

Industry standard for MPEG-2 encoding for DVD

CINEMA CRAFT[®]
encoder mp

User's Guide

Version 1.09

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Cinema Craft Encoder MP User's Guide
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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.

1 Introduction

Cinema Craft Encoder MP is a high quality MPEG-2 video encoder. This manual explains the functions and usage of Cinema Craft Encoder MP.

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

1.1 Operation environment

The following hardware, operating system and software are required to use Cinema Craft Encoder MP.

- Intel Mac
- 2GB RAM
- Mac OS X 10.5
- Apple Compressor 3

1.2 Specifications

Compression method

ISO/IEC 13818-2 | ITU-T Rec. H.262 (MP@ML, MP@HL)

Output video format

Bitrate	max. 15 Mbits/sec (MP@ML) max. 40 Mbits/sec (MP@HL) Constant Bitrate (CBR) (One pass) Constant Bitrate (CBR) (Multipass) Variable Bitrate (VBR) (Multipass)
Frame size	max. 720 × 576
Frame rate	23.976/24/25/29.97/30 (frames/sec)
Aspect ratio	Square pixel, 4:3, 16:9 or 2.21:1
GOP length	max. N:15, M:3

2 Setup

2.1 Installing HASP

Before connecting HASP protection key, install HASP driver included in the disk image of Cinema Craft Encoder MP. To install the driver, double click **Install HASP USB Driver** and follow the instructions of the installer. After the driver is installed, connect HASP key.

2.2 Installing the software

Before installing Cinema Craft Encoder MP, make sure Apple Compressor 3 is installed. If you have installed a prior version of Cinema Craft Encoder MP before, reset the background processing or restart operating system before installing Cinema Craft Encoder MP.



To install Cinema Craft Encoder MP, double click **Cinema Craft Encoder MP** in the disk image of Cinema Craft Encoder MP. The installer copies Cinema Craft Encoder MP to the following location:

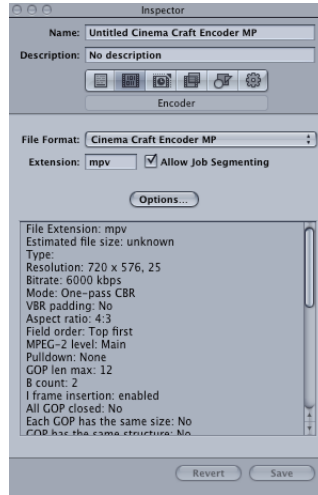
/Library/Application Support/Apple Qmaster

3 Using the Encoder

Start Compressor 3. Then click “+” button in the Settings window and select Cinema Craft Encoder MP.

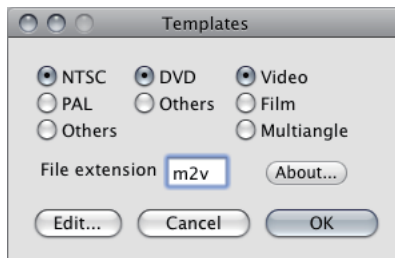


Click “+” button and then select **Cinema Craft Encoder MP**. Then Cinema Craft Encoder MP will appear in Inspector window shown right.



Inspector window

In the Inspector window, click Options button to open Templates window. Select a template and then click Edit button to set parameters such as bitrate. And then click OK to save the setting. After the parameter setting window is closed, enter a name and description for the setting in the Inspector window and then click save. Then the setting appears under the Custom folder in the Settings window of Compressor 3.



Templates window

4 Templates

Cinema Craft Encoder MP has several pre-defined parameter sets called templates. When you select one of the templates and click **Edit** button, appropriate setting window with appropriate parameters appears. For example, if you select **NTSC-DVD-Video**, frame size is set to 720×480 , frame rate is set to 29.97, maximum bitrate is limited to 9800 kbps, and so on.

