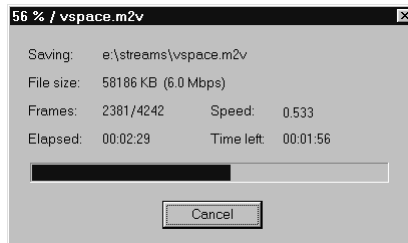


Cinema Craft Encoder SP

User's Guide

Version 2.50



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Cinema Craft Encoder SP User's Guide
Version 2.50
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The specifications on this software and information contained in this manual may be changed without prior notice.

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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 is a program for converting an AVI file and QuickTime file to an MPEG-2 file at high-speed with high picture quality. This manual explains the functions and manner of use of Cinema Craft Encoder SP.

For details on the basic operation and the terminology of the operating system and on the detailed technology of MPEG-2, refer to the respective manuals and guides.

Operation environment

The following hardware and software are required to use Cinema Craft Encoder SP.

- A computer with a mounted Intel Pentium III processor or AMD Athlon processor
- 128MB of RAM (256MB is recommended)
- Microsoft Windows 2000, Windows NT 4.0 SP4 (or later), or Windows 98
- QuickTime 4 for encoding QuickTime files
- 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	23.98/24/25/29.97/30/50/59.94/60 (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 and 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 instructions 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 functions of Lite, variable bitrate, arbitrary insertion of I frames and other functions are supported. This is the highest end product among 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

Executing Cinema Craft Encoder SP

2.1 Starting up and exiting Cinema Craft Encoder

To startup Cinema Craft Encoder SP, select

```
Program | Cinema Craft Encoder SP | Cinema Craft Encoder SP
```

from the Start menu. Normally the screen shown in Fig. 2.1 (main window) is displayed when the program starts up.

To exit the program, select **E**xit from the **F**ile of the menu of this window or click on the button at the upper right.

2.2 Basic operation procedure

This section describes the basic encoding operations of Cinema Craft Encoder SP.

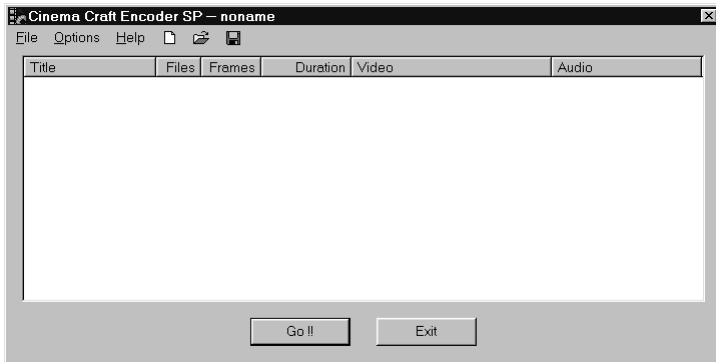


Figure 2.1: Cinema Craft Encoder SP Startup Screen

2.2.1 Basic encoding procedure

Encoding is basically executed by the following procedure.

- ① Startup Cinema Craft Encoder SP.
- ② Select the AVI file or QuickTime file to be converted from Windows Explorer, and drag and drop the file onto the window of Cinema Craft Encoder SP.
- ③ The **Encoding setting** dialog box shown in Fig. 2.2 opens. Specify the output destination, encoding mode and bitrate in this dialog box. (For details on the setting method, see “Chapter 3 Setting encoder” on page 15.)
- ④ Press the **OK** button to close this dialog box.
- ⑤ Press the **Encode** button to start encoding.
- ⑥ When encoding starts, the screen shown in Fig. 2.3 is displayed.
- ⑦ When encoding ends, the window shown in Fig. 2.3 closes.

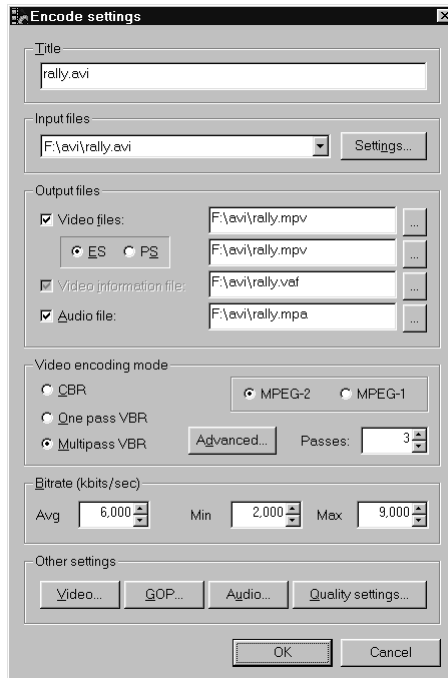


Figure 2.2: Encoding setting screen

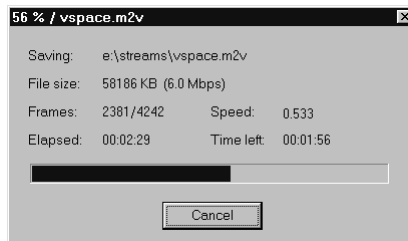



Figure 2.3: Screen during encoding

2.2.2 Encoder control list


Cinema Craft Encoder SP executes encoding according to the encoder control list. By creating this encoder control list, various parameters can be saved and batch processing encoding can be executed¹.

2.2.3 Creating encoder control list

Selecting a file to be encoded Startup Windows Explorer, and select an AVI file or a QuickTime file to be converted to MPEG-2. Then drag and drop the selected file onto the main window of Cinema Craft Encoder SP. Two or more files can be dragged and dropped together.

Setting encoding parameters To change parameters used for encoding, select the item you want to change on the list and press **Enter** or double click on it. Then a dialog box shown in Fig. 2.2 will appear. Specify a title, output file, encoding mode and bitrates, etc. here. After setting is over, press the  button to return to the original screen.

Saving encoder control list To save a created encoder control list, press **Ctrl+S**. If a file name has not been assigned, a dialog box prompting file name input is displayed. Specify the save destination file name here.


☞ The list can also be saved by pressing the  button on the main window.

2.2.4 Editing encoder control list

A saved encoder control list can be read and edited.

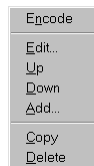
¹Cinema Craft Encoder Pro also uses an encoder control list, but an encoder control list is program specific, and cannot be shared by other encoder applications.

Reading encoder control list Startup Windows Explorer and drag and drop the encoder control list onto the main window, just like the case of reading an AVI file or QuickTime file.

☞ The list can also be read by pressing the  button.

