



IEI Technology Corp.

# MODEL: HDC-502E SDK (Linux)

A SDK software development kit for the HDC-502E Series

## User Manual

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# Revision

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22 November, 2011	1.00	Initial release

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Chapter

1

# Driver and SDK Installation

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## HDC-502E SDK (Linux)

### 1.1 Overview

A CD is shipped with the video capture card. The CD contains a driver for the video capture controllers on the card. When the video capture card is installed on the system, the driver must be installed. Failure to install the driver means that that video capture card cannot be detected by the system.

This manual includes SDK information for the HDC502E, which includes:

- HDC-502E

### 1.2 System Requirements

The following programs must be installed in order to use the HDCapture SDK in Linux:

- Kernel: Fedora16 Distribution (based on Kernel 3.1.0)
- Tool chain: Runs on Fedora 16 (binutils 2.18, gcc 4.3.2, glibc 2.9)

### 1.3 Software Installation

#### 1.3.1 Bin File Only

To install the HDCapture SDK to a system running Linux, please follow the steps below.

**Step 1:** Copy the **HDCapture\_5xx-r157\_20121212-6339-3.1.0-7.fc16.x86\_64.tar.bz2** ( **r157 release code** , **20121212 release date**, **6339 svn version**, **3.1.0-7.fc16.x86\_64 kernel version** ) file from the utility CD to the system hard drive. The user can also get the latest version from IEI website.

**Step 2:** Unzip the file by typing:

```
$ tar xf HDCapture_(hdc series)-(version)_(date)-(svn version)_(kernel version).tar.gz
$ tar -jvxf HDCapture_5xx-r157_20121212-6339-3.1.0-7.fc16.x86_64.tar.bz2
```

**Step 3:** Change to HDCapture directory by typing:

```
$ cd HDCapture_5xx-(version)_(date)-(svn version)
$ cd HDCapture_5xx-r157_20121212-6339
```

**Step 4:** Login as root by typing:

```
$ su
```

**Step 5:** Enter the password:

```
password: *****  
$
```

**Step 6:** Install the HDCapture SDK by typing:

```
sh install_ko_hdc5xx.sh
```

**Step 7:** The system starts to install the HDCapture SDK and shows:

```
Installation start.  
Installing fmb_player_apl... done.  
Installing firm... done.  
Making fmb_driver... `h55fmb.ko' -> `/lib/modules/2.6.43.5-2.fc15.i686/h55fmb.ko'  
done.  
Making mmux_driver... `media_mux.ko' -> `/lib/modules/2.6.43.5-2.fc15.i686/media_mux.ko'  
done.  
Unloading old MB86H55 device driver... done.  
Loading new MB86H55 device driver... done.  
Unloading old media_mux device driver... done.  
Loading new media_mux device driver... done.  
Installation completed.
```

### 1.3.2 Source Code

To install the HDCapture SDK to a system running Linux, please follow the steps below.

**Step 1:** Copy the **HDCapture\_SDK\_(version)\_(date)-(svn version).tar.gz** file from the utility CD to the system hard drive. The user can also get the latest version from IEI website.

**Step 2:** Unzip the file by typing:



## HDC-502E SDK (Linux)

```
$ tar xf HDCapture_SDK_(version)_(date)-(svn version).tar.gz
$ tar xf HDCapture_5xx-r157_20121212-6339.tar.gz
```

**Step 3:** Change to HDCapture directory by typing:

```
$ cd (version)
$ cd r157
```

**Step 4:** Login as root by typing:

```
$ su
```

**Step 5:** Enter the password:

```
password: *****
$
```

**Step 6:** Install the HDCapture SDK by typing:

```
#sh install_hdc5xx.sh
```

**Step 7:** The system starts to install the HDCapture SDK and shows:

```
Installation start.
Making fmb_player_apl...done.
Installing fmb_player_apl...done.
Installing firm...done.
Making fmb_driver...done.
Making mmux_driver...done.
Unloading old MB86H55 device driver...done.
Loading new MB86H55 device driver...done.
Unloading old media_mux device driver...done.
Loading new media_mux device driver...done.
Installation completed.
#
```

