFTV archives – see Post-Production Dept**

When finished, power off the HDCAM VTR, MAC PRO Tower, and all Monitors.
Turn off Master Power Switch.
color correction

Color Correction is the process by which the colors in a show (film or videotape) are adjusted, enhanced, or changed to create the look you are trying to achieve.

The Colorist makes the adjustments according to specifications you give regarding how you want your show to look on a scene-by-scene basis.

Some of the main functions of color correction:

- Reproduce accurately what was shot
- Compensate for variations in the material (i.e. film errors, white balance, varying lighting conditions)
- Optimize transfer for use of special effects
- Establish a desired 'look'
- Enhance and/or alter the mood of a scene — the visual equivalent to the musical accompaniment of a film.

Why Color Correction is Necessary
Film is not always a consistent medium. Color variations can occur between different film stocks and even different batches of the same stock. Other variables such as exposure, temperature, age and lighting all affect color balance.

Videotape more consistently reproduces color, but if the color and/or white balance of the camera(s) were not set properly at the time of shooting there will be variations in color.

What is “color balance”?
In short: the blacks are pure black - The whites; pure white and skin tones appear normal without a distracting abnormal hue (like purple skin for example)

Put another way: the color the camera “saw” and what the camera recorded, should accurately represent the color our eyes and brains “saw” at the time of the shooting.
However, what a color camera “see’s” and what our visual cortex “see’s”, is often (or more accurately:) not the same.

Our brains perform color balance corrections automatically, dynamically, and over a wide dynamic range - and with far greater precision than anything man has yet created.

For our creations, we must rely on something far more basic, such as Chip Charts and Skin Tone Reference Charts. Compared to what our brains come pre-wired to do so easily and naturally, camera engineers must rely on calibration reference schemes.

The ability to gauge proper skin tone is subjective. Obviously, someone who is “color blind” could never properly align a camera or make chroma adjustments so that what goes out over the air looks even remotely normal.

**Color Correcting Dailies**
Color correcting your dailies (the footage you will use for your off-line edit) during the telecine process is not only terribly expensive, but completely unnecessary.

First of all, if you shot a 10:1 ratio 90% of what is corrected will never be seen. Secondly, even if you correct the dailies an additional correction will be needed once the shots are cut together since there will be inevitable variations between shots.

**The Underappreciated Art of Color Correction**
Professional colorists usually do not get the respect they deserve. The untrained eye often cannot distinguish the work of an expert colorist from untreated raw footage unless it is compared side by side.

I admit to being rather novice at noticing good color correction myself (I like to use my red-green colorblindness as an excuse), but the first time I sat in on a Da Vinci session, I was blown away by the scope and precision of the colorist’s work. Not only did he correct for hue, brightness, and contrast errors in the original footage, but he also was able to enhance the tone and mood of each scene by applying lighting gradients and shading that did not previously exist. In short, he was able to turn ordinary looking footage into much more than what it was originally. And for that reason, colorists are rightfully qualified as creative artists. (Equally underappreciated: audio mixers, sound designers, and Foley artists).
Professional Colorists
Colorists drive a powerful, expensive, and rare beast, and drive it with skill, speed and unique good taste. I’ve been known to spend more than a grand (of other peoples’ money) for an hour of time with an A-list colorist. Sure, I expect his Da Vinci to run fast and intuitively and grade my shots in HD in real time without a hiccup, but mostly I expect him to live up to his personal reputation for making my footage more than the sum of its parts. When you see these top dudes do their thing it gives you a palpable respect for the power of color. To get to that point, or near it, colorists needed access to the pricey and rare color stations like the Da Vinci. As expensive as it is to own one, it’s twice as expensive to let someone putz around on one when you could be booking a client in that room.

Today colorists are staring down the barrel of a world full of Final Cut Studio users who may suddenly fancy themselves colorists in their own right. I say, don’t worry. They aren’t going to be any good. Color work is hard. The accessibility of violins has not tarnished the reputations of the Paganinis of the world. Color correcting one shot is fun. Color correcting a dozen shots to look both lovely and consistent is hard work.

Moving Deeper Into The Editing “Workflow”
As editors, we are being asked to do more and more inside our editing bays — the Final Cut Suite has begun to indoctrinate us (and our clients and producers) to the idea that editors can do it all. We can do color correction, we can do titles, we can smooth out dialog tracks removing unwanted sounds and doing EQ in a way that we used to go to a mixing stage for.

But here’s where I part ways with this idea. Even though I love the idea that there is so much more that I can do. Sure, we **have the tools** to do it all. But does it mean that we **can**. I’m practically color blind so I’m not the best person to do color correction.

In short, whatever happened to the idea of getting the right person for the job? I’d rather a real composer do the music for my film, rather than knock something out in Soundtrack Pro. A really bright and innovative title designer can usually do a better job than I could, no matter what tool I use.

The best ideas come from a dialectic between multiple creative partners. I would rather edit with a director than by myself any day of the week. Working alone is normally a guarantee that new ideas won’t be tried out. Do I think that directors should be their own cameramen? Hell no. Not only does it divide time, it shuts down interaction with another accomplished professional.
The mix

The mixer
In a sound mix all the tracks - singly called elements - production dialogue, ADR, sound effects, Foley and Music are adjusted in volume and tonal quality relative to each other and the picture. During the mix the Director and/or the Picture Editor will decide with the Mixer which sounds should be emphasized.

To keep the mix from becoming overwhelming the Mixer creates a small set of individual sub-mixes called stems. These mix stems (dialogue, effects and music) are easier to manipulate during the mix.

The Mixer equalizes, blends and balances the tracks for a seamless, invisible style. They have a number of tools to do this. Equalizers and filters can boost or decrease the intensity of low, middle or high frequencies to make dialogue or effects match those that came from microphones and sources with different characteristics. Filters can also be used to eliminate steady frequencies.

Great Mixers are artists as much as they are technicians. They are orchestrators who create sonic texture.

