AUDIOSCIENCE
((BUILT FOR BROADCAST))

ASI5041, ASI5042, ASI5044
MULTISTREAM LINEAR AUDIO ADAPTERS

1 DESCRIPTION

The ASI5041, ASI5042 and ASI5044 are professional PCI audio adapters designed for use in the broadcast and entertainment markets.

The ASI5041 features four AES/EBU inputs and outputs.

The ASI5042 features four balanced analog stereo inputs and outputs.

The ASI5044 features four balanced analog stereo inputs and outputs and four AES/EBU inputs and outputs.

SSX multi-channel mode allows record, playback and mixing of audio streams of up to 8 channels.

2 FEATURES

- Twelve mono/stereo streams of PCM playback into four stereo outputs

- Eight mono/stereo streams of PCM record

- Four stereo balanced analog outputs. Four balanced stereo analog inputs (ASI5044, ASI5042)

- Four transformer coupled AES/EBU digital outputs. Four transformer coupled AES/EBU digital inputs (ASI5044, ASI5041)

- 24bit analog-to-digital and digital-to-analog converters. 105dB SNR and 0.0015% THD+N (ASI5044, ASI5042)

- Formats include 8,16 and 32bit PCM

- Sample rates of 32, 44.1, 48, 64, 88.2, 96 and 192kHz

- SSX multi-channel mode

- SoundGuard™ transient voltage suppression on all I/O

- Up to 8 cards in one system (driver 3.12.00 or later required)

- Windows XP/Server 2003/Server 2008/7 and Linux software drivers available
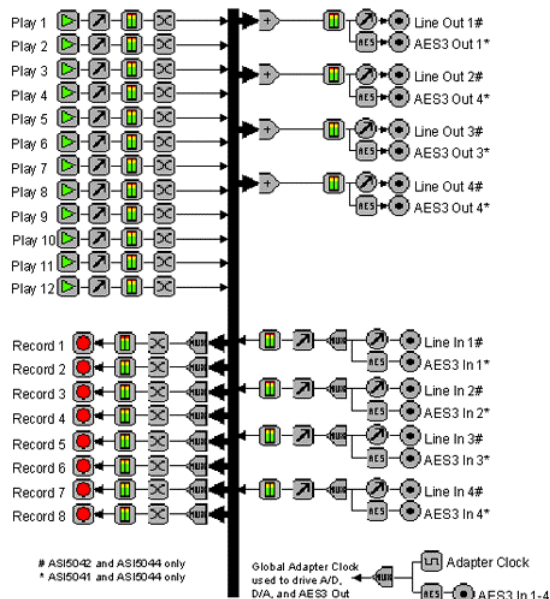
3 SPECIFICATIONS

ANALOG INPUT/OUTPUT

Type	Balanced
Connector	Mini50 (SCSI-II type)
Input Level	-10 to +20dBu in 1dBu steps
Input Impedance	20K ohms
A/D converter	24bit Over sampling
Output Level	-10 to +20dBu in 1dBu steps
D/A converter	24bit Over sampling
Load Impedance	600ohms or greater
Dynamic Range[1]	>100dB (record or play)
THD+N[2]	<0.0015% (-96dB), record or play
Sample Rates	32, 44.1, 48, 64, 88.2, 96 and 192kHz
Frequency Response	20Hz to 20kHz +/-0.25dB, 20Hz to 50kHz +0.25/-3dB

DIGITAL INPUT/OUTPUT

Type	AES/EBU (EIAJ CP-340 Type I / IEC-958 Professional)
Connector	Mini26 (SCSI-II type)
Sample Rates	32, 44.1, 48, 64, 88.2, 96 and 192kHz.
	NOTE: All inputs must be synchronized.

SAMPLE RATE CLOCK

Internal	32, 44.1, 48, 64, 88.2, 96 and 192kHz
	NOTE: When playing and/or recording multiple files, one sample rate must be used.
External	Synchronizes to AES/EBU digital input #1-4
	NOTE: All AES/EBU inputs must be synchronized to a common clock as the ASI504x does not have sample rate converters.