Moving, editing, deleting, and adding item

Click the right button of the mouse on the item of the encoder control list, then the popup menu shown at the right is displayed. Select an item here to execute the following.



- Encode Encodes the item(s) selected in the encoder control list.
- Edit... Edits the item selected in the encoder control list.
- Up Moves the item selected in the encoder control list up one position.
- Down Moves the item selected in the encoder control list down one position.
- Add... Adds a new item to the end of the encoder control list.

☞ An item can also be added by dragging and dropping a moving picture file or an encoder control list file onto a window.

- Copy Copies the item selected in the encoder control list.
- Ddelete Deletes the item(s) selected in the encoder control list.

When two or more items are selected in the encoder control list, only **E**ncode, **A**dd and **D**delete can be executed.

2.2.5 Executing encoding control list

To execute encoding according to the encoder control list, press the Encode button on the main windows.

2.2.6 Precautions when encoding

File for input

Cinema Craft Encoder SP reads an AVI file or QuickTime file and converts it to an MPEG-2 file, but cannot convert the following files.

- Video included in an AVI file or QuickTime file is outside the standard specified for Cinema Craft Encoder SP.
 - ✓ Frame size is bigger than 720×576
 - ✓ Frame rate is not 23.98/24/25/29.97/30/50/59.94/60
- The Codec² used for the AVI file is not registered in Windows.

A video stream in an AVI file is generally compressed by a video Codec. If the Codec used for compression has not been installed in the machine used for executing Cinema Craft Encoder SP, this file cannot be decoded, and Cinema Craft Encoder SP cannot access this file. The video Codec installed under Windows can be checked by the following procedure.

- ① Open the control panel.
 - ② Click on the **Multimedia** applet to display the **Multimedia property** dialog box.
 - ③ Click on the **Device** tab, and double click on the video compression CODEC.
 - ④ The Codec list shown in Fig. 2.4 is displayed. (The type of Codec to be displayed differs depending on the machine. To install a new Codec, follow the installation guide of the respective Codec.)
- One of the following values is set in biCompression of the BITMAP-INFOHEADER of the AVI video.
 - ✓ BI_RLE4

²Codec is an abbreviation for Coder - Decoder.

- ✓ BI_BITFIELDS
 - ✓ BI_JPEG
 - ✓ BI_PNG
- Video is not included in the AVI file or QuickTime file.
 - Two or more video streams are included in one AVI file or QuickTime file.
 - Two or more audio streams are included in one AVI file or QuickTime file.
 - AVI file the size of which exceeds 2GB.
 - Type-1 DV AVI file.

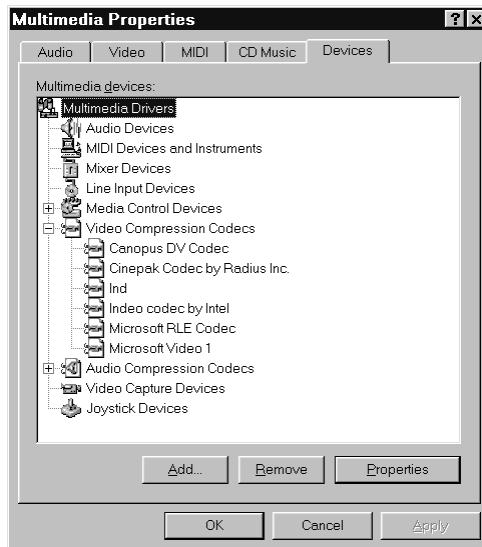


Figure 2.4: Multimedia properties

Chapter 3

Encoder settings

This chapter describes the detailed settings of the encoder functions of Cinema Craft Encoder SP.

3.1 Encoding setting screen

After adding AVI or QuickTime files on list box in main window, select an item and press **Enter** or double click on it, then the setting screen shown in Fig. 3.1 is displayed. Various settings for the encoder are executed in this screen.

3.1.1 Setting input file

To add video files to list box in the main window, do either of the following:

- Select files from Explorer, and drag and drop the files onto the main window.
- Press **Shift+F10**, A keys on the main window and select files.

If you select a file on the list box and press **Enter** or double click the left button of the mouse, a dialog box shown in Fig. 3.1 is displayed.

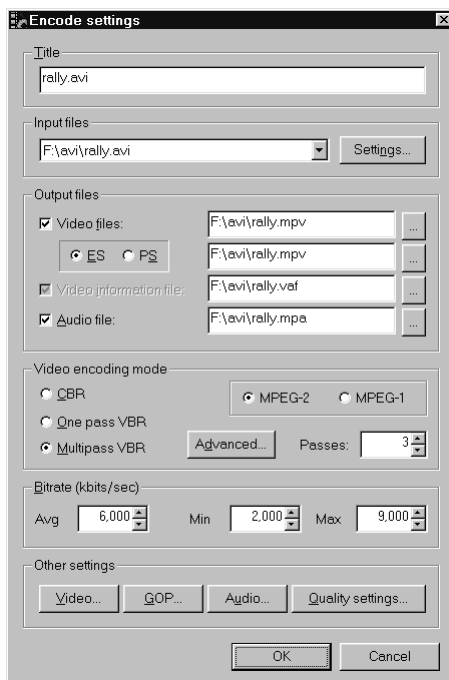


Figure 3.1: Encoding setting screen

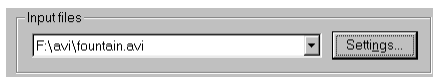


Figure 3.2: Input file setting

If the **Settings** button in this window is pressed, the screen shown in Fig. 3.3 is displayed.

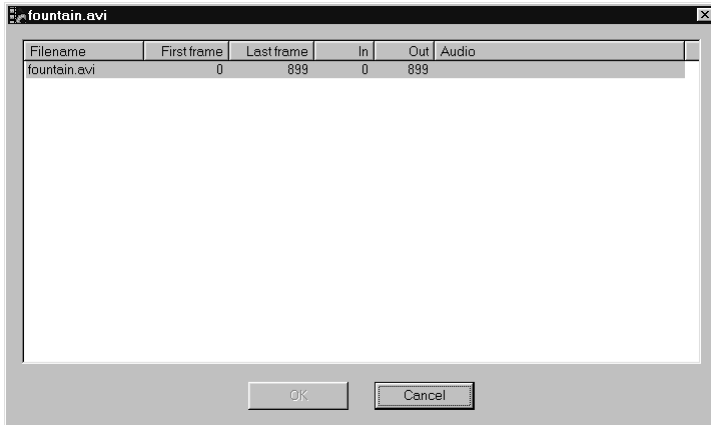


Figure 3.3: Input files setting screen

Startup Windows Explorer, and drag and drop the input file onto this window, or click the right button of the mouse on the window. Select **Add** and specify the input file. Press the **OK** button after specifying the file, and this window closes.

