ASI5540, ASI5541, ASI5544

LINEAR PCI SOUND CARDS

1 DESCRIPTION

The ASI5540, ASI5541 and ASI5544 are professional PCI sound cards designed for use in the installed sound, entertainment, and broadcast markets.

Providing 12 stereo play streams that are mixed to 4 balanced stereo outputs and 8 record streams fed from four balanced stereo inputs, the ASI554x family features AudioScience's unique "anything to anywhere" routing and mixing.

The ASI5544 offers both balanced analog and AES/EBU inputs and outputs, while the ASI5540 has analog I/O only and the ASI5541 has AES/EBU I/O only. The maximum analog input and output level is +24dBu.

Uncompressed PCM, in a choice of precision, is available for both recording and playback.

For emerging surround sound applications, SSX™ mode allows multichannel streams of up to 8 channels to be played, recorded and mixed.

2 ORDERING INFORMATION

Model	Analog I/O	AES/EBU I/O
ASI5540	4 stereo I/O	
ASI5541		4 stereo I/O
ASI5544	4 stereo I/O	4 stereo I/O

3 FEATURES

- 12 stereo streams of playback into 4 stereo outputs
- 8 stereo streams of record from 4 stereo inputs
- Formats include 8, 16, 24 and 32 bit PCM with sample rates from 32kHz to 96kHz
- SSX™ mode for multichannel record, playback and mixing
- Balanced stereo analog inputs and outputs with levels to +24dBu (ASI5540, ASI5544 only)
- 24bit ADC and DAC with 110dB DNR and 0.0015% THD+N (ASI5541, ASI5544 only)
- AES/EBU inputs and outputs with sample rate converters on all inputs (ASI5541, ASI5544 only)
- Dedicated AES/EBU and Word clock Sync input (ASI5541, ASI5544 only)
- Short length PCI card format (6.6 inches/168mm)
- Up to 4 cards in one system
- Windows 7, XP, Server 2008/2003 and Linux software drivers available

ASI554x – 12-Play Mode
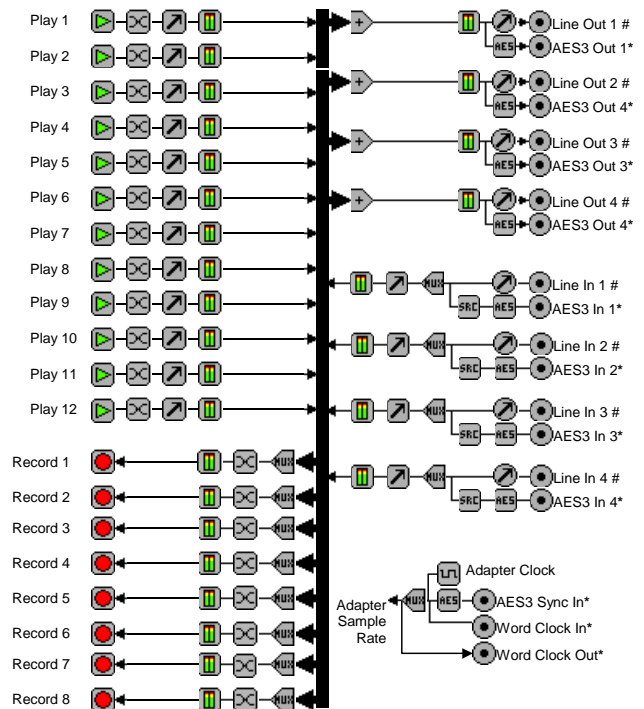
4   SPECIFICATIONS

