

## Bonus Chapter 1

# Secrets of Rendering

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### *In This Chapter*

- ▶ Understanding rendering status
  - ▶ Previewing real-time effects
  - ▶ Customizing render options, such as playback quality
  - ▶ Rendering a clip or sequence
  - ▶ Reducing rendering times
  - ▶ Managing renders on your hard drive
  - ▶ Rendering audio
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**M**ost people working in the video industry believe that the Gods of Digital Video invented rendering to punish mortal editors for the sins of their past lives. Why? *Rendering* occurs when Final Cut Pro calculates how to display a video clip or play an audio clip after you add a new effect, filter, text selection, or other element to the clip (an effect or filter that wasn't there originally). This process doesn't happen instantly after you've made your changes, though; you often have to wait while your Mac does all sorts of calculations to determine how a video clip should look or how an audio clip should sound. If you're doing lots of experimenting — for instance, trying to find the best settings for a blur filter or the length of a cross-fade or some other effect — you can quickly get tired of having to render your clips every time you make a change. What's more, those renders can take up valuable space on your hard drive, because Final Cut Pro creates a separate video or audio file for each rendering and stores it on your drive (each of these rendered files is called a *render cache file*).

Fortunately, over the past couple of years, Final Cut Pro has been steadily reducing editors' need to render clips, and Final Cut Pro HD represents the pinnacle of those antirendering efforts. If your Mac is fast enough, Final Cut can do on-the-fly rendering, which automatically renders a clip in its RAM memory at full quality instantly. But if a clip or a sequence is doing lots of fancy stuff — for instance, if a clip has more than a couple of effects applied to it, or if a Timeline sequence involves playing a number of clips at the same time (as in a montage or picture-in-picture scenario) — even the fastest Mac can't do real-time rendering.

However, a fast Mac *can*, in real-time, do rough approximations of what a render should look like. These approximations are rendered quickly because not every frame of the clip is calculated, only as many frames as are needed for real-time playback. These approximations may not look as sharp as truly rendered video, and playback may be jittery, but they're good enough for quickly doing experiments with clips (as when you endlessly tweak the settings for an effect applied to a clip or when you adjust the motion path of a moving clip until it's just right). All these real-time approximations are done by Final Cut behind the scenes, and editors need to genuinely render clips the old-fashioned way only when they're ready to output their project to videotape or QuickTime digital files.

## *Understanding Rendering Status*

Some clips don't need rendering at all (like raw DV video from your camera that you haven't enhanced with a filter or other effect). How can you know if your clip needs rendering? Handily, Final Cut shows you the rendering status of your clips in the Timeline window. As shown in Figure BC1-1, the Timeline contains two Render Status bars, just above the timecode ruler. The upper status bar is for video, and the lower one shows audio. You may have to look closely, because the Render Status bars are thin and located quite close to one another. The colors of these bars indicate the clips on the Timeline that require rendering.

The colors of these status bars have the following meanings:

- ✔ **Red:** The clip needs to be rendered. Sorry — hang out and relax.
- ✔ **Dark gray:** No rendering is necessary. This color is for clips whose clip and sequence settings match and for clips that don't have any effects.
- ✔ **Green:** This color is for effects that don't need rendering and can be played in real-time. You see this color if you're lucky enough to be using Final Cut Pro in any real-time configuration that's available. (See the sidebar "Real-time or not?" later in this chapter.) Still, the playback quality of the rendered video or audio may be slightly reduced, but that's usually okay for preview purposes. When you finally output your project to tape or digital files, the media will be fully rendered at top quality.
- ✔ **Dark green:** You see this color if you're using an effect that can be played back in real-time and is available for output to video at full quality without rendering. You see dark green status bars more often if you have a fast computer.
- ✔ **Yellow:** Good news: Yellow indicates that Final Cut Pro can show a real-time approximation of the final effect during playback. Bad news: To get the real final effect, you still need to render the material. That's life!
- ✔ **Light gray:** The clip has already been rendered! Don't worry about it, dude. Go party!

- ✓ **Blue:** This color indicates that some real-time effects are unsupported and are likely to drop frames.
- ✓ **Orange:** When you're using Unlimited RT, an orange Render Status bar takes the place of a red bar and indicates that Unlimited RT can play the clip, although you're likely to encounter dropped frames.

**Figure BC1-1:**  
The audio and video  
Render  
Status bars.



**TIP** You may encounter two other indicators that specify that you need to render. The first one is a big white *Unrendered* message over a blue background in the Viewer or the Canvas window. The message fills these windows and is hard to miss. The second indicator is a steady beep that you may hear. This beeping indicates that the audio material can't be played in real-time and requires rendering.