☞ When a plurality of files are specified here, these files are combined and generated into one MPEG-2 stream.

Specifying the encoding range of an input file

For each one of the specified input files, the encoding range can be specified in frame units. To specify an encoding range, select a target file and double click on it in the window shown in Fig. 3.3. Then the setting screen shown in Fig. 3.4 is displayed. Set the encoding range in the **Encoding range** section in this window.

➤ If “from 0 frame to 300th frame” is specified here, for example, 300 frames, from 0 frame to the 299th frame, are actually

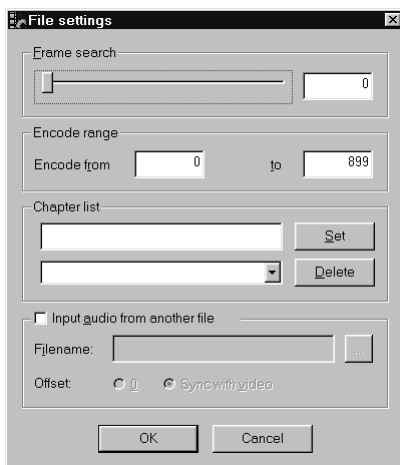


Figure 3.4: File setting screen

encoded. Note that the 300th frame is not encoded.

Specifying audio file

When the source file of a video is different from that of audio, the audio file can be specified separately.

To input an audio file name from another file, select **Input audio from another file** in the screen in Fig. 3.4, and input the audio file name into the text box below. If **Offset** is set to **Synchronize with video**, audio and video can be accurately synchronized even if encoding is started in the middle of a video input file.

- In the current version, either a Wave file or an AVI file can be specified here. An AIFF file cannot be specified.

Setting chapter

A chapter can be set in the window in Fig. 3.4.

What is a chapter ? A frame which is set as a chapter is configured to be a random access-possible frame, that is, an I frame. In MPEG, playback is possible only from the position of an I frame. An I frame is generally inserted only once every 12 to 15 frames, so playback is skipped for a maximum of 0.4 to 0.5 seconds when playback is attempted. Also, the first continuous B frames of GOP are skipped. If a chapter point is set, the frame is set as an I frame, where a sequence header and GOP header are inserted, and the GOP is created as a Closed GOP (individual frames in GOP do not refer to data outside the GOP), so that smooth playback from the chapter point is possible.

Registering a chapter A frame to be set to a chapter point is searched by moving the slider on the window in Fig. 3.4 to the left and right. When a frame is detected, input the chapter name to the text box of **Chapter list**, and press the **Set** button. Then the frame at this point is registered as a chapter point.

Deleting a chapter To delete a registered chapter, select the chapter to be deleted and press the **Delete** button.

3.1.2 Setting output file

Set or change the name of an output file by the following procedure.

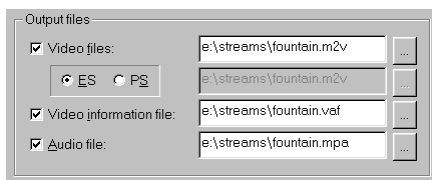


Figure 3.5: Output file setting

- ① Select the check box of the file to be output.
- ② Press the **...** button and input a file name.

☞ The file name can also be directly input to the text box.

- Video file

Specify the file name of the video stream.

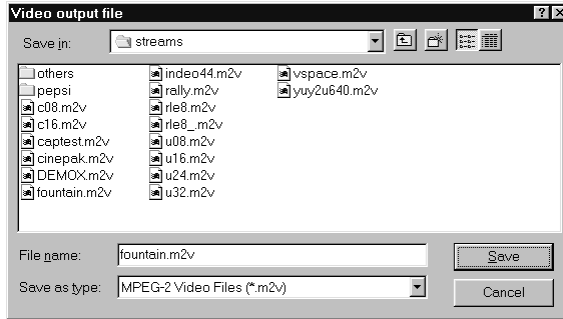


Figure 3.6: Video output destination file setting screen

Two text boxes are available for setting a video file because the previous encoding result is stored when multipass VBR encoding is executed. In other words, the encoding result for the previous pass can always be stored by alternately switching the output destination, such as, outputting data for the first pass to file #1, data for the second pass to file #2, and data for the third pass to file #1. In this way, the encoding result of the previous pass can be used even if multipass VBR encoding is canceled before completing.

Specifying stream pass Cinema Craft Encoder SP can set the type of a stream to be output. ES (Elementary Stream) or PS (Program Stream) can be set. ES is a stream with video only, and PS is a stream where video and audio are mixed. The extension of the initial setting of ES is `.mpv`, and the extension of the initial setting of PS is `.mpg`.

- Video information file

Specify the file name of the video information file to be used for multipass VBR encoding. Output of a video information file is unnecessary if VBR encoding is not used. The extension of the initial setting is `.vaf`.

- Audio file

Specify the file name of the audio stream.

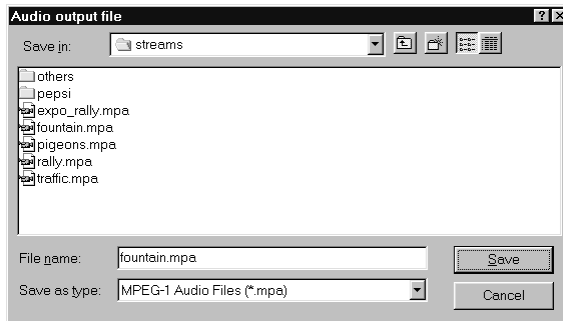


Figure 3.7: Audio output destination file setting screen

Either MPEG-1 audio or Wave file can be selected as the output file format. The extension of the initial setting of MPEG-1 audio is `.mpa`.

The extension of an output file can be changed. For how to change an extension, see **5.3 Setting extension** on page 51.

3.2 Basic setting of video encoder

This section describes the basic settings of the video encoder.

3.2.1 Selecting encoding format

You can select MPEG-2 or MPEG-1 for output video stream format in the **video settings** screen

3.2.2 Setting encoding mode

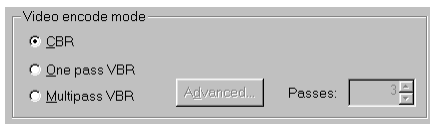


Figure 3.8: Video encoding mode

Cinema Craft Encoder SP can encode either a constant bitrate (CBR) stream or a variable bitrate (One-pass VBR or Multipass VBR) stream. See page 5 for the features of the respective modes.

