

Manual

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Settings:

In low light slow the shutter speed on tv mode and iris will adjust...only do this when the shot doesn't have much movement. If that still doesn't work raise the gain, but not too much.

Use neutral density filter in high light conditions.

In the Auto mode or any of the semi-automatic modes use the white balance. Push the protruding button and change it to the sun button in sunlight and bright light in tungsten light.

Zebra: shows where light burns out

Sensor: allows you to use the remote

Tally lamp: light which tells you when you're recording.

Audio mode: 16 bit gives 2 channels.

Audio 1 in: mic att regulates sound that's too loud or soft.

Record mode: long play lets you extend the tape but at poorer quality.

Movie mode: makes movement seem smoother.

Neutral density filter: reduces light (when it flickers, switch to other setting)

Spot light setting: when you shoot something on stage.

Record search: lets you see last few seconds.

Search: goes back to previous cut.

Iris is like your eye and gain is like changing sensitivity of your cones and rods.

Auto (A) - All settings are automatically set. Functions such as Focus, Exposure, and White Balance can be set manually.

Green light: everything is automatic

Hold button on top of camera holds all functions until you press it again.

Lamp sign for normal lamp light.

Sun sign for shooting outside

TV mode is good for high speed shoots- you change shutter speed and it changes iris.

AV mode: you change iris and it changes shutter speed.

A light button allows the camera to light up.

Exposure lock: locks iris in manual mode.

should you ever mount an XL1 / XL1S to a tripod head at the accessory mounting socket located along the underside of the slanted rear of the camcorder.

Frame Movie Mode lets you continuously record 30 frame images a second, while effectively eliminating motion flicker by capturing a full image with every scan.

When shooting low angles, use a bean bag for stability.

Audio monitoring:

For audio do the calibration first, but not every time. Connect the mic to the audio mixer and test it there first. Then do the calibration with the camera, link up the shure mixer to the camera and use the long 3 headed cable to connect it back to the sure mixer after setting the shure mixer at -4 and the camera at -12. When this is done, disconnect the thick cord and reconnect the green cord to the camera and monitor the sound on the shure mixer. This is the method of connecting the rifle mic.

For the radio mics make sure that the frequencies are the same for transmitter and receiver. The receiver has the little dial on the top. The receiver plugs into the shure mixer, and the transmitter clips in at the back. Check the batteries before leaving. The lapel should go as close to the mouth as possible. This has the same set-up for the stand-

upper mic (which gives clearest sound). When using this mic make sure that the people maintain the distance from their mouth when they speak.

There is an audio dial on the camera, make sure this is on max....it dictates how loudly the camera audio gets outputted.

With the sure mixer make sure in goes to in and out to out. When the two dials at the top left corner are up you are collecting 2 channels. Or you could send both to the left and both to the right. On the far right the master button controls their volume. The mono button should be checked if everything else is ok, sometimes it needs to be flicked.

Canon Audio

Pulse code modulation: audio is recorded in 0 and 1s. –digital signals.

The camcorder picks up sound and outputs analogue signal consisting of minute voltage changes. It's then passed through an analogue-to digital converter. The original sound is recorded by taking samples of voltage samples as numbers which in playback gets reconverted via a digital-to-analogue converter.

Quality of recording depends on how detailed the blueprint is, and how well the reconstructions is done at the playback end. The detail depends on number of samples per second and the number of binary digits per sample- which controls noise and distortion. Because digital systems use finite means to record infinite signal variations, some mismatch is inevitable and mismatch adds noise.

You can calculate a system's dynamic range= it's digits x6. I.e. the number of bits in a system limits the dynamic range.

Higher sample rates makes for increased treble response.

What is bit depth= how many bit the converter uses for each numerical measurement of the signal. Thus 16 bit cd sounds better than 8 bit, multimedia sound file.

To record three tracks, input three mics, make one primary, and pan it to one side via the shure mixer and pan the other two to the other side.

When recording sound echoey place, hold mic close to the person's mouth and have one mic recording wild sound outside.