## *Playing Back a Sequence with Real-Time Options*

Final Cut Pro 4 introduced new RT, or real-time, options for sequences that play back in the Timeline. Essentially, these RT functions allow you to watch complex sequences that you couldn't watch before without rendering. Unlimited RT reduces the time it takes to preview a sequence, even if you're working on an older machine. You can access the RT options from the RT pop-up menu that appears in the upper-left corner of the Timeline window. You can also access these options from the Playback Control tab in the Systems Settings window by choosing Final Cut Pro HD ⇨ System Settings ⇨ Playback Control (see Figure BC1-2).

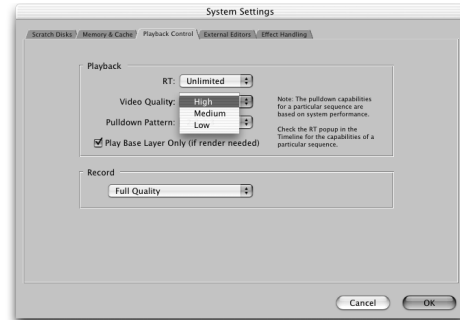
- ✓ **Unlimited RT:** If you want to quickly preview any changes or effects that you've added to a sequence, and you don't care whether a few frames are dropped, you should use the Unlimited RT setting. Unlimited RT tells Final Cut Pro to play back as much as possible in the Timeline without rendering, even if it means exceeding the real-time capabilities of your computer. The result is usually dropped frames or stuttering playback, but that's often fine when you're just trying to set up things quickly. Previously, you had to render out memory-intensive portions of the Timeline before you

could check the changes you had made. With Unlimited RT, you can try out several more filters and effects in the time it once took to render a single sequence. Unlimited RT can work well without additional modifications, but it really starts to show its stuff when it's combined with other RT settings.

- ✔ **Safe RT:** If you don't want real-time previews of renders that may drop frames (resulting in stuttering playback), Safe RT is your best choice. Safe RT turns off Unlimited RT and ensures that Final Cut tries to generate previews of only those parts of a sequence that can play back at a normal, smooth frame rate.
- ✔ **Play Base Layer Only:** This option ignores effects that cannot be rendered in real-time. Also, if a portion of your sequence with multiple layers of composited video tracks causes difficulty, only the bottom layer plays back. Personally, I've never used this option — I just go for either Safe or Unlimited RT — but it's here if you want it!
- ✔ **Playback Video Quality:** Regardless of the RT mode you've selected, you can set the quality level used for real-time previews of effects. The higher the quality, the more "thinking" your Mac has to do on the fly, and the fewer effects it can preview without dropping frames. You have the following quality choices:
  - **High:** Using a high playback-quality setting ensures that the quality of your video playback never suffers. In exchange for not dropping frames, you decrease the number of effects that can be viewed in real-time. For many simpler projects (especially if you're using a fast Mac), this option works great. Many times, the High setting can be accessed only through the Playback Control tab in the User Settings window (choose Final Cut Pro ⇨ User Settings ⇨ Playback Control).
  - **Medium:** If you need a compromise between high- and low-quality playback, the Medium setting works fine. Of course, the trick with any real-time option is to achieve the right balance. How many effects are you using? Would a decrease in playback quality eliminate a few dropped frames? Try using this setting together with Unlimited RT if your Mac can't keep up with the real-time demands.
  - **Low:** A low playback quality can seriously increase the effectiveness of real-time previews. For instance, if you have a large number of effects and you don't mind sacrificing playback quality, you should select Unlimited RT and low playback quality from the RT pop-up menu. You may not get the quality you want, but it certainly helps you preview complex sequences.

Remember, though: Eventually, even the fastest machines need to render a sequence, particularly if several complex effects are being used. Also, rendering can decrease the amount of memory used by Final Cut Pro, which makes it easier to run other applications in the background or to free other resources.

**Figure BC1-2:** The RT pop-up menu in the Timeline and playback control options in the System Settings window.



To increase the render speed of a sequence even more, adjust the Render and Playback settings on the Render Control tab of the User Preferences window. To access these options, choose Final Cut Pro → User Preferences → Render Control from the menu bar, and check the items that you want to include in your Render or Playback modes (Filters, Frame Blending for Speed, Motion Blur, Frame Rate, and Resolution).