Preparing for the mix
In the days of analog sound, mixing a short film was something that usually took place on one very long stressful day where you might only have a vague idea of how the tracks might sound all playing together for the first time, and where you might make sudden and unpleasant discoveries about sounds gone missing or out of sync, and you could end up fishing through dumpster-like bins of magnetic spaghetti looking for crucial bits of audio.

Thanks to digital workflows, you can avoid all that. The sound mix can now evolve and be refined over time in an orderly way with a final “quality control check” in a properly calibrated mix room.

Or if you prefer last-minute nightmares, you can mimic the old ways. But let’s assume you’d like to be well prepared and do most or all of your sound post in Pro Tools.
WHAT YOU SHOULD DELIVER
A Pro Tools session containing all your tracks, automation, etc. This should be as close to a polished mix as possible, because given the time constraints you really cannot be starting from “square one.”

The following assumes that you have done your previous mix from a Pro Tools session and not from within Final Cut Pro. If you don’t have a Pro Tools session, please refer to the Appendix for instruction on creating an OMF file for export to Pro Tools.

ORGANIZE YOUR TRACKS
Keep all your dialog/production sound tracks in adjacent tracks. Don’t scatter dialog regions in with sound effects or vice versa. If possible, isolate ADR in dedicated tracks, as the ADR is likely to require different processing than the production sound. You might want to follow a layout something similar to this:

Production dialog
ADR
Music
Foley
Hard Effects
Background Ambiences

PRE-DUBS AND STEMS
You may have heard these terms and are unclear about how they apply to your project. A pre-dub is a mix file in which related categories of sounds have been combined together or pre-mixed, with the aim of combining those pre-mixes with still more sounds further along in the final mix. This is common in feature film work where you may have hundreds of different tracks, more than can be handled in a single Pro Tools session. For instance, an action film with an intense chase scene might have dozens of tracks of vehicles revving and skidding, dozens more of gunshots, many more of crashes and impacts, etc. To make the final mix more manageable, the vehicles might be combined ahead of time into a single pre-dub, the gunshots into another pre-dub, and so on, to reduce many tracks to a small number of simpler stereo files. The levels of the various pre-dubs can then be adjusted relative to each other along with all the other, un-pre-dubbed tracks.

The downside of pre-dubbing is that you become more or less committed to the choices you made when you created the pre-dub. Unless you have an unusually complex mix requiring lots of tracks, you may be better off simply to organize and group your sounds across the tracks of a single Pro Tools session as suggested earlier.
Organizing the tracks this way also helps if you elect to create mix stems. With stems, instead of creating a single stereo file that combines Dialog, Music, and Effects, you create three separate master recordings: one of Dialog only, one of Music only, and one for Effects only. This can make future updates and re-mixes easier, especially for feature films that require foreign language versions. Simply solo the appropriate tracks and make three separate bounce files in Pro Tools.

An option, whether or not you actually make three separate stem recordings, is to arrange your Pro Tools tracks in a way that allows you to create submaster faders for controlling these three categories of sound separately. For instance, you may have a number of sound effects tracks that are overpowering your music. If all those effects tracks were assigned to a single submaster fader you could easily bring them all up or down relative to your music. (The details of that type of signal routing are beyond what we can go into in this brief handbook.)

**REAL TIME PLUG-IN COMPATIBILITY**

If you’ve been using the standard Digidesign Plug-ins, such as EQ III, D-Verb, etc., you should have no problem opening your Pro Tools session on other systems. However, if you’ve been using some of the more exotic real-time plug-ins available on some of LMU’s systems (such as Altiverb, X-Noise, etc.) those plug-ins may not exist on all mixing systems. (This could be especially true of an outside facility; so check with the post sound house to see what plug-ins are available on their systems.)

If you’re using an exotic plug-in, the safest course is to prepare two versions of the processed regions. One, the original, is useful in case it’s decided to go back to square one and apply new processing. The alternate processed version can be created by first soloing the affected track and doing a bounce of only the regions that you want to process. Place the bounce in an adjacent track and clearly label it as an “ALT.” This bounce gives you a file that you can take to any system -- the processing is “built-in” to the file.

**exporting quicktime picture**

Use of the DV codec is recommended for the best interchangeability in LMU sound studios that may use firewire to output video.

From Final Cut Pro export the FCP project as a “self-contained Quicktime Movie.” The settings should be:

- **Format:** DV NTSC 48kHz
- **Size:** 720x480
- **Quality:** “Medium” is the default: (actually, it’ll be high quality for the DV NTSC format)
Frame Rate: 29.97 is the normal NTSC frame rate. (If your project differs, make sure your Quicktime movie matches your FCP project settings.)
It’s recommended that you choose the “audio & video” option to embed your worktrack audio in the Quicktime movie. This can give you a useful guide track of your mix for checking sync, etc.
Settings for sound should be:
Format: Uncompressed
Sample rate: 48 kHz
Sample size: 16 (that’s the bit rate)
Channels: either 1 or 2 depending on whether you export mono or stereo. Since this is usually just guide audio, choosing mono is simpler.

exporting audio for mixing in pro tools

Change the starting timecode on your sequence to 00:58:30 to give you room to work.

In the Timeline, make sure that each audio track you want to export is enabled (the Track Visibility control next to the track is green).

Add a 1 frame “pop” of audio exactly 2 seconds BEFORE start of first picture on all audio tracks to act as a sync point “just in case”.
Add a 1 frame “pop” of audio exactly 2 seconds AFTER end of last picture on all audio tracks to act as a sync point “just in case”.
Don’t export audio until you’ve locked picture. Once you are sure your video timings won’t change, you are ready to export your audio.
Export the entire project audio as an OMF file

The benefit to using OMF files is that all clips remain individual clips, so you can move them between tracks, each with separate volume and pan controls, as well as adjusting their in and out points and adding customized fades.

Select File -> Export -> Audio to OMF

Select the sample rate, bit depth and handles (48 kHz, 16 bit are fine, you might give yourself an extra second or two on the handles).