Base cut- use in echoey space, cuts base rumble since echo comes from low frequency sound.

Lapel has limited range, rifle mic has huge range.



Depth of Field

The larger the iris the shallower the depth of field.

The more you zoom in the shallower the depth of field.

The closer you are away to an object the more you will be able to get shallow depth of field.

Turn focus ring clockwise when things are moving away from you, and anti-clockwise when they're coming closer

Camera shots.

For zooms, tilts and pans, start slow, accelerate and then slow down again before stopping.



Cables:

Kettle plug- looks the actual kettle plug.

BNC cable, often for video signals, it's analogue, it's a professional balanced cable.

RCA- non professional, has higher resistance. RCA carries either video or audio, not both.

Firewire, small (4) and big side (6)- digital. Also called protocol 1394.

You get firewire 400- what we use, but there's also 800 (as fast as USB 2)

9 pin remote cable carries control info.

Audio XLR, one we use for our audio.

Jack is kind of ending.

Quick Final Cut Pro tips

For titles go to text generators, go to text and send them there.

For drop shadowed ones go to outline.

To create key frames use the pen tool on right hand side.

Codecs

These are the standard bitstreams for various compressions.

Bitstream type	Data rate (Kilobits per second)	Time on one 700MB CD-ROM
Uncompressed high definition (1920 x 1080 29.97 fps)	745750	7.5 seconds
Uncompressed standard definition (720 x 486 29.97 fps)	167794	33 seconds
DV25 (miniDV, DVCAM, DVCPRO)	25000	3 min, 44 seconds
Typical DVD VideoCD	5000 1167	18 min, 40 seconds 80 minutes
Broadband web video	100-2000	3 hours, 8 minutes at 500 Kbps
Modem web video	18-48	48 hours, 37 minutes at 32 Kbps

converting from digital video (DV) to DVD typically entails a 5:1 compression, and converting an uncompressed source to a modem-compatible video requires about a 9000:1 compression.

DVD Formats

Modern DVD-R burners can put 4.7GB of data on a disc (called a DVD-5). Manufactured DVDs can use a dual-layer format that can hold 8.54GB (called DVD-9) of data.

Video CD Formats

VideoCD is an older disc-based format. It has much lower resolution and higher compression ratio than DVD, and so it provides lower quality. However, it uses standard CD-ROM discs, so VideoCD discs can play in a variety of devices, including most personal computers. A manufactured VideoCD can play in any DVD player.

Internet formats

Web video can use either real-time streaming mode or progressive-download mode. Real-time streaming files require specialized streaming server software and are limited in quality by the bandwidth available between the server and the end user. Progressive-download files load from standard web servers, and may take a long time to download, but may also provide higher and more reliable video and audio quality.

Understanding the fundamentals of compression

Compression technologies take advantage of the strengths and weaknesses of human senses by reducing data that isn't likely to be perceived. Fundamentally, compression works by summarizing a sequence of images and sounds as efficiently as possible. A matched pair of a compressor and a decompressor, better known as a codec, performs the compression. A compressor is part of the encoding process, reducing the amount of data required to store the video. A decompressor works on the receiving end, decoding the compressed data so that it can be presented to the viewer. It's important that the pair be matched because the decoder (decompressor) needs to understand the encoder's (compressor's) summary of the data.

Types of compression

Video codecs can use spatial compression, temporal compression, or a combination of both.

Spatial compression

also called intraframe compression, affects only a single frame at a time.

Spatial compression finds redundancy within a frame—either in areas of flat or similar colors, or areas of a frame that look like other areas of the frame—and saves space by encoding these similar areas by reference, rather than by a literal description of color attributes for each and every pixel. Many codecs are based on a technique called discrete cosine transformation (DCT). These codecs deal very well with smooth gradations in an image, but they may not be as successful at encoding random details or sharp edges at lower bit rates.