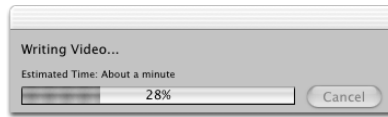
## Rendering a Clip or Sequence

When you encounter any kind of rendering indicator, you often should stop and render before you proceed, unless you chose to use the Unlimited RT function that I mention in the preceding section. Within Final Cut Pro, you can render your material in many ways. Some of the ways to render your material are as follows:

- ✔ **Rendering a clip or an effect:** Select the clip or the transition, and choose Sequence → Render Selection → Both from the menu bar. You can also choose whether to render only the video or audio portion of a clip, although rendering both is the best way to ensure consistent playback.
- ✔ **Rendering an entire sequence:** Open the sequence by double-clicking it in the Browser and then choosing Sequence → Render All → Both.
- ✔ **Rendering a portion of a sequence:** Select one or more clips or effects on the Timeline, or use the I and O keys to set an In and Out point, respectively, in the sequence. Then choose Sequence → Render Selection → Both. Remember that you can set In and Out points in the Viewer, Timeline, and Canvas windows.
- ✔ **Batch-rendering a sequence:** In the Browser, select the sequences you want to render, and choose Sequence → Render All → Both.

A progress bar, as shown in Figure BC1-3, indicates the percentage of rendering that has been finished, along with an estimated time until completion.

**Figure BC1-3:**  
The rendering progress bar.



You can cancel rendering at any time by pressing Esc or ⌘+. (that is, ⌘ plus the period key).



If Final Cut doesn't render your selection, you may need to give it a bit more guidance. Check the color of the line that appears above your clip on the Timeline's Render Status bar. (It's probably green or orange.) Then choose Sequence→Render Selection or Sequence→Render All, and make sure that the same color is checked on the Render menu (by doing this, you're telling Final Cut not to ignore clips that fall into certain render classifications). Now try to render your selection again.

## Real-time or not?

Among the latest and greatest features in Final Cut Pro are the real-time effects. Given the right equipment, you don't need to render! To take advantage of these software-based, real-time effects, you need a 500 MHz (or faster) Power Mac G4 or PowerBook G4 with at least 256MB of RAM. No extra hardware is needed, although it doesn't hurt. Dual-processor machines can also speed these real-time effects.

Depending on your computer's speed, you may see a variety of transitions and effects in real-time. If you click the Effects tab in the Browser and look in the Transitions and Effects folders, you can see certain items listed in bold text; these effects are the ones that can work in real-time on your computer.

If you're using the DV video format, you can at least see the following in real-time:

- ✓ **Cross Dissolve**
- ✓ **Iris transitions:** Diamond, Oval, Point, Rectangle, and Star
- ✓ **Wipe transitions:** Center, Clock, Edge, Inset, and V
- ✓ **Color Corrector 3-way filter**
- ✓ **Real-time motion effects:** Opacity, Scale, Center, Offset, Crop, and Aspect

If you're working with video other than DV, you can look up the Apple-approved third-party video capture cards. Many of these cards, such as the Aurora Igniter, feature real-time effects when you're working with high-end video.

The real-time features are under constant development at Apple. For the latest information, visit the Final Cut Pro site, at [www.apple.com/finalcutpro](http://www.apple.com/finalcutpro).



Final Cut Pro provides a handy way to quickly get a rough preview of your effect before you begin rendering. On the Timeline or in the Viewer, drag the playhead across the clip with the effect, and Final Cut Pro attempts to update the effect as fast as your computer allows. Drag the playhead slowly enough so that Final Cut Pro can keep up, and you get a fairly good idea of how your final rendered effect looks.

## Planning Efficient Rendering

Rendering takes time, pure and simple. Every time you make a change to an effect or a transition, you probably have to re-render unless you're using a suitable Unlimited RT setting. The time that rendering consumes can be significant while a producer breathes down the back of your neck, not to mention the simple aggravation factor.

You can do a few things to minimize the time you need to devote to rendering, especially if you're working with effect-intensive sequences. Follow these simple suggestions to manage your rendering times:



- ✓ **Make your rough cut first and then add effects.** The rule here is to plan ahead. If you can, work only with sequences with cuts. After you refine your rough cut to an acceptable look, work on adding effects and transitions.
- ✓ **Disable updates to avoid unnecessary renders.** Another trick you can use is to disable any updates in the Viewer and Canvas windows by pressing the Caps Lock key. This way, you can toggle the key on and off when you want to just edit or lay out your effects and when you later decide that you're ready to render. Locking down Caps Lock avoids the time that Final Cut Pro must take to update effect changes. This delay can often slow your work.
- ✓ **Start by using a low-quality setting.** You can start out by choosing a low or medium setting from the RT pop-up menu, which is in the upper-left corner of the Timeline window. Only when you're satisfied with the final timing should you switch the quality back to High and render the final sequence for output.
- ✓ **Do test renders.** Try test-rendering short sections of the Timeline before committing to an effect. For instance, if you add a sepia tint to a clip that's 3 minutes long, and it doesn't display in real-time, render only a portion of the 3-minute clip, decide on the settings, and then move on without waiting to render the entire clip. Later, at the end of the day, you can render the entire 3-minute clip.



