



Sphynx

Modular High Resolution Audio Interface



User Manual

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IMPORTANT NOTICE:

Please read the following information very carefully before attempting any installation. Failure to comply with the precise instructions may result in damage to your Merging hardware. Please read this entire section of the manual carefully before installation.

STATIC DANGER NOTICE:

Please note that the Sphynx Audio Interface and I/O module cards contain delicate electronic components that can be damaged or even destroyed when exposed to static electricity. Please take all of the necessary precautions when handling the Sphynx with the cover removed and all other electronic cards such as the I/O modules. This notice also applies when performing a firmware upgrade. Take all necessary precautions not to discharge static electricity when touching any of the Sphynx internals.

INFORMATION FOR THE USER:

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A 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 contained in this manual, may cause harmful interference to radio and television communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio and 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 the receiver

Connect the equipment into an outlet on a circuit different from that of the receiver

Consult the dealer or an experienced audio television technician

NOTE: Connecting this device to peripheral devices that do not comply with CLASS A requirements or using an unshielded peripheral data cable could also result in harmful interference to radio or television reception. The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. To ensure that the use of this product does not contribute to interference, it is necessary to use shielded I/O cables.

EMC: The Sphynx complies with the following specifications:

CENELEC EN 55103-1

CENELEC EN 55103-2 (E4 Environment)

Contacting Merging

For all general or sales inquiries:

In Europe, contact our Sales Office: Tel: +41 21 946 04 44 or Fax +41 21 946 04 45

In the U.S., contact our Illinois Office: Tel: +1-847-272-0500 or Fax: +1-847- 272-0597

All documentation inquiries, bug reports or suggestions for improvement can be directed to: info@merging.com

Sphynx Warranty Information

This product is warranted to be free of defects in materials and workmanship for a period of one year from the date of purchase. This Limited Warranty is extended by Merging Technologies, Inc. to the original purchaser.

In the event of a defect or failure to conform to this Limited warranty, Merging Technologies, Inc. will repair or replace the product without charge within sixty (60) days. In order to make a claim under this limited warranty; the purchaser must notify Merging Technologies, Inc. or their representative in writing, of the product failure. In this limited warranty the customer must upon Merging Technologies, Inc. request, return the product to the place of purchase, or other local designation, for the necessary repairs to be performed. If the consumer is not satisfied with the repair, Merging Technologies, Inc. will have the option to either attempt a further repair, or refund the purchase price.

This warranty does not cover: (1) Products which have been subject to misuse, abuse, accident, physical damage, neglect, exposure to fire, water or excessive changes in the climate or temperature, or operation outside maximum rating. (2) Products on which warranty stickers or product serial numbers have been removed, altered or rendered illegible. (3) The cost of installations, removal or reinstallation. (4) Damages caused to any other products.

Chapter 1 – Introduction

Congratulations on your Sphynx purchase. The Sphynx is a professional high quality, modular audio interface solution for MERGING® Pyramix users, SOFTIMAGE®|DS users and audio professionals.

Features include:

Modular I/O design. The modularity of this unit allows for custom configurations based on quality and audio interface requirements.

This extended modularity also offers an easy and low-cost upgrade path as user requirements evolve, new standards emerge and converter technology progresses.

Up to 8 inputs and 8 outputs, in a single unit, using industry standard audio connections.

The signals from the input modules are also fed to the optical lightpipes in ADAT compatible format. This allows a direct connection to ADAT compatible multitrack devices and other devices such as digital consoles. These optical lightpipe connectors support up to 8 channels of 24 bit audio on one single optical fiber with no risk at all of line hum or any other electromagnetic interference.

Rugged internal power supply. This unit accepts both 110 and 220 voltages for worldwide use.

Fully tested for CE compliance for guaranteed safety and stability.

All I/O modules audio connections are made using high quality balanced XLR type connectors.

Clear and easy to use front panel controls.

Extremely high quality 24 bit A/D and D/A using the latest generation in converter technology.

High common mode rejection balanced input circuitry on all analog input modules for optimum rejection of power line hum, RF interference, voltage drops and other externally generated noise commonly encountered with long audio cable runs.

All analog balanced output circuitry incorporates the advanced "Twin Servo Drive" output stage for maximum output signal balance ratio performance, even under adverse asymmetrical loads.

DVD Ready. Support for high Sample Rates such as 96 kHz at 24-bit resolution.

Fits into standard 2 unit 19" rack.

Local control from the front panel (in stand-alone mode).

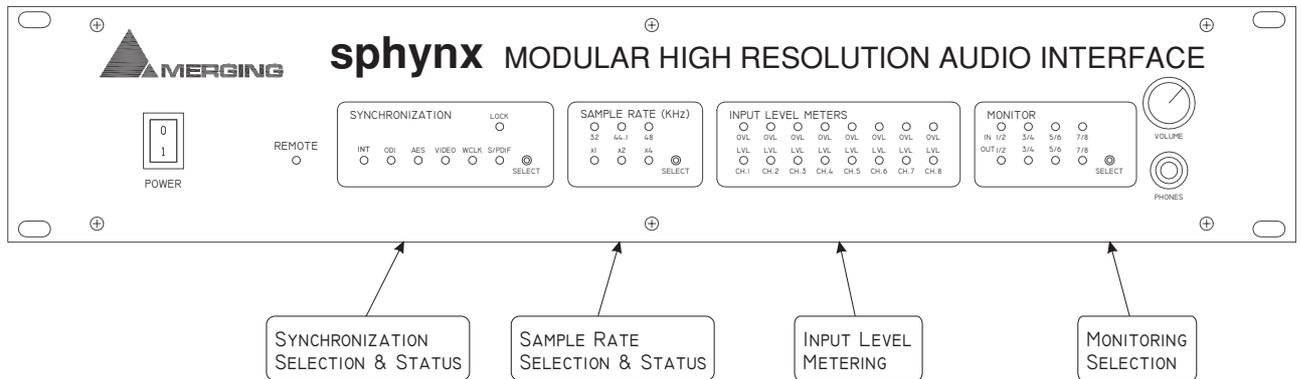
Remote control from Pyramix Virtual Studio Software.

