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User Manual

PCI EXPRESS

Lynx Studio Technology, Inc.
www.lynxstudio.com
support@lynxstudio.com

Contents

1 Introduction 4
1.1 Overview 4
1.2 Features 4
1.3 Before you begin 5
1.4 In the box 5
1.5 System requirements 6
1.6 Nomenclature used in this manual 6
2 Installation Procedures 7
2.1 AES16*e* Hardware Installation 7
2.2 Windows Driver Package (Windows XP and Windows Vista) 7
2.3 Macintosh OS X 19
3 Hardware Connections 21
3.1 Overview 21
3.2 AES/EBU Cable Connections 23
3.3 Clock Connections 24
3.4 Common Studio Setups 26
4 Getting Started 28
4.1 Windows Quick Audio Test 28
4.2 Macintosh OS X Quick Audio Test 31
5 Operational Overview 33
5.1 Signal Flow 33
5.2 Sample Clock Generator 35
5.3 SynchroLock™ 36
6 Lynx Mixer Reference 37
6.2 Adapter Window 38
6.3 Record/Play Window 44
6.4 Outputs Window 47
6.5 Mixer Menu (Windows)/ File Menu (OS X) 50
6.6 Settings Menu 52
7 Using the AES16*e* 55
7.1 Mixer Scene Storage and Recall 55
7.2 Input Patching 55
7.3 Playback Routing and Mixing 58
7.4 Clock selection and control 59
7.5 AES/EBU Dual-wire operation 59
7.6 ASIO Specific Setup (Windows only) 60
7.7 Controlling latency by changing buffer size 61
8 Working with Third Party Applications 62
8.1 Compatibility 62
8.2 Controlling Audio Bit Depth 63
8.3 Multi-Device Operation 63
9 Configuring Multiple AES16*e*'s 64
9.1 Clock Synchchronicity 64
9.2 Adapter ID's 66
10 Troubleshooting 67
11 Support 68
11.1 Lynx Website Support Resources 68
11.2 Telephone Support 68
11.3 Registering your Aurora 68
11.4 Return Policy 68

12 Appendices 69
12.1 Specifications 69
12.2 Programming the AES16*e* firmware 71
12.3 Safety instructions 71
12.4 EMC Certifications 72
13 License Agreement 73
14 Warranty Information 74

1 Introduction

Thank you for choosing the Lynx AES16*e*™ PCI-Express audio interface. The AES16*e* has been designed to provide you with the highest quality professional audio performance available, offering unequalled AES/EBU channel capacity and routing flexibility.

Even if you're an experienced audio professional, please take a few moments to read through this user's manual. It will help to streamline the installation procedure, and acquaint you with the AES16*e*'s superior feature set, allowing you to quickly realize the full potential of this powerful audio tool.

1.1 Overview

The AES16*e* turns your computer into a powerful digital audio workstation, giving you up to sixteen channels of professional AES/EBU digital input and output at sampling rates up to 192 kHz. Its integrated 64-channel software mixer provides zero-latency monitoring, with unprecedented control and matrixing flexibility. With support for Windows and Macintosh computers, the AES16 can store and recall an unlimited number of routing configurations and mixer scenes, providing you with a virtual digital patch bay.

The AES16*e* supports the latest single-wire AES/EBU 192 kHz standard for up to 16 channels of digital input and output, and is also compatible with existing dual-wire 96 kHz and 192 kHz devices.

Also, up to 48channels of I/O are available using the AES16*e*'s optional AES50/SuperMac port. This port can be used for high-channel count installations where long cable runs are possible without audio degradation, and where connected devices can be controlled or monitored through browsers via TCP/IP.

With exclusive SynchroLock™ technology, the AES16*e* provides unmatched tolerance to jitter when synchronizing to external clocks, making it an ideal solution for longer cable runs and other sources where noise may be an issue. The SynchroLock output can also provide a clean and accurate clock output for other audio devices.

Up to four AES16*e* cards can be installed in a single host computer to deliver a total of 64 inputs and 64 outputs of ultra-high bandwidth audio performance.

The AES16e provides ultra low latency drivers for most Windows protocols including WDM, MME, ASIO 2.0, DirectSound and Direct Kernel Streaming, and for Macintosh OSX Core Audio standard. The AES16e has Universal Binary drivers for use with Intel Processor based Macintosh models.

1.2 Features

- Sixteen channel "single-wire" digital I/O at sample rates up to 192 kHz.
- Eight channel "dual-wire" digital I/O at sample rates up to 192 kHz.
- Eight stereo record and playback devices available to audio applications.
- Transformer-coupled 24-bit AES/EBU inputs and outputs available on XLR or DB25 cables.
- Sixteen channels of mastering-quality sample rate conversion available (on model AES16*e*-SRC).
- Sync to external AES/EBU signals or word-clocks.
- SynchroLock™ technology provides superior immunity to jitter in clock sources.

- On-board zero-latency digital mixer provides extensive routing capabilities with patch-bay functionality.
- Full PCI Express implementation with simultaneous read/write capability.
- Low-latency drivers for Windows XP and Vista – supports WDM, MME, ASIO 2.0, DirectSound, and Direct Kernel Streaming.
- 64-bit drivers available for use with Windows XP64 and 64-bit versions of Windows Vista.
- Low-latency drivers for Macintosh – supports Core Audio for OS X (including Intel-based Macs).
- "Direct-connect" cabling available for digital mixers, recorders and converters from Lynx Studio Technology, Yamaha, Tascam, Mackie, Apogee, Benchmark Media and other manufacturers.
- Designed and manufactured in the USA by Lynx Studio Technology, Inc.

1.2.1 Upcoming features from firmware and driver updates

- Support for 384kHz sample rates in dual wire mode.
- Optional support for AES50 (SuperMac) allows multi-channel streaming over CAT 5/6 cabling.
- Full 32 input by 32 output hardware monitoring capabilities.
- Full 32-channel operation with 16-channel LStream I/O independent from the 16-channel AES/EBU I/O.

1.3 Before you begin

Before you begin using the AES16*e*, we recommend you read through this manual and familiarize yourself with the installation and operational procedures of this device. It is highly recommended that you have a good working knowledge of Windows and/or Macintosh operating system basics, and an understanding of computer hardware basics. This information is widely available on the web and from various computer hardware and software manufacturers.

We also strongly recommend you familiarize yourself with the basics of digital audio and computer recording, and particularly with the basic functionality of your chosen audio software. A solid grasp of the operational fundamentals of your Digital Audio Workstation software and its user interface will go a long way toward enhancing your experience with the AES16*e*.

1.4 In the box

The following items are included in your AES16*e* carton:

- AES16*e* PCIe card in antistatic bag.
- Lynx Installation CD containing current drivers and this manual.
- Warranty registration card.
- Quick Start Guide.

If any items are missing or damaged, please contact your dealer or Lynx at http://www.lynxstudio.com.

1.5 System requirements

Below are listed the minimum hardware and operating system requirements for compatibility with the AES16*e*. It is important to note that most professional audio applications place significant demands on your computer's resources, and it is therefore recommended that you meet or exceed the recommended system requirements for your Digital Audio Workstation software, which will likely be greater than those listed for the AES16*e*. Please refer to your audio software's documentation for more information.

1.5.1 Windows

- Windows compatible computer with PCI Express support
- One empty PCI Express slot (x1 – x16)
- Video display with 1024 x 768 minimum resolution
- Windows XP (32 or 64-bit) or Windows Vista (32 or 64-bit)

NOTE: The AES16*e* is not supported under Windows 2000, 95, 98 or ME.

1.5.2 Macintosh

- Apple Macintosh G5 or later (compatible with Intel-based Macs)
- One empty PCI Express slot (x1 – x16)
- Video display with 1024 x 768 minimum resolution
- Macintosh OS X (10.4 or higher)

1.6 Nomenclature used in this manual

The following typographic conventions are used in this manual:

- Underlined text indicates characters that are to be typed using the computer keyboard.
- ALL UPPER CASE TEXT indicates the names of specific cable connectors.
- First Character Upper Case Text indicates Lynx mixer control names or menu options.
- Phrases, such as: Start > Programs > Lynx Studio Technology use the greater than symbol (">") to indicate multiple menu options or mouse selections.

2 Installation Procedures

The procedure for installing the AES16*e* requires that you physically install the AES16*e* card inside your computer before running the driver installation.

The Setup Program will install the required driver files and the Lynx mixer application, as well as configure your system to recognize the AES16*e*.

2.1 AES16*e* Hardware Installation

1. Turn OFF the power to your computer system and disconnect the power cords.
2. Touch a metal plate on your computer system to ground yourself and discharge any static electricity.
3. Remove the cover from your computer chassis and select an empty PCI Express slot in your computer.
4. You should refer to your computer system documentation for any special instructions on installing expansion cards and peripheral equipment.
5. Unscrew and remove the slot cover from your selected PCI Express slot.
6. Insert the AES16*e* into the selected PCI Express slot and press it down so that the contacts are securely seated.
7. Secure the bracket of the AES16*e* card to the computer chassis using a chassis screw or retaining bracket.
8. Replace the computer chassis cover and reconnect the power cord.
9. Connect the Audio cables to the AES16*e*. Refer to Section 3 Hardware Connections for more information.
10. Install software using the installation procedure for your computer type and operating system from the following sections. Refer to Section 2.2 for Windows and Section 2.3 for Macintosh.

2.2 Windows Driver Package (Windows XP and Windows Vista)

The AES16*e* Driver Package provides the greatest compatibility with today's most popular audio and production software. Included are the following driver models:

- **ASIO** (Cubase, Nuendo, Sonar, Samplitude, Sequoia)
- **WDM/Direct Sound** (Sonar, Samplitude, Sequoia, Media Player)
- **MME** (Windows multi-media extensions)

The Windows Driver Package also supports multi-channel playback for use with Surround Sound or other multi-channel encoded material, and is 64-bit compatible for operation within XP64 and 64-bit Windows Vista.

2.2.1 Installation Files

The Lynx Installation CD contains all driver files mentioned in the subsequent installation steps, as well as the AES16*e* manual, driver release notes and test files. If you do not have a CDROM drive or need a more recent version, these files are available on our website at Support > Downloads.

If you have downloaded newer drivers than those included on your Lynx Installation CD, please extract the driver to its default location, C:\Lynx. The following instructions can still be followed, simply type C:\Lynx as the location for driver files, rather than "removable media" as specified in these instructions.

2.2.2 Installing the Windows Driver Package In Windows XP/XP64

1. When you start Windows after installing the AES16e into your computer, the New Hardware Wizard will appear. Select “Install from a list or specific location” and click “Next >” to proceed.



2. From the next window, select "Search removable media”. Click "Next >" to proceed.



3. Windows will begin to search for the appropriate driver files:

4. You may receive a warning that the driver has not been digitally signed by Microsoft. It is perfectly safe to disregard this warning and select “Continue Anyway.”

5. The driver installation will continue. After several moments, the new hardware wizard will indicate that it has completed the installation. Click “Finish”:



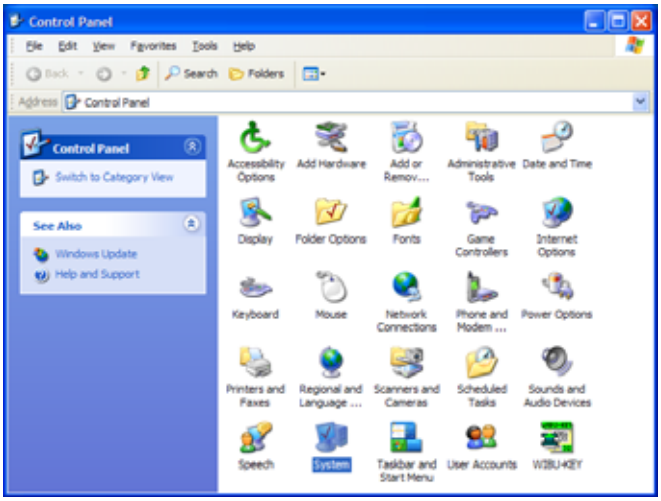
6. Navigate to the C:\Lynx folder. Right-click the file “LynxApps.inf” (Setup Information) and click “Install”. The AES16*e* Card and Lynx Mixer application are now ready to use.

2.2.3 Uninstalling the AES16e Windows Driver Package in Windows XP/XP64

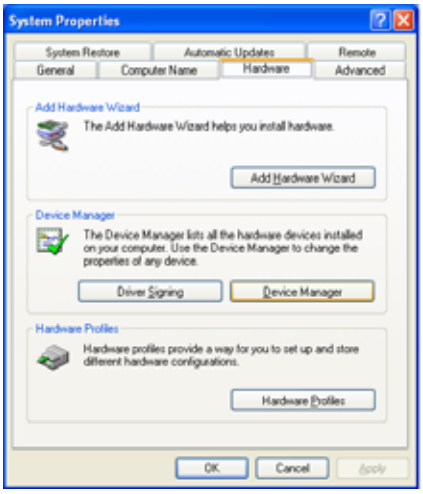
1. From the start menu, click on “Control Panel.”



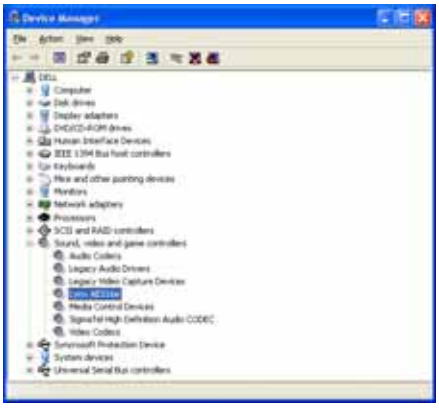
2. Click “System” to launch System Properties:



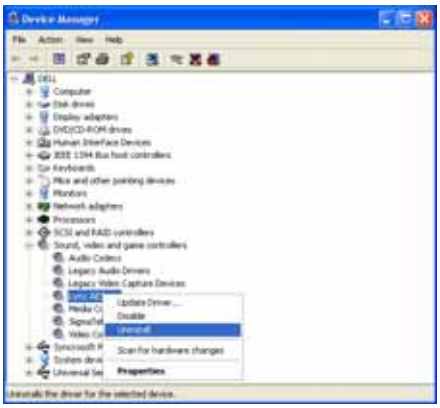
3. Choose “Device Manager” from the “Hardware” tab:



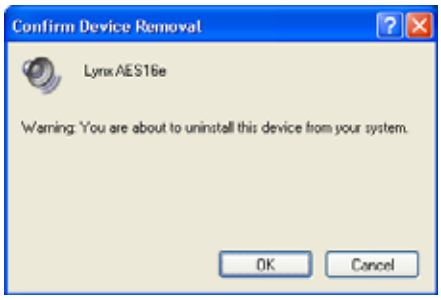
4. Expand the “Sound, video and game controllers” section of device manager be clicking its + sign:



5. Right click on “Lynx AES16” and choose “Uninstall”



6. Confirm device removal by clicking “OK”.



7. Reboot the computer

2.2.4 Updating an existing driver in Windows XP/XP64:

Navigate your web browser to: http://www.lynxstudio.com > Support > Download. Select OS = Windows; Product = AES16*e*; File Types = All Types. Download the current driver installer.

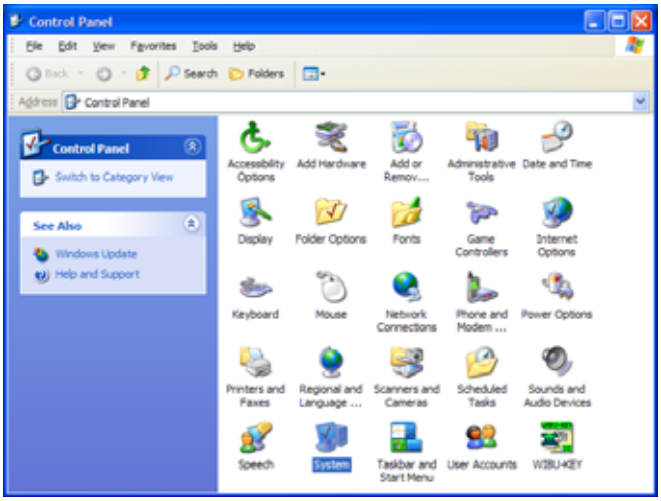
1. Double-click the downloaded file to decompress, and accept the default destination folder of C:\Lynx.



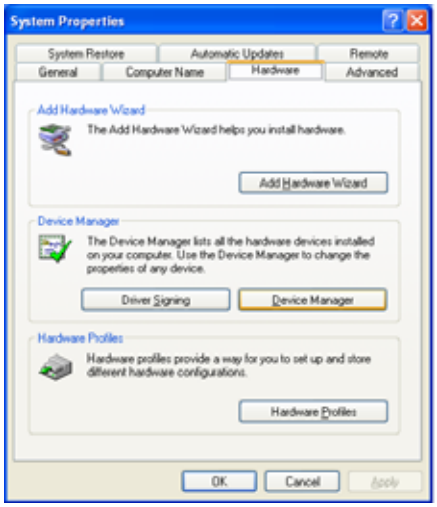
2. From the start menu, click on “Control Panel.”



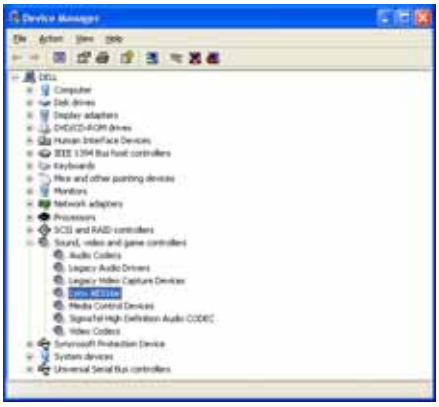
3. Click “System” to launch System Properties.



4. Choose “Device Manager” from the “Hardware” tab.



5. Expand the “Sound, video and game controllers” section of device manager be clicking its + sign.



6. Double click the “Lynx AES16*e*” entry to launch the Lynx AES16*e* Properties dialog box. Click the “Driver” tab, then click “Update Driver…”.



7. When the Hardware Update Wizard box appears, choose “Install from a list or specific location (Advanced)” and click “Next>.”



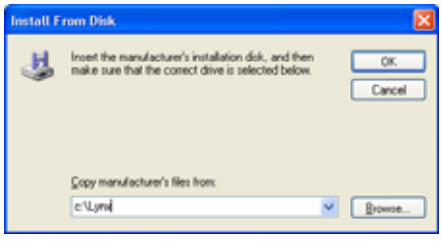
8. From the next window, select "Don’t search, I will choose the driver to install”. Click "Next >" to proceed.



9. When prompted to select a device driver, click “Have Disk”.



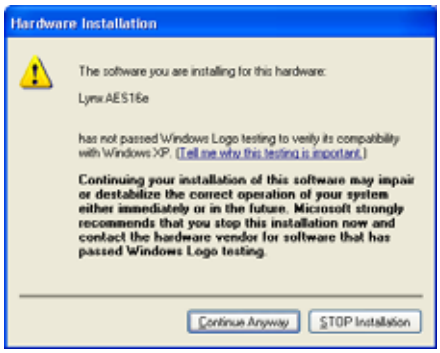
10. Next, you’ll be asked to insert the manufacturer’s installation disk into the drive selected (the default is A:\) – type “C:\Lynx” in the text box, and click “OK”.



