Encoder firmware API description
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Name   CX2341X_ENC_PING_FW
Enum   128/0x80
Description
        Does nothing. Can be used to check if the firmware is responding.

Name   CX2341X_ENC_START_CAPTURE
Enum   129/0x81
Description
        Commences the capture of video, audio and/or VBI data. All encoding
        parameters must be initialized prior to this API call. Captures frames
        continuously or until a predefined number of frames have been captured.
Param[0]
        Capture stream type:
            0=MPEG
            1=Raw
            2=Raw passthrough
            3=VBI

Param[1]
        Bitmask:
            Bit 0 when set, captures YUV
            Bit 1 when set, captures PCM audio
            Bit 2 when set, captures VBI (same as param[0]=3)
            Bit 3 when set, the capture destination is the decoder
                (same as param[0]=2)
            Bit 4 when set, the capture destination is the host
        Note: this parameter is only meaningful for RAW capture type.

Name   CX2341X_ENC_STOP_CAPTURE
Enum   130/0x82
Description
        Ends a capture in progress
Param[0]
        0=stop at end of GOP (generates IRQ)
        1=stop immediate (no IRQ)
Param[1]
        Stream type to stop, see param[0] of API 0x81
Param[2]
        Subtype, see param[1] of API 0x81

Name   CX2341X_ENC_SET_AUDIO_ID
Enum   137/0x89
Description
        Assigns the transport stream ID of the encoded audio stream
Param[0]

        Audio Stream ID

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Name   CX2341X_ENC_SET_VIDEO_ID
Enum   139/0x8B
Description
        Set video transport stream ID
Param[0]
        Video stream ID

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Name   CX2341X_ENC_SET_PCR_ID
Enum   141/0x8D
Description
        Assigns the transport stream ID for PCR packets
Param[0]
        PCR Stream ID

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Name   CX2341X_ENC_SET_FRAME_RATE
Enum   143/0x8F
Description
        Set video frames per second. Change occurs at start of new GOP.
Param[0]
        0=30fps
        1=25fps

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Name   CX2341X_ENC_SET_FRAME_SIZE
Enum   145/0x91
Description
        Select video stream encoding resolution.
Param[0]
        Height in lines. Default 480
Param[1]
        Width in pixels. Default 720

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Name   CX2341X_ENC_SET_BIT_RATE
Enum   149/0x95
Description
        Assign average video stream bitrate. Note on the last three params:
        Param[3] and [4] seem to be always 0, param [5] doesn't seem to be used.
Param[0]
        0=variable bitrate, 1=constant bitrate
Param[1]
        bitrate in bits per second
Param[2]
        peak bitrate in bits per second, divided by 400
Param[3]
        Mux bitrate in bits per second, divided by 400. May be 0 (default).

Param[4]
        Rate Control VBR Padding
Param[5]
        VBV Buffer used by encoder

Name   CX2341X_ENC_SET_GOP_PROPERTIES
Enum   151/0x97
Description
        Setup the GOP structure
Param[0]
        GOP size (maximum is 34)
Param[1]
        Number of B frames between the I and P frame, plus 1.
        For example: IBBPBBPBBPBB --> GOP size: 12, number of B frames: 2+1 = 3
        Note that GOP size must be a multiple of (B-frames + 1).

Name   CX2341X_ENC_SET_ASPECT_RATIO
Enum   153/0x99
Description
        Sets the encoding aspect ratio. Changes in the aspect ratio take effect
        at the start of the next GOP.
Param[0]
        '0000' forbidden
        '0001' 1:1 square
        '0010' 4:3
        '0011' 16:9
        '0100' 2.21:1
        '0101' reserved
        ....
        '1111' reserved

