

# USB Audio/Video Codec Model 2253

## Linux Software Manual

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SENSORAY | embedded electronics



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# Operating System Support

The SDK has been developed on Linux Ubuntu LTS and support is provided for this distribution. The SDK may work on other Linux distributions, but this is not guaranteed. The lowest required kernel version is 2.6.25. An effort has been made to support version 2.6.18, although some features may be limited.

# Installation

The software may be distributed on a CD or downloaded from Sensoray's web site. If the file is downloaded, it will need to be unzipped into a folder on the local drive prior to connecting the 2253 to the USB port.

Setup is performed as follows.

- 1) Unpack the tgz file:

```
tar xjf sdk_2253_X.Y.Z_linux.tar.bz2,  
where X.Y.Z is the version of the SDK.
```

- 2) Change the current directory to the one where the unpacked SDK is:

```
cd sdk_2253_X.Y.Z_linux
```

- 3) Build the driver and demo application:

```
make all
```

- 4) Install the modules and firmware:

```
sudo make install
```

- 5) Plug the 2253 into an available USB port. The module will be loaded automatically and the device should be ready to use.

- 6) Optional: If the 2253 was previously plugged in, unplug it and return to step 5, or load the module manually with:

```
modprobe s2253
```

Note: These steps only need to be performed once. After reboot, the module should always be loaded automatically when the 2253 is present. If the kernel version on your system changes, steps 3 and 4 may need to be performed again to reinstall the modules.

# Basic Operation

When the driver is loaded, there are three video device nodes and one GPIO char device created in the /dev directory. The video nodes are named "videoX" where X depends on the number of video devices present in the system. The first two video device nodes are for video capture/preview and the third video device node is for video output.

## ***Video Capture and Output Driver***

The driver supports Video4Linux 2 (V4L2) ioctls. The V4L2 API is well documented at the LinuxTV web site (<http://www.linuxtv.org/downloads/v4l-dvb-apis/>). V4L2 operation is not supported for kernels below 2.6.25. The v4l-dvb hg or git tree is not required (and not recommended) to use this driver.

The three video devices can be used with applications that support V4L2 API. Video can be captured using uncompressed YUV422 (packed YUYV or UYVY) or YUV420SP (NV12 semi-planar, Y plane and interleaved CrCb plane) or encoded in compressed formats JPEG, MPEG4 ASP or H.264 elementary streams. The MPEG4 or H.264 streams can also be muxed with AAC audio (with A/V sync) in a MP4 container or a MPEG transport stream. Both capture devices record video from a single source, and each capture device can be started, stopped, and configured independently. Some video options cannot be configured independently, such as interpolation, brightness, hue, contrast, and saturation.

One example of operation is capturing compressed video to a storage device while simultaneously previewing the uncompressed video on the display. Another example is capturing high-bandwidth compressed video to a storage device while simultaneously streaming low-bandwidth compressed video over a network interface.

The video output device can play compressed streams containing MPEG4 or H.264 elementary streams. MP4 muxed fragmented streams or MPEG transport streams are also supported with A/V sync. MJPEG decoding is not supported at this time.

There are internal limitations in the device that may prevent use of both input streams and the output stream simultaneously. It is recommended to limit use to both input streams simultaneously, or a single input stream and single output stream simultaneously. The limitation may appear as stuttering video and audio during playback.

## ***Troubleshooting***

If the driver fails to load, or if after loading the driver, there are no video device nodes created, this may indicate a kernel compatibility problem in the driver. Please send the output from “uname -r” and “dmesg” with the name and version number of the Linux distribution to support@sensoray.com. If you have a custom built kernel, please also provide the kernel configuration file.

The driver file is a kernel module that resides in  
`/lib/modules/`uname -r`/extra/s2253.ko`.

If this file is missing, which can happen if your Linux kernel is updated, please reinstall the driver, starting at Step 4 in the setup instructions. If you have the “lsusb” program installed, you can see if the device firmware was loaded. When Model 2253 is plugged in, it initially has the USB device id 1943:a253 and the red LED (D1) on the 2253TA board is not lit. The driver loads the firmware file on the 2253 from `/lib/firmware/s2253.fw`. If this file is missing, please reinstall the driver, Step 4 in the setup instructions. When the 2253 firmware is loaded, the USB device id should change to 1943:2253 and the red LED on 2253TA board should be lit.

If the LED fails to light and the lsusb device id 1942:a253 indicates the firmware hasn't loaded, change to the driver directory “cd driver” and do “sudo make unload” and “sudo make load”. This will reload the driver with some debug messages enabled, and “dmesg” should provide some extra detail about the problem.

The red LED on the 2253TA board will also indicate the status of the composite video input signal. The LED will blink when the signal is absent or doesn't match the requested video standard parameter. The LED blinking feature can be controlled by using a v4l2 control (see API.)

## **Demo Program**

Make sure video source is connected and turned on.

1. Make demo with command “make demo”
2. “./capture” runs the demo application.
3. Type “./capture -h” for help menu.
4. For example, type “./capture -4 -b 2000000 -o output.m4v” to save a MPEG4 video at 2 Mbps in the file output.m4v.

Mplayer could be used to display live video captured by the 2253. Below are some example Mplayer commands to display various formats:

```
mplayer tv:// -tv outfmt=yuy2:width=320:height=240:norm=NTSC:device=/dev/video1
mplayer tv:// -tv outfmt=uyvy:width=320:height=240:norm=NTSC:device=/dev/video1
mplayer tv:// -tv outfmt=mjpg:width=320:height=240:norm=NTSC:device=/dev/video1
MPEG4: mplayer tv:// -tv outfmt=0x5634504d:width=640:height=480:norm=NTSC
H264: mplayer tv:// -tv outfmt=0x34363248:width=640:height=480:norm=NTSC
```

The options for changing the format use the outfmt setting. The width and height settings control the image size. The norm setting can take NTSC or PAL. The device setting can select which capture device to play from, allowing you to use two mplayer commands to display both streams simultaneously.

## **Notes on the MP4 format**

The MP4 container format produced by the 2253 features audio and video sync muxed in a single stream. The device itself creates a “fragmented” MP4 stream, which makes it possible to stream incrementally over USB or network. A fragmented file is always valid, in case of power loss or interruption. Unfortunately the fragmented format has limited application support and may only play with Quicktime, MPlayer and FFmpeg. To ensure the recorded MP4 files are playable in most players, the capture demo transparently transcodes the fragmented stream in memory to a normal MP4 file.

To capture in normal MP4 format, use the -m option and the -4 or -x option with the capture demo. The output must be to a file.

To capture in fragmented MP4 format, use the -z option and the -4 or -x option. Note that this file may not play in some players.