ANALOG INPUT/OUTPUT [2]	
Type	Balanced
Connector	Mini50 (SCSI-II type)
Input Level	-10 to +24dBu in 0.5dBu steps
Input Impedance	10K ohms
A/D converter	24bit Over sampling
Output Level	-10 to +24dBu in 0.5dBu steps
D/A converter	24bit Over sampling
Load Impedance	600ohms or greater
Dynamic Range [1]	>110dB (record or play)
THD+N [1]	<-96dB (0.0015%) (record or play)
Frequency Response	20Hz to 20kHz +0/-0.2dB 20Hz to 40kHz +0/-3dB
Inter-channel Phase	<0.1 degrees (record or play)
Inter-channel Crosstalk	>110dB (record or play)
DIGITAL INPUT/OUTPUT [3]	
Type	AES/EBU (EIAJ CP-340 Type I / IEC-958 Professional)
Input/Output Impedance	110 ohms
Connector	Mini26 (SCSI-II type)
Sample Rates	32, 44.1, 48, 88.2 and 96kHz with sample rate converters on inputs
SAMPLE RATE CLOCK	
Internal (Adapter)	32, 44.1 48, 88.2 and 96kHz
	NOTE: When playing and/or recording multiple files, one sample rate must be used.
AES/EBU Sync In [3]	32, 44.1 48, 88.2 and 96kHz on dedicated AES/EBU input
Word In [3]	32, 44.1 48, 88.2 and 96kHz
Word Out [3]	32, 44.1 48, 88.2 and 96kHz
SIGNAL PROCESSING	
DSP	Texas Instruments TMS320C6713@300MHz
Memory	8MB
Audio Formats	8 bit unsigned PCM 16 bit signed PCM 32 bit floating point PCM
BREAKOUT CABLES (INCLUDED)	
Analog	CBL1004: Mini 50 to Centronics 50 adapter.
	CBL1044: Centronics 50 to 8 in and 8 out XLR.
Digital [2]	CBL1101: Mini 26 to Centronics 50 adapter.
	CBL1144: Centronics 50 to 4 in, 4 out stereo XLR, 1 BNC in, 1 BNC out (Word Clk).
GENERAL	
Bus	PCI
Dimensions	PCI short-length form factor (6.6 inches/168mm long).
Weight	8 oz (227g) max
Operating Temperature	0C to 70C
Power Requirements	+3.3V@1.5A +12V @ 300mA

NOTES:
[1] Dynamic Range and THD+N measured using a +20dBu 1kHz sine wave sampled at 48kHz and A weighting filter.
[2] ASI5540, ASI5544 Only
[3] ASI5541, ASI5544 Only

5 REVISIONS

Date	Description
10 March 2011	Preliminary.
22 July 2011	Removed erroneous PCI Express references.
09 August 2011	Added Low Latency mode.