Selectable monitoring of all 8 inputs and outputs

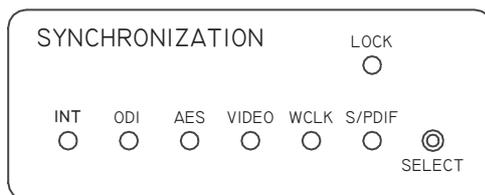
Very comprehensive choice of Sync sources

Very low jitter and calibrated internal clock

Chapter 2 – The Front Panel



Synchronization Selection and Status



The Sphynx can operate in many different synchronization modes. It can synchronize to its internal clock or to a wide range of industry standard external sources. Pressing the SELECT button allows the selection of the desired Synchronization mode.

INT:

Sphynx synchronizes and locks to its internal calibrated clock.

ODI:

Sphynx synchronizes to the optical input (ADAT). If no valid sync signal is present at the optical input (when the ODI mode is selected), the ODI LED will flash. Once a valid sync signal has been detected at the optical input, the ODI LED will remain lit. If the sample rate of the Sphynx and the ADAT signal are identical, the LOCK LED will light. The Sphynx is now locked and synchronized to the incoming ADAT signal.

AES:

Sphynx synchronizes to an AES-EBU signal. If no valid sync signal is present at the AES-EBU input (when the AES mode is selected), the AES LED will flash. Once a valid AES-EBU sync signal has been detected, the AES LED will remain lit. If the sample rate of the Sphynx and the AES-EBU signal are identical, the LOCK LED will light. The Sphynx is now locked and synchronized to the incoming AES-EBU signal. If a valid AES-EBU reference signal is connected to the AES-EBU REF. input it will lock to the "Reference" input. If the Sphynx is equipped with many AES-EBU input modules, and there is no valid AES-EBU signal connected to the "Reference" input, it will sync to the first module, based on a priority scheme starting from the first module (input 1-2) to the fourth module (input 7-8).

VIDEO:

Sphynx synchronizes to a video signal and automatically detects and adapts to either a PAL or NTSC signal. If no valid sync signal is present at the video input (when the VIDEO sync mode is selected), the VIDEO LED will flash. Once a valid video signal has been detected at the video input, the VIDEO LED will remain lit. If the video signal is either a NTSC or PAL compliant signal, the LOCK LED will light. The Sphynx is now locked and synchronized to the incoming video signal.

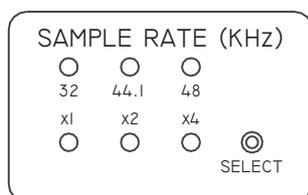
WCLK:

Sphynx synchronizes to a Wordclock signal (TTL or CMOS level square wave at the sampling rate selected on the front panel). If no valid sync signal is present at the Wordclock input (when the WCLK mode is selected), the WCLK LED will flash. Once a valid sync signal has been detected at the Wordclock input, the WCLK LED will remain lit. If the sample rate of the Sphynx and the Wordclock signal are identical, the LOCK LED will light. The Sphynx is now locked and synchronized to the incoming Wordclock signal.

S/PDIF:

Sphynx synchronizes to a S/PDIF signal. If no valid sync signal is present at the S/PDIF input (when the S/PDIF mode is selected), the S/PDIF LED will flash. Once a valid sync signal has been detected at the S/PDIF input, the S/PDIF LED will remain lit. If the sample rate of the Sphynx and the S/PDIF signal are identical, the LOCK LED will light. The Sphynx is now locked and synchronized to the incoming S/PDIF signal.

Sample Rate Selection and Status



Sphynx supports a wide range of sample rates. The desired rate is selected by pressing the SELECT button. There are three possible modes available when selecting sample rates.

Mode x1: In this mode, the available sample rates are: 32 kHz, 44.1 kHz, 48 kHz and AutoDetect.

Mode x2: In this mode, the available sample rates are: 64 kHz, 88.2 kHz, 96 kHz and AutoDetect.

Mode x4: In this mode, the available sample rates are: 128 kHz, 176.4 kHz, 192 kHz and AutoDetect.

Switching between modes is allowed by pressing the SELECT button for more than ~2s.

AutoDetect SR mode

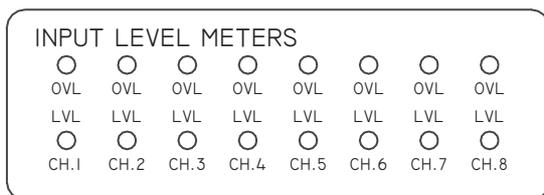
In this mode, the sample rate is automatically determined and selected based on the signal present at the selected synchronization source.

When in AutoDetect SR mode, the x1, x2 or x4 LED flashes.

For selected sync sources such as INT, ODI or VIDEO, the analysis of the incoming (and desired) sampling rate is based on the signal present at the ODI input (usually the return from the Workstation or system to which Sphynx would be connected to both ways). This allows for completely automatic sample rate detection and switching for Sphynx when using Merging's Pyramix Workstation, SOFTIMAGE®|DS, or other external ADAT compatible devices such as Multitrack Digital Recorders or Digital Mixing Consoles.

For selected sync sources such as AES, WCLK or S/PDIF, the analysis of the incoming (and desired) sampling rate is based on the actual sampling rate present at the selected sync source (AES-EBU, WCLK or S/PDIF).

Input Level Metering



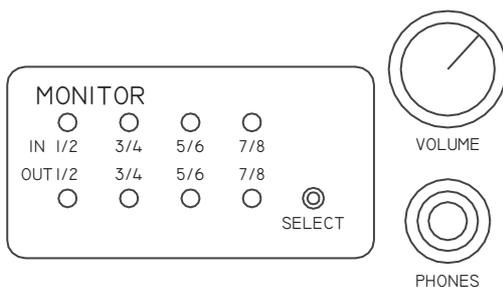
These meters provide a very quick and independent state of the current input signals detected on the input modules. They relay the following information:

LVL - This LED will light if an input signal is detected above -60 dB FS. This is also useful to verify the presence of any audio at the input.

