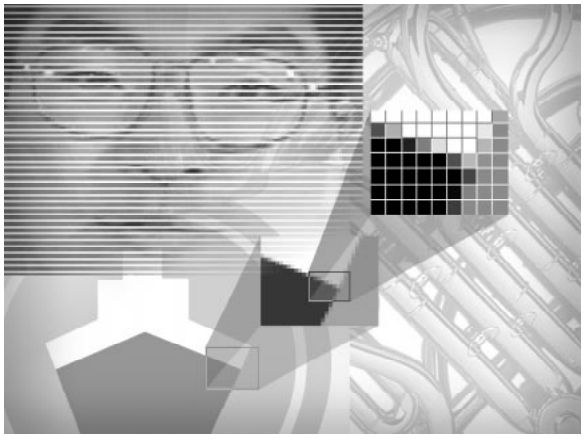
About Digital Video Editing



When you edit video, you arrange source clips so that they tell a story. That story can be anything from a fictional television program to a news event and more. Understanding the issues that affect your editing decisions can help you prepare for successful editing and save you valuable time and resources.

This lesson describes Premiere's role in video production and introduces a variety of key concepts:

- Measuring video time.
- Measuring frame size and resolution.
- Compressing video data.
- Capturing video.
- Superimposing and transparency.
- Using audio in a video.
- Creating final video.

How Premiere fits into video production

Making video involves working through three general phases:

- *Pre-production* involves writing the script, visualizing scenes by sketching them on a storyboard, and creating a production schedule for shooting the scenes.
- *Production* involves shooting the scenes.
- *Post-production* involves editing the best scenes into the final video program, correcting and enhancing video and audio where necessary. Editing includes a first draft, or *rough cut*, where you can get a general idea of the possibilities you have with the clips available to you. As you continue editing, you refine the video program through successive iterations until you decide that it's finished. At that point you have built the *final cut*. Premiere is designed for efficient editing, correcting, and enhancing of clips, making it a valuable tool for post-production.

The rest of this chapter describes fundamental concepts that affect video editing and other post-production tasks in Premiere. All of the concepts in this section and the specific Premiere features that support them are described in more detail in the *Adobe Premiere 5.0 User Guide*.

If any stage of your project involves outside vendors, such as video post-production facilities, consult with them before starting the project. They can help you determine what settings to use at various stages of a project and avoid time-consuming, costly mistakes. For example, if you're creating video for broadcast, you should know whether you are creating video for the NTSC (National Television Standards Committee) standard used primarily in North America and Japan, the PAL (Phase Alternate Line) standard used primarily in Europe, Asia, and southern Africa, or the SECAM (Sequential Couleur Avec Memoire) standard used primarily in France, the Middle East, and North Africa.

Measuring video time

In the natural world, we experience time as a continuous flow of events. However, working with video requires precise synchronization, so it's necessary to measure time using numbers. Familiar time divisions—hours, minutes, and seconds—are not precise enough for video editing, because a single second might contain several events. This section describes how Premiere and video professionals measure time, using standard methods which count fractions of a second in frames.

How the timebase and frame rates affect each other

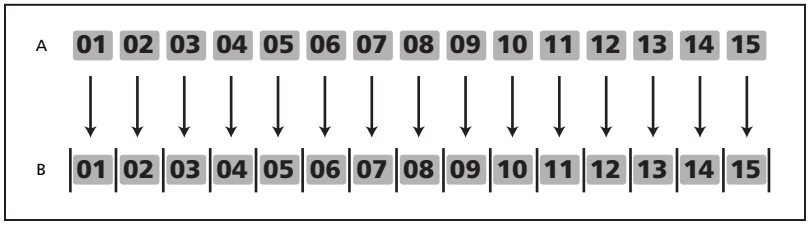
You determine how time is divided in your project by specifying the project *timebase*. For example, a timebase of 30 means that each second is divided into 30 units. The exact time at which an edit occurs depends on the timebase you specify, because an edit can only occur at a time division, and using a different timebase causes the time divisions to fall in different places.

The time divisions in a source clip are determined by the *source frame rate*. For example, when you shoot source clips using a video camera with a frame rate of 30 frames per second, the camera records the scene every 1/30th of a second. Note that whatever was happening between those 1/30th of a second intervals is not recorded, so a higher frame rate provides higher time resolution.

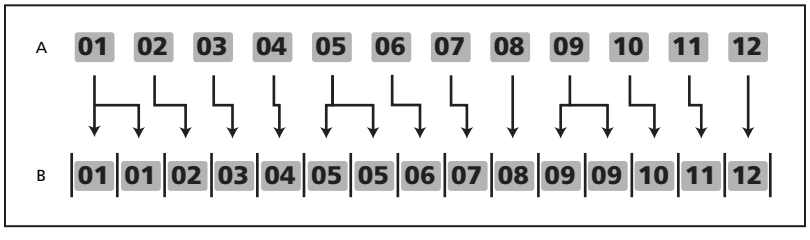
You determine how often Premiere generates frames from your project by specifying the *project frame rate*. For example, a frame rate of 30 frames per second means that Premiere will create 30 frames from each second of your project.

For smooth and consistent playback, the timebase, the source frame rate, and the project frame rate should be identical. In general, use 24 fps (frames per second) for editing motion-picture film, 25 fps for editing PAL and SECAM video, 29.97 fps for editing NTSC video, and 30 fps for other video types. (NTSC was originally designed for a black-and-white picture at 30 fps, but signal modifications made in the mid-20th century to accommodate color pictures altered the standard NTSC frame rate to 29.97 fps.)