Name   CX2341X_ENC_SET_DNR_FILTER_MODE
Enum   155/0x9B
Description
        Assign Dynamic Noise Reduction operating mode
Param[0]
        Bit0: Spatial filter, set=auto, clear=manual
        Bit1: Temporal filter, set=auto, clear=manual
Param[1]
        Median filter:
            0=Disabled
            1=Horizontal
            2=Vertical
            3=Horiz/Vert
            4=Diagonal

Name   CX2341X_ENC_SET_DNR_FILTER_PROPS
Enum   157/0x9D

Description
    These Dynamic Noise Reduction filter values are only meaningful when
    the respective filter is set to "manual" (See API 0x9B)
Param[0]
    Spatial filter: default 0, range 0:15
Param[1]
    Temporal filter: default 0, range 0:31

Name   CX2341X_ENC_SET_CORING_LEVELS
Enum   159/0x9F
Description
    Assign Dynamic Noise Reduction median filter properties.
Param[0]
    Threshold above which the luminance median filter is enabled.
    Default: 0, range 0:255
Param[1]
    Threshold below which the luminance median filter is enabled.
    Default: 255, range 0:255
Param[2]
    Threshold above which the chrominance median filter is enabled.
    Default: 0, range 0:255
Param[3]
    Threshold below which the chrominance median filter is enabled.
    Default: 255, range 0:255

Name   CX2341X_ENC_SET_SPATIAL_FILTER_TYPE
Enum   161/0xA1
Description
    Assign spatial prefilter parameters
Param[0]
    Luminance filter
        0=Off
        1=1D Horizontal
        2=1D Vertical
        3=2D H/V Separable (default)
        4=2D Symmetric non-separable
Param[1]
    Chrominance filter
        0=Off
        1=1D Horizontal (default)

Name   CX2341X_ENC_SET_VBI_LINE
Enum   183/0xB7
Description
    Selects VBI line number.
Param[0]
    Bits 0:4   line number
    Bit 31   0=top_field, 1=bottom_field
    Bits 0:31   all set specifies "all lines"
Param[1]

            VBI line information features: 0=disabled, 1=enabled
Param[2]
            Slicing: 0=None, 1=Closed Caption
            Almost certainly not implemented. Set to 0.
Param[3]
            Luminance samples in this line.
            Almost certainly not implemented. Set to 0.
Param[4]
            Chrominance samples in this line
            Almost certainly not implemented. Set to 0.

Name   CX2341X_ENC_SET_STREAM_TYPE
Enum   185/0xB9
Description
            Assign stream type
            Note: Transport stream is not working in recent firmwares.
            And in older firmwares the timestamps in the TS seem to be
            unreliable.
Param[0]
             0=Program stream
             1=Transport stream
             2=MPEG1 stream
             3=PES A/V stream
             5=PES Video stream
             7=PES Audio stream
            10=DVD stream
            11=VCD stream
            12=SVCD stream
            13=DVD_S1 stream
            14=DVD_S2 stream

Name   CX2341X_ENC_SET_OUTPUT_PORT
Enum   187/0xBB
Description
            Assign stream output port. Normally 0 when the data is copied through
            the PCI bus (DMA), and 1 when the data is streamed to another chip
            (pvrusb and cx88-blackbird).
Param[0]
            0=Memory (default)
            1=Streaming
            2=Serial
Param[1]
            Unknown, but leaving this to 0 seems to work best. Indications are that
            this might have to do with USB support, although passing anything but 0
            only breaks things.

Name   CX2341X_ENC_SET_AUDIO_PROPERTIES
Enum   189/0xBD
Description
            Set audio stream properties, may be called while encoding is in

progress.
        Note: all bitfields are consistent with ISO11172 documentation except
        bits 2:3 which ISO docs define as:
                '11' Layer I
                '10' Layer II
                '01' Layer III
                '00' Undefined
        This discrepancy may indicate a possible error in the documentation.
        Testing indicated that only Layer II is actually working, and that
        the minimum bitrate should be 192 kbps.
Param[0]
        Bitmask:
          0:1 '00' 44.1Khz
              '01' 48Khz
              '10' 32Khz
              '11' reserved

