ASI5601/5602
MULTISTREAM LINEAR PCI/PCI EXPRESS AUDIO ADAPTERS

1 DESCRIPTION

The ASI5601 and ASI5602 are professional linear audio PCI Express (PCIe) adapters designed for use in the broadcast and entertainment markets.

The ASI5601 features four balanced analog stereo inputs and one balanced analog output.

The ASI5602 features four AES/EBU inputs and one AES/EBU output and four balanced analog stereo inputs and one balanced analog output.

2 FEATURES

- One stereo stream of PCM playback to one stereo output

- Eight stereo streams of PCM record

- Four balanced stereo analog inputs

- Four transformer coupled AES/EBU digital inputs (AS5602 only)

- 24bit analog-to-digital and digital-to-analog converters, 100dB SNR and 0.002% THD+N

- Formats include 8, 16, and 32bit PCM

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

- Syncs to any AES/EBU input (ASI5602 only)

- Up to 4 cards in one system

- Windows 8, 7, Server 2008/12 and Linux drivers available

ASI5601

ASI5602

Audioscience
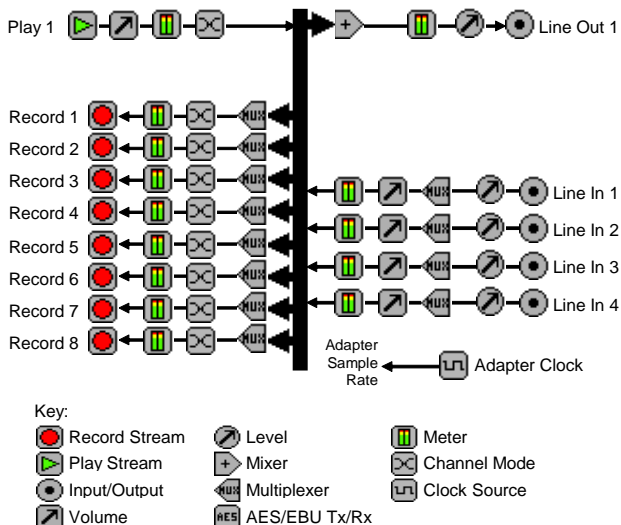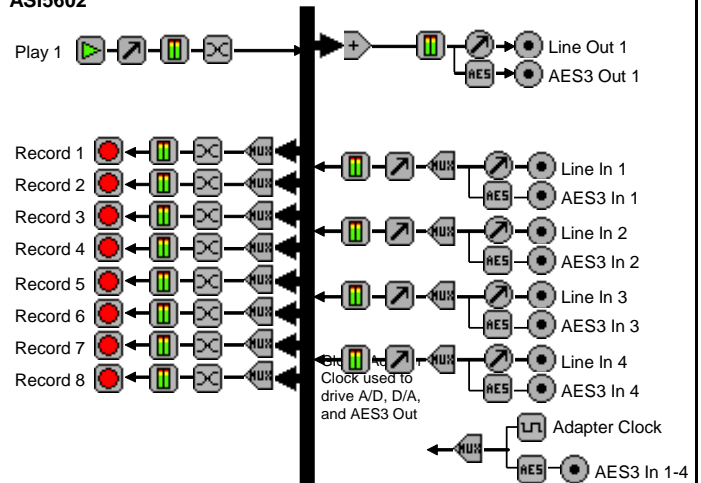
3 SPECIFICATIONS

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
S/N Ratio [1]	>105dB (record or play)
THD+N [2]	<0.0015% (record or play)
Sample Rates	32, 44.1, 48, 64, 88.2 and 96kHz
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 and 96.
	NOTE: All inputs must be synchronized.