- To encode with a variable bitrate, select ES in **Output file**. Cinema Craft Encoder SP can output a Program Stream only when CBR is selected.

To encode with the CBR mode

- ① Select **CBR** in **Video encoding mode**.
- ② Specify the bitrate in **Bitrate**. Specify the bitrate in kilo-bits/sec. units. The range of the bitrate which can be specified is 0.5 ~ 15 Mbps (0.5 ~ 9.8 Mbps for the setting to confirm to DVD).

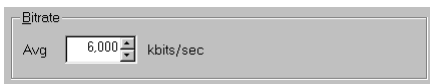


Figure 3.9: CBR bitrate setting

To encode with One-pass VBR

- ① Select ES in **Output file**.
Cinema Craft Encoder SP supports Program Stream only when CBR is selected.

- ② Select One-pass VBR in **Video encoding mode**.

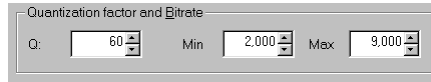


Figure 3.10: One-pass VBR bitrate setting

- ③ 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

- ④ 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 for the setting to conform to DVD).

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.

- ⑤ 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 for the setting to conform to DVD).

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.

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
- ✓ Block scan order (Zigzag or Alternate)
- ✓ 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 **ES** in **Output file**.

Cinema Craft Encoder SP supports Program Stream only in CBR.

③ Select Multipass VBR in **Video encoding mode**.

④ Specify the number of times of executing encoding in **Passes**. The range of values which can be specified here is 1 ~ 9.

When two or more passes are specified, the encoding result is alternately output to the two files which are set in **Video files**. This is because the encoding result up to the previous pass can be saved when the Multipass VBR mode is used for encoding. This is effective when a lengthy stream is created.

Image quality slightly improves each time encoding is repeated, but quality improvement reaches its limit at 3 ~ 4 times of encoding.

⑤ Specify the average bitrate in **Bitrate (kilobits/sec.)**. Specify the bitrate in kilobits/sec. units. The range of specification is 0 ~ 15 Mbps (0 ~ 9.8 Mbps for the setting to conform to DVD).

- ⑥ 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 for the setting to conform to DVD).

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.

- ⑦ Specify the maximum bitrate in **Bitrate (kilobits/sec.)**. Specify the bitrate in kilobits/sec. units. The range of specification is 0 ~ 15 Mbps (0 ~ 9.8 Mbps for the setting to conform to DVD).

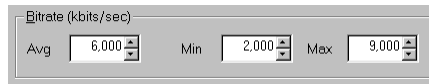


Figure 3.11: Multipass VBR bitrate setting

3.3 Advanced settings of video encoder

This section describes the advanced settings of the video encoder.

3.3.1 Adding sequence end code

Specify whether the sequence end code is added at the end of a video stream to be created in **Video settings** screen in Fig. 3.12. This window is displayed when the **Video** button in the screen shown in Fig. 3.1 is pressed.

If **Add sequence end code** is selected, the sequence end code is added. Normally select the sequence end code.

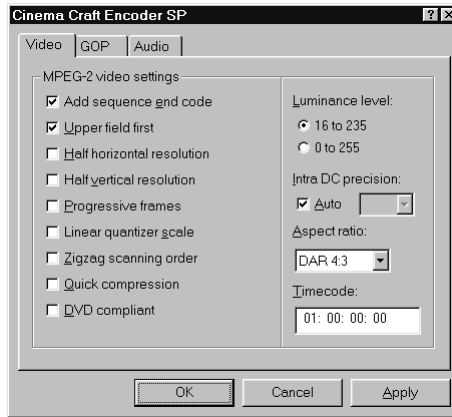


Figure 3.12: Video setting screen

3.3.2 Specifying field sequence

Specify whether the upper field or the lower field is displayed first when the encoded stream is displayed on an NTSC monitor. This setting can be done in the video setting screen.

If **Upper field first** is selected, the upper field is displayed first. Whether this should be selected depends on the configuration of the original file to be encoded, but if this is uncertain, select upper field. If this setting is incorrect, the movement of a encoded video will be jerky.

3.3.3 Setting horizontal resolution to half

If **Half horizontal resolution** is selected in the **video settings** screen, the horizontal resolution of encoding becomes half. Since the horizontal resolution must be a multiple of 16, half of the original size, 720, for example, is not 360 but 352.

3.3.4 Setting vertical resolution to half

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

3.3.5 Specifying progressive frame

When an original picture to be encoded is a progressive image, select **Progressive frames** in the **video settings** screen. This setting is reflected in the picture header of the video stream to be output.

Some software decoders which run on PCs execute image output by progressive frames by executing interlace/progressive conversion. If **Progressive frame** is selected for the stream when the source is a progressive picture, some decoders do not execute the above conversion, and output high quality pictures at high-speed. For a combination of some DVD players and a corresponding monitor, a high quality image is output if the image output is displayed not by interlace but by progressive frame.

3.3.6 Setting quantization scale type

There are two types of quantization scales: linear and non-linear. Linear quantization scale is a method used for MPEG-1, where the quantization scale is allocated linearly. To set the linear quantization scale, select **Linear quantization scale** in the **video settings** screen. However, the non-linear quantization scale is recommended unless there is a special reason.

For details, refer to the guides on MPEG-2.

3.3.7 Setting block scan order

If **Zigzag scanning order** is selected in the **video settings** screen, zigzag scan is used when sequencing DCT coefficients. This is a scan pattern used for H.261, JPEG and MPEG-1. For progressive images, zigzag scan may achieve high image quality.

If **Zigzag scanning order** is not selected, DCT coefficients are sequenced by alternate scan. Generally, for interlace pictures, alternate scan often achieves high image quality compared with zigzag scan.

For details, refer to the guides on MPEG-2.

3.3.8 Quick compression mode

If **Quick compression mode** is selected in the video setting screen, encoding is executed at about a 10% higher speed than normal mode. Image quality can be slightly lower than normal mode¹.

3.3.9 Using created stream for DVD

If **DVD compliant** is selected in the **video settings** screen, a stream is created assuming that DVD will be created.

In this case, the following is executed.

Changing frame size If the frame size of the original picture does not conform to DVD standards, the frame size is changed. When the frame rate is 29.97 fps or 30 fps, the frame size is changed to 720×480 , and when the frame rate is 25 fps, the frame size is changed to 720×576 . Even if the frame size is changed, the original image is not enlarged, but is matted.