11. You will be prompted to select the device driver you are installing. “Lynx AES16*e*” will be your only choice. Select it and click “Next>”.



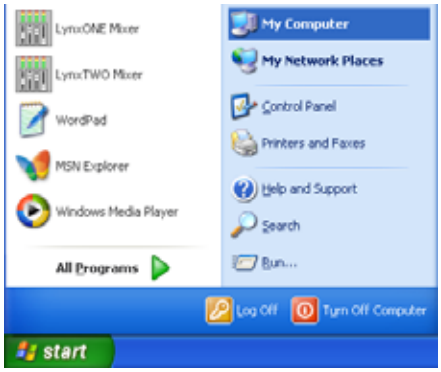
12. You may receive a warning that the driver has not been digitally signed by Microsoft. It is perfectly safe to disregard this warning and click “Continue Anyway” to proceed with the installation.



13. The driver installation will continue. After several moments, the Hardware Update Wizard will indicate that it has completed the installation. Click “Finish”.



14. Next, we need to update the Lynx Mixer. From the Start Menu, choose “My Computer.”



15. Double-click on the C: Hard Drive and look for the “Lynx” Folder. Double Click the folder to open it.



16. Right Click on the LynxApps.inf (Setup Information) file and click “Install”



17. The new Lynx Driver and Mixer application are now ready to use.

2.2.5 Installing the Windows Driver Package in Windows Vista

1. When you start Windows after installing the AES16*e* into your computer, the New Hardware Wizard will appear. Select “Locate and install driver software (recommended)”.



2. On the next screen, you will be prompted to “Insert the disc that came with your Multimedia Audio Controller”. Since we already did this in Step 2.2.1, click “Next”.



3. The driver installation will begin. A dialog box may appear prompting you to confirm installation of the driver. Select “Install”.



4. The installation will continue until a dialog box appears that reads: “The software for this device has been successfully installed”.

5. Open Windows Explorer (Start > Programs > Accessories > Windows Explorer), expand "My Computer" in the left frame, and then click on the drive letter for your CD-ROM drive (i.e. “D:\”). The files on the CD should then appear in the right frame. Open the Windows folder. Right-click on LynxApps.inf (Setup Information) and choose "Install".

2.2.6 Uninstalling the Windows Driver Package in Windows Vista

1. From the start menu, click on “Control Panel.”
2. Click “Device Manager” .
3. Expand the “Sound, video and game controllers” section of device manager be clicking its + sign:
4. Right click on “Lynx AES16*e*” and choose “Uninstall”
5. Put a check next to “remove driver software” Confirm device removal by clicking “OK”.
6. Reboot the computer

2.2.7 Updating an existing driver in Windows Vista

Navigate your web browser to: http://www.lynxstudio.com > Support > Download. Select OS = Windows/ Product = AES16*e*/ File Types = All Types. Download the current driver installer.

1. Double-click the downloaded file to decompress, and accept the default destination folder of C:\Lynx.
2. Click “Yes to All” if prompted to confirm the files to be replaced.
3. From the start menu, click on “Control Panel.”
4. Click “Device Manager” .
5. Expand the “Sound, video and game controllers” section of device manager be clicking the + sign.
6. Double click the “Lynx AES16*e*” entry to launch the LynxAES16*e* Properties dialog box. Click the “Driver” tab, then click “Update Driver…”.
7. When the Hardware Update Wizard box appears, select “Locate and install driver software (recommended)”.



8. The system will unsuccessfully attempt to locate drivers via Windows Update. On the next screen, you will be asked to install a driver disk. Select “I don’t have the disc. Show me other options.”



9. The next screen will claim that Windows couldn't find a driver. Choose "Browse my computer for driver software (advanced)"



10. On the next screen, you will be prompted to specify a location for the driver files. Either click "Browse" and navigate to the Lynx folder on the C: drive, or type in "C:\Lynx". Then click "Next".



11. If you are prompted to confirm the installation, click "Install".



12. The driver installation will proceed and then indicate that the installation has completed successfully.

13. Navigate to C:\Lynx, and right-click on LynxApps.inf, and choose "Install". The driver and mixer app are now installed and ready to use.

2.3 Macintosh OS X

The AES16*e* Driver Package provides the greatest compatibility with today's most popular audio and production software. The AES16*e* OS X driver supports the Core Audio driver standard and is Universal Binary compatible for use with Intel-based Macintosh computers.

2.3.1 OS X Installation Files

The Lynx Installation CD contains all driver files mentioned in the subsequent installation steps, as well as the AES16*e* manual, driver release notes and test files. If you do not have a CDROM drive or need a more recent version, these files are available on our website at www.lynxstudio.com > Support > Downloads.

If you have downloaded newer drivers than those included on your Lynx Installation CD, please extract the driver to the desktop. The following instructions can still be followed, use the driver file on the desktop rather than the CD as specified in these instructions.

2.3.2 Installing the AES16*e* Device Driver and Mixer Application.

1. Open the OSX folder.
2. Double-click "Lynx_OSX.pkg". This will start the driver installation.



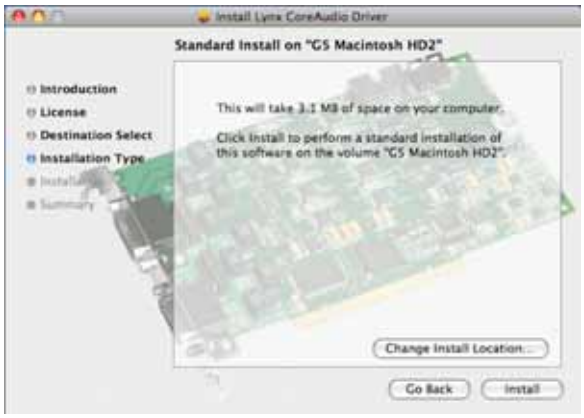
3. Click "Continue" at the "Install Lynx CoreAudio Driver Installer" dialog box.



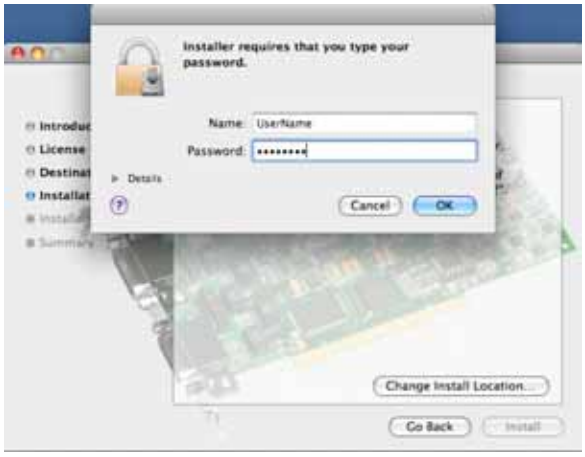
4. When prompted to Agree with the terms of the software license agreement, click "Agree".



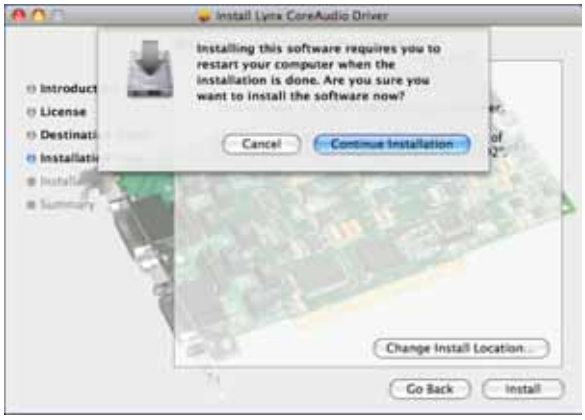
5. When prompted to select a destination for the audio driver, choose an appropriate Macintosh HD and then click “Install”.



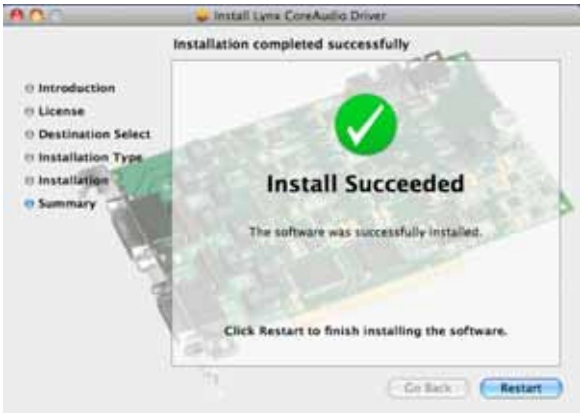
6. Enter your password in the Authenticate dialog box and click OK.



7. At the installer restart warning, click “Continue Installation”.



8. When the install is complete, you will be prompted to restart the computer.



NOTE: The OS X installation process installs both the Core Audio driver and the Lynx Mixer application. The Lynx Mixer application is installed in the "Applications" folder.

2.3.3 Uninstalling the AES16*e* Device Driver and Mixer

To uninstall the driver, you will have to use a third-party uninstaller like DesInstaller, which you can get from**:** http://www.versiontracker.com/macosx/. Follow the uninstaller's instructions to remove the Lynx_OSX.pkg.

2.3.4 Updating the AES16*e* Device Driver and Mixer

To update the AES16*e* driver with a newer version, simply follow the instructions for uninstalling the driver and then install the newer version per the installation instructions. You may need to reconfigure the Lynx Mixer and your recording application(s) after updating the driver.

3 Hardware Connections

3.1 Overview

The AES16*e* includes eight AES/EBU compatible inputs and outputs that provide sixteen channels of digital audio I/O. These signals are available on two bracket-mounted 26-pin high-density D connectors, labeled I/O Port A and I/O Port B as shown in Figure 1 below.

Also shown in Figure 1 are CLOCK IN and CLOCK OUT connectors that provide word-clock I/O for internal synchronization with other installed cards. The LStream Port provides a connection for optional Lynx LStream expansion cards.

The AES50 port is an RJ-45 connector that can be used for future format expansion with an optional bracket-mounted AES50 interface.

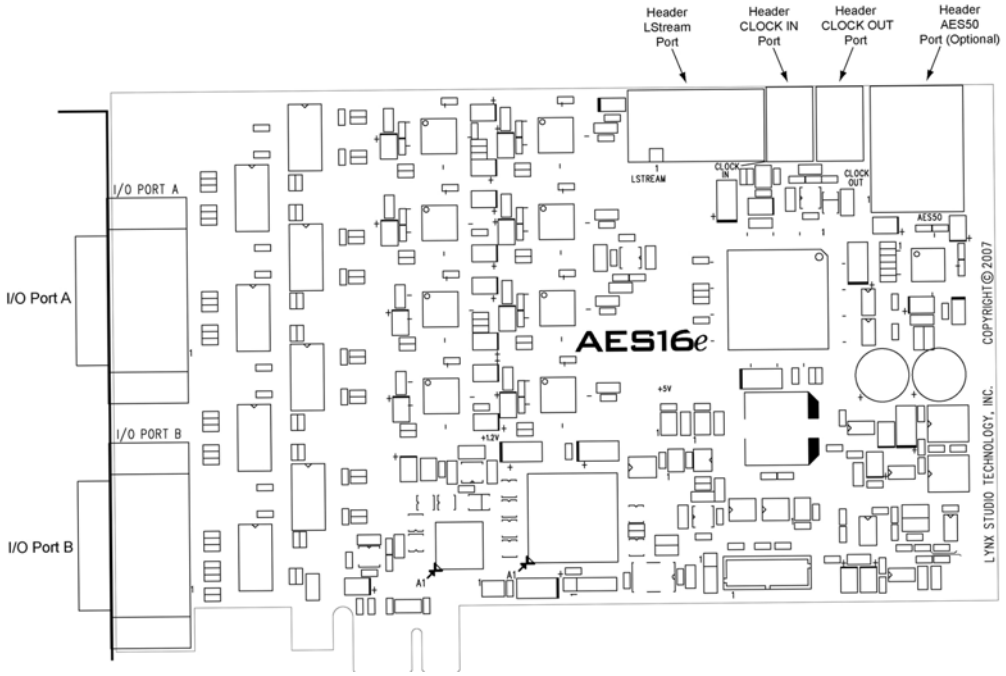


Figure 1: AES16*e* Board

3.2 AES/EBU Cable Connections

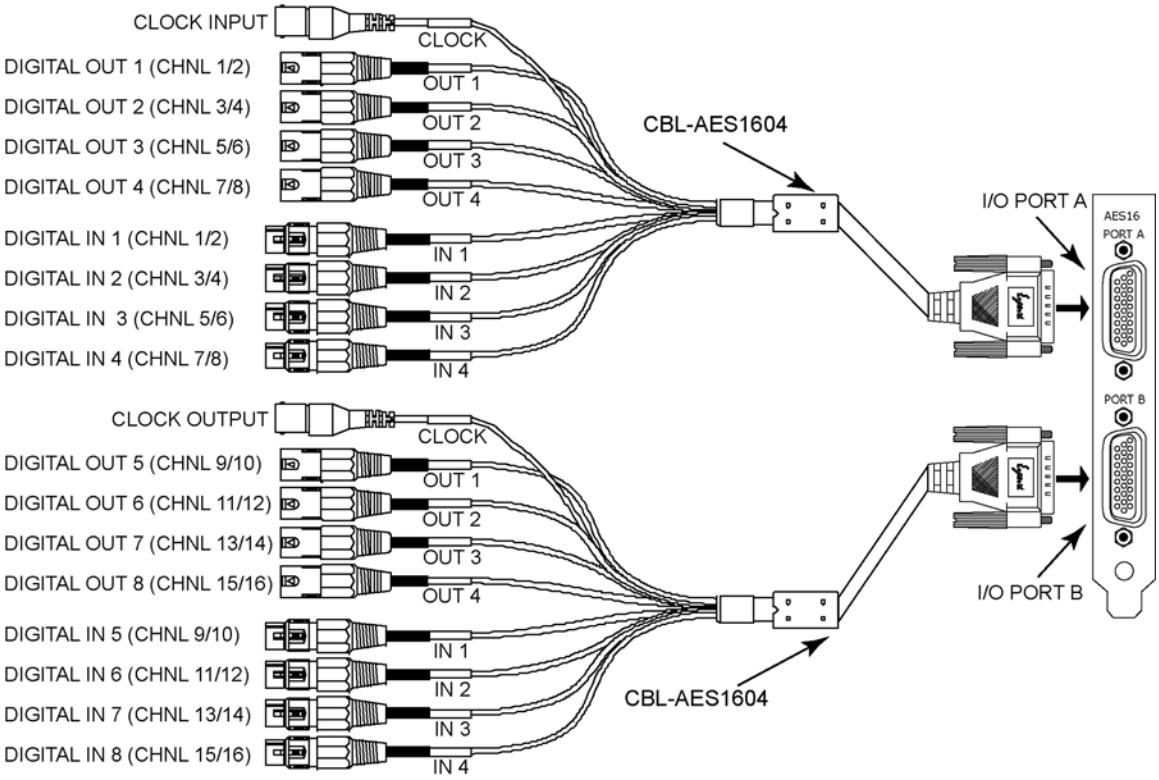
To minimize cabling issues, a variety of breakout cables are available for the AES16*e*.

3.2.1 Connections to Equipment with XLR Connectors

The CBL-AES1604 cable provides standard XLR connectors for the AES16*e*. It is a 2 meter long cable with the AES16*e* compatible HD-26 connector, 4 male and 4 female XLR connectors as well as a BNC word-clock connection. It is important to note that the signals associated with each XLR and BNC connector depend on which I/O Port it is used on. These signals are listed below in Figure 2. Clock connections are discussed in detail in Section 3.3

This is the correct cable set to use whenever the AES16*e* is attached to an AES/EBU device that has XLR connections.

Figure 2: XLR Connections with CBL-AES1604 Cable



3.2.2 Connections to Equipment with 25-Pin AES/EBU D-Sub Connectors

The CBL-AES1605 breakout cables provide 25-pin D-sub connections compatible with industry standard multi-channel digital equipment connectors. The CBL-AES1605 is a four meter cable that utilizes the Yamaha pin configuration for the 25-pin D-Sub connector. Digital devices that are compatible with this pin configuration include converters such as the Lynx Aurora and Apogee Rosetta, digital mixers such as the Yamaha 02R, Yamaha DM2000 or Mackie D8B, and processors such as the TC Electronics DSP6000. Devices that use the Tascam pin configuration **are not compatible** with the CBL-AES1605. Digital Audio products by Tascam, Digidesign, Panasonic and IZ Technology typically use the Tascam pin configuration for their AES/EBU D-Sub connectors. In these cases, one can have a custom cable made with the correct pin-out, or use a cable with XLR connections on their equipment that can be interfaced with the XLR connections on the CBL-AES1604 cable.

The signals associated with each 25-pin D-sub connector depend on which I/O Port on it connected to. I/O Port A will carry Digital Inputs 1-4 and Digital Outputs 1-4, Port B will carry Digital Inputs 5-8 and Digital Outputs 5-8. Keep in mind that each AES channel is stereo.

3.3 Clock Connections

In any system with more than one digital device, there can be only one master clock providing synchronization. Whether you designate the AES16*e* as the clock master (slaving all other devices to it) or slave the AES16*e* to another clock master, it is important that only a single device act as clock master, to prevent the occurrence of audible digital errors.

The AES16*e* provides connections that allow for synchronization with external equipment or internal devices within the computer.

3.3.1 External Clocking

Clock connections to external equipment can be established through word-clock connections or using AES/EBU digital I/O. Word-clock connections are currently provided only with the CBL-AES1604 cable set.

With the CBL-AES1604 Cable connected to **I/O Port A** of the AES16*e*, the BNC connector labeled CLOCK acts a clock ***input***. This input supports TTL signal levels and is terminated with 75 ohms of impedance.

Connect this input to the clock output of an external device and select “External” as the Sample Clock Source in the Lynx Mixer (see section 6.2).

With the CBL-AES1604 Cable connected to **I/O Port B** of the AES16*e*, the BNC connector labeled CLOCK acts a word-clock ***output***. This output provides a 75-ohm TTL level signal at a frequency that tracks the sample clock rate of the AES16*e*. Connect this output to the word-clock input of an external device.

With either the CBL-AES1604 or CBL-AES1605 cable set, the AES16*e* can be synchronized to signals coming in to Digital Inputs 1-4. Any digital devices that are connected to **I/O Port A** on the AES16*e* can serve as a clock source for the AES16*e*. From the Lynx Mixer, “Digital In 1” through “Digital In 4” can be selected as the active clock source (see section 6.2).

It is worth noting that with the AES16*e*’s SynchroLock Technology, jitter performance between the word-clock and digital inputs are very similar. Therefore in cases where this is the only external clocking method available (i.e. with the CBL-AES1605 cable), there will not be a penalty in terms of jitter or overall clock performance by selecting “Digital In” as the clock source.

3.3.2 Internal Clocking and Multi-card Systems

Clock connections to internal equipment are provided via the header CLOCK IN and CLOCK OUT connectors on the AES16*e* board. Refer to Figure 1 for the location of these connectors. The connectors support 75-ohm, TTL level signals. If you are connecting to another Lynx digital audio card, the Lynx Internal Clock Cable (CBL-ICC) or Universal Clock Cable (CBL-UCC) should be used.

