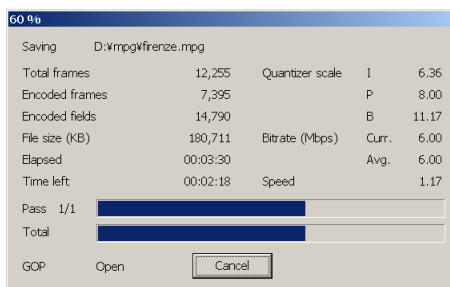


# CINEMA CRAFT<sup>®</sup> | SP E N C O D E R

## User's Guide Version 2.66



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Cinema Craft Encoder SP User's Guide

Version 2.66

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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.

# Introduction

Cinema Craft Encoder SP is a program for converting movie files to an MPEG-2 (or MPEG-1) files 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, 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 processor that supports SSE or Enhanced 3D Now !
- 256MB of RAM
- Microsoft Windows NT 4.0 SP6, Window 2000, or Windows XP
- QuickTime 5 (or later) for encoding QuickTime files
- Adobe Premiere 6 to use plug-in version
- gdiplus.dll<sup>1</sup> to encode still-image sequence (except Targa).

---

<sup>1</sup>gdiplus.dll can be downloaded from the following page:  
<http://www.microsoft.com/downloads/release.asp?releaseid=32738>  
However, you don't need to download if you are using Windows XP since it includes the file.

## 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 or DAR 16:9
GOP configuration	I, P frame interval (M) : 1 ~ 3 I frame interval (N) : max. 15 (a multiple of M)

### Output audio format

Bitrate <sup>2</sup>	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

### Input file format

The following are spec of standalone version.

---

<sup>2</sup>This is the case of two channels. In the case of one channel, the bitrate is half this bitrate.

**Video**

AVI files	AVI 1.0 (including reference file)
	AVI 2.0 (OpenDML)
	frameserver (Avisynth, VirtualDub)
QuickTime files	mov files
	DV (dif) files
Still-image sequence	Bitmap files
	Targa files
	Tiff files
	Png files
	JPEG files

**Audio**

Wave files	uncompressed files only
AIFF files	uncompressed files only



# Chapter 1

## Overview of Cinema Craft Encoder

### 1.1 Overview

Cinema Craft Encoder is a high picture quality software MPEG-2/1 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.

#### **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.

- Adobe Premiere plug-in

Cinema Craft Encoder SP includes standalone version and Adobe Premiere plug-in version. The standalone version is for encoding existing AVI or QuickTime files, and the plug-in version is used to export MPEG files from the timeline of Adobe Premiere.

## Chapter 2

# Running Cinema Craft Encoder SP

### 2.1 Running Cinema Craft Encoder SP

This manual mainly focuses on Cinema Craft Encoder SP standalone version. For Adobe Premiere plug-in version, please refer to Chapter 8 (page 69).

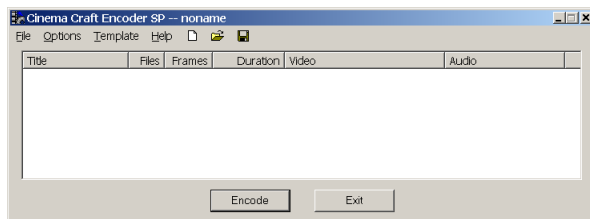


Figure 2.1: Cinema Craft Encoder SP Startup Screen

The basic procedure of using Cinema Craft Encoder SP is as follows (more detail is described in the following chapter) :

- ① Startup Cinema Craft Encoder SP.
- ② Select files to be converted (AVI, QuickTime, etc) from Windows Explorer, and drag and drop the files onto the window of Cinema Craft Encoder SP.
- ③ Select one item in the window of Cinema Craft Encoder SP and double click it to open encode setting dialog box. Specify parameters for the encoder and press **OK** to close the window.
- ④ Press **Encode** button to start encoding. When encoding starts, the screen shown in Fig. 2.2 is displayed.
- ⑤ When encoding ends, the window shown in Fig. 2.2 closes.

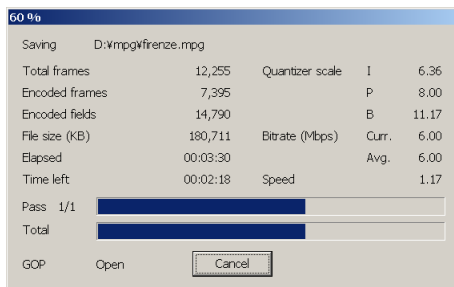


Figure 2.2: Screen during encoding

## 2.2 Options

Cinema Craft Encoder SP has the following options.

- ecl *filename* Loads specified ecl file<sup>1</sup> on startup.
- batch Starts as batch mode
- verbose Displays verbose information onto standard output.

If you run **cctsp.com** from command prompt, Cinema Craft Encoder SP acts as if it were console application.

<sup>1</sup>Regarding Ecl (Encoder Control List) file, refer to Chapter 6 (page 63).

# Chapter 3

## Encoder settings

This chapter describes the parameter settings of Cinema Craft Encoder SP.

### 3.1 Setting input file

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

- Select a file from Explorer, and drag and drop the file onto the main window.
- Press Shift+F10, A keys on the main window to show the Open-File dialog box and select a file.

#### 3.1.1 Specifying multiple files

There are two ways of specifying multiple input files.

##### **To output separate file for each one of input files**

In this case, register multiple input files in the way described above. Note that in Fig. 3.2, the value Files of each item is 1, which means one input file corresponds to one output file.

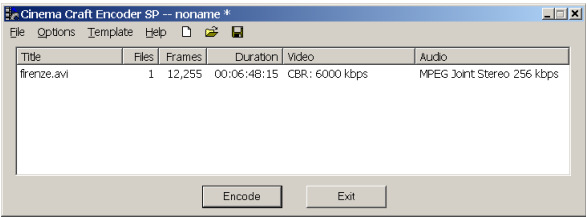


Figure 3.1: After one file is added

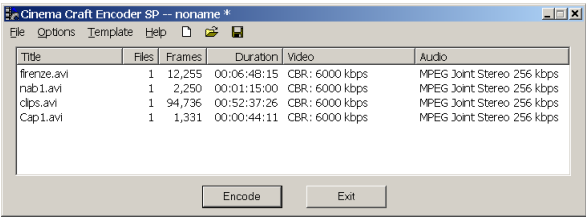


Figure 3.2: After four files are added

### To output one file from multiple of input files

Add the first file in the way described above, and click that item in the list to open the window shown in Fig. 3.3. Then click **Setting...** button to open the window shown in Fig. 3.4. After adding other files on the window, click **OK** button twice to return to the main window.

Note that in Fig. 3.6, the value **Files** is 4, which means four input files are used to produce one output file.

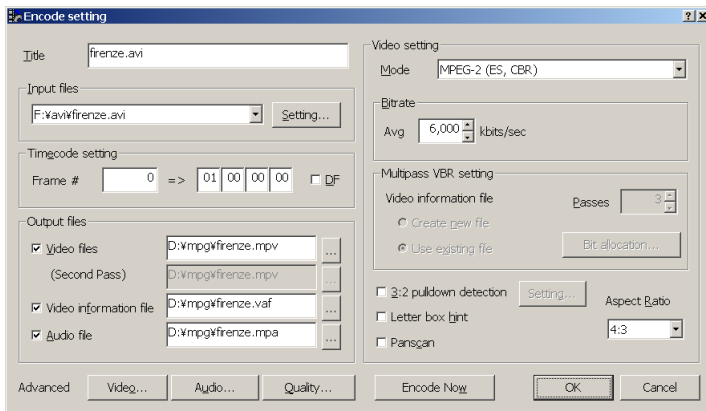


Figure 3.3: Encoding setting screen

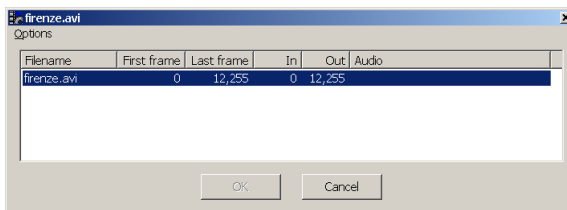


Figure 3.4: Sub window to add extra files

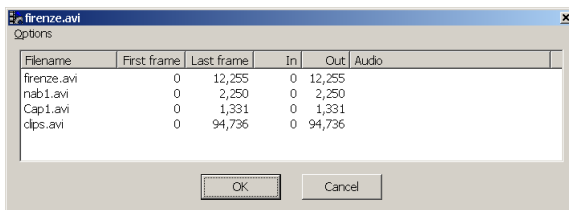


Figure 3.5: After four files are added on sub window

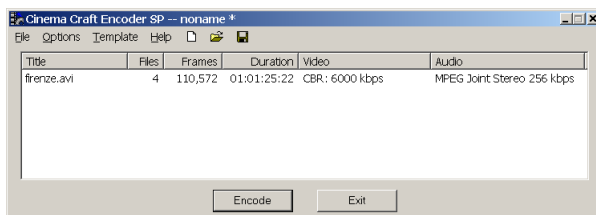


Figure 3.6: After returned to the main window

### 3.1.2 Specifying audio file

In case video and audio are stored in different files, the audio file (uncompressed Wave/AIFF file) can be specified separately.

To specify an audio file, select **Input audio from another file** in **File settings** window shown in Fig. 3.12 (page 25), and enter 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.

### 3.1.3 Precautions on input files

Cinema Craft Encoder SP reads AVI files or QuickTime files and converts them to MPEG files, 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  $720 \times 576$
  - ✓ Frame rate is not 23.98/24/25/29.97/30
- The Codec<sup>1</sup> 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 treat this file.

- One of the following values is set in biCompression of the BITMAP-INFOHEADER of the AVI video.
  - ✓ BLRLE4
  - ✓ BL\_BITFIELDS
  - ✓ BL\_JPEG
  - ✓ BL\_PNG
- Video is not included in the AVI file or QuickTime file.

---

<sup>1</sup>Codec is an abbreviation for Coder - Decoder.

## 3.2 Setting output file

To set or change the name of an output file, register a movie file at main window and double click the item in the list to open **Encode setting** dialog box, and follow the procedure below.

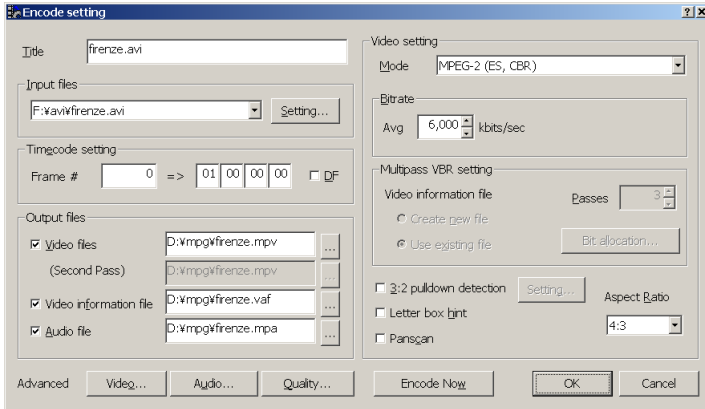


Figure 3.7: Encoding setting screen

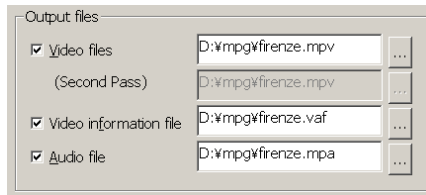



Figure 3.8: Output file setting

- 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.