**Step 8:** Type “exit” to logout from root:

```
# exit
```

## 1.4 Launch HDCapture SDK

**Step 1:** To launch the HDCapture SDK, type “hdcapture” as below:

```
$ hdcapture
```

**Step 2:** The system starts to launch the HDCapture SDK. When the main menu appears, it is ready to use.

```
[dev-0] Boot ...
[dev-1] Boot ...

/_____/

|                                     ||
| HDCapture SDK for HDC 5xx series    ||
| SDK Version: r157                  ||
| firm      : 2012-1113-9341-0400     ||
| cpld      : 502ec120                ||
| fpga      : 502ef120                ||
| mcu       : 8051a100                ||
| mmux-driver: 0.0.3.3                ||
| fmb-driver : 0.0.3.2                ||
| apl       : 0.1.5.3                 ||
| kernel    : 3.1.0-7.fc16.x86_64    ||
|_____|/

< Main menu >

Select following character.

1 Encoding
6 Encode settings
8 Video I/O settings

9 Exit
fmb-0?>
```

## HDC-502E SDK (Linux)

### 1.5 Video Capture

There two main procedures to capture video by the HDCapture SDK in Linux. First, setup the encoding setting. Second, start capturing video. These two procedures are described in the following sections.

#### 1.5.1 Encoding Setting

Before capturing the video, please connect the hardware and follow the instruction below to configure the encoding settings.

**Step 1:** Launch the HDCapture SDK (refer to **Section 1.4**).

**Step 2:** Type **6** to select “6 Encode settings” from the main menu.

```
fmb-0?>6
```

**Step 3:** The following message shows.

```
-----
-----
< Device list >
Select following number.

1 /dev/h55fmb0
2 /dev/h55fmb1

fmb-0?>
```

**Step 4:** Select a port to configure by entering the port number. For example, type **1** to select the first port.

```
fmb-0?>1
```

**Step 5:** The following message shows.

```
< Encode settings - Sub menu >
"Z"<-----
Select following number. (Current settings)
```

- |                            |                       |
|----------------------------|-----------------------|
| 1 Output port setting      | (File ./stream-0.mpg) |
| 2 Video resolution setting | (1920x1080_60p)       |
| 3 Video bitrate setting    | (CBR, 6000kbps)       |
| 4 Audio format             | (MPEG1L2, 256kbps)    |
| 5 Video scale              | (Not Use)             |

fmb-0?>


**NOTE:**

The user can enter **Z** at anytime to go back to the previous page.

**Step 6:** **Configure the file name of the encoded file.** To configure the file name, type **1** to select the “Output port setting”.

fmb-0?>1

**Step 7:** The following message shows.

```
[[[ Encode settings - Sub menu -> Output port ]]]
                'Z'<----->Enter

Select following number. (* is current setting)

1 * File

fmb-0?>
```

**Step 8:** Type **1** to select “File”.

fmb-0?>1

**Step 9:** The following message shows the current file name is “stream-0.mpg”.

```
[[[ Encode settings - Sub menu -> Output port -> File ]]]
                'Z'<----->Enter

Input filepath of stream.

Current filepath is ./stream-0.mpg.

fmb-0?>
```

**Step 10:** Type the new file name. Take “video1.mpg” as an example.

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```
fmb-0?>video1.mpg
```

**Step 11:** The encoding setting sub menu appears. The file name has been changed to “video1.mpg”.

```
< Encode settings - Sub menu >
      'Z'<-----
Select following number. (Current settings)

1 Output port setting      (File video1.mpg)
2 Video resolution setting (1920x1080_60p)
3 Video bitrate setting    (CBR, 6000kbps)
4 Audio format             (MPEG1L2, 256kbps)
5  Video scale             (Not Use)

fmb-0?>
```

**Step 12: Video resolution settings.** The encoding video resolution is automatically detected by the hardware and can not be changed from the HDCapture SDK. If the video resolution is changed and does not match the current settings list in the SDK sub-menu, please type **2** to select “Video resolution setting”.