Sometimes the time systems don't match. For example, you might be asked to create a video intended for CD-ROM distribution that must combine motion-picture source clips captured at 24 fps with video source clips captured at 30 fps, using a timebase of 30 for a final CD-ROM frame rate of 15 fps. When any of these values don't match, it is mathematically necessary for some frames to be repeated or omitted; the effect may be distracting or imperceptible depending on the differences between the timebase and frame rates you used in your project.



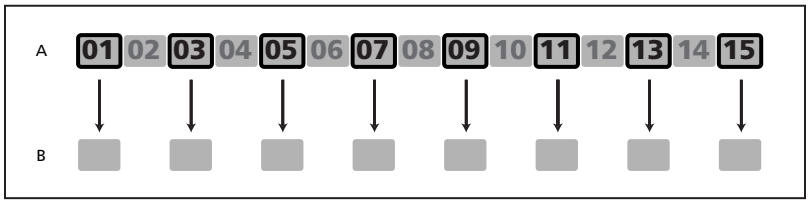
***A**. 30 fps video clip (one-half second shown). **B**. Timebase of 30, for a video production. When the source frame rate matches the timebase, all frames display as expected.*



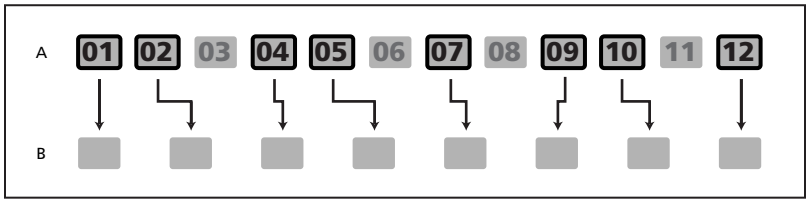
***A**. 24 fps motion-picture source clip (one-half second shown). **B**. Timebase of 30, for a video production. To play one second of 24 fps frames at a timebase of 30, source frames 1, 5, and 9 are repeated.*

Always capture your clips at the same frame rate at which you plan to export it. For example, if you know your source clips will be exported at 30 fps, capture the clips at 30 fps instead of 24 fps.

When time systems don't match, the most important value to set is the timebase, which you should choose appropriately for the most critical final medium. For example, if you are preparing a motion picture trailer that you also want to show on television, you might decide that motion picture is the most important medium for the project, and specify a timebase of 24.



***A**. Timebase of 30 (one-half second shown). **B**. Final frame rate of 15, for a Web movie. When the timebase is evenly divisible by the frame rate, timebase frames are included evenly.*



***A**. Timebase of 24 for a motion-picture film (one-half second shown). **B**. Final frame rate of 15, for a Web movie. The time is not evenly divisible by the frame rate, so frames are included unevenly. A final frame rate of 12 fps would generate frames more evenly.*

The important thing to remember is this: You'll get the most predictable results if your timebase and frame rate are identical, or are at least even multiples of each other.

For more information, see "Measuring time" in online Help, or Appendix A in the Adobe Premiere User Guide.

Counting time with timecode

Timecode defines how frames are counted and affects the way you view and specify time throughout a project. Timecode never changes the timebase or frame rate of a clip or project—it only changes how frames are numbered.

You specify a timecode style based on the media most relevant to your project. For example, you count frames differently when editing video for television than when editing for motion-picture film. By default, Premiere displays time using the SMPTE (Society of Motion Picture and Television Engineers) video timecode, where a duration of 00:06:51:15 indicates that a clip plays for 6 minutes, 51 seconds, and 15 frames. At any time, you can change to another system of time display, such as feet and frames of 16mm or 35mm film. Professional videotape decks and camcorders can read and write timecode directly onto the videotape, which lets you synchronize audio, video, and edits, or edit offline (see page 84).

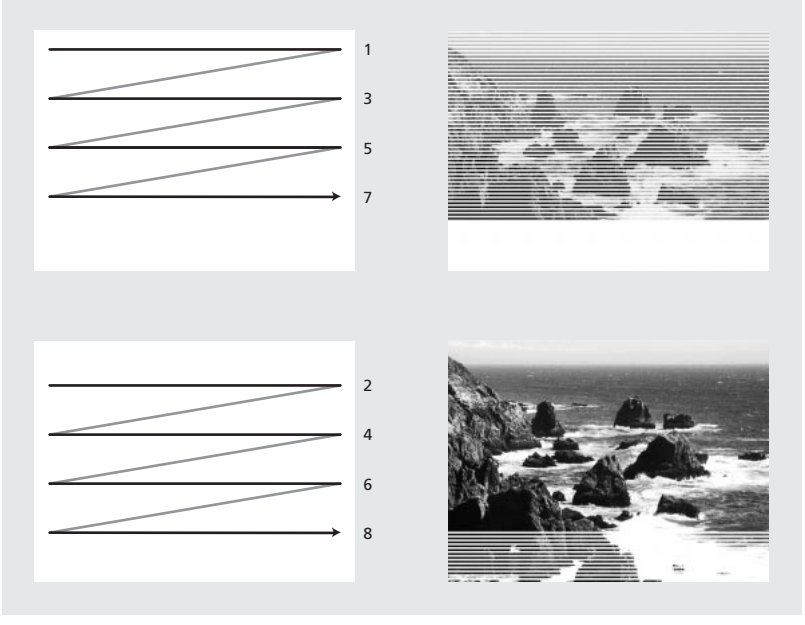
When you use the NTSC-standard timebase of 29.97, the fractional difference between this timebase and 30 fps timecode causes a difference between the displayed duration of the program and its actual duration. While tiny at first, this difference grows as program duration increases, preventing you from accurately creating a program of a specific length. *Drop-frame timecode* is a SMPTE standard for 29.97 fps video that eliminates this error, preserving NTSC time accuracy. When you use drop-frame timecode, Premiere renumbers the first two frames of every minute except for every tenth minute. For example, the frame after 59:29 is labeled 1:00:02. No frames are lost, because drop-frame timecode doesn't actually drop frames, only frame numbers. Premiere indicates drop-frame timecode by displaying semicolons between the numbers in time displays throughout the software, and displays non-drop-frame timecode by displaying colons between numbers in timecode displays.