Rate: Choose a sample rate that suits what you’re using the audio for. All of the audio you export has the same sample rate. If you use audio with different sample rates, it’s converted.

Depth: Choose 16- or 24-bit. If you choose 24-bit audio, make sure the application you will use to import the OMF file supports 24-bit audio.

Note: When exporting to OMF, Final Cut Pro uses the highest quality setting regardless of what you choose from the Audio Playback Quality pop-up menu in the General tab of the User Preferences window.

Handle Length: Enter a value in timecode format to add handles to the audio clips. Handles give your audio editor the flexibility needed to fix edits. Handles of 1 to 3 seconds are typical, but it’s best to check
with your audio editor. Handles are included only when there is additional audio media outside the clip In and Out points. When there is not enough media to create the full handle duration, Final Cut Pro includes as much of a handle as possible.

Include Crossfade Transitions: Because some OMF importing tools do not handle cross fade transitions correctly, and many sound editors prefer to create cross fades themselves, you have the option to leave cross fades out when exporting your sequence as an OMF file. When this checkbox is deselected, extra source media is substituted for the duration of the cross fade being left out. How much extra source media will be substituted depends on whether the cross fade was edited before, on, or after the edit point. Extra source media included as a result of this option will be in addition to extra source media added by the Handle Length option.

Include Levels: Audio levels and keyframes are included in the exported OMF file. Even if no audio level keyframes are set, the current level of each clip is exported.

Include Pan: Pan settings and keyframes are included in the exported OMF file. Even if no pan keyframes are set, the current pan setting of each clip is exported.

Choose a location and enter a name for the file.

When you're ready to export, click Save.

OPTION - EXPORTING AIFF FILES
To preserve all your FCP sound processing, including non-destructive “filter” effects, the solution is to export each individual track as a single audio file. For instance, mute all tracks except for A1. Go to File>Export>Using Quicktime Conversion. From “Format”, choose AIFF. Under “Options” make sure to export the track as a 16 bit 48 kHz mono file. Repeat the process for each track you wish to export. If you have head and tail leaders on your picture, make sure there are head & tail pops on each track and that they align correctly with your picture.

Now it’s just a question of importing those tracks into a Pro Tools session, making sure they are in sync with the Quicktime movie for the session, and refining your mix within Pro Tools. NOTE: This procedure is very much like what Pro Tools calls a “bounce”, so any volume graphing and such that you perform in FCP will be reflected in the AIFF files.
Even if you’re happy with a lot of the mixing you did in FCP and you do the above option of exporting individual tracks that are highly “mixed”, it would be best to also do an OMF Export of the FCP sequence and create a Pro Tools session from that OMF.

That way you can present the mixer with both options – if your “pre-mixed” tracks are working out fine, it’s less work for the mixer. But if you’ve done something questionable that tends to “tie the hands” of the mixer, the original untreated material is available in case the mixer wants to go back to the basic tracks.

**PRO TOOLS**

Open the OMF audio file in Pro Tools.

OMF files contain all the audio from your selected sequence, so the files can get fairly large. (There is a 2 GB limit on OMF files, so, if you are doing lots of tracks for a long program, you’ll probably want to break you sequences up into reels for mixing.

When you are done mixing, it’s time to get your audio out of ProTools and into Final Cut

![File Menu](image)

Go to File > Bounce to Disk.
Set the parameters to AIFF, 48K, 16-bit, to match the format of your original FCP sequence.

Then, inside Final Cut, import that final AIFF mix into your Browser.

From there,

1) Move the new mix down to two new tracks on your timeline

2) Line up the audio pop just before start of picture on the new mix with the pops that you put into your original audio tracks. I’ve never had sync drift when I kept files fully digital. However, you can reassure yourself by checking the audio pops at the tail of the project and make sure they still line up.

3) Once everything is sync’d, turn off the visibility of all audio layers EXCEPT your mix and you are ready to output.

**guidelines for Imu mixes**

By the time you’re ready to do your mix you may be so impatient just to get the project done that you’ll be tempted to skip over these recommendations. Please don’t. Record levels are especially important in film and television.
When you're listening to something like a music CD you are free to chose a playback level anywhere from "Soft Background" to "Annoy the Neighbors". But for film mixing, record and playback levels are not so arbitrary.

In the professional world, speaker playback levels in a good THX-certified theater are "carved in stone" so that the loudness a filmmaker hears in the mixing room will match the loudness the audience hears in the theater. To get this agreement between mix stage and theater requires standardized reference levels. TV broadcast also has rather strict requirements about where the average record levels should fall. For all these reasons some "target" or point of reference for audio loudness is needed, and this usually takes the form of a constant tone recorded at the start of a tape.

This tone is recorded at "Reference Level" or "Standard Operating Level" which represents a signal strength that is strong, but not too strong. Your subtlest sounds will fall well below that level; your strongest sounds will be above. For digital recording there are a number of competing standards used for reference levels; these are designed to fit the technical specs of different release formats. Since Fall 2007 LMU has adopted the SMPTE standard for a reference level of -20dBFS.

This is not the typical default level for Final Cut Pro®. Please refer to the following for guidelines on interpreting mix levels to this standard.

**TECHNICAL SPECIFICATIONS**

Students should use a digital reference level of -20dBFS for workstation mixing (as the digital equivalent of the analog reference of "0" on a VU meter. The reference tone that accompanies the color bars recorded at the head of a tape should be recorded at this level. That same reference level will be used to set playback levels at screenings.

Tapes must be labeled with the following information:
Audio: Stereo - Left Only, Right Only (Sometimes abbreviated as "Stereo LoRo")
Reference Level: -20dBFS.

During your mix, follow the recommended playback levels in those rooms that have calibrated settings. When in doubt, or if you are working at home without calibrated levels, play the audio file called "-20dBFS_LMU_LevelCheck" and adjust by ear.) This file is available on the LMU audio workstations.
For more details on getting a good sound mix for your projects, please consult the “Sound Post FAQ” on the LMU workstations. In it you’ll find some help with questions like:

What kind of production sound can I fix in Post?
How do I make edited dialogue scenes sound smoother?
How can I do some of my sound work in ProTools®?
How do I set mix levels?
How can I make the mix sound better?

