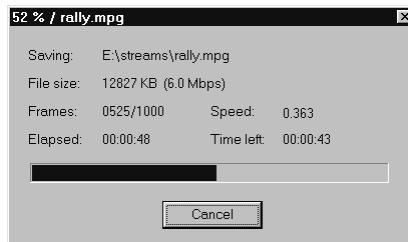


Cinema Craft Encoder SP
Plug-in for
Adobe Premiere
User's Guide
Version 2.50



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MPEGLA Statement:

Use of this product for encoding video information for the purpose of producing prerecorded video programs products for commercial sale or rental including by way of examples and without limitation, digital video disk and digital video tapes, or for the purpose of storing encoded video programs for distribution by a video server is expressly prohibited without a license under applicable patents marked on this product, or on the container, user documentation or specification sheet for this product.

Notice:

Cinema Craft Encoder SP can output MPEG-1 streams. However, Custom Technology Corporation has not tested the MPEG-1 streams on any VideoCD players. Therefore Custom Technology Corporation does not guarantee that MPEG-1 streams encoded by Cinema Craft Encoder SP are VideoCD compliant.

Introduction

Cinema Craft Encoder SP for Adobe Premiere 5.1 is a plug-in that add function of exporting MPEG-2/1 streams to Adobe Premiere 5.1. This manual explains the functions and manner of use of Cinema Craft Encoder SP for Adobe Premiere 5.1.

For details on how to use Adobe Premier 5.1, refer to the Adobe Premier User Guide, and for details on the operation method of Windows NT and on the standards of MPEG, refer to the respective manuals and guides.

Operation environment

To use Cinema Craft Encoder SP for Adobe Premiere, the following hardware and software are required.

- A computer with a mounted Intel Pentium III processor or AMD Athlon processor
- 256MB RAM
- Microsoft Windows 2000, Windows NT 4.0 SP4 (or later), or Windows 98
- Adobe Premiere 5.1
- Decoder to playback MPEG-2 streams created by Cinema Craft Encoder SP (hardware or software)

Specifications

Compression method

System	ISO/IEC 13818-1 ITU-T Rec. H.222.0 (Program Stream only) ISO/IEC 11172-1
Video	ISO/IEC 13818-2 ITU-T Rec. H.262 (MP@ML) ISO/IEC 11172-2
Audio	ISO/IEC 11172-3 (Layer 2)

Output video format

Encoding method	Constant Bitrate (CBR), Variable Bitrate (VBR) (One pass) or Variable Bitrate (VBR) (Multipass)
Bitrate	maximum 15 Mbits/sec
Frame rate	23.98/24/25/29.97/30 (frames/sec)
Aspect ratio	SAR 1:1, DAR 4:3, DAR 16:9, or DAR2.21:1
GOP configuration	I, P frame interval (M) : 1 ~ 3 I frame interval (N) : max. 15 (a multiple of M)

Output audio format

Bitrate ¹	64/96/112/128/160/192/224/ 256/320/384 (kbits/sec)
Sampling frequency	32/44.1/48 (kHz)
Quantization bits	16 bits
Mode	Stereo, Joint Stereo, Dual channel, Monaural

¹This is the case of two channels. In the case of one channel, the bitrate is half this bitrate.

Chapter 1

Overview of Cinema Craft Encoder

1.1 Overview

Cinema Craft Encoder is a high picture quality software MPEG-2 encoder developed by Custom Technology Corporation.

Fully utilizing Streaming SIMD Extensions instruction set supported by the Intel Pentium III processor, Cinema Craft Encoder achieves extraordinarily fast compression speeds by sophisticated algorithms and highly optimized codes while maintaining high picture quality equivalent to high end encoders.

Cinema Craft Encoder has the following product line.

- Cinema Craft Encoder Lite

This is an offline encoder which converts such moving picture files as AVI and QuickTime to MPEG-2 streams. Although this program is very inexpensive, the picture quality and execution speeds are equivalent to high end products. This is a plug-in version which was designed to be called up from video editing software (Adobe Premiere) and standalone versions.

- Cinema Craft Encoder SP

In addition to the Lite functions, variable bitrate mode, arbitrary insertion of an I frame and other functions are available. This is a high end product of offline encoders.