Connect the CLOCK IN connector to the clock output of an internal device and select "Header" as the clock source in the Lynx mixer. The signal on the CLOCK OUT header is a word-clock that tracks the sample rate of the AES16*e*. Connect this output to the word-clock input of an internal device or another AES16*e*.

As shown below in Figure 3, multiple AES16*e*'s can be synchronized using the optional Internal Clock Cable. A daisy chain of CLOCK OUT to CLOCK IN is created so that all cards are tightly synchronized. Refer to Section 9 Configuring Multiple AES16*e*'s for more information.

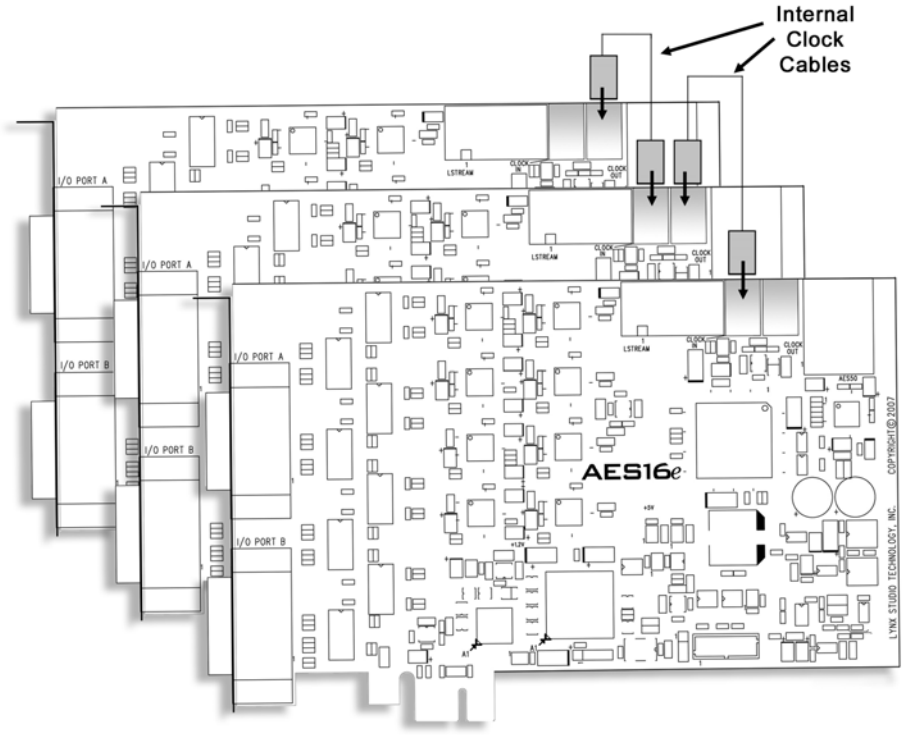


Figure 3: Synchronizing Multiple AES16*e*'s Using Internal Clock Connections

Note: If an appropriate internal clock cable is not available, multiple cards can be synchronized externally by using the BNC clock connections on the CBL-AES1604 cable. Use a standard 75-ohm BNC coaxial patch cable to connect the input clock signals to the output clock signals.

3.4 Common Studio Setups

This section describes typical studio setups using the AES16*e*.

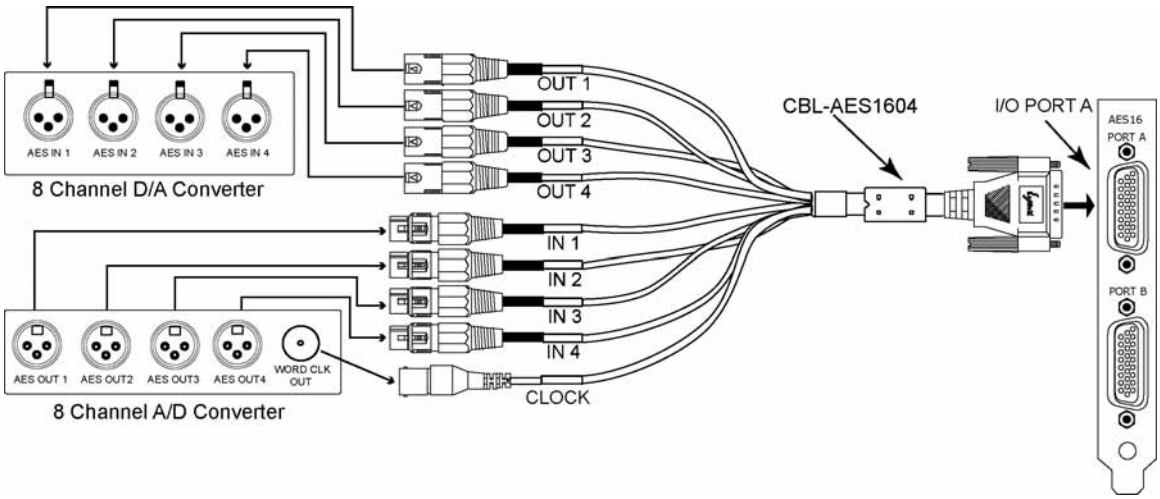
3.4.1 External A/D and D/A with Word-clock

The figure below illustrates the connection of an eight-channel A/D converter and an eight-channel D/A converter to I/O Port A of the AES16*e*. This setup uses only half of the available I/O on the AES16*e*. Additional converters can be connected to I/O Port B to provide up to 16 channels of A/D and D/A conversion.

Also shown is the use of the word-clock output of the A/D as the system clock. This signal drives the word-clock input of the AES16*e*, which is available on the CLOCK BNC connector on the breakout cable attached to I/O Port A. Note: this connector is a word-clock ***output*** when the cable is attached to I/O Port B. Also, a separate word-clock connection is not always required since any of the four AES inputs connected to I/O Port A can be used as word-clock sources.

AES16e Clock Settings
To select the external clock input as the sample clock source for the AES16*e*, set the SAMPLE CLOCK SOURCE in the Adapter window of the Lynx Mixer to “External”.

External Equipment Clock Settings
Since the internal clock of the A/D converter is the clock master in this setup, change its clock setting to select its internal clock. Set the D/A converter to slave to one of its digital inputs. Alternatively, another word-clock signal from the A/D or from I/O Port B of the AES16*e* could drive the word-clock input of the D/A. In this case, the clock source of the D/A should be set to the appropriate setting for external word-clock.



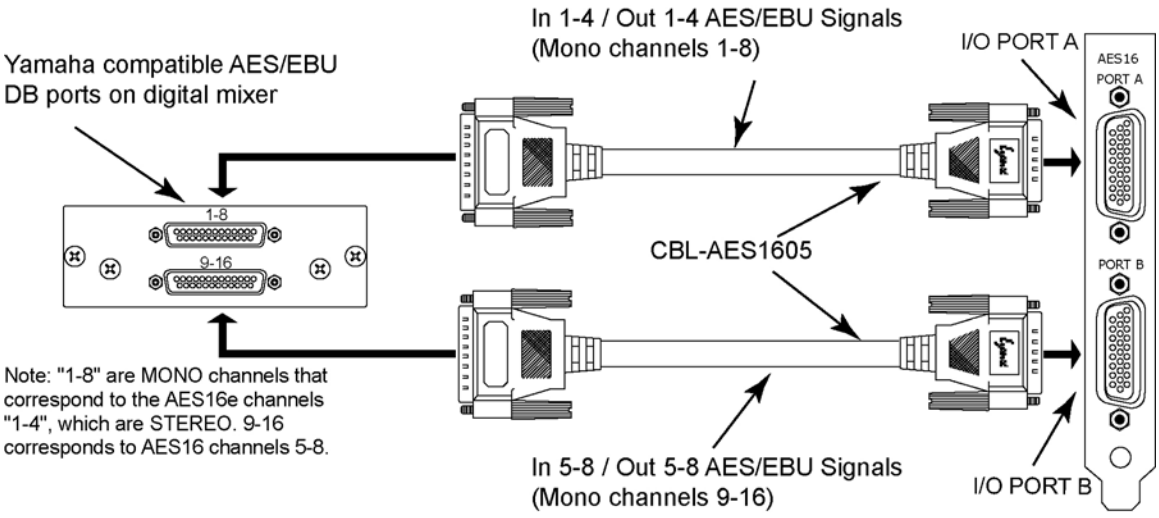
3.4.2 Digital Mixer

The figure below illustrates the connection to a digital mixer that has 16 channels of AES/EBU digital I/O. The D-Sub ports on the mixer must be compatible with the Yamaha multi-channel digital I/O standard. Each of these ports provides eight channels of input and eight channels of output.

In this setup, either the digital mixer or AES16*e* can act as the system clock master depending on the clock settings of each device. In each case, the clock is transmitted to the receiving device via the AES/EBU connection.

AES16e and External Equipment Clock Settings
To use the digital mixer as the clock master: set the SAMPLE CLOCK SOURCE in the Adapter window of the Lynx Mixer to “Digital In 1”. Change the clock source setting of the digital mixer to select its Internal clock.

To use the AES16*e* as the clock master: set the SAMPLE CLOCK SOURCE in the Adapter window of the Lynx Mixer to “Internal”. Change the clock source setting of the digital mixer to use one of its digital inputs.



4 Getting Started

With the AES16*e* and its drivers properly installed in your computer, you can begin to use its capabilities with most popular third party audio applications. In order for these applications to access the AES16*e* you must select one of the AES16*e* audio devices in the application's audio device configuration menu. Refer to Section 8 Working with Third Party Applications for more information.

The following sections provide instructions for testing your installation.

4.1 Windows Quick Audio Test

The installation of your AES16*e* can be tested using the Lynx Mixer and the Lynx Demo application included on the AES16 Installation CD. This is a quick way of verifying that the AES16*e* card is installed correctly and properly connected to your external equipment.

1. Locate "SineWaveMinus16.wav" on the Lynx Installation CD (in the "Support" folder). Drag the file to the computer's desktop.

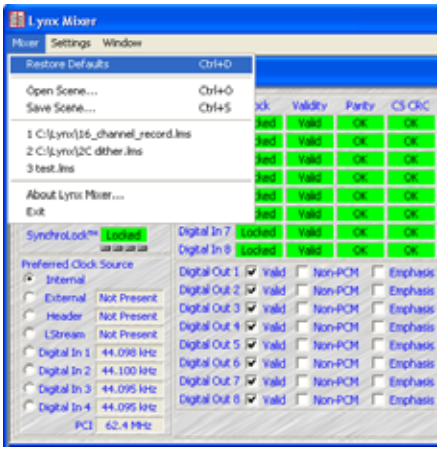
2. Connect the outputs of the AES16*e* to a digital destination (digital mixer, DA converters, etc.) capable of delivering an audio signal for listening via headphones or speakers. Depending on your external equipment, you may be using the CBL-AES1604 or CBL-AES1605 cables – please check Section 3 Hardware Connections of this manual for details on the proper connection of these cables to your equipment. Verify that DIGITAL OUT 1 of the AES16*e* is connected to your external equipment. This is the output used for this test.

3. Before testing playback, the clock relationship between the AES16*e* card and your external device must be established. For this test, the AES16*e* acts as the clock master, while your external device is the clock slave. Consult the manual for your connected equipment to determine how to set it to receive sample clock from a digital input.

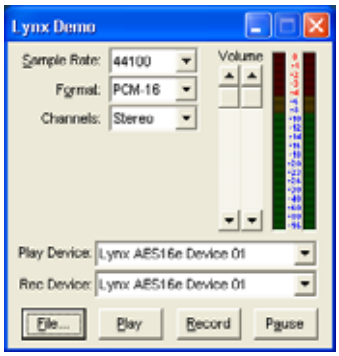
4. Most digital devices offer several choices for sample clock status, with "Internal" generally being the default. If your device does not have the ability to receive its sample clock from a digital input, please consult Section 3.4 Common Studio Setups for information on creating an alternate clock relationship with the AES16*e*. Keep in mind that the sample clock source of the AES16*e* is set to "Internal" primarily to confirm the validity of your connections and installation – ultimately you should create clock relationships that make the most sense for your specific situation.

5. Open the Lynx Mixer, which will be in the Lynx Studio Technology program directory (Start > All Programs > Lynx Studio Technology > Lynx Mixer.)

6. Choose "Restore Defaults" from the Mixer menu. This will insure that the sample clock source is set to "Internal", that the output levels are at maximum, and that no channels are muted.



7. Launch the Lynx Demo application from the Lynx Studio Technology program directory (Start > All Programs > Lynx Studio Technology > Lynx Demo). The Lynx Demo program should appear in the upper left corner of your screen. Make certain that the Play Device is set to Lynx AES16*e* Device 01.

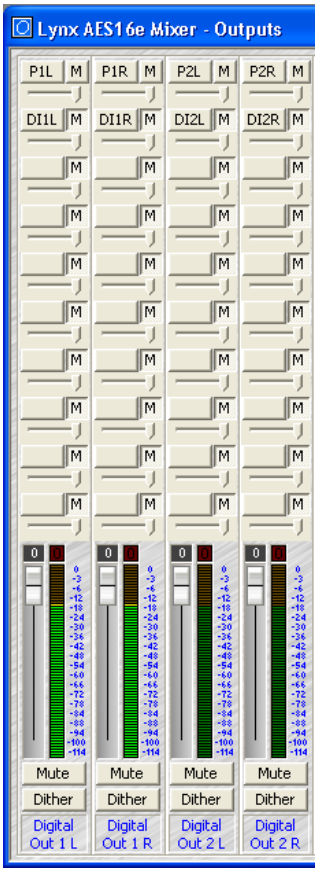


8. Click “File” and navigate to the computer’s Desktop, then select “SineWaveMinus16.wav” and click “Open.”

9. Click “Play.” You should see the progress bar move from left to right.



10. Check the Lynx Output mixer and confirm meter activity for Digital Out 1L and Digital Out 1R. If you have speakers or headphones connected to your destination device, you should hear audio as well as seeing meter activity.



If the test did not operate as described or you received any errors, please refer to Section 10 Troubleshooting.

4.2 Macintosh OS X Quick Audio Test

The installation of your AES16*e* can be tested using the Lynx Mixer and iTunes, which is included with current versions of OS X. This is a quick way of verifying that the AES16*e* card is installed correctly and is connected correctly to your external equipment.

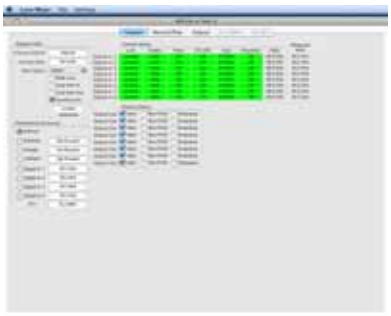
1. Open Applications > Utilities >Audio/MIDI Setup. Verify that the AES16*e* Play 1 established as the default audio playback device for your system.

2. Locate "SineWaveMinus16.aif" on the Lynx Installation CD (in the support folder). Drag the file to the computer's desktop.

3. Connect the outputs of the AES16*e* to a digital destination (digital mixer, DA converters, etc.) capable of delivering an audio signal for listening via headphones or speakers. Depending on your external gear, you may be using the CBL-AES1604 or CBL-AES1605 cables - please check Section 3 Hardware Connections for details on correctly connecting these cables to your equipment. Verify that DIGITAL OUT 1 of the AES16*e* is connected to your external equipment. This is the output used for this test.

4. Before testing playback, the clock relationship between the AES16*e* card and your external device must be established. For this test, the AES16*e* acts as the clock master while your external device is a clock slave. Consult the manual for your connected equipment to determine how to set it to receive sample clock from a digital input. Most digital devices offer several choices for sample clock status, with "Internal" generally being the default. If your device does not have the ability to receive its sample clock from a digital input, please consult Section 3.4 Common Studio Setups for information on creating an alternate clock relationship with the AES16*e*. Keep in mind that the sample clock source of the AES16*e* is set to "Internal" primarily to confirm the validity of your connections and installation – ultimately you should create clock relationships that make the most sense for your specific situation.

5. Open the Lynx Mixer, which will be in "Applications". Choose the "Adapter" tab, and verify that the CURRENT CLOCK SOURCE is set to "Internal".



6. Launch iTunes from Applications. Click "File" then "Import". Choose "SineWaveMinus16.aif" on the desktop and click "Open".

7. Highlight "SineWaveMinus16" in the iTunes Music List, and click "Play" from the iTunes transport. You should see the iTunes progress bar moving.

8. Check the Lynx Output mixer and confirm meter activity for Digital Out 1L and Digital Out 1R. If you have speakers or headphones connected to your destination device, you should also hear audio and see meter activity.



If the test did not operate as described or you received any errors, please refer to Section 10 Troubleshooting.

5 Operational Overview

5.1 Signal Flow

As shown in the signal flow diagram below, the AES16*e* with its on-board digital mixer provides extensive signal routing capabilities that can adapt to any studio requirement. The mixer is implemented using a proprietary digital signal processor (DSP) that is optimized to maintain low latency and high signal quality. The architecture of the digital mixer consists of 16 record channels and 16 play channels that are accessible to host applications as eight stereo record devices and eight stereo play devices. Submixers on each output provide low-latency mixing for record monitoring and output mixing.