SIGNAL PROCESSING

DSP	Texas Instruments TMS320C6205@190MHz
Memory	8MB
Audio Formats	8 bit unsigned PCM
	16bit signed PCM
	24bit signed PCM
	32bit signed PCM

BREAKOUT CABLES

Analog	CBL1004: Mini 50 to Centronics 50 adapter.
	CBL1044: Centronics 50 to 8 in and 8 out XLR.
Digital	CBL1101: Mini 26 to Centronics 50 adapter.
	CBL1144: Centronics 50 to 4 in, 4 out XLR

GENERAL

Bus	Universal 32bit PCI (3.3V or 5V signaling)
Dimensions	PCI form factor – 6.5" x 3.9" x 0.6" (165mm x 100mm x 15mm)
Weight	8 oz (227g) max
Operating Temperature	0C to 70C
Power Requirements	+3.3V@500mA, +12V @ 300mA, -12V @ 130mA (NOTE 3.3V must be available from the PCI bus)

[2] - THD+N measured using a +20dBu 1kHz sine wave sampled at 48kHz, 20-20kHz b/w and A weighting filter
[1] – Dynamic Range is the THD+N of a –60dBFs 1kHz sinewave + 60dB with a level of +20dBu and 20-20kHz bandwidth

4 REVISIONS

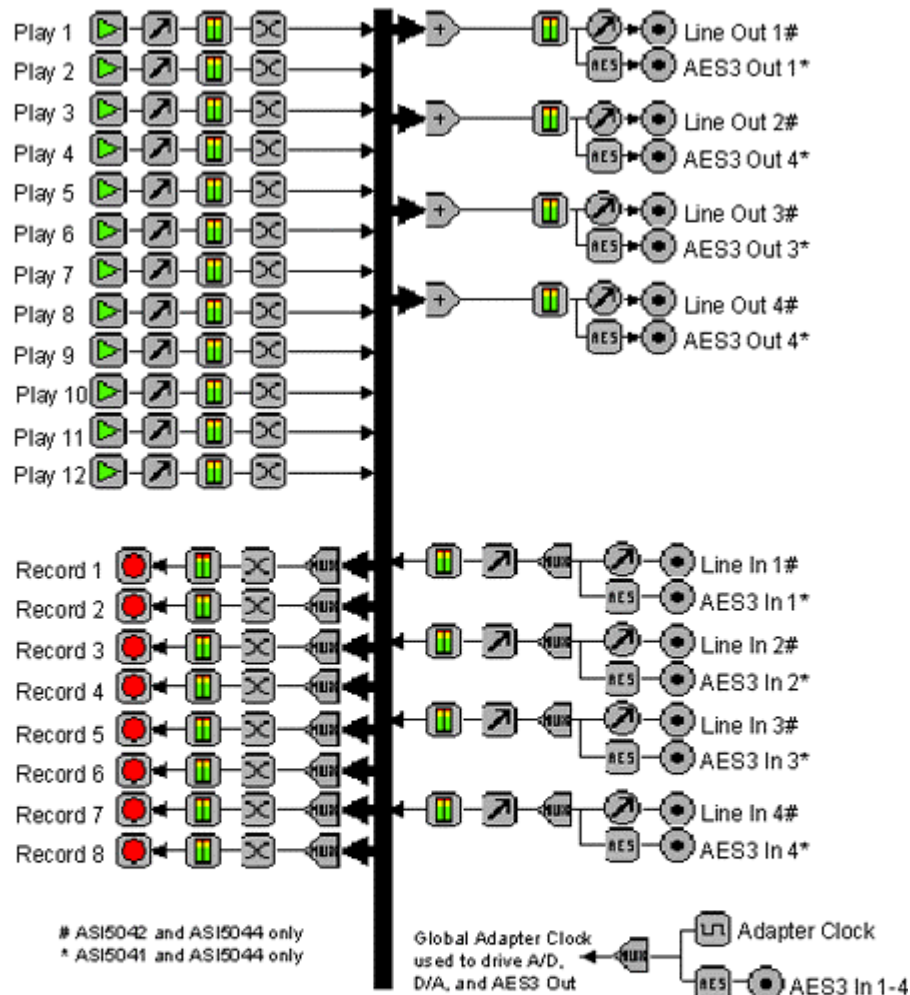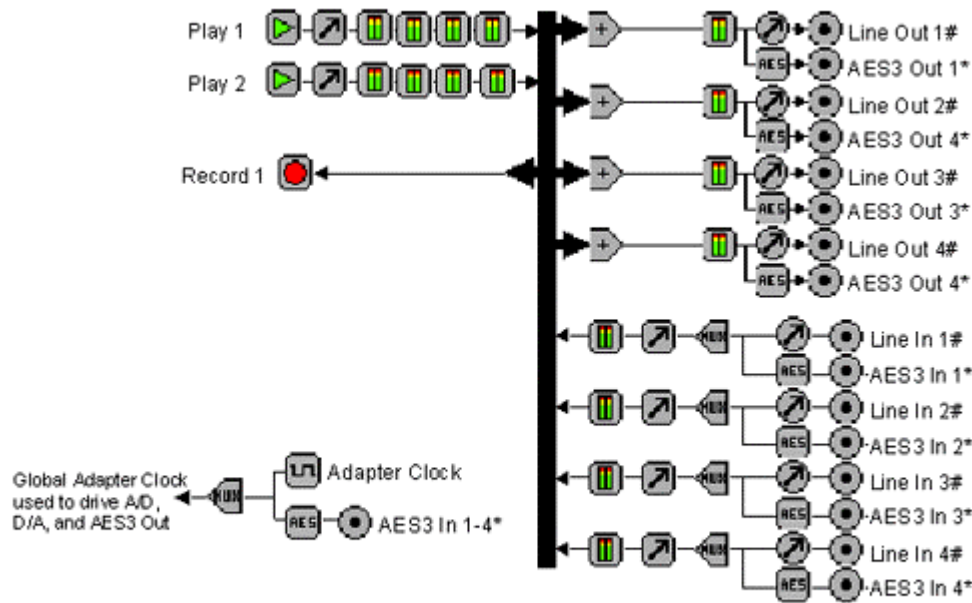| Date	Description
03 September 2008	Added phase/sample offset errata.
12 March 2009	Updated format. Adapter Modes section - added supported formats for each mode.
30 March 2009	Audio Formats and Adapter Modes sections amended; PCM8 and FLOAT32 not supported in SSX Multichannel Mode.
