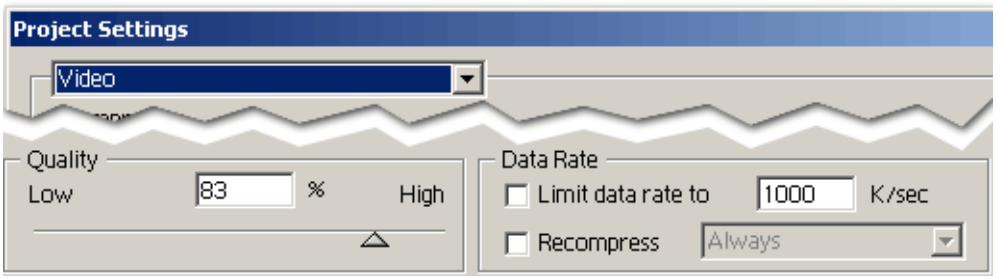
Adobe Premiere Technical Guides

Video codec compression methods

The topics in this techguide cover some types of compression methods video codecs use to handle various situations. Understanding these techniques can help you identify issues and priorities as you evaluate compression strategies for your projects in Adobe® Premiere®.

Spatial compression

Spatial (space) compression compacts the description of the visual area of a video frame by looking for patterns and repetition among pixels. For example, in a picture that includes a blue sky, spatial compression will notice that many of the sky pixels are a similar shade of blue. Instead of describing each of several thousand pixels, spatial compression can record a much shorter description, such as "All the pixels in this area are light blue." *Run-length encoding* is a version of this technique that is used by many codecs. As you increase spatial compression, the data rate and file size decrease, and the picture loses sharpness and definition. For many codecs, the degree of spatial compression is controlled by the Quality and Data Rate options—lowering the values for these options increases spatial compression.



In some codecs, Quality and Data Rate are interrelated so that changing one affects the other.

Temporal compression

Temporal (time) compression looks for ways to compact the description of the changes during a sequence of frames. It does this by looking for patterns and repetition over time. For example, in a video clip of a person speaking in front of a static background, temporal compression will notice that the only pixels that change from frame to frame are those forming the face of the speaker. All the other pixels don't change (when the camera is motionless). Instead of describing every pixel in every frame, temporal compression describes all the pixels in the first frame, and then for each frame that follows, describes only the pixels that are different from the previous frame. This technique is called *frame differencing*.

When most of the pixels in a frame are different from the previous frame, it's preferable to describe the entire frame again. Each whole frame is called a *keyframe*, which sets a new starting point for frame differencing. Many codecs can create keyframes at an interval you specify, and some codecs can also insert keyframes at markers you set in the Timeline window in Premiere. Some codecs automatically create a keyframe for a frame that is visually very different from the previous frame. As you specify fewer keyframes, the data rate and file size decreases, and so does the picture quality. The degree of temporal compression is usually controlled by a codec's Quality option and by keyframe settings—lowering the value for these options increases temporal compression. For more information about setting keyframe options, see the following topic in the Premiere 6.0 online Help: Working with Projects > Specifying project settings > Keyframe and rendering options. If you are exporting a video file, see Producing Final Video > Choosing export settings > Keyframe and Rendering export settings; see also, Producing Final Video > Choosing export settings.

Lossless and lossy compression

Some codecs use *lossless* compression, which ensures that all of the information in the original clip is preserved after compression. This maintains the full quality of the original, which makes lossless compression useful for final-cut editing or moving clips between systems. However, preserving the original level of quality limits the degree to which you can lower the data rate and file size, and the resulting data rate may be too high for smooth playback on many systems.

Other compression methods discard some of the original data during compression. This is called *lossy* compression. For example, if the pixels making up a sky actually contain 78 shades of blue, a lossy codec set for less-than-best quality may record 60 shades of blue. Lossy codecs usually let you specify how much picture quality you want to trade to lower the data rate and file size so that you can tailor playback for your audience. Lossy compression allows much lower data rates and file sizes than lossless compression, so lossy codecs are commonly used for final production of video delivered using CD-ROM or the Internet. Some codecs are always lossy, such as JPEG, or always lossless, such as Planar RGB. Other codecs may or may not be lossy, usually depending on the settings you specify for the Quality and Data Rate options—lowering the value for these options saves more space by discarding more data.

Asymmetrical and symmetrical compression

The codec you choose affects your production workflow, not just in file size or playback speed, but in the time required for a codec to compress a given number of frames. Fast compression helps video production, and fast decompression makes viewing easier, but many codecs take far more time to compress frames than to decompress them during playback. This is why a 30-second program may take a few minutes to process before playback. Compressing video is like packing a suitcase—you can pack as fast as you unpack by simply throwing clothes into the suitcase, but if you spend more time to fold and organize the clothes in the suitcase, you can fit more clothes in the same space.

Similarly, different codecs require various amounts of time to compress or decompress video. A codec is considered *symmetrical* when it requires the same amount of time to compress as to decompress a clip. A codec is *asymmetrical* when the times required to compress and decompress a clip are significantly different. For example, the Cinepak asymmetrical codec decompresses video relatively quickly, making it useful for video files that must play well on both high- and low-end computers, but to achieve this it requires more time when compressing. Symmetry varies depending on the codec and is generally not adjustable within a codec.