**ADVANCED OPTIONS - 5.1 SURROUND SOUND**

It’s a lot of work to create a really good-sounding two-track stereo mix, and currently that is all that LMU delivery specs require. But you may want to explore the possibilities of further mixing in the 5.1 surround format, either at LMU or at an outside facility.

Before you do that, you should make sure that your intended audience can properly experience the surround mix. In discrete form, a 5.1 surround mix requires six channels. Understand that many common delivery formats do not provide enough audio channels to support a 5.1 mix. HDCAM, for instance, has only four audio channels. A surround mix is sometimes placed on just two channels of an HDCAM master, but this requires the use of Dolby E encoding/decoding through a proprietary processor, which would limit your venue to fairly high-end facilities. D5 and Digibeta are two tape formats that can easily support 5.1 surround sound. But while some film festivals may support these formats, at present this is not the norm. And certainly few consumers have access to such equipment.

For theatrical presentation, 35mm film prints with digital soundtracks — usually Dolby Digital format — are the most common means of reproducing 5.1 mixes. However, creating such a print is usually too costly for most student filmmakers. But there is one very common and affordable format that supports 5.1 surround sound and that is DVD. Please note: as of this writing, the easy-to-use iDVD software does not allow for 5.1 sound; instead you must author the DVD using a program like DVD Studio Pro. This is well within the reach of an enterprising and technically proficient student.

To do this you will need: a discrete 5.1 mix from Pro Tools; this means there will be six 48 kHz 16 bit AIFF files in the SMPTE format. That means Left, Right, Center, LFE (sub), Left Surround, Right Surround. You’ll be able to tell which files are which later by their filename suffixes: .L, .R, .C, .Lf, .Ls, .Rs. To burn a DVD you will need to use Compressor software to create an AC3 file from these AIFF files.
But before you do that mixing, you’ll have to do some more editorial work.

EDITING FOR SURROUND
In the case of a flashy action film you might have hard effects that could get panned around from front to surround and back again – spaceships whizzing by, for instance, or off-screen weaponry for a big battle sequence.

Chances are that your particular film doesn’t lend itself to such exotic treatment. You can still create an enveloping environment that uses the 5.1 surround format to advantage. Just remember one basic rule: nothing critical to story content should be placed solely in the surrounds. Not every theater or video playback system has the surround channels set up to the proper specs and you don’t want anything important to get lost. So consider the surround channels to be an enhancement to the existing sounds – the icing on the cake, not the cake itself.

Ambiences are typically the kinds of sounds that work best in the surrounds, and you may find that the ambiences that worked just fine for a stereo mix will be a little thin for surround. Suppose you have a scene set in the woods and you have one stereo track of birds chirping. Assigning those to the Left and Right works well enough, but it leaves the surrounds empty. You could copy and displace in time that same ambience, and the copy could be assigned to the surrounds.

Here are the potential problems with that approach:

- You have to displace the copy by several seconds at least or you can have phasing problems.
- Any distinctive event in that track can “echo” or “repeat” from one channel to another. For instance, a particularly distinctive crow caw will stick out, first in the front channels, and then shortly later in the surrounds.
- Any sound effect that is already on the “busy” side gets twice as busy – for instance, you’ll have twice as much bird activity as before.

That’s why it’s usually better, even for plain stereo mixes, to layer sparser sounds that can then be artfully added together to create just the right amount of activity. And for surround mixing that gives you the option of placing those sounds slightly differently in the spatial field. This same idea applies even to sounds like basic low traffic rumbles, wind, or ambient room tones. The trick is to find similar but slightly different sounds that will complement each other and sound like different aspects of the same environment.
Some suggestions:

- Place busier sounds in the front speakers rather than the surrounds.
- Place crisper, more trebly sounds in the front rather than the surrounds.
- Place higher pitched ambient tones in the front rather than the surrounds.

The reason? One is just good show biz: the screen is up front and that’s where we usually want to keep the audience’s attention focused. Busier, crisper, higher pitched sounds tend to be attention-getters. The other is technical: the surround speakers in most theaters are seldom as good as the front speakers so they’re not likely to sound as crisp and clear anyway. (In fact, for the mono surround of Dolby Stereo, bandpass filters are applied to that channel to reduce some of the highest and lowest frequencies.)

CONCLUSION
Post production sound can be one of the most satisfying phases of your production - you don’t have to worry about bad weather or other location nightmares, for one thing. Just remember that to get the most out of your sound mix, you need to budget adequate time in your schedule and set realistic deadlines - then stick to them. Only then will you have the chance to play around and get creative.
layback

Upon completion of mix you will have sound with the proper number of channels; mono, stereo, LCRS or 5.1, but it will not yet exist on the finished master tape or print. If you are making a video tape of some sort, be it NTSC or HD, there must be a “layback” when the sound is recorded onto the final master tape.

If there are multiple versions of the project, such as with text and without text, there will have to be multiple laybacks.

If you are making a 35mm print, there must be a “printmaster”, when a master audio tape or magneto optical disk is made that will be used to shoot an optical track negative.

Laybacks and printmastering can take anywhere from a few hours to a day or more, depending upon the needs of the project and are considered to be mixing time.

Typically, audio is completed after the final color correction session is done and the master is complete.

getting your mix into final cut

To get your finished audio back to Final Cut, export your final mix as a stereo AIF file.

Then, inside Final Cut, import that final AIF mix into your Browser.

From there:

1) Move the new mix down to two new tracks on your timeline
2) Line up the audio pop just before start of picture on the new mix with the pops that you put into your original audio tracks. Check the audio pops at the tail of the project and make sure they still line up.
3) Once everything is sync’d, turn off the visibility of all audio layers EXCEPT your mix and you are ready to output.
deliverables

The term *deliverables* refers to a collection of “finished products” required to release a film. Deliverables are the last things created by the production team and delivered to the film’s distributor.