Drop-frame timecode uses semicolons (left) and non-drop-frame timecode uses colons (right).

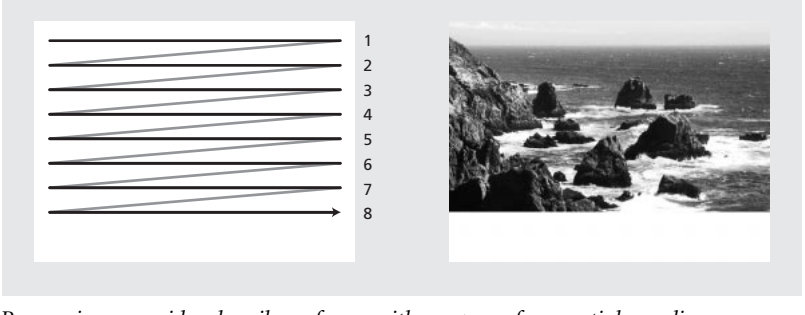
Interlaced and non-interlaced video

A picture on a television or computer monitor consists of horizontal lines. There is more than one way to display those lines. Most personal computers display using *progressive scan* (or non-interlaced) display, in which all lines in a frame are displayed in one pass from top to bottom before the next frame appears. Television standards such as NTSC, PAL, and SECAM standards are *interlaced*, where each frame is divided into two *fields*. Each field contains every other horizontal line in the frame. A TV displays the first field of alternating lines over the entire screen, and then displays the second field to fill in the

alternating gaps left by the first field. One NTSC video frame, displayed approximately every 1/30th of a second, contains two interlaced fields, displayed approximately every 1/60th of a second each. PAL and SECAM video frames display at 1/25 of a second and contain two interlaced fields displayed every 1/50th of a second each. The field that contains the topmost scan line in the frame is called the *upper field*, and the other field is called the *lower field*. When playing back or exporting to interlaced video, make sure the field order you specify matches the receiving video system, otherwise motion may appear stuttered, and edges of objects in the frame may break up with a comb-like appearance.



Interlaced video describes a frame with two passes of alternating scan lines.



Progressive-scan video describes a frame with one pass of sequential scan lines.

Deinterlacing video

If you plan to slow down or hold a frame in an interlaced video clip, you may want to prevent flickering or visual stuttering by deinterlacing *its frames, which converts the interlaced fields into complete frames. If you're using progressive-scan source clips (such as motion-picture film or computer-generated animation) in a video intended for an interlaced display such as television, you can separate frames into fields using a process known as* field rendering *so that motion and effects are properly interlaced.*

—From the Adobe Premiere User Guide, Appendix A

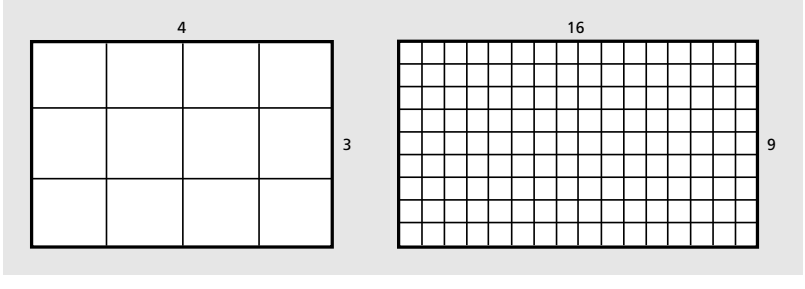
For more information, see "Processing interlaced video fields" in online Help, or Chapter 4 in the Adobe Premiere User Guide.

Measuring frame size and resolution

Several attributes of frame size are important when editing video digitally: pixel (picture element) and frame aspect ratio, clip resolution, project frame size, and bit depth. A *pixel* is the smallest unit that can be used to create a picture; you can't accurately display anything smaller than a pixel.

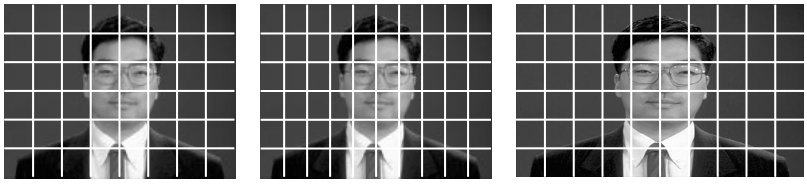
Aspect ratio

The *aspect ratio* of a frame describes the ratio of width to height in the dimensions of a frame. For example, the frame aspect ratio of NTSC video is 4:3, whereas some motion-picture frame sizes use the more elongated aspect ratio of 16:9.