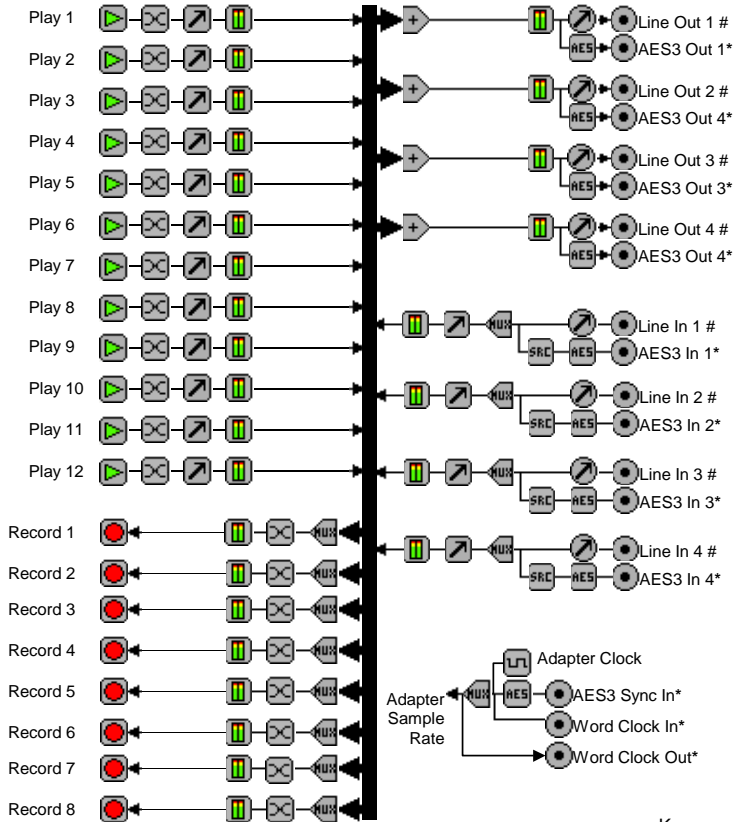# 6 CONTENTS

7 BLOCK DIAGRAMS

7.1   12-Play Mode

ASI554x – 12-Play Mode

7.2   SSX2 Multi-channel Mode

ASI554x – 12-Play Mode + SSX2 Multichannel Mode
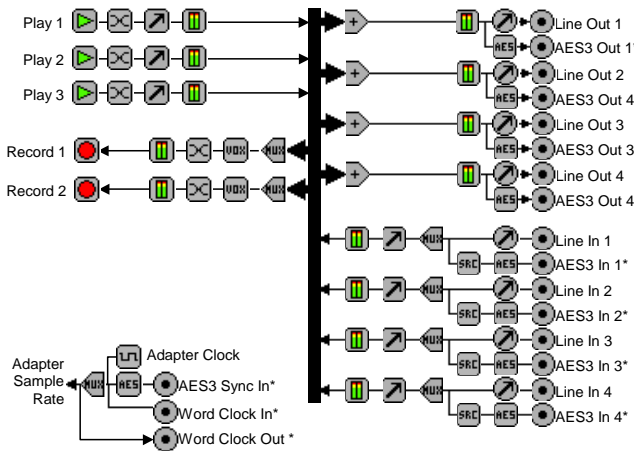
* ASI5541 and ASI5544 Only

8 CONNECTORS

8.1 Mini 50pin - Analog

Centronics 50pin

LI0-	1	26	LI0+
RI0-	2	27	RI0+
LI1-	3	28	LI1+
RI1-	4	29	RI1+
LI2-	5	30	LI2+
RI2-	6	31	RI2+
LI3-	7	32	LI3+
RI3-	8	33	RI3+
RO3-	9	34	RO3+
LO3-	10	35	LO3+
RO2-	11	36	RO2+
LO2-	12	37	LO2+
RO1-	13	38	RO1+
LO1-	14	39	LO1+
RO0-	15	40	RO0+
LO0-	16	41	LO0+
RO4-	17	42	RO4+
LO4-	18	43	LO4+
RO5-	19	44	RO5+
LO5-	20	45	LO5+
RO6-	21	46	RO6+
LO6-	22	47	LO6+
RO7-	23	48	RO7+
LO7-	24	49	LO7+
GND	25	50	GND

8.2 DB26 - Digital

**High Density
26pin**

AI1-	1	14	AI1+	AES/EBU In
AI2-	2	15	AI2+	
AI3-	3	16	AI3+	
AI4-	4	17	AI4+	
AO1-	5	18	AO1+	AES/EBU Out
AO2-	6	19	AO2+	
AO3-	7	20	AO3+	
AO4-	8	21	AO4+	
	9	22	-	
-	10	23	-	
SYNC-	11	24	SYNC+	Sync In
WORDI	12	25	WORDO	
GND	13	26	GND	

**WORD In/Out and SYNC +/-
for ASI6000 series only**

9 CABLES

9.1 Analog

CBL1004: Mini DB50 to Centronics 50pin adapter, balanced analog.
CBL1044: Centronics 50pin to XLR; 4 stereo in and 4 stereo out.

9.2 Digital

CBL1101: Mini DB26 to Centronics 50pin adapter, AES/EBU.
CBL1144: Centronics 50pin to XLR; 4 stereo in and 4 stereo, 1 BNC in, 1 BNC out (Word Clock).

1 HARDWARE INSTALLATION

This section explains how to install one or more AudioScience adapters in a computer.

1.1 Setting Adapter Index – One Adapter in the PC

1. Make sure your computer is turned off.

2. PCI adapters should be installed in any empty PCI slot and PCIe adapters should be installed in any x1 (or greater) PCIe slot.

3. Make sure the adapter jumper is set to adapter index #1, the factory default. For a new card no changes need to be made. For an AudioScience adapter from another installation, check that it is set to adapter index #1.

![AudioScience logo]

Depending on the adapter family, there are different ways of setting the adapter index.

For ASI5000 and ASI6000 families, there is an adapter jumper that must be set. The left most position represents adapter index #1.

