

# PCI Express 4-Channel Frame Grabber User's Manual

Model 811 | Rev.A | December 2009

SENSORAY | embedded electronics



Designed and manufactured in the U.S.A

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# Limited warranty

Sensoray Company, Incorporated (Sensoray) warrants the hardware to be free from defects in material and workmanship and perform to applicable published Sensoray specifications for two years from the date of shipment to purchaser. Sensoray will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The warranty provided herein does not cover equipment subjected to abuse, misuse, accident, alteration, neglect, or unauthorized repair or installation. Sensoray shall have the right of final determination as to the existence and cause of defect.

As for items repaired or replaced under warranty, the warranty shall continue in effect for the remainder of the original warranty period, or for ninety days following date of shipment by Sensoray of the repaired or replaced part, whichever period is longer.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. Sensoray will pay the shipping costs of returning to the owner parts that are covered by warranty. A restocking charge of 25% of the product purchase price will be charged for returning a product to stock.

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# Special handling instructions

The circuit board contains CMOS circuitry that is sensitive to Electrostatic Discharge (ESD).

Special care should be taken in handling, transporting, and installing circuit board to prevent ESD damage to the board. In particular:

- Do not remove the circuit board from its protective anti-static bag until you are ready to install the board into the enclosure.
- Handle the circuit board only at grounded, ESD protected stations.
- Remove power from the equipment before installing or removing the circuit board.

# Introduction

Model 811 is a PCI-Express version of 4-channel frame/video capture device designed for the applications requiring high capture rate from multiple input video channels. It supports capturing from NTSC/PAL/SECAM video sources.

For the need of audio capturing, Model 811 provides four channels of stereo or monochrome audio capturing associated with four channels of video respectively.

For each video channel, the capturing frame rate is up to 30 fps for NTSC and 25 fps for PAL. It makes total frame/video capturing rate up to 120 fps for NTSC and 100 fps for PAL. The capturing resolution can be from followings: D1.N (NTSC), D1.P (PAL), VGA, QVGA, QQVGA, SIF, 2SIF, 4SIF, CIF, QCIF, SQCIF, 4CIF.

Associated with each channel, general digital I/O signals are provided, for the control and/or alarming purpose.

A single +3.3V power supply through PCI-Express bus is required to power the board.

Model 811 implements a single-lane (x1) PCI-Express interface. It can be plugged into a PCI Express slot of any width.

## Feature Summary

- PCI-Express Video/Audio Capturing
- Video input: 4 individual input video channels (Composite or S-Video per channel)
- Audio input: 4 pair of stereo or 4 mono
- Resolution (Max): Full-D1:

NTSC: 720 x 480 @ 30 fps x 4 (Total: 120 fps)  
PAL: 720 x 576 @ 25 fps x 4 (Total: 100 fps)

- Other supported video Resolution:

D1.N: 720 x 480	D1.P: 720 x 576	D.5: 480 x 352
SIF: 352 x 240	2SIF: 704 x 240	4SIF: 704 x 480
VGA: 640 x 480	QVGA: 320 x 240	QQVGA: 160 x 112
CIF: 352 x 288	QCIF: 176 x 144	SQCIF: 128 x 96
4CIF: 704 x 576		

- Frame/Video capturing and encoding:

Raw frame capturing: YCrCb / RGB

up to 30 fps x 4, for NTSC (Total: 120 fps)  
up to 25 fps x 4, for PAL (Total: 100 fps)

Raw video capturing: YCrCb / RGB

video up to 30 fps x 4, for NTSC (Total: 120 fps)  
video up to 25 fps x 4, for PAL (Total: 100 fps)

Raw audio capturing:

audio sampling rate @ 32KHz / 48KHz

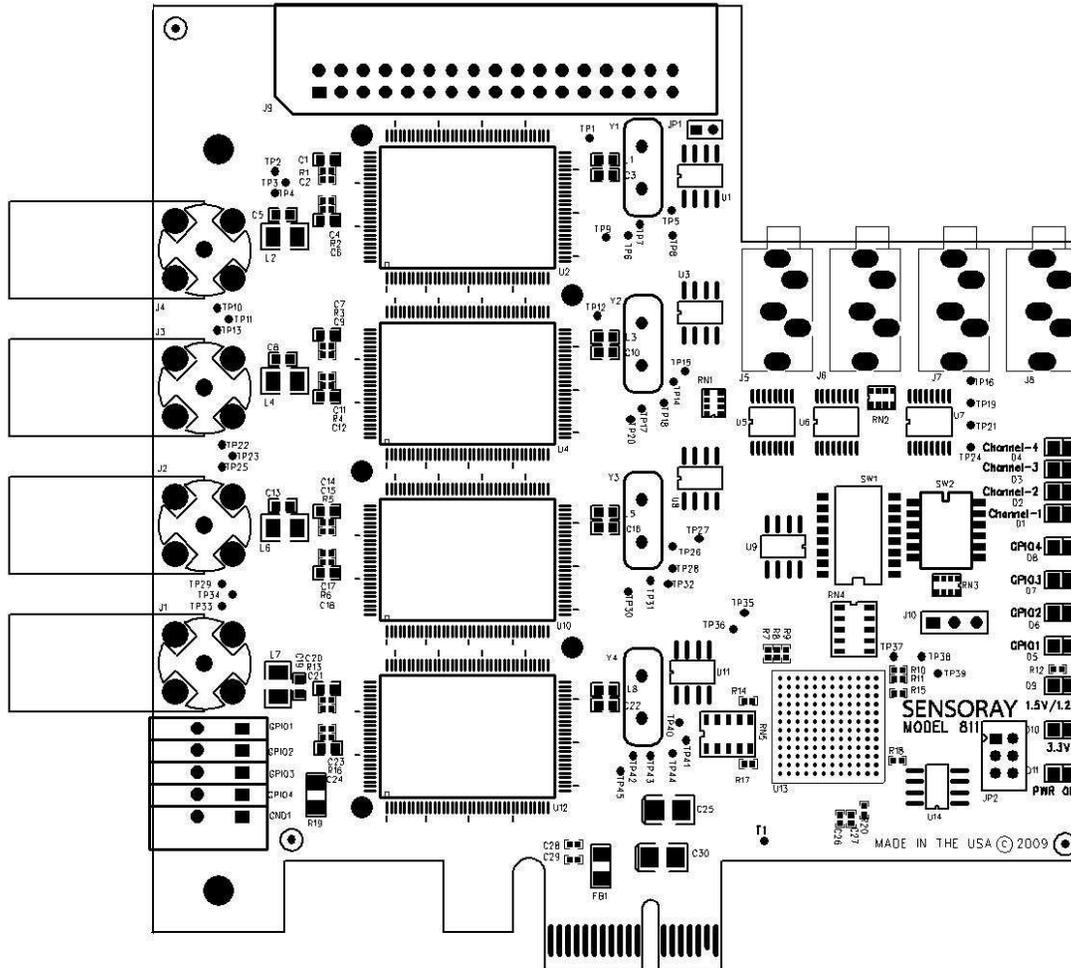
JPEG frame, MPEG-1/2/4, H.264, or MJPEG A/V capturing:

Can be done with 3<sup>rd</sup> party software or library,  
or OSS software like FFMPEG, MEncoder, and etc.

- 4 digital inputs and/or 4 digital outputs: TTL signals
- Driver and SDK for Windows available
- Linux drive natively supported by kernel.org, complying with V4L and/or V4L2

# Reference

## Board Picture and Connector Layout



## Connector List

P1	PCI-Express Connector
J1	BNC: Composite Video Input for Channel-1
J2	BNC: Composite Video Input for Channel-2
J3	BNC: Composite Video Input for Channel-3
J4	BNC: Composite Video Input for Channel-4
J5	3.5mm AudioJack: Stereo/Mono Audio Input for Channel-1
J6	3.5mm AudioJack: Stereo/Mono Audio Input for Channel-2
J7	3.5mm AudioJack: Stereo/Mono Audio Input for Channel-3
J8	3.5mm AudioJack: Stereo/Mono Audio Input for Channel-4
J9	34-pin Connector: break-in/out for Composite Video Input for Channel-1, 2, 3, and 4 S-Video Input for Channel-1, 2, 3, and 4 Stereo/mono Audio Input for Channel-1, 2, 3, & 4 Digital Inputs for Channel-1, 2, 3, and 4 Digital Output for Channel-1, 2, 3, and 4
TB1~TB4	General Purpose Digital I/O: configurable Digital Inputs for Channel-1, 2, 3, and 4 or Digital Output for Channel-1, 2, 3, and 4

## Connector Signal/Pin Definitions

### PCI-Express Bus Connector: P1

Pin – Side B	Signal	Pin – Side A	Signal
B1	+12V	A1	PRSNT#1
B2	+12V	A2	+12V
B3	Reserved *	A3	+12V
B4	Ground	A4	Ground
B5	SMCLK *	A5	TCK
B6	SMDAT *	A6	TDI *
B7	Ground	A7	TDO*
B8	+3.3V	A8	TMS *
B9	TRST# *	A9	+3.3V
B10	+3.3VAUX *	A10	+3.3V
B11	WAKE# *	A11	PWRGOOD
( C-Key )		( C-Key )	
B12	Reserved *	A12	Ground
B13	Ground	A13	REFCLKP
B14	HSOP0	A14	REFCLKN
B15	HSO0	A15	Ground
B16	Ground	A16	HSIP0
B17	PRSNT#2	A17	HSIN0
B18	Ground	A18	Ground

Note:

\* Not connected.

