◆ The contents of this document are subject to revision without prior notice. Contact our sales department for information on any revision to the document.

◆ No part of this document may be reproduced or copied without the permission of Socionext Inc.

◆ This product described herein is intended for use in consumer equipments. Customers considering the use of this product in specialized applications where failure or malfunction could directly affect human life or cause physical injury or where extremely high levels of reliability are required (such as air traffic control, aerospace systems, atomic energy control, medical devices for life support) are requested to consult our sales representative before embarking on such specialized use. Socionext Inc. will not be held liable for any claims and/or damages arising from uses such as those described above without the prior approval of the company.

◆ Because all semiconductor devices inherently have a certain rate of failure, the user must incorporate into facilities and equipment safety design measures such as redundancy, fire protection, and measures for preventing overcurrent levels and other abnormal operating conditions to protect against injury, fire damage, or loss that could be incurred by the public in the event of a failure.

◆ The furnishing of this specification does not give users any license to Socionext Inc's industrial property.

◆ The information and circuit diagrams in this document are presented as examples of semiconductor devices applications and are not intended for incorporation into devices for actual use. Socionext Inc. shall assume no responsibility for infringement of any patent rights or other rights of third parties arising from the use of this information or circuit diagrams.

◆ If the product described in this document represents goods or technologies subject to certain restrictions on export under the Foreign Exchange and Foreign Trade Control Law of Japan, prior authorization by the Japanese government will be required for the export of the product.

◆ Use of this product in any manner that complies with the MPEG-2, H.264/AVC, and H.265/HEVC standards is expressly prohibited without a license under applicable patents in the MPEG-2, H.264/AVC, and H.265/HEVC patent portfolios, which license is available from: MPEG LA, L.L.C., 4600 S. Ulster St., Suite 400 Denver, Colorado 80237 USA

◆ Use of this product in any manner that complies with the MPEG-2 AAC and MPEG-4 AAC standards is expressly prohibited without a license under applicable patents in the MPEG-2 AAC and MPEG-4 AAC patent portfolios, which license is available from: Via Licensing Corporation, 1275 Market Street, San Francisco, CA 94103-1410, USA

◆ ARM® is registered trademarks of ARM Limited (or its subsidiaries) in the EU and/or elsewhere.

◆ Depending on the IC operating conditions, the surface of the device may become extremely hot and possibly cause burns. Take appropriate safety measures for this case.

◆ All company names, brand names and trademarks herein are property of their respective owners.
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 24, 2019</td>
<td>2.00</td>
<td>Major changes</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Corresponds to V02L02R02 or later.</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>2.1 Video Codec Setting</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Changed device number specified range. (The same applies to 2.2, 2.3)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>2.3 Check the Encoding Status</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Added encode state</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.2.1 &quot;-b:v&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Changed setttable range</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.3.1 &quot;-device&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Changed setttable range. (0-15). (The same applies to 4.4.1, 5.2.1, 5.4.1, 6.4.1.)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.3.14 &quot;-cpb_delay&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Correct the error. (setttable range)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.3.37 &quot;-layer_num&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Added this option. (The same applies to 4.4.33, 5.4.35)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.3.38 &quot;-gop_hierarchy&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Added this option. (The same applies to 4.4.34, 5.4.36)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>3.3.39 &quot;-idr_interval&quot;</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Added this option. (The same applies to 4.4.35, 5.4.37)</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>9 Error Recovery</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>Added notes.</td>
</tr>
<tr>
<td>Aug 1, 2019</td>
<td>2.01</td>
<td>10.2 Scripts</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Changed device number specified range.</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Appendix About Error Messages</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Changed note.</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>1.2 About the Function of This Product</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Modification of main specifications provided by this product.</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Deleted input/output 2160x3840, 2160x4096.</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>2.2 Resolution Setting of Output Video</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Deleted script options. (set_resolution.sh -a)</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>3.2.2 &quot;-minrate&quot;</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Modification of possible values. (The same applies to 3.2.3, 3.3.9)</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>10.2.2 Getting Firmware Version</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Changed the execution result example</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>10.2.4 Dumping Flash Firmware</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Deleted this section</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>10.2.5 Dumping EEPROM Firmware</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>Deleted this section</td>
</tr>
<tr>
<td>Oct 04, 2019</td>
<td>2.02</td>
<td>11.2 Setting Specific Options</td>
</tr>
</tbody>
</table>

---

Socionext Inc.
M820 Software Package V02 Application Guide (for Operation)
Revision 2.02a  November 25, 2019
http://www.socionext.com/
<table>
<thead>
<tr>
<th>Added options. (-layer_num, -gop_hierarchy, -idr_interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1.1 M820 Software Package</td>
</tr>
<tr>
<td>Change the chapter title.</td>
</tr>
<tr>
<td>- 1.2 Product Function</td>
</tr>
<tr>
<td>Change the chapter title.</td>
</tr>
<tr>
<td>- 11.3 Video Frame Buffer</td>
</tr>
<tr>
<td>Change the chapter title.</td>
</tr>
<tr>
<td>- 11.4 Dynamic bit rate change</td>
</tr>
<tr>
<td>Change the chapter title.</td>
</tr>
<tr>
<td>- Appendix. Error Messages</td>
</tr>
<tr>
<td>Change the appendix title.</td>
</tr>
<tr>
<td>- 11.5 Example of Encoding and 11.6 Example of Encoding</td>
</tr>
<tr>
<td>(MB86M30 specific format)</td>
</tr>
<tr>
<td>Added note about sample code.</td>
</tr>
</tbody>
</table>

Nov. 25, 2019 2.02a The footer contents were changed.
Preface

The Objective of This Document

The purpose of this document is to provide the reader with an understanding of how to use the software of the product “M820 Software Package V02”.

Target Readers

This document is intended for the following readers.
- Software engineers who will use the “M820 Software Package V02”.

Prerequisites

This document assumes that readers know the basics of technologies related to Linux, Codec, and networks.
Contents

Preface .................................................................................................................................................. 4
The Objective of This Document ......................................................................................................... 4
Target Readers .................................................................................................................................... 4
Prerequisites ....................................................................................................................................... 4
1. Overview .......................................................................................................................................... 10
1.1 M820 Software Package ............................................................................................................ 10
1.2 Product Function .......................................................................................................................... 11
2. Necessary Settings before Executing FFmpeg ................................................................................ 17
  2.1 Video Codec Settings .................................................................................................................. 17
  2.2 Resolution Setting of Output Video ............................................................................................ 20
  2.3 Check the Encoding Status ......................................................................................................... 25
3. MB86M30 Encode Acceleration Function ...................................................................................... 28
  3.1 Option Setting of FFmpeg ........................................................................................................... 28
  3.2 Extended Options for Encoding .................................................................................................. 30
    3.2.1 "-bv" .................................................................................................................................. 30
    3.2.2 "-minrate" .......................................................................................................................... 31
    3.2.3 "-maxrate" .......................................................................................................................... 32
    3.2.4 "-g" .................................................................................................................................... 33
    3.2.5 "-pix_fmt" ........................................................................................................................... 34
  3.3 Specific Options for Encoding ...................................................................................................... 35
    3.3.1 "-device" ............................................................................................................................. 35
    3.3.2 "-input_id" .......................................................................................................................... 36
    3.3.3 "-output_id" ........................................................................................................................ 37
    3.3.4 "-resize" .............................................................................................................................. 38
    3.3.5 "-rc" ................................................................................................................................... 39
    3.3.6 "-profile:v" ........................................................................................................................ 40
    3.3.7 "-level:v" ............................................................................................................................ 41
    3.3.8 "-tier" .................................................................................................................................. 41
    3.3.9 "-buf_size" .......................................................................................................................... 42
    3.3.10 "-use_b" ............................................................................................................................. 42
    3.3.11 "-fix_gop" .......................................................................................................................... 43
    3.3.12 "-sc_use_idr" ...................................................................................................................... 43
    3.3.13 "-closed_gop" ................................................................................................................... 44
    3.3.14 "-cpb_delay" ..................................................................................................................... 44
    3.3.15 "-init_cpb_delay" .............................................................................................................. 45
    3.3.16 "-wp" .................................................................................................................................. 45
    3.3.17 "-aspect_ratio" ................................................................................................................... 46
    3.3.18 "-video_format" .................................................................................................................. 46
    3.3.19 "-video_full_range_flag" .................................................................................................. 46
    3.3.20 "-colour_primaries" ........................................................................................................... 47
    3.3.21 "-transfer_characteristics" ................................................................................................ 47
    3.3.22 "-matrix_coefficients" ....................................................................................................... 48
    3.3.23 "-chroma_sample_loc_type" .............................................................................................. 48
    3.3.24 "-ll_mode" .......................................................................................................................... 49
    3.3.25 "-aud" ................................................................................................................................. 49
    3.3.26 "-sps_insert" ...................................................................................................................... 50
    3.3.27 "-pps_insert" ...................................................................................................................... 50
    3.3.28 "-disp_chroma_*,_*" ......................................................................................................... 51
    3.3.29 "-disp_luma_max" .............................................................................................................. 52
4. MB86M30 Transcode Acceleration Function

4.1 Option Setting of FFmpeg

4.2 Specific Options for Decoding

4.2.1 "-sei_payload_type" .............................................. 61

4.3 Extended Options for Encoding

4.3.1 "-bv" .................................................................... 62
4.3.2 "-minrate" .............................................................. 62
4.3.3 "-maxrate" .............................................................. 62
4.3.4 "-g" ........................................................................ 62

4.4 Specific Options for Encoding

4.4.1 "-device" ................................................................ 63
4.4.2 "-input_id" ............................................................. 64
4.4.3 "-output_id" ........................................................... 65
4.4.4 "-resize" ................................................................. 66
4.4.5 "-rc" ....................................................................... 67
4.4.6 "-profilev" .............................................................. 67
4.4.7 "-levelv" ................................................................. 67
4.4.8 "-tier" ..................................................................... 67
4.4.9 "-buf_size" .............................................................. 67
4.4.10 "-use_b" ................................................................. 67
4.4.11 "-fix_gop" ............................................................... 67
4.4.12 "-sc_use_idr" ........................................................ 67
4.4.13 "-closed_gop" ........................................................ 68
4.4.14 "-cpb_delay" .......................................................... 68
4.4.15 "-init_cpb_delay" .................................................. 68
4.4.16 "-wp" ..................................................................... 68
4.4.17 "-aspect_ratio" ........................................................ 68
4.4.18 "-video_format" ..................................................... 68
4.4.19 "-video_full_range_flag" ...................................... 68
4.4.20 "-colour_primaries" .............................................. 68
4.4.21 "-transfer_characteristics" ..................................... 69
4.4.22 "-matrix_coefficients" .......................................... 69
4.4.23 "-chroma_sample_loc_type" ................................. 69
4.4.24 "-ll_mode" ............................................................. 69
4.4.25 "-aud" ................................................................... 69
4.4.26 "-sps_insert" ........................................................ 69
4.4.27 "-pps_insert" ........................................................ 69
4.4.28 "-yuv_format" ....................................................... 70
4.4.29 "-half_fr" ............................................................. 71
4.4.30 "-ip_convert" ........................................................ 72
4.4.31 "-use_radl" ........................................................... 72
4.4.32 "-first_pic_type" .................................................... 72
4.4.33 "-layer_num" ........................................................ 73
5. SC2A11+ MB86M30 Transcode Acceleration Function
5.1 Option Setting of FFmpeg
5.2 Specific Options for Decoding
5.2.1 "-video_analyze_device"
5.2.2 "-pic_buf_num"
5.2.3 "-th_num"
5.3 Extended Options for Encoding
5.3.1 "-bv"
5.3.2 "-minrate"
5.3.3 "-maxrate"
5.3.4 "g"
5.4 Specific Options for Encoding
5.4.1 "-device"
5.4.2 "-input_id"
5.4.3 "-output_id"
5.4.4 "-resize"
5.4.5 "-rc"
5.4.6 "-profilev"
5.4.7 "-levelv"
5.4.8 "-tier"
5.4.9 "-buf_size"
5.4.10 "-use_b"
5.4.11 "-fix_gop"
5.4.12 "-sc_use_idr"
5.4.13 "-closed_gop"
5.4.14 "-cpb_delay"
5.4.15 "-init_cpb_delay"
5.4.16 "-wp"
5.4.17 "-aspect_ratio"
5.4.18 "-video_format"
5.4.19 "-video_full_range_flag"
5.4.20 "-colour_primaries"
5.4.21 "-transfer_characteristics"
5.4.22 "-matrix_coefficients"
5.4.23 "-chroma_sample_loc_type"
5.4.24 "-ll_mode"
5.4.25 "-aud"
5.4.26 "-sps_insert"
5.4.27 "-pps_insert"
5.4.28 "-disp_chroma_*_*"
5.4.29 "-disp_luma_max"
5.4.30 "-disp_luma_min"
5.4.31 "-max_cll"
5.4.32 "-max_fall"
5.4.33 "-use_radl"
5.4.34 "-first_pic_type"
5.4.35 "-layer_num"
5.4.36 "-gop_hierarchy"
5.4.37 "-idr_interval"

6. SC2A11 Transcode Acceleration Function
6.1 Option Setting of FFmpeg
1. Overview

This chapter gives an overview of the "M820 Software Package V02".

1.1 M820 Software Package

"M820 Software Package" is a platform using "SC2A11" and "MB86M30" for advanced video processing such as transcoding compressed video, and extracting video metadata and integrating it to video in real time. "SC2A11" is a multi-core processor LSI implementing the ARM core, and "MB86M30" is a multi-format codec LSI which includes support for FHD/60p HEVC.
1.2 Product Function

This product provides an interface to use the M820L via FFmpeg from the host PC. Insert the M820L to the PCIe slot of an existing PC or server and use it as a video accelerator.

The video accelerator functions provided by this product are as follows.

- **M86M30 encode acceleration function**
  Encoding using MB86M30. Decoding using the FFmpeg plug-ins installed on the host PC.

- **MB86M30 transcode acceleration function**
  Encoding and decoding using MB86M30.

- **SC2A11+MB86M30 transcode acceleration function**
  Software decoding on SC2A11, and encoding using MB86M30.

- **SC2A11 transcode acceleration function**
  Software decoding and encoding on SC2A11.

The MB86M30 encode acceleration function can be used from the Libavcodec API.
A figure of software composition of this product is as follows.

Control of the M820L is performed via the M820 library and the M820 driver installed in the host PC.
The M820L has the MB86M30 driver, and the SC2A11 optimized decoding/encoding software library installed. It can perform both MB86M30 decoding/encoding, and SCA11 decoding/encoding.
The outline of specifications provided by this product is as follows.

<table>
<thead>
<tr>
<th>Input</th>
<th>MB86M30 encode acceleration</th>
<th>MB86M30 transcode acceleration</th>
<th>SC2A11+MB86M30 transcode acceleration</th>
<th>SC2A11 transcode acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video codec</td>
<td>(*1)</td>
<td>H.264/AVC, H.265/HEVC, MPEG-2 Video (*2)</td>
<td>H.264/AVC, H.265/HEVC</td>
<td></td>
</tr>
<tr>
<td>Format</td>
<td>(*1)</td>
<td>AVC/HEVC elementary stream (Annex B), MPEG-2 elementary stream</td>
<td>AVC/HEVC elementary stream (Annex B)</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>256x192 - 4096x2160</td>
<td>AVC, HEVC: 320x180 - 3840x2160, MPEG-2: 320x180 - 1920x1088</td>
<td>256x192 - 1920x1088, 3840x2160, 1920x1088, 720x1280, 1080x1920</td>
<td>160x120 - 1920x1088, 720x1280, 1080x1920</td>
</tr>
<tr>
<td>Bit depth</td>
<td>8-bit, 10-bit</td>
<td>AVC, HEVC: 8-bit, 10-bit MPEG-2: 8-bit</td>
<td>AVC : 8-bit HEVC: 8-bit, 10-bit</td>
<td></td>
</tr>
<tr>
<td>Profile</td>
<td>(*1)</td>
<td>AVC: Baseline, Main, High Constrained Baseline, Constrained High, High 10, High 4:2:2 HEVC: Main, Main10, Main 4:2:2 10 MPEG-2: Main</td>
<td>AVC: Baseline, Main, High HEVC: Main, Main 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(60000/1001)</td>
<td>(*)3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of</td>
<td>Max 16ch</td>
<td>Max 8ch</td>
<td>Max 16ch (*)4</td>
<td></td>
</tr>
<tr>
<td>inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video codec</td>
<td>H.264/AVC, H.265/HEVC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>256x192 - 1920x1088, 3840x2160, 4096x2160, 720x1280, 1080x1920</td>
<td>Progressive: 320x180 - 1920x1088, 3840x2160, 720x1280, 1080x1920</td>
<td>256x192 - 1920x1088, 3840x2160, 4096x2160, 720x1280, 1080x1920</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interlace: 1920x1080, 1440x1080, 720x576, 720x480 (*)5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resize</td>
<td>Supported (*)6</td>
<td>Not-supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chroma format</td>
<td>YUV 4:2:0, 4:2:2 (*)7</td>
<td>YUV 4:2:0, 4:2:2 (*)8</td>
<td>YUV 4:2:0 (*)9</td>
<td></td>
</tr>
<tr>
<td>Bit depth</td>
<td>8-bit, 10-bit (*)7</td>
<td>8-bit, 10-bit (*)8</td>
<td>8-bit (*)9</td>
<td></td>
</tr>
<tr>
<td>Profile</td>
<td>AVC: Constrained Baseline, Baseline, Main, High, Constrained High, High 10, High 4:2:2</td>
<td>HEVC: Main, Main 10, Main 4:2:2 10</td>
<td>AVC: Baseline HEVC: Main</td>
<td></td>
</tr>
<tr>
<td>Container</td>
<td>MP4, MPEG-2 TS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*3) Number of inputs Max 16ch Max 8ch Max 16ch (*)4

(*4) Video codec H.264/AVC, H.265/HEVC

(*5) Resolution 256x192 - 1920x1088, 3840x2160, 4096x2160, 720x1280, 1080x1920 Interlace: 1920x1080, 1440x1080, 720x576, 720x480

(*6) Resize Supported Not-supported

(*7) Chroma format YUV 4:2:0, 4:2:2

(*8) Bit depth 8-bit, 10-bit

(*9) Profile AVC: Constrained Baseline, Baseline, Main, High, Constrained High, High 10, High 4:2:2 HEVC: Main, Main 10, Main 4:2:2 10


(*11) Container MP4, MPEG-2 TS

(*12) Frame rate 120p, 60p, 50p, 30p, 25p, 24p, 119.88p (120000/1001), 59.94p (60000/1001), 29.97p (30000/1001), 23.97p (24000/1001)
<table>
<thead>
<tr>
<th>Number of outputs</th>
<th>Less than 1280x720 : Max 16ch</th>
<th>Less than 1280x720 : Max 16ch (*4)</th>
<th>Less than 1280x720 : Max 16ch (*4)</th>
<th>Max 16ch (*4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than 1920x1088 : Max 8ch</td>
<td>Less than 1920x1088 : Max 8ch</td>
<td>Less than 1920x1088 : Max 8ch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exceeds 1920x1088 : 1ch only</td>
<td>Exceeds 1920x1088 : 1ch only</td>
<td>Exceeds 1920x1088 : 1ch only</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>HDR10/HLG supported</td>
<td>HDR10, HLG, etc supported (*10)</td>
<td>HDR10/HLG supported</td>
<td>-</td>
</tr>
</tbody>
</table>
*1: The supported input formats depend on the decoder being used.
*2: Only decoding is supported for MPEG-2 Video.
*3: For interlaced input, you must deinterlace the input (e.g. by using the FFmpeg filter “yadif”) before sending it to the MB86M30 encoder.
*4: Supported number of inputs/outputs varies depending on the transcoding conditions.
*5: The vertical number of pixels are rounded down to the following multiples.
  - Progressive output
    - The nearest multiple of 4.
  - Interlace output
    - If the remainder of the number of vertical pixels divided by 32 is 16 or more, the nearest multiple of 4.
    - If the remainder of the number of vertical pixels divided by 32 is less than 16, the nearest multiple of 32.

*6: The specifications of resizing for each acceleration function differ. Please refer to the description of the “-resize” option for each acceleration function in this manual for details.
*7: The pixel format of the input video can be converted before sending it to the encoder by using the “-pix_fmt” option.
*8: The pixel format of the input video can be converted by using the “-yuv_format” option.
*9: If the bit depth of the input video is not 8 bits, it will be converted to 8 bits.
*10: The SEI included in the input file can be inherited to the output file.

Notes: Only "pass-through" can be used as the video synchronization method of the transcode acceleration functions (the acceleration functions other than the MB86M30 encode acceleration function).
2. Necessary Settings before Executing FFmpeg

This chapter describes the necessary settings before using the acceleration function of this product.

2.1 Video Codec Settings

To use the acceleration function, the output video codec (AVC / HEVC) must be set for each M820L in advance.

To switch the video codec, use the "M820_rXXXX/01_Host/01_Host_App/change_codec.sh" script included in this product.

This setting is saved even if the power is turned off.

[Format]

The options for the "change_codec.sh" script is shown below.

```
# ./change_codec.sh [-d <device_no>] -c <codec_type> [-trc <input_type>]
```

[Option]

[-d <device_no>]
Specify the device number (0 - 15) of the M820L.
If this option is not specified, device number 0 will be used.

-c <codec_type>
Specify the video codec.
Specify the following in <codec_type>.
    - hevc : For encoding to HEVC
    - h.264 : For encoding to AVC

Encoding becomes possible after setting the video codec is finished.

[-trc <input_type>]
Specify only when using "MB86M30 transcode acceleration function".
Specify the following for <input_type>.
    1: Input video resolution is 3840x2160 and single-input
       This mode is recommended if you need more than 60 fps encoding performance.
    2: Input video resolution is from 320x180 to 3840x2160
       Supports multi-input when the input resolution is 1920x1088 or less.

The "MB86M30 encode acceleration function" and "SC2A11+MB86M30 transcode acceleration function" cannot be used when this option is specified.
[Usage example]
An example of setting the video codec by using the "change_codec.sh" script is as follows.

➢ Setting of HEVC encoding ("MB86M30 transcode acceleration function" not included)

```bash
# ./change_codec.sh -d 0 -c hevc
set HEVC codec
Restarting encode application
Done
# echo $?
0
```

➢ Setting of AVC encoding ("MB86M30 transcode acceleration function" not included)

```bash
# ./change_codec.sh -d 0 -c h.264
set H.264 codec
Restarting encode application
Done
# echo $?
0
```

➢ Setting of HEVC encoding ("MB86M30 transcode acceleration" function)

```bash
# ./change_codec.sh -d 0 -c hevc -trc 1
set HEVC codec
Restarting encode application
Done
# echo $?
0
```

➢ Setting of AVC encoding ("MB86M30 transcode acceleration" function)

```bash
# ./change_codec.sh -d 0 -c h.264 -trc 1
set H.264 codec
Restarting encode application
Done
# echo $? 
0
```
[Note]
✓ When executing the "change_codec.sh" script (video codec settings), the value set by the "set_resolution.sh" script will be initialized. After executing the "change_codecs.sh" script, you must execute the "set_resolution.sh" script and set the resolution. For resolution setting of output video, refer to "2.2 Resolution Setting of Output Video" in this document.
✓ The video codec settings script "change_codec.sh" calls the subroutine "recover.sh" in the process. Please use "change_codec.sh" together with "recover.sh".
2.2 Resolution Setting of Output Video

To use the "MB86M30 encode acceleration function", "MB86M30 transcode acceleration function" and "SC2A11+MB86M30 transcode acceleration function", after setting the video codec, the output channels of the encoding and the resolution (maximum size) of the output video must be set for each output channel beforehand.

Not required when using the "SC2A11 transcode acceleration function".

To set the resolution (maximum size) of each output channel, use the "M820_rXXXX/01_Host/01_Host_App/set_resolution.sh" script included in this product.

This setting is saved even if the power is turned off.

[Format]
The options for the "set_resolution.sh" script is shown below.

```
# ./set_resolution.sh [-d <device_no>] [-f <file>]
# ./set_resolution.sh [-d <device_no>] [-t <type>]
# ./set_resolution.sh [-d <device_no>] [-s]
# ./set_resolution.sh [-h]
```

[Option]

[-d <device_no>]
Specify the device number (0 -15) of the M820L.
If this option is not specified, device number 0 will be used.

[-f <file>]
Specify a text file which defines the resolution (maximum size) of the output video for each output channel.
The specified file defines the resolution (maximum size) of the output video for each output channel.
In the text file, please describe the resolution (maximum size) of the output video for each output channel in the following format.

```
[Encoding channel ID]=[Resolution parameter]
```
The relationship between resolution parameter and resolution is as follows.

<table>
<thead>
<tr>
<th>Resolution Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Encoding</td>
</tr>
<tr>
<td>1</td>
<td>Use single encoding (Maximum size of output resolution = Exceeds 1920 x 1088)</td>
</tr>
<tr>
<td>2</td>
<td>Maximum size of output resolution = 1920 x 1088</td>
</tr>
<tr>
<td>3</td>
<td>Maximum size of output resolution = 1280 x 720</td>
</tr>
<tr>
<td>4</td>
<td>Maximum size of output resolution = 864 x 576</td>
</tr>
<tr>
<td>5</td>
<td>Maximum size of output resolution = 640 x 480</td>
</tr>
<tr>
<td>6</td>
<td>Maximum size of output resolution = 320 x 240</td>
</tr>
<tr>
<td>9</td>
<td>Specify FHD portrait (1080x1920) and FHD landscape (1920x1080)</td>
</tr>
<tr>
<td>10</td>
<td>Specify HD portrait (720x1280) and HD landscape (1280x720)</td>
</tr>
</tbody>
</table>

Resolution parameters "9" and "10" are for multi-input/multi-encoding portrait sizes.

When the resolution parameter "9" is set and performing multi-input/multi-encoding, FHD portrait (1080x1920) and FHD landscape (1920x1080) can be encoded at the same time.

When the resolution parameter "10" is set and performing multi-input/multi-encoding, HD portrait (720x1280) and HD landscape (1280x720) can be encoded at the same time.