01 May 2009	Audio Formats and Adapter Modes sections amended; PCM8 and FOAT32 not supported in Mode-2 and Mode-3. Updated first page format.
26 June 2009	Updated block diagrams.
07 January 2010	Page 1: Updated list of software drivers available. Added Mono mode section.
26 July 2010	Updated datasheet format. Updated clock source I formation. Updated to ASIControl images.
15 September 2010	Updated datasheet format. Updated Adapter Mode tables.

5   CONTENTS

6   BLOCK DIAGRAMS

6.1   Mode 1

ASI5044 – Mode 1

6.2 SSX Multichannel Mode

ASI504x – SSX Multichannel Mode

ASI5042 and ASI5044 only
* ASI5041 and ASI5044 only

Key:
- Record Stream
- Play Stream
- Input/Output
- Volume
- Level
- Mixer
- Multiplexer
- AES/EBU Tx/Rx
- Meter
- Channel Mode
- Clock Source

7 CONNECTORS

7.1 Analog – Mini 50pin

Mini 50pin - Analog

```
LI1-   1    26  LI1+
RI1-   2    27  RI1+
LI2-   3    28  LI2+
RI2-   4    29  RI2+          Analog In
LI3-   5    30  LI3+
RI3-   6    31  RI3+
LI4-   7    32  LI4+
RI4-   8    33  RI4+
RO4.   9    34  RO4+
LO4.   10   35  LO4+
RO3.   11   36  RO3+
LO3.   12   37  LO3+
RO2-   13   38  RO2+
LO2-   14   39  LO2+          Analog Out
RO1-   15   40  RO1+
LO1-   16   41  LO1+
  .    17   42  .
  .    18   43  .
  -    19   44  .
  -    20   45  -
  -    21   46  -
  -    22   47  -
  -    23   48  -
  -    24   49  -
GND    25   50  GND
```