Temporal compression

Temporal compression, also called interframe compression, adds the ability to use other frames as a reference for the current frame. In video, each frame tends to be similar to the frame preceding it. Temporal compression encodes only the changes from one frame to another

Frame types and compression

A keyframe, or I-frame, is a complete image that is compressed using intraframe compression. An I-frame isn't based on any other frames in the file. A delta frame is compressed using interframe compression and contains only those portions of the adjacent frames that are different.

There are two main types of delta frames: P-frames and B-frames. The content of a P-frame (predictive frame) is based on the previous frame; the content of a B-frame (bi-directional frame) is based on the previous and subsequent frames. I-frames are important for accessing random points in the video because they're the only frames that can be decoded all by themselves. To access a delta frame, a player must not only decode that frame, but the I-frames to which it refers. As the frequency of the I-frames increases, the number of frames that needs to be decoded for a random access operation decreases.

Color modes

There are three basic types of color in today's codecs:

- **Monochrome** In a monochrome mode, only luminance (brightness) matters. This color type works great for black-and-white movies. Most video codecs don't have an explicit grayscale mode. Notable exceptions are Cinepak and JPEG (although, not all tools expose the color space control).
- **Red, Green, Blue (RGB)** Computer screens and televisions are natively RGB—the screen has red, green, and blue phosphors for CRTs and planes for LCDs. RGB isn't very efficient for video content, so RGB codecs aren't used for broadcast video delivery anymore. However, RGB is widely used for screen recordings and motion graphics.

Y'CbCr (also called YUV, although YUV properly only refers to how color is used in NTSC video) These codecs encode luminance and two color-difference channels (the same technique used in the Adobe Photoshop® LAB mode).

Color depths

Color depths define the precision of the colors and determine how many gradations of intensity there are. Color depth is measured in the number of bits per channel (bpc) and fall into the following categories:

Best=16 and 32 bpc Some high-end applications use 16-bpc or 32-bpc color to preserve more color detail. These modes are especially useful when you have a multi-step authoring process, need to apply visual effects to your images, or when you convert from and then back to Y'CbCr. After Effects 6 and later can process 16-bpc color. After Effects 7.0 introduces 32-bpc color capabilities. Video that is saved at 16 or 32 bpc is not currently delivered to end users.

Color sampling

Y'CbCr formats support color subsampling. Color sampling records fewer pixels of chroma (color) information than luma (intensity) information. The terminology for color sampling is confusing because it uses an X:Y:Z format. The first value is the number of luma samples that are described—this is almost always four. The second value is the number of chroma samples per luma sample on the first, third, fifth, and succeeding odd lines. So if this value is two, there are two chroma samples per four luma samples horizontally. The last value is the number of chroma samples per luma sample on the second, fourth, sixth, and succeeding even lines. If this number is zero, the chroma sample from the first line is used.

- **4:4:4** Chroma is sampled every pixel with no subsampling. Y'CbCr delivery codecs don't use this format because it uses a lot of bits and doesn't provide any additional apparent quality. In authoring applications, it is sometimes

internal. RGB is always 4:4:4. **Compression Primer** • **4:2:2** This format is used for high-end video authoring, in formats like DV50, Digital Betacam, D1, and Motion JPEG. A few delivery codecs like H.263 use it as well.

- **4:2:0** The vast majority of delivery codecs use this format. There is one chroma sample per 2 x 2 block of pixels. This chroma sample looks nearly as good as 4:4:4, but at half the bits per frame. It is also used for PAL DV (but not PAL DVCPRO).

- **4:1:1** NTSC DV and PAL DVCPRO use this format. It contains the same number of bits per frame as 4:2:0 but with one sample per 4 x 1 block of pixels. This format is better for interlaced content because each field gets its own sample; however, it can result in visible chroma artifacts in areas of high saturation, which can be a problem with bluescreen or motion graphics source.

Audio compression

Sampling rate

The most fundamental factor in audio is sampling rate, which is measured in Hertz (Hz), or cycles per second. Audio CDs use 44100 Hz, or 44.1 kilohertz (KHz), which provides excellent reproduction.