Resolution parameters "33" is for the MB86M30 transcode acceleration function.

The following modes are dedicated to the MB86M30 transcode acceleration function.

<table>
<thead>
<tr>
<th>Resolution Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Used for single channel transcoding with resize (for m30trc only) (Maximum size of output resolution = Exceeds 1920 x 1088)</td>
</tr>
</tbody>
</table>

The following sample files are included in the "M820_rXXXX/01_Host/01_Host_App/" directory of this product.

- 1ch_HSMode_sample.txt
  Specify the maximum size of output channel ID (output_id) 0 to "resolution parameter=1".
- 8ch_sample.txt
  Specify the maximum size of output channel ID (output_id) 0 to 7 to "resolution parameter=2".
- 16ch_sample.txt
  Specify the maximum size of output channel ID (output_id) 0 to 15 to "resolution parameter=3".
[-t <type>]
Specify the suitable resolution (maximum size) of the output video for multi-encoding channels.
The usable values for <type> and behaviors are as follows.

- For type=1
  Set the maximum size of output channel ID (output_id) 0 to "resolution parameter=1".
  (Same as using "-f 1ch_HSMode_sample.txt")
- For type=8
  Set the maximum size of output channel ID (output_id) 0 to 7 to "resolution parameter=2".
  (Same as using "-f 8ch_sample.txt")
- For type=16
  Set the maximum size of output channel ID (output_id) 0 to 15 to "resolution parameter=3".
  (Same as using "-f 16ch_sample.txt")

[-s]
Shows the currently set resolution (maximum size) settings of the output video.

```
# ./set_resolution.sh -s
Current Resolution Type Settings:
State: "ON"
Values:
  CH00: 2, CH01: 2, CH02: 2, CH03: 2
  CH04: 2, CH05: 2, CH06: 2, CH07: 2
  CH08: 0, CH09: 0, CH10: 0, CH11: 0
  CH12: 0, CH13: 0, CH14: 0, CH15: 0
  CH16: 0, CH17: 0, CH18: 0, CH19: 0
  0 : No Transcoding
  1 : Used for single channel transcoding
  2 : Maximum size of output resolution = 1920 x 1088
  3 : Maximum size of output resolution = 1280 x  720
  4 : Maximum size of output resolution =  864 x  576
  5 : Maximum size of output resolution =  640 x  480
  6 : Maximum size of output resolution =  320 x  240
  9 : Maximum size of output resolution = 1088 x 1920 or 1920 x 1088
 10 : Maximum size of output resolution =  720 x 1280 or 1280 x  720
 33 : Used for single channel transcoding with resize (for m30trc only)
```

[-h]
Shows the help of this script (set_resolution.sh).
[Usage example]
An example of setting the resolution (maximum size) of the output video by using the "set_resolution.sh" script is shown below.

e.g.) Description example of a definition file (resolution file)
Specify the maximum resolution (1280x720) for encoding channel 0 to 7.

<table>
<thead>
<tr>
<th>CH00</th>
<th>CH01</th>
<th>CH02</th>
<th>CH03</th>
<th>CH04</th>
<th>CH05</th>
<th>CH06</th>
<th>CH07</th>
<th>CH08</th>
<th>CH09</th>
<th>CH10</th>
<th>CH11</th>
<th>CH12</th>
<th>CH13</th>
<th>CH14</th>
<th>CH15</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

An example of execution is as follows.

```
# ./set_resolution.sh -f res_sample.txt
M820 Initial Settings Are Now "ON"

Current Resolution Type Settings:
State: "ON"
Values:
CH00: 3, CH01: 3, CH02: 3, CH03: 3
CH04: 3, CH05: 3, CH06: 3, CH07: 3
CH08: 0, CH09: 0, CH10: 0, CH11: 0
CH12: 0, CH13: 0, CH14: 0, CH15: 0
CH16: 0, CH17: 0, CH18: 0, CH19: 0
0 : No Transcoding
1 : Used for single channel transcoding
2 : Maximum size of output resolution = 1920 x 1088
3 : Maximum size of output resolution = 1280 x  720
4 : Maximum size of output resolution =  864 x  576
5 : Maximum size of output resolution =  640 x  480
6 : Maximum size of output resolution =  320 x  240
9 : Maximum size of output resolution = 1088 x 1920 or 1920 x 1088
10 : Maximum size of output resolution =  720 x 1280 or 1280 x  720
33 : Used for single channel transcoding with resize (for m30trc only)

Restarting encode application
Done
```
[Note]

✓ The resolution type is determined based on the area and vertical size of the video.
  e.g.) 480x720 (Rotated SD):
    Video area is the same as SD(720x480), but vertical size is greater than 720, so set
    the resolution parameter to 3 (1280 x 720) instead of 4 (864 x 576).

✓ When executing the "change_codec.sh" script (video codec settings), the value set by
  the "set_resolution.sh" script will be initialized.
  After executing the "change_codecs.sh" script, you must execute the "set_resolution.sh"
  script and set the resolution.
  Other than "MB86M30 transcode acceleration function"
    Default value : Resolution parameter=2 (Less than 1920x1088/8ch)
    "MB86M30 transcode acceleration function"
    Default value : Resolution parameter=1 (Single encoding)

✓ Please set the same resolution parameter value for all the channels to be used.

✓ Resolution parameter "9" is a mode for multi-input/multi-encoding that mixes FHD
  vertical (1080x1920) or FHD horizontal (1920x1080). The upper limit is 1088x1920 and
  1920x1088 for alignment.

✓ If the "-resize" option is not specified and the vertical size of the resolution is 833 to 864,
  alignment (multiples of 64) must be taken into consideration.
  Therefore, please set the resolution (maximum size) of the output video to 1280x720
  instead of 864x576.

✓ When the value of output video resolution (maximum size) is set incorrectly,
  the previous settings will be used.

✓ When encoding to HEVC, and the resolution of the output is smaller than 1280x720,
  higher speed is achieved by using multi-channel settings even for single-channel
  encoding. Therefore, in this case it is recommended to set a resolution parameter larger
  than 2 for multiple channels.

✓ The resolution setting script "set_resolution.sh" calls the subscript "recover.sh" in the
  process. Please use "set_resolution.sh" together with "recover.sh".
2.3 Check the Encoding Status

You can confirm the usages of the current input/output channel by executing "m820_enc_status" command. The following shows the available options for "m820_enc_status" command.

[Format]

```
# m820_enc_status [-device <device_no>] [-interval <seconds>] [-detail]
```

[Option]

[-device <device_no>]

Specify the device number (0 -15) of the M820L. If this option is not specified, the information of all M820Ls inserted to the host PC will be displayed.

[-interval <seconds>]

Continue outputting the usage of the current input / output channel every specified number of seconds. If the "q" key is pressed, the output will stop. Specify the output time as <seconds>. If this option is not specified, the current input and output channel usage status will be displayed once.

[-detail]

Output the current encode state, the specified video codec, and the usages of each channel. The encode states (Encode State) are as follows.

- Running : Encoding is available
- Stop : Encoding is unavailable
- Error : Encoding error
- System Error : M820L system error
- Running (Unexpected Error) : An unexpected error occurred during encoding

When starting and restarting the M820L, the state changes from "Stop" status to "Running" status. Check that encoding is ready (Running) before encoding.

If the state is encoding error or M820L system error, please execute the error recovery described in the "9. Error Recovery".
[Display example]
An example display of the "m820_enc_status" command is as follows.

```
# m820_enc_status
[Date: 2018/02/21 01:09:19]
device: /dev/m820smb0
   Encode state: Running
   Encode mode:  H.264

   HOST channel status:
      INPUT:  0 of 16 channels are in use.
      OUTPUT: 0 of 16 channels are in use.

   M820 channel status:
      INPUT:  0 of 16 channels are in use.
      OUTPUT: 0 of 16 channels are in use.
```

In "AA of BB channels are in use." indication, "BB" represents the number of available channels and "AA" represents the number of channels in use.

If setting the "MB86M30 transcode acceleration function" and "-trc 1" to the setting of the video codec, "(m30trc/4K)" will be displayed in "Encode mode:"
If setting the "MB86M30 transcode acceleration function" and "-trc 2" to the setting of the video codec, "(m30trc)" will be displayed in "Encode mode:"

An example of setting the "MB86M30 transcode acceleration function" is shown below.

```
# m820_enc_status
[Date: 2018/02/21 01:09:19]
device: /dev/m820smb0
   Encode state: Running
   Encode mode:  H.264 (m30trc/4K)

   HOST channel status:
      INPUT:  0 of 16 channels are in use.
      OUTPUT: 0 of 16 channels are in use.

   M820 channel status:
      INPUT:  0 of 16 channels are in use.
      OUTPUT: 0 of 16 channels are in use.
```

The display example with "-detail" option is as follows.

```
# m820_enc_status -detail

[Date: 2018/09/21 01:10:05]

device: /dev/m820smb0
  Encode state: Running
  Encode mode: HEVC

HOST channel status:
=======================================================================
| CH00 CH01 CH02 CH03 CH04 CH05 CH06 CH07 CH08 CH09 CH10 CH11 CH12 CH13 CH14 CH15 |
| INPUT:  OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF |
| OUTPUT: OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF |
=======================================================================
INPUT:  0 of 16 channels are in use (16 channels are available for HW encoding).
OUTPUT: 0 of 16 channels are in use (8 channels are available for HW encoding).

M820 channel status:
=======================================================================
| CH00 CH01 CH02 CH03 CH04 CH05 CH06 CH07 CH08 CH09 CH10 CH11 CH12 CH13 CH14 CH15 |
| INPUT:  OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF |
| OUTPUT: OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF OFF |
=======================================================================
INPUT:  0 of 16 channels are in use (16 channels are available for HW encoding).
OUTPUT: 0 of 16 channels are in use (8 channels are available for HW encoding).
```

Only channels that can be used with "SC2A11 transcoding acceleration function" are displayed in yellow.
Unavailable channels are displayed as "N/A".
3. MB86M30 Encode Acceleration Function

Encoding using MB86M30 is called “MB86M30 encode acceleration function” in this manual. This chapter describes the "MB86M30 encode acceleration function" using FFmpeg.

### 3.1 Option Setting of FFmpeg

To encode using the "MB86M30 encode acceleration function", specify the following in the output file options of FFmpeg.

- For encoding to AVC
  Specify "-c:v m30enc_h264" as the output file option.

```bash
# ffmpeg [options...] { [infile options...] [-i infile]... ( -c:v m30enc_h264 [outfile options...] [outfile] )...}
```

- For encoding to HEVC
  Specify "-c:v m30enc_hevc" as the output file option.

```bash
# ffmpeg [options...] { [infile options...] [-i infile]... ( -c:v m30enc_hevc [outfile options...] [outfile] )...}
```

Note: Make sure to use the same output option video codec as the one set in "2.1 Video Codec Settings".
The other options are specified as follows.

[-i infile]:
  Specify file name of the input video.
  e.g.) -i sample_02.mp4

Following is an example of specifying the input file from a different directory.
  e.g.) -i sample_video/sample_02.mp4

[ outfile options...] :
  Specify the encoding settings of the MB86M30.
  Put these options after "-c:v m30enc_h264" or "-c:v m30enc_hevc ".
  For details on all options, refer to "3.2 Extended Options for Encoding" and "3.3 Specific Options for Encoding" in this manual.
  If you mistakenly specify an option of another function, it will be ignored.

[ outfile ]:
  Specify output file name.
  You can select the output file extension from MP4 or MPEG-2 TS.

  For MP4, use the file extension ".mp4".
  e.g.) output_0.mp4

  For MPEG-2 TS, use the file extension ".ts".
  e.g.) output_0.ts

Following is an example of specifying the output file for storing in a different directory.
  e.g.) result/output_0.mp4
3.2 Extended Options for Encoding

This section describes FFmpeg options that were extended to use the "MB86M30 encode acceleration function". These options are specified as output file options (outfile options).

3.2.1 "-b:v"

[Option]
- b:v

[Settable range or value]
- 100Kbps -240000Kbps: (constant bitrate)
- 100Kbps -239999Kbps: (variable bitrate)

When the value of "-g" option is "1" and the output video resolution is 3840x2160 or more, the specifiable range is as follows.

- 100Kbps -600000Kbps: (constant bitrate)
- 100Kbps -599999Kbps: (variable bitrate)

[Description]
Specify the output bitrates. Please specify "No unit" (bps), "k" (Kbps), or "M" (Mbps) as the unit.

- e.g.) -b:v 2000000 (when bps is used)
- e.g.) -b:v 2000k (when Kbps is used)
- e.g.) -b:v 2M (when Mbps is used)

When using variable bitrate, this option will be used as average bitrate.
You can specify the type of the bitrate (CBR / VBR) by using the "-rc" option.
For "-rc" option, refer to '3.3.5 "-rc"' in this manual.

If this option is not specified, it will be set to the following value.

- For AVC

<table>
<thead>
<tr>
<th>Output resolution</th>
<th>Bitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeds 1920x1088</td>
<td>32Mbps</td>
</tr>
<tr>
<td>1920x1088 or less</td>
<td>16Mbps</td>
</tr>
<tr>
<td>1280x720 or less</td>
<td>8Mbps</td>
</tr>
<tr>
<td>854x480 or less</td>
<td>4Mbps</td>
</tr>
<tr>
<td>640x360 or less</td>
<td>2Mbps</td>
</tr>
<tr>
<td>426x240 or less</td>
<td>1Mbps</td>
</tr>
</tbody>
</table>
For HEVC

<table>
<thead>
<tr>
<th>Output resolution</th>
<th>Bitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeds 1920x1088</td>
<td>16Mbps</td>
</tr>
<tr>
<td>1920x1088 or less</td>
<td>8Mbps</td>
</tr>
<tr>
<td>1280x720 or less</td>
<td>4Mbps</td>
</tr>
<tr>
<td>854x480 or less</td>
<td>2Mbps</td>
</tr>
<tr>
<td>640x360 or less</td>
<td>1Mbps</td>
</tr>
<tr>
<td>426x240 or less</td>
<td>0.5Mbps</td>
</tr>
</tbody>
</table>

[Note]
✓ Please specify the bitrate according to the specifications of AVC and HEVC.
✓ If you specify AVC and a bit rate higher than the optimum value for the resolution and frame rate of the output video file, the bitrate will be limited to the optimum value. Regardless of whether or not this option is specified, a warning message may be displayed stating that the value has been changed to the optimal value.
✓ When variable bit rate and high bit rate are set, the bit rate may be lower than the average bit rate set depending on the input video (video with less motion, simple video etc). It does not support average bit rate control by filler.

3.2.2 "-minrate"

[Option]
"-minrate"

[Settable range or value]
0Kbps - 239998Kbps

When the value of "-g" option is "1" and the output video resolution is 3840x2160 or more, the specifiable range is as follows.

0Kbps - 599998Kbps

[Description]
Specify the minimum bitrate of the output file.
Please specify "No unit" (bps), "k" (Kbps), or "M" (Mbps) as the unit.
e.g.) -minrate 2000000 (when bps is used)
e.g.) -minrate 2000k (when Kbps is used)
e.g.) -minrate 2M (when Mbps is used)
Please specify this option only for VBR.
If this option is not specified, it will be set to the following value.
(Average bitrate) / 2
[Note]
✓ The specified value must satisfy the following relational expression.
   Minimum bitrate < Average bitrate
✓ This bitrate value is a target value. The bitrate does not necessarily fit within this bitrate value.
✓ If you specify AVC and a minimum bitrate higher than the optimum value for the resolution and frame rate of the output video file, the minimum bitrate will be limited to the optimum value.

3.2.3 "-maxrate"

[Option]
-maxrate

[Settable range or value]
101Kbps - 240000Kbps

When the value of "-g" option is "1" and the output video resolution is 3840x2160 or more, the specifiable range is as follows.

101Kbps - 600000Kbps

[Description]
Specify the maximum bitrate of the output file.
Please specify "No unit" (bps), "k" (Kbps), or "M" (Mbps) as the unit.
e.g.) -maxrate 2000000 (when bps is used)
e.g.) -maxrate 2000k (when Kbps is used)
e.g.) -maxrate 2M (when Mbps is used)
Please specify this option only for VBR.
If this option is not specified, it will be set to the following value.
(Average bitrate) x 2
If this value exceeds the maximum (240000Kbps), it will be set to 240000Kbps.

[Note]
✓ The specified value must satisfy the following relational expression.
   Average bitrate < Maximum bitrate
✓ This bitrate value is a target value. The bitrate does not necessarily fit within this bitrate value.
✓ If you specify AVC and a maximum bitrate higher than the optimum value for the resolution and frame rate of the output video file, the maximum bitrate will be limited to the optimum value.
3.2.4 “-g”

[Option]
- g

[Settable range or value]
1 - 255

[Description]
Specify the output video GOP size (frame number).
e.g.) -g 24
If this option is not specified, it will be set to the following value.
➢ AVC: 30
➢ HEVC: 64

[Note]
✓ When AVC and GOP size are set to values other than multiples of 2 or 3, B frame is not used.
✓ When HEVC and GOP size are set to 1, B frame is not used.
3.2.5 "-pix_fmt"

[Option]
-pix_fmt

[Settable range or value]
yuv420p : YUV 4:2:0 8-bit
yuv420p10le : YUV 4:2:0 10-bit
yuv422p : YUV 4:2:2 8-bit
yuv422p10le : YUV 4:2:2 10-bit

[Description]
Specify the video pixel format.
If this option is not specified, the pixel format of the input file will be used.

[Note]
✓ Pixel format conversion by this option is processed by software.
✓ When using this option for multi-input and multi-encoding, this option must be set for all output files.
   For details on multi-input and multi-encoding, refer to "7.2 Multi-Input" and "7.1 Multi-Encoding" in this manual.
   e.g.) ffmpeg ... -c:v m30enc_h264 -pix_fmt yuv420p ...
      -c:v m30enc_h264 -pix_fmt yuv420p ...
✓ When using this option with multi-input, the same value must be used for the same input channel ID.
   e.g.) Correct command:
      ffmpeg -i input.mp4
          -c:v m30enc_h264 -pix_fmt yuv420p output0.mp4
          -c:v m30enc_h264 -pix_fmt yuv420p output1.mp4
   e.g.) Incorrect command:
      ffmpeg -i input.mp4
          -c:v m30enc_h264 -pix_fmt yuv420p output0.mp4
          -c:v m30enc_h264 -pix_fmt yuv420p10le output1.mp4
✓ When encoding AVC and using different pixel formats, there are some restrictions on how to specify the output channels.
   For detail on the restrictions, refer to the [Note] section of "7.1 Multi-Encoding" in this manual.
3.3 Specific Options for Encoding

This section describes FFmpeg options added for using the "MB86M30 encode acceleration function". These options are specified as output file options (outfile options).

3.3.1 "-device"

[Option]
-device

[Settable range or value]
0 - 15

[Description]
Specify the M820L (device number) board which will execute encoding.
If this option is not specified, it will be set as the following value.
➢ If both input channels and output channels are not specified, the device number will be automatically assigned to an M820L which is able to perform the encoding.
➢ If either input channels or output channels are specified, device number 0 will be used.

Please refer to '3.3.2 "-input_id"' and '3.3.3 "-output_id"' in this manual for information on input channels and output channels.

[Note]
✓ When performing multi-encoding or multiple process encoding, please don't specify to use and not use this option at the same time.
Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding. And please refer to "7.4 Multiple Process Encoding" in this manual for information on multiple process encoding.
3.3.2 "-input_id"

[Option]
- input_id

[Settable range or value]
0 - 15

[Description]
Specify the input channel ID to use in encoding.
If this option is not specified, an available input channel ID will be used.

[Note]
✓ When you perform multi-input, always specify the input channels using this option.
   Please refer to "7.2 Multi-Input" in this manual for information on multi-input.
✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2-6</td>
<td>0 - 15</td>
</tr>
<tr>
<td>9,10</td>
<td>0 - 15</td>
</tr>
<tr>
<td>33</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
3.3.3 "-output_id"

[Option]
   -output_id

[Settable range or value]
   0 - 15

[Description]
   Specify the output channel ID to use in encoding.
   If this option is not specified, an available output channel ID will be used.

[Note]
   ✓ If the codec of output file is HEVC and the channel is less than 8, please specify the value between 0-7 to the output channel ID
   ✓ When you perform multi-encoding please don't specify to use and not use this option at the same time.
     Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding.
   ✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2-6</td>
<td>0 - 15</td>
</tr>
<tr>
<td>9,10</td>
<td>0 - 15</td>
</tr>
<tr>
<td>33</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
3.3.4 "-resize"

[Option]
-resize

[Settable range or value]
Width:
  256(min)- 4096(max)
Height:
  192(min)- 2160(max)

[Description]
Specify the output video resolution.
The output video resolution is specified by "width x height".
e.g.) -resize 1280x720
If this option is not specified, the values are the same as input video.

[Note]
✓ Please use an even number for width and height.
✓ Upscaling is not supported.
✓ Downscaling is supported up to 1/8 for both width and height.
✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>256x192 - 4096x2160</td>
</tr>
<tr>
<td>2-6</td>
<td>256x192 - 1920x1088</td>
</tr>
<tr>
<td>9,10</td>
<td>256x192 - 1088x1920</td>
</tr>
<tr>
<td>33</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
✓ To specify the resolution parameter of 2 to 6 for the resolution of the output video and when the input video exceeds 1920x1088, use the "-s" option to set the resolution of the input video file to "1920x1088" or less.
✓ To specify the resolution parameter of 9 or 10 for the resolution of the output video and the input video exceeds 1088x1920, use the "-s" option to set the resolution of the input video file to "1088x1920" or less.
✓ If the number of vertical pixels is even and other than a multiple of 4 is specified, the image at the bottom of the output may blur.
3.3.5 "-rc"

[Option]
-rc

[Settable range or value]
- cbr  : Constant bitrate
- vbr  : Variable bitrate

[Description]
Specify the type of the bitrate.

➢ For constant bitrate
   Specify the bitrate using the "-b:v" option.

➢ For variable bitrate
   Specify each bitrate using the following options.
   "-b:v" : Average bitrate
   "-maxrate" : Maximum bitrate
   "-minrate" : Minimum bitrate

Please specify a value that satisfies the following relational expression to each bitrate.
   Minimum bitrate < Average bitrate < Maximum bitrate

If this option is not specified, constant bitrate (CBR) will be used (underlined value).
3.3.6 “-profile:v”

[Option]
- profile:v

[Settable range or value]
- For AVC
  - const_baseline : Constrained Baseline profile
  - baseline : Baseline profile
  - main : Main profile
  - high : High profile
  - const_high : Constrained High profile
  - high10 : High 10 profile
  - high422 : High 4:2:2 profile
- For HEVC
  - main : Main profile
  - main10 : Main 10 profile
  - main422_10 : Main 4:2:2 10 profile

[Description]
Specify the output video profile. If this option is not specified, main profile will be used (underlined value).

[Note]
✓ Please specify the resolution, the bitrate, and the frame rate according to the specifications of AVC and HEVC.
✓ When “Baseline profile” or “Constrained Baseline profile” or “Constrained High profile” are set, B frame is not used.
✓ When the pixel format is not supported in the profile which is specified by this option, warning message stating that it is not supported is displayed and automatically change the output video profile as follows.

<table>
<thead>
<tr>
<th>Pixel format</th>
<th>AVC encoding</th>
<th>HEVC encoding</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0</td>
<td>10-bit</td>
<td>Main 10</td>
</tr>
<tr>
<td>YUV 4:2:2</td>
<td>8-bit</td>
<td>Main 4:2:2 10</td>
</tr>
<tr>
<td></td>
<td>10-bit</td>
<td>Main 4:2:2 10</td>
</tr>
</tbody>
</table>
3.3.7 "-level:v"

[Option]
- level:v

[Settable range or value]
- For AVC
  2.0, 2.1, 2.2, 3.0, 3.1, 3.2, 4.0, 4.1, 4.2, 5.0, 5.1, 5.2
- For HEVC
  2.0, 2.1, 3.0, 3.1, 4.0, 4.1, 5.0, 5.1, 5.2, 6.0, 6.1, 6.2

[Description]
Specify the output video level. If this option is not specified, automatically set the optimal video level considering encoding conditions such as resolution.

[Note]
✓ Please specify the resolution, the bitrate, and the frame rate according to the specifications of AVC and HEVC.
✓ If the specified video level violates the AVC / HEVC standard for the encoding condition, warning message stating that it is not supported is displayed and automatically change the output video level.

3.3.8 "-tier"

[Option]
- tier

[Settable range or value]
main : Main tier
high : High tier

[Description]
Specify the output video tier. Please specify this option only for HEVC. If this option is not specified, high tier will be used (underlined value).

[Note]
✓ Please specify the resolution, the bitrate, and the frame rate according to the specifications of HEVC.
3.3.9 "-buf_size"

[Option]
-buf_size

[Settable range or value]
101Kbps - 2400000Kbps

When the value of "-g" option is "1" and the output video resolution is 3840x2160 or more, the specifiable range is as follows.

101Kbps - 600000Kbps

[Description]
Specify the buffer size of the output ES using variable bitrate (VBR). Please specify "No unit" (bps), "k" (Kbps), or "M" (Mbps) as the unit.
- e.g.) -b:v 2000000 (when bps is used)
- e.g.) -b:v 2000k (when Kbps is used)
- e.g.) -b:v 2M (when Mbps is used)
Please specify a value higher than the maximum bitrate for this option. If this option is not specified, the same value as maximum bitrate will be used.

[Note]
✓ If you specify AVC and a buffer size higher than the optimum value for the resolution and frame rate of the output video file, the buffer size will be limited to the optimum value.

3.3.10 "-use_b"

[Option]
-use_b

[Settable range or value]
0 : Not use B frame
1 : Use B frame

[Description]
Specify to use or not to use B frame.
If this option is not specified, "Use B frame" will be used (underlined value).