SAMPLE RATE CLOCK

Internal (Adapter)	32, 44.1 48, 88.2 and 96kHz
AES/EBU Sync In [2]	32, 44.1 48, 88.2 and 96kHz on dedicated AES/EBU input
Word In [2]	32, 44.1 48, 88.2 and 96kHz
Word Out [2]	32, 44.1 48, 88.2 and 96kHz

SIGNAL PROCESSING

DSP	Texas Instruments TMS320C6713@300MHz
Memory	8MB
Audio Formats	8 bit unsigned PCM
	16bit signed PCM
	24bit signed PCM
	32bit signed PCM

BREAKOUT CABLES
(included)

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] - S/N Ratio is the difference between a 1kHz +20dBu sine wave and digital zero using an A weighting filter and 20-20kHz b/w
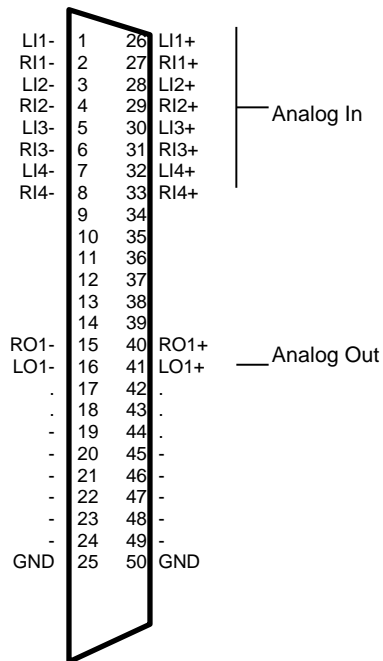
4 REVISIONS

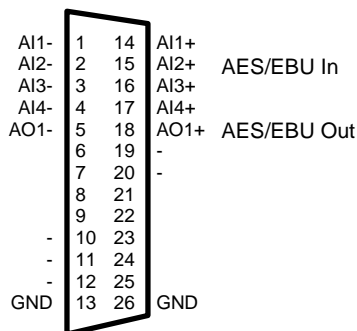| Date	Description
22 August 2011	Preliminary.
19 September 2011	Updated layout.
5 December 2011	Correct line out count
13 February 2013	Edited Digital I/O section
21 November 2014	Updated operating system and install instructions
24 March 2015	Removed ASI550x

5 CONTENTS

6 CONNECTORS

6.1 Analog – Mini 50pin

LI1-	1	26	LI1+
RI1-	2	27	RI1+
LI2-	3	28	LI2+
RI2-	4	29	RI2+
LI3-	5	30	LI3+
RI3-	6	31	RI3+
LI4-	7	32	LI4+
RI4-	8	33	RI4+
	9	34	
	10	35	
	11	36	
	12	37	
	13	38	
	14	39	
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

Analog In (pins 1–8 / 26–33)
Analog Out (pins 15–16 / 40–41)

6.2 Digital – Mini 26pin

AI1-	1	14	AI1+
AI2-	2	15	AI2+
AI3-	3	16	AI3+
AI4-	4	17	AI4+
AO1-	5	18	AO1+
	6	19	-
	7	20	-
	8	21	
	9	22	
-	10	23	
-	11	24	
-	12	25	
GND	13	26	GND

AES/EBU In (pins 1–4 / 14–17)
AES/EBU Out (pin 5 / 18)

7 CABLES (INCLUDED)

7.1 Analog

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

7.2 Digital

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

AudioScience

8   HARDWARE INSTALLATION

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

8.1   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.

Adapter Jumper set
to Adapter #1
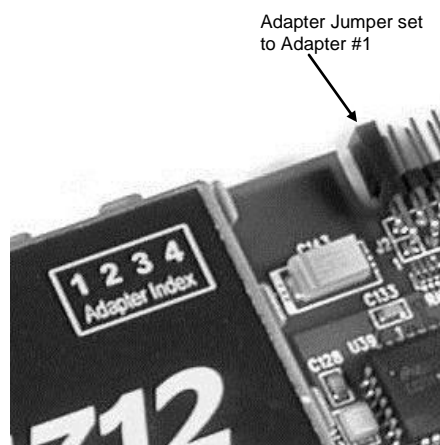
For ASI5300, ASI6300, ASI8700, and ASI8900 families, there is a rotary switch.