OVL - This LED will light if an input signal is detected above -0.5 dB FS. This is useful to indicate that the input audio signal is close to clipping or indeed clipping has occurred. When this occurs, either a reduction of the analog source level or a decrease in the sensitivity of the analog input of the Sphynx is required (see Chapter 7 for details on how to calibrate the analog I/O level).

Note: dB FS are referred to Digital Full Scale.

Monitoring Selection



This section allows for the selection and headphone level control of any of the 8 input or output audio signals in pairs. The desired monitor source is selected by pressing the SELECT button.

Headphones (stereo $\frac{1}{4}$ inch plug) are plugged into the PHONES jack and the VOLUME control adjusts the volume level.

Additional Front Panel Controls



Power Switch

This switch toggles the power source on and off. See Chapter 6 for details on power-up sequence.

Remote indicator

The REMOTE LED type indicator indicates whether the Sphynx unit is in remote or local control. If the REMOTE LED is lit, the Sphynx is in remote control. In this mode, the Sphynx front panel controls are being controlled via a software application (such as the Merging Pyramix Workstation).

Warnings Displayed

See the troubleshooting section in Appendix 4 for details on most common sources of warnings.

Synchronization LEDs blinking

If the selected synchronization LED blinks, it indicates that the signal present at the selected synchronization input is not valid (maybe at a different sample rate than the Sphynx).

While no valid sync signal is detected, the Sphynx is kept in calibrated Internal sync mode.

Sample Rate LEDs blinking

The x1 or x2 LED is blinking. This is a warning to remember you that the Sphynx is set in AutoDetect SR mode

In this mode, the Sphynx may change the sampling rate automatically, based on the selected synchronization source and its status, without any intervention of the user.

Input Level Meters LEDs blinking

The Input Level Meters OVL LEDs blink (whith the corresponding LVL LEDs turned off) on some channels when the input module of those channels has a problem.

Here is the cause of this warning for each type of input module:

Analog Input 96KHz:

The module is muted while initialized. A 30s warm up delay is necessary for those modules.

AES-EBU Input:

A simple blink means that a sample has just been dropped or re-read, because the incoming AES-EBU signal is not synchronized to the Sphynx clock (drift).

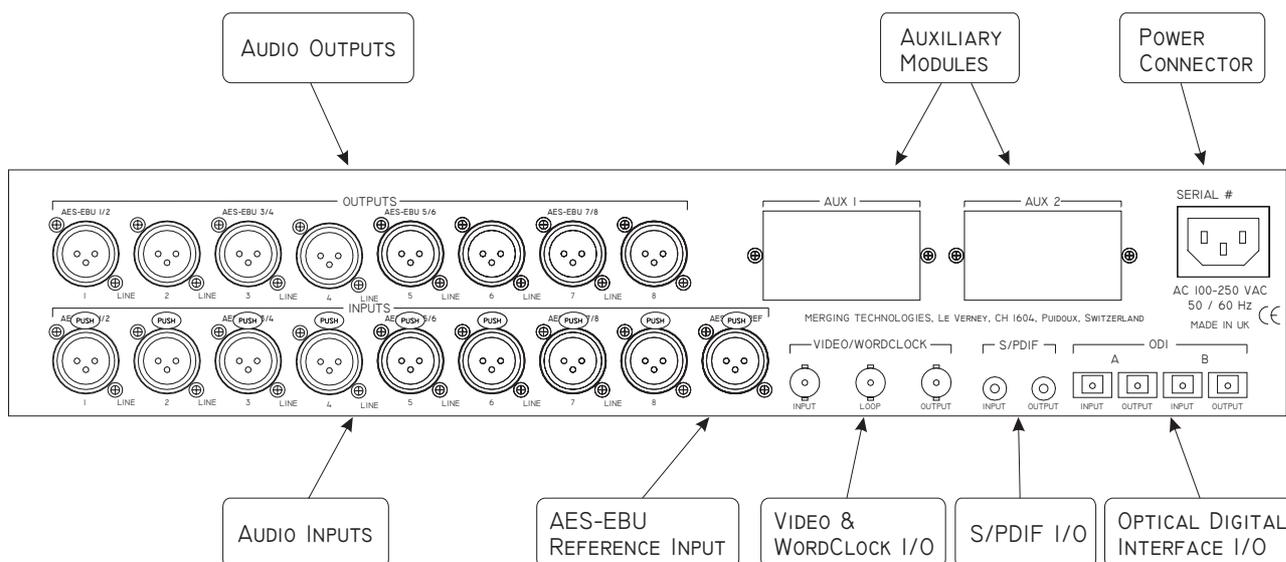
A constant blinking means that the incoming AES-EBU signal is not valid (maybe at a wrong sample rate).

Monitor OUT LEDs blinking

If all monitor OUT LEDs flash, this is an indication that the ODI-A input can't be decoded properly. In that event, the Sphynx software mutes all its outputs.

In 'x2' sample rate mode, if monitor LEDs OUT5/6 and OUT7/8 only flash, this is an indication that the ODI-B input can't be decoded properly. In that event, the Sphynx software mutes its output channels 5/6 and 7/8.