A frame using a 4:3 aspect ratio (left), and a frame using the wider 16:9 aspect ratio (right).

Some video formats use a different aspect ratio for the pixels that make up the frame. When a video using non-square pixels is displayed on a square-pixel system, or vice versa, shapes and motion appear stretched. For example, circles are distorted into ellipses.



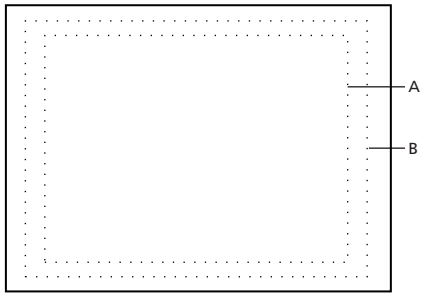
A frame with square pixels (left), a frame with tall horizontal pixels (center), and the center frame again displayed using square pixels (right).

Frame size

In Premiere, you specify a *frame size* for playing back video from the Timeline, and if necessary, for exporting video to a file. Frame size is expressed by the horizontal and vertical dimensions of a frame; for example, 640 by 480 pixels. In digital video editing, frame size is also referred to as *resolution*. In general, higher resolution preserves more image detail and requires more memory to edit. As you increase frame dimensions, you increase the number of pixels Premiere must process and store for each frame, so it's important to know how much resolution your final video format requires. For example, a 640 by 480 pixel NTSC frame contains 307,200 pixels, while a 720 by 576 PAL image contains 349,920 pixels. If you specify too low a resolution, the picture will look coarse and pixelated; specify too high a resolution and you'll use more memory than necessary.

Overscan and safe zones

Frame size can be misleading if you're preparing video for television. Most NTSC consumer television sets enlarge the picture; however, this pushes the outer edges of the picture off the screen. This process is called *overscan*. Because the amount of overscan is not consistent across all televisions, you should keep action and titles inside two safe areas—*action-safe* and *title-safe*. The action-safe zone is a margin, about the width of a typical amount of overscan, around all sides of a frame. The title-safe zone is a margin that extends further into the frame than the action-safe zone. The title-safe zone helps ensure that text and important graphics are completely displayed, and avoids the distortion of text and graphics which can occur toward the edges of many televisions. Always anticipate overscan by using safe zones, keeping important action and text within them, and testing the video on an actual television monitor.



A. *A title-safe zone* ***B.*** *An action-safe zone*

Safe zones are indicated by dotted lines in Premiere's Title window. See "About titles" on page 225.

Bit depth

In a computer, a *bit* is the most basic unit of information storage. The more bits are used to describe something, the more detailed the description can be. *Bit depth* indicates the number of bits set aside for describing the color of one pixel. The higher the bit depth, the more colors the image can contain, which allows more precise color reproduction and higher picture quality. For example, an image storing 8 bits per pixel (8-bit color) can display 256 colors, and a 24-bit color image can display approximately 16 million colors.

How much is enough?

The bit depth required for high quality depends on the color format used by the video-capture card. Many capture cards use the YUV color format, which can store high-quality video using 16 bits per pixel. Before transferring video to your computer, video-capture cards that use YUV convert it to the 24-bit RGB color format which Premiere uses. For the best RGB picture quality, save source clips and still images with 24 bits of color (although you can use clips with lower bit depths). If the clip contains an alpha channel mask, save it from the source application using 32 bits per pixel (also referred to as 24 bits with an 8-bit alpha channel, or Millions of Colors+). For example, QuickTime movies can contain up to 24 bits of color with an 8-bit alpha channel, depending on the exact format used. Internally, Premiere always processes clips using 32 bits per pixel regardless of each clip's original bit depth. This helps preserve image quality when you apply effects or superimpose clips.

—From the Adobe Premiere User Guide, Appendix A

If you're preparing video for NTSC, keep in mind that although both 16-bit YUV and 24-bit RGB provide a full range of color, the color range of NTSC is limited in comparison. NTSC cannot accurately reproduce saturated colors and subtle color gradients. The best way to anticipate problems with NTSC color is to preview your video on a properly calibrated NTSC monitor during editing.

 For more information, see "Previewing on another monitor" in online Help or in Chapter 4 of the Adobe Premiere User Guide.

Understanding video data compression

Editing digital video involves storing, moving, and calculating extremely large volumes of data compared to other kinds of computer files. Many personal computers, particularly older models, are not equipped to handle the high *data rates* (amount of video information processed each second) and file sizes of uncompressed digital video. Use *compression* to lower the data rate of digital video into a range that your computer system can handle. Compression settings are most relevant when capturing source video, previewing edits, playing back the Timeline, and exporting the Timeline. In many cases, the settings you specify won't be the same for all situations:

• It's a good idea to compress video coming into your computer. Your goal is to retain as much picture quality as you can for editing, while keeping the data rate within your computer's limits.

• You should also compress video going out of your computer. Try to achieve the best picture quality for playback. If you're creating a videotape, keep the data rate within the limits of the computer that will play back the video to videotape. If you're creating video to be played back on another computer, keep the data rate within the limits of the computer models you plan to support.