          2:3 '01'=Layer I
              '10'=Layer II

          4:7 Bitrate:
                  Index | Layer I | Layer II
                  ------+--------------+------------
                  '0000' | free format | free format
                  '0001' | 32 kbit/s | 32 kbit/s
                  '0010' | 64 kbit/s | 48 kbit/s
                  '0011' | 96 kbit/s | 56 kbit/s
                  '0100' | 128 kbit/s | 64 kbit/s
                  '0101' | 160 kbit/s | 80 kbit/s
                  '0110' | 192 kbit/s | 96 kbit/s
                  '0111' | 224 kbit/s | 112 kbit/s
                  '1000' | 256 kbit/s | 128 kbit/s
                  '1001' | 288 kbit/s | 160 kbit/s
                  '1010' | 320 kbit/s | 192 kbit/s
                  '1011' | 352 kbit/s | 224 kbit/s
                  '1100' | 384 kbit/s | 256 kbit/s
                  '1101' | 416 kbit/s | 320 kbit/s
                  '1110' | 448 kbit/s | 384 kbit/s
              Note: For Layer II, not all combinations of total bitrate
              and mode are allowed. See ISO11172-3 3-Annex B, Table 3-B.2

          8:9 '00'=Stereo
              '01'=JointStereo
              '10'=Dual
              '11'=Mono
              Note: the cx23415 cannot decode Joint Stereo properly.

         10:11 Mode Extension used in joint_stereo mode.
              In Layer I and II they indicate which subbands are in
              intensity_stereo. All other subbands are coded in stereo.
                  '00' subbands 4-31 in intensity_stereo, bound==4
                  '01' subbands 8-31 in intensity_stereo, bound==8
                  '10' subbands 12-31 in intensity_stereo, bound==12
                  '11' subbands 16-31 in intensity_stereo, bound==16

         12:13 Emphasis:

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                    '00'  None
                    '01'  50/15uS
                    '10'  reserved
                    '11'  CCITT J.17