Sample	Used	Sufficient for
8 KHz	Phone system	Speech
11 KHz	Old multimedia standard	Better speech
22.050 KHz	Also old multimedia standard	Recognizable music
32 KHz	Common in broadband video	Minimum for decent music
44.1 KHz	Audio CD	Music
48 KHz	DVD, DAT	Music
96 KHz	High-end audio recording	Music mastering

Bit depth

Bit depth is the number of bits used for each sample in each channel—the higher the bit depth, the better the audio quality.

16 is currently the standard, but 24 is fast taking over.

Channels

Most audio from computers is either mono with a single channel or stereo with two channels. Low bit rates generally use mono because it requires fewer bits. The industry is evolving to use multichannel (5.1 and 7.1) audio support as well.

Compression efficiency

So, how does someone compare codecs? The fundamental measurement is compression efficiency, which is defined by how many bits are required to reach a particular quality level. When improving compression efficiency, you can choose to lower the data rate while keeping the quality the same, increase the quality while keeping the data rate the same, or pick a point in between.

Authoring video for future compression

Interlaced versus progressive scan For content shot with a video camera, one fundamental decision is whether to use interlaced or progressive scan video. Historically, video was always interlaced. In an interlaced frame, the odd and even lines, called fields, contain images that are captured half the frame duration apart. Each video frame is made up of two fields.

Things to consider about compression in production:

Camera motion The amount and type of camera motion has a huge effect on the compressibility of content. For compression, it's much easier to handle changes of view by editing rather than camera motion, especially at lower data rates. In post-production, the motion stabilization tools in After Effects can remove unwanted camera motion before compression to reduce the size of the output video file.

Shutter speed This speed controls how long the aperture is open in the camera, and hence, how long light hits the film or the CCD. Slower shutter speeds let through more light, and hence less grain, which helps compression. Slower shutter speeds also cause moving parts of the image to become blurry, which makes them easier to compress.

Backgrounds A difficult motion for codecs is foliage rustling in the breeze

Depth of field A useful and subtle technique for controlling the complexity of images is depth of field. By managing the depth of field, you can keep unimportant objects in the background or close foreground out of focus while clearly showing the actual subject of the shot.

Post-production

Post-production techniques can have as much effect on compressibility as production techniques. Because post-production techniques occur later in the process, it is often possible to adjust them based on the results of test compressions, making fine-tuning much easier.

- **Static versus moving images** As in production, superfluous moving images aren't appropriate for content that you plan to aggressively compress. They are not that important for DVD, but they are for web and CD-ROM.
- **Motion blur** In the same way that a real-world shutter speed introduces motion blur that helps compression, you can use the virtual shutter in rendering applications. For effects that support motion blur, render them with a shutter speed that matches that of the source.

Video Signal Formats:

Analog formats Analog video uses fluctuating voltage and frequency signals to transmit image data. It ranges greatly in quality but is inherently susceptible to visual interference from electronic noise, like power lines, and suffers attenuation.

Composite A composite video signal carries the luminance and the chrominance channels in a single signal. The biggest problem with composite video is that luma information can leak into chroma, and vice versa. This leakage can lead to noise, known as chroma crawl, which can be amplified by the video capture process and reduce the overall quality.

S-Video The introduction of the S-Video format was a major advance in quality for consumer and professional video editors. S-Video splits the luma and chroma channels into two separate wire pairs, which eliminates generally half of the composite noise artifacts. The two chroma channels are still combined and still interfere with each other, leaving some noise in the signal.

Component analog Component analog, also known as YUV (Y for luminance, U for one chroma channel, and V for the other chroma channel) was the professional and broadcast standard for many years and it is still widely used today. With component analog, the luminance signal and the two color signals are all transmitted over their own dedicated cables. Because all three components or channels of the video signal are transmitted independently, the quality of the signal is quite high. Noise is very low and the colors in the video are richer and more precise.

Unbalanced audio This type of audio connection consists of a single wire that carries the signal, surrounded by a grounded shield. It is used commonly in consumer audio products because the connection and circuitry are less complex. The downside is that unbalanced connections are more susceptible to interference, so they are not often used in professional applications.