Deliverables can be divided into three categories:

**Print materials:**
The actual film in the form of negatives and/or video transfer. Used to create prints for release to theaters, plus versions for different media, trailers, etc. Digital technologies are making this a changeable process so you need to stay abreast of developments (no pun intended).

**Publicity materials:**
Still images, press releases, synopses, profiles of main actors & crew, etc. This can also include production information, especially if you have a good story to tell about how the film was made.

**Legal documentation:**
Paperwork required to prove that you have all the appropriate rights to make and show the film. This can include *release forms* and contracts for cast and crew, music licenses, resource/environmental consent and “Chain of Title” (a record of ownership for different aspects of the film).

**Tips**
Throughout the filmmaking process, bear the following in mind to avoid problems at the delivery stage:

- Ensure that everything appearing in the film has been legally cleared (e.g. talent release, product placement, music, etc)
- During production, take plenty of photographs that can be used for publicity, especially key scenes. Include professional photos of cast and crew.
Wherever possible, keep all materials and footage used in production in case you need them later.

**music cue sheet**

This is a simple listing of all the music cues, song names and durations, publishers, and artists (if other than your composer) used in your film. It’s necessary for when the film is eventually (cross your fingers!) aired on television, as many broadcasters have licensing deals with music publishers such as ASCAP and BMI. Make sure that you have all rights to your music before you mix it into your film.

<table>
<thead>
<tr>
<th>IN TC</th>
<th>OUT TC</th>
<th>USE</th>
<th>Title of Piece</th>
<th>Source</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Use codes:  
MT - main title  
ET - end title  
T - theme  
BI - background instrumental  
BV - background vocal
For purposes of any claims arising from Worker Compensation Insurance, Property Insurance and Liability Insurance extended by Loyola Marymount University to student productions:

**Production Materials**
- Call Sheets
- Production Reports
- Production Budget
- Cast / Crew List
- Shooting Schedule
- Day out of Days
- Minor’s Work Permits (if used)
- Filming Permits

In order to provide indemnification of Loyola Marymount University arising from any claims arising from the use of intellectual property and real property in the student’s work:

**Legal Materials**
- Copy of Script Supervisor’s Script
- Literary Release
- Music Cue Sheet
- Published Music Release (if used)
- Library Music Release (if used)
- Original Music (if used)
  - Composer and Musician Clearances
- Talent Releases
- Location Releases

If you plan on entering your film in festivals it is strongly suggested that the following material also be delivered:

**Publicity Materials**
- Full Credit List
- Production Stills
- Cast bios
festivals

Form a Festival Strategy

- Choose festivals with “student friendly” categories
- Be able to attend festivals that accept your work
- Choose festivals that accept films of your genre

Complete Festival Submission Form

- Fill out submission forms thoroughly and carefully
- Submit on time — festivals do not accept late entries
- If submitting to several festivals, consider using withoutabox.com — an online paperless service that streamlines the entire process.
- DO NOT mail films in fiber filled envelopes.

Create a Press Kit

- Cover
- Synopsis
- Bios
- Credits
- Production Stills

Each festival will vary. Festivals do not require an electronic press kit (EPK), but it is a very good idea to create one. EPK includes all the items listed above and a trailer, behind-the-scenes footage and interviews.
post production standards

Audiences expect, and in a sense, deserve technical competence from filmmakers. Major technical flaws can prevent the audience from becoming fully immersed in your story and disrupt the connection between artist and audience.

Photography should be in focus, properly exposed, with lighting and composition that enhances the story. Likewise, production sound recording should be clear and intelligible, free from unwanted noise and distortion. Editing should serve the story by effectively controlling screen time and directing the attention of the viewer. The post production mix should aim toward professional standards in terms of overall recording levels and a careful balancing of the elements.

Audiences may forgive filmmakers for many flaws, but they are unforgiving of those who waste their time or confuse them for no purpose.

Any of these technical expectations can be deliberately violated for artistic effect, for instance, to simulate news footage, home video, etc. But even in those situations, remember that during post it is always easier to degrade good material than it is to enhance poor material.

The following standards pertain to the formats used in the editing process at LMU on video based editing systems. Following these standards insures proper compatibility of all audio and video editing devices and systems at LMU. ALL PRODUCTIONS must follow these standards without exception. Failure to comply will result in denied access to facilities until materials are corrected to standards.

SFTV EDITORIAL STANDARDS

- DROP FRAME Timecode (if your production timecode is drop frame)
- NON-DROP FRAME T:meode (if your production timecode is non-drop frame)
- Timeline start must be 01:00:00:00 on all editing systems
- Timecode start is 01:00:00:00 (with bars/tone and video black until leader)
- Sync Mark and Pop at 2 seconds before picture starts (i.e. Academy Leader)
- 30 seconds of Video Black after end of the picture
- Audio is to be digitized at 48Khz – 16 bit (AIFF)
- Audio reference level should be at -20 dBFS

**SFTV TELECINE STANDARDS**

- NON-DROP FRAME T:me code
- Color Bars at head of each tape
- Tone over bars if production sound is synced to picture by telecine house
- Each tape should have consecutive timecode hours
- Provide a tape copy with displayed keycode and timecode
- Provide a DVCam or Beta SP tape without displayed keycode and timecode
- Have your Telecine Op provide you with Flex Files or Telecine Log files.

**SFTV STANDARDS FOR FINAL PICTURES**

- NON-DROP FRAME T:me code (if your production timecode is non-drop frame)
- Timecode start is 00:58:30:00 (with bars/tone and video black until leader)
- Sync Mark and Pop at 2 seconds before picture starts (i.e. Academy Leader)
- Master Picture starts at 01:00:00:00
- Sync Mark and Pop at 2 seconds after picture/title ends
- 30 seconds of Video Black after end Sync Mark/Pop
• Master on DVCam or HiDCam as required
• Project should be color corrected and Broadcast Safe (whites lower than 100 IRE and blacks higher than 7.5 IRE)
• Film projects should generate a printed film list ready for the negative cutter (generated by CinemaTools) as well as a timecode EDL for potential online finishing. They should also have a copy of the project with on-screen keycode and timecode for negative cutting.
• Audio is to be digitized at 48Khz – 16 bit (AIFF)
• Audio reference level should be at -20 dBFS

**TAPE LABELS**

All tapes must be labeled as to video and timecode format, and audio sample rate, reference level, and format. The audio format is “Stereo – Left Only, Right Only.” To abbreviate you may use: “Stereo=LoRo”.