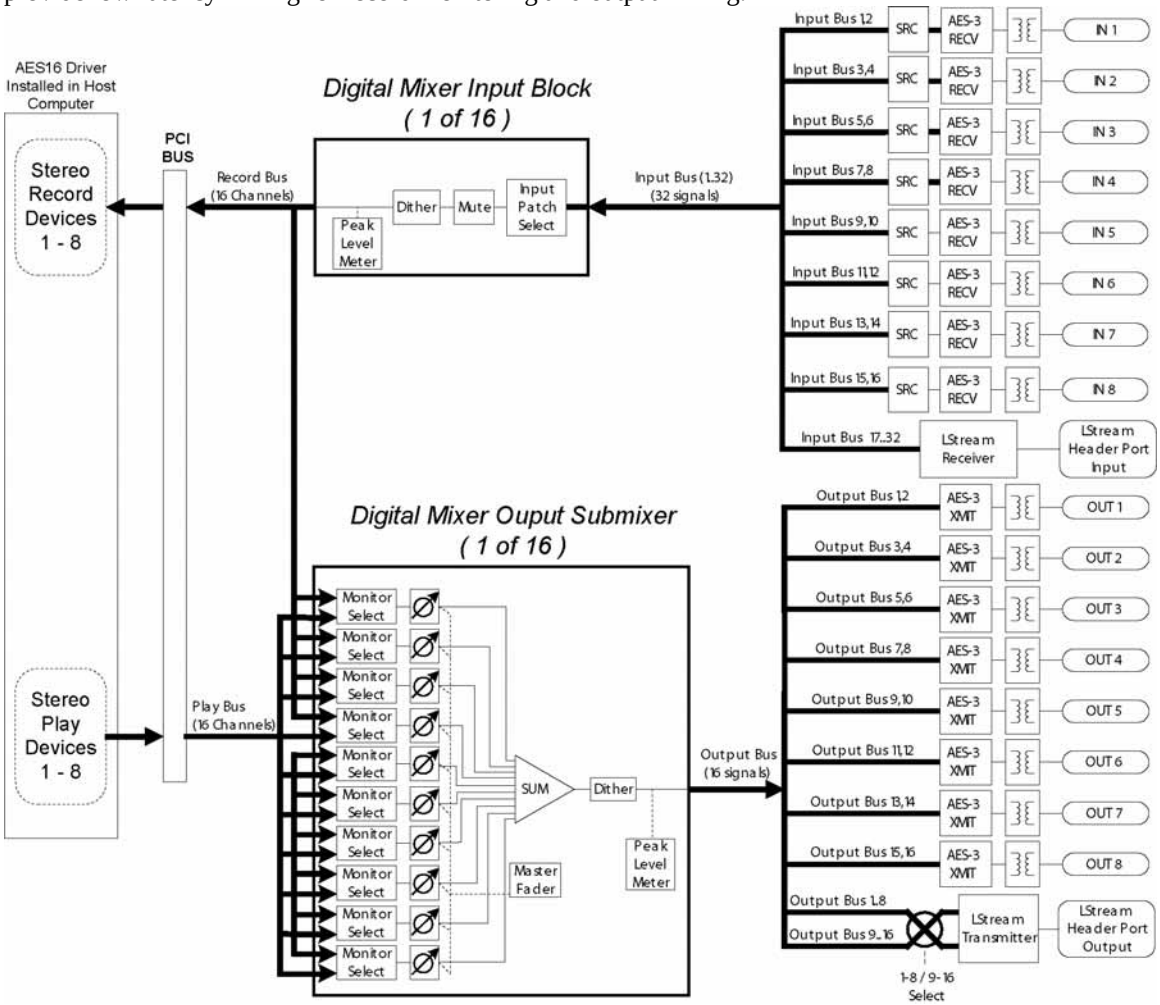


Figure 6: Signal Flow Diagram

5.1.1 Physical Inputs

Starting from the digital inputs in the upper right portion of Figure 6, each AES-3 input signal is routed through a transformer for isolation before arriving at an AES-3 receiver. The receiver extracts a word-clock, using a low jitter phase-locked loop, and signal data that is passed to the Input Bus of digital mixer.

In the case of the SRC version of the AES16*e*, the signals on digital inputs then pass through a high-performance sample rate converter before merging with the Input Bus. This sample rate converter can be enabled or disabled under user control in the Lynx Mixer.

The LStream header on the AES16*e* is an expansion port that provides an additional 16 inputs from a Lynx LStream device, such as the LS-ADAT that offers 16 channels of ADAT lightpipe. The signals from the LStream header are routed through the LStream receiver, which feeds the Input Bus.

5.1.2 Digital Mixer Inputs

The digital mixer has 16 input blocks that receive data from the Input Bus and drive the 16 channels of the record bus. Each of these blocks has an input selector that allows selection of any signal on the Input Bus. This selector allows flexible patching of any AES16*e* physical input signal to any of the 16 Record Bus channels as well as any of the 16 LStream channels. After the selector, the signal passes through a mute switch and then through the dither block, which offers three popular dither algorithms and bit-depth control. The output of the dither block is measured for peak level meters and feeds one of the Record Bus channels.

Software control of the digital mixer's input blocks is provided in the Record/Play window of the Lynx Mixer application. The input selector corresponds to the Input Source select buttons (above the faders for each record channel). Mute and dither controls are also provided for each channel on this window.

5.1.3 Record Bus and Devices

The 16 channels of the Record Bus are derived from the outputs of the mixer input blocks. These signals are routed to the host computer via the PCIe bus to the AES16*e* driver and also feed the output section of the digital mixer to provide zero latency record monitoring.

The AES driver installed on the host computer assigns the 16 channels from the Record Bus to eight stereo record devices as follows:

- Record Bus Channel 1 feeds the left channel of Record Device 1
- Record Bus Channel 2 feeds the right channel Record Device 1
- Record Bus Channel 3 feeds the left channel Record Device 2
- (etc)
- Record Bus Channel 16 feeds the right channel Record Device 8

5.1.4 Play Bus and Devices

The Play Bus is derived from the 16 channels sent to the AES16*e* play devices from host applications. In other words, when an application is used to playback a file, the data from the file is sent to an AES16*e* play device. The AES16*e* driver routes this data to the Play Bus, which feeds the output section of the digital mixer. Similar to the Record Bus, the 16 channels of the Play Bus correspond to the AES16*e*'s sixteen play devices are follows:

- Left channel of Play Device 1 feeds Play Bus Channel 1
- Right channel of Play Device 1 feeds Play Bus Channel 2
- Left channel of Play Device 2 feeds Play Bus Channel 3
- (etc)
- Right channel of Play Device 16 feeds Play Bus Channel 32

5.1.5 Digital Mixer Outputs

The 16 output signals of the digital mixer are derived from 16 ten-input submixers. The Record Bus and Play Bus feed the submixer inputs, which each have an associated selector (labeled Monitor Select in the diagram) and volume control. The submixers use 40-bit accumulators to maintain signal accuracy. The output of the submixers are dithered to 24-bits using triangular PDF dither and then measured for peak level metering in the Lynx Mixer application.

This architecture allows each digital mixer output to be a mix of up to ten signals derived from any AES16*e* input or any play device receiving data from a host application in playback mode. This capability is sample

rate limited: at sample rates of 176.4 kHz or 192 kHz, there are up to 4 sources per output. The benefits of this architecture include the ability to:

- Route any input to any or all outputs
- Route any play device data from an application to any or all outputs
- Mix any input with any play device for recording monitoring
- Create sub mixes for digital effect sends
- Since all mixing and routing is hardware-based, so called “zero latency” is achieved.

Software control of the digital mixer outputs is provided in the Outputs window of the Lynx Mixer application. The Monitor Select function in the diagram corresponds to the Output Monitor Source buttons in the Mixer. The volumes controls for the submixer inputs are below these buttons. The master fader on the Outputs window of the Mixer adjusts all of the submixer input volumes. Mute and dither controls are also provided for each channel on this window. The dither button enables the output TPDF dither.

5.1.6 Physical Outputs

The physical outputs of the AES16*e* include eight AES3 signals and the output of the LStream port. As shown in Figure 6, the 16 channels of the Output Bus derived from the output submixers feed the physical outputs. Since there are 16 physical outputs (16 AES3) and up to 32 signals on the Output Bus (including 16 LStream channels), data sent to the 16 play devices is mirrored on the LStream and AES-3 outputs.

An AES-3 transmitter followed by an isolation transformer converts Output Bus signals to AES-3 signals.

An LStream transmitter formats data for the LStream output port. To provide more routing flexibility the “1-8 / 9-16 Select” function shown in the diagram allows routing of output signals to a bank of eight LStream channels. Output Bus signals 1-8 can be routed to LStream channels 9-16 if desired.

5.2 Sample Clock Generator

The AES16*e* utilizes a master sample clock generator to derive all clocks related to the digital audio sampling rate. As shown in Figure below, the sample clock generator provides a selection of various clocks sources ands both a wide range and SynchroLock phase-lock loop (PLL).

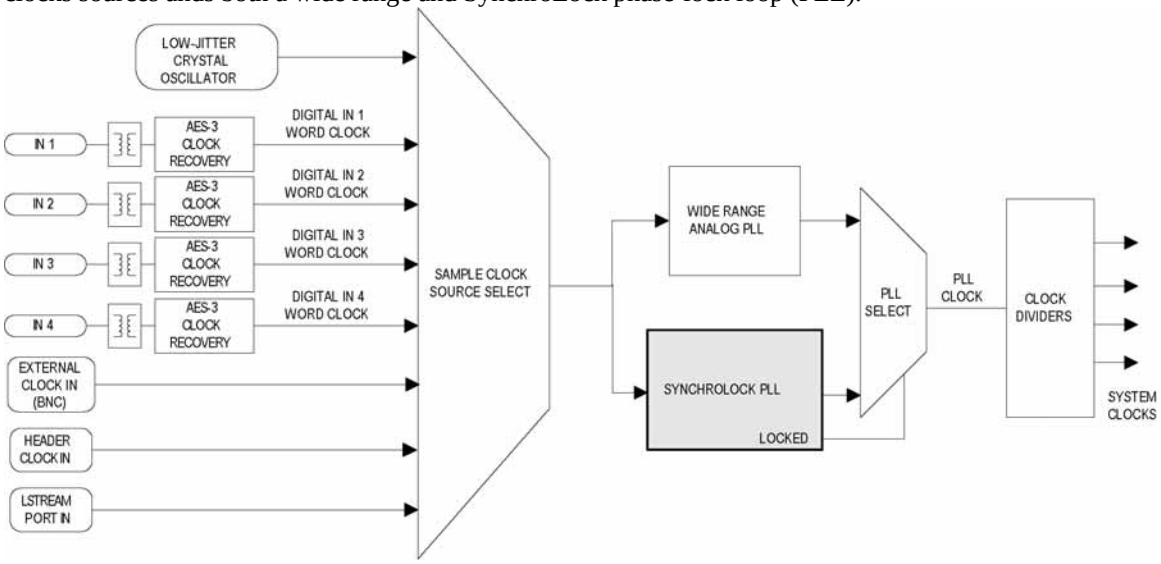


Figure 7: Sample Clock Generator

5.2.1 Sample Clock Sources

The sample clock generator can derive its reference clock from both an internal and various external sources. Only one source can be selected at any given time. User control of the sample clock source selector is provided on the Adapter window of the Lynx Mixer application. The available clock sources are:

- On-board low-jitter oscillator (Internal)
- External Clock In: signal from the CLOCK IN BNC connector on the CBL-AES1604 break-out cable
- Header Clock In: signal from the board-mounted header connector
- LStream Port In: word-clock from an LStream device connected to the LStream header port
- Digital In 1- 4: word-clock recovered from one of the first AES-3 inputs

5.2.2 Phase-lock Loops and Clock Dividers

A two-stage phase-lock loop system is used to generate a high-frequency PLL Clock while attenuating jitter in the selected sample clock source. Refer to the Section 5.3 SynchroLock™ for a description of the operation of the PLL's. Clock dividers derive required system clocks from the PLL clock.

5.3 SynchroLock™

The AES16*e* incorporates SynchroLock clock synchronization technology to provide extreme tolerance to noisy external AES/EBU and word-clock signals while generating an ultra-low jitter clock. This technology is especially useful for combating noise induced on cables in complex studio installations. SynchroLock provides clock synchronization while insuring bit-perfect digital transmission. When the AES16*e* is connected in an AES/EBU daisy chain, SynchroLock acts like a jitter firewall to prevent the propagation of jitter to downstream devices.

By coupling statistical analysis with low-noise clock generation techniques, SynchroLock is capable of attenuating jitter on incoming AES/EBU signals by a factor of 3000:1. Compare this to attenuation of 100:1 or less for professional quality analog phase-lock loops (PLL). SynchroLock can easily handle AES/EBU signals with jitter levels in excess of 800 nanoseconds.

The SynchroLock sample clock is a two-stage system that is comprised of a fast-locking, wide-range analog PLL and digitally controlled crystal-based secondary stage. Due to extensive number crunching of the secondary stage, SynchroLock typically requires one to two minutes to achieve final lock. While the secondary stage is working, the analog PLL loop maintains lock, but with much less jitter attenuation than the secondary stage.

When the final lock state is achieved, the secondary stage is switched on line and becomes the system clock source. In some cases this switching process may cause a momentary disruption in digital I/O. Because of this, it is recommended that recording or playback not be started until the green LOCK indicator in the SynchroLock status window is observed. This status window is located on the Adapter window of the Lynx Mixer.

SynchroLock works on any external word-clock signal. By default, SynchroLock is active when the Sample Clock source is set to a clock source other than Internal.

SynchroLock can be disabled in the settings menu of the mixer by clicking on "Settings > Advanced > SynchroLock," but this is not recommended.

SynchroLock is capable of locking to word-clock frequencies within +/- 100ppm of 44.1 kHz, 48 kHz, 88.2kHz, 96 kHz, 176.4 kHz, or 192 kHz. Signals that fall outside of the lock range will cause the red RANGE indictor to appear in the SynchroLock status window. In this case, the analog PLL is active and will source the system sample clock.

6 Lynx Mixer Reference

The Lynx Mixer, which is installed during setup, provides software control of the features of the AES16*e* and a visual indication of audio signal level during recording and playback. It can be used dynamically to change operational settings of the AES16*e*, but in most cases once the settings are configured for a particular studio installation they require no further adjustment.

6.1.1 Starting the Mixer

Windows: After installation and a reboot, the Lynx Mixer icon, will appear on the Windows Quick Launch bar in the lower portion of your screen.



By clicking on this icon, the Lynx Mixer will launch. If you do not have the Windows Quick Launch bar activated, the Lynx Mixer can be started be selecting "Start > All Programs > Lynx Studio Technology > Lynx Mixer."

Macintosh: In OS X, the Lynx Mixer can be launched from Applications > Lynx Mixer.

6.1.2 General Operation

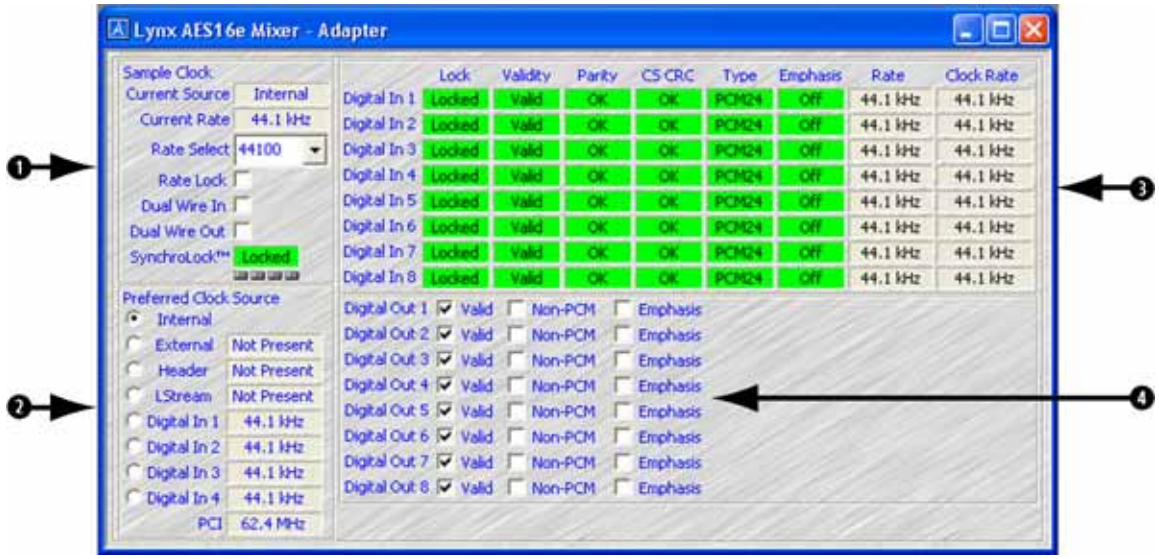
If you are simply recording and playing digital audio without synchronizing to an external clock source, you can begin using the AES16*e* by simply selecting the AES16*e* audio devices in your application software.

Typically, it is convenient to keep the Mixer running on your desktop to monitor signal levels or to allow immediate access to Mixer controls requiring dynamic changes. The Mixer can be forced to appear on top of other applications by selecting the "Always On Top" option in the Settings pull-down menu (Windows Only).

6.1.3 Mixer Configuration Recall

The settings in the Lynx Mixer are saved each time you close the Lynx Mixer application. The stored settings are automatically recalled the next time your computer is restarted. In addition, you can save Mixer scenes with all parameters intact for instant recall. Mixer scenes can be saved from the MIXER menu (Windows) or the FILE menu (OSX). This is an effective way to toggle the Mixer state for different contexts of use (i.e. recording and mixing).

6.2 Adapter Window



Windows



OSX

1 Sample Clock Section

This section of the mixer provides control of the system sample clock generator. All AES16*e* audio devices on a single card MUST have identical sample rates since there is one on-board generator. Sample rates cannot be changed while AES16*e* is playing or recording – unless the "Allow Clock Change if Active" option is selected from the Lynx Mixer Settings > Advanced menu (Windows Only).

Current Source

This displays the clock source that is active. This may differ from the selection in the "Preferred Clock Source" section, if an invalid or offline clock source was selected there.

Current Rate

Displays the current sample rate of the AES16*e*. When the AES16*e* is being used for recording or playback by an application and the CURRENT SOURCE is “Internal”, the rate shown is the rate set by the application. Applications are always the “master” in terms of setting the sample clock rate of the card when the Internal clock is utilized
When an external clock source is selected (External, Header, LStream, Digital In 1-4), the CURRENT RATE will reflect the sample rate being provided by the current clock source. In this case, the card can be operating at a different sample rate than the rate used by an active recording or playback application. When a sample rate discrepancy of this sort occurs, one of two things can occur.

1. The Operating System will resample the playback stream to match the hardware sample rate. This software resampling is generally poor in quality so this scenario is not recommended when it is possible to avoid it.
2. The audio will play back or be recorded at the wrong pitch and speed.

Rate Select

Allows selection of the card’s active sample rate manually when the CURRENT CLOCK SOURCE is “Internal”. The rate will change only if the card is idle (not recording and playing). Manual adjustments are not required if the card is being used with an application. This control is primarily useful when the AES16*e* is the clock master for other digital devices.

Rate Lock

When the CURRENT CLOCK SOURCE is “Internal” and Rate Lock is ON, the driver will ignore all requests to change the Sample Clock Rate, including those coming from applications. This effectively causes all files not running at the currently selected clock rate to be software sample rate converted by the Operating System during playback or recording. When clocking to an external clock source, the Rate Lock function is effectively ON regardless of this switch setting, and the rate is locked to the same rate of the incoming clock.

RATE LOCK On is primarily useful in cases where material of various sample rates may be played, but a static sample rate is desired - for instance when digital devices are connected that don’t support all of the sample rates desired.

Dual Wire In

Allows selection of AES/EBU dual-wire mode on ALL digital inputs for compatibility with legacy devices. Dual-wire mode is enabled when the check box is checked; otherwise the inputs operate in single-wire mode. Dual-wire mode is operational for sample rates greater than 50kHz. The number of available input channels is reduced to eight when this mode is active. Refer to Section 7.5 AES/EBU Dual-wire operation for more information.

Dual Wire Out

Allows selection of AES/EBU dual-wire mode on ALL digital output for compatibility with legacy devices. Dual-wire mode is enabled when the check box is checked; otherwise the outputs operate in single-wire mode. Dual-wire mode is operational for sample rates greater than 50kHz. The number of available output channels is reduced to eight when this mode is active. Refer to Section 7.5 AES/EBU Dual-wire operation for more information.

SynchroLock

Shows the status of SynchroLock clocking system.

SynchroLock is Lynx Studio Technology’s proprietary technology for attenuating jitter on clock inputs and providing a stable clock for all digital signals passed through the AES16*e*. The SynchroLock status window and LED indicators show the current state of the SynchroLock system as described below. Prior to

achieving lock, the four green LED's give an indication of the completion of various lock stages. During this time the wide range analog PLL maintains lock. For more information on SynchroLock, refer to the Section 5.3 SynchroLock™.