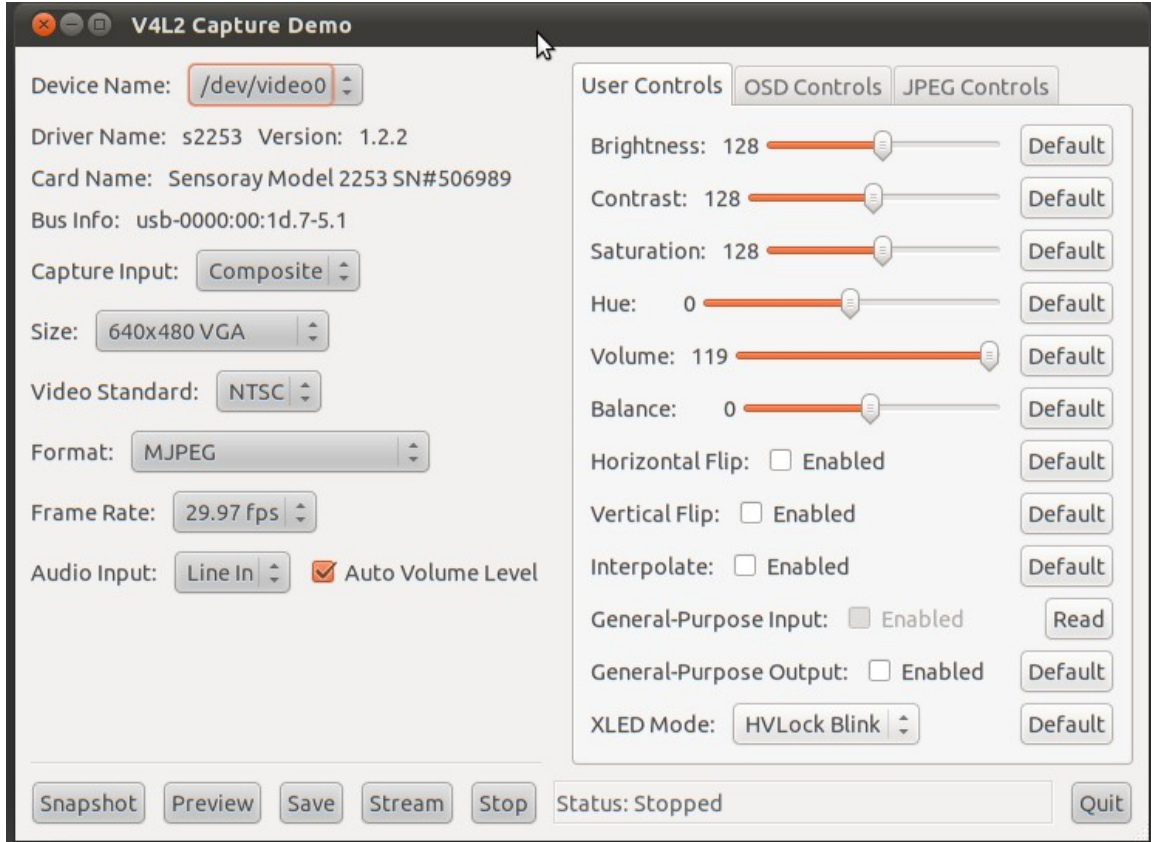
To play a MP4 file with the video output device, it must be in the fragmented format. For example, “cat output.mp4f > /dev/video2” will play the file on the device.

To play a MP4 file that is non-fragmented, use the playback demo program, which can convert the file on-the-fly to the fragmented format and play it on the device.



## GUI Demo Program

Make sure video source is connected and turned on. Execute the application “demo.py” in the driver directory. The application window will look similar to the following image:



Use the Device Name selector to choose from which device to capture. The buttons on the lower left can be used to take a single JPEG snapshot in the current directory, launch a preview window using the mplayer application (if installed,) or capture stream data to a file, or network stream over UDP. The left side controls are used only when starting the stream, and the right side tabbed controls can be adjusted while streaming. The mplayer preview or file capture will continue to run while another Device Name is selected, allowing multiple streams to be captured or previewed simultaneously.

## **Playing Recorded Files**

Examples here are for VideoLAN Player (VLC) MPlayer/MEncoder and FFmpeg.

VLC web site: <http://www.videolan.org/vlc/>

MPlayer web site: <http://www.mplayerhq.hu/>

FFmpeg web site: <http://www.ffmpeg.org/>

When fps is required, use 29.97 fps for NTSC, and 25 fps for PAL. Also, substitute the actual image size used to capture, instead of of 640x480.

### **VLC examples:**

MJPEG: vlc output.mjpg --mjpeg-fps 29.97

MPEG4: vlc output.m4v

h264: vlc output.h264

MP4: vlc output.mp4

### **MPlayer examples:**

MJPEG: mplayer output.mjpg -fps 29.97

UYVY: mplayer -rawvideo format=uyvy:w=640:h=480 -demuxer rawvideo output.uyvy  
-fps 29.97

YUYV: mplayer -rawvideo format=yuy2:w=640:h=480 -demuxer rawvideo output.yuy2  
-fps 29.97

NV12: mplayer -rawvideo format=nv12:w=640:h=480 -demuxer rawvideo output.nv12  
-fps 29.97

grey: mplayer -rawvideo format=y800:w=640:h=480 -demuxer rawvideo output.grey  
-fps 29.97

MPEG4: mplayer output.m4v

h264: mplayer output.h264 -fps 29.97

MP4: mplayer output.mp4

### **FFmpeg conversion to AVI format:**

MJPEG: ffmpeg -f mjpeg -r 29.97 -i output.mjpg -vcodec copy output\_mjpg.avi

UYVY: ffmpeg -f rawvideo -pix\_fmt uyvy422 -s 640x480 -r 29.97 -i output.uyvy  
-vcodec copy output\_uyvy.avi

YUYV: ffmpeg -f rawvideo -pix\_fmt yuyv422 -s 640x480 -r 29.97 -i output.yuyv  
-vcodec copy output\_yuyv.avi

NV12: ffmpeg -f rawvideo -pix\_fmt nv12 -s 640x480 -r 29.97 -i output.nv12  
-vcodec copy output\_nv12.avi

grey: ffmpeg -f rawvideo -pix\_fmt gray -s 640x480 -r 29.97 -i output.grey  
-vcodec copy output\_grey.avi

MPEG4: ffmpeg -f m4v -r 29.97 -i output.m4v -vcodec copy output\_mpeg4.avi

h264: ffmpeg -f h264 -r 29.97 -i output.h264 -vcodec copy output\_h264.avi

### **The raw files can also be converted to AVI format using mencoder.**

MJPEG: mencoder output.mjpg -fps 29.97 -ovc copy -o output\_mjpg.avi

UYVY: mencoder -rawvideo format=uyvy:w=640:h=480 -demuxer rawvideo output.uyvy  
-fps 29.97 -ovc copy -o output\_uyvy.avi

YUYV: mencoder -rawvideo format=yuy2:w=640:h=480 -demuxer rawvideo output.yuyv  
-fps 29.97 -ovc copy -o output\_yuyv.avi

NV12: mencoder -rawvideo format=nv12:w=640:h=480 -demuxer rawvideo output.nv12  
-fps 29.97 -ovc copy -o output\_nv12.avi

grey: mencoder -rawvideo format=y800:w=640:h=480 -demuxer rawvideo output.grey  
-fps 29.97 -ovc copy -o output\_grey.avi

MPEG4: mencoder output.m4v -ovc copy -o output\_mpeg4.avi

h264: mencoder output.h264 -fps 29.97 -ovc copy -o output\_h264.avi

## ***Using ALSA for audio capture and playback***

The driver provides an ALSA card interface for raw PCM, g.711 u-law and A-law audio capture. The ALSA device operates independently of the video capture device.