[Note]
✓ When HEVC and "Not use B frame" is specified, B frames without backward reference will be used.
3.3.11 "-fix_gop"

[Option]
-fix_gop

[Settable range or value]
- For AVC
  strict: Inserts I frame at regular intervals
  (Does not insert I frame at scene change)
  on: Inserts I frame at regular intervals
  (Inserts I frame at scene change)
  off: Resets interval of I frame at scene change
  (Inserts I frame at scene change)
- For HEVC
  strict: Inserts I frame at regular intervals
  (Does not insert I frame at scene change)
  off: Resets interval of I frame at scene change
  (Inserts I frame at scene change)

[Description]
Specify the method of inserting I frames in GOP structure.
If this option is not specified, "Insert I frame at regular intervals (Does not insert I frame at scene change)" will be used (underlined value).

3.3.12 "-sc_use_idr"

[Option]
-sc_use_idr

[Settable range or value]
  0: Insert I frame at scene change (video quality priority)
  1: Insert IDR frame at scene change

[Description]
Specify the type of I frame to be inserted at scene change.
This option is valid for the IDR frame that detected scene change.
- If the frame of the scene change is a P or B frame, an I frame will be inserted.
- If the frame of the scene change is an I frame, the frame type will not change.
- If the frame of the scene change is an IDR frame, the frame specified by this option will be inserted.

By setting this option to "1", the scene change will also maintain the closed GOP structure.
If this option is not specified, "Insert I frame at scene change" will be used (underlined value).
This option is valid only when AVC and "-fix_gop" option is "on" or "off".
3.3.13 "-closed_gop"

[Option]
-closed_gop

[Settable range or value]
0 : Open GOP
1 : Close GOP

[Description]
Specify the GOP structure.
If this option is not specified, "Open GOP" will be used (underlined value).

3.3.14 "-cpb_delay"

[Option]
-cpb_delay

[Settable range or value]
- For AVC
  45000 - 270000 (500ms - 3Sec) : low latency encoding is disabled (-ll_mode 0)
  4500 - 270000 (50ms - 3Sec) : low latency encoding is enabled (-ll_mode 1-4)
- For HEVC
  9000 - 270000 (100ms - 3Sec)

[Description]
Specify the CPB delay time
The relation of CPB delay time and the value of this option is as follows.
  CPB delay time (ms) = the value of this option (Hz) / 90KHz
  e.g.) When specified value is 9000Hz
       100ms = 9000Hz / 90KHz

If this option is not specified, 270000 (= 3Sec) will be used.

Reference: Necessary output CPB buffer size is as follows.
- For constant bitrate(CBR)
  (the specified value of "-cpb_delay") x (the specified value of "-buf_size")
- For variable bitrate(VBR)
  (the specified value of "-cpb_delay") x (the specified value of "-buf_size")

[Note]
✓ For HEVC, set this option value in units of 9000 Hz. When setting a value other than 9000 Hz unit, the value will be truncated to a multiple of 9000Hz.
✓ When AVC and low latency encoding is enabled, CPB delay time is corrected and encoded if specifying CPB delay time lower than the optimum value for the frame rate of output video file.
3.3.15 "-init_cpb_delay"

[Option]
- init_cpb_delay

[Settable range or value]
6 : 60%
7 : 70%
8 : 80%
9 : 90%
10 : 100%

[Description]
Specify the initial occupied amount of the CPB buffer (ratio).
This option can only be specified for AVC.
If this option is not specified, "100%" will be used (underlined value).

3.3.16 "-wp"

[Option]
- wp

[Settable range or value]
0  : Not use weighted prediction
1  : Use weighted prediction

[Description]
Specify to use or not to use weighted prediction.
If this option is not specified, "Not use weighted prediction" will be used (underlined value).
3.3.17 "-aspect_ratio"

[Option]
-aspect_ratio

[Settable range or value]
(Horizontal value) / (Vertical value)

[Description]
Specify the "aspect_ratio_idc" (aspect ratio) of VUI parameter. Specify this value as a fraction.
  e.g.) For 4:3
  -aspect_ratio 4/3

If this option is not specified, VUI parameter will not be set.

3.3.18 "-video_format"

[Option]
-video_format

[Settable range or value]
0 - 5

[Description]
Specify the "video_format" of VUI parameter.
If this option is not specified, VUI parameter will not be set.

3.3.19 "-video_full_range_flag"

[Option]
-video_full_range_flag

[Settable range or value]
0 - 1

[Description]
Specify the "video_full_range_flag" of VUI parameter.
If this option is not specified, VUI parameter will not be set.
3.3.20 "-colour_primaries"

[Option]
-colour_primaries

[Settable range or value]
0 - 255

[Description]
Specify the "colour_primaries" of VUI parameter.
If this option is not specified, VUI parameter will not be set.

[Note]
✓ In the case of AVC, please do not specify the reserved value of AVC specification.

3.3.21 "-transfer_characteristics"

[Option]
-transfer_characteristics

[Settable range or value]
0 - 255

[Description]
Specify the "transfer_characteristics" of VUI parameter.
If this option is not specified, VUI parameter will not be set.

[Note]
✓ In the case of AVC, please do not specify the reserved value of AVC specification.
3.3.22 "-matrix_coefficients"

[Option]
-matrix_coefficients

[Settable range or value]
0 - 255

[Description]
Specify the "matrix_coefficients" of VUI parameter.
If this option is not specified, VUI parameter will not be set.

[Note]
✓ In the case of AVC, please do not specify the reserved value of AVC specification.

3.3.23 "-chroma_sample_loc_type"

[Option]
-chroma_sample_loc_type

[Settable range or value]
0 - 5

[Description]
Specify the "chroma_sample_loc_type_top_field" and
"chroma_sample_loc_type_bottom_field" of VUI parameter.
The "chroma_sample_loc_type_top_field" and
"chroma_sample_loc_type_bottom_field" will be set to the same value.
If this option is not specified, VUI parameter will not be set.
3.3.24 "-ll_mode"

**Option**
- ll_mode

**Settable range or value**
- **0** : Disable
- **1 - 4** : Enable, refreshing MB line interval every 1 picture

**Description**
Specify the enabling or disabling of the low latency encoding function, which uses the GDR (Gradual Decoding Refresh) method.
This option can only be specified for AVC.
If 1-4 is set, low latency encoding will be enabled.
The MB line interval which is refreshed every 1 picture will be set to "specified value + 1".
If this option is not specified, disable will be used (underlined value).

**Note**
✓ If the low latency encoding function is specified to be enabled, it is necessarily to specify other options as follows.
- Specify no use of B frame (-use_b 0)
- Specify other than 1 to GOP size (-g other than 1)
✓ If the low latency encoding function is specified to be enabled, weight prediction will not be used (-wp 0).
✓ If the number of MB Lines less than the optimum value for the resolution of the output video file is specified, the MB Line number is corrected and encoded.

3.3.25 "-aud"

**Option**
- aud

**Settable range or value**
- **0** : Not add access unit delimiter
- **1** : Add access unit delimiter

**Description**
Specify to add or not add access unit delimiter.
If this option is not specified, "Add access unit delimiter" will be used (underlined value).
3.3.26 "-sps_insert"

[Option]
-sps_insert

[Settable range or value]
0 : Insert in all I/IDR frame
1 : Insert in first IDR frame

[Description]
Specify how to insert SPS in output ES.
This option can only be specified for AVC.
If this option is not specified, "Insert in all I/IDR frame" will be used (underlined value).

3.3.27 "-pps_insert"

[Option]
-pps_insert

[Settable range or value]
0 : Insert in all I/IDR frame, and automatically insert if necessary
1 : Insert in every frame
2 : Insert in I/IDR frame
3 : Insert one PPS in first IDR frame
4 : Insert multiple PPSs in first IDR frame
5 : Insert one PPS in I/IDR frame
6 : Insert multiple PPS in I/IDR frame

[Description]
Specify how to insert PPS in output ES.
This option can only be specified for AVC.
If this option is not specified, "Insert in all I/IDR frame" will be used (underlined value).
3.3.28 "-disp_chroma_*_*"

**[Option]**
- disp_chroma_*_*

**[Settable range or value]**
0.0 - 1.0 (Fixed point number)

**[Description]**
This option is for HDR.
Specify the following value of "Mastering display colour volume SEI message".

\[
\begin{align*}
&\text{display\_primaries\_x}[0], \text{display\_primaries\_x}[1], \text{display\_primaries\_x}[2], \text{white\_point\_x} \\
&\text{display\_primaries\_y}[0], \text{display\_primaries\_y}[1], \text{display\_primaries\_y}[2], \text{white\_point\_y}
\end{align*}
\]

The relationship between option name and SEI parameter is as follows.

\[
\begin{align*}
&-\text{disp\_chroma\_x\_g} : \text{display\_primaries\_x}[0] \\
&-\text{disp\_chroma\_x\_b} : \text{display\_primaries\_x}[1] \\
&-\text{disp\_chroma\_x\_r} : \text{display\_primaries\_x}[2] \\
&-\text{disp\_chroma\_x\_w} : \text{white\_point\_x} \\
&-\text{disp\_chroma\_y\_g} : \text{display\_primaries\_y}[0] \\
&-\text{disp\_chroma\_y\_b} : \text{display\_primaries\_y}[1] \\
&-\text{disp\_chroma\_y\_r} : \text{display\_primaries\_y}[2] \\
&-\text{disp\_chroma\_y\_w} : \text{white\_point\_y}
\end{align*}
\]

The SEI containing the specified values will be added to the frame of the output ES which contain SPS.
If this option is not specified, SEI is not inserted into the corresponding frame.

**[Description]**
✓ To add "Mastering display colour volume SEI message" to SPS, please specify all the following options.

"-disp_chroma\_x\_g", "-disp_chroma\_x\_b", "-disp_chroma\_x\_r", "-disp_chroma\_x\_w", "-disp_chroma\_y\_g", "-disp_chroma\_y\_b", "-disp_chroma\_y\_r", "-disp_chroma\_y\_w", "-disp\_luma\_max", "-disp\_luma\_min"

✓ For using this option at the multi-encoding, this option must set same value for all output files. Also the value of the "-sps\_insert" option is the same. If "-sps\_insert" option value is set to 1, set "-first\_pic\_type" option and "-g" option to the same value for all output. If you set different values for these options, the SEI is not inserted into the frame as expected.
3.3.29 "-disp_luma_max"

[Option]
-disp_luma_max

[Settable range or value]
0.0 - 65535.0 (Fixed point number)

[Description]
This option is for HDR.
Specify the "max_display_mastering_luminance" of "Mastering display colour volume SEI message".
The SEI containing the specified values will be added to the frame of the output ES which contain SPS.
If this option is not specified, SEI is not inserted into the corresponding frame.

[Description]
✓ To add "Mastering display colour volume SEI message" to SPS, specify the following options.
   "-disp_chroma_x_g", "-disp_chroma_x_b", "-disp_chroma_x_r", "-disp_chroma_x_w",
   "-disp_chroma_y_g", "-disp_chroma_y_b", "-disp_chroma_y_r", "-disp_chroma_y_w",
   "-disp_luma_max", "-disp_luma_min"
✓ The specified value must satisfy the following relational expression.
   disp_luma_max ≥ disp_luma_min
✓ For using this option at the multi-encoding, this option must set same value for all output files. Also the value of the "-sps_insert" option is the same. If "-sps_insert" option value is set to 1, set "-first_pic_type" option and "-g" option to the same value for all output. If you set different values for these options, the SEI is not inserted into the frame as expected.
3.3.30 "-disp_luma_min"

[Option]
-disp_luma_min

[Settable range or value]
0.0 - 65535.0 (Fixed point number)

[Description]
This option is for HDR.
Specify the "min_display_mastering_luminance" of "Mastering display colour volume SEI message".
The SEI containing the specified values will be added to the frame of the output ES which contain SPS.
If this option is not specified, SEI is not inserted into the corresponding frame.

[Note]
✓ To add "Mastering display colour volume SEI message" to SPS, specify the following options.
   
   "-disp_chroma_x_g", "-disp_chroma_x_b", "-disp_chroma_x_r", "-disp_chroma_x_w",
   
   "-disp_chroma_y_g", "-disp_chroma_y_b", "-disp_chroma_y_r", "-disp_chroma_y_w",
   
   "-disp_luma_max", "-disp_luma_min"
✓ The specified value must satisfy the following relational expression.
   
   disp_luma_max ≥ disp_luma_min
✓ For using this option at the multi-encoding, this option must set same value for all output files. Also the value of the "-sps_insert" option is the same.
   
   If "-sps_insert" option value is set to 1, set "-first_pic_type" option and "-g" option to the same value for all output. If you set different values for these options, the SEI is not inserted into the frame as expected.
3.3.31 "-max_cll"

[Option]
-max_cll

[Settable range or value]
0 - 65535

[Description]
This option is for HDR. Specify the "max_content_light_level" of "Content light level information SEI message". The SEI containing the specified values will be added to the frame of the output ES which contain SPS. If this option is not specified, SEI is not inserted into the corresponding frame.

[Note]
✓ To add "Content light level information SEI message" to SPS, specify "-max_cll" and "-max_fall" options.
✓ For using this option at the multi-encoding, this option must set same value for all output files. Also the value of the "-sps_insert" option is the same. If "-sps_insert" option value is set to 1, set "-first_pic_type" option and "-g" option to the same value for all output. If you set different values for these options, the SEI is not inserted into the frame as expected.

3.3.32 "-max_fall"

[Option]
-max_fall

[Settable range or value]
0 - 65535

[Description]
This option is for HDR. Specify the "max_pic_average_light_level" of "Content light level information SEI message". The SEI containing the specified values will be added to the frame of the output ES which contain SPS. If this option is not specified, SEI is not inserted into the corresponding frame.

[Note]
✓ To add "Content light level information SEI message" to SPS, specify "-max_cll" and "-max_fall" options.
✓ For using this option at the multi-encoding, this option must set same value for all output files. Also the value of the "-sps_insert" option is the same. If "-sps_insert" option value is set to 1, set "-first_pic_type" option and "-g" option to the same value for all output. If you set different values for these options, the SEI is not inserted into the frame as expected.
3.3.33 "-a53cc"

[Option]
-a53cc

[Settable range or value]

0 : Does not insert closed caption
1 : Insert closed caption

[Description]
Specify whether to insert the closed caption included in the input video to the output video ES or not.
If this option is not specified, closed caption is not inserted into the SEI of the output video (underlined value).

[Note]
✓ When inserting the closed caption in the output video ES, the input video must be decoded with a plug-in supporting closed caption. ("h264", etc). If you decode with a plug-in that does not support closed caption, closed caption will not be inserted into output video ES regardless of this option.
✓ For using this option at the multi-encoding, this option must set same value for all output files.
✓ If more than one cc_data are included in the SEI, one of the cc_data is inserted into the output ES. Which cc_data is inserted follows the decoder to use.

3.3.34 "-afd"

[Option]
-afd

[Settable range or value]

0 : Does not insert AFD (Active Format Description)
1 : Insert AFD

[Description]
Specify whether to insert the AFD included in the input video to the output video ES or not.
If this option is not specified, AFD is not inserted into the SEI of the output video (underlined value).

[Note]
✓ When inserting the AFD in the output video ES, the input video must be decoded with a plug-in supporting AFD. ("h264", etc). If you decode with a plug-in that does not support AFD, AFD will not be inserted into output video ES regardless of this option.
✓ When multi-encoding and using this option, the same value must be set for all output files.
3.3.35 "-use_radl"

[Option]
- use_radl

[Settable range or value]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>TRAIL</td>
</tr>
<tr>
<td>1</td>
<td>RADL</td>
</tr>
</tbody>
</table>

[Description]
Specify the NAL unit type of the frame present in the same SOP as the IDR of the output frame.
This option can only be specified for HEVC.
If this option is not specified, "RADL" will be used (underlined value).

3.3.36 "-first_pic_type"

[Option]
- first_pic_type

[Settable range or value]

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>B frame</td>
</tr>
<tr>
<td>1</td>
<td>IDR frame</td>
</tr>
</tbody>
</table>

[Description]
Specify the frame type of the first frame to display the output file.
This option can only be specified for AVC.
If this option is not specified, "B frame" will be used (underlined value).
3.3.37 "-layer_num"

[Option]
-layer_num

[Settable range or value]
1 - 3

[Description]
Specify the number of layers when the GOP has the hierarchical structure with B-picture contained.
This option can only be specified for HEVC.
This option is valid only when the value of "-g" option is a multiple of 2 and the value of "-use_b" option is 1.

The upper limit of this option depends on the value of the "-g" option as follows.

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 8</td>
<td>3</td>
</tr>
<tr>
<td>Not a multiple of 8 and a multiple of 4</td>
<td>2</td>
</tr>
<tr>
<td>Not a multiple of 4 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>

If a value exceeding the upper limit corresponding to the value of the "-g" option within the range of specifiable values is specified for this option, the upper limit is automatically set.

If this option is not specified, the following values are set.

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 8</td>
<td>3</td>
</tr>
<tr>
<td>Not a multiple of 8 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>

3.3.38 "-gop_hierarchy"

[Option]
-gop_hierarchy

[Settable range or value]
1 : Random access structure
2 : Low delay B-picture (LDB) structure

[Description]
Specify the kind of structure when the GOP has the hierarchical structure with B-picture contained.
This option can only be specified for HEVC.
This option is valid only when the value of "-g" option is a multiple of 2 and the value of "-use_b" option is 1.
If this option is not specified, "Random access structure" will be used (underlined value).
3.3.39 "-idr_interval"

[Option]
- idr_interval

[Settable range or value]
1 - 65535

[Description]
Specify the IDR frame insertion interval of GOP structure. This option is valid only when the value of "-closed_gop" option is 0. If this option is not specified, it will be set as the following value.

- For AVC : 4
- For HEVC : 100
4. MB86M30 Transcode Acceleration Function

Decoding/Encoding using MB86M30 is called "MB86M30 Transcode acceleration function" in this manual.

This chapter describes the "MB86M30 transcode acceleration function" using FFmpeg.

### 4.1 Option Setting of FFmpeg

To transcode using the "MB86M30 transcode acceleration function", specify the following in the input file options and the output file options of FFmpeg.

- **For decoding AVC**
  - Specify "-c:v m30trc" as the input file option.

  ```
  # ffmpeg [options...] (-c:v m30trc [infile options...] [-i infile])... ([outfile options...] [outfile])...
  ```

- **For decoding HEVC**
  - Specify "-c:v m30trc" as the input file option.

  ```
  # ffmpeg [options...] (-c:v m30trc [infile options...] [-i infile])... ([outfile options...] [outfile])...
  ```

- **For encoding to AVC**
  - Specify "-c:v m30trc_h264" as the output file option.

  ```
  # ffmpeg [options...] ([infile options...] [-i infile])... (-c:v m30trc_h264 [outfile options...] [outfile])...
  ```

- **For encoding to HEVC**
  - Specify "-c:v m30trc_hevc" as the output file option.

  ```
  # ffmpeg [options...] ([infile options...] [-i infile])... (-c:v m30trc_hevc [outfile options...] [outfile])...
  ```

**Notes:**
- For the output file option, specify the video codec set in "2.1 Video Codec Settings" in this manual.
- If "-c:v m30trc" is specified as the input file option and "-c:v m30trc_xxxx" or "m30enc_xxxx" is not specified as the output file option, the output video will be corrupt.
The other options are specified as follows.

(infile options...):  
Specify the decoding settings of the MB86M30.  
Put the decoding options after "-c:v m30trc".  
For details of the decoding options, please refer to "4.2 Specific Options for Decoding" in this manual.  
The FFmpeg standard RAW data conversion options cannot be used.

[-i infile]:  
Specify file name of the input video.  
e.g.) -i sample_02.mp4

Following is an example of specifying the input file from a different directory.  
e.g.) -i sample_video/sample_02.mp4

(outfile options...):  
Specify the encoding settings of the MB86M30.  
Put these options after "-c:v m30trc_h264" or "-c:v m30trc_hevc".  
For details on all options, refer to "4.3 Extended Options for Encoding" and "4.4 Specific Options for Encoding" in this manual.  
If you mistakenly specify an option of another function, it will be ignored.

[ outfile]:  
Specify output file name.  
You can select the output file extension from MP4 or MPEG-2 TS.

For MP4, use the file extension ".mp4".  
e.g.) output_0.mp4

For MPEG-2 TS, use the file extension ".ts".  
e.g.) output_0.ts

Following is an example of specifying the output file for storing in a different directory.  
e.g.) result/output_0.mp4
4.2 Specific Options for Decoding

This section describes FFmpeg options (decoding options) added for using the "MB86M30 transcode acceleration function". These options are specified as input file options (infile options).

4.2.1 "-sei_payload_type"

[Option]
-sei_payload_type

[Settable range or value]
4, 5, 7-254

[Description]
Specify the payload type of the SEI to be inherited from the input file to the output file. A maximum of 5 can be specified by separating the payload type with a colon.

Example:
-sei_payload_type 7
-sei_payload_type 7:8:9:10:11

To inherit SEI of HDR 10, specify as follows.
Example:
-sei_payload_type 137:144

[Note]
✓ When inheriting, the payload size must be 253 bytes or less.
✓ When the input video is MPEG-2, this option is invalid.
✓ When skipping the frame of the input file using the "-half_fr" option, the SEI of the frame to be displayed at the odd-numbered frame of the input file is not inherited.
✓ When converting from interlace to progressive using the "-ip_convert" option, the bottom field SEI of the input file is not inherited.
4.3 Extended Options for Encoding

This section describes FFmpeg options that were extended to use the "MB86M30 encode acceleration function". These options are specified as output file options (outfile options).

4.3.1 "-b:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.1 "-b:v"' in this manual.

4.3.2 "-minrate"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.2 "-minrate"' in this manual.

4.3.3 "-maxrate"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.3 "-maxrate"' in this manual.

4.3.4 "-g"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.4 "-g"' in this manual.
4.4 Specific Options for Encoding

This section describes FFmpeg options added for using the "MB86M30 transcode acceleration function". These options are specified as output file options (outfile options).

4.4.1 "-device"

[Option]
-device

[Settable range or value]
0 - 15

[Description]
Specify the M820L (device number) board which will execute encoding. If this option is not specified, it will be set as the following value.

➢ If both input channels and output channels are not specified, the device number will be automatically assigned to an M820L which is able to perform the encoding.
➢ If either input channels or output channels are specified, device number 0 will be used.

Please refer to '4.4.2 "-input_id"' and '4.4.3 "-output_id"' in this manual for information on input channels and output channels.

[Note]
✓ When performing multi-encoding or multiple process encoding, please don't specify to use and not use this option at the same time.
Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding. And please refer to "7.4 Multiple Process Encoding" in this manual for information on multiple process encoding.
4.4.2 "-input_id"

[Option]
- input_id

[Settable range or value]
0 - 7

[Description]
Specify the input channel ID to use in encoding.
If this option is not specified, an available input channel ID will be used.

[Note]
✓ When performing multi-input, specify the input channel by using this option.
  Please refer to "7.2 Multi-Input" in this manual for information on multi-input.
✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2-6</td>
<td>0 - 7</td>
</tr>
<tr>
<td>9,10</td>
<td>0 - 7</td>
</tr>
<tr>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
✓ For single input, set this option value to "0".
4.4.3 "-output_id"

[Option]
   -output_id

[Settable range or value]
   0 - 15

[Description]
   Specify the output channel ID to use in encoding.
   If this option is not specified, an available output channel ID will be used.

[Note]
   ✓ If the codec of output file is HEVC and the channel is less than 8, please specify the value between 0-7 to the output channel ID
   ✓ When you perform multi-encoding please don't specify to use and not use this option at the same time.
      Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding.
   ✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2-6</td>
<td>0 - 15</td>
</tr>
<tr>
<td>9,10</td>
<td>0 - 15</td>
</tr>
<tr>
<td>33</td>
<td>0</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
4.4.4 "-resize"

[Option]
-resize

[Settable range or value]
Width:
- 320(min) - 3840(max)
Height:
- 180(min) - 2160(max)

[Description]
Specify the output video resolution.
The output video resolution is specified by "width x height".
e.g.) -resize 1280x720
If this option is not specified, the values are the same as input video.

[Note]
✓ Please use an even number for width.
✓ The vertical pixel count of the output video is rounded down to the following multiple.
  ➢ For progressive output
    Round down to a multiple of 4.
  ➢ For Interlace output
    If a remainder of vertical pixels divided by 32 is 16 or more, vertical pixels are rounded down to a multiple of 4.
    If a remainder of vertical pixels divided by 32 is less than 16, vertical pixels are rounded down to a multiple of 4.
✓ Upscaling is not supported.
✓ Downscaling is supported up to 1/8 for both width and height. (Up to 1/4 in the case of interlaced output.)
✓ The range of this setting value depends on the resolution setting of the output video as follows.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unavailable</td>
</tr>
<tr>
<td>2-6</td>
<td>320x180 - 1920x1088</td>
</tr>
<tr>
<td>9,10</td>
<td>320x180 - 1088x1920</td>
</tr>
<tr>
<td>33</td>
<td>320x180 - 3840x2160</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
✓ When using this option with single encoding, set the resolution parameter of "33" for the output video. When the resolution parameter of output video is "1", this option cannot be used. Also, the "-s" option is not supported.
4.4.5 "-rc"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.5 "-rc"' in this manual.

4.4.6 "-profile:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.6 "-profile:v"' in this manual.

4.4.7 "-level:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.7 "-level:v"' in this manual.

4.4.8 "-tier"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.8 "-tier"' in this manual.

4.4.9 "-buf_size"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.9 "-buf_size"' in this manual.

4.4.10 "-use_b"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.10 "-use_b"' in this manual.

4.4.11 "-fix_gop"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.11 "-fix_gop"' in this manual.

4.4.12 "-sc_use_idr"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.12 "-sc_use_idr"' in this manual.
4.4.13 "-closed_gop"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.13 "-closed_gop"' in this manual.

4.4.14 "-cpb_delay"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.14 "-cpb_delay"' in this manual.

4.4.15 "-init_cpb_delay"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.15 "-init_cpb_delay"' in this manual.

4.4.16 "-wp"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.16 "-wp"' in this manual.

4.4.17 "-aspect_ratio"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.17 "-aspect_ratio"' in this manual.

4.4.18 "-video_format"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.18 "-video_format"' in this manual.