Applying the best compression settings can be tricky, and the best settings can vary with each project. If you apply too little compression, the data rate will be too high for the system, causing errors such as dropped frames. If you apply too much compression, lowering the data rate too far, you won't be taking advantage of the full capacity of the system and the picture quality may suffer unnecessarily. You can use the Data Rate Analyzer to evaluate any video file.

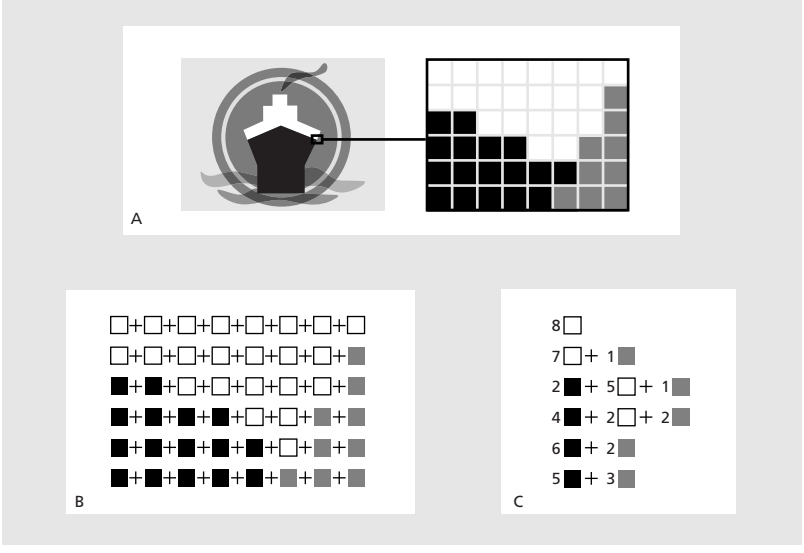
 For information on the Data Rate Analyzer, see "Analyzing clip properties and data rate" in online Help or in Chapter 3 of the Adobe Premiere User Guide.

Choosing a video compression method

The goal of data compression is to represent the same content using less data. You can specify a compressor/decompressor, or *codec*, that manages compression. A codec may use one or more strategies for compression because no single method is best for all situations. The following list describes the most common strategies used by codecs and the kinds of video they are intended to compress:

Spatial compression Spatial (space) compression looks for ways to compact a single frame by looking for pattern and repetition among pixels. For example, instead of describing each of several thousand pixels in a picture of a blue sky, 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. Codecs that use spatial compression, such as QuickTime Animation or Microsoft RLE, work well with video containing large solid areas of color, such as cartoon animation.



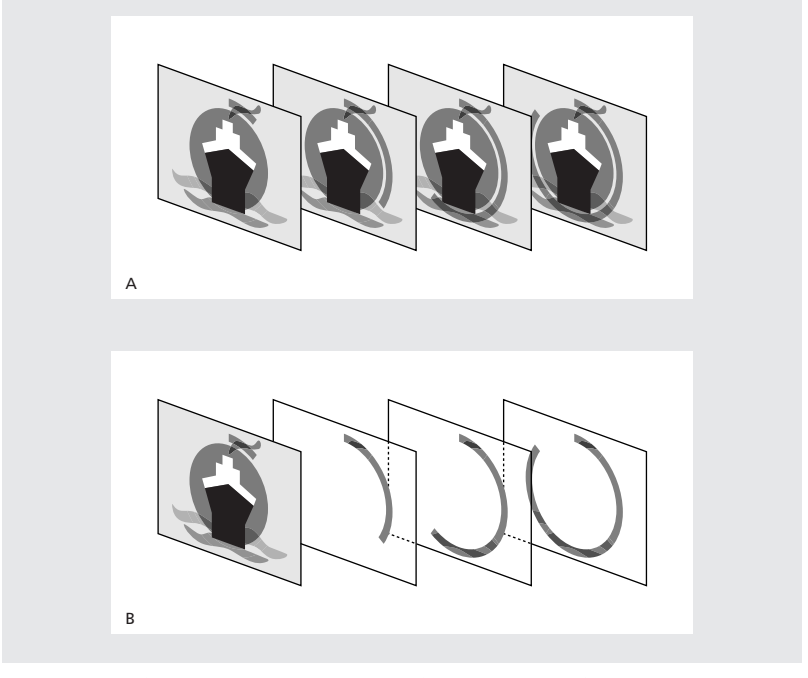
*Digital images are composed of pixels (**A**), which consume a lot of disk space when stored without compression **(B).** Applying run-length encoding stores the same frame data in much less space **(C).***

In general, as you increase spatial compression, the data rate and file size decrease, and the picture loses sharpness and definition. However, some forms of run-length encoding preserve picture quality completely, but require more processing power.

Temporal compression Temporal (time) compression compacts the changes during a sequence of frames by looking for patterns and repetition over time. In some video clips, such as a clip of a television announcer, 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. You can use Premiere to control how keyframes are created (see the *Adobe Premiere 5.0 User Guide*). Many codecs use temporal compression, including Cinepak. If you can't set keyframes for a codec, chances are it doesn't use temporal compression. Temporal compression works best when large areas in the video don't change, and is less effective when the image constantly changes, such as in a music video.

In this clip, the only change is the circle around the ship.