To find out the ALSA name of the 2253 board, use the program “arecord -l”:

```
**** List of CAPTURE Hardware Devices ****
card 1: s2253 [Sensoray 2253], device 0: s2253 [Sensoray 2253]
  Subdevices: 1/1
    Subdevice #0: subdevice #0
```

Here we see card 1 device 0 is the 2253, so it can be referred to as “hw:1,0”.

To record audio, use the arecord program and specify the device, format, sample rate, and number of channels. For example:

```
PCM 16-bit stereo: arecord -D hw:1,0 -f S16_LE -r 48000 -c 2 output.pcm
g.711 A-law mono:   arecord -D hw:1,0 -f A_LAW -r 8000 -c 1 output.g711
g.711 mu-law mono: arecord -D hw:1,0 -f MU_LAW -r 8000 -c 1 output.g711
```

Use <ctrl>C to end recording, or add the -d option to limit the duration. For more detailed options, see the man page: “man arecord”.

To play back recorded audio on the host, use the aplay program and specify the same settings used to record. For example:

```
PCM 16-bit stereo: aplay -f S16_LE -r 48000 -c 2 output.pcm
g.711 A-law mono:   aplay -f A_LAW -r 8000 -c 1 output.g711
g.711 mu-law mono: aplay -f MU_LAW -r 8000 -c 1 output.g711
```

To adjust the volume and audio input, use the alsamixer command. For example, if the 2253 ALSA card number is 1, use the -c option “alsamixer -c 1”. Use the tab key to select [All] interface, and arrow keys to select the setting to change. There are two volume controls, for Playback and Capture. The Input AGC setting is Automatic Gain Control for left and right channels - it is important to note that the volume controls have no effect when AGC is enabled. The Input Source setting allows you to select either the Mic or Line In input source. Press ESC to exit alsamixer.

In addition to the command-line utilities, any ALSA-compliant application should be able to record and change the settings of the 2253 device.

The volume and input source settings are per-board settings and will also affect the AAC audio of any MP4 or MPEG-TS streams being captured.

## ***Using the Video Output Device***

The easiest way to play a file on the video output device is to pipe a recorded file to it using the “write” method:

```
cat output.m4v > /dev/video2
```

The driver will attempt to detect the file format and set the decoder format automatically. The video output device can only play back MPEG-4 and H.264 elementary streams, MP4 fragmented streams, and MPEG-TS.

The “playback” demo program includes an example on how to convert a non-fragmented MP4 stream to a fragmented stream playable on the device. The device will determine the dimensions of the compressed stream, and there is no need to provide width and height parameters.

The “playback” demo may also be used to play uncompressed streams, but require the format and dimensions be provided as parameters.

The video standard must be set manually for playback. Failure to do so may result in a distorted image or incorrect frame rate. If the stream dimensions are smaller than the display size (720x480 NTSC or 720x576 PAL) the image will be centered in the display with a black border.

To play back the entire clip, the driver will block during the close syscall until the all buffered video data has been decoded. To stop playback immediately and discard buffered video data, use the VIDIOC\_STREAMOFF ioctl or VIDIOC\_DECODER\_CMD V4L2\_DEC\_CMD\_STOP.

## ***Using Loopback on Video Output Device***

Use this command to test loopback of mp4 fragmented stream on video output:

```
./capture -z -s 704x480 -g 1 -f 0 -o - | ./playback -
```

The capture demo flushes the output file descriptor after each frame and the playback demo uses non-buffered io to keep latency at a minimum while copying the stream over the host. This ensures that the complete packet of an encoded frame is not delayed at any point, so that it can be decoded as soon as possible. Similar measures should be taken by a streaming application developer.

Using cat (for example: cat /dev/video0 > /dev/video2) to capture from the device will introduce unnecessary 4k buffering of the stream. This buffering will transfer partial frames, causing the decoder to wait until the complete frame arrives, increasing the latency.

The playback demo uses a low-latency mode feature when playing from a non-file source, allowing the device to automatically reduce latency when the device determines that it has enough information to smoothly drop audio and video frames. See also the ioctl control S2253\_CID\_LOW\_LATENCY in the API reference.

## ***Using the Video Overlay***

The device can render graphic images overlaid the video output display. The hardware overlay features 16-bits per-pixel color information and 3-bits per-pixel transparency information. The device supports overlay images in the PNG format and 24 or 32-bit BMP format. The device can draw multiple lines of text and also supports line-drawing functions.

The device can render monochrome graphic images overlaid the video capture or preview streams. Up to 8 graphic regions may be used at the same time. Large regions should be avoided, as significant processing may caused video frames to be dropped. The graphic is applied only to the luminance channel of the image, and chrominance channel may tint the overlay graphic. PNG or BMP images will be converted to monochrome.

The SDK overlay directory contains an overlay program to load overlay images and a shell script `overlay-demo.sh` to load the sample images provided. The shell script `overlay-lines.sh` will draw lines on the display. The shell script `overlay-text.sh` will draw text on the display. The shell script `overlay-font.sh` will use a font on the system to draw antialiased text with outline/shadow and shaded background. The sample code `overlay.c` shows how to format the drawing commands for the device.

See also `S2253_VIDI0C_OVERLAY` ioctl below describing data formats for line drawing and text.

## ***GPIO Device***

The GPIO device is exposed as a Linux sysfs GPIO class. The directories containing the device are under `/sys/class/gpio/`. Each board appears as a `gpiochipNNN` subdirectory, containing a label file describing the board and serial no: "S2253 SN123456", and the base and `ngpio` files describing the GPIO range used by the board. The base describes the first `gpioNNN` subdirectory and the `ngpio` should be 2. The `gpioNNN` subdirectory contains a direction file (indicating "in" or "out") and the value file. An "in" GPIO can be monitored by reading the value file, and an "out" GPIO can be modified by writing a "1" or "0" to the value file.

A simpler method is also provided as a v4l2 control for the GPI and another for GPO. See the API reference for `S2253_CID_GPI` and `S2253_CID_GPO`.

## ***Low-Latency Preview***

To activate lowest-latency preview, the stream format must be UYVY, width 704, height 480 for NTSC or 576 for PAL, interpolate mode disabled, image flip disabled, and AAC encoder must not be in use. The low-latency mode is used automatically when those criteria are met; there is no single switch that selects low-latency mode. This mode bypasses the resizer and transfers video data over USB as soon as it becomes available from the video port.

