

1 Introduction

The AudioScience Surround Sound eXtensions (SSX and SSX2) allow certain AudioScience products to play, record and mix streams with up to 8 channels of PCM audio. The number of channels may be 1, 2, 4, 6 or 8.

Under Windows, both the WAVE and WDM drivers support SSX and SSX2, and it maybe accessed through the HPI, Wave, and DirectSound APIs. Under Linux, SSX and SSX2 is available using the HPI interface.

When enabling SSX/SSX2 on an adapter, one multichannel play or record stream will be created for each 4 play or record streams on the adapter. This means that an ASI6518 in "16-Play" mode will show 4 multichannel players after reboot, as shown in the following table that lists some of our adapters:

Adapter	Mode	SSX2	Play Streams	Record Streams
ASI6514 ASI6614	4 Play	off	4 mono/stereo	1 mono/stereo
	4 Play	on	1 multichannel	*
	12 Play	off	12 mono/stereo	2 mono/stereo
	12 Play	on	3 multichannel	**
ASI6544 ASI6644	4 Play	off	4 mono/stereo	4 mono/stereo
	4 Play	on	1 multichannel	1 multichannel
	12 Play	off	12 mono/stereo	8 mono/stereo
	12 Play	on	3 multichannel	2 multichannel
ASI6518 ASI6618	8 Play	off	8 mono/stereo	1 mono/stereo
	8 Play	on	2 multichannel	* (none for 6118)
	16 Play	off	16 mono/stereo	1 mono/stereo
	16 Play	on	4 multichannel	* (none for 6118)
ASI6416	8 Play	off	8 mono/stereo	8 mono/stereo
	8 Play	on	2 multichannel	2 multichannel
	16 Play	off	16 mono/stereo	16 mono/stereo
	16 Play	on	4 multichannel	4 multichannel
AS6585	4 play	off	4 mono/stereo	4 mono/stereo
	4 play	on	1 multichannel	1 multi-channel
	8 Play	off	8 mono/stereo	8 mono/stereo
	8 Play	on	2 multichannel	2 multichannel
	12 Play	off	12 mono/stereo	4 mono/stereo
	12 Play	on	3 multichannel	1 multichannel
	16 Play	off	16 mono/stereo	16 mono/stereo
	16 Play	on	4 multichannel	4 multichannel

* supports 1 mono/stereo record stream; does not a support multi-channel record

** supports 2 mono/stereo record streams; does not support multi-channel record

This datasheet outlines the data packing for a multi-channel audio stream and describes practical aspects of using multichannel audio on an ASI adapter.

2 SSX

Only the ASI5000 (ASI5041, ASI5042, ASI5044) series of adapters support SSX. To enable SSX, the adapter should be switched to “Multichannel” mode.

Note: When switching in and out of SSX mode, it is possible that the default volumes will not direct audio to all the desired outputs. If the user application expects output volumes to be preconfigured correctly, the user may have to invoke ASIMixer or ASIControl to set the correct cross mixing volumes.

2.1 2.1 Implementing SSX with the WAVE driver

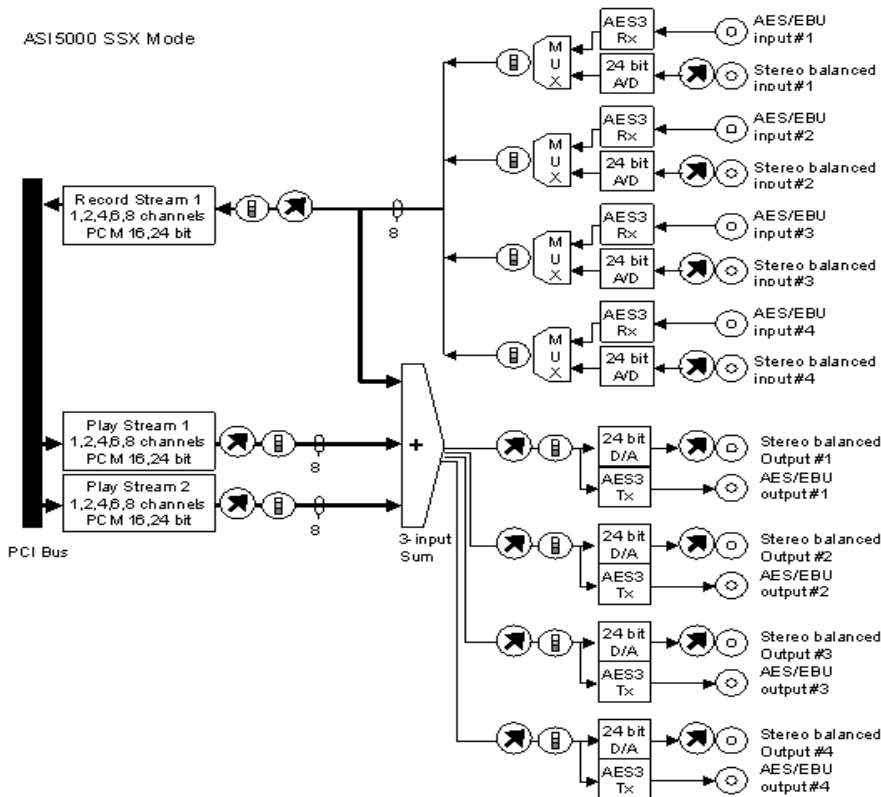
If the WAVE driver is installed, SSX is implemented from the “Mode” Combo box shown in the application ASIMIXER on “Line Out 1”. Alternatively a software program can manipulate the adapter mode directly. See HPI specification (call HPI_AdapterSetMode()) or ASX specification (call ASX_AdapterMode_Set()). The driver must be reloaded (i.e. computer rebooted) for the new mode to take effect.