```
fmb-0?>2
```

**Step 13:** When the following message shows, press **Enter** to reload the current setting.

```
[[[ Encode settings - Sub menu -> Video resolution ]]]
      'Z'<----->Enter
Select following number.
  * 1920x1080_60p
    1920x1080_50p
    1920x1080_60i
    1920x1080_50i
    1280x720_60p
    1280x720_50p
    720x480_60i
    720x480_50i
```

(\* is current setting)

Please change the input source resolution if you want to use select others. Then press "Enter" to reload.  
fmb-0?>

**NOTE:**

The new CPLD version can detect resolution automatically.

**Step 14:** Type **Z** to go back to the sub-menu of the encode setting.

fmb-0?>z

< Encode settings - Sub menu >

'Z'<-----

Select following number. (Current settings)

- |                            |                    |
|----------------------------|--------------------|
| 1 Output port setting      | (File video1.mpg)  |
| 2 Video resolution setting | (1920x1080_60p)    |
| 3 Video bitrate setting    | (CBR, 6000kbps)    |
| 4 Audio format             | (MPEG1L2, 256kbps) |
| 5 Video scale              | (Not Use)          |

fmb-0?>

**Step 15:** Configure the video scale.

fmb-0?>5

**Step 16:** The following message shows.



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```

[[[ Encode settings - Sub menu -> Video scaler ]]]

                                'Z'<----->Enter

Select following number. (* is current setting)

1.  * Not Use
3.   720x480
5.   320x240

fmb-0?>5

-----

< Encode settings - Sub menu >

                                'Z'<-----

Select following number. (Current settings)

1   Output port setting      (File ./stream-0.mpg)
2   Video resolution setting(1920x1080_59.94i)
3   Video bitrate setting   (CBR, 768kbps)
4   Audio format             (MPEG1L2, 256kbps)
5   Video scale              (320x240)

```



### NOTE:

The following video scale settings are supported:

1080(60i) -> 480(60i)  
 1080(59.94i) -> 480(59.94i)  
 1080(50i) -> 480(50i)  
 1080(60i) -> 320x240(30p)  
 1080(59.94i) -> 320x240(29.97p)  
 1080(50i) -> 320x240(25p)  
 720(60p) -> 480 (60i)  
 720(59.94p) -> 480 (59.94i)  
 720(50p) -> 480 (50i)  
 720(60p) -> 320x240(30p)  
 720(59.94p) -> 320x240(29.97p)  
 720(50p) -> 320x240(25p)

**Step 17: Configure the video bitrate.** To configure the video bitrate, type **3** to select the “Video bitrate setting”.

```
fmb-0?>3
```

**Step 18:** The following message shows.

```
[[[ Encode settings - Sub menu -> Video ratecontrol -> Video bitrate ]]]
      'Z'<----->Enter
Select following number. (* is current setting)
    1 * CBR
    2 VBR
fmb-0?>
```

**Step 19:** To configure the video bitrate as CBR, type **1** to select “CBR”. To configure the video bitrate as VBR, type **2** to select “VBR”. Now we take CBR as an example.

```
fmb-0?>1
```

**Step 20:** The following message shows the current CBR value.

```
[[[ Encode settings - Sub menu -> Video rate control -> Video bitrate ]]]
      'Z'<----->Enter
Input bitrate in kbps. (6000kbps -- 24000kbps(I) or 30000kbps(P))
Current value is 6000kbps.
fmb-0?>
```

**Step 21:** To change the value, enter a bitrate.

```
fmb-0?>24000
```

```
< Encode settings - Sub menu >
      'Z'<-----
Select following number. (Current settings)

1 Output port setting      (File video1.mpg)
2 Video resolution setting (1920x1080_60p)
3 Video bitrate setting    (CBR, 24000kbps)
4 Audio format             (MPEG1L2, 256kbps)
```

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```
5 Video scale (Not Use)
```

```
fmb-0?>
```



### NOTE:

The audio format of the encoding and decoding settings is set by default and can not be changed.

## 1.5.2 Encoding

After configuring encoding settings, the user can start capturing the video by following the steps below.

**Step 1:** Access to the main menu. Type **1** to select “1 Encoding” from the main menu.