Working: In this state SynchroLock is analyzing the input clock signal and making adjustments to frequency and phase. This process typically takes two to three minutes to complete. The four LED's show progress towards final lock: One green LED denotes frequency lock to 3.2 ppm accuracy, two LED's denote frequency lock to 1.6 ppm accuracy, three LED's denote frequency lock to 0.6 ppm and the transition to the phase lock stage, four LED's denote the start of the phase lock stage. When phase lock has been achieved, the Yellow "Working" indicator changes to the green "Locked" indication.

Locked: Indicates the SynchroLock system has achieved final lock to an incoming clock signal. This indicator will also appear when the Sample Clock Source is set to Internal and the sample clock frequency is a multiple of 44.1 kHz or 48 kHz.

Range: Indicates that the selected external clock source is not within the SynchroLock lock range.

Disabled: Indicates that SynchroLock has been manually disabled using the SynchroLock control in the Settings menu: Settings->Advanced->SynchroLock.

❷ Preferred Clock Source Section

This section of the mixer provides control of the system sample clock generator. All AES16*e* audio devices on a single card MUST have identical sample rates since there is one on-board generator. Sample rates cannot be changed while the AES16*e* is playing or recording, unless "Allow Clock Change if Active" is selected from the Lynx Mixer Settings > Advanced menu.

Clock sources available to choose from are:

Internal	Clock derived from the on-board crystal oscillator
External	Clock signal from BNC CLOCK connector
Header	Clock signal from the CLOCK IN header
LStream	Clock signal from the LStream port (i.e. LS-ADAT)
Digital In 1	Clock signal from the Digital 1 Input
Digital In 2	Clock signal from the Digital 2 Input
Digital In 3	Clock signal from the Digital 3 Input
Digital In 4	Clock signal from the Digital 4 Input

Next to each source is a box that displays real-time frequency measurements of system clocks, or "Not Present" when a valid clock source is not connected. These measurements are very useful for evaluating and validating both internal and external clock sources.

The Settings Menu offers a "High Resolution Clock Rate" option that provides three decimal places of accuracy instead of the default single decimal place. With this option enabled, lower digits may fluctuate rapidly as a result of measurement resolution. This is typically not an indication of clock jitter.

If the selected Preferred Clock Source is not also displayed as the Current Source in the SAMPLE CLOCK section of the Adapter page, it would be for one of the following reasons:

1. The selected source is not present or the connected device is not generating a valid clock signal. This can be confirmed by seeing "Not Present" next to this source. In these cases, the AES16*e* will operate from its Internal clock until a valid clock signal is connected to the selected clock source.
2. The selected clock source is generating a sample rate outside of the AES16*e*'s usable range (i.e. 22kHz). This can be corrected by setting the clock source to a supported sample rate (32kHz, 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz, 192kHz).

3. The Clock Source was selected when the AES16*e* card was being accessed by some software application. In this case, the Preferred Clock Source will become the Current Source when the card is no longer being accessed. If "Allow Clock Change if Active" is selected from the Lynx Mixer Settings > Advanced menu, then a new Preferred Clock Source can become the Current Source while the card is being accessed from a software application.

❸ Digital Input Status Section

This section displays status information pertaining to the AES16*e*'s eight AES inputs. The data displayed indicates the quality of the AES/EBU connections as well as channels status data sent by a transmitting device. The information displayed in this section is very useful for troubleshooting digital input connection issues. For more information about AES/EBU channel status data, refer to the AES-3 specification available from the Audio Engineering Society web site at http://www.aes.org.

Lock

Locked (green)	Indicates the digital receiver is locked to a valid AES/EBU source
Unlocked (gray)	Indicates the digital receiver is not locked to a valid AES/EBU source

When the Unlocked indicator is shown, all of the fields to the right will be blank.

Validity

Valid (green)	Indicates the Valid channel status bit is set
Invalid (red)	Indicates the Valid channel status bit is not set

The Valid bit is set by a transmitting device to indicate the validity of the audio data being transmitted. A DAT machine for example may mark the data as invalid when it is not in play mode.

Parity

OK (green)	Indicates accurate transmission of audio data
Error (red)	Indicates an audio data error occurred during transmission

The parity bit is included in the AES/EBU data stream to validate the transmission of audio data. A parity error indicates an audio data error was cased either by the transmitting device or the connecting cables.

CS CRC

OK (green)	Indicates valid transmission of channel status data
Error (red)	Indicates a transmission error in the channel status data

This indicator represents the state of Channel Status Cyclic Redundant Check used to validate the transmission of the channel status data embedded in the AES stream. An error indicates a channel status data error was caused either by the transmitting device or the connecting cables. Some devices do not transmit CS CRC. In this case an error will be displayed, but the audio data can still be transmitted without errors.

Type

This indicator represents the type of data stream being transmitted by the external device. The external device indicates type using specific bits in the channel status data. Typically PCM types are shown with green background and non-PCM types, such as Dolby AC3, have a yellow background.

Valid linear PCM types (bit width):

PCM	**PCM16**	**PCM18**
PCM19	**PCM20**	**PCM22**
PCM23	**PCM24**	

Valid compressed, non-PCM types:

Dolby AC-3		
MPEG1L1	**MPEG1L2**	**MPEG2**
MPEG2AAC	**MPEG2L1**	**MPEG2L2**
MPEG2L3	**MPEG-4**	
DTS I	**DTS II**	**DTS III**
ATRAC	**ATRAC2/3**	

Emphasis

Off (gray)	Emphasis is off
50/15us (green)	50/15us pre-emphasis
J17 (green)	CCITTJ.17 emphasis
Unknown (green)	Emphasis not indicated

The emphasis bit is part of the channel status data and is used by a transmitter to indicate if the audio data being transmitted has been encoded with audio signal emphasis.

Rate

This indicator represents sample rate encoded in the channel status data.

Valid Rates include the following:

32.0; 44.1; 48.0; 88.2; 96.0; 176.4; 192.0 kHz (all in green) or Unknown (red)

Note: it is the responsibility of the transmitting device to send rate status that matches the actual rate of the audio data stream being sent. However, it is possible for a rate discrepancy to exist during a valid transmission.

Clock Rate

Clock Rate displays a real-time measurement of the sample rates of the incoming signals. These measurements are very useful for evaluating and validating digital inputs when synchronization or clocking issues are encountered.

The Settings Menu offers a “High Resolution Clock Rate” option that provides three decimal places of accuracy instead of the default one decimal place. With this option enabled, lower digits may fluctuate rapidly as a result of measurement resolution.

When DualWire In is checked to enable AES dual-wire operation on input, Clock Rate should read half of the encoded channel status rate described above. For example, when running at 192 kHz with dual-wire inputs, the Clock Rate should indicate 96.0 kHz and the Current Rate should indicate 192 kHz.

SRC Enable

This checkbox will only appear when using an AES16*e*-SRC. This checkbox controls the state of the sample rate converter for a specific digital input. When checked, the incoming signal is routed through the sample rate converter so the sample rate will match the currently selected sample rate of the AES16*e*-SRC. For example, when the device connected to Digital In 5 is running at 48 kHz, the AES16*e*-SRC is running at 44.1 kHz, and SRC Enable for Digital In 5 is ON, the AES16*e*-SRC will convert the sample rate from 48 kHz to 44.1 kHz and the SRC Ratio (see below) will indicate approximately 0.918:1.

SRC Ratio

This indicator will only appear when using an AES16*e*-SRC. Indicates Sample Rate Conversion Ratio when the SRC Enable checkbox is turned on.

❹ Digital Outputs Control Section

This section provides control of status bits embedded in the AES/EBU stream for each digital output. For more information about the use of these bits, refer to the AES-3 specification available from the Audio Engineering Society web site at http://www.aes.org.

Valid

This checkbox controls the state of the Valid bit. When checked, the Valid bit is turned on to indicate to the receiving device that the audio data being transmitted is valid. This is the default state.

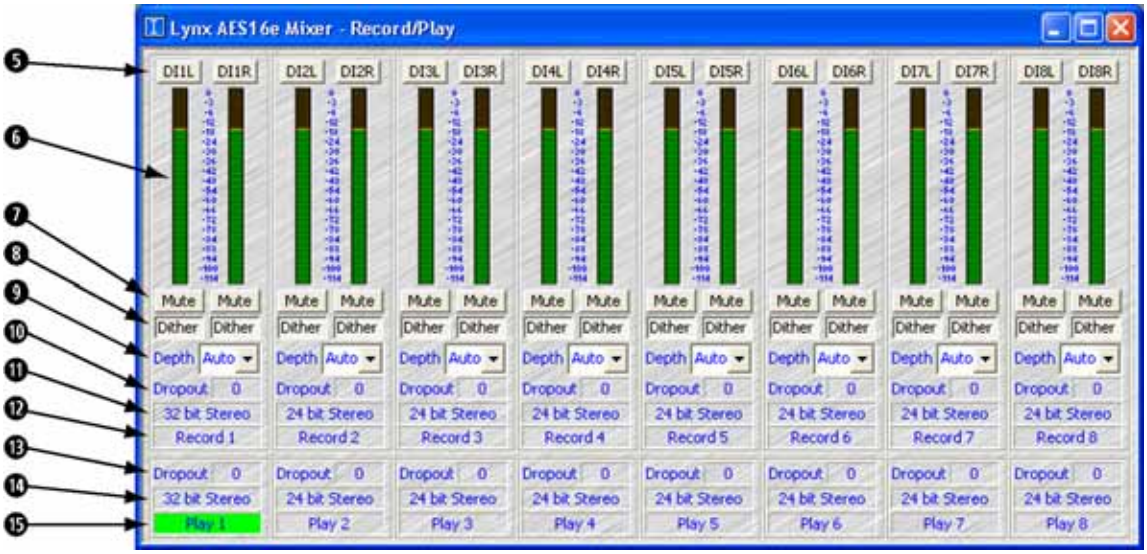
Non-PCM

This checkbox controls the state of the Non-PCM channel status bit. When checked, the Non-PCM bit is turned on to indicate that audio data other than linear PCM (such as Dolby AC3 or DTS) is being transmitted.

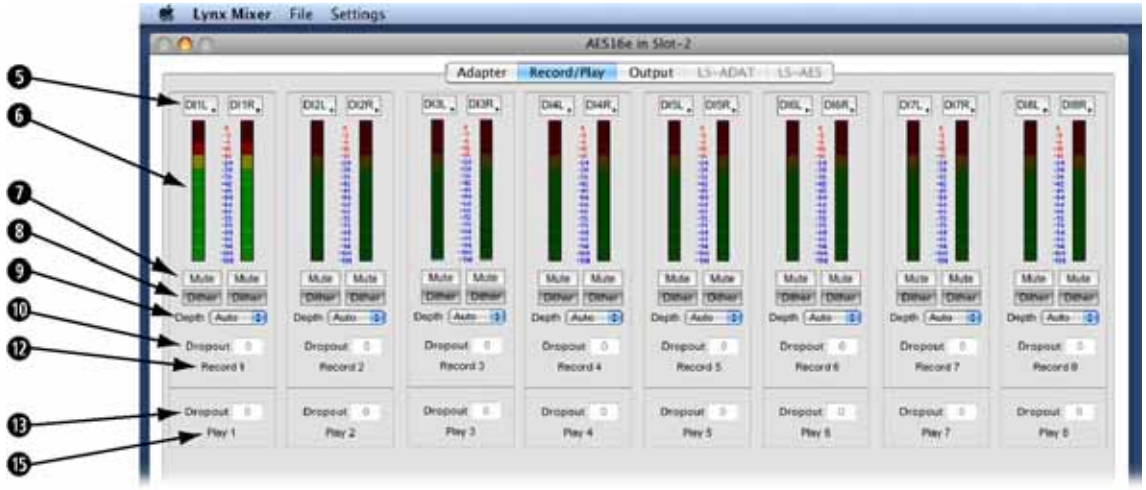
Emphasis

This checkbox controls the state of the emphasis channel status bits. When checked, the 50/15us emphasis mode is indicated in the transmitted channel status.

6.3 Record/Play Window



Windows



OSX

5 Input Source Select Buttons

These buttons control the patching of physical inputs to record device channels of the digital mixer. Each device channel can derive its source from any one of the 32 available inputs, which include 16 from I/O Port A and B and 16 from the LStream port. The button on the left side of each record device panel corresponds to the left channel of the device.



Clicking on any of the Input Source Select buttons launches a pop-up menu displaying the available sources that can be selected.

In this example, LStream In 1 is being routed to the left channel of record device 1. This input would be valid if an LS-ADAT ADAT card was connected to the AES16*e*'s LStream Port.

❻ Peak Meter

These meters display the instantaneous peak level of audio being sent to the AES16*e* input selected by the Input Source Select buttons.

❼ Mute

This button enables the mute function for the associated input.

❽ Dither

This button enables dithering for the associated input. The Record Dither Type control in the Settings menu determines the type of dither applied to the input. The Dither function is on by default, but is only active when an application requests a recording bit depth of less than 24-bits. This can be overridden with the Depth control pulldown menu.

Dither is useful for improving signal fidelity when reducing the bit depth of incoming data from 24 bits to 20, 16, or 8 bits.

❾ Depth

This control sets the bit depth used for recording on each input. The options are 8 bit, 16 bit, 20 bit, 24 bit, and Auto. When Auto is selected, the bit depth is set according to the sample format requested by an application accessing the record device. For example, if the sample format is 16 Bit Stereo, the bit depth will be set to 16 bit.

❿ Record Dropout

This status indicator represents the number of audio dropouts that have occurred during recording on a record device. Dropouts can produce audible glitches in audio files. They are typically caused by a computer's inability to process data from the AES16*e* fast enough. The indicator is reset at the start of recording or on initialization of the driver when using the ASIO driver model . When a dropout has occurred, the background for this box will turn Red.

⓫ Record Sample Format (Windows Only)

This status indicator represents the sample format of a recording device. The format, which is set by an application accessing the device, determines the format of the data sent to the host computer for storage or processing. The sample format indicates bit depth and mono, stereo, or multi-channel modes. In the case of 32 bit formats, the lower eight bits are set to zero. With ASIO application, the bit depth will be reported as "ASIO" whereas the actual bit depth of the recorded files would need to be established from within the ASIO recording application.

⓬ Record Device Label / Status Indicator

This label panel specifies the record device number associated with each input panel. When an application is accessing a record device, the background of this label turns green to indicate the device is in record mode. Observing this indicator can be very useful while debugging communication problems with third party applications.

⓭ Play Dropout

This status indicator represents the number of audio dropouts that have occurred during playback on a play device. Dropouts can produce audible glitches in audio files. They are typically caused by a computer's inability to process data from the AES16*e* fast enough. The indicator is reset at the start of playback or on initialization of the driver when using the ASIO driver model. When a dropout has occurred, the background for this box will turn Red.

⓮ Play Sample Format (Windows Only)

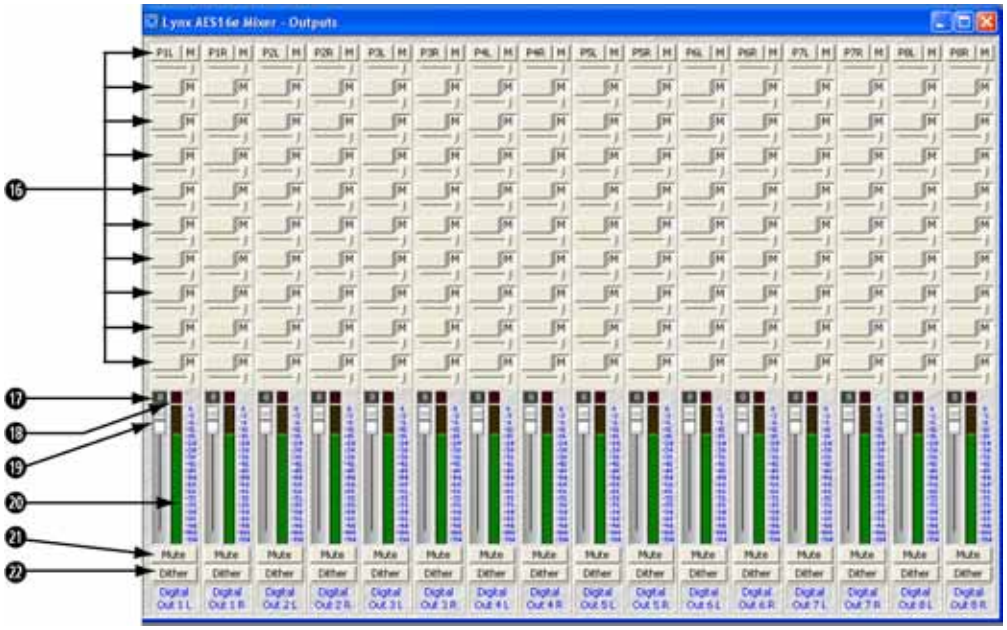
This status indicator represents the sample format of a play device. The format, which is set by an application accessing the device, determines the format of the data sent from the audio application. The sample format indicates bit depth and mono, stereo, or multi-channel modes. In the case of 32 bit formats, the lower eight bits are set to zero. With ASIO application, the bit depth will be reported as "ASIO" whereas the actual bit depth of the recorded files would need to be established from within the ASIO audio application

⓯ Play Device Label / Status Indicator

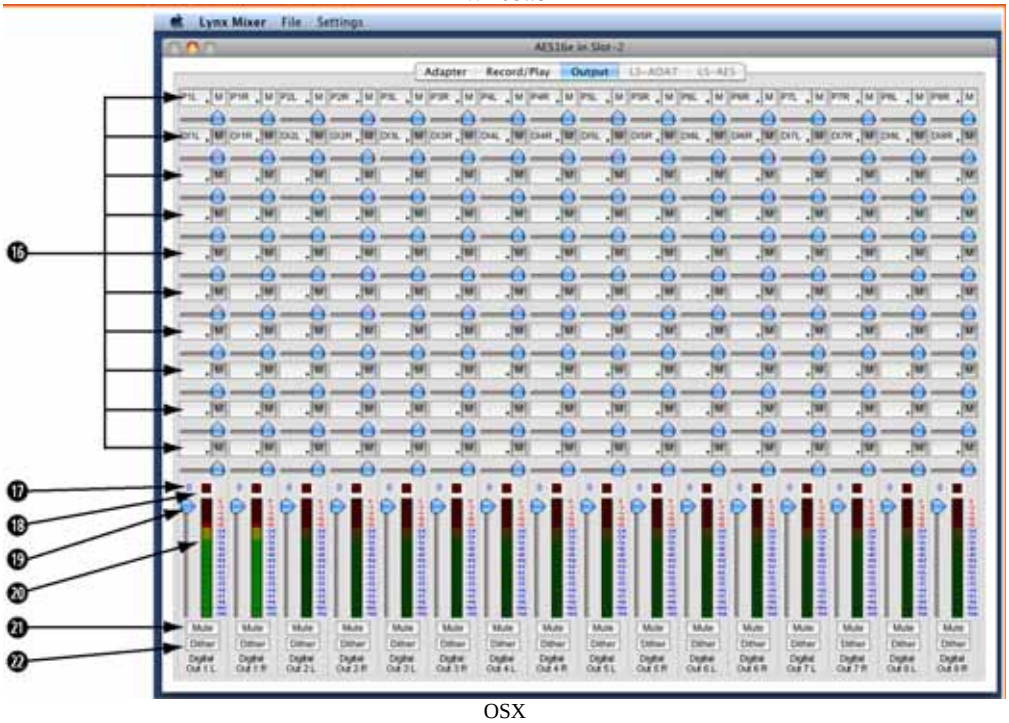
This label specifies a play device number associated with the Play Dropout and Play Sample Format indicators described above. When an application is accessing a play device, the background of this label turns green to indicate the device is in play mode. Observing this indicator can be very useful while debugging communication problems with third party applications.