- Cinema Craft Encoder Pro

This product is housed in a dedicated body along with a frame capture card and decoder card. Images are loaded from a video deck and encoded in real-time.

Features of Cinema Craft Encoder

- Completely software-based MPEG-2 MP@ML encoding processing.

Cinema Craft Encoder implements MPEG-2 MP@ML encoding processing completely by software. Real-time encoding is implemented without hardware support.

- Highly optimized program implements high-speed processing.

High-speed processing is implemented by utilizing the advanced functions (MMX, SIMD Integer Extensions) of the Intel Pentium III processor or the AMD Athlon processor.

- High quality encoding is implemented by motion detection based on original algorithms

Cinema Craft Encoder operates with original motion detection algorithms. Cinema Craft Encoder scans several images simultaneously two or more times, and operates while correcting error motion vectors. Cinema Craft Encoder minimizes the generation of particularly long error motion vectors which may have a considerable negative influence on encoding quality. When the motion of frames, which are separated by two or more frames, is detected with a general encoder, a telescopic search (a method of estimating the motion in the future from the motion in the past, so that motion only around the estimated part is searched) is normally used, but a simple telescopic search may cause an estimation error when radical luminance change occurs, or when

images exhibit complicated motion. As a result, encoding quality problems may occur. In the case of the motion detection algorithm of Cinema Craft Encoder, the motion of all adjacent frames is checked, then motion over two or more frames is detected, which makes fine motion detection possible.

- Automatic scene change detection

The video encoder reads images first before executing encoding processing, then motion detection as well as scene change detection are executed. When a scene change is detected, the first video frame at this point is automatically set to an I frame, and the GOP, starting with this frame, is automatically set to Closed GOP (a frame in a GOP does not refer to a frame of other GOPs). This makes it possible to implement high quality encoding, outputting streams which can easily be handled in an MPEG stream edit program.

- Pre-encoding

Generally the accuracy of the degree to which images should be distorted to obtain the target bitrate is unknown. Therefore, in general encoding, the relationship between distortion and bitrate is estimated based on the result of the encoding just executed, and the deviation of this estimate is corrected by feedback so that the bitrate becomes close to the target. This control, however, may not work for the change of scenes having different characteristics, and in such a case, streams having quality problems may be output. Cinema Craft Encoder first executes pre-encoding for the beginning of the scene detected by automatic scene change detection, then executes actual encoding. Since an accurate relationship between distortion and bitrate is obtained by pre-encoding, a stable output of high quality streams is implemented.

- Three operation modes

Cinema Craft Encoder has the following three operation modes.

- ① CBR (Constant Bitrate)

Outputs constant bitrate streams by one pass. The average bitrate is specified in this mode.

② One pass VBR (Variable Bitrate)

Outputs variable bitrate streams by one pass. In this mode, minimum and maximum bitrates and the degree of distortion are specified. The average bitrate cannot be specified in this mode.

③ Multipass VBR

Executes encoding processing by multiple passes, specifying minimum, maximum and average bitrates. At least two passes are necessary. For the first pass, CBR or One-pass VBR is executed to check the complexity of the images. In this pass, a file, where the complexity of images are described for each frame, is created. For the second or later passes, bit allocation is planned for each frame based on this information on complexity and actual encoding is executed accordingly. Cinema Craft Encoder supports three or more passes, while a general encoder supports only two passes. Image quality improves as the number of passes increase.

Chapter 2

Output of video file

For how to output a video file, refer to **Exporting video files** in **Chapter 11 Producing Final Video** of Adobe Premiere 5.0 User Guide.

2.1 Output of MPEG-2/1 file

An MPEG-2/1 file is output using Cinema Craft Encoder SP according to the following procedure.