```
fmb-0?>1
```

**Step 2:** The following message shows. The option marked with \* is the selected port for capturing video. The unsupported port appears with an “unknown” message. Type the port number to select or deselect the port. In this example, port 1 is selected.

```
< Device list >
      'Z'<-----~
Select following number. (* is current setting)

1 <*> /dev/h55fmb0 link : 1920x1080@59.94p
2 < > /dev/h55fmb1 no link : unknown

y Ok
z Return
fmb-0?>
```

**Step 3:** After selecting the port(s), type **y**.

```
fmb-0?>y
```

**Step 4:** The current settings of the selected port shows as following.

```
[[[ Encoding - confirm -> Encoding ]]]  
  
      'Z'<----->Enter  
  
Current settings  
Stream output      File ./stream-0.mpg  
Video format       1920x1080  
Video framerate    60p  
Video rate control CBR  
Video bitrate      6000kbps  
Audio format       MPEG1L2  
Audio bitrate      256kbps  
Scale Format        Not Use  
Press <Enter> key to start encoding.  
fmb-0?>
```

**Step 5:** Press **Enter**. The system shows the following message and starts capturing video.

```
[[[ Encoding ]]]  
  
Press <Enter> key to stop.  
fmb-0?>
```

**Step 6:** Press **Enter** again to stop capturing video.

### 1.5.3 Video I/O Settings

The HDC-502E supports the output port(s) that broadcast(s) encoded video bypass. Please follow the steps below.

**Step 1:** Type **8** to select “8 Video I/O settings” from the main menu.

```
fmb-0?>8
```

**Step 2:** The following message shows.

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-----  
< Mode list >

Select following character.

0 Video output

1 Video input

z Return

**Step 3:** Type **1** to select video input

fmb-0?>1

**Step 4:**

< Device list >

Select following character.

===== Card 1: HDC-304e =====

0 Video input [Video-0]

1 Video input [Video-1]

z Return

fmb-0?>

**Step 5:** Type **0** to select Card 1: HDC-502e Channel 0 source

fmb-0?>0

**Step 6:** The following message shows.

You Select dev-0

-----  
< Device list >

'Z'<----->Enter

Select following number. (\* is current setting)

```
0 * Video 0
1   Video 1
```

**Step 7:** Card 1: HDC-502e Channel 0 source change to [Video-1]

```
< Device list >
Select following character.

===== Card 1: HDC-304e =====
0  Video input      [Video-1]
1  Video input      [Video-1]

z  Return
```

Type Z

```
fmb-0?>z
```

The following message shows

```
-----
< Mode list >
Select following character.