        14    CRC:
                    '0'  off
                    '1'  on

        15    Copyright:
                    '0'  off
                    '1'  on

        16    Generation:
                    '0'  copy
                    '1'  original
```

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Name   CX2341X_ENC_HALT_FW
Enum   195/0xC3
Description
        The firmware is halted and no further API calls are serviced until the
        firmware is uploaded again.

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Name   CX2341X_ENC_GET_VERSION
Enum   196/0xC4
Description
        Returns the version of the encoder firmware.
Result[0]
        Version bitmask:
            Bits 0:15 build
            Bits 16:23 minor
            Bits 24:31 major

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Name   CX2341X_ENC_SET_GOP_CLOSURE
Enum   197/0xC5
Description
        Assigns the GOP open/close property.
Param[0]
        0=Open
        1=Closed

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Name   CX2341X_ENC_GET_SEQ_END
Enum   198/0xC6
Description
        Obtains the sequence end code of the encoder's buffer. When a capture
        is started a number of interrupts are still generated, the last of
        which will have Result[0] set to 1 and Result[1] will contain the size
        of the buffer.

Result[0]
        State of the transfer (1 if last buffer)
Result[1]
        If Result[0] is 1, this contains the size of the last buffer, undefined
        otherwise.

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Name   CX2341X_ENC_SET_PGM_INDEX_INFO
Enum   199/0xC7
Description
        Sets the Program Index Information.
        The information is stored as follows:

        struct info {
                u32 length;   // Length of this frame
                u32 offset_low;   // Offset in the file of the
                u32 offset_high;   // start of this frame
                u32 mask1;   // Bits 0-2 are the type mask:
                                        // 1=I, 2=P, 4=B
                                        // 0=End of Program Index, other fields
                                        //   are invalid.
                u32 pts;   // The PTS of the frame
                u32 mask2;   // Bit 0 is bit 32 of the pts.
        };
        u32 table_ptr;
        struct info index[400];

        The table_ptr is the encoder memory address in the table were
        new entries will be written. Note that this is a ringbuffer,
        so the table_ptr will wraparound.
Param[0]
        Picture Mask:
            0=No index capture
            1=I frames
            3=I,P frames
            7=I,P,B frames
        (Seems to be ignored, it always indexes I, P and B frames)
Param[1]
        Elements requested (up to 400)
Result[0]
        Offset in the encoder memory of the start of the table.
Result[1]
        Number of allocated elements up to a maximum of Param[1]

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Name   CX2341X_ENC_SET_VBI_CONFIG
Enum   200/0xC8
Description
        Configure VBI settings
Param[0]
        Bitmap:
            0   Mode '0' Sliced, '1' Raw
            1:3 Insertion:
                    '000' insert in extension & user data

                              '001' insert in private packets
                              '010' separate stream and user data
                              '111' separate stream and private data
                    8:15 Stream ID (normally 0xBD)
Param[1]
          Frames per interrupt (max 8). Only valid in raw mode.
Param[2]
          Total raw VBI frames. Only valid in raw mode.
Param[3]
          Start codes
Param[4]
          Stop codes
Param[5]
          Lines per frame
Param[6]
          Byte per line
Result[0]
          Observed frames per interrupt in raw mode only. Rage 1 to Param[1]
Result[1]
          Observed number of frames in raw mode. Range 1 to Param[2]
Result[2]
          Memory offset to start or raw VBI data

Name   CX2341X_ENC_SET_DMA_BLOCK_SIZE
Enum   201/0xC9
Description
          Set DMA transfer block size
Param[0]
          DMA transfer block size in bytes or frames. When unit is bytes,
          supported block sizes are 2^7, 2^8 and 2^9 bytes.
Param[1]
          Unit: 0=bytes, 1=frames

Name   CX2341X_ENC_GET_PREV_DMA_INFO_MB_10
Enum   202/0xCA
Description
          Returns information on the previous DMA transfer in conjunction with
          bit 27 of the interrupt mask. Uses mailbox 10.
Result[0]
          Type of stream
Result[1]
          Address Offset
Result[2]
          Maximum size of transfer

Name   CX2341X_ENC_GET_PREV_DMA_INFO_MB_9
Enum   203/0xCB
Description
          Returns information on the previous DMA transfer in conjunction with
          bit 27 or 18 of the interrupt mask. Uses mailbox 9.

Result[0]
      Status bits:
                  0   read completed
                  1   write completed
                  2   DMA read error
                  3   DMA write error
                  4   Scatter-Gather array error
Result[1]
      DMA type
Result[2]
      Presentation Time Stamp bits 0..31
Result[3]
      Presentation Time Stamp bit 32

Name   CX2341X_ENC_SCHED_DMA_TO_HOST
Enum   204/0xCC
Description
      Setup DMA to host operation
Param[0]
      Memory address of link list
Param[1]
      Length of link list (wtf: what units ???)
Param[2]
      DMA type (0=MPEG)

Name   CX2341X_ENC_INITIALIZE_INPUT
Enum   205/0xCD
Description
      Initializes the video input

Name   CX2341X_ENC_SET_FRAME_DROP_RATE
Enum   208/0xD0
Description
      For each frame captured, skip specified number of frames.
Param[0]
      Number of frames to skip

Name   CX2341X_ENC_PAUSE_ENCODER
Enum   210/0xD2
Description
      During a pause condition, all frames are dropped instead of being
encoded.
Param[0]
      0=Pause encoding
      1=Continue encoding

```
Name     CX2341X_ENC_REFRESH_INPUT
Enum     211/0xD3
Description
        Refreshes the video input
```

```
Name     CX2341X_ENC_SET_COPYRIGHT
Enum     212/0xD4
Description
        Sets stream copyright property
Param[0]
        0=Stream is not copyrighted
        1=Stream is copyrighted
```