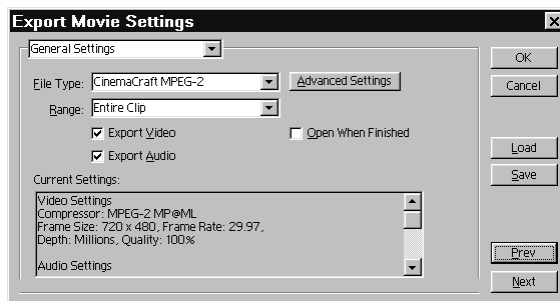


Figure 2.1: Export Movie Settings (General Settings)

1. Select “**F**ile/**E**xport/**M**ovie...” and click on Settings... button.
2. Select “Cinema Craft MPEG-2” from the **F**ile **T**ype drop down list of the general setting in the **Export Movie Settings** dialog.
3. Select the **Export V**ideo check box. Also select **Export A**udio to export audio as well. Do not select **O**pen **W**hen **F**inished.
4. Set **F**rame **S**ize and **F**rame **R**ate in the **Video Settings** screen in the **Export Movie Settings** dialog.
5. When **Export A**udio is also selected, set **R**ate and **F**ormat in the **Audio Settings** screen.
6. Press the **OK** button to return to the **Export Movie** dialog, input the file name and click on the Save button, encoding then starts.

Chapter 3

Advanced settings

With Cinema Craft Encoder, an advanced settings unique to MPEG, other than the settings described in Chapter 2, can be executed.

To execute a advanced setting

1. Select “File/Export/Movie” and click on Settings... button.
2. Press the Advanced Settings button in the **General Settings** screen in the **Export Movie Settings** dialog.
3. A property setting screen unique to Cinema Craft Encoder is displayed. Execute the advanced settings on this screen. Advanced settings are described next.

3.1 Video settings

- Encoding format

Select MPEG-2 or MPEG-1 for output video stream format.

- Add sequence end code

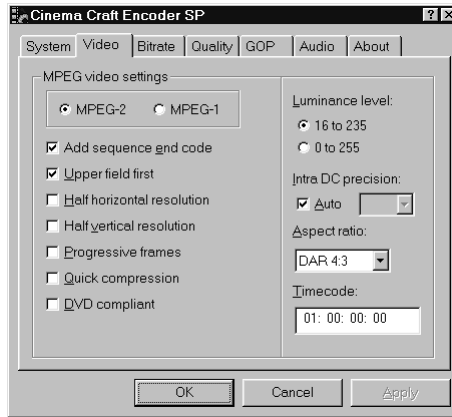


Figure 3.1: Video settings

A sequence end code is normally added at the end of an MPEG stream. If this check box is not selected, however, the sequence end code is not added. Add the sequence end code, unless multiple streams are combined later using the MPEG-2 stream edit tool.

- Upper field first

Select this check box to display upper field first. If the motion of encoded bitstream is funny, maybe this setting is not correct.

- Half horizontal resolution

If this is selected, the horizontal resolution of encoding becomes half. Since horizontal resolution must be a multiple of 16, half the original size 720, for example, is not 360 but 352.

- Half vertical resolution

If this is selected, the vertical resolution of encoding becomes half. By selecting this option together with **Half horizontal resolution**, frame size 720×480 will become 352×240 .

- Progressive frame

Select this check box if the source video is progressive-scan. Since this setting affects the motion estimation process, it also affects the quality of encoded bitstream.

- Quick compression

If quick compression is selected, encoding becomes approximately 10% faster than normal mode. Picture quality is slightly lower than normal mode¹.

- DVD compliant

If this is selected, lower resolution files (e.g., 640×480) are matted to DVD compliant resolution. The resolution will be 720×480 if the frame rate is either 29.97fps or 30 fps, and 720×576 if the frame rate is 25fps.

- Luminance level

Specify the range of luminance level. According to ITU-R BT.601-5, the range shall be 16 to 235. But if you have problem using this formula, try to set the range from 0 to 255.

The RGB to YCbCr conversion formulae are as follows:

when “16 to 235” is selected

$$R_D = 219R + 16 \times 256$$

$$G_D = 219G + 16 \times 256$$

$$B_D = 219B + 16 \times 256$$

$$Y = \frac{77R_D + 150G_D + 29B_D}{2^{16}}$$

$$C_R = \frac{131R_D - 110G_D - 21B_D}{2^{16}} + 128$$

$$C_B = \frac{-44R_D - 87G_D + 131B_D}{2^{16}} + 128$$

¹This is because the judgment accuracy on whether field ME (Motion Estimation) or frame ME is used drops slightly.

when “0 to 255” is selected

$$Y = \frac{77R + 150G + 29B}{2^8}$$

$$C_R = \frac{131R - 110G - 21B}{2^8} + 128$$

$$C_B = \frac{-44R - 87G + 131B}{2^8} + 128$$

For each case, figures after the decimal fractions will be omitted.