Chapter 3 – The Back Panel

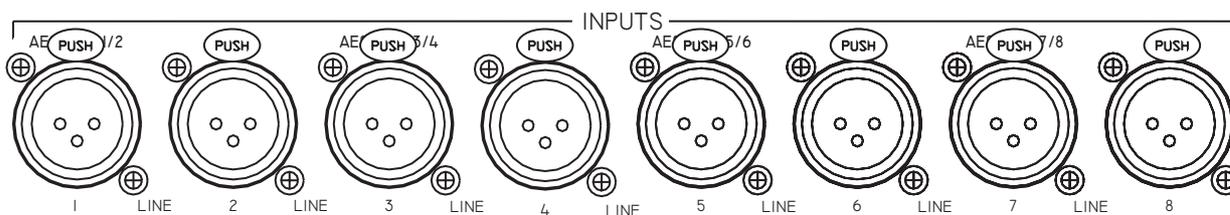


Audio Inputs

The Sphynx unit supports up to eight inputs. The inputs format is determined by the type of input modules installed in the Sphynx. Currently the Sphynx supports the following input modules:

- 24 bit analog line inputs (up to 48 kHz)
- 24 bit analog line inputs (up to 96 kHz)
- 24 bit AES-EBU inputs (up to 96 kHz)

Sphynx can accommodate up to 4 input modules, each having two discrete inputs.



As mentioned above, the input connectors are mapped in pairs to the corresponding input modules. See Chapter 5 on how to make audio connections.

Analog Inputs

When using analog input modules, the corresponding input XLR connectors are adjustable, balanced + 4 dBu nominal line level (headroom 20dB) analog inputs.

AES-EBU Inputs

When using AES-EBU input modules, the corresponding input XLR connectors (only those XLRs corresponding to odd line inputs should be used) are balanced, AES-EBU inputs.

Audio Outputs

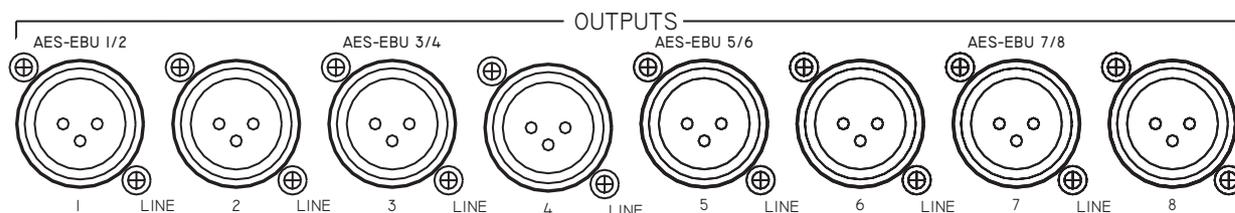
The Sphynx unit supports up to eight outputs. The outputs format is determined by the type of output modules installed in the Sphynx. Currently the Sphynx supports the following output modules:

24 bit analog line outputs (up to 48 kHz)

24 bit analog line outputs (up to 96 kHz)

24 bit AES-EBU output (up to 96 kHz)

Sphynx can accommodate up to 4 output modules, each having two discrete outputs.



As mentioned above, the output connectors are mapped in pairs to the corresponding output modules. See Chapter 5 on how to make audio connections.

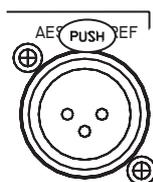
Analog Outputs

When using analog output modules, the corresponding output XLR connectors are adjustable, balanced + 4 dBu nominal line level (headroom 20dB) analog outputs.

AES-EBU Outputs

When using AES-EBU output modules, the corresponding output XLR connectors (only those XLRs corresponding to odd line outputs should be used) are balanced AES-EBU outputs.

AES-EBU Ref. Input

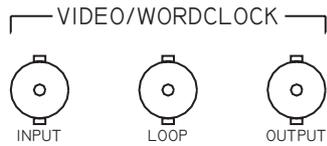


This XLR input accepts any balanced AES-EBU signal up to 48 KHz.

This reference is used primarily when the Sphynx is placed into AES sync mode.

When the Sphynx is set in 'x2' SR mode, this input will only accept an AES-EBU signal of FS/2 sample rate. For example, when set to 96 KHz, the Sphynx would lock on a 48 KHz AES-EBU signal present at this input.

Video/Wordclock I/O



Input

This BNC type connector has two functions. It can accept any NTSC (29.97 fps) or PAL (25 fps) video signal or any Wordclock signals. See Chapter 7 on how to configure the Wordclock input.

When Sphynx is set to VIDEO sync mode, it will resolve the Sphynx clock to the video signal present here.

When Sphynx is set to WCLK sync mode, it will sync the Sphynx clock to the Wordclock signal present here.

Loop

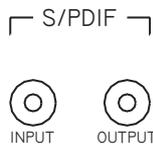
This BNC connector reflects the video or Wordclock signal present at the VIDEO/WORDCLOCK input.

Care should be taken to ensure proper termination if the Loop connector is not used. Placing a 75-Ohm terminator on the loop output should provide adequate termination in most cases. See your Video Reference Generator User's Guide for more information on proper termination techniques.

Output

This BNC connector outputs a Wordclock signal based on the current Sphynx sampling rate. This signal is always present. See Chapter 7 on how to configure the Wordclock output.

S/PDIF I/O



Input

The coaxial S/PDIF input is only used when the Sphynx is placed in S/PDIF sync mode.

In this sync mode, the Sphynx routes the two S/PDIF input channels on the input channels 1-2, in place of input module 1/2. When using the S/PDIF input, the module present in slot IN1/2 is ignored.

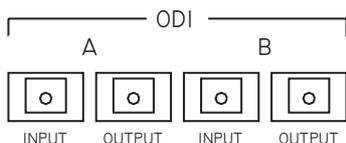
Note that the S/PDIF input is available only when using the Sphynx in 'x1' SR mode.

Output

The output signals present on output channels 1-2 are sent in parallel to module in slot OUT1/2 and to the coaxial S/PDIF output.

Note that the S/PDIF output is available only when using the Sphynx in 'x1' SR mode.

ODI (Optical Digital Interface) I/O



ODI-A Input

This EIAJ optical connector receives a signal from any ADAT compatible output.

The signal present at this input is conveyed to outputs 1-8 in 'x1' SR mode, and to outputs 1-4 in 'x2' SR mode.

ODI-B Input

This EIAJ optical connector receives a signal from any ADAT compatible output.