4.4.19 "-video_full_range_flag"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.19 "-video_full_range_flag"' in this manual.

4.4.20 "-colour_primaries"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.20 "-colour_primaries"' in this manual.
4.4.21 "-transfer_characteristics"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.21 "-transfer_characteristics"' in this manual.

4.4.22 "-matrix_coefficients"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.22 "-matrix_coefficients"' in this manual.

4.4.23 "-chroma_sample_loc_type"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.23 "-chroma_sample_loc_type"' in this manual.

4.4.24 "-ll_mode"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.24 "-ll_mode"' in this manual.

4.4.25 "-aud"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.25 "-aud"' in this manual.

4.4.26 "-sps_insert"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.26 "-sps_insert"' in this manual.

4.4.27 "-pps_insert"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.27 "-pps_insert"' in this manual.
4.4.28 "-yuv_format"

[Option]
-yuv_format

[Settable range or value]

<table>
<thead>
<tr>
<th>yuv420p</th>
<th>: YUV 4:2:0 8-bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>yuv420p10le</td>
<td>: YUV 4:2:0 10-bit</td>
</tr>
<tr>
<td>yuv422p</td>
<td>: YUV 4:2:2 8-bit</td>
</tr>
<tr>
<td>yuv422p10le</td>
<td>: YUV 4:2:2 10-bit</td>
</tr>
</tbody>
</table>

[Description]
Specify the video pixel format.
If this option is not specified, the pixel format of the input file will be used.

[Note]
✓ Valid values are determined by the pixel format of the input file.

<table>
<thead>
<tr>
<th>Pixel format of input file</th>
<th>Value (pixel format of output file)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8-bit</td>
<td>yuv420p</td>
</tr>
<tr>
<td>10-bit</td>
<td>yuv420p, yuv420p10le</td>
</tr>
<tr>
<td>YUV 4:2:2 8-bit</td>
<td>yuv420p, yuv422p</td>
</tr>
<tr>
<td>10-bit</td>
<td>yuv420p, yuv420p10le, yuv422p, yuv422p10le</td>
</tr>
</tbody>
</table>

✓ When using this option for multi-encoding, this option must be set for all output files and the same value must be used for the same input channel ID.
For details on multi-encoding, refer to "7.1 Multi-Encoding" in this manual.

e.g.) Correct command:
ffmpeg -i input.mp4
   -cv m30trc_h264 -yuv_format yuv420p output0.mp4
   -cv m30trc_h264 -yuv_format yuv420p output1.mp4

e.g.) Incorrect command:
ffmpeg -i input.mp4
   -cv m30trc_h264 -yuv_format yuv420p output0.mp4
   -cv m30trc_h264 -yuv_format yuv420p10le output1.mp4

✓ When encoding AVC and using different pixel formats, there are some restrictions on how to specify the output channels.
For detail on the restrictions, refer to the [Note] section of "7.1 Multi-Encoding" in this manual.
4.4.29 "-half_fr"

[Option]
-half_fr

[Settable range or value]

<table>
<thead>
<tr>
<th>0</th>
<th>: Not skip frames</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>: Skip frames</td>
</tr>
</tbody>
</table>

[Description]
Specify whether to skip frames of the input file.
In the case of skipping, frames of the input file are reduced to 1/2 and encoding is performed.
Also, the frame rate of the output file is reduced to 1/2 of the input file frame rate.
If this option is not specified, frames are not skipped. (underlined value)

[Note]
✓ This option is valid only for "60p", "59.94p", and "50p" for the input file frame rate.
4.4.30 "-ip_convert"

[Option]
-ip_convert

[Settable range or value]
- i2p : Convert interlaced input to progressive output
- p2i : Convert progressive input to interlaced output

[Description]
Specify the conversion of output video format (Interlace/Progressive).
The frame rate after conversion is as follows.
- For i2p

<table>
<thead>
<tr>
<th>Input frame rate</th>
<th>Converted frame rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>60i</td>
<td>30p</td>
</tr>
<tr>
<td>59.94i (60000/1001)</td>
<td>29.97p (30000/1001)</td>
</tr>
<tr>
<td>50i</td>
<td>25p</td>
</tr>
</tbody>
</table>
- For p2i

<table>
<thead>
<tr>
<th>Input frame rate</th>
<th>Converted frame rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>60p, 30p, 24p</td>
<td>60i</td>
</tr>
<tr>
<td>59.94p (60000/1001), 29.97p (30000/1001), 23.97p (24000/1001)</td>
<td>59.94i (60000/1001)</td>
</tr>
<tr>
<td>50p, 25p</td>
<td>50i</td>
</tr>
</tbody>
</table>

If this option is not specified, conversion of the output video format will be not performed.

[Note]
- If the input video and the setting condition of this option are different, this option is invalid.
  e.g.) In the case of interlaced input video and "-ip_convert p2i ", output as interlaced.
- When encoding AVC and using different pixel formats, there are some restrictions on how to specify the output channels.
  For detail on the restrictions, refer to the [Note] section of "7.1 Multi-Encoding" in this manual.

4.4.31 "-use_radl"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.35 "-use_radl"' in this manual.

4.4.32 "-first_pic_type"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.36 "-first_pic_type"' in this manual.
4.4.33 "-layer_num"

[Option]
-layer_num

[Settable range or value]
1 - 3

[Description]
Specify the number of layers when the GOP has the hierarchical structure with B-picture contained.
This option can only be specified for HEVC.
This option is valid only when the value of "-g" option is a multiple of 2 and the value of "-use_b" option is 1.

The upper limit of this option depends on the value of the "-g" option as follows.

- For progressive output

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 8</td>
<td>3</td>
</tr>
<tr>
<td>Not a multiple of 8 and a multiple of 4</td>
<td>2</td>
</tr>
<tr>
<td>Not a multiple of 4 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>

- For interlace output

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 4</td>
<td>2</td>
</tr>
<tr>
<td>Not a multiple of 4 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>

If a value exceeding the upper limit corresponding to the value of the "-g" option within the range of specifiable values is specified for this option, the upper limit is automatically set.

If this option is not specified, the following values are set.

- For progressive output

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 8</td>
<td>3</td>
</tr>
<tr>
<td>Not a multiple of 8 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>

- For interlace output

<table>
<thead>
<tr>
<th>The value of &quot;-g&quot; option</th>
<th>The set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A multiple of 4</td>
<td>2</td>
</tr>
<tr>
<td>Not a multiple of 4 and a multiple of 2</td>
<td>1</td>
</tr>
</tbody>
</table>
4.4.34 "-gop_hierarchy"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.38 "-gop_hierarchy"' in this manual.

4.4.35 "-idr_interval"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.39 "-idr_interval"' in this manual.
5. SC2A11+MB86M30 Transcode Acceleration Function

The transcoding using the software decoder on the SC2A11 and the MB86M30 encoder is called "SC2A11+MB86M30 transcode acceleration function" in this manual. This chapter describes the "SC2A11+MB86M30 transcode acceleration function" using FFmpeg.

5.1 Option Setting of FFmpeg

To transcode using the "SC2A11+MB86M30 transcode acceleration function", specify the following in the input file options and the output file options of FFmpeg.

➢ For decoding AVC
   Specify "-c:v m820_h264" as the input file option.

   ```
   # ffmpeg [options...] { -c:v m820_h264 [infile options...] [-i infile]... { [outfile options...] [outfile] }... }
   ```

➢ For decoding HEVC
   Specify "-c:v m820_hevc" as the input file option.

   ```
   # ffmpeg [options...] { -c:v m820_hevc [infile options...] [-i infile]... { [outfile options...] [outfile] }... }
   ```

➢ For encoding to AVC
   Specify "-c:v m30enc_h264" as the output file option.

   ```
   # ffmpeg [options...] { [infile options...] [-i infile]... { -c:v m30enc_h264 [outfile options...] [outfile] }... }
   ```

➢ For encoding to HEVC
   Specify "-c:v m30enc_hevc" as the output file option.

   ```
   # ffmpeg [options...] { [infile options...] [-i infile]... { -c:v m30enc_hevc [outfile options...] [outfile] }... }
   ```

Notes:
- For the output file option, specify the video codec set in "2.1 Video Codec Settings" in this manual.
- If "-c:v m820_xxxx" is specified as the input file option and "-c:v m820_xxxx" or "m30enc_xxxx" is not specified as the output file option, the output video will be corrupt.
The other options are specified as follows.

**[infile options...]:**
- Specify the decoding settings of the SC2A11.
- Put the decoding options after "-c:v m820_h264" or "-c:v m820_hevc".
- For details of the decoding options, please refer to "5.2 Specific Options for Decoding" in this manual.
- The FFmpeg standard RAW data conversion options cannot be used.

**[-i infile]:**
- Specify file name of the input video.
  - e.g.) -i sample_02.mp4

  Following is an example of specifying the input file from a different directory.
  - e.g.) -i sample_video/sample_02.mp4

**[outfile options...]:**
- Specify the encoding settings of the MB86M30.
- Put these options after "-c:v m30enc_h264" or "-c:v m30enc_hevc".
- For details on all options, refer to "5.3 Extended Options for Encoding" and "5.4 Specific Options for Encoding" in this manual.
- If you mistakenly specify an option of another function, it will be ignored.

**[outfile]:**
- Specify output file name.
  - You can select the output file extension from MP4 or MPEG-2 TS.
  - For MP4, use the file extension ".mp4".
    - e.g.) output_0.mp4
  - For MPEG-2 TS, use the file extension ".ts".
    - e.g.) output_0.ts

  Following is an example of specifying the output file for storing in a different directory.
  - e.g.) result/output_0.mp4
5.2 Specific Options for Decoding

This section describes FFmpeg options (decoding options) added for using the "SC2A11+MB86M30 transcode acceleration function". These options are specified as input file options (infile options).

5.2.1 "-video_analyze_device"

[Option]
- video_analyze_device

[Settable range or value]
0 - 15

[Description]
As preprocessing of decoding, specify M820L (device number) to analyze the video information necessary for decoding. Analysis of video information and transcoding must be handled by the same device. If "-device" option is specified, set the same device number as "-device" option to this option. For "-device" option, refer to '5.4.1 "-device"' in this manual.

[Note]
✓ When multi-input, you cannot specify multiple boards in a single encoding operation. Please refer to "7.2 Multi-Input" in this manual for information on multi-input.

5.2.2 "-pic_buf_num"

[Option]
- pic_buf_num

[Settable range or value]
2 - 32

[Description]
Specify the number of frame buffers using for decoding. If this option is not specified, it will be set as "24".

[Note]
✓ If you set a small value for this option, you can reduce the delay time, but decoding errors may occur depending on the input video file. Please change this option value or "-th_num" option value if "ERR: decoding error occurred. value of -pic_buf_num or -th_num option may be too small." error occurs during encoding.
5.2.3 "-th_num"

[Option]
-th_num

[Settable range or value]
1 - 24

[Description]
Specify the number of threads using for decoding.
If this option is not specified, it will be set as "24".

[Note]
✓ If you set a small value for this option, you can reduce the delay time, but decoding errors may occur depending on the input video file.
Please change this option value or "-pic_buf_num" option value if "ERR: decoding error occurred. value of -pic_buf_num or -th_num option may be too small." error occurs during encoding.
5.3 Extended Options for Encoding

This section describes FFmpeg options (encoding options) that were extended to use the "SC2A11+MB86M30 transcoding acceleration function". These options are specified as output file options (outfile options).

5.3.1 "-b:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.1 "-b:v"' in this manual.

5.3.2 "-minrate"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.2 "-minrate"' in this manual.

5.3.3 "-maxrate"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.3 "-maxrate"' in this manual.

5.3.4 "-g"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.2.4 "-g"' in this manual.
5.4 Specific Options for Encoding

This section describes FFmpeg options (encoding options) added for using the "SC2A11+MB86M30 transcode acceleration function". These options are specified as output file options (outfile options).

5.4.1 "-device"

[Option]
-device

[Settable range or value]
0 - 15

[Description]
Specify the M820L (device number) board which will execute encoding. If this option is not specified, it will be set as the following value.

➢ If both input channels and output channels are not specified, the device number will be automatically assigned to an M820L which is able to perform the encoding.
➢ If either input channels or output channels are specified, device number 0 will be used.

Please refer to '5.4.2 "-input_id"' and '5.4.3 "-output_id"' in this manual for information on input channels and output channels.

[Note]
✓ When performing multi-encoding or multiple process encoding, please don't specify to use and not use this option at the same time.
   Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding.
   And please refer to "7.4 Multiple Process Encoding" in this manual for information on multiple process encoding.
✓ If this option is specified, the "-video_analyze_device" option must also be specified.
   For the "-video_analyze_device" option, refer to '5.2.1 "-video_analyze_device"' in this manual.
5.4.2 "-input_id"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.2 "-input_id"' in this manual.

5.4.3 "-output_id"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.3 "-output_id"' in this manual.

5.4.4 "-resize"

[Option]
-resize

[Settable range or value]
Width: 256(min)- 4096(max)
Height: 192(min)- 2160(max)

[Description]
Specify the output video resolution. The output video resolution is specified by "width x height".
e.g.) -resize 1280x720
If this option is not specified, the values are the same as input video.

[Note]
✓ Please use an even number for width and height.
✓ Upscaling is not supported.
✓ Downscaling is supported up to 1/8 for both width and height.
✓ The range of this setting value depends on the resolution setting (resolution parameter) of the output video as follows. Also, the "-s" option is not supported.

<table>
<thead>
<tr>
<th>Resolution parameters</th>
<th>Settable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>256x192 - 4096x2160</td>
</tr>
<tr>
<td>2-6</td>
<td>256x192 - 1920x1088</td>
</tr>
<tr>
<td>9,10</td>
<td>256x192 - 1088x1920</td>
</tr>
<tr>
<td>33</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

For resolution setting, refer to "2.2 Resolution Setting of Output Video" in this document.
5.4.5 "-rc"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.5 "-rc"' in this manual.

5.4.6 "-profile:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.6 "-profile:v"' in this manual.

5.4.7 "-level:v"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.7 "-level:v"' in this manual.

5.4.8 "-tier"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.8 "-tier"' in this manual.

5.4.9 "-buf_size"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.9 "-buf_size"' in this manual.

5.4.10 "-use_b"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.10 "-use_b"' in this manual.

5.4.11 "-fix_gop"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.11 "-fix_gop"' in this manual.
5.4.12 "-sc_use_idr"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.12 "-sc_use_idr"' in this manual.

5.4.13 "-closed_gop"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.13 "-closed_gop"' in this manual.

5.4.14 "-cpb_delay"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.14 "-cpb_delay"' in this manual.

5.4.15 "-init_cpb_delay"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.15 "-init_cpb_delay"' in this manual.

5.4.16 "-wp"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.16 "-wp"' in this manual.

5.4.17 "-aspect_ratio"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.17 "-aspect_ratio"' in this manual.

5.4.18 "-video_format"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.18 "-video_format"' in this manual.
5.4.19 "-video_full_range_flag"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.19 "-video_full_range_flag"’ in this manual.

5.4.20 "-colour_primaries"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.20 "-colour_primaries"’ in this manual.

5.4.21 "-transfer_characteristics"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.21 "-transfer_characteristics"’ in this manual.

5.4.22 "-matrix_coefficients"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.22 "-matrix_coefficients"’ in this manual.

5.4.23 "-chroma_sample_loc_type"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.23 "-chroma_sample_loc_type"’ in this manual.

5.4.24 "-ll_mode"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.24 "-ll_mode"’ in this manual.

5.4.25 "-aud"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.25 "-aud"’ in this manual.

5.4.26 "-sps_insert"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to ‘3.3.26 "-sps_insert"’ in this manual.
5.4.27 "-pps_insert"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.27 "-pps_insert"' in this manual.

5.4.28 "-disp_chroma_*_*"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.28 "-disp_chroma_*_*" in this manual.

5.4.29 "-disp_luma_max"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.29 "-disp_luma_max" in this manual.

5.4.30 "-disp_luma_min"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.30 "-disp_luma_min" in this manual.

5.4.31 "-max_cll"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.31 "-max_cll" in this manual.

5.4.32 "-max_fall"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.32 "-max_fall" in this manual.

5.4.33 "-use_radl"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.35 "-use_radl" in this manual.

5.4.34 "-first_pic_type"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.36 "-first_pic_type" in this manual.
5.4.35 "-layer_num"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.37 "-layer_num"' in this manual.

5.4.36 "-gop_hierarchy"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.38 "-gop_hierarchy"' in this manual.

5.4.37 "-idr_interval"

This option is the same specification as the "MB86M30 encode acceleration function". Please refer to '3.3.39 "-idr_interval"' in this manual.
6. SC2A11 Transcode Acceleration Function

This chapter describes the "SC2A11 transcode acceleration function" using FFmpeg. Transcoding using SC2A11 decoding and SC2A11 encoding will be referred to as "SC2A11 transcode acceleration function" in this manual.

6.1 Option Setting of FFmpeg

To transcode using the "SC2A11 transcode acceleration function", specify the following in the input file options and the output file options of FFmpeg.

- For decoding AVC
  Specify "-c:v m820_h264" as the input file option.

  ```
  # ffmpeg [options...] { -c:v m820_h264 [infile options...] [-i infile]... { [outfile options...] [outfile]... 
  ```

- For decoding HEVC
  Specify "-c:v m820_hevc" as the input file option.

  ```
  # ffmpeg [options...] { -c:v m820_hevc [infile options...] [-i infile]... { [outfile options...] [outfile]... 
  ```

- For encoding to AVC
  Specify "-c:v m820_h264" as the output file option.

  ```
  # ffmpeg [options...] { [infile options...] [-i infile]... { -c:v m820_h264 [outfile options...] [outfile]... 
  ```

- For encoding to HEVC
  Specify "-c:v m820_hevc" as the output file option.

  ```
  # ffmpeg [options...] { [infile options...] [-i infile]... { -c:v m820_hevc [outfile options...] [outfile]... 
  ```

Notes:
- For the output file option, specify the video codec set in "2.1 Video Codec Settings" in this manual.
- If "-c:v m820_xxxx" is specified as the input file option and "-c:v m820_xxxx" or "m30enc_xxxx" is not specified as the output file option, the output file will be corrupt.
- If "-c:v m820_xxxx" is not specified as the input file option and "-c:v m820_xxxx" is specified as the output file option, an encoding error will occur and no video files will be output.
The other options are specified as follows.

(infile options...):
Specify the decoding settings of the SC2A11.
Put the decoding options after "-c:v m820_h264" or "-c:v m820_hevc".
For details of the decoding options, please refer to "6.2 Specific Options for Decoding" in this manual.
The FFmpeg standard RAW data conversion options cannot be used.

[-i infile]:
Specify file name of the input video.
   e.g.) -i sample_02.mp4

Following is an example of specifying the input file from a different directory.
   e.g.) -i sample_video/sample_02.mp4

(outfile options...):
Specify the encoding settings of the SC2A11.
Put these options after "-c:v m820_h264" or "-c:v m820_hevc".
For details on all options, refer to "6.3 Extended Options for Encoding" and "6.4 Specific Options for Encoding" in this manual.
If you mistakenly specify an option of another function, it will be ignored.

[outfile]:
Specify output file name.
You can select the output file extension from MP4 or MPEG-2 TS.

For MP4, use the file extension ".mp4".
   e.g.) output_0.mp4

For MPEG-2 TS, use the file extension ".ts".
   e.g.) output_0.ts

Following is an example of specifying the output file for storing in a different directory.
   e.g.) result/output_0.mp4
6.2 Specific Options for Decoding

This section describes FFmpeg options (decoding options) added for using the "SC2A11 transcode acceleration function". These options are specified as input file options (infile options).

6.2.1 "-video_analyze_device"

This option is the same specification as the "SC2A11+MB86M30 transcode acceleration function". Please refer to '5.2.1 "-video_analyze_device"' in this manual.

6.2.2 "-pic_buf_num"

This option is the same specification as the "SC2A11+MB86M30 transcode acceleration function". Please refer to '5.2.2 "-pic_buf_num"' in this manual.

6.2.3 "-th_num"

This option is the same specification as the "SC2A11+MB86M30 transcode acceleration function". Please refer to '5.2.3 "-th_num"' in this manual.
6.3 Extended Options for Encoding

This section describes FFmpeg options (encoding options) that were extended to use the "SC2A11 transcode acceleration function". These options are specified as output file options (outfile options).

6.3.1 "-b:v"

[Option]  
-b:v

[Settable range or value]  
100Kbps - 2400000Kbps

[Description]  
Specify the constant bitrate (CBR) of output video file.  
Please specify "No unit" (bps), "k" (Kbps), or "M" (Mbps) as the unit.  
e.g.) -b:v 2000000 (when bps is used)  
e.g.) -b:v 2000k (when Kbps is used)  
e.g.) -b:v 2M (when Mbps is used)  
If this option and "-qmax", "-qmin", "-i_qoffset" option are not specified, it will be set to the following value.

➢ For AVC

<table>
<thead>
<tr>
<th>Output resolution</th>
<th>Bitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeds 1280x720</td>
<td>16Mbps</td>
</tr>
<tr>
<td>1280x720 or less</td>
<td>8Mbps</td>
</tr>
<tr>
<td>854x480 or less</td>
<td>4Mbps</td>
</tr>
<tr>
<td>640x360 or less</td>
<td>2Mbps</td>
</tr>
<tr>
<td>426x240 or less</td>
<td>1Mbps</td>
</tr>
</tbody>
</table>

➢ For HEVC

<table>
<thead>
<tr>
<th>Output resolution</th>
<th>Bitrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeds 1280x720</td>
<td>8Mbps</td>
</tr>
<tr>
<td>1280x720 or less</td>
<td>4Mbps</td>
</tr>
<tr>
<td>854x480 or less</td>
<td>2Mbps</td>
</tr>
<tr>
<td>640x360 or less</td>
<td>1Mbps</td>
</tr>
<tr>
<td>426x240 or less</td>
<td>0.5Mbps</td>
</tr>
</tbody>
</table>

[Note]  
✓ Please specify the bitrate according to the specifications of AVC and HEVC.  
✓ Please specify the bitrate value so that the compression ratio is 0.5% or more.  
The specified compression ratio must satisfy the following relational expression.  
compression ratio = (bit rate x 100 x frame rate) ÷ (width x height x 24)
6.3.2 ";-qmax";

[Option]
- qmax

[Settable range or value]
0 - 51

[Description]
Specify the QP upper value of P slice.
If this option is not specified, it will be set as "31".

[Note]
✓ If this option is specified, ";-b:v" option is invalid.
✓ The specified value must satisfy the following relational expression.
qmin ≤ qmax

6.3.3 ";-qmin"

[Option]
- qmin

[Settable range or value]
0 - 51

[Description]
Specify the QP lower value of P slice.
If this option is not specified, it will be set as "2".

[Note]
✓ If this option is specified, ";-b:v" option is invalid.
✓ The specified value must satisfy the following relational expression.
qmin ≤ qmax
6.3.4 "-i_qoffset"

[Option]
- i_qoffset

[Settable range or value]
-51 - 51 (signed integer)

[Description]
Specify the QP offset value between I slice and P slice. If this option is not specified, it will be set as "0".

[Note]
✓ If this option is specified, "-b:v" option is invalid.
✓ The specified value must satisfy the following relational expression.
   \[ 0 \leq qmax + i_{qoffset} \leq 51 \text{ and } 0 \leq qmin + i_{qoffset} \leq 51 \]

6.3.5 "-g"

[Option]
- g

[Settable range or value]
1 - 255

[Description]
Specify the output video GOP size (frame number). (Closed GOP)
   e.g.) -g 24
If this option is not specified, it will be set to the following value.
   ➢ AVC: 30
   ➢ HEVC: 64
6.4 Specific Options for Encoding

This section describes FFmpeg options (encoding options) added for using the "SC2A11 transcode acceleration function". These options are specified as output file options (outfile options).

6.4.1 "-device"

[Option]
-device

[Settable range or value]
0 - 15

[Description]
Specify the M820L (device number) board which will execute encoding. If this option is not specified, it will be set as the following value.

➢ If both input channels and output channels are not specified, the device number will be automatically assigned to an M820L which is able to perform the encoding.
➢ If either input channels or output channels are specified, device number 0 will be used.

Please refer to '6.4.2 "-input_id"' and '6.4.3 "-output_id"' in this manual for information on input channels and output channels.

[Note]
✓ When performing multi-encoding or multiple process encoding, please don’t specify to use and not use this option at the same time.
   Please refer to "7.1 Multi-Encoding" in this manual for information on multi-encoding. And please refer to "7.4 Multiple Process Encoding" in this manual for information on multiple process encoding.
✓ If this option is specified, the "-video_analyze_device" option must also be specified.
   For the "-video_analyze_device" option, refer to '6.2.1 "-video_analyze_device"' in this manual.
6.4.2 "-input_id"

[Option]
-input_id

[Settable range or value]
0 - 15

[Description]
Specify the input channel ID to use in encoding.
If this option is not specified, an available input channel ID will be used.

[Note]
✓ When you perform multi-input, always specify the input channels using this option.
   Please refer to "7.2 Multi-Input" in this manual for information on multi-input.

6.4.3 "-output_id"

[Option]
-output_id

[Settable range or value]
0 - 15

[Description]
Specify the output channel ID to use in encoding.
If this option is not specified, an available output channel ID will be used.

[Note]
✓ When performing multi-encoding, please don’t specify to use and not use this option
   at the same time.
   Please refer to "7.1 Multi-Encoding" in this manual for information on
   multi-encoding.
6.4.4 ":level:v"

[Option]
-:level:v

[Settable range or value]
- For AVC
  2.0, 2.1, 2.2, 3.0, 3.1, 3.2, 4.0, 4.1, 4.2, 5.0, 5.1
- For HEVC
  2.0, 2.1, 3.0, 3.1, 4.0, 4.1, 5.0, 5.1, 5.2, 6.0, 6.1, 6.2

[Description]
Specify the output video level.
If this option is not specified, the optimal video level is automatically set for encoding conditions such as output resolution.