Low-latency preview mode cannot be used simultaneously with AAC encode/decode (when using MP4 or MPEG-TS mux, for example.) The low-latency preview will be switched automatically to normal-latency preview when AAC is started, and revert back when AAC is stopped. If low-latency preview is required and AAC audio is not needed for mux, use V4L2\_MPEG\_AUDIO\_ENCODING\_NONE option with the V4L2\_CID\_MPEG\_AUDIO\_ENCODING control.

### ***Known Limitations***

Due to device resources, only two streams should be used at a time: two capture, or one capture and one output. This table lists valid combination pairs:

<b>Capture 1</b>	<b>Capture 2</b>	<b>Output</b>
Ok	Ok	
Ok		Ok
	Ok	Ok

MPEG-4 capture/output cannot be used simultaneously with H.264 capture. This table lists valid combination pairs:

<b>Capture H.264</b>	<b>Capture MPEG-4</b>	<b>Output H.264</b>	<b>Output MPEG-4</b>
Ok		Ok	
	Ok		Ok
	Ok	Ok	

Raw preview mode can consume a large amount of USB bandwidth. If multiple devices are connected on the same USB root hub, previewing on each may cause unwanted effects (jerky or stuttering video on capture or output.)

To reduce these effects:

- move each device to a different USB root hub
- reduce the width and height of the preview video
- reduce the frame rate

Due to the same USB bandwidth limitations, D1 UYVY preview and D1 UYVY output cannot be performed simultaneously at full frame rate.

## • SDK Reference

### **General Notes**

Model 2253 device is accessed via `/dev/videoX` where X is the number assigned to the device when it was plugged in. Three `/dev/videoX` nodes will be created for each 2253 device. The first two video device nodes are for video capture and the third is a video output. Which device the node references can be determined by using the `VIDIOC_QUERYCAP` ioctl to examine the card field for the serial no. The devices support multiple open, allowing some parameters to be changed on-the-fly while another program is accessing the device.

### **Driver ioctl Reference**

This reference is provided as a convenience to detail the 2253-specific capabilities, without requiring the user to query the driver using the V4L2 API or reading the driver source code. For a complete Video4Linux2 API reference, please consult the LinuxTV.org web site.

(<http://www.linuxtv.org/downloads/v4l-dvb-apis/>)

All calls to `ioctl` function follow the same general approach.

The first parameter (`fd`) is a file descriptor returned by `open()`, which specifies the addressed device.

The second parameter (`request`) is the request code, which specifies the type of request.

The third parameter is a pointer to context-specific data.

All calls return 0 in case of success, or a negative value in case of an error.

The `ioctls` below are listed by the request parameter.

Driver-specific structures and request codes are defined in `driver/s2253ioctl.h`.

---

## **VIDIOC\_G\_FMT, VIDIOC\_S\_FMT, VIDIOC\_TRY\_FMT**

```
int ioctl(int fd, int request, struct v4l2_format *fmt);
```

```
fmt->pix.width
```

Integer range between 128 to 720 in steps of 16.

```
fmt->pix.height
```

Integer range 96 to 480 (NTSC) or 576 (PAL) in steps of 16.

Note: for output, width and height are ignored for compressed formats (JPEG/MP2V/MP4V/H264/MP42) since dimensions are encoded in the stream.

```
fmt->pix.pixelformat
```

Supported FOURCC codes:

V4L2\_PIX\_FMT\_MJPEG – compressed motion JPEG

V4L2\_PIX\_FMT\_JPEG – same as V4L2\_PIX\_FMT\_MJPEG

V4L2\_PIX\_FMT\_MP4V – MPEG-4 video elementary stream

V4L2\_PIX\_FMT\_H264 – H.264 video elementary stream

V4L2\_PIX\_FMT\_MP42 – MP4 fragmented stream

V4L2\_PIX\_FMT\_MPEG – MPEG transport stream

V4L2\_PIX\_FMT\_UYVY – raw YUV 422 interleaved chroma first

V4L2\_PIX\_FMT\_YUYV – raw YUV 422 interleaved luminance first

V4L2\_PIX\_FMT\_NV12 – raw YUV 420 in semi-planar format

V4L2\_PIX\_FMT\_GREY – raw Y 8-bit samples only

Note: Codes not defined in videodev2.h are in s2253ioctl.h.

```
fmt->pix.field
```

Supported modes:

The V4L2\_FIELD\_NONE option is used to select a single field and interpolates it to produce the missing lines. This method removes the jagged edges cause by motion between fields, producing a smooth progressive frame. This is a shared option affecting both video output streams on the 2253.

The V4L2\_FIELD\_INTERLACE option provides both interlaced fields in the captured frame. Blurriness or combing artifacts may appear when the capture height does not match the native height for the video standard. This is a shared option affecting both video output streams on the 2253. The V4L2\_FIELD\_ANY option does not change the current mode, leaving it unchanged on the device.

The field mode can also be controlled by the S2253\_CID\_INTERPOLATE extended control, see below.



---

### **VIDIOC\_G\_JPEGCOMP, VIDIOC\_S\_JPEGCOMP**

```
int ioctl(int fd, int request, v4l2_jpegcompression *jc);
```

jc->quality

Integer range 10 to 90. The default is 75.

V4L2\_PIX\_FMT\_MJPEG must be selected.

---

### **VIDIOC\_ENUM\_INPUT, VIDIOC\_G\_INPUT, VIDIOC\_S\_INPUT**

```
int ioctl(int fd, int request, struct v4l2_input *inp);
```

There is only one input at index 0, named "Composite".

The inp->status field may have the bit V4L2\_IN\_ST\_NO\_H\_LOCK set if the device was unable to lock the input video signal.

---

### **VIDIOC\_ENUM\_OUTPUT, VIDIOC\_G\_OUTPUT, VIDIOC\_S\_OUTPUT**

```
int ioctl(int fd, int request, struct v4l2_output *inp);
```

There is only one output at index 0, named "Composite".

---

### **VIDIOC\_QUERYCTRL, VIDIOC\_G\_CTRL, VIDIOC\_S\_CTRL, VIDIOC\_TRY\_EXT\_CTRL, VIDIOC\_G\_EXT\_CTRL, VIDIOC\_S\_EXT\_CTRL**

```
int ioctl(int fd, int request, struct v4l2_ext_controls *ctrls);
```

When using VIDIOC\_G\_CTRL or VIDIOC\_S\_CTRL,  
or ctrl->ctrl\_class == V4L2\_CTRL\_CLASS\_USER,  
the supported ctrl->controls id identifiers and values are:

V4L2\_CID\_BRIGHTNESS: 0 to 255, default 128. Capture only.

V4L2\_CID\_CONTRAST: 0 to 255, default 128. Capture only.