0  Video output
1  Video input

z  Return
```

**Step 8:** Type 0 to select video output, 502E only Bypass Mode

```
fmb-0?>0
```



Chapter

2

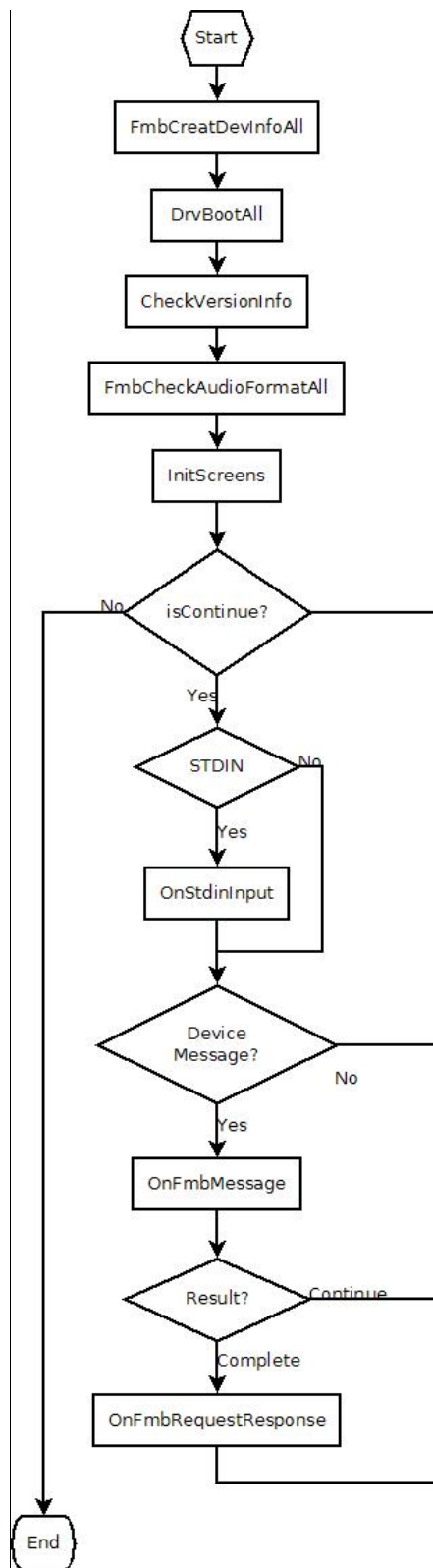
# Programming Guide

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## 2.1 Main Thread

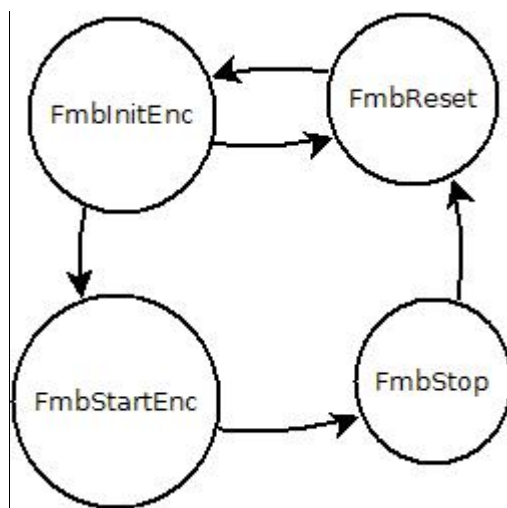
- Step 1:** Initialize global variables (FmbInitInfo).
- Step 2:** Set the default of all devices (FmbCreatDevInfoAll) and create a thread for each device (fmbRecvThread). This thread will receive Events sent by codec chip, and send the message to the main thread through the pipe.
- Step 3:** Write firmware to the codec chip and boot codec chip (DrvBootAll).
- Step 4:** Read the current version of the codec chip (CheckVersionInfo).
- Step 5:** Set the audio compression format supported by the current version of the codec chip (FmbCheckAudioFormatAll).
- Step 6:** Initialize the screen (InitScreens).
- Step 7:** Wait for the keyboard input and execute the commands of the codec chip setting (OnStdinInput)
- Step 8:** Receive the message sent by FmbRecvThread. Determine the current state of the codec chip and execute the corresponding actions (OnFmbMessage).
- Step 9:** Determine whether the device setup is completed and go to next step (OnFmbRequestResponse).
- Step 10:** Repeat **Step 7** ~ **Step 9**.

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## 2.2 Encode

- void FmbReset(void);
- void FmbInitEnc(void);
- void FmbStartEnc(void);
- void FmbStop(void);



### NOTE:

Be sure to use OnFmbMessage () function to confirm the codec chip return the message to switch the state (return FMBEnmResultRequestComplete), then continue to the next action.

## 2.3 Functions Reference

### 2.3.1 OnFmbMessage

**Description:** receive the returned message from codec chip to determine the current state

**Prototype:** enum FMBResultEnum OnFmbMessage (int fd)

**Parameters:** fd: device (codec chip) handle

**Return Value:** Current state: FMBEnmResultContinue, FMBEnmResultRequestComplete  
enum FMBResultEnum {FMBEnmResultContinue, FMBEnmResultRequestComplete}

### 2.3.2 FmbInitInfo

**Description:** card initialized

**Prototype:** int FmbInitInfo (void)

**Parameters:** NONE

**Return Value:** TRUE: function succeeded; FALSE: functioned failed

### 2.3.3 FmbReleaseInfo

**Description:** release the card resources

**Prototype:** void FmbReleaseInfo (void)

**Parameters:** NONE

**Return Value:** NONE

### 2.3.4 FmbCreatDevInfoAll

**Description:** create and initialize all the codec chip resources

**Prototype:** int FmbCreatDevInfoAll(void)

**Parameters:** NONE

**Return Value:** TRUE: function succeeded; FALSE: functioned failed

### 2.3.5 FmbDelDevInfoAll

**Description:** release all of codec chip resources

**Prototype:** void FmbDelDevInfoAll(void)

**Parameters:** None

**Return Value:** None

### 2.3.6 FmbGetDeviceTotal

**Description:** get the current number of codec chip

**Prototype:** int FmbGetDeviceTotal(void)

**Parameters:** None

**Return Value:** codec chip number

### 2.3.7 FmbGetBoardTotal

**Description:** get the current number of card

**Prototype:** int FmbGetBoardTotal (void)

**Parameters:** None

**Return Value:** card number

### 2.3.8 FmbSetCurDeviceNum

**Description:** set the codec chip number

**Prototype:** void FmbSetCurDeviceNum(enum FMBDeviceNumEnum deviceNum)

**Parameters:** enum FMBDeviceNumEnum, device number