![Tape Label Image]
AUDIO REFERENCE LEVEL

At LMU we have recently adopted a reference level of –20 dBFS. This corresponds to the SMPTE (Society of Motion Picture & Television Engineers) standard for mixing and release on formats such as DigiBeta, DVD or a Dolby Digital film print. (See Guidelines for Student Mixes for more details.)

FINAL OUTPUT TO TAPE

Black and Timecode your blank tapes in correct frame rate before outputting your project to tape.

- Timecode should begin at: 58:00:00.

- Insert Color Bars & 1KHZ Tone from: 58:30:00 – 59:30:00

- Insert Slate from: 59:35:00 – 59:45:00

- Insert Countdown from: 59:50:00 – 59:58:00

- Insert Sync mark and pop 2 from: 59:58:00 – 59:58:01

- Insert Program @: 1:00:00:00 – end.

Your project should be archived upon completion onto Post-Production provided Hard Drive for SFTV archives.
### Technical Checklist for Graduate Thesis Projects

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape format</td>
<td>HDCAM</td>
<td>Standard Definition upconverted to High Definition format will not result in an increase in detail.</td>
</tr>
<tr>
<td>Recording format</td>
<td>1920x1080i 59.94 FPS or 1920x1080p 23.98 FPS</td>
<td>Depending on your project HD capture vs Film Xfer</td>
</tr>
<tr>
<td>Image format</td>
<td>16:9</td>
<td></td>
</tr>
<tr>
<td>Color Bars / 1KHZ tone</td>
<td>60 seconds</td>
<td></td>
</tr>
<tr>
<td>Slate</td>
<td>(e.g.) May 1, 2008 PROD 650 Bob’s Big Show TRT: 15:35</td>
<td></td>
</tr>
<tr>
<td>Academy Leader</td>
<td>Sync mark and “pop” 2 seconds before picture start</td>
<td></td>
</tr>
<tr>
<td>LMU SFTV logo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copyright information</td>
<td>© 2008 Jane Doe</td>
<td>See Production Handbook p86-91</td>
</tr>
<tr>
<td>End credit</td>
<td>This production was done in partial fulfillment of degree requirements for a Master of Fine Arts at Loyola Marymount University.</td>
<td>Single card for 6 seconds</td>
</tr>
<tr>
<td>Color correction</td>
<td>Broadcast safe</td>
<td>Whites lower than 100 IRE and blacks higher than 7.5 IRE</td>
</tr>
<tr>
<td>Audio Mix</td>
<td>mix sound in ProTools</td>
<td>Master to AIFF file on hard drive</td>
</tr>
<tr>
<td>Audio levels</td>
<td>-20dBFS reference level</td>
<td>At standard playback level, in a large theater, pink noise at -20 dBFS produces a loudness of 85 dB SPL.</td>
</tr>
<tr>
<td>Audio Layback</td>
<td>CH1=Left Only CH2=Right Only</td>
<td></td>
</tr>
<tr>
<td>Music Cue Sheets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music Releases</td>
<td></td>
<td>All music must be cleared</td>
</tr>
<tr>
<td>Tape Label:</td>
<td>Title Director Production Number</td>
<td></td>
</tr>
<tr>
<td>Tape case label</td>
<td>Title Director Production Number Semester and Year TRT (total running time) Audio: Stereo (left only, right only)</td>
<td></td>
</tr>
<tr>
<td>Deliver to:</td>
<td>SFTV Graduate Office CA 313</td>
<td>Mary Abshire 310 338 5991 <a href="mailto:mabshire@lmu.edu">mabshire@lmu.edu</a></td>
</tr>
</tbody>
</table>
examples of final cut pro workflows

BASIC WORKFLOW 1
Shoot on 29.97 NTSC low data (MiniDV, DVCam, DVC PRO 50)
Finish on 29.97 NTSC low data

This workflow is proper for all low data formats. Because the data rate is low, the video can be stored on a standard FireWire 400 drive. Because this is low data, there is no need to on-line since the off-line edit is at full resolution.

Most often, single-system sound is used with this workflow, recording audio directly on the camera tape. However, some projects use double-system sound, recording audio on a sync sound recorder. In this case there will be no pull-down, the sample rate for recording digital audio should not be a “30FPS” film speed sample rate such as 48,048Hz, but rather a “29.97FPS” video speed sample rate. 48K is ideal.

The aspect can be cropped to any size, but the native aspect ratios are 4x3 and 16x9.

Log and capture all footage

If the footage is anamorphic, set up the capture and sequence to anamorphic

If the project is going to be cropped to another aspect ratio, capture using the shooting aspect ratio 4x3 or 116x9. Cropping will be done later

If using double system sound, import or transfer all audio

Sync all takes using the merge clip function

Create finished titles and graphics or edit in slug or scratch titles

Edit the project to a locked cut, the length and sync must be exact including end credits

Cut in a Cinema Tools head leader (29.97FPS)

Organize and split off all sound tracks
Export the movie as a QuickTime

Export the audio as OMF

Open the OMF as a Pro Tools session using Digi Translator

Import the QuickTime movie and guide track into the Pro Tools session

Record and import all sound effects, ADR, Foley and music

Edit the sound tracks and create the automated mix

Export the mix with the “bounce to disc” function

The next three steps can be performed before, during or after the sound edit and mix. These steps can be done in any order.

