

### 1 DESCRIPTION

The ASI8821 is a professional PCI(e) tuner adapters designed for use in radio broadcast monitoring and auditing.

The ASI8821 card is based on tuner modules. Each module has four tuners on it and the ASI8821 can hold a maximum of two modules.

Up to eight different channels/stations of AM, FM, HD Radio, DAB/DAB+ can be received and recorded simultaneously from a single antenna input. Recording formats include PCM and MPEG-1 layer2 and MPEG-1 Layer 3 (MP3).

### 2 ORDERING INFORMATION

ASI8821-1000	4 channels of AM/FM/RBDS/RDS
ASI8821-1100	8 channels of AM/FM/RBDS/RDS
ASI8821-2000	4 channels of AM/FM/RBDS/RDS + MCX external antenna jacks
ASI8821-2200	8 channels of AM/FM/RBDS/RDS + MCX external antenna jacks
ASI8821-5000	4 channels of HD Radio/DAB/DAB+
ASI8821-5500	8 channels of HD Radio/DAB/DAB+

### 3 FEATURES

- Up to 8 channels of HD Radio/DAB/DAB+ audio capture
- Up to 8 channels of AM/FM audio capture
- Up to 8 channels of FM RBDS/RDS data capture
- AM/FM/RBDS/RDS tuners can be fed from individual external antennae
- Audio monitoring of all tuners simultaneously
- MRX technology allows each stream to have an independent sample rate of between 8 and 48kHz
- PCM and MPEG-1 Layer 2 and MP3 recording formats
- PCIe interface
- Half-length PCI(e) card
- Up to 8 cards in one system
- Windows 10, 7, Server 2008/2012 and Linux drivers available



## 4 SPECIFICATIONS

### RF INPUT

Connector	F type 75 ohms, on card bracket MCX connector (optional) (AM/FM only, per tuner, jumper selectable)
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### FM/RDS TUNER (-1000, -1100, -2000, -2200)

#### FM

Modes	Mono or Stereo
Frequency range	75.9MHz - 108.1MHz, 50kHz channel spacing
Sensitivity	15dBuV for -30dB THD+N
Input Level	90 dBuV Maximum (F connector) 100 dBuV Maximum (External antenna connector)
THD+N	-55dB @ 60dBuV RF Level, 1kHz sinewave, mono, 75kHz deviation, A-weighting
De-emphasis	50us or 75us (software selectable)
Audio bandwidth	30Hz-15kHz (+/-3dB)

#### RDS/RDBS

Sensitivity	25 dBuV
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### AM TUNER (-1000, -1100, -2000, -2200)

#### AM

Frequency range	520kHz-1720kHz, 1kHz channel spacing
Sensitivity	30dBuV for -30dB THD+N
Input Level	F connector: 75 dBuV Maximum External antenna MCX connector: 90dBuV Maximum
THD+N	-50dB @ 60dBuV RF Level, 1kHz sinewave, 75% modulation, A-weighting, 2kHz bandwidth
De-emphasis	None or 50us (software selectable)
Audio bandwidth	100Hz - 2kHz (+/-3dB)

### FM/RDS/HD Radio/DAB/DAB+ TUNER (-5000, -5500)

#### FM

Modes	Mono or Stereo
Frequency range	75.9MHz - 108.1MHz, 50kHz channel spacing
Sensitivity	15dBuV for -30dB THD+N
Input Level	90 dBuV Maximum (F connector) 100 dBuV Maximum (External antenna connector)
THD+N	-55dB @ 60dBuV RF Level, 1kHz sinewave, mono, 75kHz deviation, A-weighting
De-emphasis	50us or 75us (software selectable)
Audio bandwidth	30Hz-15kHz (+/-3dB)

#### RDS/RDBS

Sensitivity	25 dBuV
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#### HD Radio

Modes	Automatic
Frequency Range	87.5MHz – 108MHz
Sensitivity	15.9dBuV for -20dBc digital sideband power
Input Level	90dBuV Max
De-emphasis	50us or 75us (software selectable)

#### DAB/DAB+

Modes	DAB+ lock, DAB lock, or Automatic
Input Frequency	168MHz – 250MHz
Sensitivity	5.99 dBuV with $10^{-4}$ BER
Input Level	100dBuV Maximum
Ensemble Acquisition Time	940ms at 60dBuV RF level