The signal present at this input is conveyed to outputs 5-8 in 'x2' SR mode.

In 'x1' SR mode and S/PDIF sync, this input accepts an S/PDIF compatible format signal (the Sphynx detects and selects automatically between the coaxial and the ODI-B inputs).

ODI-A Output

This EIAJ optical connector transmits a signal to any ADAT compatible input.

This output conveys signals present at inputs 1-8 in 'x1' SR mode, and inputs 1-4 in 'x2' SR mode.

ODI-B Output

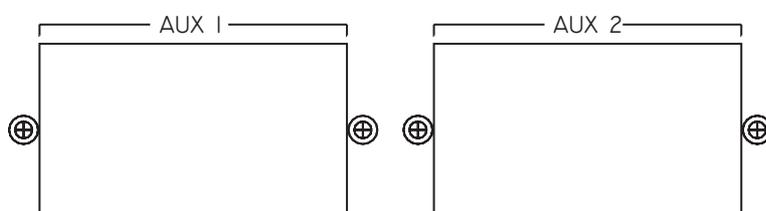
This EIAJ optical connector transmits a signal to any ADAT or S/PDIF compatible input.

In 'x2' SR mode, this output conveys signals present at inputs 5-8 in ADAT format.

In 'x1' SR mode, the signal routed to this output is selectable via the Settings Menu.

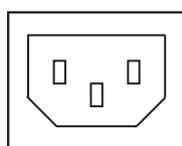
See Chapter 7 on how to set the ODI-B OUT routing.

Auxiliary Modules



The AUX-1 and AUX-2 modules are reserved for future I/O modules that will be developed by Merging Technologies.

Power Connector



AC 100-250 VAC
50 / 60 Hz

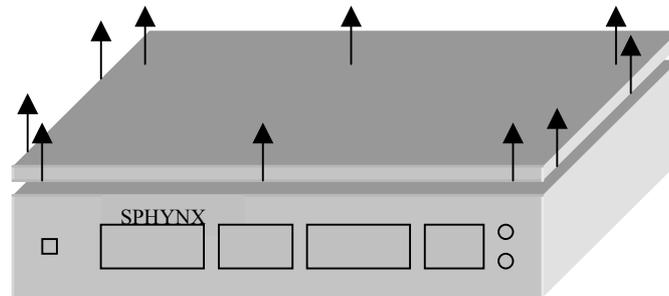
Sphynx uses a variable power supply that accepts AC from 100 to 250 volts. It is designed to be connected to an outlet that includes three pins (center pin to ground). The ground connection is an important safety feature designed to keep potentially dangerous voltages away from the chassis. Never defeat the ground safety feature.

Never operate the Sphynx with ungrounded outlets. Plugging the Sphynx into an ungrounded outlet, or defeating the ground pin, can create a potentially hazardous condition. Merging Technologies cannot be held responsible for problems caused to Sphynx or any associated equipment with improper AC connections.

Chapter 4 - Adding/Removing I/O Modules

Removing the Top Cover

In order to add or remove I/O modules, the ten top cover screws need to be removed. As a safety precaution, the unit must be switched off and the power cable unplugged before opening the top cover.



Placement of I/O Modules

The Sphinx I/O modules are plugged into the white PCI-type connectors located in the Sphinx.

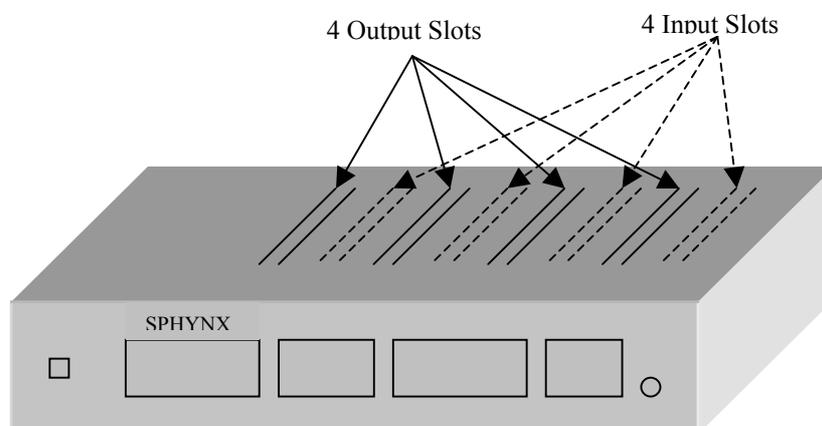
Align the I/O module to fit properly in the desired slot. Insert the module firmly into place.

Please note that the output modules are physically longer than the input modules. This reduces the chance of the output modules being incorrectly inserted into an input slot. The input modules can however be inserted into the output slots (this will not cause any damage to the I/O module or Sphinx).

Caution: Never try to insert any Sphinx I/O modules into a PC computer PCI slot. This could damage both the computer and the Sphinx module.

I/O Module Slots

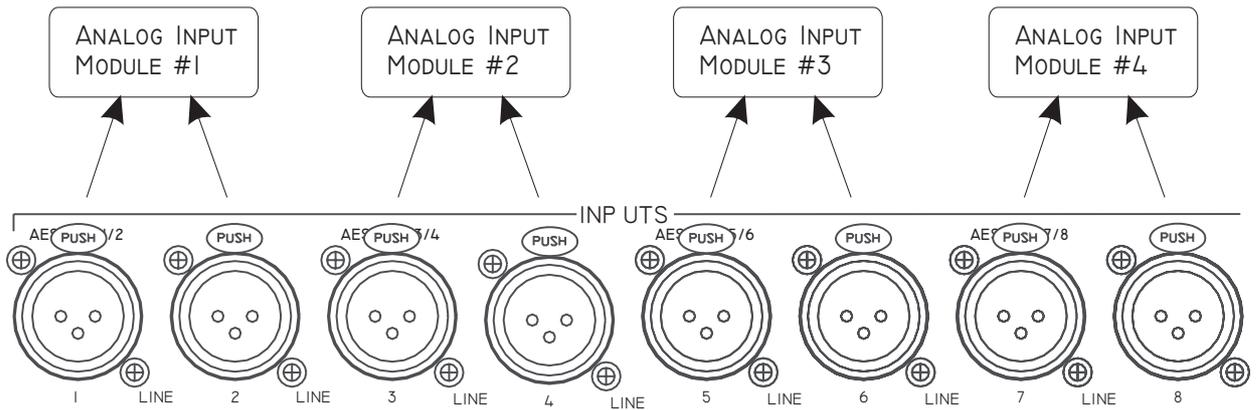
The four input and output slots are displayed here.