7.2 Digital – Mini 26pin

Mini 26pin - Digital

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

8 CABLES

8.1 Analog

CBL1004 - Mini 50 to Centronics 50 adapter
CBL1044 - Centronics 50 to 8 in and 8 out XLR

8.2 Digital (ASI5041, ASI5044 only)

CBL1101 - Mini 26 to Centronics 50 adapter
CBL1144 - Centronics 50 to 4 in, 4 out XLR

9   HARDWARE INSTALLATION

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

9.1   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.

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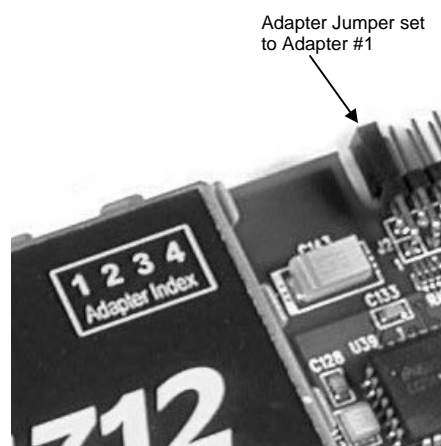
For ASI5300, ASI6300, ASI8700, and ASI8900 families, there is a rotary switch.

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

Adapter Jumper set to Adapter #1

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.

9.2   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.

10 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.

10.1 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.

10.1.1 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).

10.1.2 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).

10.1.3 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).

10.1.4 ASIO

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

10.1.5 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.

10.2 Drivers for Linux

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

10.3 Applications for Windows

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

10.3.1 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:
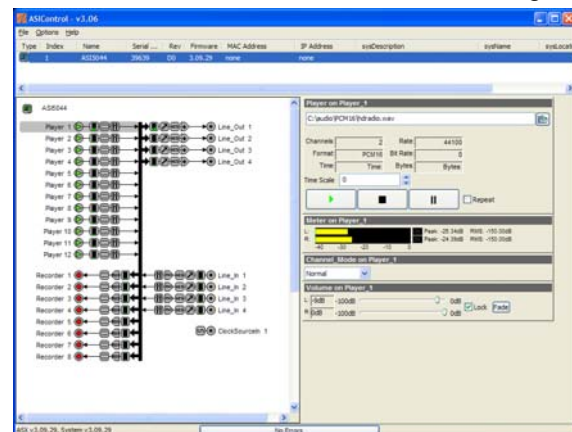
10.3.2 ASIMixer

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.

11 OPERATION USING ASICONTROL

Using ASIControl, the ASI5044 will look like so:

11.1 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.

11.1.1 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.

11.1.2 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. On the left hand side, bus based adapters show player and recorder streams, while CobraNet adapters show their network connections.

Each of these inputs and outputs is referred to as a Node and each Node contains one or more Controls on it. The topology shows each Control as a small square 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.

11.1.3 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.

11.2 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.

Below is a list of controls in ASIControl specific to this adapter.

11.2.1 Adapter Information

This control displays information about the installed adapter or ASI2416.

11.2.1.1 Interface

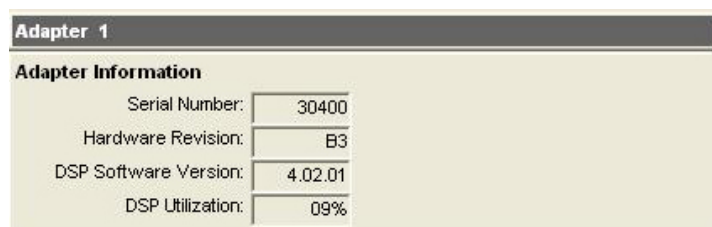**Figure 1. Adapter information seen in right side of ASIControl.**

Serial Number:
The serial number is displayed here.