[Note]
✓ Please specify the resolution, the bitrate, the frame rate. and CPB buffer size according to the specifications of AVC and HEVC.
✓ If the specified video level violates the AVC / HEVC standard for the encoding condition, warning message stating that it is not supported is displayed and automatically change the output video level.

6.4.5 ":buf_size"

[Option]
-buf_size

[Settable range or value]
1024bit (min) - Upper limit specified by AVC and HEVC (max)

[Description]
Specify the buffer size of CPB.
Please specify "No unit" (bit), "k" (Kbit), or "M" (Mbit) as the unit.
- e.g.) -buf:2000000 (when bit is used)
- e.g.) -buf:2000k (when Kbit is used)
- e.g.) -buf:2M (when Mbit is used)

If this option is not specified, the value calculated from resolution and bit rate will be used.
Also, if this option specifies a value less than the minimum CPB buffer size required for encoding, that value will be recalculated to the minimum required CPB buffer size.
6.4.6 "-usable_core"

[Option]
-usable_core

[Settable range or value]
1-24

[Description]
Specify the number of threads using for encoding.
This option can only be specified for HEVC.
It will encode with the specified number of threads.
If this option is not specified, it will be set as "24".

6.4.7 "-parallel_exec"

[Option]
-parallel_exec

[Settable range or value]
1-16

[Description]
Specify the number of frames using for encoding in parallel.
This option can only be specified for HEVC.
If this option is not specified, it will be set as "16".
6.4.8 "-use_b"

[Option]
-use_b

[Settable range or value]
- 0 : Not use B frame
- 1 : Use B frame

[Description]
Specify to use or not to use B frame.
This option can only be specified for HEVC.
If this option is not specified, "Use B frame" will be used (underlined value).

A GOP structure is as follows.
➢ For "Not use B frame"
  The value of "-g" option is 2 or more. : IPPP...
  The value of "-g" option is 1 : I...

➢ For "Use B frame"
  The value of "-g" option is a multiple of 4. : IBBBPBBBP ...
  The value of "-g" option is a multiple of 2. : IBPBP...
  The value of "-g" option is 1 : IPPP.. (B frame not inserted)
  The value of "-g" option is other than the above : I.. (B frame not inserted)

6.4.9 ",-rc-lookahead"

[Option]
-rc-lookahead

[Settable range or value]
0-16

[Description]
Specify the number of frames to be analyzed in advance.
This option can only be specified for HEVC.
If this option is not specified, it will be set as "0".
6.4.10 "-aud"

[Option]
   -aud

[Settable range or value]
   0 : Not add access unit delimiter
   1 : Add access unit delimiter

[Description]
   Specify to add or not add access unit delimiter.
   This option can only be specified for HEVC.
   If this option is not specified, "Add access unit delimiter" will be used (underlined value).
7. Multi-Channel Processing
This section describes multi-channel processing of each acceleration function.

7.1 Multi-Encoding
Multiple channel encoding can be performed in parallel while inputting one video file. This type of encoding will be referred to as “multi-encoding” in this manual.

Single-encoding

---

Multi-encoding

---

When executing multi-encoding, specify multiple output files in one FFmpeg command.

The method of specifying multi-encoding is as follows.

< MB86M30 encode acceleration function >

```
# ffmpeg [options...] [infile options...] [-i infile]...
{ -c:v m30enc_h264 [outfile options...] [outfile] }
{ -c:v m30enc_h264 [outfile options...] [outfile] }
...
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg [options...] { -c:v m30trc [infile options...] [-i infile]... 
{ -c:v m30trc_h264 [outfile options...] [outfile] }
{ -c:v m30trc_h264 [outfile options...] [outfile] }
...
```
< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg [options...] (-c:v m820_h264 [infile options...] [-i infile] )...
( -c:v m30enc_h264 [outfile options...] [outfile] )
( -c:v m30enc_h264 [outfile options...] [outfile] )
...
```

< SC2A11 transcode acceleration function >

```
# ffmpeg [options...] (-c:v m820_h264 [infile options...] [-i infile] )...
( -c:v m820_h264 [outfile options...] [outfile] )
( -c:v m820_h264 [outfile options...] [outfile] )
...
```
7.1.1 Multi-encoding example (1)

![Diagram of multi-encoding example]

- e.g.) Encode 1 input video file (sample_01.mp4) with 2 settings in parallel.

  Encode setting : avc, 1000000bps output_0.mp4
  Encode setting : avc, 2000kpbs   output_1.mp4

- **< MB86M30 encode acceleration function >**

  ```sh
  # ffmpeg -i sample_01.mp4 -c:v m30enc_h264 -b:v 1000000 output_0.mp4
  # ffmpeg -i sample_01.mp4 -c:v m30enc_h264 -b:v 2000k output_1.mp4
  ```

- **< MB86M30 Transcode acceleration function >**

  ```sh
  # ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc_h264 -b:v 1000000 output_0.mp4
  # ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc_h264 -b:v 2000k output_1.mp4
  ```

- **< SC2A11+MB86M30 transcode acceleration function >**

  ```sh
  # ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m30enc_h264 -b:v 1000000 output_0.mp4
  # ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m30enc_h264 -b:v 2000k output_1.mp4
  ```

- **< SC2A11 transcode acceleration function >**

  ```sh
  # ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -b:v 1000000 output_0.mp4
  # ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -b:v 2000k output_1.mp4
  ```

**Note:** When multi-encoding using MB86 M30 encoding acceleration function, FFmpeg might output warning messages like the following, and cannot create the output file normally.

```
Past duration 0.999992 too large
```

This happens because the framerate of the output ES is not synchronized with the stream timestamp. In such case, please specify “-vsync cfr” option for the output video, so that the framerate and timestamp can be synchronized properly.
Note: When encoding AVC and encoding different pixel formats or different video scan methods (interlace / progressive), the output channels must be specified with the following considerations.

The output channels (output_id) are classified in the following groups. Different pixel formats cannot be used in the same group.

When using different pixel formats, different groups must be used.

<table>
<thead>
<tr>
<th>Group 0</th>
<th>0, 4, 8, 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>1, 5, 9, 13</td>
</tr>
<tr>
<td>Group 2</td>
<td>2, 6, 10, 14</td>
</tr>
<tr>
<td>Group 3</td>
<td>3, 7, 11, 15</td>
</tr>
</tbody>
</table>

Correct usage:

The same pixel format can be encoded in the same group.

The same video output format can be encoded in the same group.
Incorrect usage:

The different pixel formats can not be encoded in the same group.

The different video output formats can not be encoded in the same group.
7.1.2 Multi-encoding example (2)

Multi-encoding using multiple M820Ls is supported when multiple M820Ls are inserted on Host PC. When multiple M820Ls are inserted, multi-encoding of different video codecs is supported.

Specify the device to perform encoding by using the "-device" option.

When multiple M820Ls are used, an examples of multi-encoding is follows.

Multi-encoding when multiple M820Ls are inserted.

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input file A</td>
<td>Condition A</td>
<td>Output file A</td>
</tr>
<tr>
<td></td>
<td>Condition B</td>
<td>Output file B</td>
</tr>
<tr>
<td></td>
<td>device 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Condition C</td>
<td>Output file C</td>
</tr>
<tr>
<td></td>
<td>Condition D</td>
<td>Output file D</td>
</tr>
<tr>
<td></td>
<td>device 1</td>
<td></td>
</tr>
</tbody>
</table>

E.g.) Encode 1 input video file with 4 settings. (two conditions for two devices)

Encode setting A (device 0): avc, 1000000bps, output_00.mp4
Encode setting B (device 0): avc, 2000kpbs, output_01.mp4
Encode setting C (device 1): hevc, 1000000bps, output_10.mp4
Encode setting D (device 1): hevc, 2000kpbs, output_11.mp4

< MB86M30 encode acceleration function >

```
# ffmpeg -i sample_01.mp4
  -c:v m30enc_h264 -device 0 -b:v 1000000 output_00.mp4
  -c:v m30enc_h264 -device 0 -b:v 2000k output_01.mp4
  -c:v m30enc_hevc -device 1 -b:v 1000000 output_10.mp4
  -c:v m30enc_hevc -device 1 -b:v 2000k output_11.mp4
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4
  -c:v m30trc_h264 -device 0 -b:v 1000000 output_00.mp4
  -c:v m30trc_h264 -device 0 -b:v 2000k output_01.mp4
  -c:v m30trc_hevc -device 1 -b:v 1000000 output_10.mp4
  -c:v m30trc_hevc -device 1 -b:v 2000k output_11.mp4
```
< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4
  -c:v m30enc_h264 -device 0 -b:v 1000000 output_00.mp4
  -c:v m30enc_h264 -device 0 -b:v 2000k output_01.mp4
  -c:v m30enc_hevc -device 1 -b:v 1000000 output_10.mp4
  -c:v m30enc_hevc -device 1 -b:v 2000k output_11.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4
  -c:v m820_h264 -device 0 -b:v 1000000 output_00.mp4
  -c:v m820_h264 -device 0 -b:v 2000k output_01.mp4
  -c:v m820_hevc -device 1 -b:v 1000000 output_10.mp4
  -c:v m820_hevc -device 1 -b:v 2000k output_11.mp4
```
7.2 Multi-Input

You can execute encoding while inputting multiple video files in parallel. This type of encoding will be referred to as "multi-input" in this manual.

Single-Input

Multi-Input

Multiple input files (-i option) can be specified in one FFmpeg command. Use the "-map" option to map the input file to the input channel used for encoding. When executing multi-input, specify the input channel ID by using the "-input_id" option.

You need to specify a free channel ID when using "-input_id" option. The free channel ID can be checked with the "m820_enc_status -detail" command.

The method of specifying multi-input is as follows.

< MB86M30 encode acceleration function >

```
# ffmpeg [options...] { [infile options...] -i <infile_A> } { [infile options...] -i <infile_B> }...
-map 0 { -cv m30enc_h264 -input_id 0 [outfile options...] [outfile] }
-map 1 { -cv m30enc_h264 -input_id 1 [outfile options...] [outfile] }
...`
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg [options...] { -cv m30trc [infile options...] -i <infile_A> } { -cv m30trc [infile options...] -i <infile_B> }...
-map 0 { -cv m30trc_h264 -input_id 0 [outfile options...] [outfile] }
-map 1 { -cv m30trc_h264 -input_id 1 [outfile options...] [outfile] }
...`
```
< SC2A11+MB886M30 transcode acceleration function >

```
# ffmpeg [options...]
(-c:v m820_h264 [infile options...] -i <infile_A> ) (-c:v m820_hevc [infile options...] -i <infile_B> )
-map 0 (-c:v m30enc_h264 -input_id 0 [outfile options...] [outfile])
-map 1 (-c:v m30enc_h264 -input_id 1 [outfile options...] [outfile])
...
```

< SC2A11 transcode acceleration function >

```
# ffmpeg [options...]
(-c:v m820_h264 [infile options...] -i <infile_A> ) (-c:v m820_hevc [infile options...] -i <infile_B> )
-map 0 (-c:v m820_h264 -input_id 0 [outfile options...] [outfile])
-map 1 (-c:v m820_h264 -input_id 1 [outfile options...] [outfile])
...
```
7.2.1 Multi-input example (1)

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>map 0</td>
<td>input_id: 0</td>
<td>Output file A</td>
</tr>
<tr>
<td>Input file A</td>
<td>Condition A</td>
<td></td>
</tr>
<tr>
<td>map 1</td>
<td>input_id: 1</td>
<td>Output file B</td>
</tr>
<tr>
<td>Input file B</td>
<td>Condition B</td>
<td></td>
</tr>
<tr>
<td>device 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e.g.) Encode 2 input video files.

Encode setting (output_id 0): avc, Encode result: output_0.mp4
Encode setting (output_id 1): avc, Encode result: output_1.mp4

< MB86M30 encode acceleration function >

```
# ffmpeg -i sample_01.mp4 -i sample_02.mp4 ¥
   -map 0 -c:v m30enc_h264 -input_id 0 output_0.mp4 ¥
   -map 1 -c:v m30enc_h264 -input_id 1 output_1.mp4
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc -i sample_02.mp4 ¥
   -map 0 -c:v m30trc_h264 -input_id 0 output_0.mp4 ¥
   -map 1 -c:v m30trc_h264 -input_id 1 output_1.mp4
```

< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m8020_hevc -i sample_02.mp4 ¥
   -map 0 -c:v m8020_enc_h264 -input_id 0 output_0.mp4 ¥
   -map 1 -c:v m8020_enc_h264 -input_id 1 output_1.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_hevc -i sample_02.mp4 ¥
   -map 0 -c:v m820_h264 -input_id 0 output_0.mp4 ¥
   -map 1 -c:v m820_h264 -input_id 1 output_1.mp4
```
7.2.2 Multi-input example (2)

Multi-input using multiple M820Ls is supported when multiple M820Ls are inserted on Host PC.
When multiple M820Ls are used, an examples of multi-input is follows.

**e.g.) Multi-input when multiple M820Ls are inserted. Encode one input video file each.**

Multi-input when multiple M820Ls are inserted.

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input file A&lt;br&gt;map 0</td>
<td>input_id: 0 → Condition A → Output file A output_id: 0&lt;br&gt;device 0</td>
<td></td>
</tr>
<tr>
<td>Input file B&lt;br&gt;map 1</td>
<td>input_id: 0 → Condition B → Output file B output_id: 0&lt;br&gt;device 1</td>
<td></td>
</tr>
</tbody>
</table>

Encode setting A (device 0, output_id 0): avc, Encode result: output_0.mp4
Encode setting B (device 1, output_id 0): hevc, Encode result: output_1.mp4

< MB86M30 encode acceleration function >

```
# ffmpeg -i sample_01.mp4 -i sample_02.mp4 -map 0 -c:v m30enc_h264 -device 0 -input_id 0 output_0.mp4
# ffmpeg -i sample_01.mp4 -i sample_02.mp4 -map 1 -c:v m30enc_hevc -device 1 -input_id 0 output_1.mp4
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc -i sample_02.mp4 -map 0 -c:v m30trc_h264 -device 0 -input_id 0 output_0.mp4
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc_hevc -device 1 -input_id 0 output_1.mp4
```

< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_hevc -i sample_02.mp4 -map 0 -c:v m30enc_h264 -device 0 -input_id 0 output_0.mp4
# ffmpeg -c:v m820_hevc -i sample_01.mp4 -c:v m820_hevc -i sample_02.mp4 -map 1 -c:v m30enc_h264 -device 1 -input_id 0 output_1.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_hevc -i sample_02.mp4 -map 0 -c:v m820_h264 -device 0 -input_id 0 output_0.mp4
# ffmpeg -c:v m820_hevc -i sample_01.mp4 -c:v m820_hevc -i sample_02.mp4 -map 1 -c:v m820_h264 -device 1 -input_id 0 output_1.mp4
```
7.3 Combination of Multi-Input and Multi-Encoding

You can specify a combination of multi-input and multi-encoding.

7.3.1 Multi-input and multi-encoding example (1)

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>map 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>map 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>map 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e.g.) Encode one input video file under three conditions. Encode another input video under two conditions. Execute these with one ffmpeg command.

Input video file (map 0, input_id 0): sample_01.mp4
- Encode setting (output_id 0): hevc, 1000000bps, Encode result: output_0.mp4
- Encode setting (output_id 1): hevc, 2000kbps, Encode result: output_1.mp4
- Encode setting (output_id 2): hevc, 500000bps, Encode result: output_2.mp4

Input video file (map 1, input_id 1): sample_02.mp4
- Encode setting (output_id 3): hevc, 8000000bps, Encode result: output_3.mp4
- Encode setting (output_id 4): hevc, 1000kbps, Encode result: output_4.mp4

< MB86M30 encode acceleration function >

```
# ffmpeg -i sample_01.mp4 -i sample_02.mp4
-map 0 -c:v m30enc_hevc -input_id 0 -b:v 1000000 output_0.mp4
-map 0 -c:v m30enc_hevc -input_id 0 -b:v 2000k output_1.mp4
-map 0 -c:v m30enc_hevc -input_id 0 -b:v 500000 output_2.mp4
-map 1 -c:v m30enc_hevc -input_id 1 -b:v 800000 output_3.mp4
-map 1 -c:v m30enc_hevc -input_id 1 -b:v 1000k output_4.mp4
```
< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc -i sample_02.mp4 
  -map 0 -c:v m30trc_hevc -input_id 0 -b:v 1000000 output_0.mp4 
  -map 0 -c:v m30trc_hevc -input_id 0 -b:v 2000k output_1.mp4 
  -map 0 -c:v m30trc_hevc -input_id 0 -b:v 500000 output_2.mp4 
  -map 1 -c:v m30trc_hevc -input_id 1 -b:v 800000 output_3.mp4 
  -map 1 -c:v m30trc_hevc -input_id 1 -b:v 1000k output_4.mp4
```

< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -i sample_02.mp4 
  -map 0 -c:v m30enc_hevc -input_id 0 -b:v 1000000 output_0.mp4 
  -map 0 -c:v m30enc_hevc -input_id 0 -b:v 2000k output_1.mp4 
  -map 0 -c:v m30enc_hevc -input_id 0 -b:v 500000 output_2.mp4 
  -map 1 -c:v m30enc_hevc -input_id 1 -b:v 800000 output_3.mp4 
  -map 1 -c:v m30enc_hevc -input_id 1 -b:v 1000k output_4.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -i sample_02.mp4 
  -map 0 -c:v m820_hevc -input_id 0 -b:v 1000000 output_0.mp4 
  -map 0 -c:v m820_hevc -input_id 0 -b:v 2000k output_1.mp4 
  -map 0 -c:v m820_hevc -input_id 0 -b:v 500000 output_2.mp4 
  -map 1 -c:v m820_hevc -input_id 1 -b:v 800000 output_3.mp4 
  -map 1 -c:v m820_hevc -input_id 1 -b:v 1000k output_4.mp4
```
7.3.2 Multi-input and multi-encoding example (2)

The following shows an example of combining multiple inputs and multiple encoding when using multiple M820Ls.

e.g.) Encode 2 input video files to each M820L under two conditions.

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input file A map 0</td>
<td>input_id: 0</td>
<td>Condition A</td>
</tr>
<tr>
<td>device 0</td>
<td></td>
<td>Condition B</td>
</tr>
<tr>
<td>Input file A map 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>device 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input file B map 1</td>
<td>input_id: 0</td>
<td>Condition C</td>
</tr>
<tr>
<td>device 0</td>
<td></td>
<td>Condition D</td>
</tr>
</tbody>
</table>
| Input video file (map 0, input_id 0): sample_01.mp4
Encode setting (device 0, output_id 0): avc, 1920x1080, Encode result: output_00.mp4
Encode setting (device 0, output_id 1): avc, 720x480, Encode result: output_01.mp4 |
| Input video file (map 1, input_id 0): sample_02.mp4
Encode setting (device 1, output_id 0): hevc, 1280x720, Encode result: output_02.mp4
Encode setting (device 1, output_id 1): hevc, 320x240, Encode result: output_03.mp4 |

< MB86M30 encode acceleration function >

```
# ffmpeg -i sample_01.mp4 -i sample_02.mp4 \
-map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 1000k output_0.mp4 \
-map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 2000k output_1.mp4 \
-map 1 -c:v m30enc_hevc -device 1 -input_id 0 -b:v 3000k output_2.mp4 \
-map 1 -c:v m30enc_hevc -device 1 -input_id 0 -b:v 4000k output_3.mp4
```

< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc -i sample_02.mp4 \
-map 0 -c:v m30trc_h264 -device 0 -input_id 0 -b:v 1000k output_0.mp4 \
-map 0 -c:v m30trc_h264 -device 0 -input_id 0 -b:v 2000k output_1.mp4 \
-map 1 -c:v m30trc_hevc -device 1 -input_id 0 -b:v 3000k output_2.mp4 \
-map 1 -c:v m30trc_hevc -device 1 -input_id 0 -b:v 4000k output_3.mp4
```
< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_264 -i sample_02.mp4
  -map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 1000k output_0.mp4
  -map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 2000k output_1.mp4
  -map 1 -c:v m30enc_hevc -device 1 -input_id 0 -b:v 3000k output_2.mp4
  -map 1 -c:v m30enc_hevc -device 1 -input_id 0 -b:v 4000k output_3.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_264 -i sample_02.mp4
  -map 0 -c:v m820_h264 -device 0 -input_id 0 -b:v 1000k output_0.mp4
  -map 0 -c:v m820_h264 -device 0 -input_id 0 -b:v 2000k output_1.mp4
  -map 1 -c:v m820_hevc -device 1 -input_id 0 -b:v 3000k output_2.mp4
  -map 1 -c:v m820_hevc -device 1 -input_id 0 -b:v 4000k output_3.mp4
```
7.3.3 Multi-input and multi-encoding example (3)

e.g.) Encode 2 input video files. Input both files to each M820L. Each input file is
multi-encoded with 2 different conditions, which makes the total number of output
files 8 (2 M820L x 2 input x 2 output).

< MB86M30 encode acceleration function >
< MB86M30 Transcode acceleration function >

```
# ffmpeg -c:v m30trc -i sample_01.mp4 -c:v m30trc -i sample_02.mp4 -map 0 -c:v m30trc_h264 -device 0 -input_id 0 -b:v 1000k output_0A.mp4 -map 0 -c:v m30trc_h264 -device 0 -input_id 0 -b:v 2000k output_0B.mp4 -map 0 -c:v m30trc_hevc -device 1 -input_id 0 -b:v 3000k output_0C.mp4 -map 1 -c:v m30trc_hevc -device 0 -input_id 0 -b:v 4000k output_0D.mp4
```

< SC2A11+MB86M30 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -i sample_02.mp4 -map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 1000k output_0A.mp4 -map 0 -c:v m30enc_h264 -device 0 -input_id 0 -b:v 2000k output_0B.mp4 -map 0 -c:v m30enc_hevc -device 1 -input_id 0 -b:v 3000k output_0C.mp4 -map 1 -c:v m30enc_hevc -device 0 -input_id 1 -b:v 1000k output_1A.mp4 -map 1 -c:v m30enc_hevc -device 0 -input_id 1 -b:v 2000k output_1B.mp4 -map 1 -c:v m30enc_hevc -device 1 -input_id 1 -b:v 3000k output_1C.mp4
```

< SC2A11 transcode acceleration function >

```
# ffmpeg -c:v m820_h264 -i sample_01.mp4 -c:v m820_h264 -i sample_02.mp4 -map 0 -c:v m820_h264 -device 0 -input_id 0 -b:v 1000k output_0A.mp4 -map 0 -c:v m820_h264 -device 0 -input_id 0 -b:v 2000k output_0B.mp4 -map 0 -c:v m820_hevc -device 1 -input_id 0 -b:v 3000k output_0C.mp4 -map 1 -c:v m820_hevc -device 0 -input_id 1 -b:v 1000k output_1A.mp4 -map 1 -c:v m820_hevc -device 0 -input_id 1 -b:v 2000k output_1B.mp4 -map 1 -c:v m820_hevc -device 1 -input_id 1 -b:v 3000k output_1C.mp4
```
7.4 Multiple Process Encoding

By using multiple processes, multiple encoding processes can be started asynchronously. This type of encoding will be referred to as "multiple process encoding" in this manual.

An example of multiple process encoding is as follows. In the following example, input channel ID / output channel ID is specified explicitly using "-input_id" and "-output_id" option.

e.g.) In process A, encoding processing is performed using encoding channel 0.
   In process B, encoding processing is performed using encoding channel 1.
   In process C, encoding processing is performed using encoding channel 2.

1) In process A, encoding processing of channel 0 (input_id 0, output_id 0) is executed.

   ```bash
   # ffmpeg -i sample_01.mp4 -c:v m30enc_h264 -input_id 0 -output_id 0 test01.mp4
   ```

2) In process B, encoding processing of channel 1 (input_id 1, output_id 1) is executed.

   ```bash
   # ffmpeg -i sample_02.mp4 -c:v m30enc_h264 -input_id 1 -output_id 1 test02.mp4
   ```

3) In process C, encoding processing of channel 1 (input_id 2, output_id 2) is executed.

   ```bash
   # ffmpeg -i sample_03.mp4 -c:v m30enc_h264 -input_id 2 -output_id 2 test03.mp4
   ```
7.4.1 Multiple process encoding example (1)

There is no difference in processing results in single process encoding / multi process encoding. The difference is whether you execute multiple encodings as one FFmpeg command or multiple FFmpeg commands. With multi-inputs, the need for some options may change depending on whether single process encoding or multi process encoding.

Single-process

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input file A</td>
<td>input_id: 0</td>
<td>Condition A</td>
</tr>
<tr>
<td>Input file B</td>
<td>input_id: 1</td>
<td>Condition B</td>
</tr>
</tbody>
</table>

Multi-process

<table>
<thead>
<tr>
<th>Input video</th>
<th>Encoding setting</th>
<th>Encoded video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input file A</td>
<td></td>
<td>Condition A</td>
</tr>
<tr>
<td>Input file B</td>
<td></td>
<td>Condition B</td>
</tr>
</tbody>
</table>

Execution example of the above multi-input encoding is shown below. (In case of MB86M30 encode acceleration function)

Single process

```
# ffmpeg -i sample_01.mp4 -i sample_02.mp4
   -map 0 -c:v m30enc_h264 -input_id 0 output_0.mp4
   -map 1 -c:v m30enc_h264 -input_id 1 output_1.mp4
```

"-map" and "-input_id" are required

Multi process