### LINE OUTPUT

Connector	Mini 50pin on card bracket
Breakout Cable (included)	CBL3004 – Mini 50pin to 24 RCA jacks
Audio	4Vpp max into 10Kohms

<b>SIGNAL PROCESSING</b>	
DSP	Texas Instruments TMS320C6713@300MHz
Memory	8MB
Sample rates [1]	8, 11.025, 12, 16, 22.05, 24, 32, 44.1, 48kHz
Audio Formats	8 bit unsigned PCM, 16bit signed PCM, 24 bit signed PCM 32bit IEEE floating point PCM MPEG-1 Layer 2, MPEG-1 Layer 3 (MP3)  (MPEG Layer-3 audio coding technology licensed from Fraunhofer IIS and THOMSON multimedia)
<b>GENERAL</b>	
Bus	ASI8821 – X1 PCI Express
Dimensions	PCI full height short-length form factor (3.9 x 6.6 inches/100 x 168mm)
Weight	7oz (200g) max
Operating Temperature	0°C to 70°C
Power Requirements	3.3V @ 1.3A, +5V @ 0.8A, -12V @0.1A

[1] The ASI8821-5000/5500 series cards can only be set to operate at 48kHz due to issues with DAB/HDRadio

**Note:** As of Jan 2019, all specs listed also apply to the discontinued ASI8921-xxxx PCI series of cards. This is subject to change in future releases.

## 5 REVISIONS

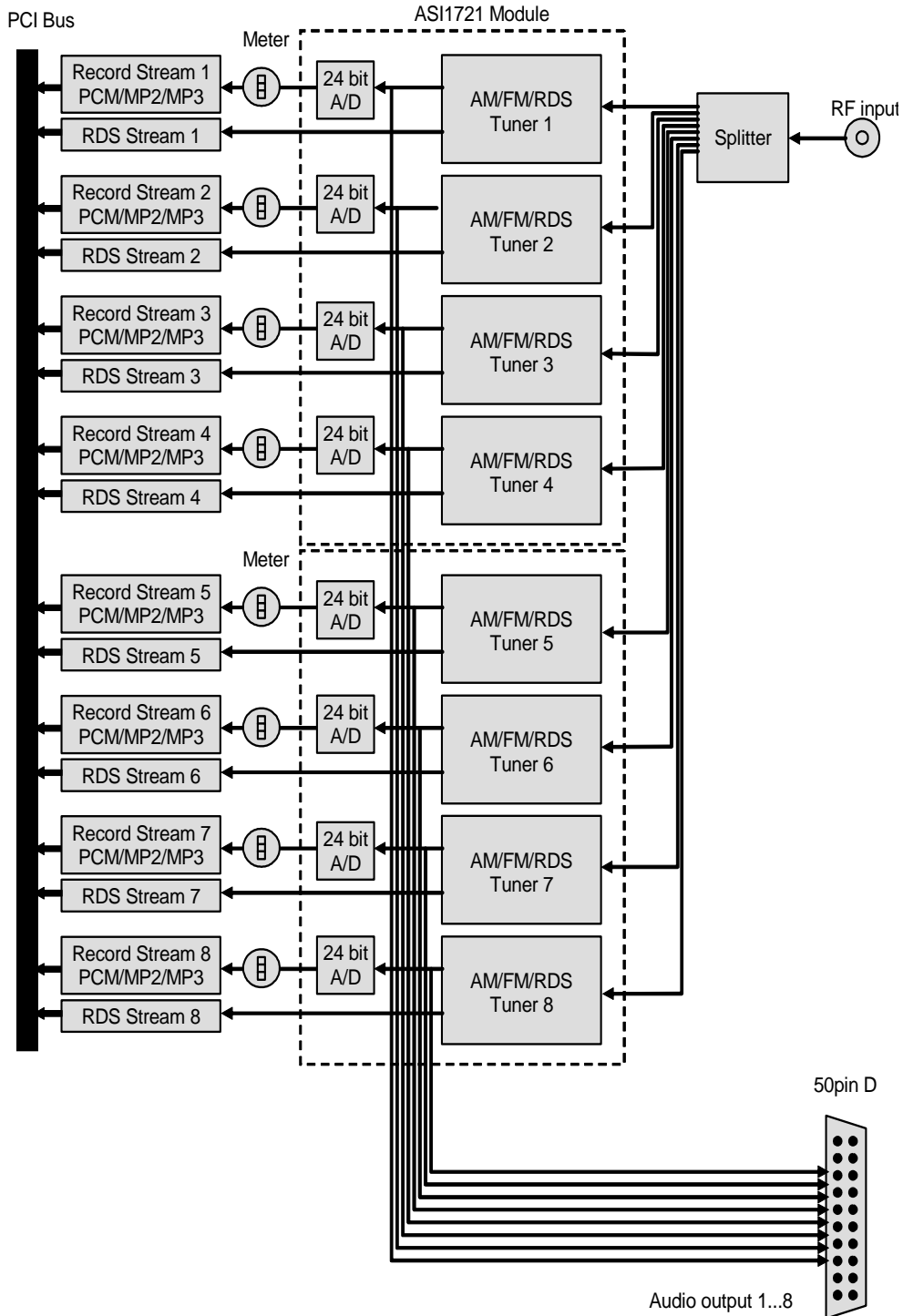
Date	Description
02 April 2008	Released.
23 January 2009	Formatting updates.
21 June 2010	Added ASI8821 (PCI Express version).
16 July 2010	First page: Added ASI8821 image and updated ASI8921 image.
30 August 2010	Added analog television options (-3000, -3300) and preliminary specs.
06 January 2011	Added HD-50 pinout
09 October 2012	started HD Radio/DAB/DAB+ additions
03 April 2013	Finalized HD Radio/DAB/DAB+ additions
18 June 2013	Added info regarding tuner increment limitations
29 September 2014	Added audio formats supported section
21 November 21, 2014	Updated operating system and install instructions
23 January 2015	Removed TV tuner info for 3000 and 3300 model
18 June 2015	Updated size specs to include height
16 June 2016	Added not re: 5000/5500 series clock rate limited to 48k
14 Feb 2019	Removed ASI892x
25 Oct 2019	Clean up and reformat