V4L2\_CID\_SATURATION: 0 to 255, default 128. Capture only.

V4L2\_CID\_HUE: -128 to 128, default 0. Capture only.

V4L2\_CID\_AUDIO\_VOLUME: 0 to 119 for capture, 0 to 117 for output.

V4L2\_CID\_AUDIO\_BALANCE: -100 to 100, default 0.

V4L2\_CID\_HFLIP: boolean horizontal flip, default 0. Capture only.

---

V4L2\_CID\_VFLIP: boolean vertical flip, default 0. Capture only.

S2253\_CID\_DFLIP:

Boolean diagonal flip, default 0. Capture only. Not available for YUYV, UYVY or JPEG formats.

To rotate the video image, use the following flip combinations:

90 degrees: HFLIP=1 VFLIP=0 DFLIP=1

180 degrees: HFLIP=1 VFLIP=1 DFLIP=0

270 degrees: HFLIP=0 VFLIP=1 DFLIP=1

S2253\_CID\_INTERPOLATE:

Boolean, duplicates the functionality of the pix.field option in the format struct, provided as a convenience to the GUI demo. Capture only.

S2253\_CID\_OUTPUT\_MODE:

Integer range 0 to 3, with the following meanings:

0: Idle - display black screen on output.

1: Video Capture - display the input video on output.

2: Color Bars - display a set of color bars.

3: Flash - display a single white frame and play a sound blip. Useful for measuring audio-video sync.

Output device only.

S2253\_CID\_LOW\_LATENCY:

Boolean, determines whether low-latency playback mode is on or off.

0: Off - use when playing from a file or recorded stream.

1: On - use when playing a live stream. The playback device will attempt to drop audio and video frames to reduce playback latency based on the amount of stream data available. Frames are dropped gradually to avoid noticeable glitches in the audio or video - however it may take tens of seconds to settle at lowest possible latency.

Output device only.

S2253\_CID\_GPI:

Boolean, read-only control whose value indicates the state of the general-purpose input.

S2253\_CID\_GPO:

Boolean, determines state of the general-purpose output.

S2253\_CID\_XLED\_MODE:

Integer range 0 to 3, with the following meanings:

0: HVLock Blink - XLED will blink when video lock is absent.

1: HVLock Solid - XLED will turn off when video lock is absent.

2: On - XLED is always on (power indicator).

3: Off - XLED is always off.

S2253\_CID\_OSD\_ENABLE:

Integer, determines whether the on-screen-display text is visible, or which font is used.

- 0: disabled (default)
- 1: enabled, with 8x14 font
- 2: enabled, with 16x16 font

S2253\_CID\_OSD\_TRANSPARENT:

Integer, determines how transparent the on-screen-display text background is.

- 0: 0% (black background)
- 1: 100% (clear background) (default)
- 2: 50%
- 3: 25%

S2253\_CID\_OSD\_POSITION:

Bottom: 0, Top: 1, Default 1.

S2253\_CID\_OSD\_DATEFORMAT:

- 0: MM-DD-YYYY (default)
- 1: DD-MM-YYYY
- 2: MM-DD-YY
- 3: DD-MM-YY
- 4: MMM-DD-YYYY
- 5: DD-MMM-YYYY
- 6: MMM-DD-YY
- 7: DD-MMM-YY
- 8: MMM DD, YYYY
- 9: DDMMMYYYY
- 10: MMM DD, YY
- 11: DDMMMYY

S2253\_CID\_OSD\_TIMEFORMAT:

HH:MM:SS: 0, HH:MM:SS.0: 1, HH:MM:SS.00: 2, Default 0.

S2253\_CID\_OSD\_TIMEZONE:

Menu containing hour offsets from UTC. Default UTC + 0.

Note: this is only used to set the time on the device relative to the UTC time stored in the host kernel.

S2253\_CID\_OSD\_MESSAGE:

String. May contain “^d” and “^t” to insert date and time, respectively.

S2253\_CID\_OSD\_XOFF:

Integer range 0 to image format width, default 10.

S2253\_CID\_OSD\_YOFF:

Integer range 0 to image format height, default 10.

When `ctrls->ctrl_class == V4L2_CTRL_CLASS_MPEG`, supported `ctrls->controls` id identifiers and values:

V4L2\_CID\_MPEG\_STREAM\_VBI\_FMT:

Use enum `V4L2_MPEG_STREAM_VBI_FMT_NONE` or `V4L2_MPEG_STREAM_VBI_FMT_IVTV`. Use to insert closed captions from

VBI line 21 into h.264 stream, elementary or MPEG-TS. Capture only.  
When enabled, user data insertion will be overridden.

**V4L2\_CID\_MPEG\_AUDIO\_ENCODING:**  
Use enum `V4L2_MPEG_AUDIO_ENCODING_AAC` or  
`V4L2_MPEG_AUDIO_ENCODING_NONE`. Only with MP4 or MPEG-TS. Capture  
only.

**V4L2\_CID\_MPEG\_AUDIO\_MODE:**  
Use enum `V4L2_MPEG_AUDIO_MODE_STEREO` or  
`V4L2_MPEG_AUDIO_MODE_MONO`. Only with MP4 or MPEG-TS. Capture only.

**V4L2\_CID\_MPEG\_AUDIO\_AAC\_BITRATE:**  
32,000 to 512,000 bps in steps of 16,000 bps, default 192,000 bps.  
Only with MP4 or MPEG-TS. Capture only.

**V4L2\_CID\_MPEG\_VIDEO\_ENCODING:**  
Use enum `V4L2_MPEG_VIDEO_ENCODING_MPEG_4_AVC` (h.264) or  
`V4L2_MPEG_VIDEO_ENCODING_MPEG_4` (MPEG-4)  
Only with MP4 or MPEG-TS. Capture only.

**V4L2\_CID\_MPEG\_VIDEO\_ASPECT:**  
Integer range 0 to 3 to select aspect ratio of video input signal. Capture  
only.  
0: 1x1  
1: 4x3  
2: 16x9  
3: 2.21x1  
Note: option 0 is Pixel Aspect Ratio, others are Display Aspect Ratio.

**V4L2\_CID\_MPEG\_VIDEO\_GOP\_SIZE:**  
Integer range 0 to 30. The default setting of 0 means to use the  
codec-default GOP size. Capture only.

**V4L2\_CID\_MPEG\_VIDEO\_BITRATE:**  
100,000 to 10,000,000 bps in steps of 100,000 bps, default 2,000,000  
bps. Capture only.

**V4L2\_CID\_MPEG\_VIDEO\_H264\_I\_PERIOD:**  
Integer range 0 to 100. Only for H.264 encoding. Default setting of 0 will  
encode first frame as IDR only, otherwise encode IDR at first frame of  
every Nth GOP.