```
# ffmpeg -i sample_01.mp4 -c:v m30enc_h264 output_0.mp4

# ffmpeg -i sample_02.mp4 -c:v m30enc_h264 output_1.mp4
```

Since each command is single encoding, "-map" is not necessary, "-input_id" is optional
7.5 Maximum number of encoding channels

The maximum number of channels for multi-channel processing depends on the resolution setting of the output video. The maximum number of channels that can be multi-encoded is as follows. Note that the maximum number of channels that can be multi-encoded is the number of channels for one M820L.

< MB86M30 encode acceleration function >

<table>
<thead>
<tr>
<th>Resolution parameter</th>
<th>Resolution</th>
<th>AVC</th>
<th>HEVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Encoding</td>
<td>1ch only</td>
<td>1ch only</td>
</tr>
<tr>
<td>2</td>
<td>1920x1088 or less</td>
<td>Max 8ch</td>
<td>Max 8ch</td>
</tr>
<tr>
<td>3</td>
<td>1280x720 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>4</td>
<td>864x576 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>5</td>
<td>640x480 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>6</td>
<td>320x240 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>FHD landscape or FHD portrait</td>
<td>Max 7ch</td>
<td>Max 10ch</td>
</tr>
<tr>
<td>10</td>
<td>HD landscape or HD portrait</td>
<td>Max 12ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>33</td>
<td>Single Encoding</td>
<td>Unavailable</td>
<td>Unavailable</td>
</tr>
</tbody>
</table>

Note: Number of channels for one M820L

< MB86M30 Transcode acceleration function >

<table>
<thead>
<tr>
<th>Resolution parameter</th>
<th>Resolution</th>
<th>AVC</th>
<th>HEVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Encoding</td>
<td>1ch only</td>
<td>1ch only</td>
</tr>
<tr>
<td>2</td>
<td>1920x1088 or less</td>
<td>Max 8ch</td>
<td>Max 8ch</td>
</tr>
<tr>
<td>3</td>
<td>1280x720 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>4</td>
<td>864x576 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>5</td>
<td>640x480 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>6</td>
<td>320x240 or less</td>
<td>Max 16ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>FHD landscape or FHD portrait</td>
<td>Max 7ch</td>
<td>Max 10ch</td>
</tr>
<tr>
<td>10</td>
<td>HD landscape or HD portrait</td>
<td>Max 12ch</td>
<td>Max 16ch</td>
</tr>
<tr>
<td>33</td>
<td>Single Encoding</td>
<td>1ch only</td>
<td>1ch only</td>
</tr>
</tbody>
</table>

Note: Number of channels for one M820L
< SC2A11+MB86M30 transcode acceleration function >

- **1 input : 1 output, parallel encoding - (1:1)xm**
  
<table>
<thead>
<tr>
<th>Pixel format</th>
<th>Resolution</th>
<th>Decoding</th>
<th>Encoding</th>
<th>Maximum channel number</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8-bit</td>
<td>1920x1080</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 8ch</td>
</tr>
<tr>
<td>HEVC</td>
<td>AVC</td>
<td>Max 7ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVC</td>
<td>HEVC</td>
<td>Max 8ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 7ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1280x720</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 16ch</td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>AVC</td>
<td>Max 15ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVC</td>
<td>HEVC</td>
<td>Max 16ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 15ch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **1 input : n output - (1:n)x1**
  
<table>
<thead>
<tr>
<th>Pixel format</th>
<th>Resolution</th>
<th>Decoding</th>
<th>Encoding</th>
<th>Maximum channel number</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8-bit</td>
<td>1920x1080</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 8ch</td>
</tr>
<tr>
<td>HEVC</td>
<td>AVC</td>
<td>Max 8ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVC</td>
<td>HEVC</td>
<td>Max 8ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 8ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1280x720</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 16ch</td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>AVC</td>
<td>Max 16ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVC</td>
<td>HEVC</td>
<td>Max 16ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 16ch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Number of channels for one M820L

For transcode conditions that exceed the maximum number of channels, the following error occurs during transcode processing: In this case, reduce the maximum number of channels before processing.

ERR: software decoder cannot be initialized due to lack of memory.
< SC2A11 transcode acceleration function >

➢ 1 input : 1 output, parallel encoding - (1:1)xm

<table>
<thead>
<tr>
<th>Pixel format</th>
<th>Resolution</th>
<th>Decoding</th>
<th>Encoding</th>
<th>Maximum channel number</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8-bit</td>
<td>1920x1080</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 9ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>AVC</td>
<td>Max 7ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVC</td>
<td>HEVC</td>
<td>Max 5ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 4ch</td>
</tr>
<tr>
<td></td>
<td>1280x720</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>AVC</td>
<td>Max 15ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVC</td>
<td>HEVC</td>
<td>Max 10ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 9ch</td>
</tr>
</tbody>
</table>

➢ 1 input : n output - (1:n)x1

<table>
<thead>
<tr>
<th>Pixel format</th>
<th>Resolution</th>
<th>Decoding</th>
<th>Encoding</th>
<th>Maximum channel number</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8-bit</td>
<td>1920x1080</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>AVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVC</td>
<td>HEVC</td>
<td>Max 9ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 9ch</td>
</tr>
<tr>
<td></td>
<td>1280x720</td>
<td>AVC</td>
<td>AVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>AVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVC</td>
<td>HEVC</td>
<td>Max 16ch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HEVC</td>
<td>HEVC</td>
<td>Max 16ch</td>
</tr>
</tbody>
</table>

Note: Number of channels for one M820L

For transcode conditions that exceed the maximum number of channels, the following error occurs during transcode processing: In this case, reduce the maximum number of channels before processing.

ERR: software decoder cannot be initialized due to lack of memory.

ERR: software encoder cannot be initialized due to lack of memory.
8. Combination of Acceleration functions

This product has the following 4 types of accelerated functions. This chapter describes combinations of accelerated functions.

➢ MB86M30 Encode Acceleration Function
➢ MB86M30 Transcode Acceleration Function
➢ SC2A11+MB86M30 Transcode Acceleration Function
➢ SC2A11 Transcode Acceleration Function

8.1 Combination of Multi-Encoding

For multi-encoding, you can combine following functions.

➢ Combination of "SC2A11+MB86M30 transcode acceleration function" and "SC2A11 transcode acceleration function"

The "MB86M30 encode acceleration function" and "MB86M30 transcode acceleration function" cannot be combined with other functions.
8.2 Combination of Multi-Input

For multi-input, you can combine following functions.

➢ Combination of "MB86M30 encode acceleration function", "SC2A11+MB86M30 transcode acceleration function" and "SC2A11 transcode acceleration function"

The "MB86M30 transcode acceleration function" cannot be combined with other functions.
8.3 Combination of Multiple Process Encoding

For multiple process encoding, you can combine following functions.

➢ Combination of "MB86M30 encode acceleration function", "SC2A11+MB86M30 transcode acceleration function" and "SC2A11 transcode acceleration function"

➢ Combination of "MB86M30 encode acceleration function" and "SC2A11 transcode acceleration function"

The combination of "MB86M30 encoding acceleration function" and "MB86M30 transcode acceleration function" cannot be used for one M820L.
### 8.4 Combination of Multiple Device Encoding

When multiple M820Ls are inserted in the Host PC, all functions can be used in combination. Also, you can specify a different video codec of encoding for each M820L.

- Combination example 1
  - `#device 0 "MB86M30 transcode acceleration function" (AVC 1920x1080 8ch)`
  - `#device 1 "SC2A11 transcode acceleration function" (HEVC 3840x2160 1ch)`

```
# ./change_codec.sh -d 0 -c h.264
# ./set_resolution.sh -d 0 -t 8
# ./change_codec.sh -d 1 -c hevc -trc 1
# ./set_resolution.sh -d 1 -t 1
```
➢ Combination example 2

#device 0 "MB86M30 transcode acceleration function" (AVC 1920x1080 8ch)
#device 1 "MB86M30 transcode acceleration function" (HEVC 3840x2160 1ch)

```
# ./change_codec.sh -d 0 -c h.264 -trc 1
# ./set_resolution.sh -d 0 -t 8
# ./changeCodec.sh -d 1 -c hevc -trc 1
# ./set_resolution.sh -d 1 -t 1
```
9. Error Recovery

If an error occurs during encoding with the MB86M30, the M820L must be restarted. Encoding errors of the MB86M30 can be confirmed in the Encode State by "m820_enc_status" command.

If the state of the Encode State is the following, please restart the M820L.

➢ "Encode State" becomes "System Error".
➢ After "Encode State" became "Error" once, the status returns to "Running", and "Error" occurs again.

In addition to these, restart the M820L if encoding of the MB86M30 does not complete.

The restart procedure is as follows.

1) Reboot the M820L
   Reboot the M820L by executing the following commands.

   ```
   # m820_util -device <device_no> reboot
   Reboot Start
   Now Shutdown
   Shutdown done
   Now bootup
   Done
   # echo $?
   0
   ```

   For the optional <device_no>, specify the device number of the M820L to be restarted.

2) Forced reboot the M820L
   If the M820L does not restart even if 1) shown above is executed, forced reboot must be performed.
   Execute the following commands.

   ```
   # m820_util -device <device_no> -f reboot
   Reboot Start
   Now Shutdown
   Shutdown done
   Now bootup
   Done
   # echo $?
   0
   ```
For the option `<device_no>`, specify the device number of the M820L to be restarted.

Notes:
- If the process of FFmpeg is still in the running state, restart the M820L after forcibly terminating the process (SIGKILL). Make sure that all FFmpeg processes have completed terminating before restarting the M820L.
- While restarting the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.
- Please set the time of the M820L immediately after restarting the M820L. (execute the "date_set.sh" script).
- If an unexpected error is detected during encoding, the encode state changes from "Running" to "Running (Unexpected Error)". After the encoding process is completed, the encode state will be "System Error". If the encode state is "Running (Unexpected Error)", an error will occur even if a new encoding process is performed.
- It doubts M820L is broken down when the encode state becomes System Error. Execute the M820L self-test according to "2.5 Executing the M820L Self-Test" in the Application Guide (for Linux Introduction) after the error recovery has finished.
10. M820L Control Utility

A utility to control the M820L from host (m820_util) is attached to this product. This chapter describes the commands and usage of the utility.

10.1 Function Overview

The M820L control utility (m820_util) has two types of functions. One type is used by m820_util command alone. The other type is used by scripts which use the m820_util command.

The following shows the functions provided by m820_util.

<table>
<thead>
<tr>
<th>Large classification</th>
<th>Middle classification</th>
<th>Small classification</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scripts</td>
<td>Performing self-test</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Getting firmware version</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Setting up date</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Performing DDR test</td>
<td>-</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td>Getting eMMC information</td>
<td>-</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td>Getting dmesg information</td>
<td>-</td>
<td>For maintenance</td>
</tr>
<tr>
<td>Commands</td>
<td>Start control</td>
<td>Starting M820L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shutting down M820L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restarting M820L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(not disconnected PCIe)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restarting M820L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(disconnected PCIe)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Temperature sensor control</td>
<td>Obtaining temperature</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setting the temperature obtaining interval</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>M820 system control</td>
<td>Initializing</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transferring files</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Executing commands</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Getting M820L firmware state</td>
<td>For maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Getting the M820L control utility version information</td>
<td>For maintenance</td>
</tr>
</tbody>
</table>
The following shows the return value from executing m820_util. Please check the return value after you execute each command.

<table>
<thead>
<tr>
<th>Return value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Success</td>
</tr>
<tr>
<td>255</td>
<td>Command error</td>
</tr>
<tr>
<td>254</td>
<td>Abnormal data size</td>
</tr>
<tr>
<td>253</td>
<td>Checksum error</td>
</tr>
<tr>
<td>252</td>
<td>File open error</td>
</tr>
<tr>
<td>251</td>
<td>Shell command execution error in the M820L</td>
</tr>
<tr>
<td>250</td>
<td>System error</td>
</tr>
<tr>
<td>249</td>
<td>Time out error</td>
</tr>
<tr>
<td>248</td>
<td>DDR initialize error</td>
</tr>
<tr>
<td>Other</td>
<td>Shell command execution result in the M820L</td>
</tr>
</tbody>
</table>
10.2 Scripts

This section describes the functionality of the scripts using the M820L control utility. There are other scripts that are stored in the same directory as the scripts described below. These scripts are substitutional scripts which are used by the scripts described below.

10.2.1 Performing Self-test

[Format]

# ./self_test.sh <device_no>

[Argument]

<device_no>
   Specify the device number (0 - 15) of the M820L.
   If this option is not specified, device number 0 will be used.

[Description]

A self-test for M820L will be executed. It takes about 15 minutes.
This script checks the following.
- Host PC PCIe recognition
- M820L boot up
- M820L serial No. obtaining
- M820L PCIe recognition
- M820L driver boot
- M820 service boot
- M820L mounted DDR
- MB86M30 maintenance mode
- eMMC information
- Encoding

The "bft_etsa.sh" script and the "m820_util_exec_v1.sh" script are sub-scripts called from the "self_test.sh" script.

If all functions work properly, the following message is displayed and the return value will be 0.

M820 CHECK ALL OK

If one or more functions do not work properly, the following message is displayed and the return value will be a number other than 0.

M820 CHECK NG

An information file (LOG_x_xx_YYYYYMDDhhmmss_NG.tgz) containing the error information will be created in the current directory.
In case an error was detected, please contact our sales department.
10.2.2 Getting Firmware Version

[Format]

# ./get_ver.sh <device_no>

[Argument]

<device_no>

Specify the device number (0 - 15) of the M820L.
If this option is not specified, device number 0 will be used.

[Description]

Version information of M820L will be displayed.
The following firmware version information will be displayed.

➢ The M820L serial No.
➢ Version of the M820L firmware
➢ Individual version of the M820L flash firmware
➢ Version of the M820L EEPROM firmware
➢ Individual version of the M820L MB86M30 firmware
Below is an example of the execution result of this script.

```
[sc2a11 serial number]
XXXX-XXXXXXXX

[m820 firmware version]
19660
V02

[m820 encoder version]
$Rev: 19626 $ HP

[sc2a11 flash firmware version]
dev: version name
mtd0: 13580 "p-master-cm3"
mtd1: 1800 "arm-tf"
mtd2: 1800 "uefi"
mtd4: 1934 "flash-writer"
mtd7: 8266 "cm3-booter-ro"

[sc2a11 eeprom firmware version]
dev: version
eeprom: 3357

[m30 firmware version]
Application version : 2.5.8.3.2147
Driver version : 2.5.8.3.2147
MCPU firmware version : 9.3.8.0.18025
Base firmware version : V01L01R09_r2119_r1600
System firmware version : V01L01R17_r2022_r2070
Kernel version : 4.14.2+
Machine hardware name : aarch64
Core firmware version
HEVC Enc Single channel : m30hevc_20190617_213823_3529a7c
HEVC Enc Multi channel : m30hevc_20190617_213823_3529a7c
HEVC Enc Single channel Ultra Low Latency : m30hevc_20190319_193020_d0fb127
HEVC Enc Multi channel Ultra Low Latency : m30hevc_20190319_193020_d0fb127
H.264 Enc Single/Multi channel : 20190610_105915_2498246
MPEG2 Enc Single/Multi channel : 20190319_090118_fd5fa38
TS MUX Core0 : m30numux_20190125_r1732
TS MUX Core1 : m30numux_20190125_r1732
TS MUX Core2 : m30numux_20190125_r1732
TS MUX Core3 : m30numux_20190125_r1732
HEVC Enc Single channel for Trc : m30hevc_20190618_132904_3529a7c_trc
HEVC Enc Multi channel for Trc : m30hevc_20190618_132904_3529a7c_trc
H.264 Enc Single/Multi channel for Trc : 20190610_110433_2498246
TS DEMUX Core0 for Trc : m30ndemux_20190226_083327_
TS DEMUX Core1 for Trc : m30ndemux_20190226_083327_
TS DEMUX Core2 for Trc : m30ndemux_20190226_083327_
TS DEMUX Core3 for Trc : m30ndemux_20190226_083327_
HEVC Enc Single channel 1chip 8K : m30hevc_20190617_213627_3e4ff59_8K
User firmware version
No Data.
```
10.2.3 Setting Up Date

[Format]

```bash
# ./date_set.sh <device_no>
```

[Argument]

<device_no>
Specify the device number (0 - 15) of the M820L.
If this option is not specified, device number 0 will be used.

[Description]
The M820L does not have a real time clock. Therefore, the date information of the host PC must be set by executing this script.

10.2.4 DDR Test

[Format]

```bash
# ./a11_ddr_test.sh <device_no>
# ./m30_ddr_test.sh <device_no>
```

[Argument]

<device_no>
Specify the device number (0 - 15) of the M820L.
If this option is not specified, device number 0 will be used.

[Description]
Execute the DDR test of the M820L.
There are two scripts for the DDR test. One is for the SC2A11_DDR, and the other one is for the MB86M30_DDR.
This is used for maintenance when the operation is abnormal.
10.2.5 Getting eMMC Information

[Format]

`# ./get_emmc_info.sh <device_no>`

[Argument]

`<device_no>`

Specify the device number (0 -15) of the M820L.
If this option is not specified, device number 0 will be used.

[Description]

Get the eMMC information mounted in the M820L.
This is used for maintenance when the operation is abnormal.

10.2.6 Get the dmesg Information

[Format]

`# ./get_dmesg.sh <device_no>`

[Argument]

`<device_no>`

Specify the device number (0 -15) of the M820L.
If this option is not specified, device number 0 will be used.

[Description]

Get the log information in the M820L.
This is used for maintenance when the operation is abnormal.
10.3 Start Control

Start, shut down, and restart the M820L.

10.3.1 Starting M820L

[Command]

```
# m820_util [-device <device_no>] [-t] bootup
```

[Description]
Send a boot request to the M820L, and wait until the boot is complete.

[Option]

- `-device <device_no>`
  Specify the device number of the M820L by `<device_no>`. If this option is not specified, device number 0 will be used.

- `-t`
  Option for self-test.

[Note]
- ✓ While starting the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.
- ✓ The "-t" option is used for the self-test. Please do not use.
10.3.2 Shutting Down M820L

[Command]

```
# m820_util [-device <device_no>] [-f] shutdown
```

[Description]
Send a shut down request to the M820L and wait until the shut down is complete.

[Option]

[-device <device_no>]
  Specify the device number of the M820L by <device_no>.
  If this option is not specified, device number 0 will be used.

[-f]
  Shut down M820L forcibly without stopping the system.

[Note]

✓ The M820L will boot if the M820L is stopped, and the PERST signal from PCIe is asserted due to the rebooting of the host PC.
✓ While shutting down the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.
10.3.3 Restarting M820L (not disconnected PCIe)

[Command]

```
# m820_util [-device <device_no>] [-f] reboot
```

[Description]
Send a reboot request to the M820L and wait until the reboot is complete. The M820L will reboot while keeping the PCIe connection with the host PC.

[Option]
```
[-device <device_no>]
```
Specify the device number of the M820L by <device_no>. If this option is not specified, device number 0 will be used.

```
[-f]
```
Forcibly reboot the M820L without shutting down the M820L system.

[Note]
✓ While restarting the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.
10.3.4 Restarting M820L (disconnected PCIe)

[Command]

```bash
# m820_util [-device <device_no>] [-f] sys_reboot
```

[Description]
Send a reboot request to the M820L and wait until the reboot is complete. The M820L will reboot after disconnecting from the host PC PCIe.

[Option]

```
[-device <device_no>]
```
Specify the device number of the M820L by <device_no>. If this option is not specified, device number 0 will be used.

```
[-f]
```
Forcibly reboot the M820L without shutting down the M820L system.

[Note]
✓ The PCIe will be disconnected.
✓ The operation of the host PC changes depending whether an automatic system recovery (ASR) function is installed or not.
➢ ASR is installed
   If PCIe is disconnected, the host PC will judge that a bus error has occurred, and reboot automatically.
➢ ASR is not installed
   Even if PCIe is disconnected, the host PC does not reboot the system.
   By removing/rescanning the PCIe bus used by the M820L, the host PC can reconnect to the M820L.
✓ While restarting the M820L, please do not perform M820L operation such as encode operation, check the encoding status, execute M820L control utility, etc.
10.3.5 Operative Sequence

Starting the M820L
After starting the host PC, use "m820_util bootup" to boot the M820L and check that the boot is complete.
If the M820L has already been started, nothing will happen.

Starting the M820L (when the M820L is not started)

```
# m820_util -device 0 bootup
Bootup Start
Done
# echo $?
0
```

Starting the M820L (when the M820L is started)

```
# m820_util -device 0 bootup
Already Bootup
Done
# echo $?
0
```

Shutting down the M820L
When shutting down the host PC, the power supply to the M820 is shut off. Therefore, it is necessary to stop the internal system of the M820L first.

Shutting down the M820L

```
# m820_util -device 0 shutdown
Shutdown Start
Done
# echo $?
0
# shutdown -h now
```

Starting the M820L after shutting down
After shutting down the M820L, it is possible to start the M820L again.

Starting the M820L after shutting down

```
# m820_util -device 0 shutdown
Shutdown Start
Done
# echo $?
0
# m820_util -device 0 bootup
Bootup Start
Done
# echo $?
0
```
Boot up - Shut down Sequence
**Restarting the host PC**

When restarting the host PC, execute the restart command for the host PC. After restarting, please boot the M820L and check if booted properly.

```
# shutdown -r now

# m820_util -device 0 bootup
Already Bootup
Done
# echo $?
0
#
```

If you restart the host PC when the M820L system is shut down, the PCIe will be reset and M820L will boot.

```
# m820_util -device 0 shutdown
Shutdown Start
Done
# echo $?
0
# shutdown -r now

# m820_util -device 0 bootup
Already Bootup
Done
# echo $?
0
#```
M820L boot up sequence when rebooting the host PC
10.4 Temperature Sensor Control

Control the temperature sensor of the M820L.

10.4.1 Obtaining Temperature

[Command]

```
# m820_util [-device <device_no>] [-F] temp <sensor id>
```

[Description]

Acquire temperature information of the M820L SC2A11. The M820L has seven temperature sensors in the SC2A11 as follows. The temperature is displayed by three decimal numbers shown in the standard output.

[Argument]

`<sensor id>`

Specify the sensor number (0-6) of the SC2A11.
[Option]

[-device <device_no>]
Specify the device number of the M820L by <device_no>.
If this option is not specified, device number 0 will be used.

[-F]
Display temperature information using Fahrenheit.
If this option is not specified, Centigrade will be used.

[Note]
➢ If a temperature sensor breaks, it will not be able to acquire a valid value. Please estimate the temperature based on the other temperature sensors.
➢ The default value of interval of temperature acquisition is 5 seconds. The interval is changeable. Please refer to "10.4.2 Setting the Temperature Obtaining Interval" in this manual.

[Usage example]
Below are a few examples of obtaining temperature information.

Obtain temperature from sensor 0 (Centigrade)

```bash
# m820_util -device 0 temp 0
34.250[degrees]
# echo $?
0
#
```

Obtain temperature from sensor 1 (Fahrenheit)

```bash
# m820_util -device 0 -F temp 1
94.325[F]
# echo $?
0
#
```
10.4.2 Setting the Temperature Obtaining Interval

[Command]

```
# m820_util [-device <device_no>] temp_int <interval (1 - 10sec)>
```

[Description]
Specify the update interval of temperature acquisition.

[Argument]

```
<interval (1 - 10sec)>
```
Specify the update interval of temperature acquisition in seconds.
Default value is 5 seconds.

[Option]
```
[-device <device_no>]
```
Specify the device number of the M820L by <device_no>.
If this option is not specified, device number 0 will be used.

[Note]
✓ If SC2A11 is rebooted, temperature acquisition interval is reset to default value.

[Usage example]
Below is an example of changing the temperature acquisition interval to 10 seconds.

```
# m820_util -device 0 temp_int 10
# echo $? 0
#```


10.5 M820 System Control

These commands control the M820 system, and they are used for updating the M820 firmware, hardware diagnostic, etc. These commands are used for maintenance.

10.5.1 Initialization

[Command]

```
# m820_util [-device <device_no>] init
```

[Description]
Use m820_util to initialize the M820 system control commands. For every M820 system control command, it is necessary to execute this initialization command.

[Option]

[-device <device_no>]
Specify the device number of the M820L by <device_no>. If this option is not specified, device number 0 will be used.

[Note]
✓ Please execute this command every time before executing file transfer and command execution.

[Usage example]

Execute the initialization command every time you execute the M820 system control command.

An example of the initialization command is as follows.

```
# m820_util -device 0 init && m820_util -device 0 exec "xxxxxxxx"
# m820_util -device 0 init && m820_util -device 0 send ./xxxx.txt ./xxxx.txt
```
10.5.2 Transferring files

[Command]

```bash
# m820_util [-device <device_no>] send <source file name> <destination file name>
```

[Description]
Transfer a file to the M820 system from host PC. The maximum number of characters capable of input is 256 including command and NULL character (\0).

[Argument]
- `<source file name>`
  Specify the transmission source file name.

- `<destination file name>`
  Specify the transmission destination file name. If destination path is not specified, the file will be stored in "/tmp" directory.

[Option]
- `[-device <device_no>]`
  Specify the device number of the M820L by <device_no>. If this option is not specified, device number 0 will be used.

[Note]
✓ Before executing this command, please execute the initialization of the M820 system control command.

[Usage example]
An example of this command is as follows. This example transfers "xxxx.txt" from host PC to the M820L system as "/root/xxxx1.txt".

```bash
# m820_util -device 0 init && # m820_util -device 0 send xxxx1.txt /root/xxxx1.txt
# echo $?;
0
#
```
10.5.3 Executing Commands

[Command]

```bash
# m820_util [-device <device_no>] exec <script>
```

[Description]
Execute the shell command `<script>` on the M820 system.
The maximum number of characters capable of input is 256 including command and NULL character (\0)

[Argument]

`<script>`
Specify the Linux shell command to execute.

[Option]

`[-device <device_no>]`
Specify the device number of the M820L by `<device_no>`.
If this option is not specified, device number 0 will be used.

[Note]
✓ Before executing this command, please execute the initialization of the M820 system control command.

[Usage example]
An example of this command is as follows.
This example copies "\root\xxxx1.txt", which was transferred in the example of "10.5.2 Transferring files", to "\root\xxxx2.txt".

```bash
# m820_util -device 0 init && m820_util -device 0 exec "cp /root/xxxx1.txt /root/xxxx2.txt"
# echo $?
0
#```
10.5.4 Getting M820L firmware state

[Command]

```
# m820_util [-device <device_no>] get_status
```

[Description]
Get status of M820L firmware. (For debugging)
Output the status of M820L firmware to standard output.

[Option]

```
[-device <device_no>]
```
Specify the device number of the M820L by <device_no>.
If this option is not specified, device number 0 will be used.