If scratch titles and graphics were used in the edit, create the finished versions and cut them into the project. Use care not to change the length of the title, it needs to be a straight replacement. NTSC graphics should be 720x480 pixels.

Go through the project shot by shot and color correct using the Final Cut Pro plug-ins (i.e., color corrector three way) or use second-party plug-ins.

If cropping to another aspect ratio, crop the project using the motion tab controls

Make a copy of the sequence in the timeline and delete all of the sound tracks. Do not use the original edit; use a copy

Import the mix into Final Cut Pro, drag it into the new sequence and line up the 2 pop

If the project is full-screen 4x3 or letterboxed 4x3, the project is finished. Print to tape and/or export the QuickTime for burning to a DVD

If the project is anamorphic, you can record the anamorphic version to tape or export for DVD; however, if you need a full-screen letterboxed version, drag your 16x9 sequence from the browser window into an empty 4x3 sequence and render. This will give you a letterboxed version
**Basic Workflow 2**

Shoot on 24P NTSC low data (SDX900, DVX100, XL2)
Finish on 24P DVD, HD or film

The shooting data rate is low, so the video can be captured and stored on a FireWire 400 drive. There will be no real on-line, but rather some type of up-convert of the full-resolution off-line edit.

For best possible results use double-system sound. There will be no pull-down, as we are shooting at 23.98, a “video speed”. The aspect should be 16x9 anamorphic. HD finish will also be anamorphic. Although the cameras can shoot 3:2 or advanced, use the advanced cadence 2:3:3:2.

- Set up Final Cut Pro for 24P NTSC anamorphic. This can be done from capture and sequence settings or with an “easy setup”.
- Log and capture all footage at 23.98FPS
- As this footage uses advanced 2:3:3:2 pull down, simply set the capture rate to 24P in the capture window
- If using double-system sound, import or transfer all audio
- Sync all takes using the link clip function
- Create finished titles and graphics or edit in slug or scratch titles
- Edit the project to a locked cut, the length and sync must be exact including all credits
- If you are planning a film-out, divide the show into proper reels. Even if you are not planning a film transfer, if your film is long, you may want to divide it into ten-minute film reels just to keep the project more manageable
- Cut in a Cinema Tools head leader (23.98FPS) on every reel
- Organize and split off all sound tracks
- Export the movie (reels) as a QuickTime (they will be 23.98FPS QuickTimes)
- Export the audio for the reels as OMF
- Open the OMF as a Pro Tools session using Digi Translator
Import the QuickTime movie and guide track into the Pro Tools session. Pro Tools will support the 23.98fps rate

Record and import all sound effects, ADR, Foley and music

Edit the sound tracks and create the automated mix

If you are making a feature, or want to open up more distribution options, you will want to make stems. Do not mix dialogue, effects or music in the same tracks.

Copy the 2 pop form Pro Tools track 1 into one effects track and one music track. In export, every stem needs a 2 pop.

Export the composite mix with the “bounce to disc” function

Mute the effects and music tracks and export the dialogue stem with the bounce-to-disc function. Do the same for the effects stems and the music stems.

Create the finished HD titles and graphics. Graphics should be made at 1080x1900 pixels. If you are using Final Cut Pro titles, and you are up-converting by rendering instead of going tape-to-tape, they do not need to be redone. The will automatically be rendered at high definition in the HD render.

The finishing and up-conversion can follow several workflows. All have advantages and disadvantages. The simplest and most straightforward system is by rendering to HD

Take the finished project on FireWire to an HD on-line facility

They will copy your project onto the facilities high-speed drive array

Make a new sequence with HD settings. Copy or drag your sequence (picture only) into this new sequence

The new sequence now needs to be rendered. The render is quite long; however, most facilities do renders after hours at a greatly reduced rate

Do some test renders. Often problems come up, don’t dive in and render everything only to find problems need to be addressed in the standard definition before rendering. Often, problems come up in bright reds. Reds tend to blow out in the HD render. You may need to use the Final Cut Pro color correction tools to pull down some colors before the HD render. These can be restored after the render in final color correction.
If scratch titles and graphics were to be used in the edit, the finished versions are now cut into the project. Use care to not change the length of the graphic or title, it needs to be a straight replacement.

Import the mix into Final Cut Pro, drag it into the new sequence and line up the 2 pop.

The project is now ready for final color correction.
**Basic Workflow**

Shoot on film (16mm, Super 16mm or 35mm)
Finish on HDCAM (virtual digital intermediate)

There are many variations on this workflow

At the end of every shooting day, the camera negative is processed and datacined to HDCAM tape (at 24 or 23.98FPS). Down converted clones are made to DVCam with window burns for 29.97NDF and 23.98 NDF.

A copy of the telecine log is made and imported into a new database in Cinema Tools. A batch list is exported.

The batch list is imported into Final Cut Pro and the DVCam footage is batch captured. A second copy of the batch list is opened in Text Edit and used as a cutting log.

The Cinema Tools database is reopened and the captured footage is linked to the database. The footage is reverse telecined to 23.98.

The Final Cut Pro project is reopened and the shots in the project are relinked to the new 23.98 footage. A new sequence is created at 23.98 and the picture edited. With virtual digital intermediate (VDI) double uses are fine so there is no need to make a daily double use report. Edit only to V1 with any superimpositions in V2.

When the picture is locked you go to the HD on-line edit. The rest of the finish will be an HD high-bandwidth finish.

As with other workflows, split the edit into twenty-minute or less reels, and slug for missing titles or effects.

The sound is handled exactly like the other workflows.

Cut in a Cinema Tools head leader (23.98 or 24FPS) on every reel.

Organize and split off all sound tracks.

Export the movie (reels) as QuickTime (they will be 23.98FPS Quick-Times).

Export the audio for the reels as OMF.

For those planning to recapture audio from the production DAT, an audio EDL is exported and used to batch capture audio to the digital audio workstation. Several digital recorders and theater sound formats.
now support very high sample rates, 96K at 24 bit. Pro Tools HD is also capable of these sample rates. So rather than the OMF derived from the 48K 16 or 24 bit Final Cut Pro edit, audio is recaptured from the original production tapes.