Hardware Revision:
This lists the hardware revision.

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 adapter's DSP in percent.
Note: Utilization should be kept below 90%

11.2.2 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.

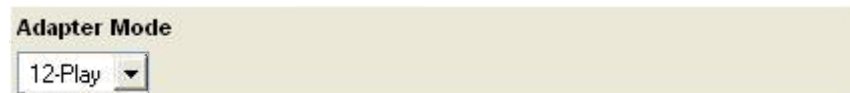### 11.2.2.1 Interface

Adapter Mode

12-Play ▾

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 ASI504x supports sample rates up to 192 kHz, but not all rates are available in all modes, or at full sample resolution. The following tables describe the bit resolutions available at various sample rates on an ASI504x in each mode.

11.2.2.2 Mode-1 (default) – Standard Sample Rate

This mode is supported on the ASI5044, ASI5042, and ASI5041 and exposes 12 Play streams and 8 Record streams. 24-bit sampling is supported up to 48 kHz.

Formats supported: PCM8, PCM16, PCM24, PCM32, FLOAT32

Sample Rate (kHz)	Analog sample resolution	AES/EBU sample resolution	Number of play/record streams
32-48	24	24	12/8
64-96	Not supported	Not supported	-
192	Not supported	Not supported	-

11.2.2.3 Mode-2 – High Sample Rate (Analog & Digital)

This mode is supported on the ASI5044, ASI5042, and ASI5041. All sample rates are supported. At sample rates higher than 48 kHz, 16-bit sample resolution is used.

Formats supported: PCM16, PCM24, PCM32

Sample Rate (kHz)	Analog sample resolution	AES/EBU sample resolution	Number of play/record streams
32-48	24	24	4/4
64-96	16	16	4/4
192	16	16	2/2

11.2.2.4 Mode-3 – High Sample Rate (Digital Only)

This mode is supported on the ASI5044 and ASI5041. All sample rates are supported at 24 bits resolution. Analog I/O does not work.

Formats supported: PCM16, PCM24, PCM32

Sample Rate (kHz)	Analog sample resolution	AES/EBU sample resolution	Number of play/record streams
32-48	Not supported	24	4/4
64-96	Not supported	24	4/4
192	Not supported	24	2/2

11.2.2.5 Mono Mode

Note: Driver 4.02.00 or higher is required.
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.

11.2.3 SSX Mode

The AudioScience Surround Sound eXtensions (SSX) mode control changes the players/recorders of the AudioScience ASI504x series of adapters to play, record, and mix streams of up to 8 channels of audio. The number of channels may be 1, 2, 4, 6, or 8.

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

SSX mode supports 2 Play streams and 1 Record stream on the ASI5041/2/4. 24-bit sampling is supported up to 48 kHz.

Formats supported: PCM16, PCM24, PCM32

Sample Rate (kHz)	Analog sample resolution	AES/EBU sample resolution
32-48	24	24
64-96	Not supported	Not supported
192	Not supported	Not supported

11.2.3.1 Enabling SSX

To enable SSX, the adapter should be switched to "Multichannel" mode. Below describes how to do this.

11.2.3.1.1 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.

11.2.3.1.2 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.

For more information, see the SSX/SSX2 specification - http://www.audioscience.com/internet/tech/ssx.htm.

11.2.4 Balanced Analog I/O

The ASI504X has stereo balanced analog inputs and outputs on a mini 50 pin female connector.

11.2.4.1 Analog I/O Level

The analog Level (or Trim) is software programmable independently for the input and output. It can be set from -10 to +20dBu in 1dB increments.

User
Analog levels are adjusted using the Trim/Level controls located on the LineIn and LineOut panels in the ASIControl:
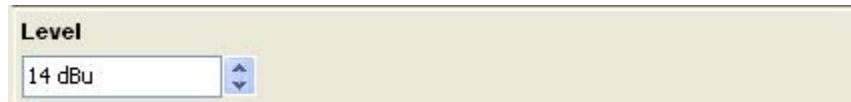
Developer
Windows – Analog levels are controlled using mixerSetControlDetails() on a control of type signed and with the name Level/Trim.
HPI – Analog levels controlled using the HPI_LevelSet() API.