A. *Storing the clip without compression records all pixels in all frames.* ***B.*** *Applying temporal compression creates a keyframe from the first frame, and subsequent frames record only the changes.*

Lossless and lossy compression Some codecs use *lossless* compression, which ensures that all of the information—and thus all of the quality—in the original clip is preserved after compression. 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. Other compression methods use *lossy* compression, which discards some of the original data during 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 compression allows much lower data rates and file sizes than lossless compression, so lossy codecs such as Cinepak or Sorenson Video are commonly used for final production of video delivered using CD-ROM or the Internet. Lossless codecs such as Animation (at the Best quality setting) are used to preserve maximum quality during editing or for still images where data rate is not an issue.

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 clip may take a few minutes to process before playback. 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.

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.

Capturing video

Before you can edit your video program, all source clips must be instantly accessible from a hard disk, not from videotape. You import the source clips from the source videotapes to your computer through a post-production step called *video capture*. You must have a hard disk big enough to store all the clips you want to edit, so to save space, capture just the clips you know you want to use.

Capturing to support online or offline editing

Depending on the level of quality you want and the capabilities of your equipment, you may be able to use Premiere for either online or offline editing. The settings you specify for video capture are different for offline or online editing.

About online and offline editing

Online editing *is the practice of doing all editing (including the rough cut) on the same computer that will produce the final cut. Previously, online editing had to be done on expensive high-end workstations designed to handle the picture quality and high volumes of data created by broadcast-quality video. Today, continuing improvements in the speed of personal computers make online editing increasingly practical for broadcast television or motion-picture film productions. For online editing, you capture clips once at the highest level of quality your computer and its connected hardware can handle.*

In offline editing*, you edit video using lower-quality copies of the original clips and produce the final version on a high-end system using the original clips. When you capture video for offline editing, you specify settings that emphasize editing speed over picture quality. In most cases you need only enough quality to mark the beginning and ending frames for each scene. Once you have completed the offline edit in Premiere, you export a text file of scene sequences called an* edit decision list*, or EDL. You then move the EDL to an* edit controller *on a high-end system, which applies the sequence worked out in Premiere to the original high-quality clips. In this way, the editing work done on a slower, less-expensive workstation is used to create the final cut on a more expensive, higher-quality workstation.*

—From the Adobe Premiere User Guide, Chapter 3

Offline editing requires clips captured with frame-accurate timecode (see "Counting time with timecode" on page 73). To do this, use device control to capture clips (see "Using device control to capture or export video" on page 87).

Components that affect video capture quality

Video capture requires a higher and more consistent level of computer performance—far more than you need to run general office software, and even more than you need to work with image-editing software. Getting professional results depends on the performance and capacity of all of the components of your system working together to move frames from the video-capture card to the processor and hard disk. The ability of your computer to capture video depends on the combined performance of the following components:

Video-capture card You need video-capture hardware—either a video-capture card or equivalent capability built into your computer—to transfer video between a videotape deck (or other video source) and your computer. Note that a video-capture card is not the same as the video card that drives your computer monitor. Premiere is sold with many video-capture cards, which usually include non-Premiere software written by the card manufacturer to control the specific card type.

Your video-capture card must be fast enough to capture video at the level of quality that your final medium requires. For full-screen, full-motion NTSC video, the card must be capable of capturing thirty frames (sixty fields) per second at 640 by 480 pixels without dropping frames; for PAL and SECAM, twenty-five frames (fifty fields) per second at 720 by 576 pixels (see "Interlaced and non-interlaced video" on page 74). However, if you're capturing video for a project requiring a smaller frame size or lower frame rate than those listed here, such as for Internet video, save processing time and disk space by specifying the lower values more appropriate to your medium.

Hard disk The hard disk stores the video frames you capture. It must be fast enough to store captured video frames as quickly as they arrive from the video card, otherwise frames will be dropped as the disk falls behind. For capturing at the NTSC video standard of just under 30 frames per second, your hard disk should have an average (not minimum) access time of 10 milliseconds (ms) or less, and a sustained (not peak) data transfer rate of at least 3 MB per second but preferably around 6 MB per second. (The *access time* is how fast a hard disk can reach specific data. The *data transfer rate* is how fast the hard disk can move data to and from the rest of the computer.) Due to factors such as system overhead, the actual data transfer rate for video capture is usually about half the stated data transfer rate of the drive. For best results, capture to a separate high-performance hard disk intended for use with video capture and editing, such as an AV (audio-video)-certified hard disk configuration with a SCSI 2, Ultra SCSI, or Ultra DMA IDE drive, or a disk array. The state of high-end video hardware changes rapidly; consult the manufacturer of your video-editing card for suggestions about appropriate video storage hardware.

Central processing unit (CPU) Your computer's processor—such as a Pentium or PowerPC chip—handles general processing tasks in your computer. It must be fast enough to process captured frames at the capture frame rate. A faster CPU or using multiple CPUs in one computer (multiprocessing) is better. However, other system components must be fast enough to handle the CPU speed. Using a fast CPU with slow components is like driving a sports car in a traffic jam.

Codec (compressor/decompressor) Most video-capture cards come with a compression chip that keeps the data rate within a level your computer can handle (see "Understanding video data compression" on page 79). If your video-capture hardware doesn't have a compression chip, capture using a fast, high-quality codec such as Motion JPEG. If you capture using a slow-compressing or lossy codec such as Cinepak, you'll drop frames or lose quality.