```
enum FMBDeviceNumEnum {  
    FMBEnmDevice_NONE = -1,
```



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```
FMBEnmDevice_0 = 0,  
FMBEnmDevice_1,  
FMBEnmDevice_2,  
FMBEnmDevice_3,  
FMBEnmDevice_4,  
FMBEnmDevice_5,  
FMBEnmDevice_6,  
FMBEnmDevice_7,  
FMBEnmDeviceMax  
};
```

**Return Value:** None

### 2.3.9 FmbGetCurDeviceNum

**Description:** get the chip number of the current operating codec (numbering by the order of all the codec on the board)

**Prototype:** enum FMBDeviceNumEnum FmbGetCurDeviceNum(void);

**Parameters:** None

**Return Value:** enum FMBDeviceNumEnum, device number

### 2.3.10 FmbGetCurDevNumOnBoard

**Description:** get the chip number of the current operating codec (numbering by the order of the codec on a board)

**Prototype:** enum FMBDeviceNumEnum FmbGetCurDevNumOnBoard (void);

**Parameters:** None

**Return Value:** enum FMBDeviceNumEnum, device number

### 2.3.11 FMBDeviceNumEnum

**Description:** get the chip number of the current operating codec

**Prototype:** enum FMBDeviceNumEnum FmbGetCurDeviceNum(void)

**Parameters:** None

**Return Value:** enum FMBDeviceNumEnum, device number

### 2.3.12 FmbSetFirstDev

**Description:** set to switch the current operating device to the first available device code

**Prototype:** enum FMBDeviceNumEnum FmbSetFirstDev(void)

**Parameters:** None

**Return Value:** enum FMBDeviceNumEnum: return the device number set, return FMBEnmDevice\_NONE if there is no available devices

### 2.3.13 FmbSetNextDev

**Description:** set to switch the current operating device to the next available device number of the current device

**Prototype:** enum FMBDeviceNumEnum FmbSetNextDev(void)

**Parameters:** None

**Return Value:** enum FMBDeviceNumEnum: return the device number set, return FMBEnmDevice\_NONE if there is no available devices

### 2.3.14 DrvBootAll

**Description:** load the firmware of all the codec chip and start the codec chip

**Prototype:** int DrvBootAll(void)

**Parameters:** None

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**Return Value:** 0: function succeeded, other values: function failed