10.5.5 Getting the M820L control utility version information

[Command]

```
# m820_util vsn
```

[Description]
Get version of M820L control utility.
Output version of M820L control utility to standard output.
11. MB86M30 Encoding Using FFmpeg libavcodec

This product executes MB86M30 encoding via libavcodec library. This chapter describes how to encode with MB86M30 using the libavcodec library API.

To encode MB86M30 via the libavcodec library API, FFmpeg must be built with "-enable_shared" option.

11.1 Setting Extended Options

The FFmpeg options that are extended to use with MB86M30 encoding are passed to the libavcodec library using the members of the AVCodecContext structure.

e.g.)

```c
    c = avcodec_alloc_context3(codec);
    c->bit_rate = 400000;  // "-b:v" option
```

The following is a list of the AVCodecContext members to use to set the extended options. For the specifications of extended options, please refer to "3.2 Extended Options for Encoding" in this manual.

<table>
<thead>
<tr>
<th>Extended option</th>
<th>AVCodecContext member</th>
<th>Sample value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;-b:v&quot;</td>
<td>int64_t bit_rate</td>
<td>4000000 (4Mbps)</td>
</tr>
<tr>
<td>&quot;-minrate&quot;</td>
<td>int64_t rc_min_rate</td>
<td>2000000 (2Mbps)</td>
</tr>
<tr>
<td>&quot;-maxrate&quot;</td>
<td>int64_t rc_max_rate</td>
<td>8000000 (8Mbps)</td>
</tr>
<tr>
<td>&quot;-g&quot;</td>
<td>int gop_size</td>
<td>64</td>
</tr>
<tr>
<td>&quot;-pix_fmt&quot;</td>
<td>AVPixelFormat pix_fmt</td>
<td>AV_PIX_FMT_YUV420P (YUV 4:2:0 8-bit)</td>
</tr>
</tbody>
</table>
11.2 Setting Specific Options

The FFmpeg options that are added to use with MB86M30 encoding are passed to the libavcodec library using the member “priv_data” of the AVCodecContext structure.

To set these option values to the member “priv_data”, use the following FFmpeg functions, and specify the field name when using these functions. The function to use depends on the data type of the value to be set.

For function specifications, refer to FFmpeg Documentation at URL: https://www ffmpeg.org/.

<table>
<thead>
<tr>
<th>FFmpeg Function</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>av_opt_set_int( )</td>
<td>int</td>
</tr>
<tr>
<td>av_opt_set_double( )</td>
<td>double</td>
</tr>
<tr>
<td>av_opt_set_q( )</td>
<td>AVRational</td>
</tr>
<tr>
<td>av_opt_set( )</td>
<td>string</td>
</tr>
</tbody>
</table>
The field names used to set the specific options are as follows. For the specifications of the options, please refer to "3.3 Specific Options for Encoding" in this manual.

<table>
<thead>
<tr>
<th>Specific option</th>
<th>Field name</th>
<th>Data type</th>
<th>Sample value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;device&quot;</td>
<td>&quot;device&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;input_id&quot;</td>
<td>&quot;input_id&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;output_id&quot;</td>
<td>&quot;output_id&quot;</td>
<td>int</td>
<td>2</td>
</tr>
<tr>
<td>&quot;resize&quot;</td>
<td>&quot;resize&quot;</td>
<td>string</td>
<td>&quot;320x240&quot;</td>
</tr>
<tr>
<td>&quot;rc&quot;</td>
<td>&quot;rc&quot;</td>
<td>string</td>
<td>&quot;vbr&quot;</td>
</tr>
<tr>
<td>&quot;profile:v&quot;</td>
<td>&quot;profile&quot;</td>
<td>string</td>
<td>&quot;main&quot;</td>
</tr>
<tr>
<td>&quot;level:v&quot;</td>
<td>&quot;level&quot;</td>
<td>string</td>
<td>&quot;3.1&quot;</td>
</tr>
<tr>
<td>&quot;tier&quot;</td>
<td>&quot;tier&quot;</td>
<td>string</td>
<td>&quot;high&quot;</td>
</tr>
<tr>
<td>&quot;buf_size&quot;</td>
<td>&quot;buf_size&quot;</td>
<td>int</td>
<td>80000000 (8Mbps)</td>
</tr>
<tr>
<td>&quot;use_b&quot;</td>
<td>&quot;use_b&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;fix_gop&quot;</td>
<td>&quot;fix_gop&quot;</td>
<td>string</td>
<td>&quot;strict&quot;</td>
</tr>
<tr>
<td>&quot;closed_gop&quot;</td>
<td>&quot;closed_gop&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;cpb_delay&quot;</td>
<td>&quot;cpb_delay&quot;</td>
<td>int</td>
<td>9000</td>
</tr>
<tr>
<td>&quot;init_cpb_delay&quot;</td>
<td>&quot;init_cpb_delay&quot;</td>
<td>int</td>
<td>4</td>
</tr>
<tr>
<td>&quot;wp&quot;</td>
<td>&quot;wp&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;aspect_ratio&quot;</td>
<td>&quot;aspect_ratio&quot;</td>
<td>AVRational</td>
<td>(AVRational){4,3}*4:3</td>
</tr>
<tr>
<td>&quot;video_format&quot;</td>
<td>&quot;video_format&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;video_full_range_flag&quot;</td>
<td>&quot;video_full_range_flag&quot;</td>
<td>int</td>
<td>2</td>
</tr>
<tr>
<td>&quot;colour_primaries&quot;</td>
<td>&quot;colour_primaries&quot;</td>
<td>int</td>
<td>3</td>
</tr>
<tr>
<td>&quot;transfer_characteristics&quot;</td>
<td>&quot;transfer_characteristics&quot;</td>
<td>int</td>
<td>4</td>
</tr>
<tr>
<td>&quot;matrix_coefficients&quot;</td>
<td>&quot;matrix_coefficients&quot;</td>
<td>int</td>
<td>5</td>
</tr>
<tr>
<td>&quot;chroma_sample_loc_type&quot;</td>
<td>&quot;chroma_sample_loc_type&quot;</td>
<td>int</td>
<td>6</td>
</tr>
<tr>
<td>&quot;ll_mode&quot;</td>
<td>&quot;ll_mode&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;aud&quot;</td>
<td>&quot;aud&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;sps_insert&quot;</td>
<td>&quot;sps_insert&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;pps_insert&quot;</td>
<td>&quot;pps_insert&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;disp_chroma_<em>_</em>&quot;</td>
<td>&quot;disp_chroma_<em>_</em>&quot;</td>
<td>double</td>
<td>2.34</td>
</tr>
<tr>
<td>&quot;disp_luma_max&quot;</td>
<td>&quot;disp_luma_max&quot;</td>
<td>double</td>
<td>5.67</td>
</tr>
<tr>
<td>&quot;disp_luma_min&quot;</td>
<td>&quot;disp_luma_min&quot;</td>
<td>double</td>
<td>8.90</td>
</tr>
<tr>
<td>&quot;max_ccl&quot;</td>
<td>&quot;max_ccl&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;max_fall&quot;</td>
<td>&quot;max_fall&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;a53cc&quot;</td>
<td>&quot;a53cc&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;afd&quot;</td>
<td>&quot;afd&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;use_radl&quot;</td>
<td>&quot;use_radl&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;first_pic_type&quot;</td>
<td>&quot;first_pic_type&quot;</td>
<td>int</td>
<td>0</td>
</tr>
<tr>
<td>&quot;layer_num&quot;</td>
<td>&quot;layer_num&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;gop_hierarchy&quot;</td>
<td>&quot;gop_hierarchy&quot;</td>
<td>int</td>
<td>1</td>
</tr>
<tr>
<td>&quot;idr_interval&quot;</td>
<td>&quot;idr_interval&quot;</td>
<td>int</td>
<td>4</td>
</tr>
<tr>
<td>&quot;user_app&quot;</td>
<td>&quot;user_app&quot;</td>
<td>(int)</td>
<td>1</td>
</tr>
</tbody>
</table>

*1: Setting the value of "resize" will change the picture size (AVCodecContext member width, height) to the resized value.
*2: These options are specifically used when using the libavcodec API. For more information on these options, please refer to "11.3 Video Frame Buffer" in this manual.
Examples of setting specific option values are as follows.

e.g.) Setting int type (input_id) and string type (profile)

```c
    c = avcodec_alloc_context3(codec);
    av_opt_set_int(c->priv_data, "input_id", 4, 0); // "-input_id" option
    av_opt_set(c->priv_data, "profile", "main", 0); // "-profile:v" option
```

e.g.) Setting int type (input_id) and double type (disp_chroma_x_g)

The int, double and AVRational type options can also be set using string types.

```c
    c = avcodec_alloc_context3(codec);
    av_opt_set(c->priv_data, "input_id", "4", 0); // "-input_id" option
    av_opt_set(c->priv_data, "disp_chroma_x_g", "0.25", 0); // "-disp_chroma_x_g" option
```
11.3 Video Frame Buffer

When encoding using this product, the address of the frame buffer used for passing raw data to the encoder must be different for each frame by default.

By setting the following option, the same address for the frame buffer can be used for each frame.

<table>
<thead>
<tr>
<th>Field name</th>
<th>Data type</th>
<th>Value to set</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;user_app&quot;</td>
<td>int</td>
<td>1</td>
</tr>
</tbody>
</table>

e.g.)

```
c = avcodec_alloc_context3(codec);
av_opt_set_int(c->priv_data, "user_app", 1, 0);
```

For an example of processing using this option, please refer to "11.5 Example of Encoding" in this manual.

[Note]
✓ For multi-encoding (1: n), please allocate and initialize all of the AVCodecContext structures before executing the avcodec_send_frame() function.
11.4 Dynamic bit rate change

To change the bit rate setting during encoding, update the following members of the AVCodecContext structure before executing the avcodec_send_frame() function.

<table>
<thead>
<tr>
<th>member</th>
<th>data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;bit_rate&quot;</td>
<td>int</td>
</tr>
<tr>
<td>&quot;rc_max_rate&quot;</td>
<td>int</td>
</tr>
<tr>
<td>&quot;rc_min_rate&quot;</td>
<td>int</td>
</tr>
<tr>
<td>&quot;priv_data&quot;</td>
<td>Int</td>
</tr>
<tr>
<td>(&quot;-buf_size&quot; specific option)</td>
<td></td>
</tr>
</tbody>
</table>

### VBR
- When "bit_rate" is updated during constant bit rate (CBR) encoding
- When "buf_size" is updated during variable bit rate (VBR) encoding

In the following cases, if the parameter is updated during encoding, an EOS (end of sequence) frame is output and a new sequence is started from the next frame.

\[
\begin{align*}
&\checkmark \text{ When } \"\text{bit_rate}\" \text{ is updated during constant bit rate (CBR) encoding} \\
&\checkmark \text{ When } \"\text{buf_size}\" \text{ is updated during variable bit rate (VBR) encoding}
\end{align*}
\]

If the above parameters contain incorrect values, the bitrate change request is discarded and the application updated parameter values are restored by the m30enc plugin.

e.g.)

```c
  c->bit_rate = 4000000;
  c->rc_max_rate = 6000000;
  c->rc_min_rate = 2000000;
  av_opt_set_int(c->priv_data, "buf_size", 10000000, 0);
```
11.5 Example of Encoding

This sample source code generates and encodes 30 frames of video and outputs the file.

<table>
<thead>
<tr>
<th>Input</th>
<th>Video resolution</th>
<th>352x288</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>Video resolution</td>
<td>256x192</td>
</tr>
<tr>
<td></td>
<td>Frame rate</td>
<td>29.97fps</td>
</tr>
<tr>
<td></td>
<td>Frame number</td>
<td>30 frames (about 1 sec)</td>
</tr>
<tr>
<td></td>
<td>Bitrate</td>
<td>400Kbps (CBR)</td>
</tr>
<tr>
<td></td>
<td>GOP size</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Pixel format</td>
<td>YUV 4:2:0 8-bit</td>
</tr>
<tr>
<td></td>
<td>Time base</td>
<td>90KHz</td>
</tr>
</tbody>
</table>

➢ Sample source code (encode_video.c)

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <libavcodec/avcodec.h>
#include <libavutil/opt.h>
#include <libavutil/imgutils.h>

static void encode(AVCodecContext *enc_ctx, AVFrame *frame, AVPacket *pkt, FILE *outfile)
{
    int ret;

    /* Send the frame to the encoder. */
    ret = avcodec_send_frame(enc_ctx, frame);

    /* Receive the packet from the encoder. */
    while (ret >= 0) {
        ret = avcodec_receive_packet(enc_ctx, pkt);
        if (ret == AVERROR(EAGAIN) || ret == AVERROR_EOF)
            return;
        printf("Write packet %3"PRIId64" (size=%5d)\n", pkt->pts, pkt->size);
        fwrite(pkt->data, 1, pkt->size, outfile);
        av_packet_unref(pkt);
    }
}

int main(int argc, char **argv)
{
    const char *filename, *codec_name;
    const AVCodec *codec;
    AVCodecContext *c = NULL;
    int i, x, y;
    FILE *f;
    AVFrame *frame;
    AVPacket *pkt;
```
/* Parse arguments. */
filename = argv[1];
codec_name = argv[2];

/* Register codecs. Required for FFmpeg-3.4.x. */
//
avcodec_register_all();

/* Find a registered encoder with the specified name. */
codec = avcodec_find_encoder_by_name(codec_name);

/* Allocate AVCodecContext and set its fields. */
c = avcodec_alloc_context3(codec);

c->bit_rate = 400000;
c->width = 352;
c->height = 288;
c->gop_size = 10;
c->pix_fmt = AV_PIX_FMT_YUV420P;
/* Set framerate parameters. These will be used when setting output video PTS/DTS. */
c->time_base = (AVRational){1, 90000};
c->framerate = (AVRational){30000, 1001};

/* Set option to use single-buffer mode. */
av_opt_set_int(c->priv_data, "user_app", 1, 0);

/* Set option for scaler. */
av_opt_set(c->priv_data, "resize", "256x192", 0);

/* Open file for output. */

f = fopen(filename, "wb");

/* Allocate an AVFrame and set its fields. */
frame = av_frame_alloc();
frame->format = c->pix_fmt;
frame->width = c->width;
frame->height = c->height;

/* Allocate new buffer for RAW video data. */
av_frame_get_buffer(frame, 32);

/* Allocate an AVPacket to store encoded video stream. */
pkt = av_packet_alloc();

/* Open and initialize the AVCodecContext. */
avcodec_open2(c, codec, NULL);

/* Encode 30 frames of video. */
for (i = 0; i < 30; i++) {
    fflush(stdout);
    /* Ensure that the frame data is writable. */
    av_frame_make_writable(frame);
Notes:
- When using FFmpeg-3.4.x, you must call the avcodec_register_all() function.
- When using this product with the libavcodec API, you must make sure the previous frame data is not overwritten. To do this, before writing data to the data member in the AVFrame structure, be sure to call the av_frame_make_writable() function or av_frame_ref() function.
  If you call the av_frame_ref() function, make sure to call av_frame_unref() after encoding to release the allocated frame.
➢ How to build the source code
Execute the following command from the Linux terminal of the Host PC to build the sample source code.

```bash
# gcc -o encode_video encode_video.c -lavcodec -lavutil
# sudo ldconfig
```

➢ How to execute the source code
The execution procedure of the source code is as follows.

1) Set the output video codec using the "change_codec.sh" script.

2) Execute the following command from the terminal.

```bash
# ./encode_video <output> <codec>
```

The command arguments specify the following.

- `<output>`: Output file name
  - Please use either "xxx.h264" or "xxx.hevc" extension.
- `<codec>`: Output video codec
  - Please use either "m30enc_h264" or "m30enc_hevc".
11.6 Example of Encoding (MB86M30 specific format)

Video RAW data in MB86 M30 specific format can be input from API of libavcodec library. Using this feature can improve performance because the plug-in does not need to perform format conversion.

This function is set by "flags" bit 26 of AVFrame structure.
- 1 : Use this function (MB86M30 specific format)
- 0 : Do not use this function

For details on the MB86M30 specific format, refer to "11.7 MB86M30 specific format".

11.6.1 Encoding application implementation method

To use this function, set the AVFrame structure as follows.

- **frame->format**

  The following pixel formats can be specified.

<table>
<thead>
<tr>
<th>Format</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>YUV 4:2:0 8bit</td>
<td>AV_PIX_FMT_YUV420P</td>
</tr>
<tr>
<td>YUV 4:2:0 10bit</td>
<td>AV_PIX_FMT_YUV420P10LE</td>
</tr>
<tr>
<td>YUV 4:2:2 8bit</td>
<td>AV_PIX_FMT_YUV422P</td>
</tr>
<tr>
<td>YUV 4:2:2 10bit</td>
<td>AV_PIX_FMT_YUV422P10LE</td>
</tr>
</tbody>
</table>

- **frame->width**: Horizontal size of video raw data

- **frame->height**: Vertical size of video raw data

- **frame->linesize[i]**

  - In the case of Chroma interleaved:
    - **frame->linesize[0]**: Line size of Y component aligned in bytes
    - **frame->linesize[1]**: Line size of C component aligned in bytes
    - **frame->linesize[2]**: Fixed to zero
    - **frame->linesize[3]**: Fixed to zero

  - In the case of Separate chroma planes:
    - **frame->linesize[0]**: Line size of Y component aligned in bytes
    - **frame->linesize[1]**: Line size of Cb component aligned in bytes
    - **frame->linesize[2]**: Line size of Cr component aligned in bytes
    - **frame->linesize[3]**: Fixed to zero

* This value is not referenced by the m30enc_xxx plugin.
This value is used by the libavcodec API to create the video raw data buffer when calling av_frame_get_buffer().

- frame->flags

- bit28: Specify use V210 format or not
  - 1: Use V210 format
  - 0: Do not use V210 format

- bit27: Specify chroma format
  - 1: Chroma interleaved
  - 0: Separate chroma planes

- bit26: Specify this function
  - 1: Use this function (MB86M30 specific format)
  - 0: Do not use this function
The following m30_rawdata_test.c is a sample application of this function (MB86M30 specific format input).

- Sample source code (m30_rawdata_test.c)

```c
//===========================================================
// @file   m30_rawdata_test.c
// @brief  Sample application for input of RAW video data with a MB86M30 specific format
// @copyright (C)2019, Socionext Inc., ALL RIGHTS RESERVED.
//==========================================================================
#define _LARGEFILE64_SOURCE
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>
#include <unistd.h>
#include <libavcodec/avcodec.h>
#include <libavutil/opt.h>
#include <libavutil/imgutils.h>
#define FPS     29
#define YC_FORMAT_PLANAR            0
#define YC_FORMAT_SEMIPLANAR        1
#define YC_FORMAT_V210_PLANAR       2
#define YC_FORMAT_V210_SEMIPLANAR   3
#define YC_FORMAT_NUM               4
#define CAL_3PIXEL_ALIGNMENT(value)         ((((value) + 2) / 3) * 3)
#define CAL_V210_WIDTH_DATA_SIZE(value)     ((CAL_3PIXEL_ALIGNMENT(value) * 4) / 3)
#define CAL_ALIGNMENT(value, align)         (((value) + ((align) - 1)) / (align)) * (align))

static void encode(AVCodecContext *enc_ctx, AVFrame *frame, AVPacket *pkt, int fd_es_file, uint64_t *frame_count)
{
    int ret;

    /* send one frame of video raw data to the encoder */
    ret = avcodec_send_frame(enc_ctx, frame);
    if (ret < 0) {
        fprintf(stderr, "Error sending a frame for encoding\n");
        exit(1);
    }