Please note play device information is unrelated to the record device controls contained in the same vertical panel on the Record/Play Window. The location of this information was chosen in order to provide a compact view of record and play device status.

6.4 Outputs Window



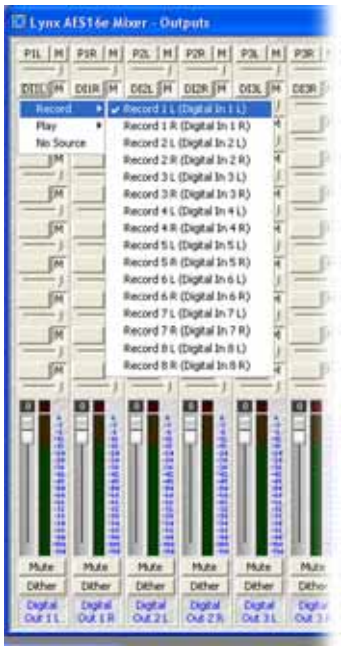
Windows



OSX

⑯ Output Monitor Source Buttons

These buttons control the routing of record and playback sources that feed each of the 16 output channels. Since each output is derived from the sum of the ten sources, each button controls the selection of one of the sources.



When a button is clicked, a pop-up menu is launched that displays the available sources that can be selected. A **Record** submenu lists inputs and their corresponding the record devices (which is dynamically updated to reflect Input Source selections in the Record/Play window). A **Play** submenu lists the left and right channels of the eight stereo play devices. The **No Source** option disables a monitor source.

The example to the left shows Digital In 1 L being selected as one of the ten sources for DIGITAL OUT 1 L.

After a monitor source is selected, a four-character abbreviation of the selection is placed on the button. For example, DI1L indicates Digital In 1 Left.

⑯ Output Monitor Mute Buttons

The buttons, labeled **M,** located to the right of each Output Monitor Source Button control the muting of the adjacent monitor source. When the button is "pushed in", the mute function is enabled.

⑰ Attenuation Indictor

This indicator represents the amount of attenuation in dB that has been performed on an output when the associated volume fader has been pulled down.

⑱ Overload Indictor

This indicator turns red when signal overloads that have occurred on an output. Overloads occur when the summation of the ten monitor sources feeding an output exceeds the full scale digital output level.

⑲ Volume Faders

Theses faders provide digital attenuation of the output signal prior to D/A conversion. With the volume fader at its maximum position, the Attenuation Indicator will display "0" (zero attenuation). In this case the audio stream is unaltered. This is the recommended position for critical recording and mixdown sessions in which the highest signal quality is required. To attenuate a pair of channels, hold down the "Shift" key on the computer keyboard while click-dragging one of the faders of the pair to be attenuated. To attenuate all sixteen channels, hold down the "CTRL" key while click-dragging any fader.

⓴ Peak Meters

These meters display the instantaneous peak level of the output signal. Meters turn red when the output level is within 16dB of clipping.

㉑ Mute

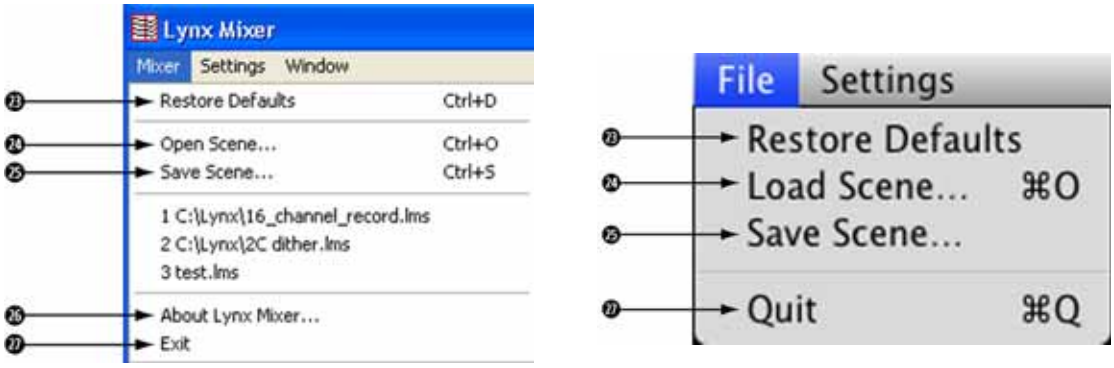
This button enables the mute function for the associated output.

㉒ Output Dither

This button enables the addition of triangular probability density dither for each associated output. Dither is recommended for improving signal fidelity when more than one monitor source is driving an output or when the volume fader is not at its maximum.

6.5 Mixer Menu (Windows)/ File Menu (OS X)

The Mixer menu, located at the top left of the screen, allows selection of global mixer functions.



㉓ Restore Defaults

This option restores all user-selectable parameters to factory default settings. This feature should be used as a first step when mixer settings issues are encountered.

㉔ Open Scene (Windows)/ Load Scene (OS X)

This feature allows user-defined mixer scenes to be restored. Mixer scene files can be saved to any directory on the computer's hard drive. After clicking "Open Scene" navigate to the directory where the desired scene file has been saved, highlight the file and click "Open".

㉕ Save Scene

This feature provides the ability to save all user-selectable parameters. "Scenes" that contain the state of all mixer settings can be saved to a file on the computer harddrive. Recalling Scenes is a very quick and efficient way to revert the mixer to an appropriate state for different contexts of use.

Scene memory is global to all users on a single computer and is initially empty. There is no limit to the number of scenes that can be stored.

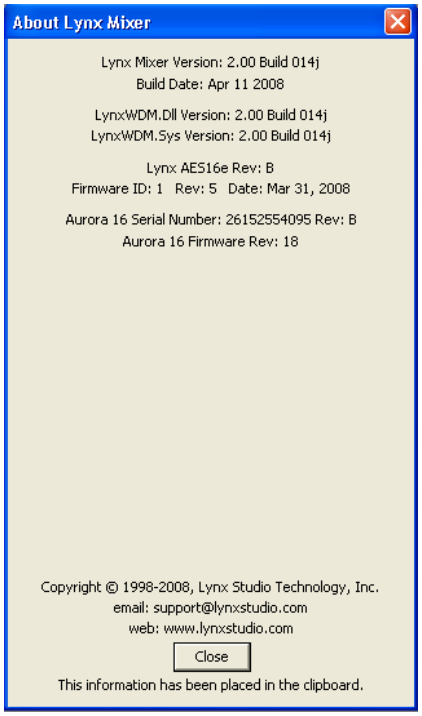
After "Save Scene" is selected, A File Name will need to be created and a directory selected for the mixer scene file to be written to. The current mixer parameters will be stored into scene memory. Selecting an existing scene name and clicking the Save button will overwrite that scene with the current parameters.

In Windows, recent Mixer scenes will appear by name from the Mixer menu, allowing quick retrieval without navigating to the directory where the scene file is stored

To delete a scene simply delete the mixer scene file from the hard drive.

NOTE: When the computer is shut down, the current mixer state is saved. When the computer is restarted, the mixer state is restored. This function is independent of Mixer Scene operation.

❷❻ About Lynx Mixer (Windows Only)



PLEASE NOTE: The About Lynx Mixer window will display different information than what is shown here.

This option displays information about the Lynx Mixer, driver, and firmware as follows:

Mixer/Driver Version: Displays the current mixer version and build number.
Build Date: Displays the date the driver and mixer were released.
LynxWDM.Dll Version: Helps to identify a driver/mixer version mismatch. This version should be the same as the Mixer/Driver Version.
LynxWDM.Sys Version: Helps to identify a driver/mixer version mismatch. This version should be the same as the Mixer/Driver Version.
Adapter Name: Displays the name of the Lynx audio adapter installed. Up to four Lynx audio adapters may be shown.
Serial Number: Displays the serial number of the Lynx audio adapter installed.
PCB Revision: Displays the revision of the printed circuit board.
Firmware ID: Displays the firmware sub-version identification number.
Firmware Revision: Displays the firmware revision.
Firmware Date: Displays the date the firmware was released.

If a Lynx Aurora AD/DA converter is connected to the AES16*e*, the Aurora serial#, PCB Revision, And Aurora Firmware Revision may also appear in the “About Lynx Mixer” dialog box (as pictured).

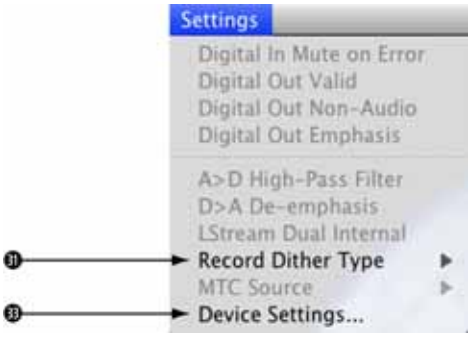
❷❼ Exit (Windows)/ Quit (OS X)

This option closes the Lynx Mixer application.

6.6 Settings Menu

The Settings Menu offers access to advanced settings and an alternative method of accessing commonly used functions that appear in the Adapter Window.





OS X Note: Grayed Out selections are for L22/LynxTWO cards only.

㉘ Always on Top (Windows Only)

When this option is checked, the Lynx Mixer window stays on top of other active windows.

㉙ High Resolution Clock Rates (Windows Only)

When checked, this option enables the display of measured clock rates with 1-hertz resolution. Otherwise, rates are displayed with 100-hertz resolution. This feature controls the display of all System Clock Rates and the Digital Input Clock Rates on the Adapter Window of the mixer.

NOTE: With this option enabled, lower digits may fluctuate rapidly as a result of measurement resolution. This is typically not an indication of clock jitter.

㉚ Level Meter Range (Windows Only)

This option provides control of the range displayed by the peak meters on the Record/Play and Output windows of the mixer. The available ranges are 70dB, 96dB, and 114dB (default). Decreasing the range will increase the resolution of the meter display, which may be required for more critical monitoring. This is a universal setting for all meters – it is not possible to set multiple ranges.

❸❶ Record Dither Type

This option provides selection of the type of dither used on all record channels. The following options are available:

Triangular - Enables the addition of triangular probability density dither. Triangular is the preferred dither type in most cases.

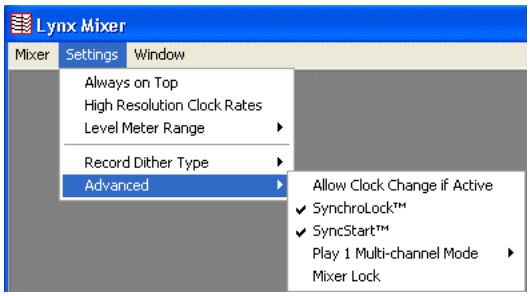
Shaped Triangular - This type of dither is essentially high-pass filtered triangular dither that places most of the dither energy at higher frequencies making it less audible to the human ear. Shaped triangular dither decreases signal-to-noise by 4.8 dB

Rectangular - This type of dither decreases the signal-to-noise ratio by 3 dB (less than triangular), but is less desirable because of its noise modulation effects.

In order to enable the selected dither type on a record channel, the Dither button on the associated channel on the Record/Play window must be "pushed in". See Section 6.3 Record/Play Window.

❸❷ Advanced (Windows Only)

This option provides access to several advanced menu functions.



Allow Clock Change if Active – This option allows the Current Clock Source to be changed even when the card is being used by an audio application. Please note: there will be an audible glitch when a clock source is changed during playback or recording of audio. With the Allow Clock Change if Active option OFF (the default), changing the Preferred Clock Source will not change the Current Clock Source until the driver is no longer being utilized by a software application.

SynchroLock™ – When checked, enables the SynchroLock clock generator. This should be disabled only when locking to external clocks that are near the limit of the SynchroLock lock range. Enabled by default.

SyncStart™ – When checked, enables the SyncStart feature, which provides sample accurate synchronization of multiple record and playback devices. Enabled by default.

Play 1 Multi-Channel Mode – This option provides selection of the playback mode for Device 1 of the AES16*e*. Choices include: Stereo, Quad, 5.1 and 7.1.

Mixer Lock – When checked, enables a locking feature that prevents changes to any of the mixer controls by any application, including the Lynx Mixer.

㉝ Device Settings (OS X Only)

This option provides access to several parameters for fine-tuning the driver performance. The default settings are appropriate for most conditions of use, but in some cases Lynx Technical Support will suggest altering these parameters as a troubleshooting option. Settings are organized by specific sample rate ranges to maximize the performance benefits. Changes must be made while the driver is not active, so make sure all audio applications are closed before changing Device Settings.



Transfer Size – This parameter controls the size of the packets transferred to and from the card's buffer. The Transfer Size should never be more than ½ the size of the Core Audio buffer size. Increasing the Transfer Size will increase the actual record and play latency, but in some cases can reduce CPU usage and improve performance

Number of Record Devices – This parameter controls how many stereo Record Devices are active in the Operating System. The AES16*e* can present up to 8 Record Devices, which is the default for sample rates up to 96kHz, and 4 Record Devices are the default for rates over 100 kHz. Reducing the number of Record Devices can reduce the load on the computer's processor, thereby potentially improving performance. Record Devices are presented in numerical order, so if the number of Record Devices for a given sample rate range has been reduced to 6, then AES16*e* Record Devices 1-6 will be active, and Devices 7 and 8 will no longer pass audio.

Number of Play Devices – This parameter controls how many stereo Play Devices are active in the Operating System. The AES16*e* can present up to 8 Play Devices, which is the default for sample rates up to 96kHz, and 4 Play Devices are the default for rates over 100 kHz. Reducing the number of Play Devices can reduce the load on the computer's processor, thereby potentially improving performance. Play Devices are presented in numerical order, so if the number of Play Devices for a given sample rate range has been reduced to 6, then AES16*e* Play Devices 1-6 will be active, and Devices 7 and 8 will no longer pass audio.

7 Using the AES16*e*

This section describes how to perform common tasks with AES16*e*. Additional information is available in the Frequently Asked Questions (FAQ) section on the Lynx web site (http://www.lynxstudio.com).

7.1 Mixer Scene Storage and Recall

Once you have configured the mixer's routing and other parameters, you may save that configuration in memory as a mixer "Scene." Saved scenes may be recalled to quickly reconfigure the mixer.

When the computer is restarted after being shut down, the mixer will restart with its last-used configuration. This function is independent of the Mixer Scene memory.

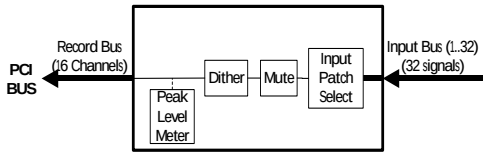
For more information on saving and recalling mixer scenes, refer to Section 6.5 Mixer Menu.

7.2 Input Patching

The physical inputs of the AES16*e* can be patched to any Record Bus channel of the on-board digital mixer. This feature allows complete flexibility in routing inputs to tracks and record devices within software applications.

As described in Section 5.1.2 Digital Mixer Inputs, and shown below, the digital mixer has 16 input blocks, each with an Input Patch Select switch. The Input Bus originates from the physical inputs. The Record Bus feeds the record devices of the driver.

Digital Mixer Input Block
(1 of 16)



Access to the Input Patch Select switch is provided via the Input Source select buttons on the Record/Play window of the Lynx Mixer.

By clicking on one of these buttons at the top of a mixer channel strip, you can select from any of the available inputs and route the selected input to that record mixer channel.

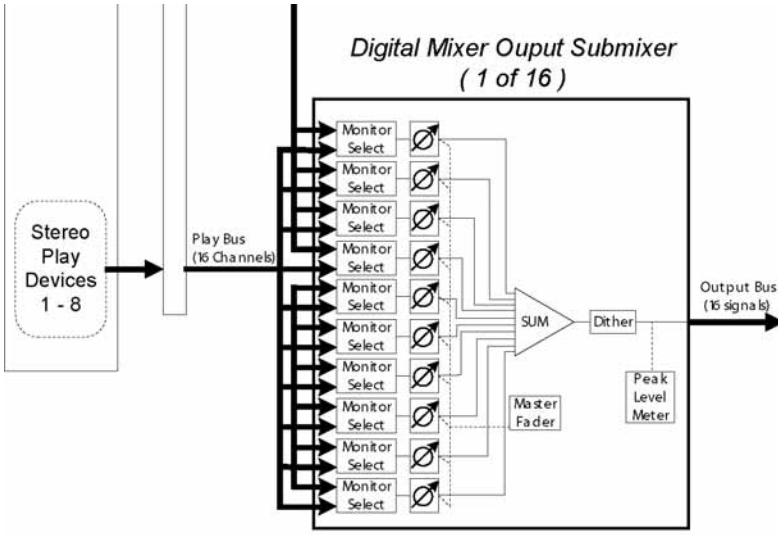
Each mixer record channel can derive its source from any of the 32 physical inputs (16 AES-3 digital inputs and 16 LStream port signals).

For more information on the Lynx Mixer input patching, refer to Section 6.3 Record/Play Window.

7.2.1 Monitoring Theory

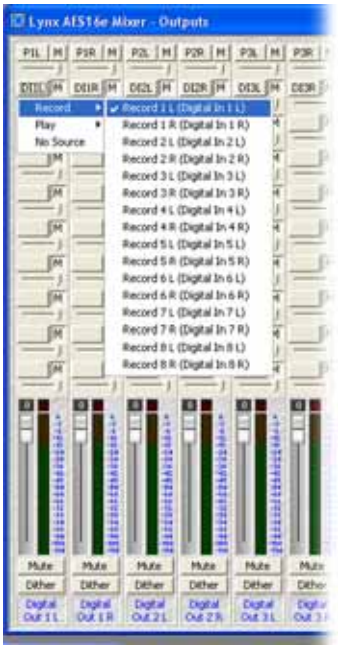
Low latency monitoring can be enabled using the AES16*e*'s on-board digital mixer. This method avoids delays caused be monitoring through application software. The digital mixer can be setup manually using the Lynx Mixer application or within applications that support ASIO Direct Monitoring.

As discussed in Section 5.1.5 Digital Mixer Outputs, each output of the AES16*e* is derived from a ten-input submixer. This submixer is shown below. The inputs to the submixers include both input signals and playback signals. Enabling record monitoring is simply a matter of selecting a desired input signal for mixing on a particular output.



7.2.2 Monitor Setup Using Lynx Mixer

The Outputs window of the Lynx Mixer provides access to the submixer connected to each physical output. Controls on this window allow manual setup of monitoring.



The ten Monitor Select blocks shown in the submixer diagram correspond to the ten Output Monitor Source buttons above the faders on each output channel of the Lynx Mixer. A mouse click on one of these buttons launches a menu of Record and Playback sources. Selecting a Record source causes in input signal to be routed to the output.

