

AdobeSM Customer Services

Choosing the Right Compression Method

One of the most commonly asked questions about the Adobe Premiere program is what kind of compression to use for a project. Compression affects the visual quality of a movie and how well it plays on your computer. You can compress QuickTime® movies using any of the six software compressors that come with the Apple QuickTime program. In addition, you can add CODECS (compression/decompression components) to your System Folder to provide a variety of compression formats from which to choose. Finally, several hardware compressors are offered by third parties, such as the SuperMac™ Digital Film, the RasterOps MoviePak, and the Radius™ VideoVision™.

There are a variety of factors to consider when choosing a compression method for your movie. In general, the type of original images you have and the hardware configuration on which your movie will play back determine the best compression method. For example, if you are going to distribute your 16-bit or 24-bit video on CD-ROM, and you want your movie to play well on virtually any Macintosh®, you should choose a frame size of 160 pixels by 120 pixels and use the Apple Cinepak compressor—the Cinepak compressor is designed for use on CD-ROM media, and a 60-pixel-by-120-pixel movie can play smoothly on any Macintosh II or better.

In the Adobe Premiere program, you specify the compression method you want to use by selecting a Preset when you first set up the project. You can modify the compression settings of existing Presets by using the Compression Settings dialog box. If the intended use for the movie changes, you can select a different compression method later. Working with Presets is described in Chapter 2 of the *Adobe Premiere User Guide*. Using the Compression Settings dialog box is described in Chapter 7.

ABOUT COMPRESSION

Compression is the process of removing or restructuring data to decrease the size of a file. There are four factors that determine the speed and quality of image compression: compression ratio, image quality, compression/decompression speed, and spatial/temporal compression.

Compression ratio

The compression ratio indicates how much compression has been achieved for a particular image. The ratio is usually measured by factors such as 10:1, 20:1, and so on. It is determined by dividing the original image size by the size of the compressed image. In the Adobe Premiere program, the compression ratio is determined by the Quality slider in the Compression Settings dialog box (described later in this technical note) and the compressor being used—the higher the quality, the lower is the ratio. The trade-off, however, is in playback speed; lower ratios normally produce slower playback speeds. With most compressors, the more complex the image, the less compression you can expect to achieve.

Image quality

Compressors provide either lossy or lossless compression. *Lossless* compression preserves the original data, ensuring that the image is the same before and after compression. For example, PICT files employ a type of lossless compression known as *run-length encoding*, a process that discards continuous regions of duplicate colors. In general, lossless compression is not very effective with digitized video and scanned photographs, because colors in these images are usually represented by high dithering and diffusion and contain few areas of continuous color.

Lossy compressors, on the other hand, attempt to remove picture information that viewers are not likely to notice. This type of compression results in lost picture information that cannot be recovered. As more picture information is removed, picture quality decreases. If too much information is removed, the image may look *pixelated*—appearing to be made up of squares rather than looking smooth in areas with tonal gradations. The amount of information that is lost is determined by the amount of compression. As stated in the previous discussion of compression ratio, you control the amount of compression by using the Quality slider in the Compression Settings dialog box.

Compression and decompression speed

Compression and decompression time is the amount of time it takes to compress (encode) and decompress (decode) an image. You will want a fast compression ratio for capturing video and a fast decompression ratio for playback. Some compressors achieve better results for compression than for decompression, and others achieve better decompression than compression.

Spatial and temporal Compression

Spatial compression compresses the data in each frame of a clip. All QuickTime compressors provide spatial compression. Common side effects of spatial compression include blurring, blockiness, streaking, and contouring (regions of constant color).

Some compressors also provide *temporal compression*, which compresses data by comparing frames throughout the clip. *Key differencing* is a type of temporal compression that minimizes the amount of data required to represent each frame in a clip by storing data for only the frames containing changes. For example, for a movie that contains a minimum amount of movement and a fair amount of duplication from one frame to the next, key differencing compression provides effective compression by storing the data from certain key frames and discarding other data. A common side effect of key differencing is a type of blockiness

characterized by blocks of frames appearing in subsequent frames. Key differencing should not be used for images containing a great deal of fluid motion, or in areas with wipes, fades, or other transitions that use motion.

SOFTWARE COMPRESSORS

The five compressors shipped with Apple QuickTime 1.6 are software compressors. These compressors appear in the Compressor pop-up menu in the Compression Settings dialog box.

Note: *If you will be mastering your movie to CD-ROM, you may want to use the Apple MovieShop™ program to analyze your finished clips and to help you choose the right compression method for your distribution and playback needs. It will also optimize your audio and video blocks for the best possible playback from the media you will be using. You can find MovieShop on the Apple Developer's QuickTime CD-ROM.*

Video

The Apple Video compressor is the most popular compressor used by systems not equipped with hardware compression. It is used for capture and compression of analog video, high-quality playback from hard disk, and moderate-quality playback from CD-ROM. It permits fast compression and decompression while maintaining good picture quality.

The Video compressor supports both spatial and temporal compression. Spatial compression alone achieves compression ratios of between 5:1 and 8:1 and reasonably good quality. Spatial and temporal compression combined extend the range to between 5:1 and 25:1. Temporal compression is enabled by using key frames. For best results, you should set your key frame option to match your frame rate.

The Video compressor's compression and decompression speed varies depending on your CPU performance. In general, you can achieve half-screen (320 pixels by 240 pixels), 30 fps video with the Video compressor running on a Macintosh Quadra™ 950 or 800. As the CPU and disk speeds decrease, performance degrades.