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# 7 BLOCK DIAGRAMS

## ASI8821 - 8 x AM/FM/RDS



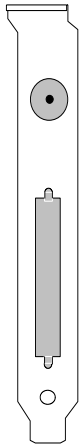
## 8 CONNECTORS

### 8.1 F-Type

The F connector feeds the RF signal from an external antenna to all tuners on the ASI8821.

### 8.2 HD50

The HD50 connector makes available the mono or stereo audio of each tuner output. Ch1 is sourced from a software-controlled mux and may be programmed to output Ch1-8. The output level is 2Vpp into 10Kohms.



**HD50 Pinout**

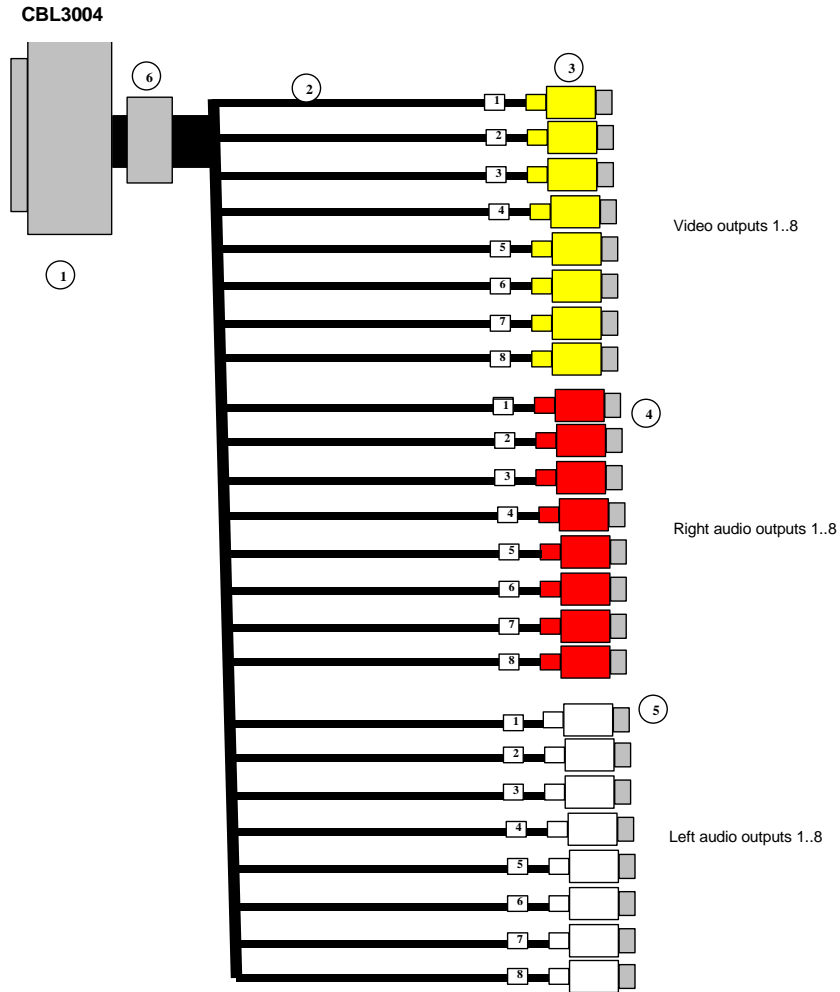
GND	1	26	VID8
GND	2	27	VID7
GND	3	28	VID6
GND	4	29	VID5
GND	5	30	VID4
GND	6	31	VID3
GND	7	32	VID2
GND	8	33	VID1
GND	9	34	RO4
GND	10	35	LO4
GND	11	36	RO3
GND	12	37	LO3
GND	13	38	RO2
GND	14	39	LO2
GND	15	40	RO1
GND	16	41	LO1
GND	17	42	RO5
GND	18	43	LO5
GND	19	44	RO6
GND	20	45	LO6
GND	21	46	RO7
GND	22	47	LO7
GND	23	48	RO8
GND	24	49	LO8
GND	25	50	GND