2.2 Implementing SSX with the WDM driver

With the WDM driver, a different mechanism must be used for switching the adapter mode. The application ASICONTROL is installed along with the WDM driver and it should be used to navigate to the “Adapter” field of the control tree. Next select the “Multichannel” adapter mode and reboot the system.

2.3 ASI5000 SSX Topology

In SSX mode the topology of an ASI5000 series adapter looks like the following:



2.4 Meters

Note that Meter controls are still stereo, even though the play and record streams are handling multi-channel audio. This means that only meter information for the first two channels is available. To display multi-channel meters, the individual meter values from the linein and lineouts need to be read and displayed.

3 SSX2

SSX2 is the second version of SSX and is implemented in driver 3.08.00 and later. All ASI6000/5600/5500 adapters support SSX2. Note ASI504x adapters will continue to also support legacy SSX.

SSX2 Mode and Adapter Mode can be used in conjunction with each other. Set the required Adapter Mode (Mono mode can not be used with SSX2 Mode), enable SSX2 Mode (see below) and then reboot. For example, an ASI6518 set to "16-Play" in Adapter Mode and "On" in SSX2 Mode will show 4 multichannel players after reboot. An ASI6518 set to "8-Play" in Adapter Mode and "On" in SSX2 to on will show 2 multichannel players after reboot.

Note that in ASIControl, the Player volumes cannot be unlocked to move the left and right channels independently when an adapter is in SSX2 mode.

3.1 Enabling SSX2 With Driver 3.08.00 - 3.14.13

With drivers 3.08.00 through 3.14.13, SSX2 is implemented by editing C:\Windows\ASIDRV.INI and changing the SSX2 field to enable it. Look for the following line and change the default of 'no' to "yes"

```
Enabled SSX2 streams = yes
```

then reboot the PC.

The devices and controls presented to the user are the same as those in SSX mode. Since the SSX2 specification is stored in ASIDRV.INI instead of the adapter mode, the SSX2 setting will not follow the adapter when it is moved to a different computer.

Note: When switching in and out of SSX2 mode, it is possible that the default volumes will not direct audio to all the desired outputs. If the user application expects output volumes to be preconfigured correctly, the user may have to invoke ASIControl to set the correct cross mixing volumes.

3.2 Enabling SSX2 With Driver 4.02.00 and Later

With drivers 4.02.00 and later, SSX2 is implemented by setting the SSX2 mode in ASIControl to "on," Open ASIControl and in the right pane click on the adapter's name to access the Adapter Information screen in the right pane. Look for the SSX2 Mode field and change it from 'OFF' to "ON." Reboot the PC. Since SSX2 is stored in the adapter mode, the SSX2 setting will follow the adapter when it is moved to a different computer.

Note: When switching in and out of SSX2 mode, it is possible that the default volumes will not direct audio to all the desired outputs. If the user application expects output volumes to be preconfigured correctly, the user may have to invoke ASIControl to set the correct cross mixing volumes.

3.3 SSX2 Note – ASI6416 and ASI6585

Because an ASI6416 and ASI6585 run at the native network sample rates of 48 kHz, playing 44.1 kHz file will cause sample rate conversion to be invoked. This limits the maximum number of 44.1 kHz multichannel that should be active at once to 3. If there is a requirement to use all 4 multichannel devices simultaneously, a sample rate of 48 kHz should be used.

3.4 SSX2 Note – Mono Playback

Playing back a mono file in SSX2 will cause both the left and right channels of the first output to contain audio. This operation is not recommended.

4 Multichannel Data Organization

AudioScience SSX and SSX2 capable adapters support playback and recording of packed, interleaved multichannel audio samples. Just as 16-bit stereo samples are packed:

left, right, left, right, ..., etc.

Multi-channel audio samples are packed:

c0, c1, c2, c3, c4, c5, c0, c1, c2, c3, c4, c5, c0, c1, c2, c3, c4, c5, ..., etc.

for the 6 channel case. By convention, for the 6-channel case, these channels are labeled:

left, right, center, sub-woofer, left-side, right-side

AudioScience SSX and SSX2 capable adapters support multi-channel data in 8-bit, 16-bit, 24-bit, 32-bit and 32-bit float PCM sample formats.

5 Input and Output Channel Mapping

Output channels map in order to the line out (or digital out) cabling. For the 6-channel case the mapping is:

Channel	Line Out Name	Channel Name
0	1 Left	Left
1	1 Right	Right
2	2 Left	Center
3	2 Right	Sub-woofer
4	3 Left	Left-rear
5	3 Right	Right-rear
6	4 Left	Left-side
7	4 Right	Right-side

Input channels are mapped similarly.

6 Practical Aspects of Using Multichannel Audio

6.1 Multichannel mode

Normally, AudioScience adapters have the capability of playing back multiple mono or stereo streams of audio to any output. In order to support more than 2 channels of audio per stream, the adapter should be switched to SSX or SSX2.

6.2 Specifying the audio format

Multichannel audio formats are straightforward to specify. In the HPI and ASX APIs the number of channels should be increased from the normal 2 channels to 4, 6, or 8. Similarly when using the Microsoft WAVE or DirectSound API, a multi-channel .wav file is played by setting the nChannels field of the WAVEFORMATEX structure to correctly reflect the number of channels of the file being played (or recorded).

6.3 Setting up Speaker Configuration when using WDM Driver

First see section 2 or 3 on switching the adapter to SSX or SSX2 mode.

When using the WDM driver it is necessary to set the speaker configuration in Windows to have at least the number of channels needed. The setting is in the "Sounds and Multimedia" applet of the Control Panel in the Advanced section of the Sound Playback device on the Audio tab.

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