Chapter 5 - Making Audio Connections

Connecting Analog Inputs

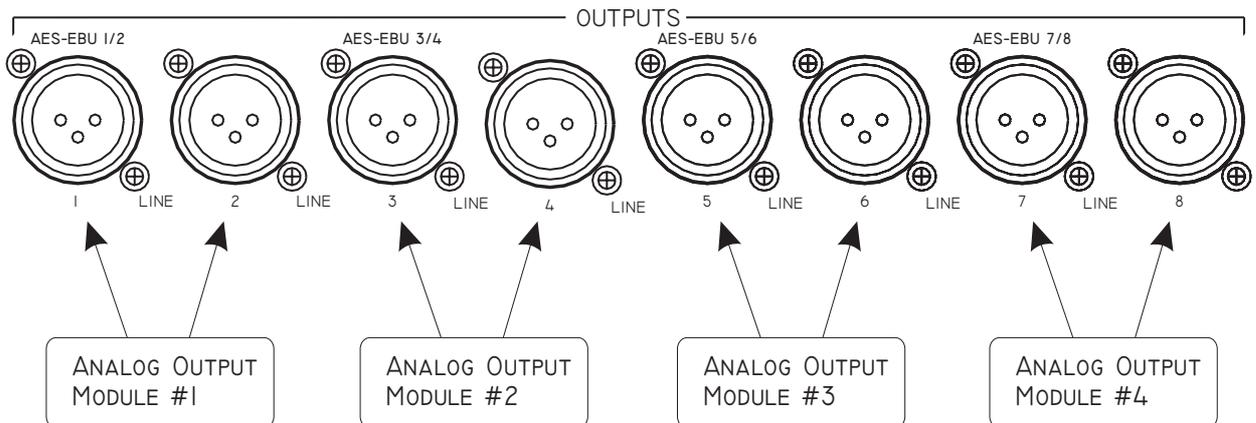
Any professional level balanced audio output source can be connected to the analog inputs of the Sphynx. The input format used is determined by the type of input modules installed in Sphynx. The XLR inputs on the rear of the Sphynx map to installed analog input modules as shown below.



Note that the rear panel labeling of the analog XLR inputs is “MIC/LINE”. Currently, the Sphynx only accepts line analog inputs.

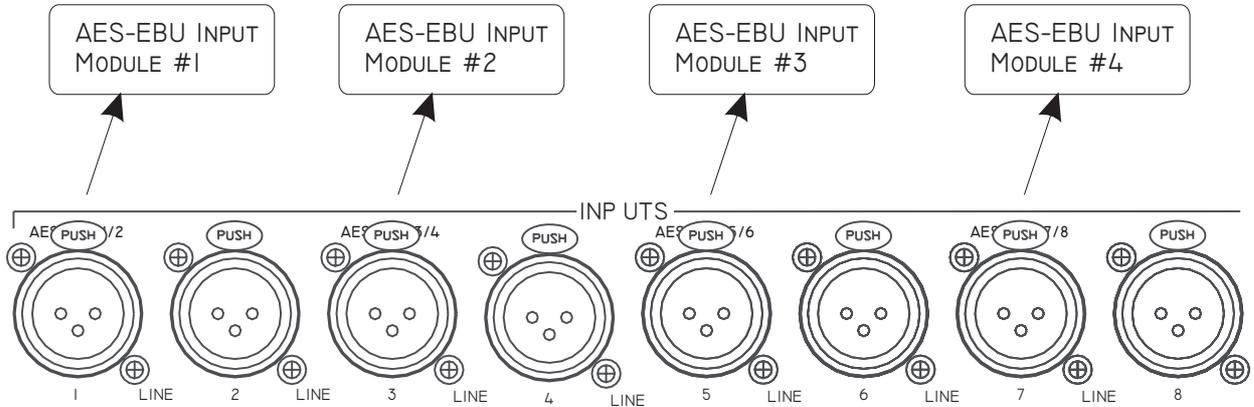
Connecting Analog Outputs

Any professional level balanced audio input sources can be connected to the analog outputs of the Sphynx. The output format used is determined by the type of output modules installed in Sphynx. The XLR outputs on the rear of the Sphynx map to installed analog output modules as shown below.