Balanced audio This type of connection consists of two wires, which serve to balance the signal, and a shield. A balanced connection is far less susceptible to interference, so it is possible to maintain high quality with long cable runs. Balanced audio normally uses the XLR, or three-pin, locking connector, which provides a much tighter and robust connection than the connectors used for unbalanced audio. Once again, longer cable runs and a locking connector form the basic standard for a professional connection.

Digital formats

DV formats the original video signal on tape using digital data similar to that used by computers. All brightness and color data is stored in this very accurate computer-style method and as such suffers no problem of interference or noise between the channels of the video signal.

Choosing the right capture codec

When you capture content, you must choose an appropriate codec. The choice depends on the capture hardware you're using, the format from which you're capturing, and your storage requirements. There are three basic types of codecs to choose from: DV, Motion JPEG, and uncompressed.

Understanding preprocessing

Preprocessing is the middle step of video compression and involves transforming the decoded frame of the source video into the optimized frame given to the codec. The goal of preprocessing is to transform the video into the final format.

Why preprocessing matters

Preprocessing is one of the more subtle steps of compression, and it is often the most time consuming and difficult. It's also very important for quality, and getting it right can dramatically improve the quality of the final video. A well preprocessed video can look better than the same source file poorly preprocessed, but can be encoded at twice the data rate.

Preprocessing is critical for web video, but generally it is not needed when you convert to video formats like MPEG-2 for DVD or SVCD. Because those formats are played back as video, instead of on a computer screen, you can leave them as-is.

Also, you can create rendered graphics natively for computer playback without preprocessing.

Understanding telecine and inverse telecine

A special case of progressive scan is film source and film-like 24P production. Traditional motion picture film runs at exactly 24 frames per second (fps) progressive scan, which doesn't convert to the 59.94 fps of NTSC or the 50 fps of PAL.

Converting from film to PAL is easy. The video is sped up 4% to 25 fps and converted into progressive PAL.

Noise reduction

Noise reduction encompasses a variety of techniques to remove noise, especially grain, from an image, making it easier to compress. Very simple noise reduction algorithms are just blurs—they can hide grain, but can make the image quite soft as well. The commonly used Median filter is a good blur for noise reduction. More advanced algorithms try to blur only the parts of the image that have grain and may take advantage of differences among frames.

Luma range expansion

In the past, a major issue in video compression was making sure that black was pure black and white was pure white. Some tools, formats, and codecs considered black to be 0 and white to be 255, but others used the ITU standard of black as 16 and white as 235. Generally, modern tools automatically keep black and white consistent. But if blacks and whites appear either crushed or faded, there might be a luma range mismatch during the authoring process.

Black levels While you can get values down to black by either reducing brightness or increasing contrast, using both techniques gives you more precise control than doing only one or the other. Applying noise reduction before adjusting luma range can help you return some of the brighter black pixels closer to black, so you can use a less aggressive luma expansion.

Gamma correction

Gamma is a measurement of how the 0-255 luma range turns into brightness when it is displayed. With different gamma values, 0 and 255 appear the same way, but values in the middle of the range look different. Different platforms (such as Mac OS, SGI, and Windows) have different default gammas. The net effect is that some files appear to have brighter midtones on a Macintosh computer than on a computer running Windows. However, most modern video codecs can automatically convert to the proper gammas upon playback.

Encoding

If preprocessing is the art of compression, encoding is its science. Encoding means defining the correct parameters, such as data rate, frame size, and frame rate, to get optimum results for the project. Balancing these parameters can be difficult because there are many trade-offs. As always, it's most important to understand the goals that the compressed video is meant to achieve. This section starts with parameters that apply to all codecs and continues with parameters that are specific to video and audio.

Setting frame size

Frame size (also called resolution) is the height and width of the final video frame, measured in pixels. The data rate changes in proportion to the area of the frame (height times width). Thus, converting from 320 x 240 to 640 x 480 would require about four times the data rate, but converting to 192 x 144, you could reduce the data rate down to one-third. The effect isn't quite as strong as the math would suggest; because there are fewer pixels, pixel quality becomes more important.