Tuner Video Out 1..8  
Format is CVBS Composite  
analog video

Tuner Audio Out 1..8  
LO1 = Left channel out, Tuner #1  
RO1 = Right channel out, Tuner #1

# 9 CABLE

Breakout cable CBL3004 is supplied with the ASI8821. This supplies the 8 stereo audio outputs and 8 CVBS video outputs, all on RCA (phono) jacks. The video outputs are only active on the -3000 and -3300 models (discontinued Jan 2015).





## 10 HARDWARE INSTALLATION

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

### 10.1 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.

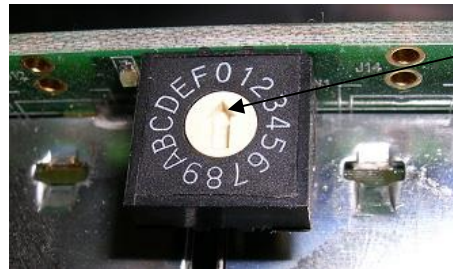
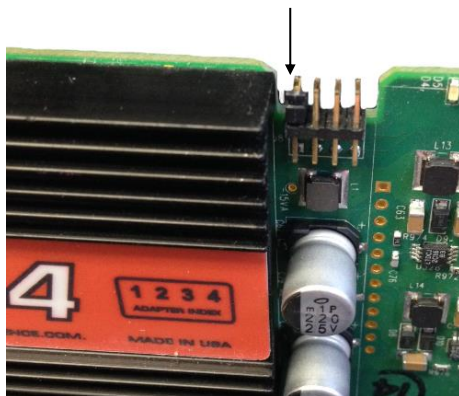
Depending on the adapter family, there are different ways of setting the adapter index.

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



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.

#### 10.1.1 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.

## 11 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.

### 11.1 Drivers for Windows 10, 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](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.

#### 11.1.1 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](http://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).

#### 11.1.2 ASIO

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

#### 11.1.3 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 accessed from the Administrative Tools applet in Windows Control Panel under 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](mailto:support@audioscience.com).

### 11.2 Drivers for Linux

The latest Linux driver can be downloaded from the AudioScience website – [www.audioscience.com](http://www.audioscience.com)

### 11.3 Applications for Windows

AudioScience provides ASIControl for adapter set-up and configuration.