Bitrate limitation In the DVD standard, the maximum bitrate of Video ES is limited to 9.8 Mbps. In the MPEG-2 VIDEO international standard (ISO/IEC 13818-2), the size of an individual picture is limited using the concept of “VBV (Video Buffering Verifier)”. In the concept of VBV, a stream having a 9.8 Mbps bitrate can create GOP which has a size equivalent to a maximum of 11 Mbps. This perfectly conforms to the MPEG-2 VIDEO international standard (ISO/IEC 13818-2), but whether it conforms to the 9.8 Mbps restriction of DVD depends on interpretation. If **DVD compliant** is selected, instantaneous bitrate in GOP units is controlled to be a maximum of 9.8

¹This is because the judgment in determining whether field ME (Motion Estimation) or frame ME is used will be somewhat less strict

Mbps. During VBR operation, 9.8 Mbps is always written to the sequence header regardless the specified maximum bitrate. 9.8 Mbps is the maximum bitrate allowed under the DVD standard. 9.8 Mbps is used here because in the case of the VBV model in VBR, bit allocation planning by the encoder becomes more flexible as the maximum bitrate becomes higher, therefore higher image quality can be achieved.

3.3.10 Specifying aspect ratio

Specify the aspect ratio in **Aspect ratio** in the video setting screen. The value which can be set here is SAR 1:1, DAR 4:3, DAR 16:9, or DAR 2.21:1. SAR refers to “Sample Aspect Ratio”, and DAR refers to “Display Aspect Ratio”. DAR 4:3 is an aspect ratio used for a general NTSC monitor. For the film material of a movie where the screen is rectangular, DAR 16:9 is selected. The MPEG-2 reproduction device (e.g. DVD player) refers to this setting, and corrects the aspect ratio when outputting data to an NTSC monitor.

3.3.11 Specifying luminance level

Specify the range of luminance level in **Luminance level** in the video setting screen. In ITU-R BT. 601-5, the range of luminance is specified as 16 to 235. If this setting has problems, set as 0 to 255.

The conversion formula from RGB to YCbCr is as follows.

When “16 to 235” is specified

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

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

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

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

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

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

When “0 to 255” is specified

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

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

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

In any case, decimals in the result of the division are omitted.

3.3.12 Specifying intra-DC precision

Specify the bit precision of the DC coefficient of the intra-block in **Intra DC precision** in the **video settings** screen. One of 8, 9 and 10 bits can be set here.

In general the optimum settings cannot be determined since changes depend on the details of the picture and movement intensity. For pictures with intensive movement and fine bumps, a low number of bits is appropriate. For smooth pictures with little movement, a higher number of bits is appropriate. A low number of bits may be specified for use at a low bitrate up to 4 Mbps, and a high number of bits may be specified for use at a high bitrate.

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

For details, refer to the guides on MPEG-2.

3.3.13 Setting timecode of first frame

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 **Time code of the first frame** in the video setting screen is used for the first frame to be encoded.

3.3.14 Setting GOP configuration

Press the GOP... button in the encoding setting screen in Fig. 3.1 (page 16), and the GOP setting screen is displayed.

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

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

- 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 for 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 streams. To edit encoded streams, however, it is more convenient to use numerous I pictures.
- P picture (Predictive-coded picture)
A P picture consists of motion vectors when previous (just before) I pictures or P pictures are used for reference and differential information between a 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 the encoder and the decoder.
- B picture (bi-directionally 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 for reference and differential information between a picture comprised of these motion vectors and an

²Inverse Discrete Cosine Transform

original picture. Therefore, 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 M and N/M values. By changing the M value, the number of B pictures can be changed, and by changing the N/M value, the number of P pictures can be changed. The standard setting is $M = 3$ and $N/M = 5$.

GOP header

Specify the number of frames to which a GOP header is added. This value is regarded as the GOP length. $1 \sim 15$ can be set. Since the GOP length must be a multiple of N , you may not be able to set other than $1 \times N$ in some case. For example, if $M = 3$ and $N/M = 5$, then no value other than $1 \times N$ can be set.



Figure 3.13: GOP settings

SEQ header Specify the number of GOPs to which a sequence header is inserted. The standard setting is 1.

Restricting 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.

Closing 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.

3.3.15 Image quality priority

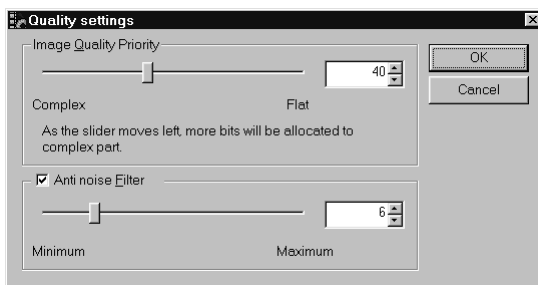


Figure 3.14: Image quality settings screen

This setting decides priority among image areas which the encoder assigns to allocate the bit amount. 0 to 100 can be specified. The initial value is 25. Set the value in the window shown in Fig. 3.14, which is displayed when the **Quality priority** button in the **encoding setting** screen in Fig. 3.1 is pressed.

As the value becomes closer to 0, a higher bit amount is allocated to complicated images areas. As the value becomes closer to 100, a higher bit amount is allocated to flat image areas. When the value is

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

close to 0, the mosquito noise at the edges (noise causing hazy part along the edges, looking like flying mosquitoes) is less outstanding, but the contouring noise (noise which looks like contour line patterns, which appear in flat and wide areas, such as a dark background) is more outstanding. The opposite occurs when the value is closer to 100.

3.3.16 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.

3.3.17 Setting packet size

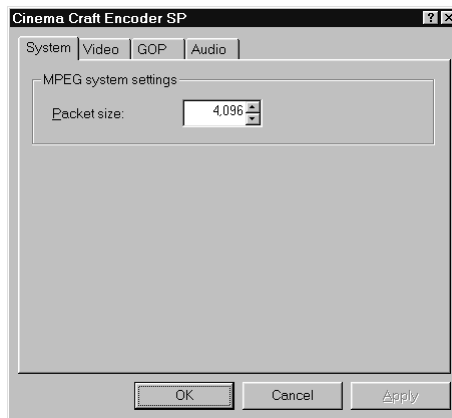


Figure 3.15: Packet size setting screen

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

To open the System page, click **Video** button in the screen shown in Fig. 3.1 and select System tab.