11.2.5 AES/EBU I/O

The ASI504X has an AES/EBU digital audio input and output on a mini 26-pin female connector. The AES/EBU I/O operates at 32, 44.1, 48, 64, 88.2,96 or 192 kHz. The bitstream contains samples of 24bit precision (depending on the samplerate and adapter mode – see section 5). When a valid AES/EBU source is connected to the ASI504X, the card will automatically generate the sample clock from that source.

11.2.6 Channel Status and User Data

The ASI Mixer does not setup the Channel Status and User Data in the AES/EBU output. This must be done by the application using the following APIs:

> **Windows** – Use Digital I/O controls – see the "AudioScience WavX Specification" (SPCWAVX.PDF)
> **HPI** – Use HPI_AESEBU_Transmitter_SetChannelStatus() and HPI_AESEBU_Transmitter_SetUserData() APIs

Your application can also read the Channel Status and User Data of the AES/EBU input using the following APIs:

> **Windows** – Use Digital I/O controls – see the "AudioScience WavX Specification" (SPCWAVX.PDF)
> **HPI** – Use HPI_AESEBU_Receiver_GetChannelStatus() and HPI_AESEBU_Receiver_GetUserData() APIs

11.2.7 Sample Rate Clock

The ASI504X has two methods of generating the sample clock. The default method is to use the on board sample rate generator. The other method is to use the clock derived from one of the AES/EBU inputs.

The Sample Clock Control determines selection between these two clocking options.

> ### *User*
> Sample Clock source is selected using the SampleClk control on the Clock Src node. The options are:
>
> **Local** – the card gets its clock from the internal sample rate generator.
> The sample clock can be locked to the Local rate by checking the **Local Rate Lock** checkbox.
> **Note**: driver 3.12.00 or later is required.
>
> **AES3 In 1…4** – the card gets its clock from a specific AES/EBU input (#1 through #4).
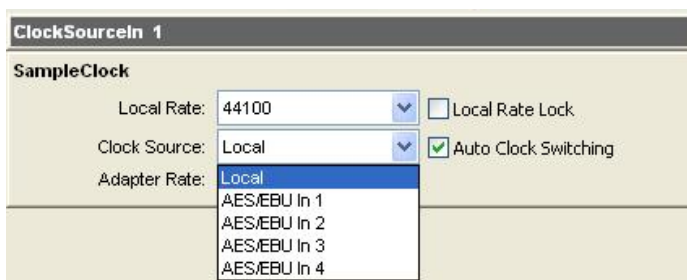
By checking the **Auto Clock Switching** checkbox**,** the card gets its clock from the first valid AES/EBU input, starting from #1.
Note: driver 3.12.00 or later is required to see the Auto Clock Switching check box. Prior to 3.12.00, select "AES3 Auto" from the dropdown list to accomplish the same thing.
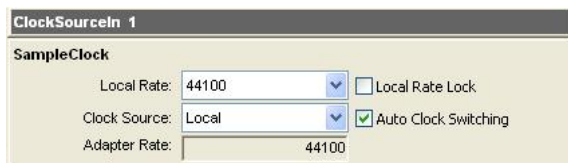
The **Adapter Rate** box displays the rate that the adapter is currently running at.

> ### *Developer*
> **Windows** – The SampleClk control appears as a Windows standard SingleSelect control of type MIXERCONTROL_CONTROLTYPE_SINGLESELECT. Use mixerSetControlDetails() with a details array of type MIXERCONTROLDETAILS_BOOLEAN to set the control value. Use mixerGetControlDetails() with parameter type MIXERCONTROLDETAILS_LISTTEXT and flags set to MIXER_GETCONTROLDETAILSF_LISTTEXT to retrieve the list of strings. Additionally the current setting can be obtained using mixerGetControlDetails () with parameter type MIXERCONTROLDETAILS_BOOLEAN and flags set to MIXER_GETCONTROLDETAILSF_VALUE.
>
> **HPI** – Use the `HPI_SampleClock_SetSource()` and `HPI_SampleClock_SetSourceIndex()` APIs

When using multiple AES/EBU inputs, all AES/EBU inputs should be locked to the same master clock. This is because the ASI504X captures exact digital samples without any sample rate conversion on the input audio data.