- Intra-DC precision

Specifies the precision of DC coefficients in blocks in intra macroblocks. It can be either 8-bit, 9-bit, or 10-bit. If there is a part where luminance is gradually changing, high precision will be better. But if the bitrate is low, it may be a better to decrease this precision and allocate the bits to other parts.

When **Auto** is selected, the precision varies according to quantization scale.

- Aspect ratio

Specifies the ratio of the width of a picture to its height. Aspect ratio can be either SAR 1:1, DAR 4:3, or DAR 16:9, where SAR stands for “Sample Aspect Ratio”, and DAR stands for “Display Aspect Ratio”.

- Timecode

A timecode is normally not included in an AVI file and QuickTime file. Without a timecode in an MPEG-2 stream, however, some decoders may not be able to decode accurately. Therefore Cinema Craft Encoder SP generates a timecode internally and embeds it in the MPEG-2 stream. At that time, a timecode set in **Timecode** in the video setting screen is used for the first frame to be encoded.



Figure 3.2: Bitrate settings

3.2 Bitrate setting

In this page, you can specify video bitrate and image quality priority parameter.

3.2.1 Bitrate setting

Bitrate is the data volume per unit time, and is normally expressed by the number of bits per second. As this value increases, the data volume increases, and picture quality improves.

Before setting bitrates, select the encoding mode, CBR (constant bitrate), 1-pass VBR (1-pass variable bitrate), or VBR (multipass variable bitrate). If you want the amount of bits in each GOP to be the same, select CBR, and if you want the quality of each frame to be the same, select VBR. Note, however, that if you select VBR or 1-pass VBR, audio multiplexing will not be performed.

To encode with the CBR mode

- ① Select **CBR** in **Video encoding mode**.

- ② Specify the bitrate in **Bitrate**. Specify the bitrate in kilobits/sec. units. The range of the bitrate which can be specified is 0.5 ~ 15 Mbps (0.5 ~ 9.8 Mbps when DVD compliant is selected).

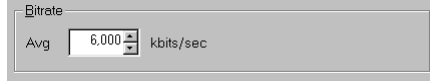


Figure 3.3: CBR bitrate setting

To encode with One-pass VBR

- ① Select One-pass VBR in **Video encoding mode**.

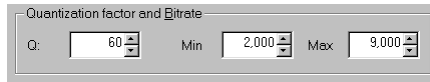


Figure 3.4: One-pass VBR bitrate setting

- ② Specify the output picture by the Q. value in **Q.factor and Bitrate**. Q. is a concept unique to Cinema Craft Encoder. The range of the specification is 1 ~ 300. As the Q. value becomes smaller, image quality improves, and as the value becomes larger, higher compression is used. For the setting, refer to the following.

Q.factor	Description
1 ~ 40	Priority is given to image quality over compression rate
40 ~ 80	Standard setting
80 ~ 120	Priority is given to compression rate over image quality
120 ~	Image quality deteriorates considerably

- ③ Specify the minimum bitrate in **Quantization factor and Bitrate**. Specify the bitrate in kilobits/sec. units. The range of the bitrate specification is 0 ~ 15 Mbps (0 ~ 9.8 Mbps when DVD compliant is selected).

The encoder executes encoding while adjusting image quality such that the bitrate does not become lower than the value specified here. If the specified value is 0, this means that the minimum bitrate is not specified.

- ④ Specify the maximum bitrate in **Quantization factor and Bitrate**. Specify the bitrate in kilobits/sec. units. The range of the bitrate specification is 0.5 ~ 15 Mbps (0.5 ~ 9.8 Mbps when DVD compliant is selected).

To encode with Multipass VBR mode

- ① Create the video information file in advance before encoding. This file can be created by executing encoding by either the CBR or the One-pass VBR mode.

The video information file is specified at **Information file** field in Fig. 3.2. The initial value is `%drive%dir%fname.vaf`, which means that output drive, directory, and base filename of the video information file is the same as that of output file. For example, if the name of output MPEG file is `E:\streams\ospace.mpg`, `%drive`, `%dir`, and `%fname` will be substituted as `E:`, `\streams\`, and `ospace`, respectively, thus the name of the video information file will be `E:\streams\ospace.vaf`.