NOTE: Position 0 (zero) represents adapter #1, position 1 is adapter #2, etc.
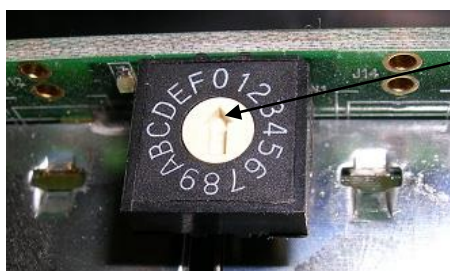
Adapter Index switch
set to Adapter #1

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.

8.1.1   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.

9   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.

9.1   Drivers for Windows 8, 7, Server 2008, Server 2012

Typically, drivers are not included with the hardware and will need to be downloaded from the AudioScience website. They can be found here: http://www.audioscience.com/internet/download/win_drivers.htm

The first step is to determine what type of driver is needed for your operating system. Drivers are available for 32-bit and 64-bit Windows systems.

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 and AVB products should select the second option with the "+Network Audio Driver." in the text.

9.1.1   Combo Driver

The Combo driver installs WDM devices by default and presents an option to "Install legacy 32-bit WAVE driver" in case your application requires it. Download the file named ASICOMBO_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).

9.1.2   ASIO

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

9.1.3   Driver Failure

In the event that an adapter's driver fails to load, check the OS's event viewer as follows:

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.

9.2   Drivers for Linux

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

9.3   Applications for Windows

AudioScience provides ASIControl for adapter set-up and configuration.
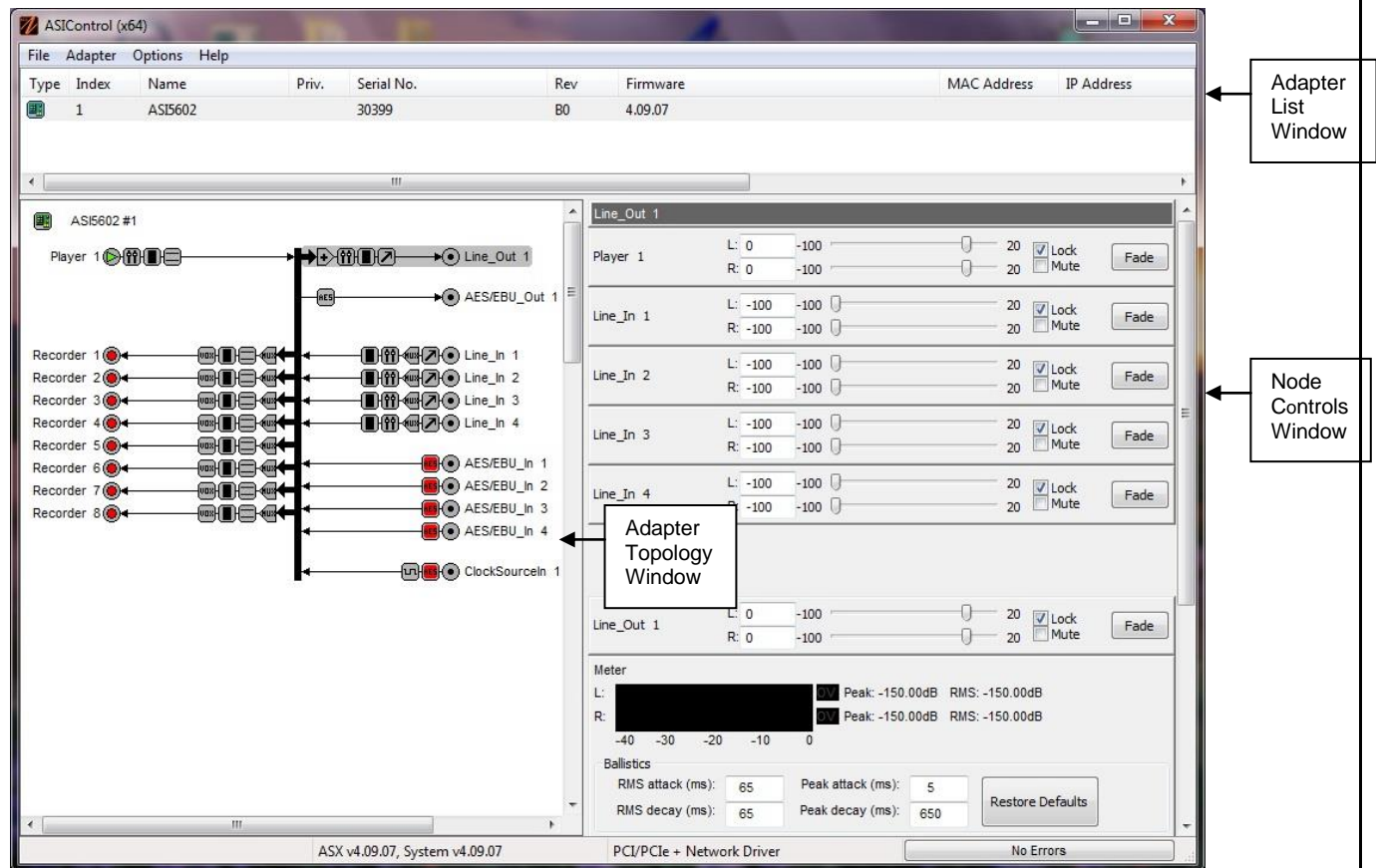
9.3.1   ASIControl