### 3.2.1 Video file

Specify the file name of the video stream.

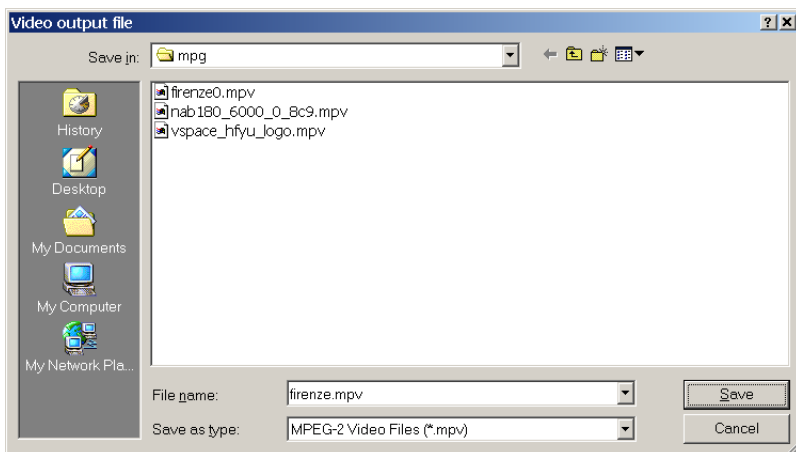


Figure 3.9: Video output destination file setting screen

### 3.2.2 Video file (Second Pass)

If multipass VBR is selected for video encoding mode, two video file names can be specified. If you specify another name here, this name is used for the files at 2, 4, 6, and 8th pass of VBR encoding. Using two names alternately, the encoding result of the previous pass is saved even if multipass VBR encoding is canceled before completing.

### 3.2.3 Video information file

Specify the file name of the video information file to be used for multipass VBR encoding. This file can be created only in CBR mode

or one pass VBR mode. If multipass VBR is selected when video information file does not exist, Cinema Craft Encoder SP implicitly perform encoding in CBR mode in order to create video information file, thus another pass is consumed besides the specified passes.

### 3.2.4 Audio file

Specify the file name of the audio stream.

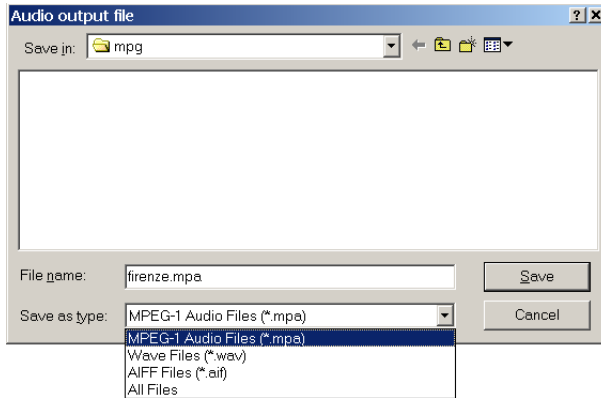


Figure 3.10: Audio output destination file setting screen

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

The extension of output files can be changed. For how to change an extension, see **4.2 Setting extensions** on page 54.

## 3.3 Basic setting of encoder

### 3.3.1 Specifying timecode

Since a timecode is normally not included in an AVI file and a Quick-Time file, Cinema Craft Encoder SP generates a timecode internally and embeds it in the MPEG stream.

The timecode to embed can be specified by associating the specified frame number to the specified timecode. This setting can be done on the **Timecode setting** section in the **Encode setting** window shown in Fig. 3.7.

Initially, the first frame (frame number 0) is mapped to timecode 01:00:00:00. Although you can change this setting, avoid using the timecode 00:00:00:00 since this value has special meaning to Cinema Craft Encoder SP.

If you prefer dropped frame, select **DF** check box.

### 3.3.2 Setting encoding mode

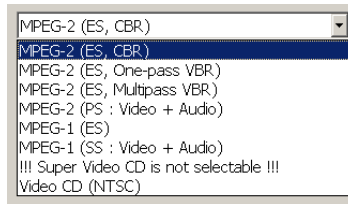


Figure 3.11: Video encoding mode

The video encoding mode can be selected from a drop down list that is located on upper right of **Encode setting** dialog box. There are following encoding modes.

- MPEG-2 (ES, CBR)  
Outputs MPEG-2 video elementary stream (Video ES) in constant bitrate (CBR) mode. The bitrate of each GOP is almost the same.

- MPEG-2 (ES, One-pass VBR)  
Outputs MPEG-2 video elementary stream in one pass variable bitrate (One-pass VBR) mode. The bitrate of each GOP varies but quantization scale is almost the same<sup>2</sup>.
- MPEG-2 (ES, Multipass VBR)  
Outputs MPEG-2 video elementary stream in multipass variable bitrate (Multipass VBR) mode. The bitrate of each GOP varies but quality will be constant. Unlike One-pass VBR, one can specify average bitrate.
- MPEG-2 (PS : Video + Audio)  
Outputs MPEG-2 program stream (PS) that is a multiplex of MPEG-2 video elementary stream encoded in CBR mode and audio elementary stream.
- MPEG-1 (ES)  
Outputs MPEG-1 video elementary stream in CBR mode.
- MPEG-1 (SS : Video + Audio)  
Outputs MPEG-1 system stream (SS) that is a multiplex of MPEG-1 video elementary stream encoded in CBR mode and audio elementary stream.
- Super Video CD  
Outputs Super Video CD compatible stream. This mode can be selected only if the frame size is  $480 \times 480$  and frame rate is 29.97 fps or frame size is  $480 \times 576$  and frame rate is 25 fps.
- Video CD  
Outputs Video CD compatible stream. This mode can be selected only if the frame size is  $352 \times 240$  and frame rate is 29.97 or frame size is  $352 \times 288$  and frame rate is 25 fps<sup>3</sup>.

---

<sup>2</sup>The quantization scale may be changed in order to keep upper and lower bounds of bitrate.

<sup>3</sup>The movie file that satisfies the condition of frame size by applying **Half horizontal resolution** or **Half vertical resolution** can also be used as a source file of Video CD compatible stream.

### 3.3.3 Bitrate and Q.factor

Bit amount per one second is called bitrate. The higher the bitrate, the better the quality and larger the file size. (1 kilo bits is regarded as 1,000 bits.)

For example, if the average bitrate is 6,000 kbits/sec and the length of the movie file is 2 hours, the file size of encoded video elementary stream is:

$$2 \times 60 \times 60 \times 6000 \times 1000 \div 8 = 5,400,000,000 \text{ bytes}$$

(To convert from bits to bytes, it is divided by 8.)

Q.factor is a parameter unique to Cinema Craft Encoder. This parameter influences quantization scale and can be specified only in one pass VBR mode. 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

For each encoding mode, one can set the following parameters.

Encoding mode	avg	min	max	Q.
MPEG-2 (ES, CBR)	✓	—	—	—
MPEG-2 (ES, One-pass VBR)	—	✓	✓	✓
MPEG-2 (ES, Multipass VBR)	✓	✓	✓	—
MPEG-2 (PS : Video + Audio)	✓	—	—	—
MPEG-1 (ES)	✓	—	—	—
MPEG-1 (SS : Video + Audio)	✓	—	—	—
Super Video CD	✓	—	—	—
Video CD	—	—	—	—

- avg, min, max, Q. stand for average bitrate, minimum bitrate, maximum bitrate, and Q.factor, respectively.

- ◆ If Super Video CD is selected, upper bound of bitrate will be limited to 2,460 kbps.
- ◆ If Video CD is selected, bitrate will be fixed to 1,150 kbps.

### 3.3.4 Multipass VBR setting

When you select Multipass VBR at encoding mode setting, select either **Create new file** or **Use existing file** for video information file, and specify passes from 1 to 9.

#### Video information file

Generally at least two passes are required to create a variable bitrate stream for specified average bitrate. Cinema Craft Encoder SP checks the complexity of images and saves the information to a video information file at the first pass. And in the next pass, encoding is executed by using the information.

#### Creating and recreating video information file

A video information file is created by encoding in the CBR or the One-pass VBR mode. Settings at this time should be close to the settings 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.

If **Create new file** is selected for video information file, the video information file is automatically created in the above manner.

#### When recreation of video information file is required

In a video information file, parameters having a major influence on encoding method is saved. Therefore, these parameters cannot be changed after the creation of video information file. Conversely, **if these parameters are changed, a video information file must be recreated**. The following are such parameters.

- ✓ mapping of frame and timecode

- ✓ in points and out points
- ✓ chapter points
- ✓ aspect ratio
- ✓ inverse 3:2 pulldown setting
- ✓ GOP configuration (N, M, GOP header interval, sequence header interval)
- ✓ progressive frame flag
- ✓ block scan order (Zigzag or Alternate)
- ✓ quantization matrices setting

Unless above parameters are changed, you don't need to recreate video information file. 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 an average bitrate is set to twice or more or half or less than that previously specified, recreating the video information file is recommended.

### 3.3.5 Specifying aspect ratio

Specify the aspect ratio in **Aspect Ratio**. The value which can be set here is SAR 1:1, 4:3, or 16:9. SAR refers to "Sample Aspect Ratio". If SAR 1:1 is selected, the aspect ratio of each pixel becomes 1:1. Therefore, for example, if a footage whose frame size is  $720 \times 480$  is encoded with SAR 1:1, the display aspect ratio will be 3:2.

4:3 is an aspect ratio used for a general TV monitor. If the footage is wide screen, 16:9 may be appropriate. The MPEG-2 playback device (e.g. DVD player) refers to this setting, and corrects the aspect ratio when outputting data to a TV monitor.

### 3.3.6 Inverse 3:2 pulldown

If the material to be encoded is NTSC and is 3:2 pulldowned, improvement of image quality is expected by applying inverse 3:2 pulldown on encoding time. To perform 3:2 pulldown, select **3:2 pulldown detection** check box in **Encoding setting** window (Fig. 3.7).

- ◆ 3:2 pulldown is a method of converting 24 frames (24 fps) of film into 60 fields (30 fps) of NTSC video. By this conversion, 12 (=  $60 - 24 \times 2$ ) fields of copy fields per second will be created. If **3:2 pulldown detection** is selected, these copy fields are detected and treated as repeated field of MPEG-2<sup>4</sup>.
- ◆ If **3:2 pulldown detection** is selected, progressive frame flag is automatically raised.
- ◆ Do not use this option to originally video material, otherwise, movement of decoded images will be jerky.