11.2.8 Meters

Note that the ASI504x line of adapters does not support RMS peak meters because the ASI504x line employs a fixed point DSP.

12 AUDIO FORMATS

The ASI504x supports record and play of the following formats:

Format	Description	HPI format	Windows format
PCM8 *	8 bit unsigned PCM	HPI_FORMAT_PCM8_UNSIGNED	WAVE_FORMAT_PCM, wBitsPerSample=8
PCM16	16 bit signed PCM	HPI_FORMAT_PCM16_SIGNED	WAVE_FORMAT_PCM, wBitsPerSample=16
PCM24	24 bit signed PCM	HPI_FORMAT_PCM24_SIGNED	WAVE_FORMAT_PCM, wBitsPerSample=24
PCM32	32 bit signed PCM	HPI_FORMAT_PCM32_SIGNED	WAVE_FORMAT_PCM, wBitsPerSample=32
FLOAT32 *	32 bit floating point PCM (+/-1.0)	HPI_FORMAT_PCM32_FLOAT	WAVE_FORMAT_IEEE_FLOAT

* Supported in Mode-1 only.

Note: Not all Modes support all formats (see Adapter Mode section).

13 Errata

13.1 0.25 sample offset between odd and even numbered inputs and outputs

Applies to: all ASI504xs

Relative to Line Out 1 and 3, samples on Line Out 2 and 4 are delayed 0.25 of a sample period. At 44.1 kHz this corresponds to 5.7us (2 degrees of phase @ 1 kHz, 40 degrees @ 20 kHz, 2mm at the speed of sound).
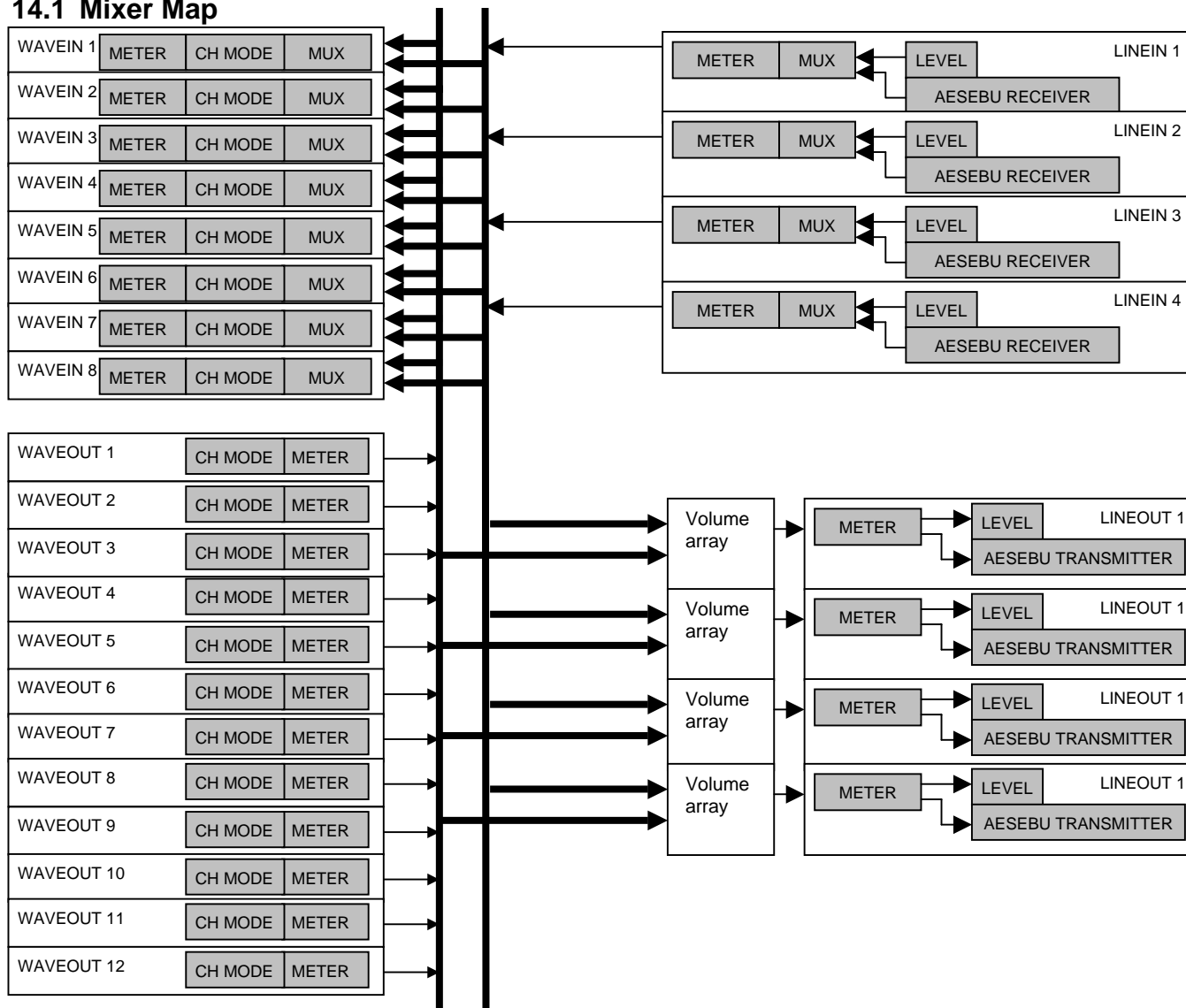
AES/EBU outputs have identical phase offsets to the analog Line Outs.