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

10 OPERATION USING ASICONTROL

Using ASIControl, the ASI5602 will look like so:

11 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 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.

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. 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.

12 AUDIO FORMATS

The ASI500x supports record and play of the following formats:

Format	HPI format	Windows format
8 bit unsigned PCM	HPI_FORMAT_PCM8_UNSIGNED	WAVE_FORMAT_PCM, wBitsPerSample=8
16 bit signed PCM	HPI_FORMAT_PCM16_SIGNED	WAVE_FORMAT_PCM, wBitsPerSample=16
32 bit signed PCM	HPI_FORMAT_PCM32_SIGNED	WAVE_FORMAT_PCM, wBitsPerSample=32
32 bit floating point PCM (+/-1.0)	HPI_FORMAT_PCM32_FLOAT	WAVE_FORMAT_IEEE_FLOAT

13 ADAPTER MODES

Change the mode setting using ASIControl; a restart of the PC is required. The mode setting is saved on the adapter EEPROM.

13.1 Mode-1 (default)

This mode supports 1 Play stream and 8 Record Streams. 24-bit sampling is supported up to 48 kHz.

13.2 Mono Mode

This mode supports 2 Play streams and 8 Record Streams.

13.3 Low Latency Mode

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.

13.4 Adapter Mode SSX Multichannel

ASI5001 and ASI5002: This mode supports 1 Record Stream. 24-bit sampling is supported up to 48 kHz. For more information, see the SSX specification - http://www.audioscience.com/internet/tech/ssx.htm.
There is no Play Stream in Multichannel mode on the ASI5001/5002.

Formats supported: PCM8, PCM16, PCM24, PCM32

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

14 BALANCED ANALOG I/O

The ASI5602 has stereo-balanced analog inputs and outputs on a mini 50-pin female connector.

14.1 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.

15 AESEBU I/O

The ASI5602 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 or 96.

15.1 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()

16 SAMPLE RATE CLOCK

The ASI5602 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 any of the AES/EBU inputs. Selection between these two clocking options is automatic. In other words, if a valid AES/EBU data stream is connected to any of the AES/EBU inputs, that input will effectively become the master clock source for the adapter. **<end>**