The followings are actual pre-defined parameters and alternatives (in parenthesis) for each template:

4.1 PAL vs. NTSC

	PAL	NTSC
frame size	720×576 (704×576)	720×480 (704×480)
frame rate	25	29.97 ¹
GOP length	12	15
film mode	no pulldown	2:3 (3:2) pulldown

4.2 Video vs. Film vs. Multiangle

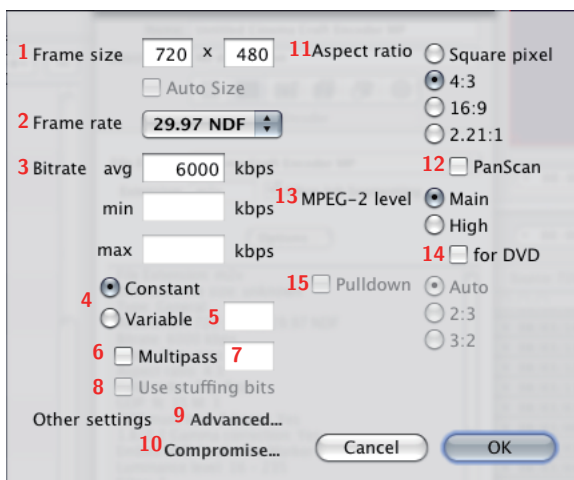
	Video	Film	Multiangle
encoding mode	CBR (VBR)	CBR (VBR)	CBR only
progressive frame flag	off	on	off
auto I frame insertion	on (off)	on (off)	off
all closed GOP	off (on)	off (on)	on
equalize GOP size	off (on)	off (on)	on
fix GOP structure	off (on)	off (on)	on

¹Input frame rate of **NTSC-Film** should be 23.976.

5 Parameter details

In this section is described each parameter for Cinema Craft Encoder MP.

5.1 Main window



1. Frame size

Enter frame size of the source movie. If the size specified here is different from that of original source, Compressor 3 resizes the frame before feeding it to Cinema Craft Encoder MP. About resizing, please refer to 5.5 Caution when changing frame size (page 15) .

2. Frame rate

Specify frame rate of the source movie. If the rate specified here is different from that of original source, Compressor 3 changes the frame rate before feeding it to Cinema Craft Encoder MP.

3. Bitrate

Bitrate is the amount of bits per unit of time, and **kbps** stands for **kilo bits per second**. The size of output file is determined by the bitrate and the length of source movie. For example,

if the average bitrate is 6,000 kbps and the movie length is 2 hours, the file size of output file is:

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

4. Constant/Variable

When **Constant** is selected, the bitrate will be kept constant throughout the output file. Otherwise, bitrate varies while encoding. The purpose of variable bitrate is to keep the picture quality constant. When you select variable bitrate, you should also specify minimum and maximum bitrate as well as average bitrate.

5. Bitrate constancy

This parameter specifies how constant the bitrate of output file should be. It is valid only when **Variable** is selected. If this value is 100, the bitrate will be constant though the output file is generated as variable bitrate stream.

6. Multipass

If **Multipass** is selected, **Cinema Craft Encoder MP** uses multiple passes to generate an MPEG-2 file. Multipass encoding is needed to create variable bitrate stream. When **Constant** is selected, multipass encoding is not required unless the output file is used for multiangle DVD.

7. Passes

Specify a number of encoding passes. This value is valid only when **Multipass** is selected.

8. Use stuffing bits

The stuffing bits are used when the source movie is quite simple and cannot raise bitrate to the specified level even if the quantization scale is minimized. When **Constant** is selected, stuffing bits is used as needed regardless of this setting. On the other hand, when **Variable** is selected, stuffing bits is used only if this option is selected.

9. Advanced...

When this button is clicked, **Advanced settings** window opens. See page 10 for details.

10. Compromise...

When this button is clicked, DVD player issues window opens. See page 14 for details.

11. Aspect ratio

Aspect ratio is a ratio of width to height. This setting is saved in MPEG-2 file and used at playback time. Players resize the screen size to meet the specified aspect ratio. Note that encoder does not perform frame size conversion even if the aspect ratio of the source movie does not match the aspect ratio specified here. Suppose the frame size of source movie is 720×480 and specified aspect ratio is 4:3. In this case aspect ratio of 720×480 is 3:2, which does not match the specified aspect ratio 4:3. But encoder does not convert the frame size to, say, 640×480 before encoding. It's the player's task to convert the frame size to meet the specified aspect ratio.