#### 11.3.1 ASIControl

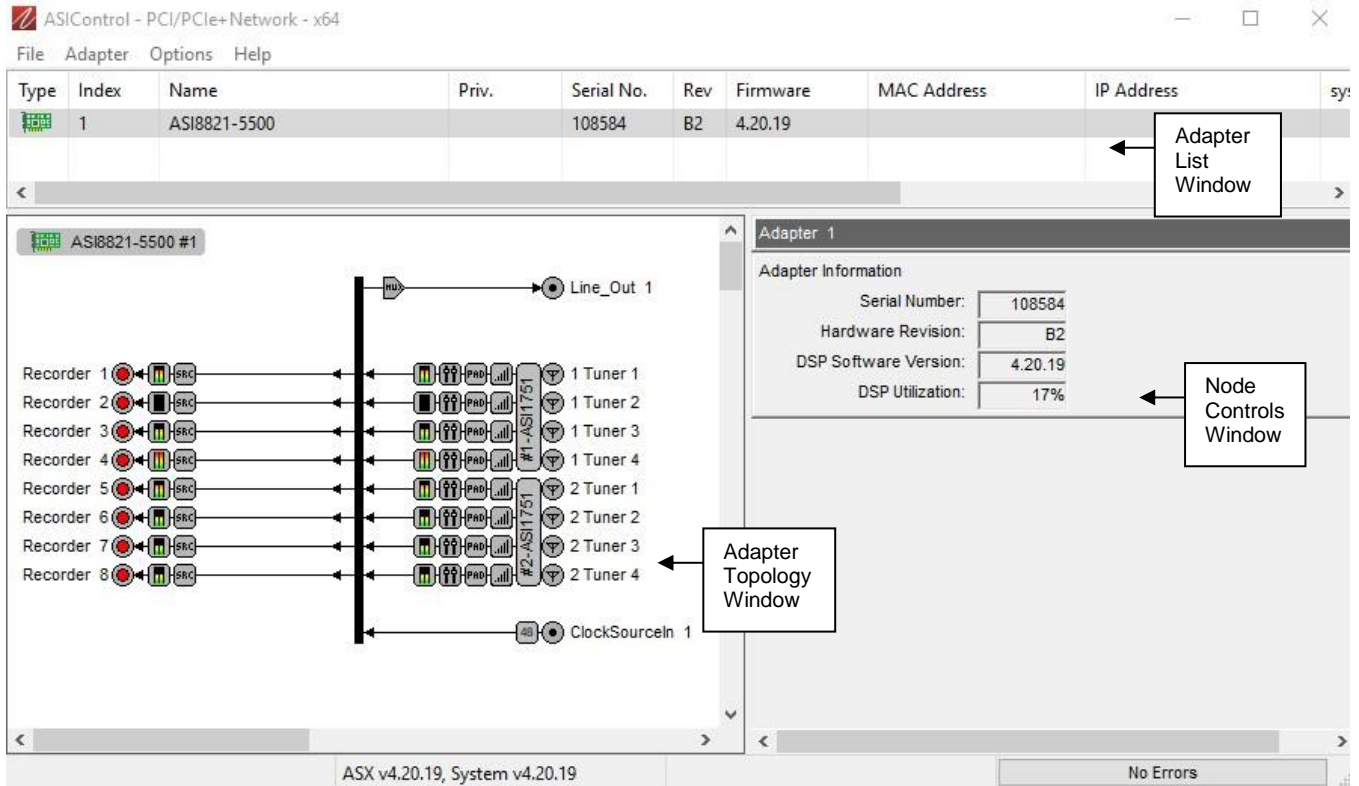
All Windows drivers install an AudioScience application called ASIControl that can be used to setup and verify functionality of adapters. ASIControl provides a common interface for users across all driver types.

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



## 12 OPERATION USING ASICONTROL

Using ASIControl, the ASI8821-5500 will look like so:



## 13 USER INTERFACE

### 13.1 ASIControl Layout

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.

#### 13.1.1 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.

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

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.

### 13.1.3 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.

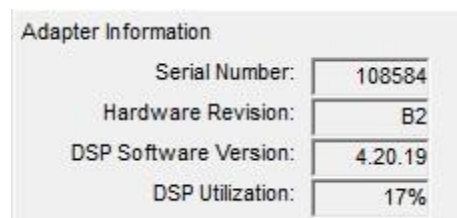
For a comprehensive listing of controls and how to operate ASIControl, please see the ASIControl manual available from [www.audioscience.com](http://www.audioscience.com) and also installed by the driver. Not all adapters have all controls. The section below lists some common and any specific controls, as seen in ASIControl, for this adapter.

## 13.2 Controls

### 13.2.1 Adapter Information

This control displays information about the installed AudioScience product.

#### 13.2.1.1 Interface



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%.

### 13.2.2 Tuner



The Tuner control is used to tune radio channels on the ASI8700 and ASI8900 series tuner adapters. There are six sections to the tuner control: **Generic**, **Analog Radio**, **PSD/RBDS**, **Tuner** volume, and **Meter**. See below for a review on each section.