3.3.18 Advanced VBR setting

Press the **Advanced** button in the encoding setting screen in Fig. 3.1, and the screen shown in Fig. 3.16 is displayed.

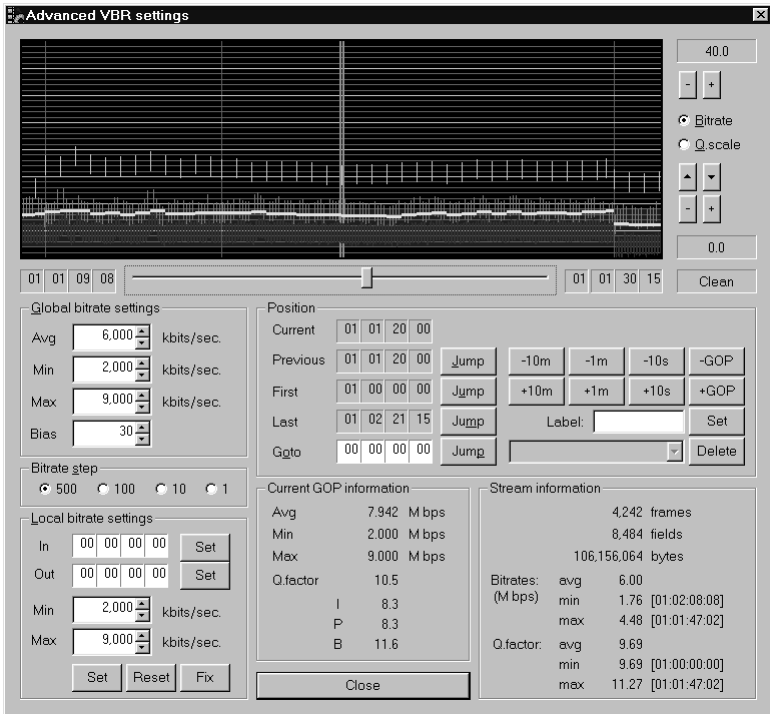



Figure 3.16: Advanced VBR setting screen

- Before opening this dialog box, a video information file must be created. Also, **Multipass VBR** must be set for the video

encoding mode.

This screen has the following parts.

- **Bitrate/quantization scale graph**
Displays the bitrate or quantization scale of the stream to be encoded in frame units as a graph.
- **Global bitrate setting**
Specifies the global bitrate of the stream.
- **Bitrate step**
Specifies the changes of the bitrate when the  button is pressed.
- **Local bitrate setting**
Changes the bitrate of a specified part of the stream.
- **Position**
Changes the current position of the graph.
- **Current GOP information**
Displays information on GOP of the current position of the graph.
- **Stream information**
Displays information on the stream, such as size and bitrate.

Bitrate/Quantization scale graph

Displays the bitrate or quantization scale graph of encoded moving pictures.

Bitrate display Bitrate is displayed in the graph shown in Fig. 3.17. To display the bitrate, select **Bitrate** at the right of the graph. The white line, green line, red line and yellow line of the graph indicate the average bitrate of I pictures, P pictures, B pictures and the respective GOP units. The double vertical lines at the center show the currently selected timecode. The band displayed in blue shows the band between the maximum bitrate and the minimum bitrate.

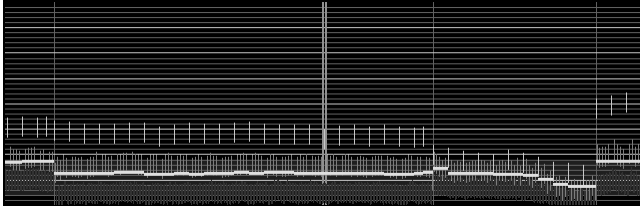


Figure 3.17: Bitrate graph

Quantization scale display The quantization scale is displayed in the graph shown in Fig. 3.18. To display the quantization scale, select **Q.scale** at the right of the graph. Just like the case of the bitrate display, the white line, green line, red line and yellow line of the graph indicate the average quantization scale of I pictures, P pictures, B pictures and the respective GOP units. The double vertical lines at the center show the currently selected timecode.

As the value of the graph becomes smaller, the distortion of the frame becomes smaller. When the quantization scale is displayed, the background is colored with green, gray and red. The part where the background is green is encoded at relatively good image quality, the gray part at standard image quality, and the red part at image quality where distortion tends to be outstanding. Once one becomes used to reading this display, image quality can be roughly estimated before encoding. Use this graph for setting the bitrate.

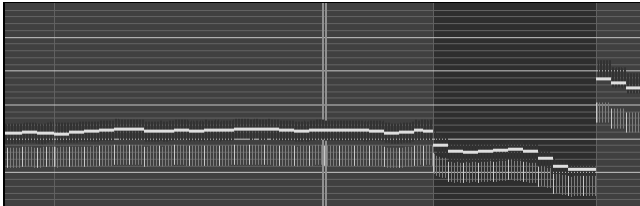


Figure 3.18: Quantization scale graph

Shifting display range The display range is shifted by the slider directly below the graph. The timecodes at the left and right of the slider indicate the timecodes at the left end and right end of the graph. By pressing the button at the right of the graph, the scale of the graph can be changed or the display range can be changed. The [+] and [-] buttons at the top change the upper limit value of the graph, and the [+] and [-] buttons at the bottom change the lower limit value of the graph. The ▲ and ▼ buttons scroll the graph up and down.

Updating the graph The display [Clean] at the very bottom indicates that the currently displayed graph is most recent. If the bitrate setting is changed, recalculation of bit allocation planning automatically starts, and [Planning] is displayed instead of [Clean] during this calculation. When the calculation completes, the graph is automatically updated and [Clean] is displayed again. [Planning] indicates that the graph has not yet been updated to the current setting. Even while [Planning] is displayed, the setting can be changed (only when operated in Windows NT). In this case, bit allocation planning currently in-calculation is automatically discarded and calculation starts again.

Global bitrate settings

The minimum, maximum and average bitrate of the entire stream can be specified in this frame.

Minimum, maximum and average bitrate specification This specification is the same as the specification executed in the encoder setting window, but for convenience can be set here as well.

Breaking into bit allocation strategy The encoder allocates bits based on the original evaluation standard, so that all images have the same visual quality. Changing the value of the **Bias** part breaks into this evaluation standard. 0 to 100 can be set here. The initial value is 30. As the value becomes smaller, more bits are allocated to complicated scenes, and at value 0, the bitrate fluctuation is largest.