If you ever drop a clip from the Browser into the Timeline, and a red render line appears on the status bar (see the section “Understanding Rendering Status,” earlier in this chapter), check to see whether a mismatch exists between the capture settings of the clip and the settings of the sequence preset. If a clip without an effect creates a red render line, this mismatch is most likely the culprit.

## *Managing Renders on Your Hard Drive*

Whenever you render in Final Cut Pro, a render cache file is generated. This render file is what Final Cut Pro plays during the effect that was rendered. For instance, imagine a dissolve between two clips. After the dissolve is rendered, the render file that’s created from the two clips fading into one another plays when you play through the dissolve. While playing around the dissolve, however, the respective media files for the clips (not the render file) are used for playback.



Rendering can take time, and in certain projects you may end up with hundreds, if not thousands, of render cache files. You must, therefore, manage your render files efficiently. I explain how to do this in this section.

### *Setting storage for your render files*

The first step in managing your render files is to set a proper location in which to store them. You do this task on the Scratch Disks tab, which I discuss in Chapter 2. After you set the location, Final Cut Pro organizes the files for you, which I explain in the next section. Note that if you don’t set a location, Final Cut Pro defaults to storing your render files on your main system drive. Follow these steps to set a location for storing your render files:

- 1. Choose Final Cut Pro HD ⇄ System Settings from the menu bar.**
- 2. Click the Scratch Disks tab in the System Settings window (see Figure BC1-4).**
- 3. Make sure that the Video Render and Audio Render check boxes in the top row of buttons are selected.**

The Video Capture check box should also be selected if you’re setting the scratch disk for your video captures.

- 4. Click the Set button in the top row.**

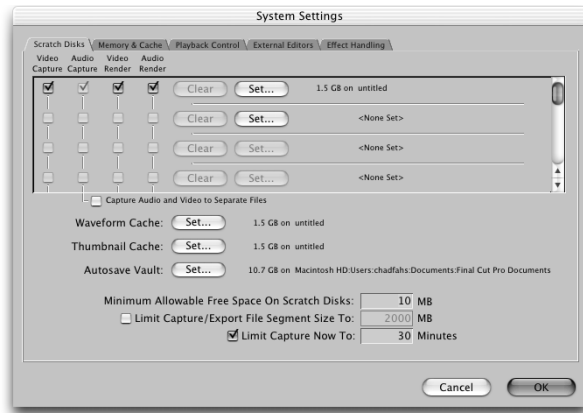
Final Cut Pro enables you to set numerous drives as your capture and render scratch disks. Here, I'm just using the top row of buttons to select just one drive. If you have more than one drive that you want to assign as your capture or render scratch disk, click the relevant buttons in the subsequent rows.

A dialog box appears that shows your drives.

5. In the dialog box, select a drive, and click Choose.
6. Click OK on the Scratch Disks tab when you're done.

Final Cut Pro now uses the drive you selected to store your render files.

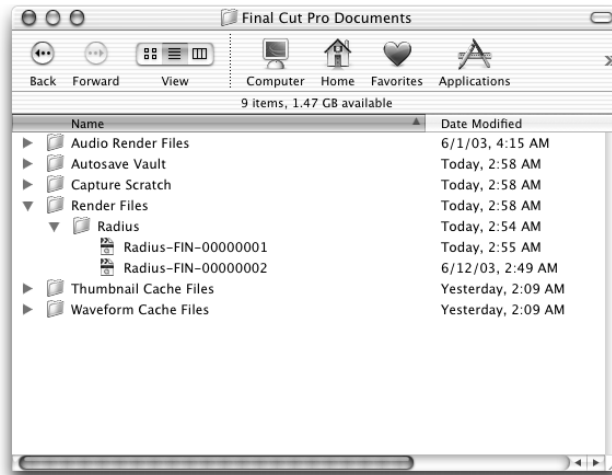
**Figure BC1-4:**  
Select a destination for your render files on the Scratch Disks tab.