**Note:** Not all tuner adapters support all six sections.

#### 13.2.2.1 Generic



**Figure 2. Generic section of Tuner controls.**

**Band:**

Selects which type of demodulation the tuner will perform. Depending on the adapter type, the following Bands may be available:

Band	Description	Supported adapters
AM	Mono AM radio	ASI8821 - 1000/1100/2000/2200
FM Mono	Mono FM radio	ASI8821 - 1000/1100/2000/2200/5000/5500
FM Stereo	Stereo FM radio	ASI8821 - 1000/1100/2000/2200/5000/5500
DAB		ASI8821 – 5000/5500

**RF Level:**

Shows the RF signal strength of the incoming RF signal in dBuV.

**Firmware Version:**

**13.2.2.2 Analog Radio**



**Figure 3. Analog Radio section of Tuner controls**

If an analog AM/FM tuner is present on the adapter then the following items are available.

**Frequency:**

Sets the frequency of the channel to be tuned. It is specified in kilohertz (kHz). For example, an FM radio frequency of 88.1MHz is specified as 88100 and NTSC-TV Ch2 is specified as 55250.

**FM Stereo:**

Shows whether the FM signal is being received as stereo.

**Locked:**

Shows whether the tuner is locked to a signal.

**De-emphasis:**

Sets the de-emphasis for analog radio. Available choices are:

**AM:** none, 50us

**FM:** 50 or 75us

**13.2.2.3 PSD/RBDS**

This control shows metadata that is contained in an analog FM broadcast. (The PSD information is for HD Radio broadcast metadata available on the ASI8821-5000 series.)

**13.2.2.3.1 RBDS - Analog FM**

PSD/RBDS	
Station:	WCMF-FM
PI:	F000
Type/PTY:	06 : Classic Rock
Title/PS:	EDGE OF 17
Artist/RT:	STEVIE NICKS

**Figure 4. FM RBDS information as seen in ASIControl.**

When an analog FM signal is being received that has RDS (Europe) or RBDS (United States) data, the following fields are available:

**Station:**

Station call letters

**PI:**

Short for Program Identification. A unique code that identifies the station. F000 is shown above.

**Type/PTY:**

Short for Program Type. A code representing up to 31 different radio program types. RDS and RBDS definitions are different. In the above example the PTY code is 06, which represents in RBDS coding, Classic Rock type.

**Title/PS:**

Short for Program Service. It is an eight-character string that represents the call letters or station identity. In this example WCMF is shown.

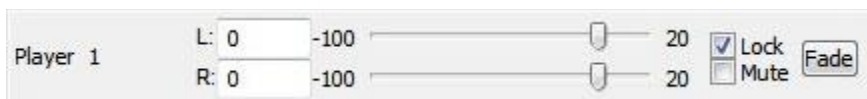
**Artist/RT:**

Short for Radio Text. This is a string up to 64 characters long. In the example shown, the current artist (STEVIE NICKS) and song (I CAN'T STAND IT), as well as frequency (96.5) are shown.

### 13.2.3 Volume

The Volume control allows the audio signal's gain to be altered in the range of -100 to +20dB.

#### 13.2.3.1 Interface



#### A Player volume in ASIControl.

**Left and Right display boxes:**

Displays the gain settings that the slider bars are set to.

**Slider Bars:**

Click on the bar with the mouse and drag to desired gain. Once the bars are selected, the left and right arrow keys can also be used to change the settings.

**Lock:**

When checked, locks the left and right channels to the same gain value. When unchecked, allows the left and right channels to have independent gains. (Note that if an adapter is in SSX2 mode, the Player volumes cannot be unlocked to move the left and right channels independently.)

**Mute:**

Check this box to mute the volume.

**Fade:**

When pressed, automatically fades the volume to the opposite end of the scale.

#### 13.2.3.2 Developer

##### 13.2.3.2.1 Windows APIs

### Wave/Mixer – MIXERCONTROL\_CONTROLTYPE\_VOLUME

This is a Windows standard volume control. Settings are in the range of 0 to 65535, where 0 completely mutes the output and 65535 is the maximum volume.

**HPI** – [HPI Volume](#) APIs.

**ASX** – [ASX Volume](#) APIs.

**DirectSound** – TBD.

#### 13.2.3.2.2 Linux APIs

**HPI** – [HPI Volume](#) APIs.

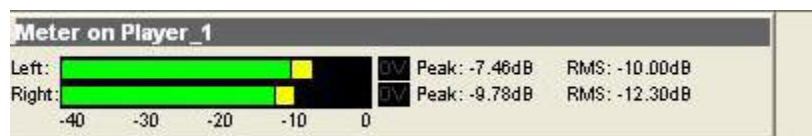
**ASX** – [ASX Volume](#) APIs.