As this value becomes larger, more bits are allocated to simple scenes, and at value 100, streams closer to CBR are output.

Local bitrate settings

The minimum and maximum bitrates in the specified range can be specified here.

Setting and canceling bitrate range If the **Set** button next to **In** and **Out** is pressed, the currently selected timecode is set. Either specify the range of the timecode by pressing the **In** and **Out** buttons, or by directly inputting the timecode range. Specify the minimum and maximum bitrate for that range, and press the **Set** button, then the setting of the bitrate range for the specified range becomes valid. To reset the specified setting to the original setting, press the **Reset** button. If the **Reset** button is pressed after specifying the first and last timecodes of a stream, the minimum and maximum bitrates are reset to the values set by the **Global bitrate settings** for the entire range, which is the state where nothing was set for the bitrate range.

Fixing bitrate If the **Fix** button is pressed after specifying the range, the bit allocation in the specified range is fixed to the same values as the previous encoding result. In other words, even if recalculation for bit allocation is executed hereafter, the range specified here is not influenced. For the range which is set here, the blue band is not displayed in the bitrate graph.

- To conform to the VBV standard of MPEG, a minimum allocation change may be made.

Position

The current position of a timecode can be moved within this frame. The following are the types of “moves”.

- ① When the timecode at the moving destination is known, specify the timecode directly in the **Goto** field, and press the **Jump** button next to the field.

- ② The timecode previous specified is displayed in the **Previous** fields. To return to that timecode, press the **J**ump button next to the frame.
- ③ To move to the first or last position, press the **J**ump button next to the **F**irst field or **L**ast field respectively.
- ④ It is possible to move to 10 minutes before/after, 1 minute before/after, 10 seconds before/after or immediately before/after GOP. In this case, press the desired button.
- ⑤ The timecode displayed in the **C**urrent field is the timecode currently selected. This timecode can be stored by assigning a name to it. For this, input a label in the text box **L**abel, and press the **S**et button next to this text box. To jump to a timecode previously recorded, select the timecode to jump to from the combo box below the text box. To delete the setting of the timecode currently displayed in the combo box, press the **D**elte button.

GOP information on current timecode

Information on GOP in the currently selected timecode is displayed in the **C**urrent **G**OP **i**nformation frame.

The bitrate of the GOP is written in **A**verage. **M**inimum and **M**aximum are displayed, which are the minimum value and maximum value of the bitrate allowed for this GOP.

In **Q**.factor, the distortion amount of the GOP is displayed by an evaluation value unique to Cinema Craft Encoder. The average value of the Q.factor for each picture type is also displayed. Distortion becomes smaller as these value become smaller.

Stream information

Information on the stream is displayed in **S**tream **i**nformation. Here, the total number of frames and the total number of fields of a stream, the size of the stream, average bitrate, minimum bitrate, maximum bitrate, and average, minimum and maximum of Q. factor

are displayed. The timecode of the GOP, which has this value, is displayed next to the bitrate and the minimum and maximum value of the Q. factor.

3.4 Setting audio encoder

This section describes the setting of the audio encoder.

The setting of the audio encoder is executed in the **Audio setting screen** in Fig. 3.19. To display this window, press the **Audio** button in the "Encoding setting screen" shown in Fig. 3.1 (page 16).

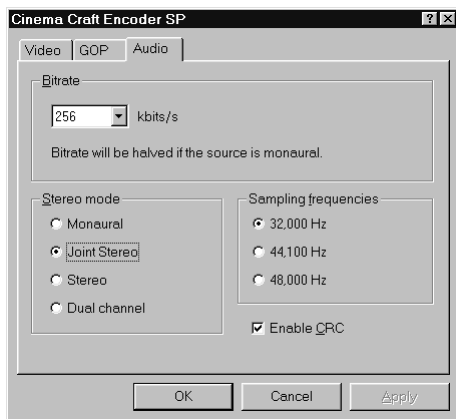


Figure 3.19: Audio setting screen

3.4.1 Setting bitrate

Set the bitrate for creating an MPEG Audio stream. The initial set value is 256 kilobits/sec. (half this in the case of monaural).

3.4.2 Setting channel mode

Set the channel mode when an MPEG Audio stream is created. Set one of the following.

- Monaural
The left and right channels are synthesized and encoded as monaural.
- Joint stereo
Encoded in joint stereo format.
Joint stereo is a special stereo format specified in MPEG Audio. In this mode, the high pitch tone part, where the sound localization is insensitive, is encoded as monaural using the sound volume difference between the left and right as a balance signal. Encoding quality is slightly better than stereo.
- Stereo
Encoded in stereo.
- Dual channel
Encoded in sound multiplex mode.

3.4.3 Specifying sampling frequency

Specify the sampling frequency of the MPEG Audio stream to be output. The sampling frequency the same as the original file of encoding (the first file if a plurality of files are selected) is selected as the default. Since sound quality deteriorates, do not convert the sampling frequency unless absolutely necessary.

- In the current version, when the audio of an AVI file or Wave file is compressed, format conversion (sampling frequency conversion, number of quantization bits conversion, monaural/stereo conversion) for the audio data cannot be executed.

3.4.4 Adding CRC data

Select whether CRC data is added to create an MPEG Audio stream.

Chapter 4

Template settings

You can create up to 16 templates to save parameter set for encoding.

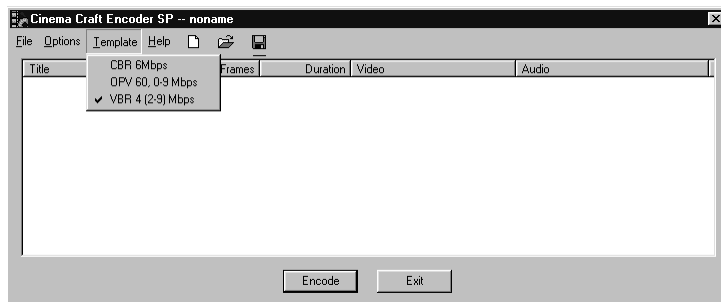


Figure 4.1: When 3 templates are set

In Fig. 4.1, three templates are registered. The template with a check mark (✓) is the currently selected template.

4.1 Creating/editing/deleting templates

Initially, only one template **Standard** is registered. New template will be created based on this template.

4.1.1 Creating template



Figure 4.2: Template setting screen

To create a template follow the instructions below:

- ① Select **Standard** from **Template** menu in the main window of Cinema Craft Encoder SP. Then a dialog box shown in Fig. 4.2 will be displayed.
- ② Set various parameters in the dialog box. The string in **Title** field will be used for the menu name.
- ③ Press the **Add** button to save the setting.