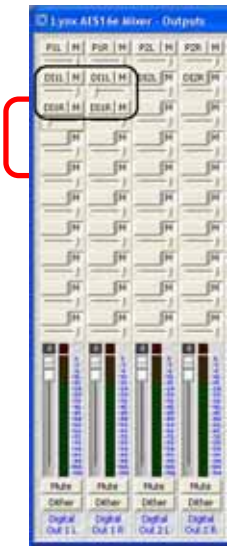
Horizontal faders below these buttons correspond to the submixer input volume controls, , shown in the diagram above.

In this example, Digital In 1 is being selected as a monitor source for Digital Out 1 Left. The "M" button next to the Output Monitor Source button must be in the "out" position to unmute a monitor source. After the source is selected, a corresponding four-letter pneumonic will appear on the button.

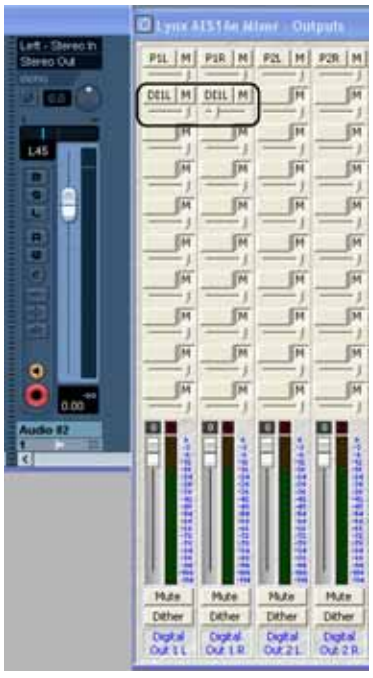
7.2.3 Using Direct Monitoring in an ASIO Application

The Direct Monitoring (sometimes referred to as “hardware monitoring”) feature offered in many popular third party applications provides a means to enable low-latency monitoring supported by the AES16*e*’s on-board digital mixer. Instead of using the Lynx Mixer to manually enable monitoring as discussed in the previous section, controls within the application provide convenient access to this functionality.

Additionally, some applications offer “tape type” monitoring whereby inputs are monitored only when recording is taking place. When utilizing Direct Monitoring from a recording application, it is preferable to NOT make alterations to the Lynx mixer directly, as these changes may cause Direct Monitoring to produce unexpected results.



When Direct Monitoring is enabled in an application, Output Monitor Source Buttons B through J are automatically assigned monitor sources.

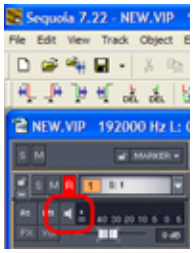


Since panning of mono input sources is available with Direct Monitoring, even though pan controls are not a feature of the Lynx mixer, each mono source is assigned to both the left and right channels of an output channel strip. When a mono signal is panned from within the host application, the level sliders under each instance of the monitor source will move accordingly. As an example: If Digital In 1 Left is being monitored on Digital Out 1 Left & Right, when you pan the input signal to the left the Monitor Source Volume for Digital Out 1 Left increases and the Monitor Source Volume for Digital Out 1 Right decreases.

Since this feature relies upon code within a third party application to operate, different software versions may behave differently than described.



Click the speaker icon in the Cubase /Nuendo Mixer window to enable Direct Monitoring.



Click the speaker icon in Samplitude/Sequoia to enable Direct Monitoring.

7.3 Playback Routing and Mixing

In addition to standard monitoring of inputs through physical outputs, the Lynx mixer is capable of sophisticated routing and mixing of playback and record sources. One can monitor playback from several applications through a single output, combine live input and playback streams, and record a single source into several applications with the power of this flexible tool.



In the Lynx Mixer Output Window, clicking one of the ten Output Monitor Source Buttons for each channel provides the opportunity to select a “Play” source, which can be any of the 16 playback device channels available to the system. For Digital Out 1 (Left and Right), the system default is to monitor Play1 (Left and Right), which appear as the monitor sources P1L and P1R. In this state, any audio assigned to play out Play1 would be heard out of Digital Out 1.



Selecting Play 2 (P2L and P2R) in the next set of Monitor Source Buttons down, allows you to monitor audio from Play 1 and Play 2 out of Digital Out 1 at the same time. If one application or playback stream is assigned to Play 1, and another to Play 2, you would hear audio from both out of Digital Out 1. You can adjust the relative level of these two sources with the volume slider directly underneath each Monitor Source Button.

Similarly, Record sources can be added so that up to ten combinations of live input, and pre-recorded playback can be routed and mixed to a single output. In this way, headphone mixes, alternate house feeds, or a seamless blend of canned and live broadcast material can be easily routed to appropriate outputs on the AES16*e* card.

7.4 Clock selection and control

A valid clock source signal must be connected to the appropriate AES16*e* clock connector when the PREFERRED CLOCK SOURCE is set to “External,” “Header,” “Lstream,” or one of the Digital Inputs. If a signal is not present, the CURRENT CLOCK SOURCE will change to “Internal” until a valid signal from the PREFERRED CLOCK SOURCE is restored. When an External clock source is selected, or when “Rate Lock” is active, and an audio file or project file is played back at a different sample rate, either the audio will play back at the wrong speed or pitch, or the Operating System will resample the playback stream to match the current sample rate of the AES16*e*. In this case the audio speed and pitch will be fine, but there may be undesirable consequences from this low-quality sample rate conversion. In general it is preferable that the card’s sample rate matches the sample rate of the audio being played.

The AES16*e* also includes a SynchroLock clocking system to provide robust synchronization to degraded input clock signals. Refer to Section 5.3 for a detailed description of SynchroLock.

7.5 AES/EBU Dual-wire operation

The AES16*e* supports dual-wire AES/EBU operation in which each physical input or output connection passes a single channel AES/EBU signal running at half the system sample rate. This capability provides compatibility with legacy devices that do not support single-wire AES running at sample rates greater than 50kHz.

Dual-wire mode can be enabled independently for inputs and outputs using the Dual Wire In and Dual Wire Out controls on the Adapter window of the Lynx Mixer. See Section 6.2 for more information. When dual-wire mode is enabled the number of available audio channels is reduced to eight.

With Dual Wire In enabled, the AES16*e* translates dual-wire input signals internally to input channels of the on-board mixer according to the first table to the right. In this mode, input channels 5 – 8 are not active.

NOTE: Mixer Input Channel selection is available using the Input Source select buttons on the Record/Play window of the Lynx Mixer. See Section 6.3. Record/Play Window.

With Dual Wire Out enabled, the AES16*e* translates output signals to dual-wire connections according to the second table. In this mode, output channels 5 – 8 are not active.

Input Connector	*Mixer Input Channel*
IN 1	Digital In 1L
IN 2	Digital In 1R
IN 3	Digital In 2L
IN 4	Digital In 2R
IN 5	Digital In 3L
IN 6	Digital In 3R
IN 7	Digital In 4L
IN 8	Digital In 4R

Dual-wire Input Routing

Mixer Output Channel	*Input Connector*
Digital Out 1L	OUT 1
Digital Out 1R	OUT 2
Digital Out 2L	OUT 3
Digital Out 2R	OUT 4
Digital Out 3L	OUT 5
Digital Out 3R	OUT 6
Digital Out 4L	OUT 7
Digital Out 4R	OUT 8

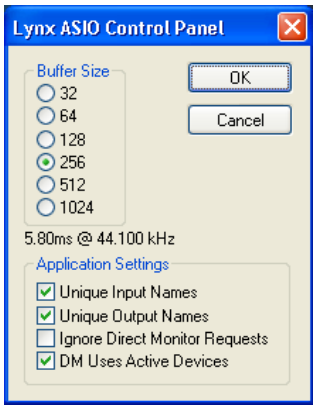
Dual-wire Output Routing

7.6 ASIO Specific Setup (Windows only)

Several control parameters of the AES16*e* are accessible from the ASIO Control Panel within applications that utilize the AES16*e* ASIO driver. One of the benefits offered by this inter-application control, is that these parameters can be saved with a project – allowing consistent performance conditions each time a project is opened.

For this reason, it is preferable to initiate these settings from within the ASIO application, rather than from the Lynx Mixer Adapter window whenever possible. All ASIO Control Panel settings except for Buffer Size are application specific, so if more than one ASIO application is used, the settings will be need to be established as appropriate for each application.

The ASIO Control Panel can generally be launched from the settings or options menu where the active ASIO device is established. The following parameters are accessible from this window:



Buffer Size - This control allows the size of the ASIO buffer in samples to be established. The buffer size is the primary factor in the amount of latency that a user will experience when using the AES16*e*. For details, see Section 7.8 Controlling latency by changing buffer size.

Latency – Displays the amount of latency in milliseconds that is the result of the selected buffer size at the active sample rate.

Unique Input and Output Names – These switches allow the user to select if "Left" & "Right" are appended to the device names within the ASIO application. When checked, "Left" & "Right" are appended to the device names such as "Record 1 Left". When unchecked the device names are simply "Record 1".

Ignore Direct Monitor Requests – This switch causes the AES16*e* driver to disregard Direct Monitor commands from an ASIO software application. Since Direct Monitor calls can assign and mute monitor sources in the Lynx Mixer Outputs page, setting this parameter to "ON", can prevent mixer settings from being changed when an ASIO application is launched.

DM Uses Active Devices – This switch sets the Direct Monitoring scheme for the application. When unchecked, all devices (active or not) may be used for Direct Monitoring. When checked, only active devices are used for Direct Monitoring. This gets around a problem where Cubase & Nuendo might select the wrong Direct Monitoring input or output if non-contiguous devices are active. This switch is ON by default for Nuendo 2 & 3 and Cubase 2 & 3 and OFF by default for all other applications.

For specific information about the parameters available from within the most popular audio applications, please see the application notes on our website, at: http://www.lynxstudio.com/ > Support > Support Documentations > Software Application Notes.

7.6.1 ASIO Positioning Protocol

The AES16*e* drivers support Steinberg's ASIO Positioning Protocol (APP) for users that need timecode synchronization capabilities and use an application that supports ASIO Positioning Protocol. In order to take advantage of this feature, a Lynx LS-ADAT card would need to be used in conjunction with the AES16*e* in order to provide a sync source to the system. With a valid sync source connected to the ADAT Sync In port on the LS-ADAT, sample-accurate synchronization is possible via APP.

7.7 Controlling latency by changing buffer size

Latency in an audio interface can be defined as the time required to process a sample requested from an application to the interface's audio output. A number of factors determine the achievable latency performance of a system housing the AES16*e* card: processor speed, operating system, sample rate, number of utilized record or play channels, system efficiency, etc.

Latency can be manipulated by changing the size of the buffers used to transfer data to and from the AES16*e*. When using an ASIO application (i.e. Cubase, Samplitude, Sonar) the buffer settings can be accessed via the application's ASIO control panel. Additionally, the AES16*e* Mixer Adapter window provides access to a global buffer setting, which can define a single buffer size available to WDM, ASIO applications (Windows Only).

The smaller the buffer size the lower the latency will be. However, if a buffer size is too small for the system or context, audio anomalies such as clicks and pops can occur. One should become familiar with altering the AES16*e* buffer size to best suit their projects. Project sample rate is a critical factor in determining an appropriate buffer size. It is important to consider that as sample rate increases, latency at the same buffer size decreases. For instance, at a sample rate of 48 kHz, a buffer size of 128 samples will produce a latency of 2.66ms. At 96 kHz, the same buffer size would produce a latency value of 1.55ms. Consequently, at the higher sample rate, it is likely that you would need to increase the buffer size to get the same performance.

With most Core Audio audio production applications, the buffer size can be adjusted from within a settings menu in the program. Most Core Audio multi-media/media playback applications do not provide access to buffer size parameters.

8 Working with Third Party Applications

8.1 Compatibility

The drivers included with your AES16*e* provide compatibility with all standard third party digital audio applications that communicate with Windows Wave audio, DirectSound, Core Audio and ASIO devices. Support for these driver models insures compatibility with the vast majority of OSX and Windows audio applications. A partial list of applications that have been specifically tested for compatibility is provided on the Lynx web site at http://www.lynxstudio.com > Support > Support Documents > Software Compatibility

8.1.1 AES16*e* Devices

Third party applications communicate with the AES16*e* through its installed driver. The driver presents the AES16*e*'s audio capabilities to applications as standard multimedia, DirectSound or ASIO devices (Windows) or CoreAudio devices for OS X. Most, if not all, third party pro audio applications provide device selection in configuration, options, or preference setting windows or menus. Many multimedia audio applications do not allow direct selection of an audio output device, and instead rely upon the Operating System's default playback device. The system default play device can be established from the Windows control panel (XP: Sounds and Audio > Audio, Vista: Sound). In OS X, the default device can be established from Applications > Utilities > AudioMidi Setup.

For two channel or stereo audio applications, a separate selection option is typically provided for the input or recording device and the output or playback device. Multitrack applications provide multiple input and output device selection menus or windows. Refer to the documentation included with your application to determine how to select audio devices.

With the AES16*e* properly installed in your computer, the digital audio devices will be available to applications, and their names will appear in their device selection menus as follows:

ASIO (Unique Input/Output Names)		**DirectSound/MME**	
Record	**Play**	**Record**	**Play**
AES16e Record 1 (Left/Right)	AES16e Play 1 (Left/Right)	AES16e Device 1	AES16e Device 1
AES16e Record 2 (Left/Right)	AES16e Play 2 (Left/Right)	AES16e Device 2	AES16e Device 2
AES16e Record 2 (Left/Right)	AES16e Play 3 (Left/Right)	AES16e Device 3	AES16e Device 3
etc.	etc.	etc.	etc.
ASIO (No Unique Input/Output Names)		**Core Audio**	
Record	**Play**	**Record**	**Play**
AES16e Record 1	AES16e Play 1	AES16e Record 1	AES16e Play 1
AES16e Record 2	AES16e Play 2	AES16e Record 2	AES16e Play 2
AES16e Record 2	AES16e Play 3	AES16e Record 2	AES16e Play 3
etc.	etc.	etc.	etc.

When more than one AES16*e* is installed in your system, the device names will contain a numeric adapter ID assigned by the operating system. For example, the first input device on adapter 2 would be listed as "AES16*e* 2 Record 1". Refer to the "Configuring Multiple AES16*e*'s" in section 9 for more information.

8.1.2 Optimized PCI Express DMA engine

The AES16*e* takes full advantage of the bi-directional capabilities of the 2.5 Gbit/second PCI Express bus. It's optimized DMA engine supports simultaneous bus read and write transactions and integrates tightly

with ASIO and WDM drivers. The net result is exceptional low-latency performance with minimal CPU overhead.

8.2 Controlling Audio Bit Depth

The creation of an audio file with a particular bit depth (or resolution) is controlled through an application's recording settings. These settings are typically adjusted in an audio device configuration menu or in a recording setup window just prior to recording. When recording is initiated the AES16*e* will generate audio samples of the desired resolution.

Bit depth control during playback of an audio file is also an application issue. When a file is played, the recorded bit depth is read from the file's header by the application. The application uses this information to set the resolution of the AES16*e*.

The AES16*e* supports file types with 8, 16, 24, or 32 bit word widths. Note that 32-bit files contain 24-bit data with zero data in the least significant bit positions.

The Lynx Mixer application displays the currently selected bit depth for each device just above the device name in the Record/Play window.

8.3 Multi-Device Operation

The sixteen audio devices of the AES16*e* operate completely independent in terms of whether they are in recording or playback modes and their associated audio files. This implies that the devices can operate simultaneously and support the so-called "full duplex" mode where, for instance, the AES16*e* Record 1 device is recording while the AES16*e* Play 1 device is playing.

Although the devices act independently, when multiple devices are being used to record or play multiple audio files simultaneously, the AES16*e* driver has the capability to synchronously start all devices with sample accuracy. This is especially important for maintaining synchronization during playback of multiple devices and overdubbing.

Additionally, the AES16*e* is capable of multi-client operation, whereby multiple applications can access driver devices of the AES16*e* simultaneously. For instance, one application can be playing audio out of AES16*e* Play 1 and 2, while another application plays audio out of AES16*e* Play 3.

9 Configuring Multiple AES16*e*'s

More than one AES16*e* card can be installed in a computer for additional audio channels. It is also possible to mix AES16*e* and AES16 or LynxTWO/L22 cards in systems that have both PCIe and standard PCI slots. If required, all AES16*e*'s in a computer can be configured to maintain sample accurate synchronization during digital audio recording and playback.

9.1 Clock Synchchronicity

In multi-card configurations it is essential to good performance that a coherent clocking scheme is utilized. As in any digital audio system, all devices must utilize a single clock source to prevent audible digital errors. Additionally, audio software programs can behave erratically if each card in a multi-card system has a unique clock reference.

An acceptable clock scheme can consist of either:

A. Establishing one of the Lynx audio cards as a clock master, and the other card(s) as clock slaves.
B. Configuring all of the Lynx audio cards as slaves to some external clock reference, either through word-clock or digital input connections.

Which arrangement is appropriate will generally depend on the equipment included in the system, the context of use, and user preferences. Details for correctly setting up both types of clocking scenarios are as follows.

9.1.1 Configuring one Lynx card as clock master and others as slaves

In this case, cards are synchronized in a master-slave arrangement with one card selected as the clock master, which provides the word-clock source for the other slave card(s) in the system. From the master, the word-clock signal is daisy-chained from one slave to the next.

Word-clock signals can be connected internally using the CBL-ICC Internal Clock Cable, which is available from Lynx. The CLOCK OUT header of one card is connected to the CLOCK IN header of the next card. A separate cable is required for each slave card in the system. See Section 9.1.3 - Clocking multiple cards with the CBL-ICC Internal Clock Cable. Alternatively, the CLOCK connectors on the CBL-AES1604 cables can be connected externally with a standard 75 ohm BNC patch cable.

In order to select master and slave AES16*e*'s in a system, each adapter ID must be first physically associated with an AES16*e* installed in a computer slot. The procedure is as follows:

- Connect at least OUT1 of each AES16*e* to your AES/EBU monitoring equipment.
- Choose an audio application that allows selection of audio devices for audio playback.
- Select "AES16*e* 1 Play 1" as the playback device.
- Listen to the playback of any audio file and note which AES16*e* card is generating the audio signal. In this case, the card generating audio is adapter 1.
- Repeat steps 3 and 4, for "AES16*e* 2 Play 1", "AES16e 3 Play 1", and so on until all AES16*e*'s in your system have been identified.

We strongly suggest making the first adapter be the clock master. This is preferable because applications that are capable of sending sample rate change requests to the audio hardware, will only be able to communicate a sample rate request to the first card available. This way, when you choose a project with a different sample rate, or specifically change sample rates for an open project, all of the cards will automatically switch to the new rate.

After the cable connections have been established, the clock sources for each card must be set correctly in the Lynx Mixer.