If the material is recorded in letter box<sup>5</sup>, select **Letter box hint**, then upper and lower black areas are not used for 3:2 pulldown detection, which improves detection precision.

### 3.3.7 Panscan

If you want to create MPEG-2 file for DVD-Video that is displayed panscan on 4:3 TV monitor, select **Panscan** check box.

## 3.4 Setting the encoding range and chapters

For each one of specified input files, encoding range can be specified in frame units.

To specify an encoding range, select a target file and double click it in the window shown in Fig. 3.4 (page 13). Then the setting screen shown in Fig. 3.12 (page 25) is displayed. Set the encoding range in the **Encode range** section in this window.

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<sup>4</sup>The 3:2 pulldown material has only  $48/60 = 4/5$  of information compared to those that are not 3:2 pulldowned. By applying inverse 3:2 pulldown, 1/5 of redundant information can be reduced, thus effective encoding can be achieved.

<sup>5</sup>Letter box is a wide screen confined to 4:3 screen. Since aspect ratios are different, there are black areas on top and bottom of the screen.

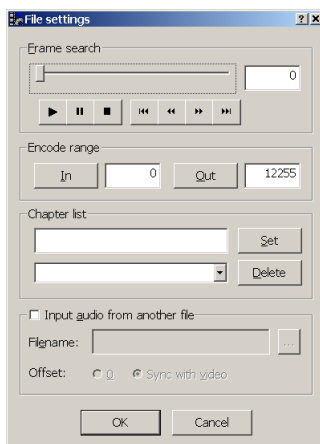


Figure 3.12: File settings screen

- ◆ If “from 0 frame to 300th frame” is specified here, for example, 300 frames, from 0 frame to the 299th frame, are actually encoded. Note that the 300th frame is not encoded.

### 3.4.1 Specifying in timecode

If you prefer to use timecode rather than to use frame number when specifying encoding range, open **Option** window by clicking **Option** menu in the window shown in Fig. 3.4 (page 13) and select **Specify chapter by Timecode**. Then click **OK** button and return to **File settings** window.

### 3.4.2 Setting chapter

Chapter points can be set in **File settings** window shown in Fig. 3.12.

**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,

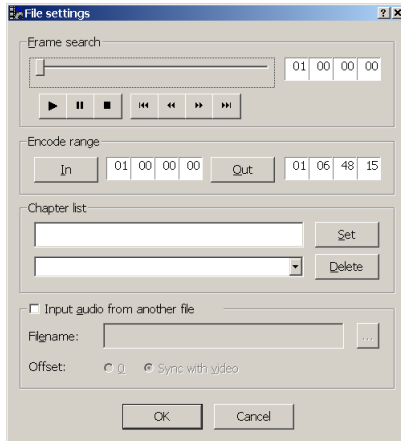


Figure 3.13: File settings screen 2

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.

**Adding a chapter** A frame to be set to a chapter point is searched by moving the slider on the window in Fig. 3.12 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.

## 3.5 Quality settings

By clicking **Quality...** button in **Encode setting** dialog box shown in Fig. 3.7, **Quality settings** dialog box appears. In this window, parameters that influence image quality of encoded stream can be set.

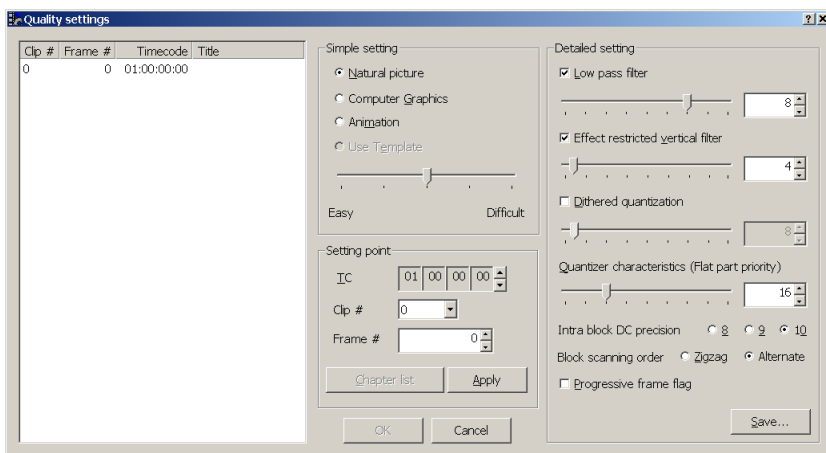


Figure 3.14: Quality settings screen

The parameters you can set here can be confined to specified temporal range. The range can be specified by timecodes or combination of clip numbers and frame numbers.

### 3.5.1 Quality setting method 1 (Simple setting)

Using simple setting, you will get appropriate setting for the material just by setting a type of material and its complexity.

**Material types** Specify the material type from the following three types.

- Natural picture

This setting is appropriate for natural images.

- **Computer Graphics**

This setting is appropriate for smooth images like computer graphics.

- **Animation**

This setting is appropriate for high contrast images such as scanned animation.

**Complexity of material** This is a setting of difficulty for Cinema Craft Encoder SP to encode the material. If you think the footage is easy for Cinema Craft Encoder SP to encode, move the slider to the left, and vice versa.

After the setting, click **Apply** button to update the list on the left. If you want to apply this setting from the specified frame, specify the frame at **Setting point** section before clicking **Apply** button.

### 3.5.2 Quality setting method 2 (Detailed setting)

In detailed setting section, you can specify each filter setting individually.

**Low pass filter** Low pass filter cuts the signal of high frequency information from image. The value you can set is from 2 through 10. As the value becomes large, cut off frequency will be high.

**Effect restricted vertical filter** This is a vertical filter used to reduce noise from image. The range of this filter is from 1 to 64.

- ◆ This filter is unique to Cinema Craft Encoder. It applies vertical filter adaptively.
- ◆ To use this filter on interlaced material, specify 16 or less, otherwise, a movement will be jerky.
- ◆ To use this filter on progressive material or the material that is inverse 3:2 pulldown, up to 32 is recommended.

**Dithered quantization** This filter adds noise before quantization process.

- ◆ This filter is effective when contouring noise<sup>6</sup> is outstanding at fading or gradated area. It smoothes the boundary.
- ◆ **Added noise causes radical quality degradation on an area where contouring noise was not there.** Use this filter moderately. Up to 40 is appropriate for most cases.

**Quantization characteristics** This parameter changes the balance of characteristics at quantization. The range is 0 to 64.

As the value becomes closer to 0, a higher bit amount is allocated to complicated image areas. As the value becomes closer to 64, a higher bit amount is allocated to flat image areas. When the value is 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 64.

- ◆ As the value becomes smaller, the mosquito noise<sup>7</sup> is less outstanding, but the contouring noise<sup>8</sup> is more outstanding.

The optimal setting depends on the footage, but roughly speaking, 16 to 40 is recommended. If the bitrate is relatively high, greater value may cause better result.

**Intra-DC precision** In case of encoding in MPEG-2, the bit precision of the DC coefficient of intra-blocks can be specified. To create DVD-Video, 10 is recommended.

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<sup>6</sup>noise which looks like contour line patterns, which appear in flat and wide areas, such as a dark background

<sup>7</sup>noise causing hazy part along the edges

<sup>8</sup>noise which looks like contour line patterns, which appear in flat and wide areas, such as a dark background

**Block scan order** There are two ways of ordering  $8 \times 8$  blocks. By default, **Alternate** is selected. If the footage is progressive, **Zigzag** may be a better selection.

- ◆ If MPEG-1 is selected, Zigzag scan is used regardless of this setting since MPEG-1 does not support Alternate scan.

**Progressive frame** Select **Progressive frame flag** if the footage is progressive. This setting is valid only for MPEG-2 encoding mode.

After the setting, click **Apply** button to update the list on the left. If you want to apply this setting from the specified frame, specify the frame at **Setting point** section before clicking **Apply** button.

## 3.6 Advanced settings of video encoder

This section describes the advanced settings of the video encoder. The setting screen is displayed by clicking **Video...** button in **Encode setting** window (Fig. 3.7).

### 3.6.1 Setting GOP configuration

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, 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.

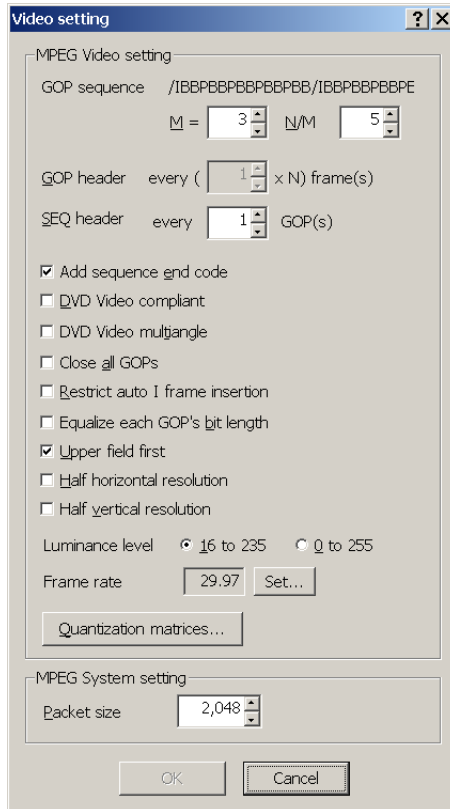


Figure 3.15: Video settings screen

- **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 IDCT<sup>9</sup> 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 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.

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<sup>9</sup>Inverse Discrete Cosine Transform

**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 multiangle DVD, 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.

- ◆ If I frame is inserted, the length of GOP will be changed. If you want to fix the GOP length, select **Restrict auto I frame insertion** check box.
- ◆ If **Restrict auto I frame insertion** is selected, image quality will be slightly degraded. Therefore, do not select this unless necessary.

**Closing all GOPs** If **C**lose **all GOPs** is selected, all GOPs are closed, i.e., individual frames in a GOP do not refer to frames outside the GOP, in which case, each B picture can be correctly decoded even in random access mode.

- ◆ Even if **C**lose **all GOPs** is not selected, the GOP starting from new scene is automatically closed<sup>10</sup>.
- ◆ If **C**lose **all GOPs** is selected, image quality will be slightly degraded. Therefore, do not select this unless necessary.

**Equalize each GOP's bit length** Although slight bitrate movement in CBR is allowed to improve image quality, **E**qualize each GOP's **bit length** option forces the bit amount of each GOP to be equal.

- ◆ If **D**VD video **m**ultiangle is selected, **E**qualize each GOP's **bit length** is automatically selected.

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<sup>10</sup>only when **Restrict auto I frame insertion** is **not** selected.

- ◆ If **Equalize each GOP's bit length** is selected, image quality will be slightly degraded. Therefore, do not select this unless necessary.

### 3.6.2 Adding sequence end code

It is possible to specify whether the sequence end code should be added at the end of an encoded video stream or not. To add the sequence end code, select **Add sequence end code** check box.

### 3.6.3 Specifying field order

If **Upper field first** is selected, the upper field is displayed on a TV monitor 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.

This setting is valid only in MPEG-2 encoding mode.