12. PanScan

If PanScan is specified, DVD players shows 16:9 screen on 4:3 monitors in panscan mode, in which some portions of the left and right areas of the screen are cut to fit the monitor size. PanScan can be selected only when 4:3 is selected for aspect ratio.

13. MPEG-2 level

When Main level is selected, maximum bitrate is 15,000 kbps. And when High is selected, you can specify up to 40,000 kbps. Note that DVD supports only up to 9,800 kbps and does not support high level.

14. for DVD

Outputs DVD compatible stream. When Variable is selected, maximum bitrate written to the sequence header of output MPEG file will always be 9,800 kbps though actual maximum bitrate does not exceed the bitrate you specified.

15. Pulldown

Select 2:3 or 3:2 pulldown to convert frame rate from 24 (23.976) fps to 30 (29.97) fps.

5.2 About pulldown

The pulldown function is provided to convert 24 (23.976) fps source material into 30 (29.97) fps NTSC video. When **Pulldown** is selected, field count will be increased by 5/4 without changing the frame count. In MPEG, pulldown is achieved by using the following three flags.

- Progressive Frame flag
- Top Field First flag
- Repeat First Field flag

Progressive Frame flag

The source file to which pulldown is applied must be progressive. Therefore, Progressive Frame flag is automatically set when **Pulldown** is selected.

Top Field First flag

If this flag is set to a frame, top field is displayed first at decoding time (unless when progressive monitor is used). It is used together with the following Repeat First Field flag to perform pulldown.

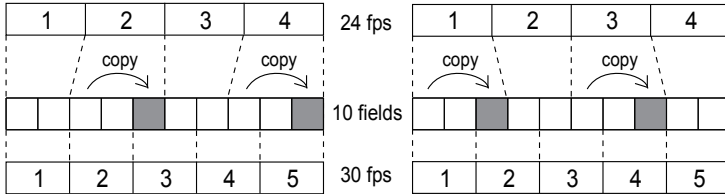
Repeat First Field flag

If this flag is set, the first field is used twice at decoding time. For instance, if both Top Field First flag and Repeat First Field flag are set to a frame, the top field is displayed first, then the bottom field, and then the top field is displayed again. Therefore, when Repeat First Field flag is set, one frame is expanded to three fields.

For convenience, let's give a name from *A* to *D* to each frame depending on which flags are set: (Note that Progressive Frame flag is always set when performing pulldown.)

Name	Top Field First flag	Repeat First Field flag	field count
<i>A</i>	ON	OFF	2
<i>B</i>	ON	ON	3
<i>C</i>	OFF	OFF	2
<i>D</i>	OFF	ON	3

When 2:3 pulldown is selected, the first frame will be *A*, followed by *B, C, D, A, B, C, D, ...* frames. When 3:2 pulldown is selected, the first frame will be *B*, followed by *C, D, A, B, C, D, ...* frames.



2:3 and 3:2 pulldown

Even when Pulldown is selected, the numbers of top fields and bottom fields must be the same. Therefore when the first frame starts from either *A* or *B* frame – starting from the top field – the last frame must be either *A* or *D* frame, which ends with the bottom field. If the last frame does not happen to be either *A* or *D* frame, Cinema Craft Encoder MP breaks the pulldown pattern (cadence) so that it ends with either *A* or *D*.

Case 1: 2:3 pulldown (First frame is *A*.)

Frame count	last 4 frames
$4n$	ABCD
$4n + 1$	BCDA
$4n + 2$	CDAB → CDAA
$4n + 3$	DABC → DAAA
$(n = 1, 2, 3, \dots)$	

Case 2: 3:2 pulldown (First frame is *B*.)