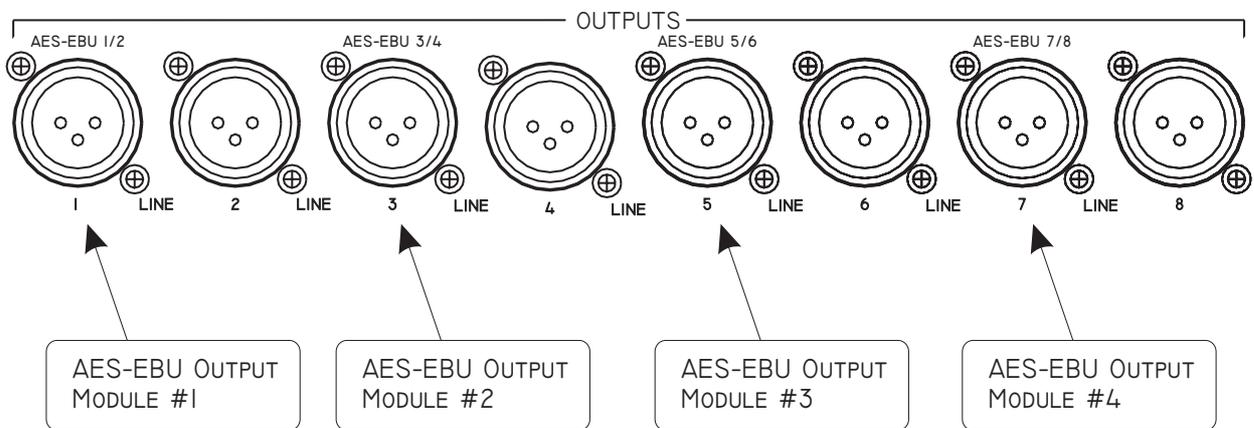
Connecting AES-EBU Inputs

Any professional level balanced digital AES-EBU audio outputs sources can be connected to the AES-EBU inputs of the Sphynx. The input format used is determined by the type of input modules installed in Sphynx. The XLR inputs on the rear of the Sphynx map to installed AES-EBU input modules as shown below.



Connecting AES-EBU Outputs

Any professional level balanced digital AES-EBU audio input sources can be connected to the AES-EBU outputs of the Sphynx. The output format used is determined by the type of output modules installed in Sphynx. The XLR outputs on the rear of the Sphynx map to installed AES-EBU output modules as shown below.

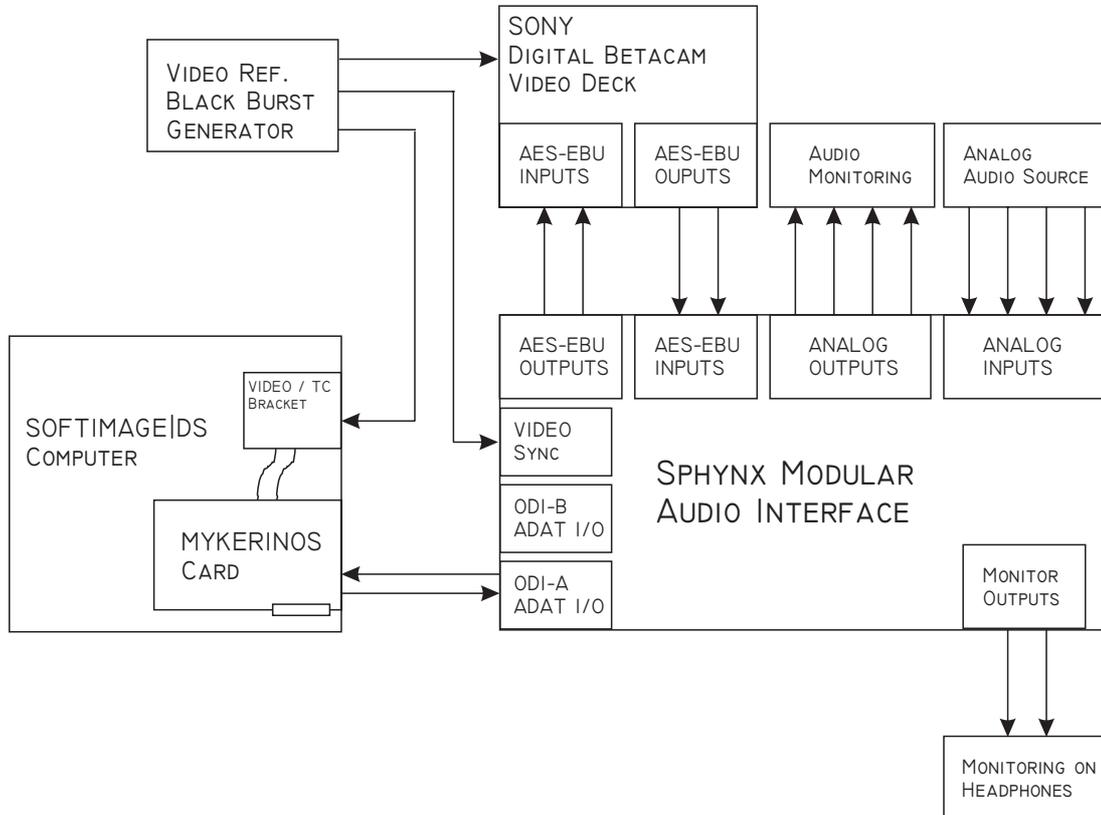


Typical Connection Scenarios

This section will display some typical audio connection scenarios for Sphynx.

SOFTIMAGE®|DS with SONY® Digital BetaCam Users

This example is based on Digital Studio users who are using the Sphynx in conjunction with the Merging Keops boards and a Digital Betacam video deck.



This example uses the following:

Monitoring is done through the Digital Betacam analog outputs, the Sphynx headphones output, or the Sphynx analog outputs (if analog output modules are installed).

The Sphynx contains at least 2 AES-EBU input modules (4 mono inputs) and 2 AES-EBU output modules (4 mono outputs). Analog output modules are optional in this configuration.