---

## **VIDIOC\_ENUMAUDIO, VIDIOC\_G\_AUDIO, VIDIOC\_S\_AUDIO**

```
int ioctl(int fd, int request, struct v4l2_audio *audio);
```

There are two audio inputs:

Index 0: "Mic" (mono)

Index 1: "Line In" (stereo)

Both inputs support audio->mode `V4L2_AUDMODE_AVL` (automatic volume level, also known as AGC, automatic gain control.) The audio input selection and AGC is per-board: both streams record from the same input regardless of

which stream selects it.

---

### **VIDIOC\_ENUMAUDOUT, VIDIOC\_G\_AUDOUT, VIDIOC\_S\_AUDOUT**

```
int ioctl(int fd, int request, struct v4l2_audioout *audio);
```

There is one audio output:

Index 0: "Line out" (stereo)

No properties can be changed.

---

### **VIDIOC\_ENCODER\_CMD**

```
int ioctl(int fd, int request, struct v4l2_encoder_cmd *cmd);
```

Pause or resume capture.

cmd->cmd: V4L2\_ENC\_CMD\_PAUSE or V4L2\_ENC\_CMD\_RESUME

cmd->flags: must be 0

Requires Linux kernel 2.6.29 or later.

---

### **VIDIOC\_DECODER\_CMD**

```
int ioctl(int fd, int request, struct v4l2_decoder_cmd *cmd);
```

Pause or resume playback.

cmd->cmd: V4L2\_DEC\_CMD\_PAUSE or V4L2\_DEC\_CMD\_RESUME

cmd->flags: must be 0

Stop the stream immediately. (Same effect as VIDIOC\_STREAMOFF.)

cmd->cmd: V4L2\_DEC\_CMD\_STOP

cmd->flags: V4L2\_DEC\_CMD\_STOP\_IMMEDIATELY

Requires Linux kernel 3.3 or later.

---

### **S2253\_VIDIOC\_OSD**

```
int ioctl(int fd, int request, struct s2253_osd *osd);
```

osd

Pointer to OSD struct

```
struct s2253_osd {
```

```

int    osdOn,           //OSD on if != 0
int    osdChan,        //OSD channel (filled in by driver)
int    osdBmp,         //OSD on bitmap if !=0
int    transparent,    //text background transparent if !=0
int    positionTop,    //OSD string on top of the screen if !=0
int    ddmm,           //date format is dd-mm if != 0
int    year2,          //date is truncated to 2 digits if !=0
int    fraction,       //digits showing fraction of a second: 0, 1, 2
char   line[80],       //caption text
int    xoff, yoff      //x and y offsets from top/bottom left corner
};

```

---

### **S2253\_VIDIOC\_CLOCK**

```
int ioctl(int fd, int request, struct s2253_clock *clk);
```

clk

Pointer to

```

struct s2253_clock {
    __u64  sec,         //Seconds
    __u32  usec        //Microseconds
}

```

This structure is similar to the struct `timeval` used with the `gettimeofday()` function. If this struct is initialized using `gettimeofday()`, it should also be adjusted to local time. The clock on the device does not make adjustments for timezones or daylight-saving.

---

### **S2253\_VIDIOC\_OVERLAY**

```
int ioctl(int fd, int request, struct s2253_overlay_image *ovl);
```

```

struct s2253_overlay_image {
    unsigned char id; // unique id representing this overlay
    unsigned char transparent; // 0=transparent .. 7=opaque
                                // 8=use PNG or BMP transparency info
    unsigned char update; // bit 0: update the display,
                            // bit 1: update the x&y offset,
                            // bit 2: update the transparency
                            // (see defines below)
    unsigned char reserved;
    __u32 xOffset; // x offset from left side
    __u32 yOffset; // y offset from top
    __u32 length; // length of image data (or 0 to use existing
                  // data, and update transparent,
                  // xOffset and yOffset only)
}

```

---

```

    unsigned char data[0]; // data must contain headers that
                          // describe image dimensions
};

```

```

#define OVERLAY_UPDATE_DISPLAY 1
#define OVERLAY_UPDATE_POSITION 2
#define OVERLAY_UPDATE_TRANSPARENT 4

```

Upload an image to be overlaid on the video output frames. The device remembers the id where each image was placed, allowing it to be moved later. To move an existing overlay image, set the id, set length to zero, set update to OVERLAY\_UPDATE\_POSITION, and set the x and y offsets to the new position. Due to hardware limitations, the x offset may be limited to a multiple of 2 (output display only.) The transparent setting allows the overlay to have a transparency effect, allowing the underlying video to be mixed with the image. When transparent is 8, the alpha channel in a 32-bit PNG or BMP will be used. To hide an existing image, update the id with transparent set to zero and update set to OVERLAY\_UPDATE\_TRANSPARENT. When update bit 0 is not set, the images are rendered to a working buffer, and don't become visible until an operation is called with update bit 0 set to OVERLAY\_UPDATE\_DISPLAY (recommended for batch updates.)

Image overlays are destructive; moving or overlapping images will cause the previous image to be overwritten by the rectangular region of the updated image, regardless of the transparency setting.

Lines may be drawn using overlay image data in the following format:

```

4 bytes: "line"
1 or more struct s2253_line {
    int x1;
    int y1;
    int x2;
    int y2;
    int width;
    int argb;
};

```

(struct s2253\_overlay\_image members id, transparent, xOffset, yOffset are not used for line drawing)

The line width parameter is useful for drawing squares, by drawing a vertical line with a large line width. For example, to clear the whole screen send

```

data:
"line"
x1=0
y1=0
x2=0
y2=575

```

width=720  
argb=0

Text is drawn using overlay image data in the following format:

4 bytes: "text"  
4 bytes: argb color  
remaining bytes: text

NOTE: The "line" and "text" formats are not supported for Stream 1 and 2. Recommend using the the monochrome graphic overlay instead.

Monochrome graphic overlay uses the following format:

4 bytes: "RLE "  
2 bytes: width  
2 bytes: height  
2 bytes: rgb565 color (only used on output display)  
remaining bytes: run-length encoded image data  
bits 7..4: drawing mode  
    0: transparent  
    1..6: background shaded to black  
    7..15: opaque black to white  
bits 3..0: run length in pixels  
    when 0, next byte contains run length + 16

The user application may render text or lines into a RGBA buffer and use the functions in overlay.c to encode the RLE data.

---

## **S2253\_VIDIOC\_SET\_USER\_DATA**

```
int ioctl(int fd, int request, struct s2253_user_data *data);  
struct s2253_user_data {  
    char *data;        /* data to be inserted in the stream */  
    int len;           /* length of the data */  
    int interval;      /* 0=insert once per ioctl,  
                        otherwise every Nth frame */  
};
```

User data is inserted in the MPEG-4 or H.264 stream, once or at a specified frame interval. Up to 1024 bytes may be inserted per frame. User data may NOT contain MPEG start codes, which means there may not be more than 23 consecutive zero bits in the data. This function will not check for start codes. It is recommended, therefore to separate the data; for instance, if you want to store a 32 bit (4 byte) latitude position in the stream, you could put the high order bytes in the first 2 bytes of user data, followed by a "marker byte" of 0xff, and put the other 2 bytes in the next 2 user data bytes. Eg. For a



latitude with hex value 0x70000111, the user data would be data[0] = 0x70, data[1] = 0x00, data[2]=0xff(marker), data[3]=0x01, data[4]=0x11. Similarly, if other user data needs inserted, simply add a marker byte to separate the data into sections.