### 3.6.4 Changing frame size

If **Half horizontal resolution** is selected, 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.

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

### 3.6.5 Setting frame rate

Cinema Craft Encoder SP basically encodes with the same frame rate as that of source file. Although it can be forcibly changed, frame number will be the same when the source is either AVI or still-image sequence. As a result, playback speed (time) will be changed.

### 3.6.6 Creating stream for DVD

If **DVD compliant** is selected, encoder creates a stream that is DVD compliant.

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, the frame size is changed to  $720 \times 480$ , and when the frame rate is 25 fps, the frame size is changed to  $720 \times 576$ . 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 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.

### 3.6.7 DVD Video multiangle

If **DVD Video multiangle** is selected, Video ES that is compatible with multiangle DVD is created.

- ◆ This setting is similar to selecting the following three options.
  - Close all GOPs

- Restrict auto I frame insertion
- Equalize each GOP's bit length

### 3.6.8 Specifying luminance level

Specify the range of luminance level in **Luminance level** in the **Video settings** 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.

### 3.6.9 Setting packet size

The default value of packet size of program streams is 2048 bytes. However, you can change this value.

### 3.6.10 Quantization matrices setting

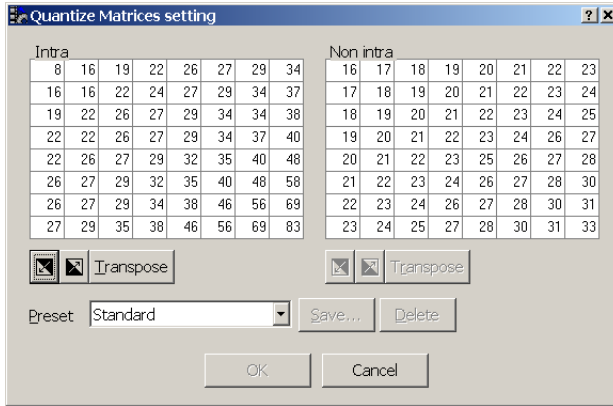



Figure 3.16: Quantization matrices settings screen

By pressing **Matrices...** button in the **Video setting** window, the **Quantize Matrices setting** window opens. In this window, quantization matrices can be set.

There are quantization matrices for intra block and non-intra block. You can set each matrix independently. To set the value, edit the displayed quantization matrices directly.


- ◆ The range you can specify is from 1 through 127<sup>11</sup>.
- ◆ Setting value other than 8 to (1,1) element in intra block violates MPEG standard.

You can also change the value by the following methods:

- By pressing  button,  $(i, j)$  element is copied to  $(j, i)$  element if  $i < j$ .

---

<sup>11</sup>In MPEG standard, upto 255 is allowed, but restricted by the program, you can set only upto 127.

- By pressing  button,  $(i, j)$  element is copied to  $(j, i)$  element if  $i > j$ .
- By pressing **Transpose** button, matrix is transposed, i.e.,  $(i, j)$  element and  $(j, i)$  element are interchanged.

If each  $(i, j)$  element is equal to  $(j, i)$  element in the matrix, above three buttons are disabled. Therefore you can tell whether the matrix is symmetrical or not by checking the three buttons.

Also, Cinema Craft Encoder SP provides several set of quantization matrices. You can select one from the **Preset** combo box. Each set has the following characteristics:

- **Standard** is the standard setting of Cinema Craft Encoder SP. This setting was used for evaluation when the MPEG-2 international standard algorithm was determined. For natural images, this setting is appropriate.
- **MPEG standard** is the default setting of the MPEG-2 international standard. If a relatively high bitrate is used and the image quality must be improved, use of this setting may improve the image quality.
- **Smooth (CG etc.)** is appropriate for CG images with low noise.
- **Very low bitrate** is intended to be used when the bitrate is 4 Mbps or less.
- **Ultra low bitrate** is intended to be used when the bitrate is 2 Mbps or less. But how low you can specify depends on source file.

Other than above preset, you can also save your own setting by pressing **Save...** button and by specifying an appropriate name for the setting. If you want to delete it, select the setting you want to delete and press **Delete** button.

## 3.7 Inverse 3:2 pulldown

### 3.7.1 About 3:2 pulldown

It is necessary to perform frame rate conversion when creating 30 fps (60 fields/sec) NTSC video from 24 fps film. A common method for this conversion is called 3:2 pulldown.

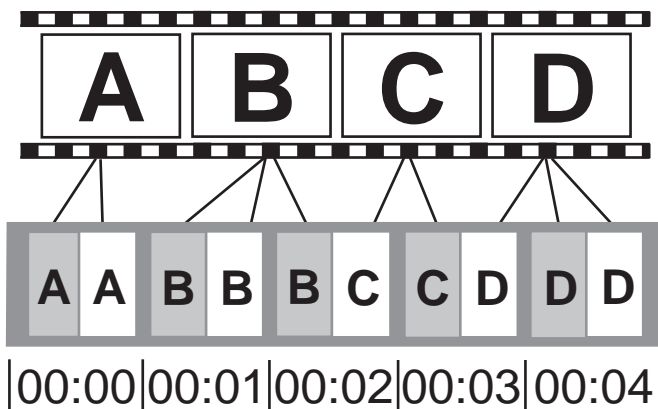


Figure 3.17: 3:2 pulldown

As shown in Fig. 3.17, 3:2 pulldown converts four frames of film into 10 fields. In this figure, the first and the third fields in frame B is the same (this also applies to frame D). What is to be noted is while frame number is 25 percent increased, the amount of information is the same as that of original footage. If an encoder does not recognize this fact, encoding efficiency will be reduced.

The inverse 3:2 pulldown function is a function to avoid such inefficiency. If this function is enabled, Cinema Craft Encoder SP detects repeated fields (in this figure, the third fields of frame B and D), and raises **repeat first field** flag to the frames concerned instead of encoding those fields<sup>12</sup>.

<sup>12</sup>Since those frames are decoded in three fields, the frame rate remains 29.97

Since the fields to be encoded is reduced when inverse 3:2 pulldown is applied, the bit amount of each field will be increased. Also, since it is far more effective to encode progressive pictures than to encode interlaced video, more than 25 percent improvement of image quality is expected.

### 3.7.2 Editing 3:2 pulldown list

After encoding with **3:2 pulldown detection** selected in **Encode setting** dialog box (Fig. 3.7), click **Setting...** button to open **3:2 pulldown list** window. In this window, the result of 3:2 pulldown detection is shown.

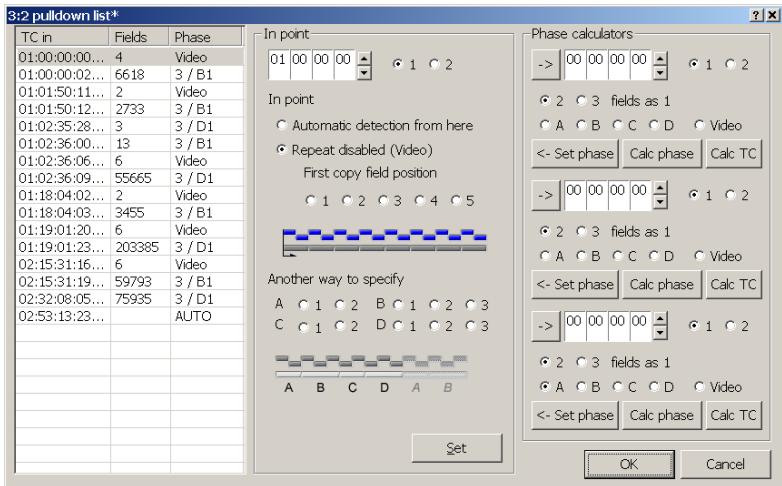


Figure 3.18: 3:2 pulldown list screen

You can modify the pulldown list in this window.

◆ Users of Adobe Premiere plug-in version should load pulldown list file (\*.pdn) by clicking **Load...** button to view or edit the fps even after inverse 3:2 pulldown is applied.

pulldown list.

### Modifying pulldown list

- ① Select the point to be modified from the list. Then the timecode is set as *in point*.
- ② Specify the pulldown phase at that point. There are two ways of specifying pulldown phase.
  - Specifying by field order and the position of copy field  
Select the first field at *in point* from field 1 and field 2, and specify the location of the first copy field from the *in point*.
  - Specifying by selecting from A1 to D3  
Specify the pulldown phase by selecting predefined pulldown phase named from A1 to D3.
- ③ Click **Set** button to to save the change.

To delete unnecessary item from the list, select the item and press **Delete** key.

### Caution when applying inverse 3:2 pulldown

- The algorithm of Cinema Craft Encoder SP's pulldown detection is so sophisticated that most of the case when the material is properly 3:2 pulldowned, it is *not* necessary to correct or modify the pulldown result.
- The error of pulldown detection causes jerky movement of decoded images. If this problem happens everywhere on the decoded stream, the material does not seem to suit for pulldown detection. In that case, clear the **3:2 pulldown detection** check box and encode again.
- Do not apply filters to the material before 3:2 pulldown, otherwise the precision of 3:2 pulldown detection will be dropped. However, there is no problem to use Cinema Craft Encoder

SP's internal filters because those filters are applied after 3:2 pulldown detection.

- If the original images are compressed, deterioration caused by the compression affects the precision of pulldown detection. Therefore do not perform heavy compression over the footage to be encoded. For example, avoid using codec whose compression ratio is higher than DV codec. Also avoid recompression during video editing.
- When encoding in multipass VBR mode, make sure to **recreate video information file if you manually changed inverse 3:2 pulldown setting**. If an existing video information file is used, an error message like Fig. 3.19 is shown.

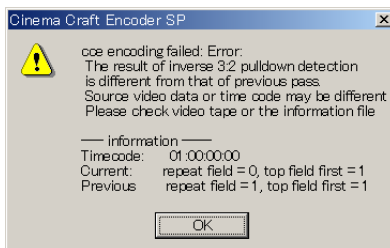


Figure 3.19: Inverse 3:2 pulldown error

- Chapter setting affects 3:2 pulldown detection because the adjustment is made so that the first field of chapter frame is displayed first. If the pulldown sequence is disturbed because of the chapter, move the chapter. However, the influence on image quality is usually ignorable.

## 3.8 Advanced VBR setting


When you select Multipass VBR, you can specify advanced setting such as changing bitrate of only certain area, or changing bitrate

movement.

To specify such settings, click **Bit allocation...** button in the **Encode setting** screen shown in Fig. 3.7, and the screen shown in Fig. 3.20 is displayed.

- ◆ Before opening this dialog box, a video information file must be created. Also, **MPEG-2 (ES, Multipass VBR)** must be selected 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.