### 2.3.15 MmuxInit

**Description:** initialize the CPLD to control handle

**Prototype:** MmuxHandle MmuxInit(int deviceNum)

**Parameters:** deviceNum: request to initialize the version of card number and strat from 0

**Return Value:** MmuxHandle

### 2.3.16 MmuxRelease

**Description:** release CPLD and control handle

**Prototype:** void MmuxRelease(MmuxHandle hdMmux)

**Parameters:** hdMmux: get handle when MmuxInit executes

**Return Value:** None

### 2.3.17 MmuxGetVer

**Description:** get the current version of CPLD, FPGA and driver

**Prototype:** int MmuxGetVer(MmuxHandle hdMmux, struct MmuxVer \*p\_Ver)

```
struct MmuxVer {
    unsigned long    CPLD;
    unsigned long    FPGA;
    char             driver[MMUX_VER_LEN];
};
```

**Parameters:** hdMmux: handle obtained when MmuxInit executes, p\_Ver: the structure indicator of stored information

**Return Value:** 0: get version successfully, the other value failed

### 2.3.18 MmuxGetCodecSrcResolution

**Description:** get the current resolution of the codec chip input

**Prototype:** enum MMUX\_RESOLUTION MmuxGetCodecSrcResolution(MmuxHandle hdMmux, int codecNum);

```
enum MMUX_RESOLUTION {  
    MMUX_RESOLUTION_1080P_60,  
    MMUX_RESOLUTION_1080P_59,  
    MMUX_RESOLUTION_1080P_50,  
    MMUX_RESOLUTION_1080I_60,  
    MMUX_RESOLUTION_1080I_59,  
    MMUX_RESOLUTION_1080I_50,  
    MMUX_RESOLUTION_1080P_24,  
    MMUX_RESOLUTION_1080P_23,  
    MMUX_RESOLUTION_720P_60,  
    MMUX_RESOLUTION_720P_59,  
    MMUX_RESOLUTION_720P_50,  
    MMUX_RESOLUTION_720P_24,  
    MMUX_RESOLUTION_720P_23,  
    MMUX_RESOLUTION_480i,  
    MMUX_RESOLUTION_576i_50,  
    MMUX_RESOLUTION_UNKNOWN = 0x1f,  
};
```

**Parameters:** hdMmux: Get handle when MmuxInit executes, codecNum: Request the codec chip number

**Return Value:** the current resolution (enum MMUX\_RESOLUTION)

### 2.3.19 MmuxIsCodecSrcConnect

**Description:** request whether there is signal input from the current codec chip

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**Prototype:** int MmuxIsCodecSrcConnect(MmuxHandle hdMmux, int codecNum)

**Parameters:** hdMmux: Get handle when MmuxInit executes, codecNum: request the codec chip number

**Return Value:** 0: no signal, 1: signal input

### 2.3.20 MmuxGetOutputSrc

**Description:** get the current source set of the video output

**Prototype:** enum MMUX\_OUTPUT\_SRC MmuxGetOutputSrc(MmuxHandle hdMmux, int outputNum)

```
enum MMUX_OUTPUT_SRC {
    MMUX_OUT_NONE = -1,
    MMUX_OUT_IN_0 = 0,
    MMUX_OUT_IN_1,
    MMUX_OUT_IN_2,
    MMUX_OUT_IN_3,
    MMUX_OUT_CODEC_0,
    MMUX_OUT_CODEC_1,
    MMUX_OUT_CODEC_2,
    MMUX_OUT_CODEC_3,
    MMUX_OUT_SRC_MAX,
};
```

**Parameters:** Get handle when MmuxInit executes, outputNum: request the output Fu number (currently always 0)

**Return Value:** enum MMUX\_OUTPUT\_SRC: the sources of current set

### 2.3.21 MmuxSetOutputSrc

**Description:** set the source of the video output

**Prototype:** `int MmuxSetOutputSrc(MmuxHandle hdMmux, int outputNum, enum MMUX_OUTPUT_SRC outputSrc)`

**Parameters:** `hdMmux`: Get handle when `MmuxInit` executes, `outputNum`: request the output number (currently always 0), `outputSrc`: set the image source

**Return Value:** 0: set succeeded



Chapter

**3**

# Linux Open Source Code

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#### Linux Open Source Code

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