## Locating your render files

What happens after you specify a location to store your render files? Final Cut Pro first creates a Final Cut Pro Documents subfolder in the Documents folder, which is located on your scratch disk. This Final Cut Pro Documents folder has subfolders for captured media, render files, and cache files for waveforms and thumbnails. In the Render Files folder, Final Cut Pro creates a subfolder for each of your projects by name and stores all the render files for that project in the relevant folder. Figure BC1-5 shows how Final Cut Pro organizes the render files.

The labels on these render files may at first seem confusing, but they're easy to decode. For instance, consider the render file Final Sequenc-FIN-0000002. The name tells you that this render file is from a sequence named Final Sequence and that this is the second render file from that sequence. The code FIN stands for the render quality that was used to create this render, which in this case is your final, highest resolution.



**Figure BC1-5:**  
Final Cut Pro  
organizes  
render files.

## *Dump those old renders?*

What happens to renders when they grow old? No, they aren't put out to a peaceful pasture.

Imagine this scenario: You render a 1-minute clip after you apply a blur and sepia tint effect to it. This action creates a render cache file for the 1-minute clip. Because the DV video format uses 3.6MB per second, this file measures approximately 216MB.

Later, you decide that you need to reduce the blur effect on your clip, so you go ahead and make the change. Of course, you have to rerender your effect. This action creates another render cache file, which is approximately 216MB as well. Now you have two large render cache files taking up space on your scratch disk, one of which isn't being used. And of course, Final Cut Pro has to save the first one for a while, in case you decide that you like the original render better and you use the Undo command ( $\text{⌘}+\text{Z}$ ) a few times to go back to your first render. Hmm. All this stuff can get complicated.

Fear not! It's not as bad as it sounds. Final Cut Pro holds on to an old render cache file until it drops off the undo queue. So if you chose Final Cut Pro → User Preferences and set your undo levels to 10 on the General tab, you can go back 10 steps by using the Undo command ( $\text{⌘}+\text{Z}$ ). Final Cut Pro then holds on to your first render cache file until the second render is the 11th step in the undo queue. You can do at least 10 undoable actions after rendering the first file, but when the second render action becomes the 11th action, Final Cut Pro automatically deletes the old render cache file.

It sounds like you don't need to worry about deleting your old render cache files. However, in some cases, your projects may get quite large, and you may spread your render files out across so many disks and folders that you simply lose track of them. This can happen despite the fact that Final Cut Pro is very good at keeping your files organized. In addition, you may have created render files at various render qualities, and you now may want to delete all except the ones that were done at the highest quality setting. In many cases, you may have rendered many times at the same render quality. This process can get pretty messy and disorganized.

In such a case, you could delete all render files and then re-render your entire sequence or sequences in the project. This technique may take time, but it cleans up the render cache file mess.

I would be remiss, however, if I didn't mention that Apple engineers strongly recommend against this approach; they state in no uncertain terms that you should avoid manually deleting your old render cache files. In other words, don't just go through your render folders on the various drives and toss out all the render files. This action may cause some issues later, when you reopen the project. Final Cut Pro may still look for the old render files and attempt to link to them.



The proper way to delete old render cache files is to use the Render Manager, so keep reading.

## *Using the Render Manager*

Apple engineers designed the Render Manager to help you do two key things: delete render files from old or deleted projects; and delete files that are no longer needed, such as the ones that were created at a lower quality setting.

When you use the Render Manager, you see files from projects that are open, as well as the ones that aren't open. You can use the modification dates on these files to determine what you want to save and what you want to delete.

To use the Render Manager, follow these steps:

**1. Choose Tools ⇨ Render Manager from the menu bar.**

The Render Manager window appears (see Figure BC1-6). In the Render Manager window, the files are sorted into folders by project and sequence name. The first main folder is the project folder, and the subfolders represent the sequences.

**2. Click in the Remove column next to a file to add a check mark to the file you want to remove.**



**Figure BC1-6:**  
Use the Render Manager window to delete old render cache files.

### 3. Click the OK button.

All the checked render files are removed. Bear in mind that files removed via the Render Manager cannot be restored.



Files removed by using the Render Manager cannot be restored by pressing  $\text{⌘}+\text{Z}$  to undo the action.

## *A Word about Audio Rendering*

Final Cut Pro can play back about eight audio tracks in real-time. However, as you add audio effects and transitions, the track costs add up, and you can't play as many tracks in real-time. Again, the trick is to render audio often.

To render individual audio clips with effects applied to them, select the audio clip, and choose **Sequence** → **Render Only** → **Mixdown** from the menu bar. You can also mark In and Out points (by pressing the I and O keys) in the Timeline and then choose **Sequence** → **Render Only** → **Mixdown** to render just the audio items that are between the In and Out points.