Adapter Jumper set
to Adapter #1
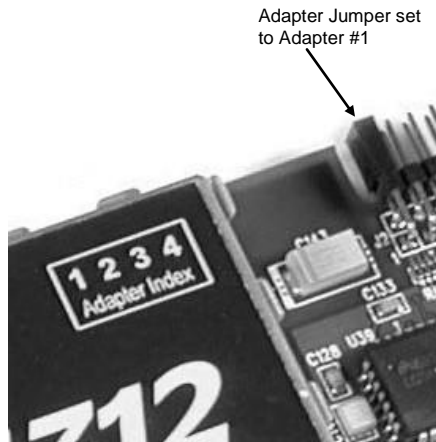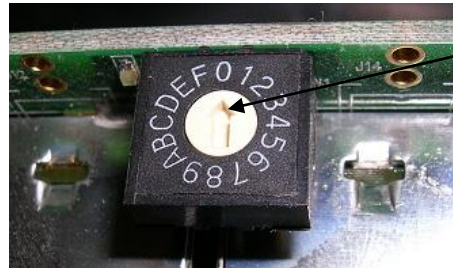

For ASI5300, ASI6300, ASI8700, and ASI8900 families, there is a rotary switch.

NOTE: Position 0 (zero) represents adapter #1, position 1 is adapter #2, etc.

Adapter Index switch
set to Adapter #1

4. Turn on the computer and let it boot. Under Windows, a dialog box will pop up informing you that the computer has detected a new Multimedia Audio card. Cancel out of this dialog box and proceed to the software installation section of this datasheet.

1.1.1   Setting Adapter Index - Two or More Adapters in the PC

1. Make sure your computer is turned off.

2. PCI adapters should be installed in any empty PCI slots and PCIe adapters should be installed in any x1 (or greater) PCIe slots. Different adapter types can coexist in the same computer; for example, an ASI6416 and ASI8921 will work correctly if installed in the same PC. Different adapter types still require unique adapter index numbers.

3. Each adapter in the PC needs to have its adapter jumper/rotary switch position set to unique numbers. For example if you are installing two adapters, the first one would be set to adapter index #1 and the second to adapter index #2.

3.1. For ASI5000 and ASI6000 families, the position to the right of index #1, when jumpered, represents adapter index #2. The next position represents #3, and the rightmost position, when jumpered, represents #4.

3.2. For ASI5300, ASI6300, ASI8700, and ASI8900 families, rotate the rotary switch to indicate what position is required.

4. Turn on the computer and let it boot. Under Windows, a dialog box will pop up informing you that the computer has detected a new Multimedia Audio card. Cancel out of this dialog box and proceed to the software installation section of this datasheet.

2   SOFTWARE INSTALLATION

AudioScience makes audio adapters and drivers for various operating systems. Enhancements to an adapter's utility come from the integrators software that uses the audio driver to implement sophisticated audio playback and recording functions.

2.1   Drivers for Windows XP/Server 2003/Server 2008/7

The first step is what type of driver is needed for the adapter. There are two types of drivers for Windows: The WAVE driver and the WDM driver. Typically this will be decided by the application used with the AudioScience adapter. For any application that uses DirectSound, use the WDM driver.

Driver 3.10 and later present the user with three install options during installation:
- Install Standard PCI/PCIe Driver.
- Install Standard + Network Audio Driver.
- Remove all driver components

Traditional installs should select the first of these options. Users of AudioScience CobraNet products should select the second option with the "+Network Audio Driver." in the text.

2.1.1   WAVE Driver

Download the file named ASIWAVE_xxxxxx.EXE from www.audioscience.com and run it (_xxxxxx is the version number). After the EXE has run, reboot the computer and the audio adapter will be operational. If the cover is off the computer, one can see one or two blinking LEDs on top of the card indicating its DSP is running and communicating with the driver.

Verify that the adapter is running using ASIControl (see ASIControl section in this document).

2.1.2   WDM Driver

Download the file named ASIWDM_xxxxxx.EXE from www.audioscience.com and run it (_xxxxxx is the version number). After the EXE has run, reboot the computer and the audio adapter will be operational. If the cover is off the computer, one can see one or two blinking LEDs on top of the card indicating its DSP is running and communicating with the driver.

Verify that the adapter is running using ASIControl (see ASIControl section in this document).

2.1.3   Combo Driver

The Combo driver presents both Wave and WDM devices to the user. Download the file named ASICOMBOV_xxxxxx.EXE from www.audioscience.com and run it (_xxxxxx is the version number). After the EXE has run, reboot your computer and the audio adapter will be operational. If the cover is off the computer, one can see one or two blinking LEDs on top of the card indicating its DSP is running and communicating with the driver.

Verify that the adapter is running using ASIControl (see ASIControl section in this document).