C-Key Connector Key

### Composite Video Input Connector, BNC: J1, J2, J3, and J4

Pin	Signal	Pin	Signal
Inner	Composite Video Signal	Outer/Ring	Shield, Analog ground

### Stereo Audio Input Connectors, 3.5mm TRS StereoJack: J5, J6, J7, and J8

Pin	Signal	Pin	Signal	Pin	Signal
Tip	Stereo Line-in Left	Ring	Stereo Line-in Right	Sleeve	Analog ground

## Full A/V (Video & Audio) and Digital I/O Connector: J9

Pin	Signal	Pin	Signal
1	Analog Ground	2	Composite Video In / S-Video In – Y for Channel-1
3	S-Video In – C for Channel-1	4	Audio In – L for Channel-1
5	Audio In – R for Channel-1	6	Digital Input for Channel-1
7	Digital Output for Channel-1	8	Digital Ground
9	Analog Ground	10	Composite Video In / S-Video In – Y for Channel-2
11	S-Video In – C for Channel-2	12	Audio In – L for Channel-2
13	Audio In – R for Channel-2	14	Digital Input for Channel-2
15	Digital Output for Channel-2	16	Digital Ground
17	Analog Ground	18	Composite Video In / S-Video In – Y for Channel-3
19	S-Video In – C for Channel-3	20	Audio In – L for Channel-3
21	Audio In – R for Channel-3	22	Digital Input for Channel-3
23	Digital Output for Channel-3	24	Digital Ground
25	Analog Ground	26	Composite Video In / S-Video In – Y for Channel-4
27	S-Video In – C for Channel-4	28	Audio In – L for Channel-4
29	Audio In – R for Channel-4	30	Digital Input for Channel-4
31	Digital Output for Channel-4	32	Digital Ground
33	+3.3V	24	Not Used

## Digital I/O Connectors: TB1 ~ TB5

TB	Signal
1	GPIO1 – Digital Input/Output for Channel-1
2	GPIO2 – Digital Input/Output for Channel-2
3	GPIO3 – Digital Input/Output for Channel-3
4	GPIO4 – Digital Input/Output for Channel-4
5	Digital ground

## DIP Switches

### Manufacturing DIP Switch: SW1

The DIP switch, SW1, is used for manufacturing only. Therefore, it is not described in this manual.

### Digital I/O Configuration DIP Switch: SW2

The DIP switch, SW2, is used for configuring Digital I/O routing. Refer to the table below for the routing details:

SW2-1	SW2-2	SW2-3	SW2-4	SW2-5	SW2-6	Description
OFF	X	X	X	X	X	Disconnect all digital I/O to TB1~TB4
X	X	OFF	X	X	X	Disconnect all digital inputs from J9
X	X	X	X	OFF	X	Disconnect all digital outputs to J9
X	X	ON	OFF	X	X	Enable connectivity from J9's digital input pins to the board (for all 4 channels)
X	X	X	X	ON	OFF	Enable connectivity from the board to J9's digital output pins (for all 4 channels)
X	X	ON	OFF	ON	OFF	Enable connectivity for both digital inputs & outputs from/to J9 connector
ON	ON	ON	OFF	ON	OFF	Enable connectivity for both digital inputs & outputs from/to J9 connector; And, route the digital inputs connected to the TB1 ~ TB4
ON	OFF	ON	OFF	ON	OFF	Enable connectivity for both digital inputs & outputs from/to J9 connector; And, route the digital outputs connected to the TB1 ~ TB4
Others						Reserved

## LED

### Channel Status Indicators: D1 ~ D4

The LED D1, D2, D3, and D4 can be used for indicating the channel status, respectively.

LED	Signal
D1	Status for Channel-1, the driving signal is connected to the Channel-1 capturing chipset SAA713xHL's GPIO15. A logic low turns the LED on, and a high turns it off
D2	Status for Channel-2, the driving signal is connected to the Channel-2 capturing chipset SAA713xHL's GPIO15. A logic low turns the LED on, and a high turns it off
D3	Status for Channel-3, the driving signal is connected to the Channel-3 capturing chipset SAA713xHL's GPIO15. A logic low turns the LED on, and a high turns it off
D4	Status for Channel-4, the driving signal is connected to the Channel-4 capturing chipset SAA713xHL's GPIO15. A logic low turns the LED on, and a high turns it off

### GPIO Status Indicators: D5 ~ D8:

The LED D5, D6, D7, & D8 are used for indicating the status of the digital input/output signals (pins), labeled as GPIO1 ~ GPIO4 on the board, and directly connected to the TB1 ~ TB4. A logic 0 (low) turns the LED on and a logic 1 (high) turns it off.