What is a video information file ? Generally at least two passes are required to create a variable bitrate stream for specifying an average bitrate. This is because the complexity of images is checked and saved in a file by the first pass, and the allocation of the bit amount for each frame is calculated according to the stored information on the complexity of the images, and encoding is executed in the next pass. Unlike a general encoder, Cinema Craft Encoder does not distinguish between a pass for

encoding and a pass for analyzing complexity, but always analyzes the complexity of images during encoding. Therefore, a video information file does not always have to be recreated to change the setting of an average, minimum and maximum bitrate.

A video information file has a history of information for a plurality of times of encoding, and information is accumulated each time encoding is executed. This information improves the image quality for encoding by the Multipass VBR system.

Creating and recreating video information file A video information file is created by encoding by the CBR or the One-pass VBR mode. Setting at this time should be close to the setting for the Multipass VBR mode. If CBR is selected to create a video information file, set the bitrate for CBR to the same value as the average bitrate to be specified for executing Multipass VBR.

A video information file has information for each image frame. Therefore, values when a video information file is created are used for parameters which have a major influence on the encoding of image frames. These parameters are as follows.

- ✓ Setting chapter point
- ✓ Setting GOP configuration (N, M, GOP header interval, sequence header interval)
- ✓ Progressive frame flag
- ✓ Aspect ratio

To change the above parameters, the video information file must be recreated. To change other parameters, the video information file does not have to be recreated. If the setting of the bitrate is a major change, however, it is better to recreate the video information file because a better encoding result can be obtained with less number of passes. When a bitrate is set to

twice or more or half or less than the average bitrate, recreating the video information file is recommended.

- ② Select Multipass VBR in **Video encoding mode**.
- ③ Specify the number of times of executing encoding in **Passes**. The range of values which can be specified here is 1 ~ 9.

Image quality slightly improves each time encoding is repeated, but quality improvement reaches its limit at 3 ~ 4 times of encoding.
- ④ Specify the average bitrate in **Bitrate (kilobits/sec.)**. Specify the bitrate in kilobits/sec. units. The range of specification is 0.5 ~ 15 Mbps (0.5 ~ 9.8 Mbps when DVD compliant is selected).
- ⑤ Specify the minimum bitrate in **Bitrate (kilobits/sec.)**. Specify the bitrate in kilobits/sec. units. The range of specification is 0 ~ 15 Mbps (0 ~ 9.8 Mbps when DVD compliant is selected).

The encoder executes encoding while adjusting image quality so that bitrate does not become lower than the bitrate specified here. If 0 is specified, this means that no value is specified for the minimum bitrate.
- ⑥ Specify the maximum bitrate in **Bitrate (kilobits/sec.)**. Specify the bitrate in kilobits/sec. units. The range of specification is 0.5 ~ 15 Mbps (0.5 ~ 9.8 Mbps when DVD compliant is selected).



Bitrate (kbits/sec)					
Avg	6,000	Min	2,000	Max	9,000

Figure 3.5: Multipass VBR bitrate setting

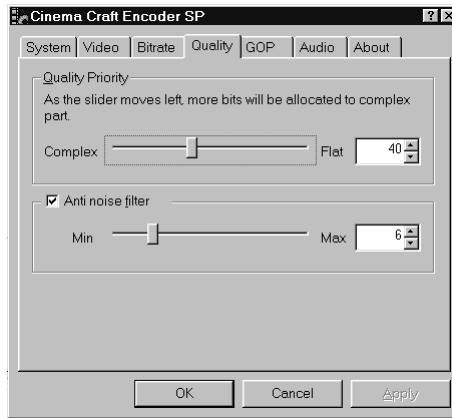


Figure 3.6: Image quality settings screen

3.2.2 Image quality priority

By changing this value from 0 to 100, you can change the bit allocation in a frame. The initial value is 40.

As this value becomes small, more bits will be allocated to complex parts. As a result, mosquito noise will be reduced. Conversely, if this value becomes large, more bits will be allocated to flat part. Then contouring noise on a flat part will be reduced.

3.2.3 Anti noise filter

This filter can be used to reduce noises in the original motion pictures. The value you can specify is from 0 to 32. The bigger the value, the stronger the filtering will be. If it's too strong, frames will be like progressive frame, so the movement of a encoded video will be jerky.