---

### **S2253P\_VIDIIOC\_S\_ENCODER\_RESET**

```
int ioctl(int fd, int request, struct s2253p_encoder *data);
struct s2253p_encoder {
    __u8 chan_mask; // mask of channels to reset
    __u8 enable_mask; // not used
    __u32 counts[2]; // not used
};
```

Reset the selected encoders to zero.  
Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_ENCODER\_READ**

```
int ioctl(int fd, int request, struct s2253p_encoder *data);
struct s2253p_encoder {
    __u8 chan_mask; // mask of channels to read
    __u8 enable_mask; // not used
    __u32 counts[2]; // not used
};
```

Send the command to start the read of the selected encoders. To get the value, use S2253P\_VIDIIOC\_G\_ENCODER\_READ. When asynchronous mode is enabled for an encoder, this command may be omitted, see S2253P\_VIDIIOC\_S\_ENC\_ASYNCEN.  
Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_ENCODER\_READ**

```
int ioctl(int fd, int request, struct s2253p_encoder *data);
struct s2253p_encoder {
    __u8 chan_mask; // not used
    __u8 enable_mask; // not used
    __u32 counts[2]; // filled by driver
};
```

Read the encoder counters from the device. A send command must first be sent using S2253P\_VIDIIOC\_S\_ENCODER\_READ to read the current value. If asynchronous mode is enabled for an encoder, the current value may be read

---

at any time. If the count is 0xffffffff, the value is not ready yet and should be retried shortly.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_GPS\_DATA**

```
int ioctl(int fd, int request, struct s2253p_data *data);
struct s2253p_data {
    __u8 size;
    __u8 data[255];
};
```

Send a command to the GPS unit. Commands are not documented here.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_GPS\_DATA**

```
int ioctl(int fd, int request, struct s2253p_data *data);
struct s2253p_data {
    __u8 size;
    __u8 data[255];
};
```

Receive a reply from the GPS unit. Replies are not documented here.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_GPS\_READSTATUS**

```
int ioctl(int fd, int request, void *data);
```

Send a read status command to the GPS unit. The reply is read using S2253P\_VIDIIOC\_G\_GPS\_READSTATUS.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_GPS\_READSTATUS**

```
int ioctl(int fd, int request, struct s2253p_gps *data);
struct s2253p_gps {
    union {
        __u8 status; // filled by the driver
        __u8 enable;
        __u8 satellites;
        __u8 lock;
    };
};
```

Get the reply from a S2253P\_VIDIOC\_S\_GPS\_READSTATUS. The status field in the union is filled by the driver, and may be set to 0xff indicating that the status is not ready yet, and should be retried shortly.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_GPIO\_CONFIG**

```
int ioctl(int fd, int request, struct s2253p_gpio *data);
struct s2253p_gpio {
    union {
        __u8 port_mask; // mask of gpios to configure
        __u8 not_ready_mask; // not used
    };
    union {
        __u8 value_mask; // not used
        __u8 dir_mask; // direction mask 0=in 1=out
    };
};
```

Configure the selected gpio direction. Not currently accessible, for future use only. Not associated with the S2253\_CID\_GPI or S2253\_CID\_GPO.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_GPIO\_WRITE**

```
int ioctl(int fd, int request, struct s2253p_gpio *data);
struct s2253p_gpio {
    union {
        __u8 port_mask; // mask of gpios to be written
        __u8 not_ready_mask; // not used
    };
    union {
        __u8 value_mask; // mask of values to be written
        __u8 dir_mask; // not used
    };
};
```

Set the value on selected gpios. Gpio must be configured as an output. Not currently accessible, for future use only. Not associated with the S2253\_CID\_GPI or S2253\_CID\_GPO.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_GPIO\_READ**

```
int ioctl(int fd, int request, struct s2253p_gpio *data);
struct s2253p_gpio {
```

```

union {
    __u8 port_mask; // mask of gpios to be read
    __u8 not_ready_mask; // not used
};
union {
    __u8 value_mask; // not used
    __u8 dir_mask; // not used
};
};

```

Send the command to read the value from selected gpios. Gpio must be configured as an input. Not currently accessible, for future use only. Not associated with the S2253\_CID\_GPI or S2253\_CID\_GPO. Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPIO\_READ**

```

int ioctl(int fd, int request, struct s2253p_gpio *data);
struct s2253p_gpio {
    union {
        __u8 port_mask; // not used
        __u8 not_ready_mask; // mask of values not ready
    };
    union {
        __u8 value_mask; // mask of values read
        __u8 dir_mask; // not used
    };
};

```

Read the value of selected gpios. Gpio must be configured as an input. Bitmask of not\_ready bits indicate that the value isn't available yet, and the read should be retried shortly. Not currently accessible, for future use only. Not associated with the S2253\_CID\_GPI or S2253\_CID\_GPO. Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_ECHO**

```

int ioctl(int fd, int request, struct s2253p_data *data);
struct s2253p_data {
    __u8 size;
    __u8 data[255];
};

```

Send an echo command to the TB board. Internal use only. Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_GPS\_ENABLE**

```
int ioctl(int fd, int request, struct s2253p_gps *data);
struct s2253p_gps {
    union {
        __u8 status;
        __u8 enable; // 0=disabled, 1=enabled
        __u8 satellites;
        __u8 lock;
    };
};
```

Enable or disable the receipt of GPS messages.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_ENABLE**

```
int ioctl(int fd, int request, struct s2253p_gps *data);
struct s2253p_gps {
    union {
        __u8 status;
        __u8 enable; // filled by driver, 0=disabled, 1=enabled
        __u8 satellites;
        __u8 lock;
    };
};
```

Read the current state of the GPS enable flag.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_VERSION\_READ**

```
int ioctl(int fd, int request, void *data);
```

Send the command to load the version to be read by  
S2253P\_VIDIOC\_G\_VERSION\_READ.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_VERSION\_READ**

```
int ioctl(int fd, int request, struct s2253p_version *data);
struct s2253p_version {
    __u32 version; // filled by driver
};
```

Read the version of the TB board firmware. A send command must first be sent using S2253P\_VIDIIOC\_S\_VERSION\_READ to read the current value. If the version is 0xffffffff, the value is not ready yet and should be retried shortly. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_COMSTAT\_READ**

```
int ioctl(int fd, int request, void *data);
```