Cinepak

Also known as *Compact Video*, the Apple Cinepak compressor is similar to the Video compressor. Although the Cinepak compression speed is considerably slower than the Video compressor's speed, its decompression speed outperforms the Video compressor. For example, compressing a 24-bit, 640-pixel-by-480-pixel image on a Macintosh IIsi can take about 2.5 minutes; decompressing the image can take less than a second.

The Cinepak compressor achieves higher compression ratios (about 18:1), better image quality, and faster playback speeds than the Video compressor. In addition, the data rate for playback can be defined by the user. This feature is particularly important when compressing material for playback from CD-ROM.

For best quality results, the Cinepak compressor should be used on raw source data that has not been previously compressed with a highly lossy compressor such as the Video compressor.

Photo (JPEG)

JPEG (Joint Photographic Experts Group) is an international standard for compressing still images. The Apple Photo compressor is used for images that contain smooth transitions or that do not contain a high percentage of edges or other sharp detail, such as most natural images. It is commonly used for situations in which quality needs to be maintained but real-time playback is not required. With the Photo compressor, compression ratios can range from 5:1 to 100:1, depending on image content. The best picture quality is achieved with compression ratios of between 10:1 and 20:1.

Most high-end capture cards also use JPEG compressors. Because the compression is being applied by a hardware device, fast sample rates can be achieved when capturing and when playing back.

Animation

The Apple Animation compressor is used for compression of images that were originally in digital form (animation and computer-generated content) and were not obtained from analog videotape, such as sequences of screen captures created by applications like CameraMan. This compressor uses an algorithm developed by Apple based on run-length encoding (RLE) techniques. Although the Animation compressor can play back full-screen images at up to 30 fps, its performance depends on the type of images being used.

The Animation compressor can work in either a lossy or lossless mode, and it supports both spatial and temporal compression. Although some quality is lost with lossy compression, it is fast enough for real-time playback.

Graphics

Probably the least-used software compressor is the Apple Graphics compressor, which is designed for compressing analog video when you need good picture quality for playback on 8-bit screen displays. Because the Graphics compressor does not achieve high compression ratios for video, it is suitable for playback from a hard disk drive but not from CD-ROM.

SOFTWARE COMPRESSION OPTIONS

Choosing a compression method involves more than just selecting which compressor to use. The compression method includes the movie's pixel depth, spatial compression quality, frame rate, and—depending on the compressor you choose—the data rate limit and use of key framing.

Note: When you use the *Compression Settings* dialog box to set up the compression method, you can preview how the settings will affect your compiled movie. To do so, select a clip in the *Project* window, and copy it to the *Clipboard*. A frame from the clip will appear in the dialog box. As you change compression settings, the clip displays the effects of the changes.

Pixel depth

The pixel depth determines the number of colors that can appear in the images. Smaller depths can reduce the file size but may degrade the image quality. You use the Color pop-up menu in the Compression Settings dialog box to specify pixel depth. Note that there is no Color pop-up menu for the Apple Video compressor, because it is fixed at 16 bits and cannot be changed.

Spatial compression quality

The lower the quality you choose, the higher is the movie's compression ratio and the smaller is the file size. A high quality setting results in less information being lost than is lost with a low quality setting. You use the Quality slider in the Compression Settings dialog box to specify the spatial compression quality.

Frame rate

Frame rate may be the most misunderstood and misused option in Adobe Premiere. The frame rate you specify when setting up a compression method should not be confused with the time base you set up when you create a new project. Although the time base is expressed as frames per second, it merely determines how Adobe Premiere interprets imported clips and lets the program know how many frames make 1 second of a movie for editing. Although the time base is not the same as the frame rate, you should consider the frame rate of your final movie when setting the time base for a project. Doing so ensures that data will not be lost through interpolation when Adobe Premiere translates data from the project frame rate into the compiled movie's frame rate. For example, if you want to output a final movie at 15 frames per second (fps), you should set the time base at 30 fps, because 30 is evenly divisible by 15 (every two frames will be duplicates).

The frame rate determines the playback rate of the movie. In general, higher rates yield better results, with smoother, more natural-looking motion. However, you should select a rate that matches the maximum playback rate of the computer system on which the finished movie will be played. Selecting a rate that cannot be achieved by the playback system results in dropped frames and possible flutter when the movie is played. The maximum rate of the playback system depends on the speed of its components—the CPU, the hard disk drive, and the display card.

Data rate limit

If you are using the Cinepak compressor for playback on CD-ROM, you can specify the data rate limit. For playback on a regular CD-ROM, you should set the limit to between 90 and 100 kilobytes per second. For playback on a double-speed CD-ROM, you can set the limit as high as 200 to 250 kilobytes per second. Adobe Premiere will automatically adjust the spatial and temporal quality of the movie to achieve the data rate you set.

Key frame

If you are using a compressor that uses frame differencing (see “Spatial and Temporal Compression” earlier in this technical note), you can specify the rate at which the movie is sampled for key frames. A key frame is the frame against which the other frames are compared for differences. Key frames are saved in their entirety; only the differences in the intermediate frames are saved. Using the Key Frame option allows for greater compression and increased playback speed, but it can cause delays in accessing individual frames in a movie. If the movie is designed to be viewed from beginning to end, you should set the Key Frame option higher than you would if viewers skip around to different parts of the movie.

Hardware Compression

Many video boards provide hardware compression. Hardware compression is much faster and more effective than software compression. Hardware compression frees up the processor to work on other tasks, which can speed playback significantly. If your video board provides hardware compression, you should refer to the documentation that came with your board for recommendations on which compressor to choose.

***Note:** Because of the way data travels on a Macintosh Quadra or Centris®, software compression allows playback with these computers that is significantly faster than with other CPUs, especially when the internal video of the Quadra is used. However, third-party hardware compression still offers a faster alternative.*