<b>LED</b>	<b>Signal</b>
D5	Status of GPIO1 (associated with Channel-1)
D6	Status of GPIO2 (associated with Channel-2)
D7	Status of GPIO3 (associated with Channel-3)
D8	Status of GPIO4 (associated with Channel-4)

### **Power-OK indicators: D9, D10, D11**

The LED D9, D10, and D11 are used for indicating on-board Power-OK status.

<b>LED</b>	<b>Signal</b>
D9	1.5V Power-OK Status
D10	3.3V Power-OK Status
D11	Power-OK Status for PCI-Express to PCI bridge, PLX PEX8112

# Software

## Device Driver and SDK

Device driver and SDK including driver API & demo application programs are available for both Windows and Linux.

### Windows

Sensoray Co. provides 811 WDM driver and DirectX filter for Windows platform. The SDK includes the Windows driver, DLL, Demo application & source code, etc. It is packaged in a "s811\_v1xx.zip" file for distribution and/or for customer(s) to download from Sensoray's website.

Refer to the "Model 811 Windows SDK User's Manual" for the SDK, DLL, API, and programming details.

Since the driver is built and based on the WDM BDA and DirectShow oriented architecture, the Microsoft GraphEdit utility can be used for building live A/V preview and/or capturing application. Also, 3<sup>rd</sup> party freeware/shareware like VLC player and AMCap software can be used for still/live video capturing and preview.

### Linux

The device driver for Linux is natively in the Linux kernel, provided by kernel.org and comes with most commonly used and/or popular Linux distributions. The API complies with standard V4L2 (Video for Linux Version 2), formerly known as V4L (Video for Linux). The API spec and capturing sample program can be downloaded from following websites:

<http://v4l2spec.bytesex.org/>

[http://www.linuxtv.org/downloads/video4linux/API/V4L2\\_API/spec-single/v4l2.html](http://www.linuxtv.org/downloads/video4linux/API/V4L2_API/spec-single/v4l2.html)

In addition to the application samples from V4L/V4L2, Sensoray Co. provides customized capturing sample/demo programs and HOW-TO type of app/instruction notes for the Model 811, upon customer's requests.

For live video preview or capturing, commonly used V4L application programs like XawTV can be used for capturing/previewing from each channel of the 811.

For capturing JPEG frame, MPEG-1/2/4, H.264 or MJPEG video, 3<sup>rd</sup> party's or OSS libraries and CODECs can be used and integrated in the application programs. As a good example, FFMPEG (<http://en.wikipedia.org/wiki/FFmpeg>) is a well-known and highly recommended OSS that can be used with 811. Sensoray Co. provides an application note on how to use command-line based FFMPEG to capture compressed A/V (video or audio).

# Specifications

Video Formats	NTSC, PAL, SECAM
Video Inputs	4 input channels, simultaneously: 4 Composite video via 4 NBC connectors, 75 Ohms; or 4 S-Video via a 34-pin breakout connector, 75 Ohms; or combinations up to 4 channels , 75 Ohms
Audio Inputs	4 input channels: associated with 4 separated video channels Stereo or mono for each channel, via four 3.5mm TRS StereoJack; Or, break-in stereo/mono signal from a 34-pin connector Signal level: Line-in level, +/- 1.0V
Capturing Mode	Raw: RGB or YUV
Capture rate	Up to: 120 (30x4) frames/sec for NTSC/RS-170/CCIR 100 (25x4) frames/sec for PAL/SECAM
Frame/Video Encoding	Could be done by software and/or 3 <sup>rd</sup> party CODEC: JPEG, MPEG-1/2/4, MJPEG, and H.264
Resolution	Up to Full-D1: NTSC: 720x480      PAL: 720x576 Supported: D1.N: 720x480      D1.P: 720x576      D.5: 480x352 SIF: 352x240      2SIF: 704x240      4SIF: 704x480 VGA: 640x480      QVGA: 320x240      QQVGA: 160x112 CIF: 352x288      QCIF: 176x144      SQCIF: 128x96 4CIF: 704x576
Digital I/O	4 inputs + 4 outputs: TTL signals 4 configurable inputs/outputs, via I/O terminals; all 4 inputs + all 4 outputs on breakout 34-pin connector
Bus	PCI-Express x1: Compliant of PCI-Express Base Specification (Revision 1.0/1.1) PCI-to-PCI Bridge Specification (Revision1.2)
OS Platform	Windows and Linux
Power	6.6W, +3.3V @ 2A
Temperature	0 – 70 C
Board Size	4.2" x 4.2" (107mm x 107mm)