2.1.4   ASIO

All AudioScience drivers also install an ASIO driver interface. It is installed by default.

2.1.5   Driver Failure

In the event that an adapter's driver fails to load correctly, the OS's event viewer should be checked. The event log is viewed as follows:

XP: The system event log is accessed from \Start\Control Panel\Administrative Tools\Event Viewer. The System view should be selected.

7: The system event log is accessed from \Start\Control Panel\System and Maintenance\Administrative Tools\Event Viewer. The Windows Logs\System view should be selected.

If two or more adapters are installed in the same system, the first thing to check is that the adapters were assigned unique adapter numbers. If issues persist, please email support@audioscience.com.

2.2   Drivers for Linux

The latest Linux driver can be downloaded from the AudioScience website – www.audioscience.com

2.3   Applications for Windows

AudioScience provides two application for adapter set-up and configuration: ASIControl and ASIMixer.

2.3.1 ASIControl

All Windows drivers install an AudioScience application called ASIControl that can be used to setup and verify functionality of adapters. ASIControl provides a common interface for users across all driver types.

The following list of controls are uniquely supported in ASIControl (as opposed to ASIMixer):
- ASI8700 tuner pre-emphasis   - ASI8900 tuner RBDS
- ASI8900 tuner FM stereo indication   - ASI8914 HD Radio PSD field
- ASI8914 HD Radio Digital status field   - ASI8914 HD Radio Digital program number selection

From the Windows Start menu, navigate to Start→Programs→AudioScience and run the ASIControl program.

When started, ASIControl will look something like the following:
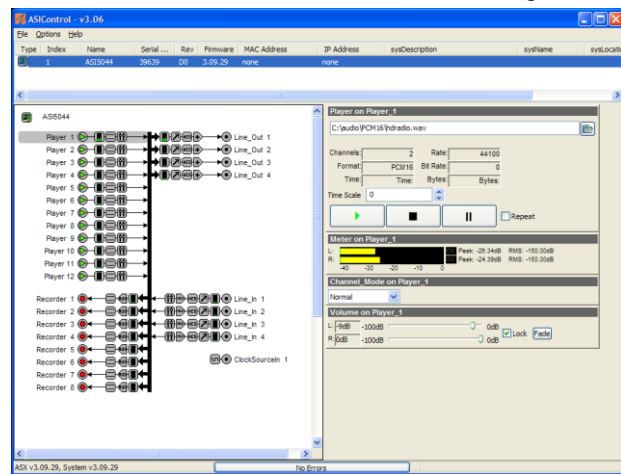

2.3.2 ASIMixer

ASIMixer is specific to the Wave and Combo drivers and is available from the AudioScience website. It uses the Wave/Mixer interface to control AudioScience adapters. Users of driver version 3.10 and later are encouraged to use ASIControl for manipulating adapter controls.

See the list of controls in the previous section that that are only available in ASIControl.