**ALSA** – TBD.

## 13.3 Meter

Meters in ASIControl are located on audio nodes and display the audio level as the audio signal passes through the node. Most AudioScience devices return both RMS and peak level readings and ASIControl displays both simultaneously.

### 13.3.1 Interface



**Figure 1. A stereo peak meter display. The RMS is the green bar and the peak is the yellow bar.**

To the right of the peak meter is the absolute readings in dBFS. These can be useful when testing input tones of a specific known level.

### 13.3.2 Developer

#### 13.3.2.1 Windows APIs

**Wave/Mixer** – Meters are read using `mixerGetControlDetails()` on a control of type signed and with type “Peak” the name “Peak Meter”. A minimum value is 0 and maximum is 32767. The interface returns the peak readings only, not the RSM level. It confirms to expected Windows functionality.

**HPI** – Meters are read using the [HPI Meterxxx\(\)](#) API.

**ASX** – Meters are read using the [ASX Meter xxx\(\)](#) API.

**DirectSound** – TBD.

#### 13.3.2.2 Linux APIs

**HPI** – Meters are read using the [HPI Meterxxx\(\)](#) API.

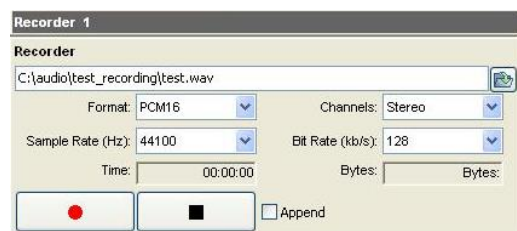
**ASX** – Meters are read using the [ASX Meter xxx\(\)](#) API.

**ALSA** – TBD.

## 13.4 Recorder

The Recorder control supports recording of an audio file.

### 13.4.1 Interface



**A recorder in ASIControl.**

The first box contains the name given to the recorded file and the location where it is to be saved. Below that is the file information, the record time and record bytes, the recorder control buttons and the file Append option.

### 13.4.2 How To Record a File

The first step in recording a file is to have audio coming into the adapter. This can be from a line-in or from one of the players in ASIControl. See appropriate sections in this datasheet to accomplish this. Next, the new file needs a name and place to be saved, or an existing audio file can be selected to be overwritten or appended to. Use the **file icon button** to navigate to the location to create the file and to give it a name, or to open a previously recorded file to overwrite or append to it. Next, from the dropdown arrows, select the number of “**Channels**”, the “**Sample Rate**”, the “**Format**”, and the “**Bitrate**” that the file should be recorded in.

Check the **Append** checkbox to save the audio to the end of an already existing file.

The file is now ready to be recorded. To start recording, press the **record button**. At this point the “**Time**” and “**Bytes**” fields report record time and the number of bytes of the file that have been recorded.

Once recording has started the **stop** and **pause buttons** can be used to stop or pause the playback.