Processing time required by other software If you capture video while several other programs are running (such as virtual memory, network connections, non-essential system enhancers, and screen savers), the other programs will probably interrupt the video capture with requests for processing time, causing dropped frames. Capture video while running as few drivers, extensions, and other programs as possible. In Mac OS, turn off AppleTalk. See the Mac OS documentation or online Help.

Data bus Every computer has a data bus that connects system components and handles data transfer between them. Its speed determines how fast the computer can move video frames between the video-capture card, the processor, and the hard disk. If you purchased a high-end computer or a computer designed for video editing, the data bus speed is likely to be well matched to the other components. However, if you've upgraded an older computer with a video-capture card, a faster processor, or a hard disk, an older data bus may limit the speed benefits of the new components. Before upgrading components, review the documentation provided by the manufacturer of your computer to determine whether your data bus can take advantage of the speed of a component you want to add.

Using device control to capture or export video

You can control some videotape decks from within Premiere by using device control. This lets you use the source playback controller in Premiere to operate a deck directly, making it much easier to capture video into your computer or print your project to videotape. To use device control, you'll need the following items:

- A frame-accurate videotape deck that supports external device control.
- A cable that connects the deck to your computer.
- Premiere-compatible plug-in software that lets you control the tape deck directly from Premiere (usually included by the deck manufacturer).
- Source videotape recorded with timecode (see "Counting time with timecode" on page 73).

Device control is not available on consumer videocassette recorders (VCRs). Device-control decks are sold by dealers of professional video equipment, and are more expensive than VCRs.

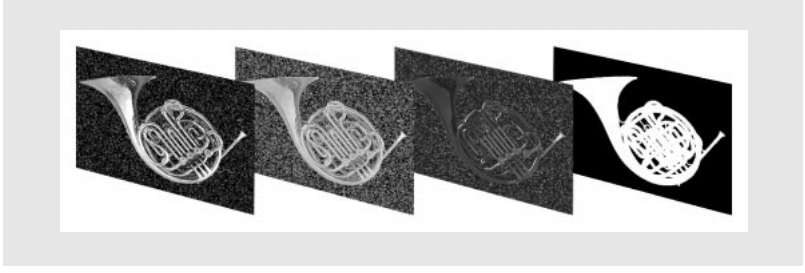
 For more information, see "Capturing video with device control" in online Help or in Chapter 3 of the Adobe Premiere User Guide.

Understanding transparency and superimposing

Transparency allows a clip (or any part of it) to reveal a second, underlying clip, so that you can create composites, transitions, or other effects. Several kinds of transparency are possible in Premiere:

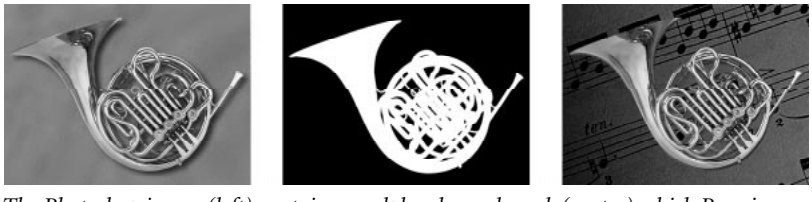
Matte or mask A matte or mask is an image that specifies transparent or semitransparent areas for another image. For example, if you want to superimpose an object in one clip over the background of another clip, you can use a mask to remove the background of the first clip. You can use other still-image or motion graphics software to create a still-image or moving (traveling) matte and apply it to a clip in your Premiere project. In a mask, black areas are transparent, white areas are opaque, and gray areas are semitransparent—darker areas are more transparent than lighter areas. You can use shades of gray to create feathered (soft-edged) or graduated masks.

Alpha channel Color in an RGB video image is stored in three color *channels*—one red, one green, and one blue. An image can also contain a mask in a fourth channel called the *alpha channel*. By keeping an image together with its mask, you don't have to manage two separate files. (Saving a mask as a separate file can be useful in some cases, such as when creating a track matte effect. That's because the mask must be placed in a separate track in Premiere's Timeline. See "Applying the Track Matte transparency key type" on page 268.)



A 32-bit frame consisting of four 8-bit channels: red, green, blue, and an alpha channel mask.

Programs such as Adobe Photoshop and Adobe After Effects let you paint or draw a mask and use the alpha channel to keep the mask with the image or movie. Premiere uses the alpha channel for compositing.



The Photoshop image (left) contains an alpha channel mask (center) which Premiere uses to composite the subject against another background (right).

Keying Keying finds pixels in an image that match a specified color or brightness and makes those pixels transparent or semitransparent. For example, if you have a clip of a weatherman standing in front of a blue-screen background, you can *key out* that blue and replace it with a weather map.

Opacity You can control the degree of overall transparency for a clip. You can use opacity to fade a clip in or out.

You can combine the transparency options described here. For example, you can use a matte to remove the background from one clip and superimpose it over a second clip, and then use opacity to fade in the first clip's visible area.

Using audio in a video

In a video, audio can play an equally important role in telling your story. You can use Premiere to *mix* audio tracks. For example, you might combine each character's dialogue clips with ambient background sounds and a musical soundtrack. Mixing in Premiere can include any combination of the following tasks:

- Fading, or increasing or decreasing the level of an audio clip.
- Panning, or positioning audio anywhere to the left or right within a stereo field.
- Sweetening, or removing noise, enhancing frequency response and dynamic range, and adding sound effects.

When you import a video clip that contains audio, the audio track is *linked* to its video track by default so that they move together. When you edit superimposed video tracks, remember to consider the effects of your edits on the audio tracks.