### 3.8.1 Bitrate/Quantization scale graph

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. 3.21. To display bitrates, select **Bitrate** at the right of the graph. Each white line,

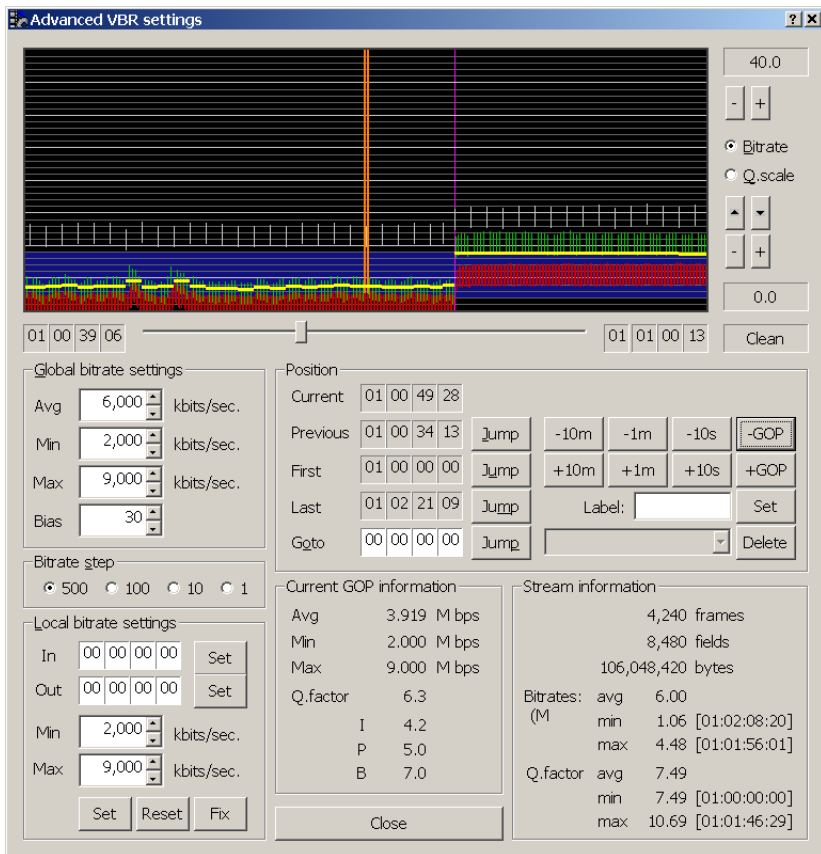


Figure 3.20: Advanced VBR setting screen

green line, and red line of the graph indicate the bitrate of I picture, P picture, and B picture, respectively. And yellow line indicates the average bitrate of GOP. 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.

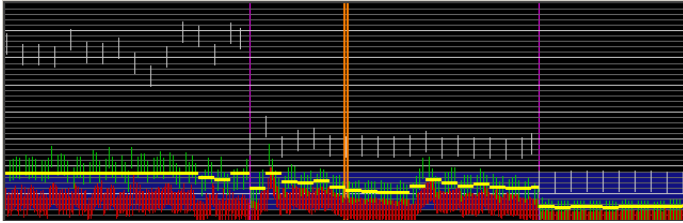


Figure 3.21: Bitrate graph

### Quantization scale display

The quantization scale is displayed in the graph shown in Fig. 3.22. To display quantization scales, select **Q.scale** at the right of the graph. Just like the case of the bitrate display, each white line, green line, and red line of the graph indicate the quantization scale of I picture, P picture, and B picture, respectively. And yellow line indicates the average quantization scale of GOP. 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.

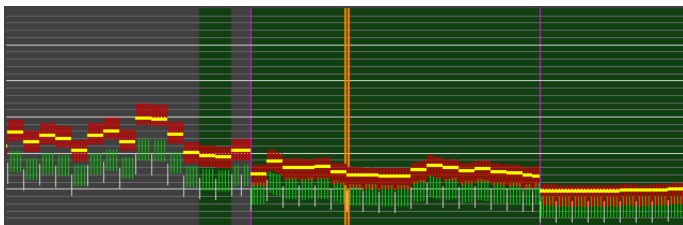


Figure 3.22: Quantization scale graph

### 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  $\blacktriangle$  and  $\blacktriangledown$  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. In this case, bit allocation planning currently in-calculation is automatically discarded and calculation starts again.

### 3.8.2 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.

#### Changing bit allocation balance

Cinema Craft Encoder SP 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 is the bitrate movement, and vice versa.

Please refer Fig. A.20–A.23 (pages 84–86) to see the difference of movement of bitrate and quantization scale when *bias* is changed. (In the figures, thickest line indicates bitrate, the others indicate quantization scale of I picture, P picture, and B picture in the order of thickness.

- ☞ When the distortion of complex part is more outstanding than that of flat part, decreasing **Bias** value may improve image quality of complex part. On the contrary, if the distortion of flat part is more outstanding, increasing **Bias** value may improve the quality of that part. Although similar adjustments are possible by using **Local bitrate setting** described below, this function is more effective because it can change bit allocation of entire part at once.

### 3.8.3 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. Specify the range of 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 the 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 minimal allocation change may be made.

### 3.8.4 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** field. To return to that timecode, press the **Jump** button next to the field.

- ③ To move to the first or last position, press the **Jump** button next to the **First** field or **Last** 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 **Current** 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 **Label**, and press the **Set** 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 **Delete** button.

### 3.8.5 GOP information on current timecode

Information on GOP in the currently selected timecode is displayed in the **Current GOP information** frame.

The bitrate of the GOP is written in **Average**. **Minimum** and **Maximum** 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.

### 3.8.6 Stream information

Information on the stream is displayed in **Stream information**. 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.

## 3.9 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 shown in Fig. 3.23. To display this window, press the **Audio** button in the **Encoding setting** screen shown in Fig. 3.7 (page 16).

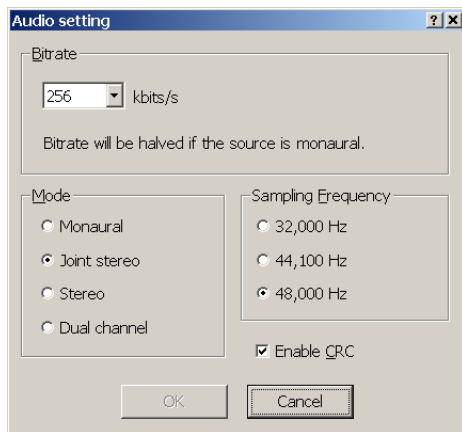


Figure 3.23: Audio setting screen

### 3.9.1 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).

### 3.9.2 Setting channel mode

Set the channel mode when an MPEG Audio stream is created. You can select 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 dual channel mode.

### 3.9.3 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 default. Since sound quality deteriorates, do not convert the sampling frequency unless necessary.

### 3.9.4 Adding CRC data

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



# Chapter 4

## Optional settings

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

### 4.1 Setting default output file destination

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

#### How to set default output file destination

- ① Select **Outputs** from **Option** menu 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.

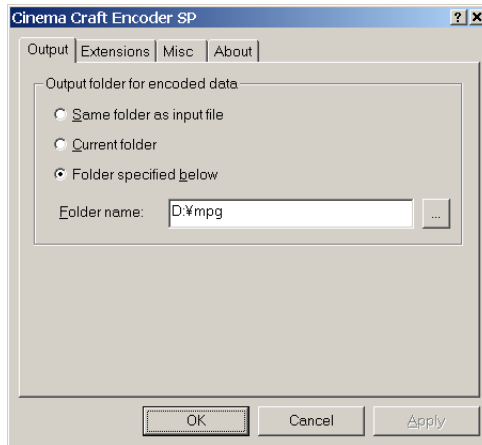


Figure 4.1: Output destination setting

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

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

## 4.2 Setting extensions

Extensions 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 CD

- Super Video CD
- Video information file

### How to set extensions

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

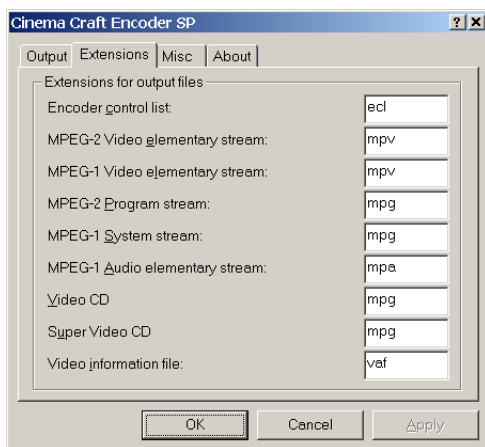


Figure 4.2: Extensions setting

## 4.3 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 check boxes, users can specify that the above processes will not be performed. Normally, these settings need not be changed.

### How to set AVI decoding format

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

## 4.4 QuickTime file reading method

Since the frame rate of QuickTime file may change in the middle of the stream, some frames may be used more than twice or may not be used at all when QuickTime files are used as input. If you want to avoid this, select **Use GetMovieNextInterestingTime function** check box. Please note that if this is selected, some QuickTime files may not be properly read.

## 4.5 Overlapped Output

You can select Overlapped Output for outputting MPEG streams. If you select Overlapped Output, file writing may be faster.

### How to set Overlapped Output

- ① Select **Misc...** from **Option** menu in the main window of Cinema Craft Encoder SP.
- ② Set the check box of **Use Overlapped Output**.

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

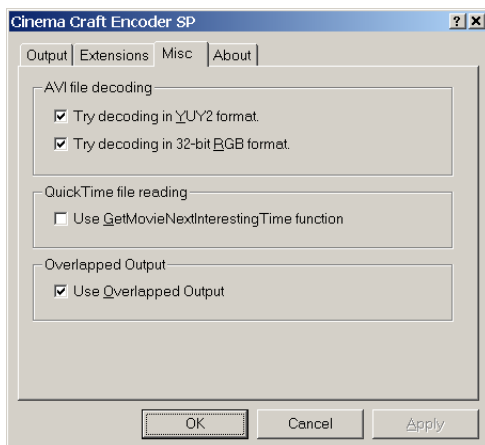


Figure 4.3: Misc settings



# Chapter 5

## Template settings

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

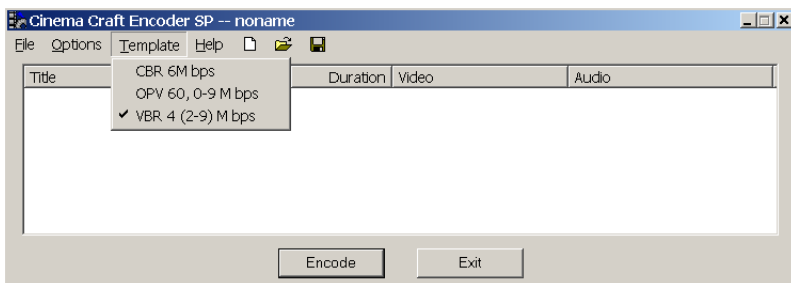


Figure 5.1: When 3 templates are set

In Fig. 5.1, three templates are registered. The template with a check mark (✓) is the currently selected template.