Relative to Line In 1 and 3, samples on Line In 2 and 4 are delayed 0.25 of a sample period. At 44.1 kHz this corresponds to 5.7us (2 degrees of phase @ 1 kHz, 40 degrees @ 20 kHz, 2mm at the speed of sound).

AES/EBU inputs have identical phase offsets to the analog Line Outs.

14 REFERNCES

14.1 Mixer Map

WAVEIN 1	METER	CH MODE	MUX
WAVEIN 2	METER	CH MODE	MUX
WAVEIN 3	METER	CH MODE	MUX
WAVEIN 4	METER	CH MODE	MUX
WAVEIN 5	METER	CH MODE	MUX
WAVEIN 6	METER	CH MODE	MUX
WAVEIN 7	METER	CH MODE	MUX
WAVEIN 8	METER	CH MODE	MUX

| METER | MUX | LEVEL | LINEIN 1 |
| | | AESEBU RECEIVER | |

| METER | MUX | LEVEL | LINEIN 2 |
| | | AESEBU RECEIVER | |

| METER | MUX | LEVEL | LINEIN 3 |
| | | AESEBU RECEIVER | |

| METER | MUX | LEVEL | LINEIN 4 |
| | | AESEBU RECEIVER | |

WAVEOUT 1	CH MODE	METER
WAVEOUT 2	CH MODE	METER
WAVEOUT 3	CH MODE	METER
WAVEOUT 4	CH MODE	METER
WAVEOUT 5	CH MODE	METER
WAVEOUT 6	CH MODE	METER
WAVEOUT 7	CH MODE	METER
WAVEOUT 8	CH MODE	METER
WAVEOUT 9	CH MODE	METER
WAVEOUT 10	CH MODE	METER
WAVEOUT 11	CH MODE	METER
WAVEOUT 12	CH MODE	METER

Volume array — METER — LEVEL — LINEOUT 1 — AESEBU TRANSMITTER

Volume array — METER — LEVEL — LINEOUT 1 — AESEBU TRANSMITTER

Volume array — METER — LEVEL — LINEOUT 1 — AESEBU TRANSMITTER

Volume array — METER — LEVEL — LINEOUT 1 — AESEBU TRANSMITTER

<end>