Understanding digital audio

You hear sounds because your ear recognizes the variations in air pressure that create sound. *Analog audio* reproduces sound variations by creating or reading variations in an electrical signal. *Digital audio* reproduces sound by sampling the sound pressure or signal level at a specified rate and converting that to a number.

The quality of digital audio depends on the sample rate and bit depth. The *sample rate* is how often the audio level is digitized. A 44.1 kHz sample rate is audio-CD-quality, while CD-ROM or Internet audio often uses a sample rate of 22 kHz or below. The *bit depth* is the range of numbers used to describe an audio sample; 16 bits is audio-CD-quality. Lower bit depths and sample rates are not suitable for high-fidelity audio, but may be acceptable (though noisy) for dialogue. The file size of an audio clip increases or decreases as you increase or decrease the sample rate or bit depth.

Keeping audio in sync with video

Be mindful of audio sample rates in relation to the timebase and frame rate of your project. The most common mistake is to create a movie at 30 fps with audio at 44.1 kHz, and then play back the movie at 29.97 fps (for NTSC video). The result is a slight slowdown in the video, while the audio (depending on your hardware) may still be playing at the correct rate and therefore will seem to get ahead of the video. The difference between 30 and 29.97 results in a synchronization discrepancy that appears at a rate of 1 frame per 1000 frames, or 1 frame per 33.3 seconds (just under 2 frames per minute). If you notice audio and video drifting apart at about this rate, check for a project frame rate that doesn't match the timebase. Although the best solution for NTSC is to build all video and animation at 29.97 fps, you can also alter your audio sample rate from 44.1 kHz to 44.056 kHz (slowing audio playback by 0.1%), or build the audio source clip at 44.144 kHz at 30 fps (speeding up the original audio clip by 0.1%).

A similar problem can occur when editing motion-picture film after transferring it to video. Film audio is often recorded on a digital audio tape (DAT) recorder at 48 kHz synchronized with a film camera running at 24 fps. When the film is transferred to 30 fps video, the difference in the video frame rate will cause the audio to run ahead of the video unless you slow the DAT playback by 0.1% when transferring to the computer. Using your computer to convert the sample rate after the original recording doesn't help with this problem; the best solution is to record the original audio using a DAT deck that can record 0.1% fast (48.048 kHz) when synchronized with the film camera.

Older CD-ROM titles sometimes used an audio sample rate of 22.254 kHz; today, a rate of 22.250 kHz is more common. If you notice audio drifting at a rate accounted for by the difference between these two sample rates (1 frame every 3.3 seconds), you may be mixing new and old audio clips recorded at the two different sample rates.

Creating final video

Premiere provides a number of ways to create final video. If you want to create videotape or motion-picture film from a Premiere project, you must have either the proper hardware for video or film transfer or have access to a service provider that offers the equipment and services you require.

Exporting a video file You can export a file for viewing from a hard disk, removable cartridge, CD-ROM, or the World Wide Web. Through plug-in software modules, Premiere can also export formats provided by other software manufacturers. Some video-capture cards include plug-ins that export formats to Premiere. When exporting for hard disk or cartridge playback, you can use high quality settings. When exporting for low-bandwidth media such as CD-ROM or the World Wide Web, you'll lower the frame size and picture quality to achieve a low data rate.

Recording directly to videotape You can play a completed video program while a connected videotape deck records the video. Device control makes this easy. See "Using device control to capture or export video" on page 87. You'll specify the highest quality frame size and picture quality settings your system can handle.

Creating an edit decision list (EDL) You can have Premiere generate an EDL when you require a level of quality that your system cannot provide. An EDL creates a list of edits, synchronized to the original clips using timecode. This lets you re-create your edits precisely for the final cut using the high-quality original tapes in an online edit bay. Edit bays generally don't include the same feature set as Premiere, so some effects and transitions won't translate into the EDL.

 You'll learn to export in many of the lessons in this book. For more information on the other output paths, see "Producing Final Video" in online Help or Chapter 11 in the Adobe Premiere User Guide.

Review questions

1 What's the difference between the timebase and the project frame rate?

2 Why is non-drop-frame timecode important for NTSC video?

3 How is interlaced display different from progressive scan?

4 Why is data compression important?

5 What's the difference between applying a mask and adjusting opacity?

6 What is an EDL and why is it useful?

Answers

1 The timebase specifies the time divisions in a project. The project frame rate specifies the final number of frames per second that are generated from the project. Movies with different frame rates can be generated from the same timebase; for example, you can export movies at 30, 15, and 10 frames per second from a timebase of 30.

2 Counting NTSC frames using 30 fps timecode will cause an increasingly inaccurate program duration due to the difference between 30 fps and the NTSC frame rate of 29.97 fps. Drop-frame timecode ensures that the duration of NTSC video is measured accurately.

3 Progressive scan displays a frame's scan lines in one pass. Interlacing displays a frame's scan lines in two alternating passes.

4 Without data compression, digital video and audio often produce a data rate too high for many computer systems to handle smoothly.

5 A mask is a separate channel or file that marks transparent or semitransparent areas within a frame. In Premiere, opacity specifies the transparency of an entire frame.

6 An EDL is an edit decision list, or a list of edits marked by timecode. It's useful whenever you have to transfer your work to another editing system because it lets you re-create a program using the timecode on the original clips.