    while (ret >= 0) {
        /* receive encoded es data */
        ret = avcodec_receive_packet(enc_ctx, pkt);
        if ((ret == AVERROR(EAGAIN)) || (ret == AVERROR_EOF)) {
            return;
        } else if (ret < 0) {
            fprintf(stderr, "Error during encoding\n");
            exit(1);
        }
    }
}
```

AVCodecContext* init(const char *codec_name, const int pix_fmt, const int in_width, const int in_height, const int out_width, const int out_height, const char *s_out_width, const char *s_out_height)
{
    int ret;
    char s_resize[32] = {0};

    AVCodecContext *c;
    const AVCodec  *codec;

    const double fps = FPS;

    codec = avcodec_find_encoder_by_name(codec_name);
    if (!codec) {
        fprintf(stderr, "Codec '%s' not found.
        exit(1);
    }

    /* create AVCodecContext */
    c = avcodec_alloc_context3(codec);
    if (!c) {
        fprintf(stderr, "Could not allocate video codec context.
        exit(1);
    }

    /* bit rate settings */
    c->bit_rate    = 0;
    c->rc_max_rate = 0;
    c->rc_min_rate = 0;

    /* input image size settings */
    c->width  = in_width;
    c->height = in_height;

    /* frame rate settings */
    switch ((int)fps) {
    case 29:
        c->framerate = (AVRational){30000, 1001};
        break;
    case 59:
        c->framerate = (AVRational){60000, 1001};
        break;
    case 60:
        c->framerate = (AVRational){60, 1};
        break;
    default:
        c->framerate = (AVRational){30, 1};
        break;
    }

    /* write the received es data to the file */
    ret = write(fd_es_file, pkt->data, pkt->size);
    if (ret != pkt->size) {
        fprintf(stderr, "Error: write()\n");
        exit(1);
    }

    av_packet_unref(pkt);
}

else {

print("NO %lu, PTS %ld, DTS %ld, LEN %ld\n", *frame_count, pkt->pts, pkt->dts, pkt->size);
(*frame_count)++;

/* write the received es data to the file */
ret = write(fd_es_file, pkt->data, pkt->size);
if (ret != pkt->size) {
    fprintf(stderr, "Error: write()\n");
    exit(1);
}

av_packet_unref(pkt);
}
break;
}

/* misc. settings */
c->time_base = (AVRational){1, 90000};
c->gop_size = 64;
c->max_b_frames = 1;
c->pix_fmt = pix_fmt;

/* m30enc_xxx specific options */
if ((in_width != out_width) || (in_height != out_height)) {
    /* use "-resize" option */
    sprintf(s_resize, "%sx%s", s_out_width, s_out_height);
    av_opt_set(c->priv_data, "resize", s_resize, AV_OPT_SEARCH_CHILDREN);
}

av_opt_set(c->priv_data, "rc", "cbr", AV_OPT_SEARCH_CHILDREN);

av_opt_set_int(c->priv_data, "device", 0, AV_OPT_SEARCH_CHILDREN);
av_opt_set_int(c->priv_data, "input_id", 0, AV_OPT_SEARCH_CHILDREN);
av_opt_set_int(c->priv_data, "output_id", 0, AV_OPT_SEARCH_CHILDREN);
av_opt_set_int(c->priv_data, "pts_mode", 0, AV_OPT_SEARCH_CHILDREN);
av_opt_set_int(c->priv_data, "user_app", 1, AV_OPT_SEARCH_CHILDREN);

/* initialize m30enc_xxx plugin */
ret = avcodec_open2(c, codec, NULL);
if (ret < 0) {
    fprintf(stderr, "Could not open codec: %s\n", av_err2str(ret));
    exit(1);
}
return c;
}

static void encode_loop(AVCodecContext *ctx, AVPacket *pkt, int pix_fmt, int yc_fmt, int width, int height, int fd_vraw_file, int fd_es_file)
{
    int ret;
    uint32_t bytes_y;
    uint32_t bytes_c;
    int linesize;
    uint32_t cnt_in;
    uint64_t cnt_out;
    ssize_t read_size;
    off_t offset;
    uint64_t vraw_file_size;
    uint64_t frame_size;
    uint64_t frame_size_y;
    uint64_t frame_size_c0;
    uint64_t frame_size_c1;
    uint32_t total_frame_num;
    AVFrame *frame = NULL;

    cnt_out = 0;

    /* create AVFrame */
    frame = av_frame_alloc();
    if (!frame) {
        fprintf(stderr, "Could not allocate video frame.\n");
        exit(1);
    }

    /* make settings for AVFrame */
    frame->format = pix_fmt;
frame->width = width;
frame->height = height;
frame->linesize[3] = 0;
frame->flags |= 0x04000000;

if (yc_fmt == YC_FORMAT_PLANAR) {
    if (((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV422P)) {
        linesize = CAL_ALIGNMENT(frame->width * 8, 256) / 8;
    } else {
        linesize = CAL_ALIGNMENT(frame->width * 10, 64) / 8;
    }
    frame->linesize[0] = linesize;
    frame->linesize[1] = linesize >> 1;
    frame->linesize[2] = linesize >> 1;
    bytes_y = linesize * frame->height;
    if (((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV420P10LE)) {
        bytes_c = bytes_y >> 2;
    } else {
        bytes_c = bytes_y >> 1;
    }
    frame_size_y = bytes_y;
    frame_size_c0 = bytes_c;
    frame_size_c1 = bytes_c;
} else if (yc_fmt == YC_FORMAT_SEMIPLANAR) {
    if (((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV422P)) {
        linesize = CAL_ALIGNMENT(frame->width * 8, 128) / 8;
    } else {
        linesize = CAL_ALIGNMENT(frame->width * 10, 32) / 8;
    }
    frame->linesize[0] = linesize;
    frame->linesize[1] = linesize;
    frame->linesize[2] = 0;
    bytes_y = linesize * frame->height;
    if (((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV420P10LE)) {
        bytes_c = bytes_y >> 1;
    } else {
        bytes_c = bytes_y;
    }
    frame_size_y = bytes_y;
    frame_size_c0 = bytes_c;
    frame_size_c1 = 0;
    frame->flags |= 0x08000000;
} else if (yc_fmt == YC_FORMAT_V210_PLANAR) {
    linesize = CAL_ALIGNMENT(CAL_V210_WIDTH_DATA_SIZE(frame->width), 64);
    frame->linesize[0] = linesize;
    frame->linesize[1] = linesize >> 1;
    frame->linesize[2] = linesize >> 1;
    frame_size_y = linesize * frame->height;
    if (((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV420P10LE)) {
        frame_size_c0 = frame_size_y >> 2;
        frame_size_c1 = frame_size_y >> 2;
    } else {
        frame_size_c0 = frame_size_y >> 1;
    }
frame_size_c1 = frame_size_y >> 1;
}
frame->flags |= 0x10000000;
} else {
    linesize = CAL_ALIGNMENT(CAL_V210_WIDTH_DATA_SIZE(frame->width), 64);
    frame->linesize[0] = linesize;
    frame->linesize[1] = linesize;
    frame->linesize[2] = 0;
    frame_size_y = linesize * frame->height;
    if ((frame->format == AV_PIX_FMT_YUV420P) || (frame->format == AV_PIX_FMT_YUV420P10LE)) {
        frame_size_c0 = frame_size_y >> 1;
        frame_size_c1 = 0;
    } else {
        frame_size_c0 = frame_size_y;
        frame_size_c1 = 0;
    }
    frame->flags |= 0x18000000;
}
frame_size = frame_size_y + frame_size_c0 + frame_size_c1;
/* create video raw data buffer */
ret = av_frame_get_buffer(frame, 1);
if (ret < 0) {
    fprintf(stderr, "Could not allocate the video frame data.\n");
    exit(1);
}
/* get file size */
vraw_file_size = (uint64_t)lseek64(fd_vraw_file, 0, SEEK_END);
if ((vraw_file_size % frame_size) == 0) {
    total_frame_num = (uint32_t)(vraw_file_size / frame_size);
} else {
    fprintf(stderr, "Input file size is invalid. File size must be multiple of %ld.\n", frame_size);
    exit(1);
}
lseek(fd_vraw_file, 0, SEEK_SET);
for (cnt_in = 0; cnt_in < total_frame_num; cnt_in++) {
    fflush(stdout);
#if 0
    /* In the case of MB86M30 specific format, it is necessary to replace it with an alternative code */
    if (av_frame_is_writable(frame) == 0) {
        AVFrame tmp;
        tmp.format         = frame->format;
        tmp.width          = frame->width;
        tmp.height         = frame->height;
        tmp.channels       = frame->channels;
        ret = av_frame_make_writable(frame);
        if (ret < 0) {
            fprintf(stderr, "av frame is not writable\n");
            exit(1);
        }
    } else {
        /* Replace with the following code */
        if (av_frame_is_writable(frame) == 0) {
            AVFrame tmp;
            tmp.format         = frame->format;
            tmp.width          = frame->width;
            tmp.height         = frame->height;
            tmp.channels       = frame->channels;
            ret = av_frame_make_writable(frame);
            if (ret < 0) {
                fprintf(stderr, "av frame is not writable\n");
                exit(1);
            }
        }
    }
#endif
}
tmp.channel_layout = frame->channel_layout;
tmp.nb_samples = frame->nb_samples;

av_frame_unref(frame);
frame->format = tmp.format;
frame->width = tmp.width;
frame->height = tmp.height;
frame->channels = tmp.channels;
frame->channel_layout = tmp.channel_layout;
frame->nb_samples = tmp.nb_samples;
ret = av_frame_get_buffer(frame, 1);
if (ret < 0) {
    fprintf(stderr, "Could not allocate the video frame data.
    
    ");
    exit(1);
}
#endif
if (frame_size_y > 0) {
    read_size = read(fd_vraw_file, frame->data[0], frame_size_y);
    if (read_size != frame_size_y) {
        fprintf(stderr, "Error: read()\n\n    ");
        exit(1);
    }
}
if (frame_size_c0 > 0) {
    read_size = read(fd_vraw_file, frame->data[1], frame_size_c0);
    if (read_size != frame_size_c0) {
        fprintf(stderr, "Error: read()\n\n    ");
        exit(1);
    }
}
if (frame_size_c1 > 0) {
    read_size = read(fd_vraw_file, frame->data[2], frame_size_c1);
    if (read_size != frame_size_c1) {
        fprintf(stderr, "Error: read()\n\n    ");
        exit(1);
    }
}
frame->pts = (cnt_in + 1) * (90000 * ctx->framerate.den / ctx->framerate.num);
frame->pkt_dts = cnt_in * (90000 * ctx->framerate.den / ctx->framerate.num);

/* encode one frame of video raw data */
encode(ctx, frame, pkt, fd_es_file, &cnt_out);

av_frame_free(&frame);

/* flush remained frame */
while ((cnt_out + 1) < total_frame_num) {
    encode(ctx, NULL, pkt, fd_es_file, &cnt_out);
}
int main(int argc, char **argv) {
    int fd_vraw_file;
    int fd_es_file;

    /* arguments */
    const char *codec_name;
    const char *pix_fmt;
    int fmt;
    int yc_fmt;
    int in_width;
    int in_height;
    int out_width;
    int out_height;
    const char *s_out_width;
    const char *s_out_height;
    const char *infile_name;
    const char *outfile_name;

    /* library parameters */
    AVCodecContext *ctx = NULL;
    AVPacket *pkt;

    /* check arguments */
    if (argc <= 9) {
        fprintf(stderr, "Usage: %s <codec name> <pix_fmt> <yc_fmt> <in_width> <in_height> <out_width> <out_height> <infile_name> <outfile_name>\n", argv[0]);
        exit(0);
    }
    codec_name   = argv[1];
    pix_fmt      = argv[2];
    yc_fmt       = atoi(argv[3]);
    in_width     = atoi(argv[4]);
    in_height    = atoi(argv[5]);
    s_out_width  = argv[6];
    s_out_height = argv[7];
    out_width    = atoi(s_out_width);
    out_height   = atoi(s_out_height);
    infile_name  = argv[8];
    outfile_name = argv[9];

    avcodec_register_all();

    pkt = av_packet_alloc();
    if (!pkt) {
        fprintf(stderr, "Error: av_packet_alloc()\n");
        exit(1);
    }

    /* check parameters */
    if (argc < 9) {
        fprintf(stderr, "Error: av_packet_alloc()\n");
        exit(1);
    }

    /* check parameters */
    if (strcmp(pix_fmt, "yuv420p") == 0) {
        fmt = AV_PIX_FMT_YUV420P;
    } else if (strcmp(pix_fmt, "yuv420p10le") == 0) {
        fmt = AV_PIX_FMT_YUV420P10LE;
    } else if (strcmp(pix_fmt, "yuv422p") == 0) {
        fmt = AV_PIX_FMT_YUV422P;
    } else if (strcmp(pix_fmt, "yuv422p10le") == 0) {
        fmt = AV_PIX_FMT_YUV422P10LE;
    } else {
        fprintf(stderr, "Invalid argument: pix_fmt\n");
        exit(1);
    }

    if ((yc_fmt < 0) || (yc_fmt >= YC_FORMAT_NUM)) {
fprintf(stderr, "Invalid argument: yc_fmt\n");
exit(1);
}

if ((in_width < 256) || (in_width > 3840) || ((in_width & 0x1) != 0)) {
    fprintf(stderr, "Invalid argument: in_width\n");
    exit(1);
}

if ((in_height < 192) || (in_height > 2160) || ((in_height & 0x1) != 0)) {
    fprintf(stderr, "Invalid argument: in_height\n");
    exit(1);
}

if ((out_width < 256) || (out_width > in_width) || ((out_width & 0x1) != 0)) {
    fprintf(stderr, "Invalid argument: out_width\n");
    exit(1);
}

if ((out_height < 192) || (out_height > in_height) || ((out_height & 0x1) != 0)) {
    fprintf(stderr, "Invalid argument: out_height\n");
    exit(1);
}

fd_vraw_file = open(infile_name, O_RDONLY);
if (fd_vraw_file <= 0) {
    fprintf(stderr, "Raw data file cannot be opened.\n");
    exit(1);
}

fd_es_file = open(outfile_name, O_WRONLY | O_CREAT | O_TRUNC, S_IRUSR | S_IWUSR | S_IRGRP | S_IWGRP | S_IROTH);
if (fd_es_file <= 0) {
    fprintf(stderr, "Output file cannot be opened.\n");
    exit(1);
}

if ((yc_fmt == YC_FORMAT_V210_PLANAR) || (yc_fmt == YC_FORMAT_V210_SEMIPLANAR)) {
    if ((fmt != AV_PIX_FMT_YUV420P10LE) && (fmt != AV_PIX_FMT_YUV422P10LE)) {
        fprintf(stderr, "V210 format supports only 10bit pixel formats.\n");
        exit(1);
    }
}

if ((in_width != out_width) || (in_height != out_height)) {
    if (((yc_fmt == YC_FORMAT_PLANAR) || (yc_fmt == YC_FORMAT_SEMIPLANAR)) &&
        ((fmt == AV_PIX_FMT_YUV420P10LE) || (fmt == AV_PIX_FMT_YUV422P10LE))) {
        fprintf(stderr, "V210 format is required in resizing input raw data with a 10bit pixel format.\n");
        exit(1);
    }
}

/* do encoding */
ctx = init(codec_name, fmt, in_width, in_height, out_width, out_height, s_out_width, s_out_height);
encode_loop(ctx, pkt, fmt, yc_fmt, in_width, in_height, fd_vraw_file, fd_es_file);
avcodec_free_context(&ctx);
close(fd_vraw_file);
close(fd_es_file);
av_packet_free(&pkt);
return 0;
Notes: When using this product with the libavcodec API, you must make sure the previous frame data is not overwritten. However, when inputting Video RAW data that is in an MB86M30 specific format, calling the `av_frame_make_writable()` function, which uses the `av_frame_copy()` function, may forcibly terminate the application. To avoid forced termination of the application, replace the `av_frame_copy()` function or the `av_frame_make_writable()` function with other functions or logic. Please refer to the green marked section in the sample above for an example of an alternative approach.
➢ How to build the source code
Execute the following command from the Linux terminal of the Host PC to build the sample source code. In order to compile this program, you need to have FFmpeg installed on your PC.

```
# gcc -o m30_rawdata_test m30_rawdata_test.c -lavcodec -lavutil
```

➢ How to execute the source code
The execution procedure of the source code is as follows.

Execute the following command from the terminal

```
# ./m30_rawdata_test <codec name> <pix_fmt> <yc_fmt> <in_width> <in_height> <out_width> <out_height> <infile_name> <outfile_name>
```

Specify the following as command arguments

- **<codec name>**
  - m30enc_h264: Use m30enc_h264 encode plugin
  - m30enc_hevc: Use m30enc_hevc encode plugin
- **<pix_fmt>**
  - yuv420p: YUV 4:2:0 8bit
  - yuv420p10le: YUV 4:2:0 10bit
  - yuv422p: YUV 4:2:2 8bit
  - yuv422p10le: YUV 4:2:2 10bit
- **<yc_fmt>**
  - 0: Separate chroma planes
  - 1: Chroma interleaved
  - 2: V210 format (Separate chroma planes)
  - 3: V210 format (Chroma interleaved)
- **<in_width>**
  - Horizontal size of RAW video data
- **<in_height>**
  - Vertical size of RAW video data
- **<out_width>**
  - Horizontal size of output ES
- **<out_height>**
  - Vertical size of output ES
- **<infile_name>**
  - Input file name (MB86M30 specific format)
- **<outfile_name>**
  - Output file name of ES
11.7 MB86M30 specific format

The MB86M30 specific format is divided into the following parameters:

<table>
<thead>
<tr>
<th></th>
<th>YUV420 8bit</th>
<th>YUV420 10bit</th>
<th>YUV422 8bit</th>
<th>YUV422 10bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chroma Interleaved</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Separate chroma planes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Chroma Interleaved (V210)</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Separate chroma planes (V210)</td>
<td>-</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

Please input V210 format when using scaling function with 10 bits.
The MB86M30 specific format must satisfy both "Pixel order" and "Pixel line alignment" shown below.

11.7.1 Pixel order

This section shows the pixel order of the MB86M30 specific format. The order of luminance (Y) and chroma (Cb / Cr) is as follows.

<YUV 4:2:0 8bit>

![Diagram of Pixel Order]
<YUV 4:2:2 8bit>

Chroma interleaved

Separate chroma planes

Luminance data of one line

Chrominance data of one line

Luminance data of one line

Chrominance(Cb) data of one line

Chrominance(Cr) data of one line

<YUV 4:2:0 10bit>

Chroma interleaved

Separate chroma planes

Luminance data of one line

Chrominance data of two line

Luminance data of one line

Chrominance(Cb) data of two line

Chrominance(Cr) data of two line
<YUV 4:2:2 10bit>

Chroma interleaved

|------|------|------|------|-----------|-------------|--------|----------|

Separate chroma planes

|------|------|------|------|-----------|-------------|--------|----------|

Luminance data of one line

Luminance data of one line

Chrominance data of one line

Chrominance data of one line

Chrominance (Cb) data of one line

Chrominance (Cr) data of one line

H: Horizontal size
V: Vertical size
In order to input a 10bit input image and use the scaling function, RAW video data must be in V210 format (10bit with gap).

The V210 format (10bit with gap) is the following format that creates a 2bit gap for every 30 bits.

< Chroma Interleaved >

< Separate chroma planes >
11.7.2 Pixel line alignment

The conditions for stride specification of input RAW video data differ depending on the difference in encoding conditions. If alignment adjustment is required, prepare RAW video data including the alignment adjustment area (B).

✓ Case of chroma interleaved

RAW video data format | Byte alignment (N)
---|---
bit depth | V210
8bit | 16 byte
10bit | 4 byte

*1 : When using the scaling function with a 10bit input image

✓ Case of separate chroma planes

RAW video data format | Byte alignment (N)
---|---
bit depth | V210
8bit | 32 byte
10bit | 8 byte

*1 : When using the scaling function with a 10bit input image
Appendix. Error Messages

This chapter describes error messages output by this product.

The error message output by this product is the following two types.

- Error message output from FFmpeg interface
- Error message directly output from the plug-in provided by this product

- Error message output from FFmpeg interface
  The plug-in error provided by this product is an error message output via FFmpeg interface.
  An example of outputting an error message is as follows.

  e.g.)

  ![Example Error Message](image)

The underlined part in the error message output example indicates the plug-in that detected the error.

The plug-in error message provided by this product is output as follows.

<table>
<thead>
<tr>
<th>Error message of header part</th>
<th>Plug-in that detected the error</th>
</tr>
</thead>
<tbody>
<tr>
<td>[H.264 encoder on MB86M30 @ 0x1c3d640]</td>
<td>MB86M30 encoder (H.264)</td>
</tr>
<tr>
<td>[HEVC encoder on MB86M30 @ 0xXXXXXX]</td>
<td>MB86M30 encoder (HEVC)</td>
</tr>
<tr>
<td>[H.264 transcoder on MB86M30 @ 0xXXXXXX]</td>
<td>MB86M30 transcoder (H.264)</td>
</tr>
<tr>
<td>[HEVC transcoder on MB86M30 @ 0xXXXXXX]</td>
<td>MB86M30 transcoder (HEVC)</td>
</tr>
<tr>
<td>[H.264 decode plugin for M820 transcode @ 0xXXXXXX]</td>
<td>SC2A11 decoder (H.264)</td>
</tr>
<tr>
<td>[HEVC decode plugin for M820 transcode @ 0xXXXXXX]</td>
<td>SC2A11 decoder (HEVC)</td>
</tr>
<tr>
<td>[H.264 encode plugin for M820 transcode @ 0xXXXXXX]</td>
<td>SC2A11 encoder (H.264)</td>
</tr>
<tr>
<td>[HEVC encode plugin for M820 transcode @ 0xXXXXXX]</td>
<td>SC2A11 decoder (HEVC)</td>
</tr>
</tbody>
</table>

An example of an error message output from the FFmpeg interface is as follows.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error setting option XXXX to value YYYY.</td>
<td>The value &quot;YYYY&quot; of &quot;XXXX&quot; option is incorrect.</td>
</tr>
<tr>
<td>Unable to parse option value YYYY</td>
<td>The value &quot;YYYY&quot; is incorrect.</td>
</tr>
<tr>
<td>Value YYYY for parameter 'XXXX' out of range [MIN - MAX]</td>
<td>The value &quot;YYYY&quot; of &quot;XXXX&quot; option is incorrect. (Out of range)</td>
</tr>
<tr>
<td>Undefined constant or missing '(' in 'YYYY'</td>
<td>The value &quot;YYYY&quot; is incorrect. (Undefined value)</td>
</tr>
</tbody>
</table>

When the above error message is output, the setting value of the option described in this manual may be incorrect. Please check the option value.
Note: In the case of an error in the specifiable range, the value of "minimum value-1" may be output to the error message. This is because the value when not specifying the option is defined as "minimum value-1". For example, for an option whose specifiable value is [0-15], the value is defined as "-1" when it is not specified, so the error message will be output as [-1-15]. The actual minimum value is "0" as is.

[H.264 encoder on MB86M30 @ 0x257fa80] Value YYYY for parameter 'XXXX' out of range [-1 - 15]

➢ Error message directly output from the plug-in provided by this product
   This error is an error message that directly outputs the error detected by the plug-in of this product.
   The name of the plug-in function that detected the error is output to the message, an error is output to the message on the next line.
   An example of outputting an error message is as follows.

   e.g.)

   (fmpg_m30enc_send_frame (2383))
   ERR: the specified device is not available.
   ...
The error cause and an example of the error message are as follows.

<table>
<thead>
<tr>
<th>FFmpeg command error</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cause:</strong> An out-of-range value was specified for an option.</td>
</tr>
<tr>
<td>e.g.) <code>-g 256</code></td>
</tr>
<tr>
<td>&quot;ERR: the specified gop size is not supported (must be within the range from 1 to 255).&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Specify two or more options and do not support combinations of their values.</td>
</tr>
<tr>
<td>e.g.) <code>-ll_mode 1</code> and <code>-g 1</code></td>
</tr>
<tr>
<td>&quot;ERR: gop size must be greater than 1 when using ll_mode.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Mixed the presence or absence of the &quot;-device&quot;, &quot;-input_id&quot; and &quot;-output_id&quot; option for multiple output channels.</td>
</tr>
<tr>
<td>e.g.) When mixing the presence or absence of the &quot;-device&quot; option for multiple output channels.</td>
</tr>
<tr>
<td>&quot;ERR: device is not correctly specified.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Specify more than 16 output channels for a device.</td>
</tr>
<tr>
<td>e.g.) Specify more than 16 encodings for device #0.</td>
</tr>
<tr>
<td>&quot;ERR: the number of output channel of device #0 is too many.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Specify different values for options that require the same value for all output channels of a device.</td>
</tr>
<tr>
<td>e.g.) Mixed &quot;-c:v m30enc_h264&quot; and &quot;-c:v m30enc_hevc&quot; in the output channel of device 0.</td>
</tr>
<tr>
<td>&quot;ERR: video codec type is not consistent in device #0.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Specify different values for options that must specify the same value for all output channels with the same input channel ID.</td>
</tr>
<tr>
<td>e.g.) Mixed &quot;-s 1280x720&quot; and &quot;-s 720x480&quot; in the output channel with &quot;-input_id 0&quot; specified.</td>
</tr>
<tr>
<td>&quot;ERR: input image size is not consistent in input_id #0 for device #0.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Assign the same output channel ID to multiple output channels of a device.</td>
</tr>
<tr>
<td>e.g.) Specify &quot;-device 0&quot; and &quot;-output_id 0&quot; for each output channel.</td>
</tr>
<tr>
<td>&quot;ERR: output_id must be different from each other.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> Specify an unavailable option for the specified codec.</td>
</tr>
<tr>
<td>e.g.) Specify the unavailable option for the selected codec.</td>
</tr>
<tr>
<td>&quot;ERR: resize by -s option and format conversion by -pix_fmt option are not available in M820 transcode.&quot;</td>
</tr>
<tr>
<td><strong>Cause:</strong> The combination of the specified decoder and encoder is not supported.</td>
</tr>
<tr>
<td>e.g.) Do not specify the decoder codec and specify &quot;-c:v m820_h264&quot; as the encoding option.</td>
</tr>
<tr>
<td>&quot;ERR: m820_h264 software encoder is not available without m820_xxx software decoder&quot;</td>
</tr>
</tbody>
</table>
### Input video specification error

<table>
<thead>
<tr>
<th>Cause</th>
<th>Description</th>
</tr>
</thead>
</table>
| Resolution of input video is not supported. | e.g.) Input the video of resolution 15360x8640. "ERR: input image size is too large in the current resolution setting."  
  Specifying "-c:v m30enc_h264" as the encoding option and input the video of resolution 176x144. "ERR: Specified output resolution is 176x144. Minimum supported resolution is 256x192." |
| Frame rate of input video is not supported. | e.g.) Input the video of 100 fps. "ERR: invalid frame rate : 100/1" |
| Value of "-resize" option is out of range. | e.g.) Input the video of resolution 3840x2160, and specify "-resize 256x192" as the encoding option.  
  "ERR: Downsampling is supported up to 1/8: Input 3840x2160 (1/8 = 480x270) -> Output 256x192  
  e.g.) Input the video of resolution 1280x720, and specify "-resize 1920x1080" as encoding option.  
  "ERR: Upscaling is not supported: Input 1280x720 -> Output 1920x1080"
| Color format of input video is out of range. | e.g.) Color format input YUV 4: 2: 2 10 bit video, and "-c:v m820_h264" is specified in the decoder option.  
  "ERR: input image format is not supported. supported format is YUV420 8bit only." |

### ID assignment error

<table>
<thead>
<tr>
<th>Cause</th>
<th>Description</th>
</tr>
</thead>
</table>
| Specify unavailable device. | e.g.) Specify "-device 1" with only one M820L installed on the HOST PC.  
  "ERR: the specified device does not exist or cannot encode the input raw data." |
| There is no device that can use the specified encoding condition. | e.g.) To specify the resolution parameter of 3 and encoded the input video of resolution 1920x1080.  
  "ERR: the specified device does not exist or cannot encode the input raw data."  
  "encode image size may be too large. check resolution setting." |
| There are devices available for the specified encoding condition, but there is no space in the output channel (output_id). | e.g.) Assigned 2 channels with only 1 channel available.  
  "ERR: output_id cannot be allocated." |
| "-c:v m30enc_xxx" and "-c:v m820_xxx" were mixed as encoding options without specifying the output channel ID (output_id). | e.g.) "-c:v m30enc_h264" and "-c:v m820_h264" were specified as encoding options without specifying an output channel ID.  
  "ERR: allocation of output_id is not available when both m30enc_xxx and m820_xxx are specified as encoder for one input." |
<table>
<thead>
<tr>
<th>Encoding setting error</th>
</tr>
</thead>
</table>
| **Cause:** The codec specified in the video codec setting (change_codec.sh) does not match the codec specified in the encoding option "-c:v".  
  e.g.) "-c:v m30enc_h264" was specified for a HEVC encoded device.  
  "ERR: the specified device does not support the specified video codec."  
| **Cause:** Specify the device or channel which can not be used in the encoding option to the resolution setting of the output video (set_resolution.sh).  
  e.g.) Specify "-output_id 15" with channels 0 to 7 enabled for the resolution setting of the output video.  
  "ERR: output_id #15 is not available. check resolution setting."  
| **Cause:** Specify the channel in use.  
  e.g.) Specify "-input_id 0" when input channel 0 is in use.  
  "ERR: the specified input_id is not available."  
| **Cause:** Encoded at an output resolution larger than the resolution specified in the resolution setting of the output video (set_resolution.sh).  
  e.g.) To specify the resolution parameter of 3 and encoded the input video of resolution 1920x1080.  
  "ERR: encode image size (1920x1088) is too large. check resolution setting."  
| **Cause:** Input an image exceeding 1920x1088 resolution to an input channel other than 0.  
  e.g.) Input a video with a resolution of 3840x2160 for input channel 1.  
  "ERR: input image size is invalid."  
| **Cause:** The pixel format of the input video to be multi-encoded violates the notes described in "Multi-encoding" in this manual.  
  e.g.) Encoding condition "-c:v m30enc_h264 -output_id 0 -pix_fmt yuv420p" and encoding condition "-c:v m30enc_h264 -output_id 4 -pix_fmt yuv422p" mixed and encoded.  
  "ERR: different pixel formats cannot be encoded with same core." |

<table>
<thead>
<tr>
<th>Codec initialization error</th>
</tr>
</thead>
</table>
| **Cause:** Specify an option value that violates the codec standard when using the "-c:v m820.xxx" option.  
  e.g.) The value of "-b:v" is too large for the level specified by "-level".  
  "ERR: software encoder cannot be initialized due to invalid encode parameter."  
| **Cause:** Failed to initialize software decoder or encoder due to lack of M820L internal memory.  
  e.g.) Failed to initialize software decoder.  
  "ERR: software decoder cannot be initialized due to lack of memory."  
| **Note:** This error is detected only when using "SC2A11+MB86M30 transcode acceleration function" and "SC2A11 transcode acceleration function". |

<table>
<thead>
<tr>
<th>Data input/output error</th>
</tr>
</thead>
</table>
| **Cause:** Detected timeout for video input or ES output.  
  e.g.) Detected timeout for ES output.  
  "ERR: es output timed out."  
| **Tips:** The appropriate timeout time depends on the Host PC environment.  
  Please change the timeout value according to the change procedure described in "2.2 Installation of This Product" in introduction manual. |
<table>
<thead>
<tr>
<th><strong>Decoding error</strong></th>
<th></th>
</tr>
</thead>
</table>
| Cause: Decoding failed due to an input stream containing an abnormal frame.  
*E.g.* “ERR: decoding error occurred. an invalid frame may be included in the input stream.” |  |
| Cause: Decoding failed by setting too small value to “-pic_buf_num” or “-th_num” option.  
*E.g.* “ERR: decoding error occurred. value of -pic_buf_num or -th_num option may be too small.” |  |
| Note: This error is detected only when using “SC2A11+MB86M30 transcode acceleration function” and “SC2A11 transcode acceleration function”. |  |

<table>
<thead>
<tr>
<th><strong>Application error using libavcodec API</strong></th>
<th></th>
</tr>
</thead>
</table>
| Cause: Specify different value for each output channel in “user_app” option.  
*E.g.* Specify “user_app=1” only for certain output channels in multi-encoding.  
“ERR: user_app option is not consistent.” |  |
| Cause: Call order error of avcodec_open2 () and avcodec_send_frame ().  
*E.g.* Avcodec_open2 () was called after avcodec_send_frame () for an input_id.  
“ERR: open was called after send_frame.” |  |