4.1.2 Editing template

To edit a template, do the following:

- ① Select a template to edit from **Template** menu in the main window of Cinema Craft Encoder SP while pressing a shift key. Then a dialog box shown in Fig. 4.2 will displayed.
- ② Set various parameters in the dialog box.
- ③ Press the **Replace** button to save the setting.

If you press **Add** button instead of pressing the **Replace** button, a menu is added. If you add a menu, change the title of the template.

4.1.3 Deleting template

To delete a template, do as follows:

- ① Select a template to edit from **Template** menu in the main window of Cinema Craft Encoder SP while pressing a shift key. Then a dialog box shown in Fig. 4.2 will displayed.
 - ② Press the **Delete** button and the template will be deleted.
- If you delete all of the templates, you cannot create new template. In this case, restart Cinema Craft Encoder SP, then **Standard** template will be automatically created.

Chapter 5

Optional settings

This chapter describes other parameters which can be set for Cinema Craft Encoder SP.

5.1 Setting output file save destination

The default output destination of a stream output by Cinema Craft Encoder SP can be specified.

How to set output file save destination

- ① Select **Outputs** from **Option** in the main window of Cinema Craft Encoder SP.
- ② File output destination can be selected from the following three choices.
 - Same folder as input file
If this is selected, the same folder as the input file is set as the output destination.
 - Current folder
If this is selected, the folder selected when Cinema Craft Encoder SP starts up is set as the output destination.

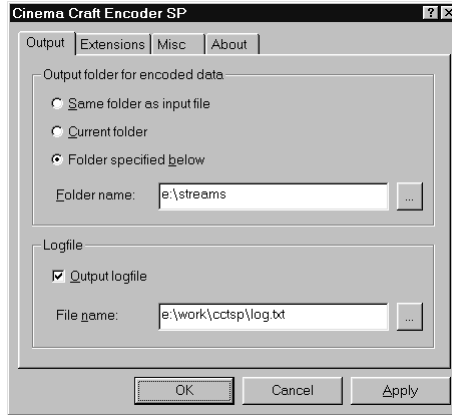


Figure 5.1: Output destination setting

- Folder to be specified below
If this is selected, the output destination folder can be directly specified.

③ Press the **OK** button to save the setting.

5.2 Setting log file

The log at encoding can be output to a file.

How to specify log file

- ① Select **Outputs** from **Option** in the main window of Cinema Craft Encoder SP.
- ② Select the **Output logfile** check box and specify the log file name in **File name**.
- ③ Press the **OK** button to save the setting.

5.3 Setting extensions

An extension can be set for the following output files.

- Encoder control list
- MPEG-2 Video elementary stream
- MPEG-1 Video elementary stream
- MPEG-2 Program stream
- MPEG-1 System stream
- MPEG-1 Audio elementary stream
- Video information file

How to set extensions

- ① Select **E**xtensions... from **O**ption in the main window of Cinema Craft Encoder SP.
- ② Set the respective extension.
- ③ Press the button to save the setting.

5.4 Setting AVI decoding format

When decoding an AVI file, Cinema Craft Encoder SP tries first to decode the AVI file in YUY2 format, because if the AVI file can be decoded in YUY2 format, color space conversion will not be necessary, thus the quality of encoded bitstream will be improved. But all of the AVI files cannot be decoded in YUY2 format. Then Cinema Craft Encoder SP will try to encode the file in 32-bit RGB format, because 32-bit RGB image can be encoded faster than 24-bit RGB image.

By clearing one or both of these checkboxes, users can specify that the above processes will not be performed. Normally, these settings need not be changed.

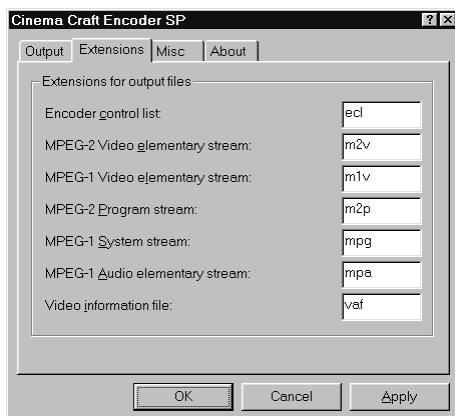


Figure 5.2: Extensions setting



Figure 5.3: Misc settings

How to set AVI decoding format

- ① Select **Misc...** from **Option** in the main window of Cinema Craft Encoder SP.
- ② Set or clear the check boxes in the AVI decoding frame.
- ③ Press the button to save the setting.

5.5 Overlapped Output

You can select Overlapped Output for outputting MPEG streams. If you select Overlapped Output, file writing may be faster. However, you cannot use this feature on Windows 98/Me.

How to set Overlapped Output

- ① Select **Misc...** from **Option** in the main window of Cinema Craft Encoder SP.
- ② Set the check box of Use **Overlapped Output**.
- ③ Press the button to save the setting.

Chapter 6

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 Version 2.50” from the list box in the **Install/Uninstall** page, and click on the Add/Remove... button.
 - ④ This software is deleted after the system is restarted.
- HASP driver will not be uninstalled automatically. To uninstall HASP driver, see ① below.

If the above uninstallation didn't performed properly, do the manual uninstall described below:

- ① Run `hinstall.exe -remove` in the folder where Cinema Craft Encoder SP is installed. Then HASP driver will be uninstalled.
- ② Start the registry editor and delete the following three registry keys:

¹Trial version does not need HASP.

```
HKEY_CURRENT_USER\Software\Custom Technology\Cinema Craft Encoder SP
HKEY_LOCAL_MACHINE\SOFTWARE\Custom Technology\Cinema Craft Encoder SP
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall\ccesp
```

③ Delete the folder where Cinema Craft Encoder SP is installed.

④ Delete the following folder:

- In case of Microsoft Windows 98

```
\\%windir%\Start Menu\Programs\Cinema Craft Encoder SP
```

- In case of Microsoft Windows NT 4.0

```
\\%windir%\Profiles\%user name%\Start Menu\Programs\Cinema Craft Encoder SP
```

- In case of Microsoft Windows 2000

```
\\%ALLUSERPROFILE%\%user name%\Start Menu\Programs\Cinema Craft Encoder SP
```

⇒ %windir% is a folder where Windows are installed.

⇒ %ALLUSERPROFILE% is normally C:\Documents and Settings.