3.2.4 Packet size setting

The default value of packet size of program streams is 4096 bytes. However, you can change this value from the System page.



Figure 3.7: Packet size setting screen

3.3 GOP configuration

In MPEG, a group of pictures is handled as a GOP (Group of Pictures). The structure of a GOP can be changed.

Picture type In MPEG-2, three types of picture types are defined, that is, an I picture, P picture and B picture.

- I picture (intra-coded picture)
An I picture holds all the picture information on one picture within itself. It is not necessary to refer to another picture to decode an I picture, but compression efficiency is not as good as other types of pictures. Therefore when the bitrate is the same, the picture quality of a stream of I pictures is lower than that of other types of pictures. To edit encoded streams, however, it is more convenient to use many I pictures.
- P picture (predictive-coded picture)
A P picture consists of motion vectors when a previous (in the

past) I pictures or P pictures are used for reference and differential information between the picture comprised of these motion vectors and an original picture. To decode a P picture, pictures used for reference are required, but compression can be more efficient than I pictures. In the case of a sequence where P pictures continue, however, picture quality may deteriorate as the P picture deviates from the reference I picture, since errors accumulate during decoding due to the difference in the IDCT² calculation method between encoder and decoder.

- B picture (bidirectionally predictive-coded picture)

A B picture consists of motion vectors when previous (just before) I pictures or P pictures and/or future (just after) I pictures or P pictures are used as reference and differential information between a picture comprised of motion vectors and an original picture. To decode B pictures, two pictures used for reference are required, but compression efficiency is even better than P pictures. Since a B picture itself is not used for reference, errors do not accumulate even if B pictures continue, unlike the case of P pictures. However, if B pictures continue, the distance from a reference picture increases, and as a result, the motion compensation effect may decrease.

The configuration of a GOP may be changed by changing the value of M and N/M . By changing M , the number of B pictures can be changed, and by changing N/M , the number of P pictures can be changed. The standard setting is $M = 3$, and $N/M = 5$.

GOP header Specifies the number of frames to which a GOP header is added. This value can be regarded as GOP length. The range of this value is 1 to 15.

Note that the GOP length must be a multiple of N . So if N is greater than 7, GOP length must be N because GOP length should not exceed 15. For example, if $M = 3$, $N/M = 5$, then $N = 15$ and the GOP length cannot be other than 15.

²Inverse Discrete Cosine Transform.

SEQ header Specifies the number of GOPs to which a sequence header is inserted. Standard setting is 1.



Figure 3.8: GOP settings

Restrict auto I frame insertion Cinema Craft Encoder automatically detect scene change points and encodes the first frame of new scene as I frame. This function is important for improving image quality. However, if you are to create streams for multi angle, auto I frame insertion may produce a problem since every I frame should be the same position for each angle. In this case, select **Restrict auto I frame insertion** not to auto-insert I frames.

Close all GOPs When strong random accessibility for a stream is demanded³, set this option, then all GOPs can be set to Closed GOP (individual frames in a GOP do not refer to frames outside the GOP). Since image quality slightly drops, use this function only when absolutely necessary.

³An example is when a multi-angle is used for DVD creation, where frequent channel hopping is executed.

3.4 Audio settings

The bitrate and stereo mode can be specified in the Audio settings screen.



Figure 3.9: Audio settings

In the case of stereo, the appropriate bitrate is normally 256kbits/sec (in the case of monaural, the bitrate is half this).

There are three types of stereo mode: joint stereo, stereo and dual. In joint stereo mode, the common portions of left and right sound are collectively encoded, therefore the compression efficiency is better than stereo. Dual is specified for dual language audio.

And you can also specify whether CRC should be included in the output stream or not.

Chapter 4

Uninstallation

Uninstallation of Cinema Craft Encoder SP is executed as follows. Be sure to connect HASP key¹ before uninstallation.

1. Open the Control panel.
2. Start up **Add/Remove Programs** applet.
3. Select “Cinema Craft Encoder SP Plug-in Version 2.50” from the list box in the **Install/Uninstall** page, and click on the

Add/Remove...

 button.
4. The software is deleted after the system is restarted.

¹Trial version does not need HASP.