Send the command to the load communication statistics struct to be read by S2253P\_VIDIIOC\_G\_COMSTAT\_READ. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_COMSTAT\_READ**

```
int ioctl(int fd, int request, struct s2253p_comstat *data);
```

```
struct s2253p_comstat {
    __u16 framing_errors;
    __u16 overrun_errors;
    __u16 buffer_overflow;
    __u16 gps_framing_errors;
    __u16 gps_overrun_errors;
    __u16 gps_buffer_overflow;
};
```

Read the communication statistics. No indication if the values are stale, hence a short delay is recommended between S2253P\_VIDIIOC\_S\_COMSTAT\_READ and S2253P\_VIDIIOC\_G\_COMSTAT\_READ. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_XIO\_ENABLE**

```
int ioctl(int fd, int request, struct s2253p_xio *data);
```

```
struct s2253p_xio {
    union {
        __u8 port_mask; // mask of xios to change
        __u8 not_ready_mask; // not used
    };
    union {
        __u8 value_mask; // not used
        __u8 enable_mask; // mask of enable bits 0=disable 1=enable
    };
};
```

Enable or disable selected xios. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_XIO\_READ**

```
int ioctl(int fd, int request, void *data);
```

Send the command to read the value from all xios, to be read by S2253P\_VIDIIOC\_G\_XIO\_READ.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_XIO\_READ**

```
int ioctl(int fd, int request, struct s2253p_xio *data);
```

```
struct s2253p_xio {
    union {
        __u8 port_mask; // not used
        __u8 not_ready_mask; // filled by driver, not ready bits
    };
    union {
        __u8 value_mask; // filled by driver, bitmask of values
        __u8 enable_mask; // not used
    };
};
```

Read the value of all xios. Bitmask of not\_ready bits indicate that the value isn't available yet, and the read should be retried shortly. The xios are active low.

Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_XIO\_PAUSE**

```
int ioctl(int fd, int request, struct s2253p_xio_pause *data);
```

```
struct s2253p_xio_pause {
    __u8 stream; // 0=capture 1=preview 2=output
    __u8 port; // xio port 3=A0 2=B0 1=A1 0=B1
    __u8 mode;
};
enum s2253p_pause_mode {
    S2253P_PAUSE_MODE_DISABLED = 0,
    S2253P_PAUSE_MODE_RISING_EDGE = 1,
    S2253P_PAUSE_MODE_FALLING_EDGE = 2,
    S2253P_PAUSE_MODE_LEVEL_HIGH = 3,
    S2253P_PAUSE_MODE_LEVEL_LOW = 4,
};
```

Configure the selected stream to be paused by changes in the xio states. The pause can be edge-triggered or level-triggered. The xios are active low. Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_LATITUDE**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```

Read the GPS latitude. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_LONGITUDE**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```

Read the GPS longitude. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_SPEED**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```

Read the GPS speed. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_COURSE**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```

Read the GPS course heading. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_UTC\_TIME**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```



Read the GPS time in UTC. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_UTC\_DATE**

```
int ioctl(int fd, int request, struct s2253p_gps_item *data);
struct s2253p_gps_item {
    char str[16]; // filled by driver
};
```

Read the GPS date in UTC. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_SATELLITES**

```
int ioctl(int fd, int request, struct s2253p_gps *data);
struct s2253p_gps {
    union {
        __u8 status;
        __u8 enable;
        __u8 satellites; // filled by the driver
        __u8 lock;
    };
};
```

Read the number of satellites in view by the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_LOCK**

```
int ioctl(int fd, int request, struct s2253p_gps *data);
struct s2253p_gps {
    union {
        __u8 status;
        __u8 enable;
        __u8 satellites;
        __u8 lock; // filled by the driver, 0=no lock, 1=locked
    };
};
```

Read the satellite lock status of the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_GGA**

```
int ioctl(int fd, int request, struct s2253p_gps_msg *data);
struct s2253p_gps_msg {
    char str[80];
};
```

Read the most recent GGA message from the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_GSA**

```
int ioctl(int fd, int request, struct s2253p_gps_msg *data);
struct s2253p_gps_msg {
    char str[80];
};
```

Read the most recent GSA message from the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_GSV**

```
int ioctl(int fd, int request, struct s2253p_gps_msg *data);
struct s2253p_gps_msg {
    char str[80];
};
```

Read the most recent GSV message from the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_G\_GPS\_RMC**

```
int ioctl(int fd, int request, struct s2253p_gps_msg *data);
struct s2253p_gps_msg {
    char str[80];
};
```

Read the most recent RMC message from the GPS. GPS must be enabled.  
Requires S2253P system.

---

### **S2253P\_VIDIOC\_S\_ENC\_ASYNCEN**

```
int ioctl(int fd, int request, struct s2253p_encoder *data);
struct s2253p_encoder {
    __u8 chan_mask; // mask of channels to change
    __u8 enable_mask; // mask of channels to enable async
```

```
    __u32 counts[2]; // not used
};
```

Enable asynchronous reading of the selected encoders. When asynchronous mode is enabled, the encoder values are updated automatically and can read by a single call to S2253P\_VIDIIOC\_G\_ENCODER, and are updated on the OSD. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_S\_ENCODER\_LOAD**

```
int ioctl(int fd, int request, struct s2253p_encoder *data);
struct s2253p_encoder {
    __u8 chan_mask; // mask of channels to load
    __u8 enable_mask; // not used
    __u32 counts[2]; // encoder values to load
};
```

Load a count value into the selected encoders. Requires S2253P system.

---

### **S2253P\_VIDIIOC\_G\_ONLINE**

```
int ioctl(int fd, int request, struct s2253p_enable *data);
struct s2253p_enable {
    __u8 enable; // filled by driver, 0=offline 1=online
};
```

Read the status of the TB board, indicating whether or not it is online. This will return 0 for the S2253S system, or 1 for the S2253P system.

---

### **S2253P\_VIDIIOC\_S\_SUSPEND**

```
int ioctl(int fd, int request, struct s2253p_enable *data);
struct s2253p_enable {
    __u8 enable; // suspend mode 0=disable 1=enable
};
```

Set the suspend mode the TB board, when the 2253 device is in USB suspend. When enabled, the TB board will be held in reset during suspend, resulting in encoder count values being lost, asynchronous modes disabled, and GPS disabled. The default mode is disabled. Requires S2253P system.

---

# Revision history

Version	Notes
1.0.0, June 2010	Initial release.
1.0.1, July 2010	Mplayer examples added.
1.0.2, July 2010	GUI Demo and OSD controls
1.0.3, August 2010	Playback section added.
1.0.4, November 2010	MP4 format and audio controls added.
1.0.5, March 2011	Video output device added.
1.0.6, June 2011	User data ioctl added.
1.2.1, September 2011	Add known limitations
1.2.2, January 2012	Add MPEG-TS and new controls, low-latency section.
1.2.3, March 2012	Add new OSD features
1.2.6, March 2013	Add MPEG STREAM VBI control
1.2.7, August 2013	Add monochrome graphic overlay feature. Add pause, resume functions.
1.2.8, December 2013	Add S2253P functions