Open the Adapter page for the card that is functioning as the clock master. Make sure that the PREFERRED CLOCK SOURCE for this card is set to "Internal". For the first clock slave card, open its Adapter window and verify that a sample rate is displayed next to "Header" in the PREFERRED CLOCK SOURCE section. If not, power down the computer, check cable connections and card orientation, and then power up and check again. If a sample rate is displayed next to "Header", then select "Header" as the preferred clock source. If no audio applications are open, "Header" should then become the "Current Source" at the top of the Adapter page. Repeat this process for every slave card in the system.

9.1.2 All Lynx cards as clock slaves

If your studio is oriented around a dedicated clock source, or you prefer to have your AD/DA converters operate as clock masters, the Lynx cards in your system can be configured to slave to an external clock reference.

Clock can be received by the AES16*e* cards via word-clock connections when the CBL-AES1604 cable sets are used - see (section 3.3.1 External Clocking) or by slaving to the signals presented to the digital inputs. When multiple digital devices are connected to the Lynx cards it is essential that all of those devices are synchronized to a single clock source for proper operation. It is generally recommended to avoid "daisy chaining" clock connections between digital devices beyond a second generation as the clock signal can degrade. In such cases it is preferable to use some form of clock generation to insure the word-clock integrity.

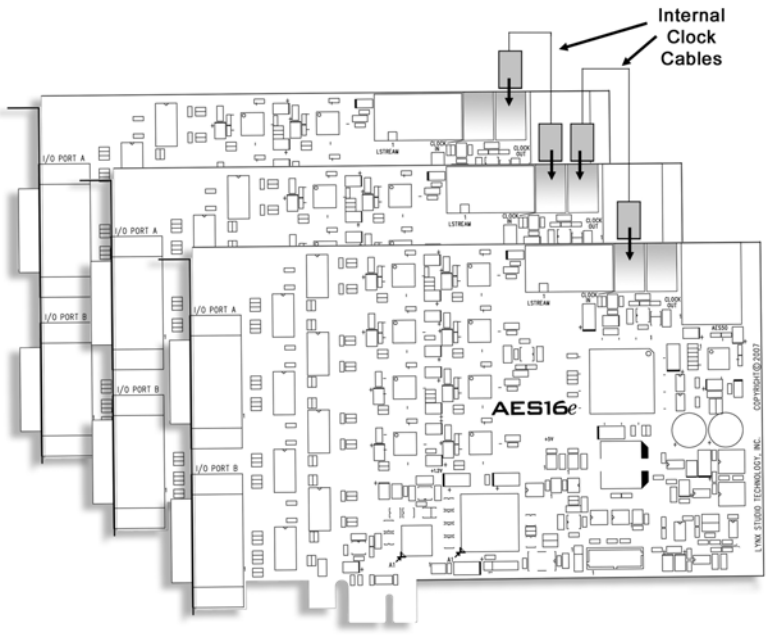
After the cable connections have been established, the clock sources for each card must be set correctly in the Lynx Mixer. One at a time, open the Adapter page for each card in the system. Verify that a sample rate is reported next to the target clock source in the "Preferred Clock Source" section of the Adapter page. For the word-clock input, "External" would be the appropriate choice. For a digital input, "Digital In 1-4" would be appropriate. If no sample rate is present, verify cable connections and check again. When a sample rate is reported as expected, select the appropriate source as the "Preferred Clock Source". If no audio applications are open, the selected source should then become the "Current Source" at the top of the Adapter page. Repeat this process for every card in the system.

The AES16 and AES16*e* feature the Lynx SynchroLock technology (see SynchroLock) which regenerates clock signals on output. For this reason, it is perfectly acceptable to daisy chain clock signals between Aes16 and AES16*e* cards without concern for clock degradation. Therefore, one legitimate clock configuration is to provide a clock signal to one Lynx card in a multi-card configuration through a word-clock or digital input connection, and then daisy chain the clock signal from that Lynx card to the others in the system. The Word-clock "daisy-chain" can be connected internally using the CBL-ICC Internal Clock Cable, which is available from Lynx. The CLOCK OUT header of one card is connected to the CLOCK IN header of the next card. A separate cable is required for each slave card in the system. See Clocking multiple cards with the CBL-ICC Internal Clock Cable. Alternatively, the CLOCK connectors on the CBL-AES1604 cables can be connected externally with a standard 75 ohm BNC patch cable.

In this case, the card receiving an external clock signal should be set to "External" (for a word-clock connection) or "Digital In 1-4" (for a digital input connection) as the Preferred Clock Source in the Lynx Mixer Adapter page. The other cards should be set to "Header" if the CBL-ICC clock cable is used, or "External" if a word-clock patch cable is used for the clock connections.

9.1.3 Clocking multiple cards with the CBL-ICC Internal Clock Cable

Starting with the master AES16*e*, insert the plug on one end of a Lynx Internal Clock Cable into the CLOCK OUT header, until it clicks and locks into place. This header is polarized to ensure the correct orientation of the cable plug. Insert the plug on the free end of the cable into the CLOCK IN header, on the nearest slave AES16*e*. Connect each slave in a similar manner. Refer to the figure below:



9.2 Adapter ID's

When multiple AES16*e* cards are installed in a computer they are automatically assigned unique adapter ID numbers. These adapter ID's provide a means to identify and communicate with each AES16*e* when using the Lynx Mixer application and to select audio devices in third party applications.

In the Lynx Mixer, the adapter that a user wishes to control is selected from the "Window" pull-down menu (Windows Only), or by selecting the desired Mixer from the cascade of Mixer windows (OS X). In a Windows system with four AES16*e*'s, the adapters will be listed as follows:

AES16*e* 1 Mixer
AES16*e* 2 Mixer
AES16*e* 3 Mixer
AES16*e* 4 Mixer

In each case, the adapter ID is the numeric character just before the word "Mixer" in each selection.

Most third party applications provide a setup or configuration menu for selecting a desired wave audio device for recording and playback. With multiple AES16*e*'s in a system, each device name will contain the adapter ID. For example, the first play device on adapter 2 is listed as "AES16*e* 2 Play 1".

In OS X, each adapter will be identified by which slot it has been installed into. For instance, AES16*e* in Slot-3, AES16*e* in Slot-2, etc.

10 Troubleshooting

Clicking, popping or crackling noises in your audio:

1. Check clock master settings. In any digital audio configuration, there can be one, and only one master clock. All other digital audio devices must be configured as slaves to the designated master clock. Since the AES16*e*'s SynchroLock™ technology provides an extremely stable and jitter-resistant clock, we recommend setting the AES16*e* as the master clock in your digital audio system.

2. Check buffer settings in your audio application software. Smaller buffer sizes are preferred because they reduce latency (the time it takes for an audio signal to travel through your audio software). In some cases, however, setting too small a buffer size can overtax your computer's processor, particularly when running multiple tracks and/or a number of DSP plug-ins. This can result in clicks and pops in your audio playback. Try increasing the buffer size and see if your playback performance improves.

Audio plays back at a faster or slower rate than expected:

This is usually the result of mismatched clock rates and multiple clock masters. For example, if you are playing back a file recorded at 44.1 kHz, but you have set the clock for 48 kHz, the file will play back faster and at a higher pitch than expected. Make certain you have set only one device as clock master.

No audio:

If you see signal appearing on the AES16*e*'s output meters, verify your output connections, making certain you have a valid signal flow from the AES16*e*'s outputs to your mixer or other D/A device, and from that device to your speakers.

If you see no signal appearing on the AES16*e*'s input meters in the Lynx Mixer Record/Play page, verify your connections, making certain you have valid signal flow from your digital audio source to the AES16*e*'s inputs.

11 Support

We are devoted to making your experience with the AES16*e* trouble-free and productive. If the troubleshooting and operational sections of this manual did not help resolve your questions, several support options are available to you:

11.1 Lynx Website Support Resources

Logging on to http://www.lynxstudio.com/ > Support will provide several options for resolving your support issues:

- **Support Ticket**
  For direct attention from the Lynx Technical Support Staff, registered users can submit a support ticket online that details their problem and steps they've taken to resolve it. Most Support Ticket submissions are responded to within 24 hours.

- **Frequently Asked Questions**
  An extensive catalog of FAQs derived directly from our most common tech support inquiries. Our FAQ section is updated regularly and designed to allow users to find the answers to their most common questions quickly.

- **Firmware and Driver Downloads**
  A library of current firmware and driver files are available for download and installation. Check back regularly to insure that your AES16*e* is up-to-date.

- **Lynx Support Forum**
  An online Lynx user's support forum provides a venue for customers to post questions and issues and receive responses from other users as well as Lynx technical administrators. Searching previous posts is often an excellent way to uncover valuable information about Aurora operation and troubleshooting. See http://www.lynxstudio.com > Support > Support Forum.

11.2 Telephone Support

Telephone support is available by calling +1 (949) 515-8265 extension 206 from 9AM to 5PM Pacific Time, Monday through Friday, excluding United States Holidays.

11.3 Registering your Aurora

Lynx is committed to providing you with the best service possible. To help us serve you better, please be sure to register your AES16*e* using one of the following methods:

- Fill out and mail the Warranty Registration Card included with your AES16*e*.
- Register on the web at: http://www.lynxstudio.com > Support > Register Your Products

Once you are registered you will automatically receive notifications of new products and upgrades.

11.4 Return Policy

If you have a unit that you suspect is defective or is malfunctioning contact Lynx technical support via one of the means described above for diagnosis. If the technician determines that the unit is faulty, they will issue an RMA number so you can send the unit in for repair. Units received without a valid RMA number will be refused. All RMA numbers are valid for 30 days from the date of issue.

12 Appendices

12.1 Specifications

DIGITAL I/O	
Number / Type	Eight inputs and eight outputs, 24-bit AES/EBU format, transformer coupled
Channels	16 in/out in single-wire mode, 8 in/out in dual-wire mode
Sample Rates	All standard rates and variable rates up to 192 kHz in both single wire and dual-wire modes
Sample Rate Conversion	Sixteen channels available with support for conversion ratios up to 16:1. Dynamic range: 144 dB. AES16*e*-SRC model only.
ARCHITECTURE	
Core	FPGA-based core contains custom PCI Express interface, data routing and formatting, device/stream control, digital mixing, clock routing and control, and DMA engine. Support for field upgrades of firmware.
Audio Devices	Card is visible to host applications as eight record devices and eight play devices. Each device has two channels and can be used independently for multi-client functionality.
CLOCKING	
Sources	Digital inputs 1 – 4, external word-clock on BNC (with optional CBL-AES1604 cable), internal word-clock on header, on-board low-jitter crystal oscillator
SynchroLock	Multi-stage, VCXO-based clock generation system with 3000:1 jitter attenuation. Wide mode tracks off-frequency clocks, narrow mode generates ultra-low jitter output for standard frequencies.
ON-BOARD DIGITAL MIXER	
Type	Hardware-based, low-latency
Routing	Ability to route any input to any or multiple outputs
Mixing	Up to 22 input or playback channels mixed to any output, 40-bit precision
Status	Peak levels to -114 dB on all inputs and outputs.
LSTREAM EXPANSION PORT	
Compatibility	Supports Lynx LStream expansion cards including the LS-ADAT 16-Channel ADAT I/O card
Type	High-speed serial, up to 16 channels @ 24-bits. 14-pin internal connector.
CONNECTIONS	
I/O Ports	Two bracket-mounted 26-pin high-density female D-sub connectors.
External Clock	75-ohm BNC word-clock input and output provided on XLR breakout cables
Internal Clock	Two 75-ohm board mounted 2-pin headers for word-clock input and output
SOFTWARE	
Windows Drivers	Windows XP / Vista platforms: MME, ASIO 2.0, WDM, and DirectSound
Macintosh Drivers	Core Audio for OS X 10.4 and up. Universal Binary.
Mixer Application	Multi-window GUI provides complete control of digital mixer and all hardware settings.
GENERAL	
PCI Express Bus	Version 2.0 compliant
Data Transfers	Bi-directional up to 250 Mbytes/second. Custom 32-channel, zero-wait state, scatter-gather DMA engine. Bus mastering supported.
Size	4.4” H X 6.6” W X 0.75” D (standard half-size PCI Express card)

OPTIONAL CABLES	
CBL-AES1604	26-pin high-density male D-sub to four female XLR's (AES inputs), four male XLR's (AES outputs), and two female BNC's (word clock I/O). Six-foot, 110-ohm shielded twisted pair cabling.
CBL-AES1605	26-pin high-density male D-sub to 25-pin male D-sub. Supports 4 channels of input and output. Compatible with Aurora converters and devices with standard Yamaha digital I/O pinout from Yamaha, Apogee, Mackie, and others. Twelve- foot, 110-ohm shielded twisted pair cabling.

12.2 Programming the AES16*e* firmware

Firmware is a set of configuration data that controls the low-level operation of a hardware device. The firmware can be altered to change how a particular function works or add new features. From time to time, Lynx will provide new firmware to improve the functionality of a product. End users cannot alter firmware supplied by Lynx.

Firmware is stored on the card in electronically erasable programmable read-only memory (EEPROM) so that it is retained when power is not supplied. The contents of the EEPROM can be erased and then replaced using Lynx firmware updater programs.

When updating the Lynx firmware, it is critical that the computer not be turned off or the process interrupted in any way. If it is, the card may stop functioning and need to be returned to the factory to be re-programmed.

Firmware updaters are posted on the Download page of the Lynx website for Windows and OSX platforms. It is recommended to read the firmware release notes to determine if a new firmware version is applicable to your situation. Also, occasionally firmware updates require updated drivers in order to function correctly, and this will be documented in the firmware release notes.

The Lynx AES16*e* firmware updaters can be downloaded and launched with or without a driver loaded. Follow the prompts to complete the programming process. Shut down the computer when prompted. When the computer is powered up again the new firmware will be active.

12.3 Safety instructions

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

12.4 EMC Certifications

12.4.1 FCC DECLARATION OF CONFORMITY

TRADE NAME:	Computer Audio Card
MODEL NUMBER:	AES16
COMPLIANCE TEST REPORT NUMBER:	Covered by European Standards Report #B30915V1
COMPLIANCE TEST REPORT DATE:	November 2, 2003
RESPONSIBLE PARTY (IN USA):	Lynx Studio Technology, Inc.
ADDRESS:	711 West 17th Street, Suite H3, Costa Mesa, CA 92627
TELEPHONE:	(949) 515-8265

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If the unit does cause harmful interference to radio or television reception, please refer to your user's manual for instructions on correcting the problem.

I the undersigned, hereby declare that the equipment specified above conforms to the above requirements.

Costa Mesa, California
April 23, 2008



Robert Bauman
Compliance Engineer

12.4.2 EC DECLARATION OF CONFORMITY

MANUFACTURERS NAME:	Lynx Studio Technology, Inc.
MANUFACTURER ADDRESS:	711 West 17th Street, Suite H3 Costa Mesa, CA 92627, U.S.A.
COMPLIANCE TEST REPORT NUMBER:	B30915V1
COMPLIANCE TEST REPORT DATE:	November 2, 2003
TYPE OF EQUIPMENT:	Information Technology Equipment
EQUIPMENT CLASS:	Residential, Commercial and Light Industry
MODEL NUMBER:	AES16
CONFORMS TO THESE STANDARDS:	EN50022: 1998, EN55024:1998 + A1:2001, CISPR 16:1993 IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11
YEAR OF MANUFACTURE:	2003

I the undersigned, hereby declare that the equipment specified above conforms to the above directives and standards.

Newport Beach, California
April 23, 2008



Robert Bauman
Compliance Engineer

13 License Agreement

This End-User License Agreement (this “Agreement”) is a legal contract between you, as either an individual or a single business entity, and Lynx Studio Technology, Inc. and its affiliates (“Lynx”).

READ THE TERMS AND CONDITIONS OF THIS AGREEMENT CAREFULLY BEFORE INSTALLING LYNX’S SOFTWARE (THE “SOFTWARE”). THE SOFTWARE IS COPYRIGHTED AND IT IS LICENSED TO YOU UNDER THIS AGREEMENT, NOT SOLD TO YOU. BY INSTALLING OR DOWNLOADING THE SOFTWARE, YOU ACKNOWLEDGE THAT YOU HAVE READ THIS AGREEMENT, THAT YOU UNDERSTAND IT, AND THAT YOU ACCEPT AND AGREE TO BE BOUND BY ITS TERMS. IF YOU DO NOT AGREE TO THE TERMS OF THE AGREEMENT, DO NOT OPEN THE ANTI-STATIC BAG CONTAINING THE AES16E BOARD. PROMPTLY RETURN THE UNOPENED PACKAGE AND ALL OTHER ITEMS USING THE ORIGINAL PACKAGING TO THE LOCATION OF PURCHASE.

BY INSTALLING THE SOFTWARE YOU AGREE TO INDEMNIFY AND HOLD HARMLESS LYNX STUDIO TECHNOLOGY, INC. FROM ALL CLAIMS, COSTS AND EXPENSES (INCLUDING LEGAL EXPENSES) ARISING OUT OF ANY USE OF OR INABILITY TO USE THIS SOFTWARE.

IN NO EVENT WILL LYNX BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL OR OTHER DAMAGES RESULTING FROM THE USE OF THIS SOFTWARE, INCLUDING, AMONG OTHER THINGS, DAMAGE TO PROPERTY, DAMAGE BASED ON INCONVENIENCE OR ON LOSS OF USE OF THE PRODUCT, AND, TO THE EXTENT PERMITTED BY LAW, DAMAGES FOR PERSONAL INJURY.

14 Warranty Information

AES16*e*

One year Free Labor / One year Parts Exchange
This product must be returned to the factory for repair.

Who Is Covered?
You must have proof of purchase to receive warranty service. A sales receipt or other document showing when and where you purchased the product is consider proof of purchase. This warranty is enforceable only by the original retail purchaser. To be protected by this warranty, the purchaser must complete and return the enclosed warranty card or register online within 14 days of purchase.

What Is Covered?
Warranty coverage beings the day you buy your product. *For one year thereafter*, Lynx shall, at its sole and absolute option, either repair or replace free of charge any product that proves to be defective on inspection by Lynx or its authorized service representative. In all cases disputes concerning this warranty shall be resolved as prescribed by law. All parts, including repaired and replaced parts, are covered only for the original warranty period. When the warranty on the product expires, the warranty on all replaced and repaired parts also expires.

What Is Excluded?
You warranty does not cover:

- Labor charges for installation or setup of the product.
- Product repair and/or part replacement because of misuse, accident, unauthorized repair or other cause not within the control of Lynx.
- A product that requires modification or adaptation to enable it to operate in any country other than the country for which it was designed, manufactured, approved and/or authorized, or repair of products damaged by these modifications.
- Incidental or consequential damages result from the product, damage to property, damage based on inconvenience or on loss of use of the product, and, to the extent permitted by law, damages for personal injury. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
- A product that is used for rental purposes.

To Get Warranty Service…
To obtain warranty service, the purchaser must first call or email Lynx at the email address or telephone number printed in Section 11 Support to obtain a Return Authorization Number and instructions concerning where to return the unit for service. All inquiries must be accompanied by a description of the problem. All authorized returns must be sent to Lynx or an authorized Lynx repair facility postage prepaid insured and properly packaged. Proof of purchase must be presented in the form of a bill of sale, canceled check or some other positive proof that the product is within the warranty period. Lynx reserves the right to update any unit returned for repair. Lynx reserves the right to change or improve design of the product at any time without prior notice.

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