10 OPERATION USING ASICONTROL

Using ASIControl, the ASI5544 will look like similar to the following:
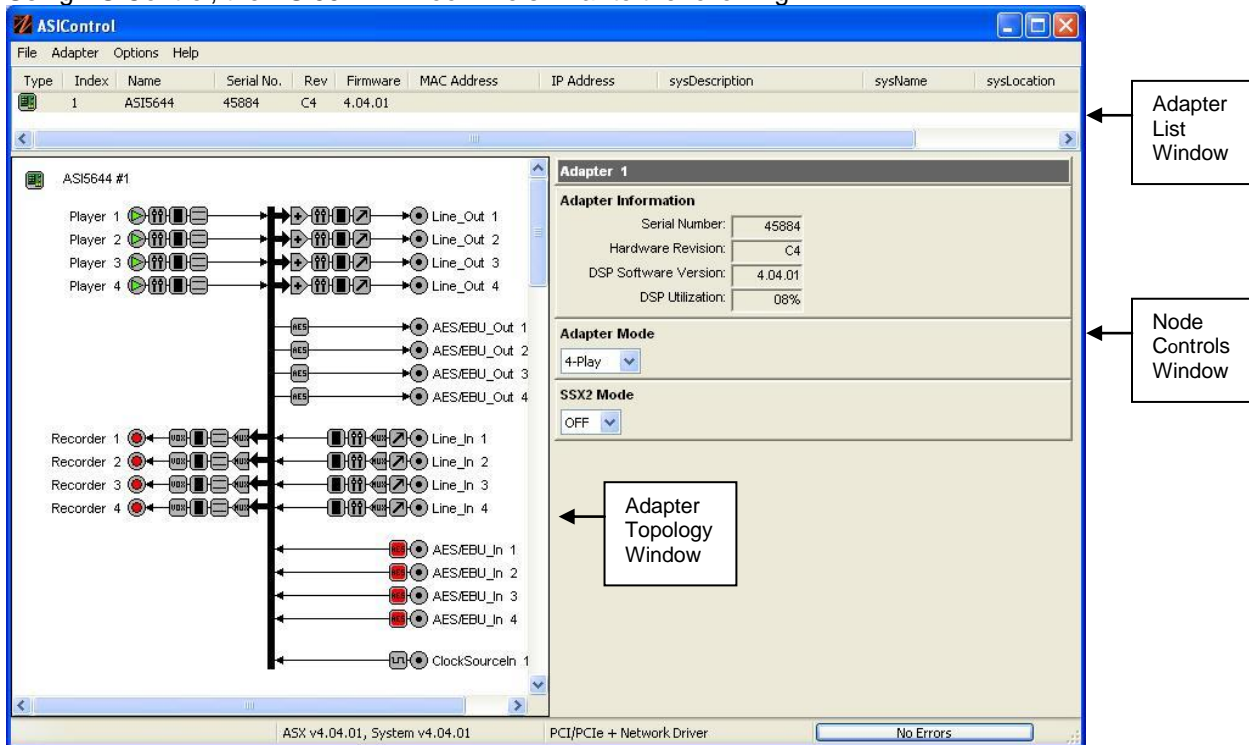
2.4   User Interface

ASIControl consists of three main windows: the adapter list in the top portion of the window, the adapter topology view on the left hand side, and the node control list on the right hand side.

2.4.1   Adapter List Window

The top portion of ASIControl shows a list of all the adapters that the application has found. By default, only bus based (i.e. PCI and/or PCI Express) adapters will be shown. If the network portion of the driver is installed (by selecting "Install Standard + Networked Audio Driver" after running the driver installer) and "Local PCI(e) + Networked adapters" is selected from ASIControl's Options→Configure adapter interface, then AudioScience and other third party CobraNet devices will be shown.

Adapters are listed in order of adapter index. For bus-based adapters, this is determined by the adapter index jumper on the card. For AudioScience CobraNet devices this is calculated from the unit's MAC address. Third party CobraNet devices are listed last as they have no AudioScience index.

2.4.2   Adapter Topology Window

The left hand side of ASIControl contains the topology view of the adapter. It is essentially a block diagram of the device showing the available physical inputs and outputs on the right hand side of the black, vertical 'bus' line. On the left hand side of the bus line, bus-based adapters show player and recorder streams, while CobraNet adapters show their network connections.

Each of the inputs and outputs is referred to as a node and each Node contains one or more controls. The topology shows each control as a small icon. A non-exhaustive list of nodes follows:

Line In	Recorder
Line Out	Tuner
AES/EBU In	Clock Source In
AES/EBU Out	CobraNet In
Player	CobraNet Out

Hovering the mouse over a particular node will highlight it. Clicking on a node will bring up the controls resident on that node in the right hand control list.

There is an adapter node in the top left corner of the topology window. Clicking on this will show adapter-specific controls and properties on the right hand side.

Not all adapters have all nodes.

2.4.3   Node Controls Window

The right hand side of ASIControl shows the controls associated with the selected node in the topology view. The controls are arranged, from top to bottom, in order of audio signal flow, i.e. the audio signal can be viewed as entering the node at the top control and leaving at the bottom control. Controls may be used to either manipulate the audio as it passes through the node, or report back control status information.

For a comprehensive listing of controls and how to operate ASIControl, please see the ASIControl manual available from www.audioscience.com and also installed by the driver. Not all adapters have all controls.