Frame count	last 4 frames
$4n$	BCDA
$4n + 1$	CDAB → CDAA
$4n + 2$	DABC → DAAA
$4n + 3$	ABCD
$(n = 1, 2, 3, \dots)$	

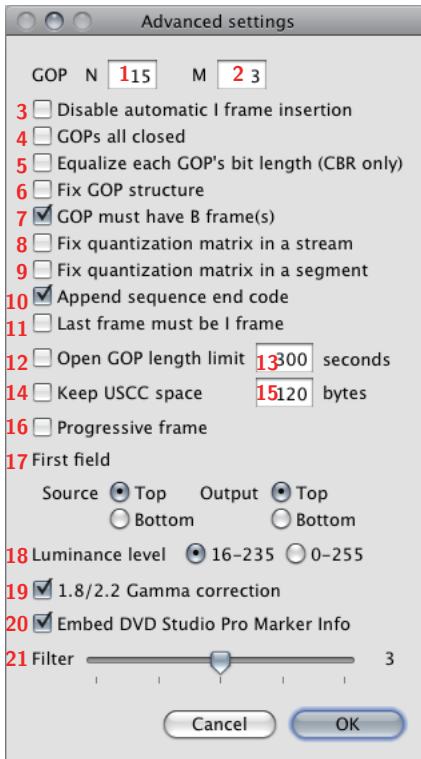
When Auto is selected at Pulldown, one of 2:3 or 3:2 pulldown which has less breaks of pulldown cadence is selected. (When either does not break the cadence, 2:3 pulldown is selected.)

Case 3: Auto selection from 2:3 or 3:2 pulldown

Frame count	First frame	Last 4 frames
$4n$	A	ABCD
$4n + 1$	A	BCDA
$4n + 2$	A	CDA A
$4n + 3$	B	ABCD

($n = 1, 2, 3, \dots$)

5.3 Advanced settings



1. **GOP N**

N specifies the distance between adjacent I frames. When automatic I frame insertion is enabled, I frame is inserted at scene change, in which case, the distance may be shorter than specified value.

2. **GOP M**

M specifies the distance between adjacent Non-B frames. When **Fix GOP structure** is not selected, GOP structure adaptively changes during encoding. In such case, the distance may sometimes be shorter than specified value.

3. **Disable automatic I frame insertion**

By default, Cinema Craft Encoder MP encodes the first frame of the new scene as an I frame, which is very important thing to keep good picture quality. Selecting this check box will turn off the feature.

4. **GOPs all closed**

Select **GOPs all closed** to generate closed GOPs throughout the stream. Closed GOP does not need to refer to previous GOP in order to decode B frames in itself, which is convenient for random access in which previous GOP may not have been decoded beforehand. However, it is not recommended selecting this option because it affects picture quality. Note that Cinema Craft Encoder MP generates closed GOP at scene change points (unless **Disable automatic I frame insertion** is selected) and chapter points regardless of this setting. Therefore you don't usually need to select this option.

5. **Equalize each GOP's bit length**

This option is provided in order to generate files for multiangle DVD. If selected, the data size of each GOP will be the same. But because it affects picture quality, do not use this option unless you really need it.

6. **Fix GOP structure**

This option is provided in order to generate files for multiangle DVD. If selected, each GOP will have the same structure. But

because it affects picture quality, do not use this option unless you really need it.

7. **GOP must have B frame(s)**

By default, Cinema Craft Encoder MP determines GOP structure dynamically by trial and error during encoding. Sometimes it may find that the GOP without B frame is the best for the specific scenes. But because there are some players which cannot handle GOP without B frame properly, this option is provided.
8. **Fix quantization matrix in a stream**

If selected, Cinema Craft Encoder MP does not change the quantization matrices throughout the streams. Because this option affects picture quality, do not use it except when necessary.
9. **Fix quantization matrix in a segment**

If selected, Cinema Craft Encoder MP does not change the quantization matrices until chapter changes. Because this option affects picture quality, do not use it except when necessary.
10. **Append sequence end code**

If selected, sequence end code is appended at the end of stream. Keep selected unless there is a special reason not to append sequence end code.
11. **Last frame must be I frame**