Adjusting the frame rate

The output number of frames per second must be an integer divisor of the number of source frames per second. Therefore, the output can be one-half or one-third the source but not three-fifths. Good frame rates for each type of source appear in the table below.

Channels

For most codecs, the only choice for number of channels is between mono and stereo. Some codecs are mono only, some are stereo only, and some offer multichannel modes such as 5.1 or 7.1. Number of channels is less important to

perceived quality than sample rate or the presence of audible artifacts. 32-KHz mono sounds better to most than 22.050-KHz stereo. Generally, you should use stereo only if you can use at least at 32 KHz—ideally, at least 44.1 KHz. Multichannel (5.1 and 7.1) audio codecs also exist. The most common of these codecs are Dolby Digital (AC-3) for DVD and WMA9 Professional. Multichannel is supported in RealAudio 10.

Choosing a compression format

Depending on the project, picking the correct format can be an easy or a difficult decision. Sometimes the customer mandates the format; other times the person performing the compression has to make a recommendation. Sometimes the project requires features that are only available in a particular format.

Using Windows Media for streaming delivery

Windows Media originally focused on real-time streaming, and even though it has become a more diverse technology over time, real-time streaming is still a core focus. Windows Media 9 has an excellent streaming architecture, excelling with MBR technology, servers, and codecs.

Windows Media players

There is a wide variety of different Windows Media players available for different platforms, making compatibility a moving target. Recent versions of the player aren't always available for some common operating systems, a condition that requires you to provide multiple versions of the content or exclude some platforms.

There are various formats that have been gone through during history but are not worth mentioning here.

Exporting to QuickTime format

QuickTime is the oldest of the mainstream digital media formats; it was introduced in 1991. It predates the modern, widespread popularity of the Internet and even the CD-ROM drive as standard computer equipment, and has matured to support a wide variety of applications (although it is less advanced than RealMedia and Windows Media for real-time streaming). The greatest strength of QuickTime is that it supports rich interactivity and rich media. By default, QuickTime data rate is set as total kilobytes per second, not the total kilobits per second of RealMedia or the kilobits per stream per second of Windows Media. However, many tools that support multiple formats provide the rate in Kbits. For consistency, data rates are listed in Kbits below.

QuickTime video codecs

Given the long heritage of QuickTime for flexibility and support for third-party codec vendors, the range of codecs supported in QuickTime is broader than in the other formats. There are also too many to mention here.

QuickTime audio codecs

QuickTime audio codecs don't have a specific data rate control in their main user interface. Instead, you set the data rate, if controllable, in the Options dialog box.

Exporting to MPEG-1 format

MPEG-1 was the first open multimedia standard. The original vision for MPEG-1 for computers was that users would buy add-on MPEG-1 decoder boards for their computers for playback. However, this vision didn't become popular, so MPEG-1 playback didn't happen widely until computers became fast enough to perform all of the decoding in software.

MPEG-1 video and audio codec

MPEG-1 only supports one video codec, also called MPEG-1. This codec also includes three audio modes: Layer I, Layer II, and Layer III.

Exporting to MPEG-4 format

MPEG-4 is the follow-up ISO standard to MPEG-1 and MPEG-2. Unlike those formats, which were created before the popularity of the Internet and were strictly focused on audio and video playback, MPEG-4 is a much broader and extensible format. The format is only now becoming well known.

Exporting to AVI format

The Microsoft Audio Video Interleave format was a very early format for CD-ROM, and it is still widely used in a variety of applications.

Using AVI for web delivery

AVI is not a good web format because it doesn't support real-time streaming. Also, the set of codecs that are available by default on all computers is relatively limited. AVI files on the web are almost always distributed as complete files.

Using AVI for disc-based delivery

AVI is still a popular format for disc-based playback. It's well supported in applications, such as Adobe® Director, and because codecs can be delivered with a disc, installations are much less of a worry.