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

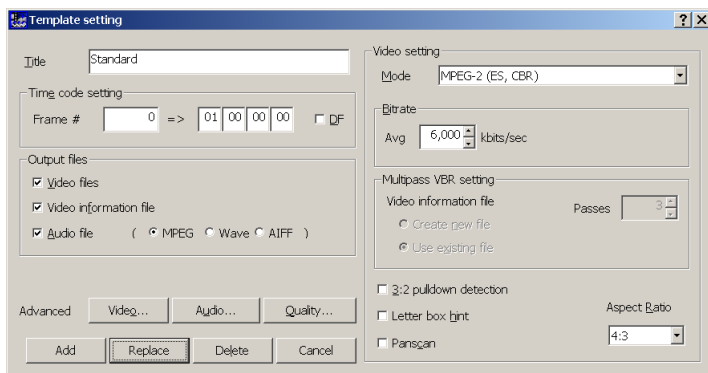


Figure 5.2: Template setting screen

## 5.1 Creating template

To create a template follow the instructions below:

- ① Select **Standard** (or other) from **Template** menu in the main window of Cinema Craft Encoder SP. Then a dialog box shown in Fig. 5.2 will displayed.
- ② Set 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.

## 5.2 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. 5.2 will displayed.
- ② Set parameters in the dialog box.

- ③ Press the **Replace** button to save the setting.

If you do not want to overwrite the current setting, press **Add** button instead of **Replace** button. In this case, change the title of the template.

### 5.2.1 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. 5.2 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 6

## 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 executed<sup>1</sup>.

### 6.1 Creating encoder control list

Encoder control list is created by the following procedure.

**Selecting a file to be encoded** Startup Windows Explorer, and select movie files to be encoded. Then drag and drop the selected file onto the main window of Cinema Craft Encoder SP.

☞ If folder is dropped onto the window, all files in the folder are added to the list.

**Setting encoding parameters** To change parameters used for encoding, select the item you want to change on the list and double click it. Then a dialog box shown in Fig. 6.1 will appear. Specify a title,

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<sup>1</sup>Cinema 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.

output file, encoding mode and bitrates, etc. here. After setting is over, press the **OK** button to return to the original screen.

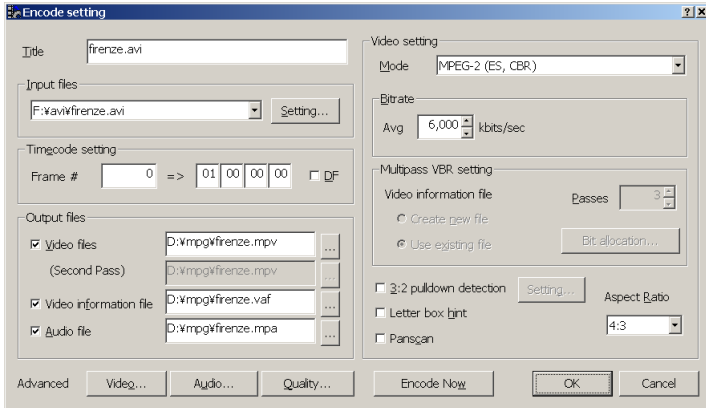



Figure 6.1: Encoding setting screen

☞ You can set default value for each parameter by using template function. To use template function, refer to **Chapter 5 Template settings** (page 59).


**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.

### 6.1.1 Editing encoder control list

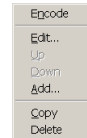
A saved encoder control list can be read and edited.

**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.



- **E**ncode Encodes the item(s) selected in the encoder control list.
- **E**dit... Edits the item selected in the encoder control list.
- **U**p Moves the item selected in the encoder control list up one position. This menu cannot be used if the selected item is already at the top most.
- **D**own Moves the item selected in the encoder control list down one position. This menu cannot be used if the selected item is already at the bottom most.
- **A**dd... 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.

- **C**opy Copies the item selected in the encoder control list.
- **D**elete 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**elete can be executed.

## 6.2 Executing encoding control list

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

# Chapter 7

## Uninstallation

Uninstallation of Cinema Craft Encoder SP is executed as follows.

- ① Open the control panel.
  - ② Start up **Add/Remove Programs** applet.
  - ③ Select “Cinema Craft Encoder SP” from the list box in the **Install/Uninstall** page, and click 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, run `hinstall.exe -remove` in the folder where Cinema Craft Encoder SP is installed.



# Chapter 8

## Adobe Premiere plug-in

This chapter describes about Cinema Craft Encoder SP for Adobe Premiere<sup>1</sup>.

### 8.1 Output MPEG file

The procedure to output MPEG files from Adobe Premiere via Cinema Craft Encoder SP is as follows.

- ① From **File** menu, select **Export Clip** or **Export Timeline**, then select **Movie...** to open **Export Movie** dialog box.
- ② Click **Settings...** button and open **Movie Export Settings** dialog box.
- ③ From the **File Type** list box, select **CinemaCraft MPEG-2/1**.
- ④ Click **Advanced Settings** button to open the window of Cinema Craft Encoder SP.

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<sup>1</sup>To call Cinema Craft Encoder SP from Adobe Premiere, you need to install Cinema Craft Encoder SP for Adobe Premiere.

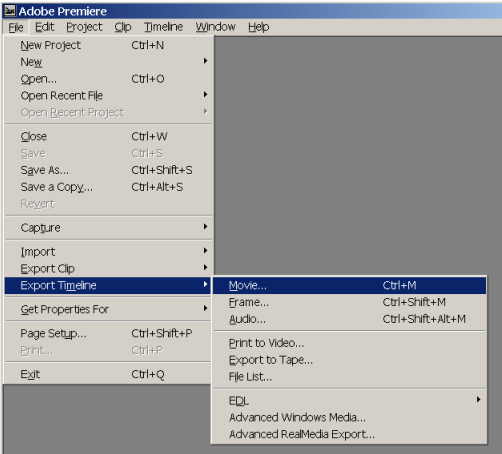


Figure 8.1: Movie Export menu

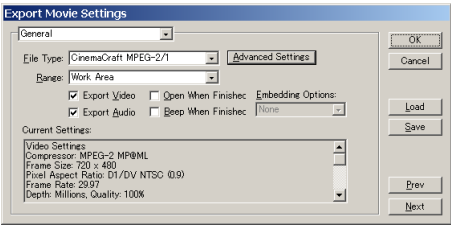


Figure 8.2: Movie Export Settings window

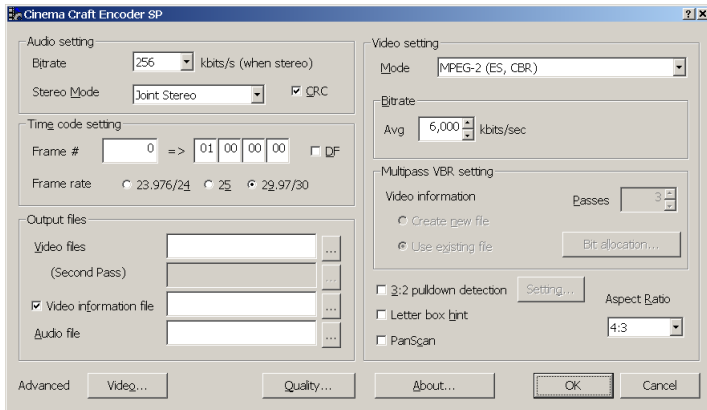


Figure 8.3: Plug-in setting screen

- ⑤ After all the parameters has been set, click **OK** button to close the window.
- ⑥ Click **OK** button to close **Movie Export Settings** window.
- ⑦ After returned to **Export Movie** window, click **Save** button, encoding then starts.



# Appendix A

## Bitrate and Quantization scale

Bitrate and quantization scale are deeply related. In this appendix, we will see a number of graphs that shows these movements at several encoding modes and parameters applied on the same material.

In the graphs shown below, horizontal axis indicates time (frames) and vertical axis indicates bitrate (in Mbps). The thickest line indicates bitrate, the other lines indicate quantization scale of I picture, P picture, and B picture in the order of thickness.

### A.2 CBR

Fig. A.4 to Fig. A.7 are the graphs of CBR with different bitrates. The nearly flat bitrate graphs indicate that the bitrates are almost constant. Instead, the graphs of quantization scales moves widely. Since complex scene has more information than that of simple scene, it is necessary to change quantization scale in order to hold bitrate.

It is easy to decrease bitrate – increasing quantization scale is enough, but how we can increase bitrate when the scene is very simple, in which case, decreasing quantization scale is not enough.

In the graph, the last 400 frames is one of the example. The part is so simple that even in 4.0 Mbps, quantization scale is quite low. To

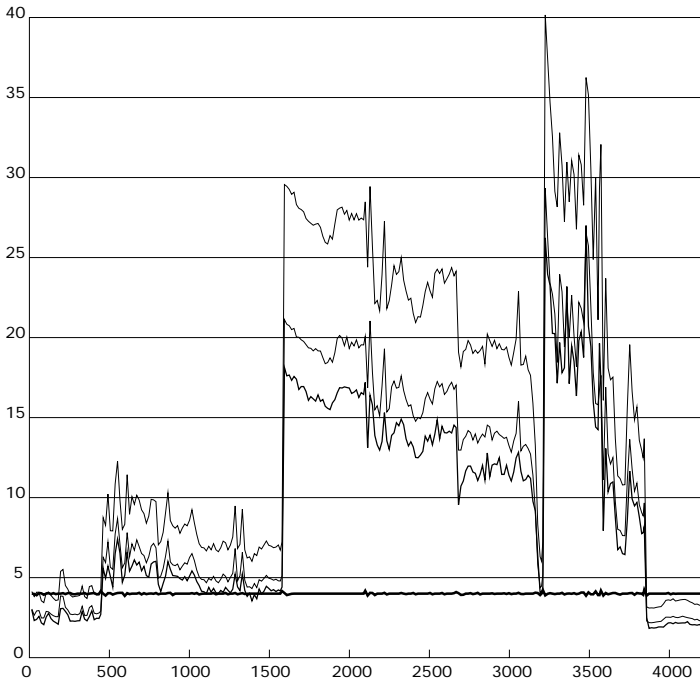


Figure A.4: CBR 4.0 Mbps

raise bitrate of such part, we need to stuff the stream with meaningless data.

### A.3 One-pass VBR

Fig. A.8 to Fig. A.11 are the graphs of one pass VBR with different Q.factors. (The minimum and maximum bitrate are set to 0 Mbps and 15 Mbps, respectively.)

Contrary to the graphs of CBR, the quantization scales are almost

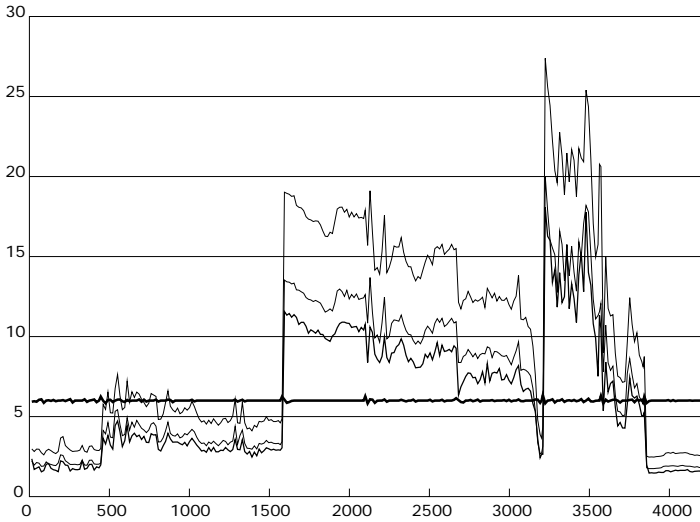


Figure A.5: CBR 6.0 Mbps

flat but bitrates moves widely<sup>2</sup>.