If selected, last frame is encoded as an I frame and the frame will be the sole member of the last GOP. Please note that this option will have an impact on picture quality of the last frame, do not use it unless you really need it.
12. **Open GOP length limit**

This option limits the duration of consecutive sequence of open GOPs. By default, Cinema Craft Encoder MP generates closed GOP only at scene change points or at chapter points. If this option is selected, closed GOP will be generated at specified intervals even if there is no scene change or chapter point.
13. **Open GOP length duration**

When Open GOP length limit is selected, closed GOP is generated so that the duration of consecutive sequence of open GOPs

does not exceed the duration specified here. Because too many closed GOPs affect picture quality, do not specify a value less than 60.

14. **Keep USCC space**

USCC stands for *United States Closed-Captioning*, which is used for DVDs in United States having closed captions. If this option is selected, Cinema Craft Encoder MP keeps space for USCC after GOP headers.

15. **USCC space**

The size specified here is kept for USCC if **Keep USCC space** is selected.

16. **Progressive frame**

If selected, source movies are encoded as progressive frames. You cannot change this setting when **NTSC-DVD-Film** is selected, in which case, source movies are handled as progressive frames.

17. **First field**

When **Progressive frame** is not selected, you need to specify the field order for both source and output movies. Please make sure that the field order for the source movies are correctly set, otherwise, you will see a stuttered motion at playback time. When the field order for the source and the output is different, encoding starts from the second line for each frame.

18. **Luminance level**

Compressor 3 feeds the data of source movie to Cinema Craft Encoder MP in either YCbCr or RGB color space. When the data were in RGB, the encoder converts the color space to YCbCr before encoding in such a way that luminance levels fall within 16 to 235 so that it conform to ITU-R BT. 601-5. An alternative option is provided for those who wants the wider range of luminance level.

19. **1.8/2.2 Gamma correction**

If selected, 1.8/2.2 Gamma correction is applied when source

signals are input as RGB data. Clear this check box if the encoded image is brighter than expected.

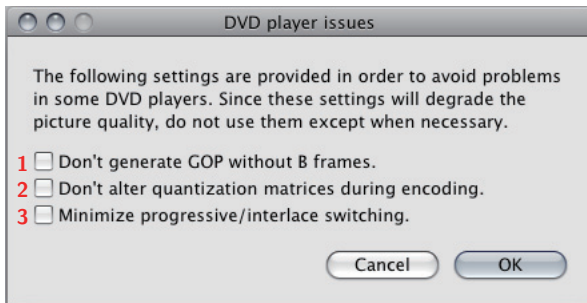
20. Embed DVD Studio Pro Marker Info

If selected, Cinema Craft Encoder MP embeds Marker Info in output MPEG-2 file so that DVD Studio Pro can import chapter points. If marker info for DVD Studio Pro is not necessary or you don't want any meta data inserted to MPEG-2 file, do not select this option.

21. Filter

When movies containing complicated motions are encoded with low bitrate, digital noises such as mosquito noise may be noticeable. This filter is provided in order to reduce such digital noises. The filter setting is specified as an integer value, 1 through 5. The greater the value, the stronger the filter will be. Although stronger filter reduces more digital noises, the encoded picture will be somewhat blurred.

5.4 DVD player issues



Even if encoded stream perfectly conforms to MPEG-2 standard, there are (were?) some cases in which a few DVD players cannot handle the stream correctly. Although those are DVD player issues, Cinema Craft Encoder MP provides several options to avoid such problems. Please use them considerably because each option may affect picture quality to a certain extent.

1. Don't generate GOP without B frames.
If selected, Cinema Craft Encoder MP always generates GOPs having at least one B frame.
2. Don't alter quantization matrices during encoding.
If selected, Cinema Craft Encoder MP does not change quantization matrices during encoding.
3. Minimize progressive/interlace switching.
If selected, progressive/interlace switching will be minimized.

5.5 Caution when changing frame size

When the frame size of input file and output file differs, such as when HD movies are used as input, make sure to switch On the Frame Controls in Inspector window. Failing to do this will cause serious problem in picture quality of encoded file.