### 13.4.3 Developer

#### 13.4.3.1 Windows APIs

**Wave** – use `waveInOpen()`, `waveInStart()` etc.

**HPI** – use [HPI\\_InStreamxxx\(\)](#) functions.

**ASX** – use [ASX\\_Recorder\\_xxx\(\)](#) functions.

#### 13.4.3.2 Linux APIs

**HPI** – use [HPI\\_InStreamxxx\(\)](#) functions.

**ASX** – use [ASX\\_Recorder\\_xxx\(\)](#) functions.



## 14 ANTENNAS

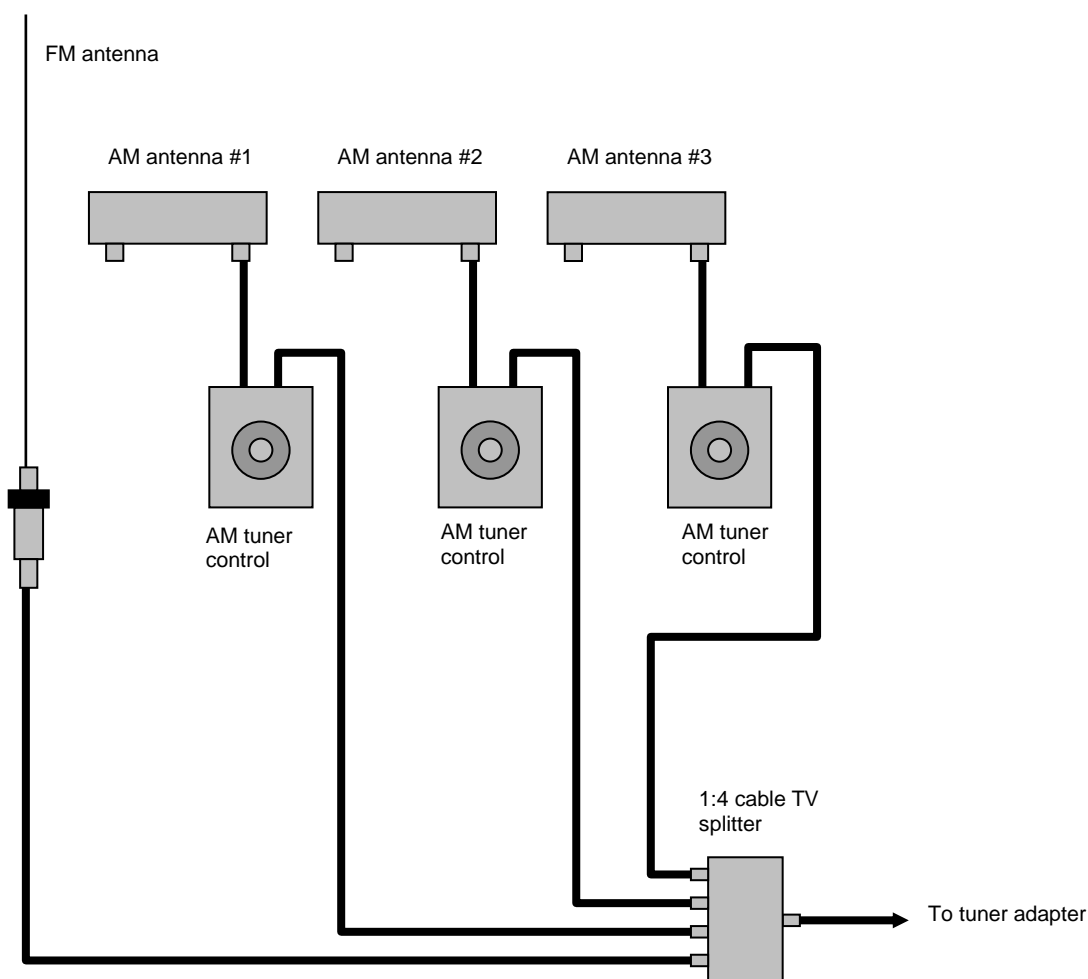
AudioScience has tested and can recommend the following antenna configuration for use with the ASI8700 and ASI8900 series adapters.

The configuration is made up of an omni-directional FM whip antenna, plus multiple ferrite stick antennas, each oriented and tuned to pick up a particular AM station. The antenna's signals are mixed using a common 75-ohm cable TV splitter, which we have found has the necessary low end bandwidth to pass AM signals.

The FM antenna is made by Fanfare (<http://www.fanfarefm.com>) and is part number FM-2G. Besides FM stations, this antenna will also pickup strong AM stations.

The AM antenna is made by C. Crane (<http://www.ccrane.com>) and is part number TCA. This antenna has a tuning control that allows you to tune into a particular station using a dial on the front of the control.

The following diagram shows how three AM and the one FM antennas would be wired.





## 15 ERRATA

This section lists known issues for specific hardware revisions.

### 15.1 Rev D0

Tuner 5 through 8: Right channels are not present on the mini DB-50 connector

### 15.2 Rev G0 8921-5500

DAB mode is not available.

RF Level is set only on initial tune acquisition.

Station Name is not set in HD FM mode.

Output levels are 20 dB lower compared to 8921-2200

## 16 REFERENCES

### 16.1 RDS

Wright, Scott, 1997, *"The broadcaster's guide to RDS"*, ISBN 0-240-80278-0

### 16.2 Specifications

SPCHPI.PDF - [Hardware Programming Interface \(HPI\) Specification](#)

SPCWAVX.PDF - [WavX - AudioScience Windows Multimedia Extensions](#)

These documents are available from [www.audioscience.com](http://www.audioscience.com) in the Technical Info section.