The section below lists some common and any specific controls, as seen in ASIControl, for this adapter.
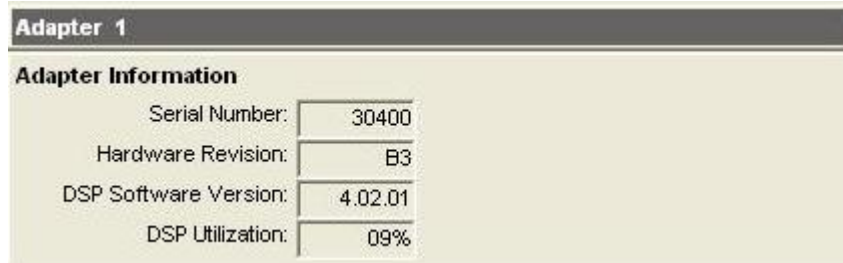
10.1 Controls

For further information on controls common to all AudioScience adapters and how to operate ASIControl, please see the ASIControl manual, available from www.audioscience.com and also installed by the driver.

2.5   Adapter Information

This control displays information about the installed AudioScience product.

2.5.1   Interface

Figure 1. Adapter information seen in right side of ASIControl.

Serial Number:
The serial number is displayed here.

Hardware Revision:
This lists the hardware revision of the AudioScience product.

DSP Software Version:
The DSP software version is displayed; usually the same as the driver version installed.

DSP Utilization:
This shows the loading of the AudioScience product's DSP in percent.
Note: Utilization should be kept below 90%.

2.6 Adapter Mode

The Adapter_Mode control changes the number of players/recorders/lineouts that an adapter has. On certain adapters, not all sample rates/formats are supported; changing the mode of the adapter allows for best functionality with certain sample rates/formats. Different adapters will have different modes available, and not all adapters have modes. Please see datasheets on specific adapters, available at www.audioscience.com, to learn more.

2.6.1 Interface

Figure 2. Adapter Mode in ASIControl.

Selecting the appropriate mode from the list using the dropdown arrow changes the Adapter_Mode setting. A reboot is necessary after changing adapter mode. The mode setting is saved to the adapter's EEPROM.

The ASI554x family supports four adapter modes: 4-Play, 12-Play, Mono, and Low Latency.

10.1.1.1 4-Play

This mode supports 4 Play streams and 4 Record streams with full mixing capabilities.

10.1.1.2 12-Play

This mode supports 12lay streams and 8 Record streams with full mixing capabilities.

10.1.1.3 Mono

Note: Driver 4.02.00 or later is needed for Mono mode.
This mode supports 8 mono Play streams and 8 mono Record streams with full mixing capabilities. Mono mode supports mapping a single Play or Line_In device to a single Line_Out channel.

2.7 SSX2 Mode

The AudioScience Surround Sound eXtension v2 (SSX2) mode control changes the players/recorders of an adapter to be able to play/record multichannel files of 2, 4, 6, or 8 channels. Implementing SSX2 mode is slightly different depending on what driver version is installed with the AudioScience adapter' see below.

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), set SSX2 Mode to On 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.

For further information on SSX2, see its datasheet under the Technology section at www.audioscience.com.

2.7.1 Enabling SSX2 with Driver 4.02 and Higher

2.7.1.1 Interface

Figure 3. SSX2 Mode seen in right side of ASIControl.

Selecting "On" using the dropdown arrow changes the SSX2 Mode setting. A reboot is necessary after changing the mode setting. The mode setting is saved to the adapter's EEPROM. After rebooting, one multichannel play or record stream will be created for each 4 play or record streams on the adapter.

2.7.2 Enabling SSX2 with Driver 3.08 to 3.14

SSX2 was fully implemented starting with driver 3.08. For drivers 3.08 to 3.14, the ASIDRV.INI file is altered to enable SSX2 mode. Got to `C:\Windows\ASIDRV.INI`. Double click on `ASIDRV.INI` and change the SSX2 field to enable it:

```
Enabled SSX2 streams = yes
```

then reboot. After rebooting, one multichannel play or record stream will be created for each 4 play or record streams on the adapter.
Selecting "On" using the dropdown arrow changes the SSX2 Mode setting. A reboot is necessary after changing the mode setting. The mode setting is saved to the adapter's EEPROM. After rebooting, one multichannel play or record stream will be created for each 4 play or record streams on the adapter.

10.1.1.4 Low Latency

NOTE: Driver 4.06.00 or later is required.

This mode supports a single multichannel audio stream enabling live sound processing in ASIO and Core Audio applications. See the [Low Latency Mode datasheet](#) for further information.