Interestingly enough, the movement of bitrate in the graphs of one pass VBR resembles that of quantization scale in the graphs of CBR, which indicates that bitrate and quantization scale are strongly related.

Fig. A.12 to Fig. A.15 are the graphs of one pass VBR with different Q.factors. (The minimum and maximum bitrate are set to 2 Mbps and 8 Mbps, respectively.)

This time, the quantization scales are widely moving. For example, in Fig. A.12, the quantization scales from 1600th frame to 3800th frame is widely moving. This indicates that the quantization scales are tuned so that bitrate does not exceed upper bound of 8 Mbps.

---

<sup>2</sup>The movement of quantization scales from 3200th to 3600th frames in Fig. A.8 indicates that the limiter has invoked so as not to exceed 15 Mbps boundary.

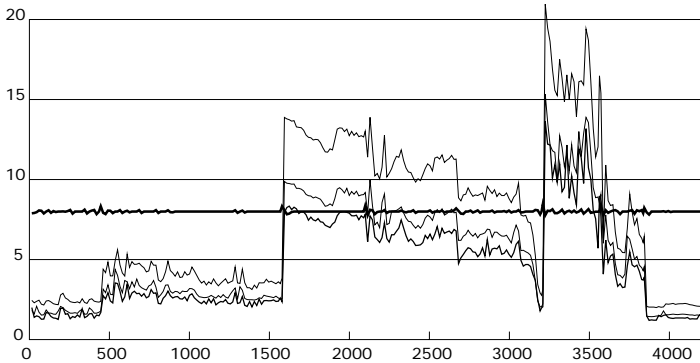


Figure A.6: CBR 8.0 Mbps

Although the quantization scale after 3800th frame is also moving, this was done so that bitrate does not fall below the lower bound of 2 Mbps.

The movement of quantization scales in Fig. A.14 is much less than that in Fig. A.12. This indicates that in most of the part, bitrates falls between 2 Mbps and 8 Mbps without changing quantization scales. It means that it is appropriate to use 80 for `Q.factor` in this case.

## A.4 Multipass VBR

Fig. A.16 to Fig. A.19 are the graphs of multipass VBR with different minimum and maximum bitrates. The average bitrate is 6 Mbps for each case. (Each is encoded in 3 passes.)

In Fig. A.16 whose minimum and maximum bitrate are 0 Mbps and 12 Mbps, respectively, the movements of bitrate and quantization scales are similar.

In Fig. A.17 where minimum and maximum bitrate are 2 Mbps and 10 Mbps, respectively, the quantization scales between 3200th frame and 3500th frame are outstanding, so that the image quality of this area does not seem to be good enough. Also in Fig. A.18, the

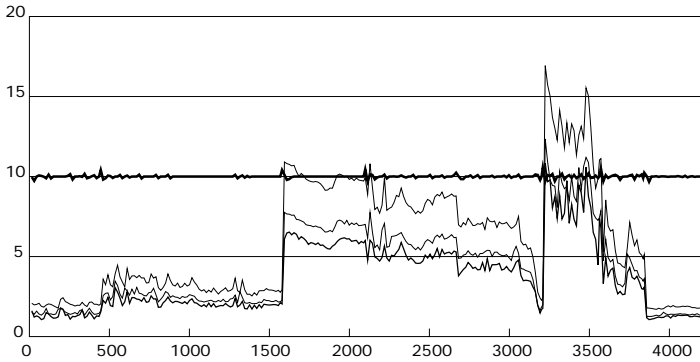


Figure A.7: CBR 10.0 Mbps

quantization scales between 1600th frame and 2700 frames are high. For those intervals, it is better increasing bitrate a bit in order to keep image quality.

The Fig. A.19 is an example gone to the extreme, where both minimum and maximum bitrate are set to 6 Mbps. In this case, bitrate is totally flat and the graph quite resembles Fig. A.5. Unlike in Fig. A.5 where bitrate is slightly moving, the bitrate of Fig. A.19 is perfectly flat, which is due to multipass encoding<sup>3</sup>.

The reason of the movement of quantization scales in Fig. A.18 and Fig. A.19 is there are severe bitrate conditions. But why is the movement of quantization scales in Fig. A.16 ? To keep the same image quality, should the quantization scales not be constant ?

Theoretically yes, but actually, image distortion is more visible in simple scene than that in complex scene. So Cinema Craft Encoder SP changes the quantization scales so that one can feel the distortion is constant for each scenes.

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<sup>3</sup>Although the bitrate of VBR stream whose maximum and minimum bitrate are the same will be constant bitrate, the stream format is VBR so it cannot be as same as that of CBR. Regarding image quality, VBR stream has advantage because there is no VBV restriction in VBR.

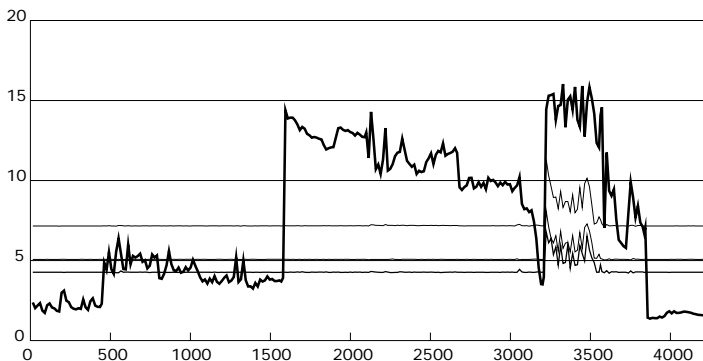


Figure A.8: OPV 40 (min 0.0 Mbps, max 15.0 Mbps)

However, the feeling of distortion is subjective to the certain extent and there may be a difference of this feeling. To compensate this difference, Cinema Craft Encoder SP provides another parameter named *bias* only for multipass VBR<sup>4</sup>. By changing this parameter, you can change the characteristics of rate control of Cinema Craft Encoder SP.

Fig. A.20 to Fig. A.23 are the graphs of multipass VBR whose average bitrate, minimum bitrate, maximum bitrate are 6 Mbps, 0 Mbps, and 15 Mbps, respectively, and only *bias* is different. (Each is encoded 3 passes.)

If the value of *bias* is small, bitrate movement will be large so it will be like VBR. On the contrary, if the value of *bias* is large, bitrate movement will be small so it will be much like CBR. You can confirm these things by looking at the four graphs. By default, the value of *bias* is set to 30. If you feel that the movement of bitrate is too much or too little, change this value and try again.

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<sup>4</sup>This parameter is unique to Cinema Craft Encoder SP so it is not defined in MPEG standard.

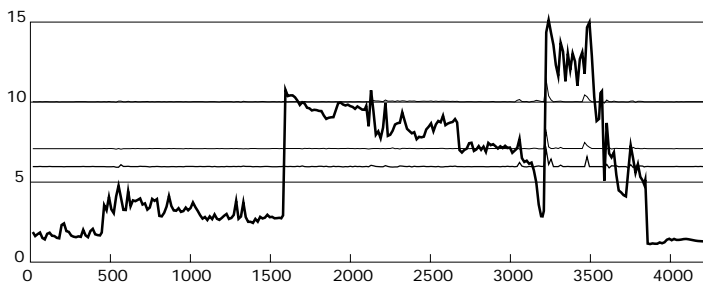


Figure A.9: OPV 60 (min 0.0 Mbps, max 15.0 Mbps)

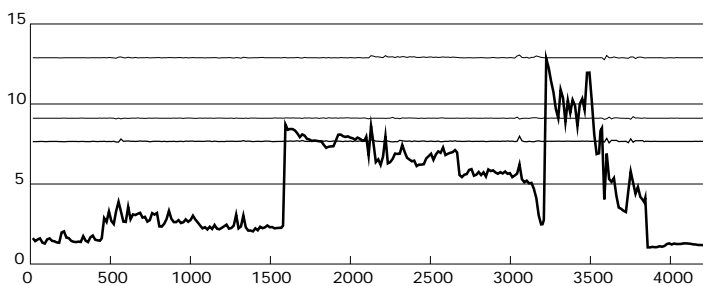


Figure A.10: OPV 80 (min 0.0 Mbps, max 15.0 Mbps)

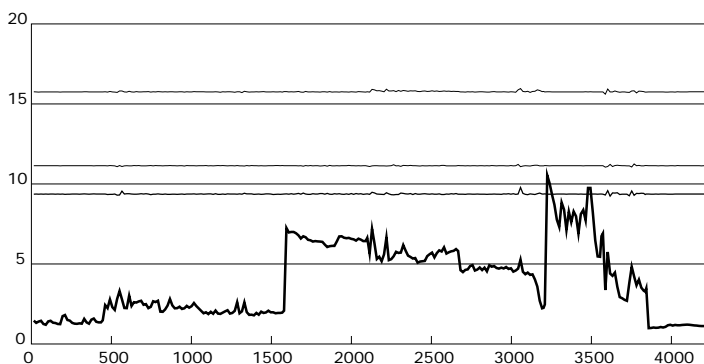


Figure A.11: OPV 100 (min 0.0 Mbps, max 15.0 Mbps)

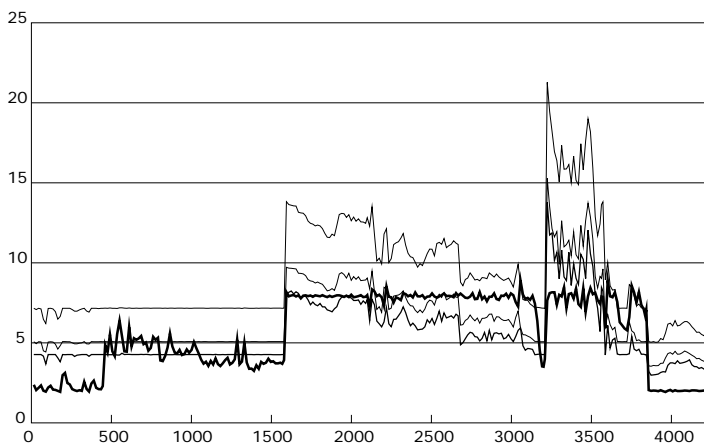


Figure A.12: OPV 40 (min 2.0 Mbps, max 8.0 Mbps)