Open the OMF as a Pro Tools session using Digi Translator.

Import the QuickTime movie and guide track into the Pro Tools session. Pro Tools will support the 23.98fps rate.

Record and import all sound effects, ADR, Foley and music.

Edit and sync the sound tracks.

On-line the show using the HDCAM footage.

Perform tape-to-tape color correction.

Layback audio mix to the on-line edit.
frame of reference

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### ASPECT RATIOS

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<tr>
<th>Aspect Ratio</th>
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<tr>
<td>1:2.40</td>
<td>Widescreen Aspect Ratio</td>
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<tr>
<td>1:1.85</td>
<td>American Theatrical Aspect Ratio</td>
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<tr>
<td>16:9</td>
<td>High Definition Television Aspect Ratio</td>
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<tr>
<td>1:1.66</td>
<td>European Theatrical Aspect Ratio</td>
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<tr>
<td>4:3</td>
<td>Standard Definition Television Aspect Ratio</td>
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### STANDARD FRAME RATES

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<tr>
<td>24fps</td>
<td>Standard frame rate for theatrical film</td>
</tr>
<tr>
<td>23.976fps</td>
<td>HD frame rate as well as film-to-tape transfer speed for American NTSC feature films</td>
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<tr>
<td>29.97fps</td>
<td>NTSC video/broadcast television</td>
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<tr>
<td>25fps</td>
<td>PAL video/broadcast television</td>
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<tr>
<td>59.94fps</td>
<td>59.94 fps HD format/broadcast television</td>
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### HD RESOLUTIONS AND FRAME RATES

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<td>n/a</td>
<td>23.976, 24, 25, 29.97, 30, 50, 59.94, 60</td>
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<td>1980 x 1080</td>
<td>16:9</td>
<td>25 (50i), 29.97 (59.94i), 30 (60i)</td>
<td>23.976, 24, 25, 29.97, 30</td>
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<td>Gauge</td>
<td>Perfs</td>
<td>Format</td>
<td>Counts</td>
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<td>-------------------------------------------</td>
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<td>21 frames first foot rollover: +20</td>
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<td>21 frames second foot rollover: +20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22 frames third foot rollover: +21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16 frames/foot</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8 frames/foot</td>
</tr>
<tr>
<td>65mm</td>
<td>120</td>
<td>5 perf</td>
<td>24 frames/KeyKode rollover: +14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 frames/KeyKode rollover: +14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 frames/KeyKode rollover: +12</td>
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<td>8 frames/KeyKode rollover: +07</td>
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</table>

**NTSC**: The TV standard prepared by the National Television Systems Committee or the US, Canada, Japan, Central America, half of the Caribbean and half of South America. NTSC video is a standard-definition format that is made up of 525 lines at 30 Hz. The number of active display lines per frame is 480.

**PAL**: Phase Alternating Line is the TV format used in most of Western Europe, Australia, and other countries. PAL video is a standard-definition format that consists of 625 lines at 25 Hz and only refers to the way color signals are coded for broadcast purposes. The number of active display lines per frame is 576.

**SECAM**: Sequential Couleur Avec Memoire (sequential color with memory) is the TV format used in France, Eastern Europe, and other countries. Like PAL, SECAM video is 625 lines at 25 Hz. The number of active lines per frame is 576.

KeyKode™ is a trademark of Eastman Kodak Company
For more information on KeyKode, Please visit www.kodak.com

### TIME/Footage for Various Film Formats (24 frames per second)

<table>
<thead>
<tr>
<th>Time</th>
<th>Reg. 8mm</th>
<th>Super 8mm</th>
<th>16mm</th>
<th>35mm</th>
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</thead>
<tbody>
<tr>
<td>10 sec.</td>
<td>3 feet</td>
<td>3 1/3 feet</td>
<td>6 feet</td>
<td>15 feet</td>
</tr>
<tr>
<td>30 sec.</td>
<td>9 feet</td>
<td>10 feet</td>
<td>18 feet</td>
<td>45 feet</td>
</tr>
<tr>
<td>1 min.</td>
<td>18 feet</td>
<td>20 feet</td>
<td>36 feet</td>
<td>90 feet</td>
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<tr>
<td>3 min.</td>
<td>54 feet</td>
<td>60 feet</td>
<td>108 feet</td>
<td>270 feet</td>
</tr>
<tr>
<td>5 min.</td>
<td>90 feet</td>
<td>106 feet</td>
<td>180 feet</td>
<td>450 feet</td>
</tr>
<tr>
<td>10 min.</td>
<td>180 feet</td>
<td>206 feet</td>
<td>360 feet</td>
<td>900 feet</td>
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Post Production Standards 99
<table>
<thead>
<tr>
<th>Time</th>
<th>360 feet</th>
<th>400 feet</th>
<th>720 feet</th>
<th>1800 feet</th>
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<tbody>
<tr>
<td>20 min.</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>30 min.</td>
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<table>
<thead>
<tr>
<th>Resolution</th>
<th>Data Rate</th>
<th>Color Sampling</th>
<th>30 sec</th>
<th>5 min</th>
<th>22 min</th>
<th>100 min</th>
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<tbody>
<tr>
<td><strong>DV</strong></td>
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<td>DV25</td>
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<td>4:1:1 / 4:2:0 (PAL)</td>
<td>188 MB</td>
<td>940 MB</td>
<td>4.1 GB</td>
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<td>DV50</td>
<td>50 Mbps</td>
<td>4:2:2</td>
<td>375 MB</td>
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<td>8.3 GB</td>
<td>37.5 GB</td>
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<td><strong>SD</strong></td>
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<td>29 GB</td>
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<td><strong>HD</strong></td>
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<tr>
<td>Uncompressed HD</td>
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<td>HDCAM</td>
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<td>1 GB</td>
<td>5 GB</td>
<td>22 GB</td>
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<td>5.3 GB</td>
<td>23.4 GB</td>
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