```
Name     CX2341X_ENC_SET_EVENT_NOTIFICATION
Enum     213/0xD5
Description
        Setup firmware to notify the host about a particular event. Host must
        unmask the interrupt bit.
Param[0]
        Event (0=refresh encoder input)
Param[1]
        Notification 0=disabled 1=enabled
Param[2]
        Interrupt bit
Param[3]
        Mailbox slot, -1 if no mailbox required.
```

```
Name     CX2341X_ENC_SET_NUM_VSYNC_LINES
Enum     214/0xD6
Description
        Depending on the analog video decoder used, this assigns the number
        of lines for field 1 and 2.
Param[0]
        Field 1 number of lines:
            0x00EF for SAA7114
            0x00F0 for SAA7115
            0x0105 for Micronas
Param[1]
        Field 2 number of lines:
            0x00EF for SAA7114
            0x00F0 for SAA7115
            0x0106 for Micronas
```

```
Name     CX2341X_ENC_SET_PLACEHOLDER
Enum     215/0xD7
Description
        Provides a mechanism of inserting custom user data in the MPEG stream.
Param[0]
```

```
         0=extension & user data
         1=private packet with stream ID 0xBD
Param[1]
         Rate at which to insert data, in units of frames (for private packet)
         or GOPs (for ext. & user data)
Param[2]
         Number of data DWORDs (below) to insert
Param[3]
         Custom data 0
Param[4]
         Custom data 1
Param[5]
         Custom data 2
Param[6]
         Custom data 3
Param[7]
         Custom data 4
Param[8]
         Custom data 5
Param[9]
         Custom data 6
Param[10]
         Custom data 7
Param[11]
         Custom data 8
```

```
Name     CX2341X_ENC_MUTE_VIDEO
Enum     217/0xD9
Description
         Video muting
Param[0]
         Bit usage:
          0       '0'=video not muted
                  '1'=video muted, creates frames with the YUV color defined below
          1:7     Unused
          8:15    V chrominance information
          16:23   U chrominance information
          24:31   Y luminance information
```

```
Name     CX2341X_ENC_MUTE_AUDIO
Enum     218/0xDA
Description
         Audio muting
Param[0]
         0=audio not muted
         1=audio muted (produces silent mpeg audio stream)
```

```
Name     CX2341X_ENC_SET_VERT_CROP_LINE
Enum     219/0xDB
Description
```

        Something to do with 'Vertical Crop Line'
Param[0]
        If saa7114 and raw VBI capture and 60 Hz, then set to 10001.
        Else 0.

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Name   CX2341X_ENC_MISC
Enum   220/0xDC
Description
        Miscellaneous actions. Not known for 100% what it does. It's really a
        sort of ioctl call. The first parameter is a command number, the second
        the value.
Param[0]
        Command number:
         1=set initial SCR value when starting encoding (works).
         2=set quality mode (apparently some test setting).
         3=setup advanced VIM protection handling.
           Always 1 for the cx23416 and 0 for cx23415.
         4=generate DVD compatible PTS timestamps
         5=USB flush mode
         6=something to do with the quantization matrix
         7=set navigation pack insertion for DVD: adds 0xbf (private stream 2)
           packets to the MPEG. The size of these packets is 2048 bytes
(including
         the header of 6 bytes: 0x000001bf + length). The payload is zeroed
and
         it is up to the application to fill them in. These packets are
apparently
         inserted every four frames.
         8=enable scene change detection (seems to be a failure)
         9=set history parameters of the video input module
        10=set input field order of VIM
        11=set quantization matrix
        12=reset audio interface after channel change or input switch (has no
argument).
          Needed for the cx2584x, not needed for the mspx4xx, but it doesn't
seem to
          do any harm calling it regardless.
        13=set audio volume delay
        14=set audio delay

Param[1]
        Command value.