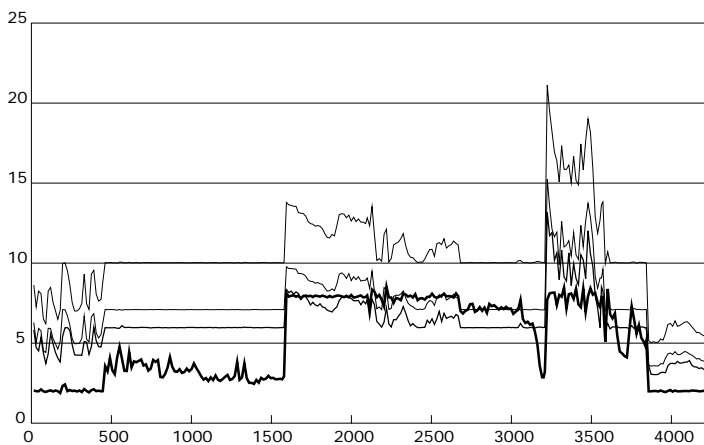


Figure A.13: OPV 60 (min 2.0 Mbps, max 8.0 Mbps)

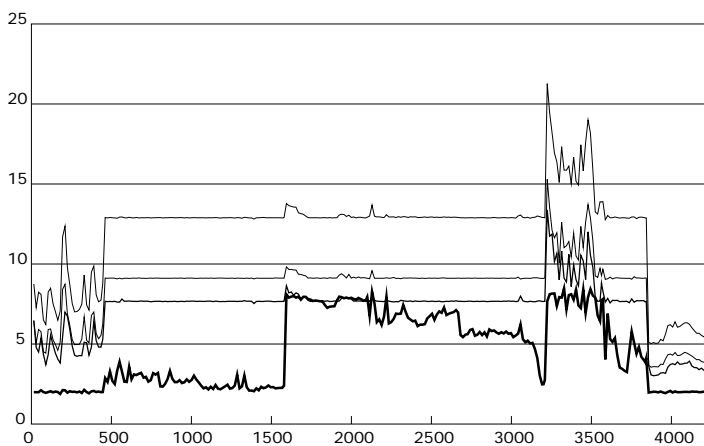


Figure A.14: OPV 80 (min 2.0 Mbps, max 8.0 Mbps)

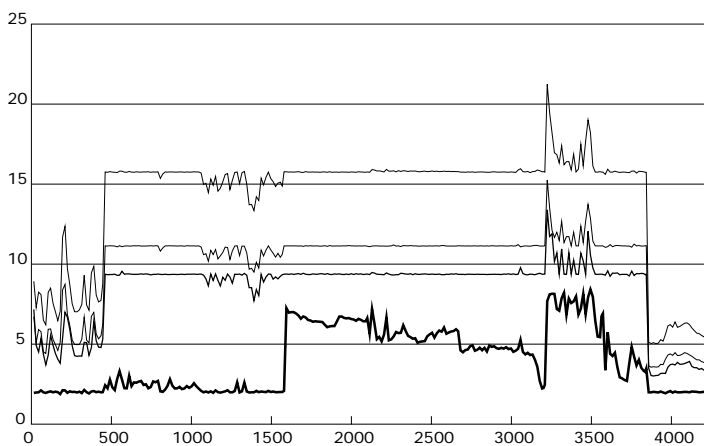


Figure A.15: OPV 100 (min 2.0 Mbps, max 8.0 Mbps)

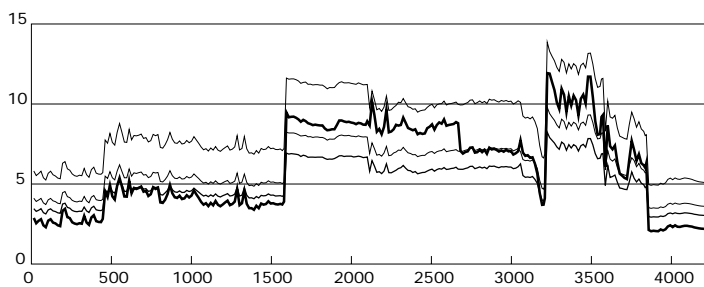


Figure A.16: VBR 6.0 (min 0.0, max 12.0) Mbps

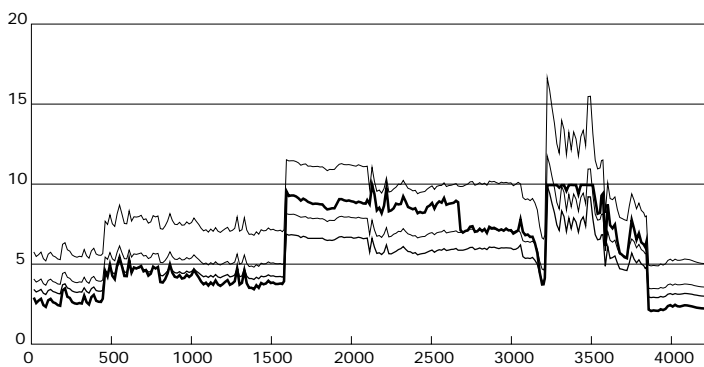


Figure A.17: VBR 6.0 (min 2.0, max 10.0) Mbps

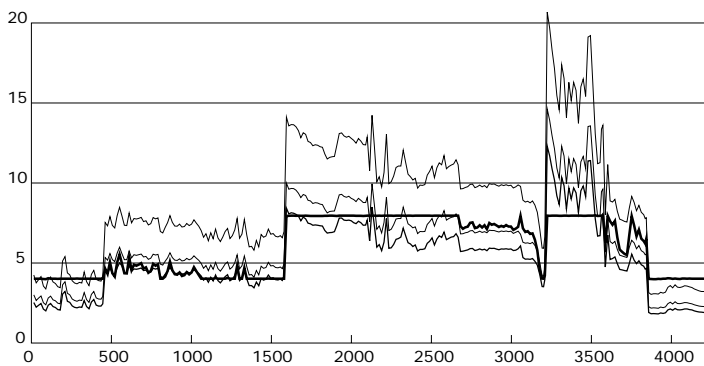


Figure A.18: VBR 6.0 (min 4.0, max 8.0) Mbps

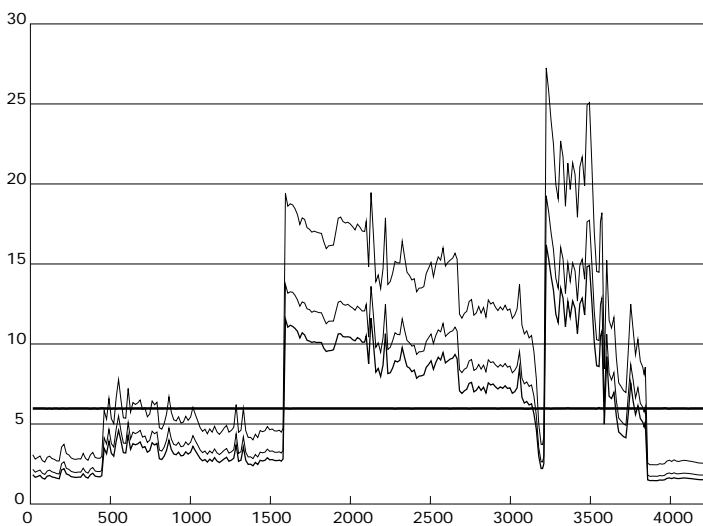


Figure A.19: VBR 6.0 (min 6.0, max 6.0) Mbps

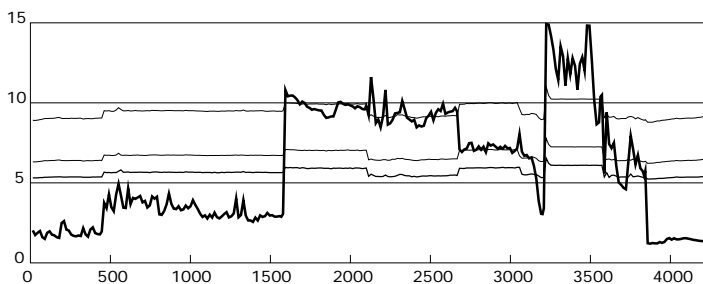


Figure A.20: VBR 6.0 (min 0.0, max 15.0) Mbps, Bias 0

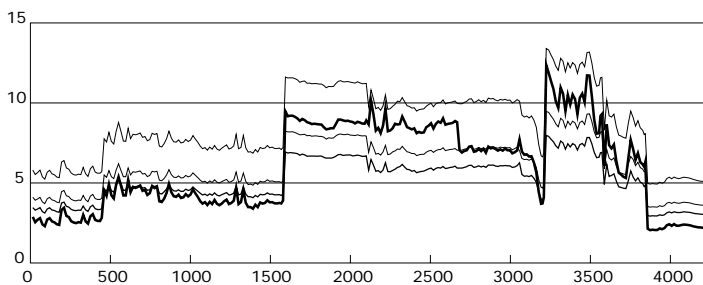


Figure A.21: VBR 6.0 (min 0.0, max 15.0) Mbps, Bias 30

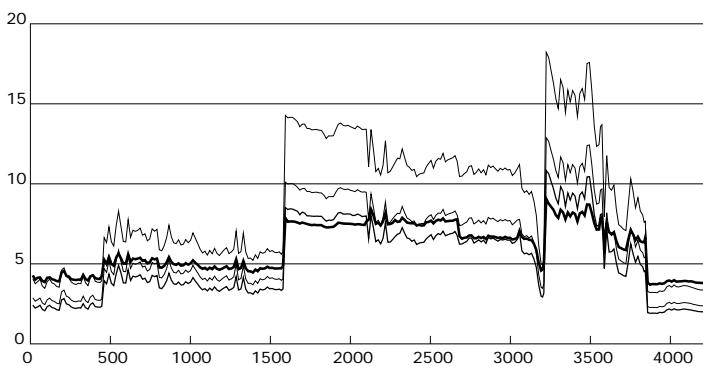


Figure A.22: VBR 6.0 (min 0.0, max 15.0) Mbps, Bias 60

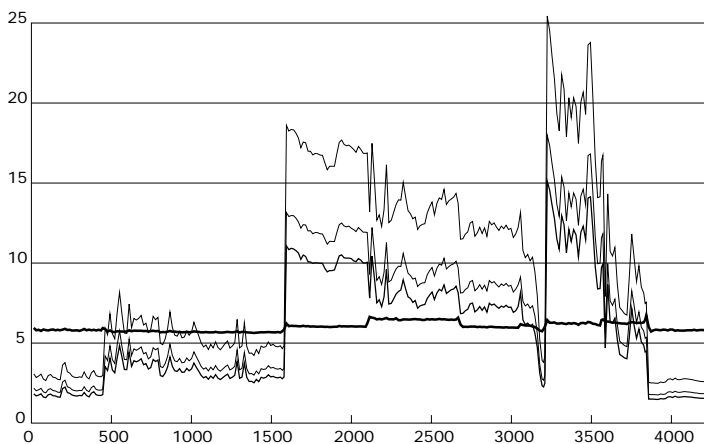


Figure A.23: VBR 6.0 (min 0.0, max 15.0) Mbps, Bias 90