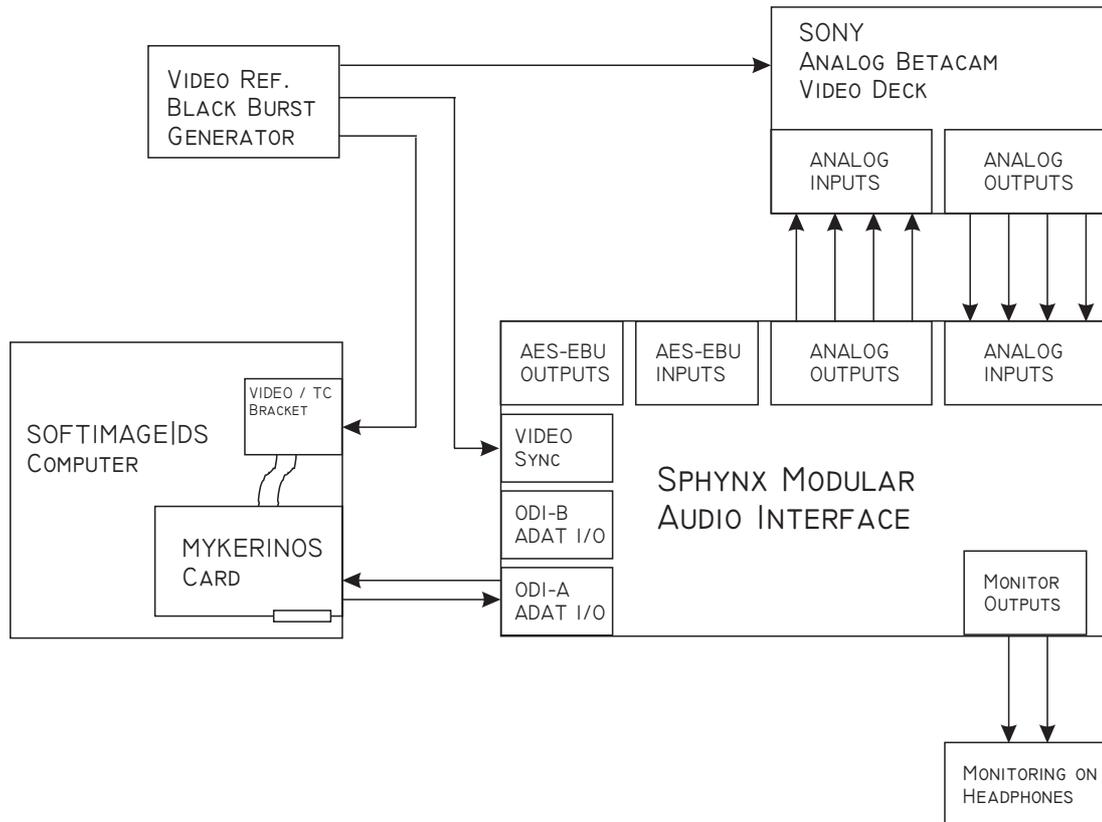
All units (Mykerinos card – via TC card, Video Deck and Sphynx) are connected to the video reference generator. Note that any composite video source can also be used as a video reference for Sphynx.

Note that the video Loop output can be used to supply the video reference to other devices. Otherwise, a 75-Ohms terminator must be connected to the Loop output.

The Sphynx is set to VIDEO or AES-EBU Sync Mode.

SOFTIMAGE®|DS with SONY® Analog BetaCam Users

This example is based on Digital Studio users who are using the Sphynx in conjunction with the Merging Keops boards and an Analog Betacam video deck.



This example uses the following:

All monitoring is done by the front panel Monitoring selection and output

The Sphynx contains 2 analog input modules (4 inputs) and 2 analog output modules (4 outputs) AES-EBU output modules are optional in this configuration.

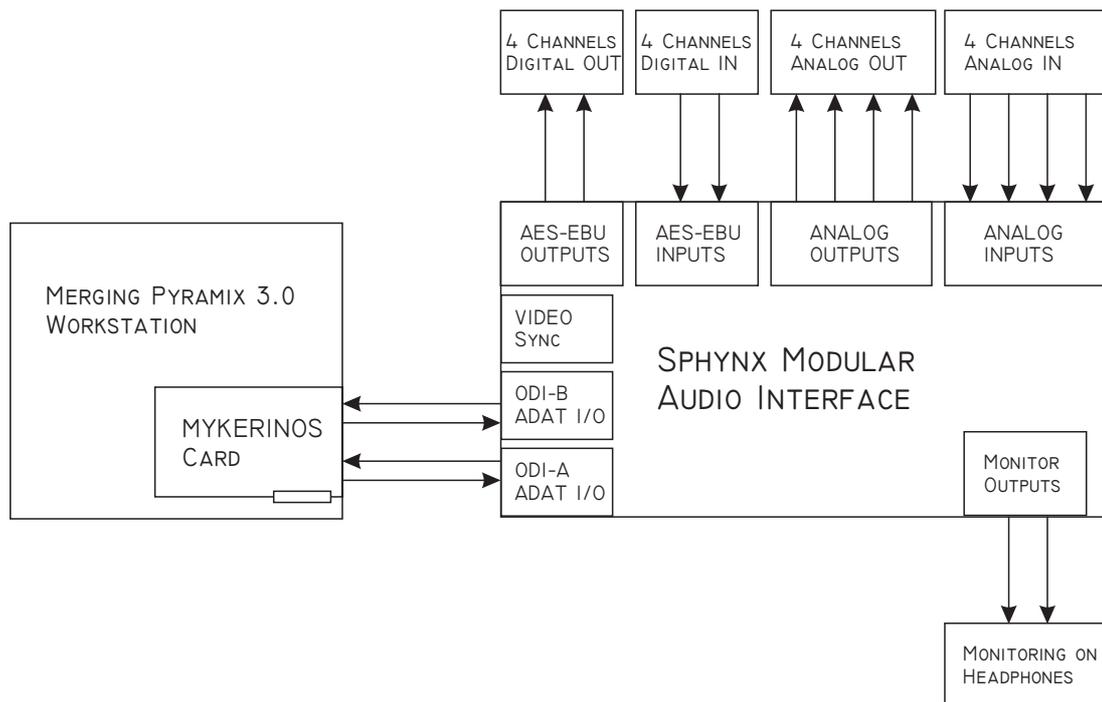
All units (Mykerinos card – via TC bracket, Video Deck and Sphynx) are connected to the Video Sync generator Note that any composite video source can also be used as a Video Sync reference for Sphynx.

Note that the Video Loop output can be used to supply the video reference to other devices Otherwise, a 75-Ohms terminator must be connected to the Loop output.

The Sphynx is set to VIDEO Sync Mode

MERGING® Pyramix 3.0 DAW Setup

This example is based on a typical Pyramix analog/digital audio studio with both types of devices. This configuration allows up to 8 inputs and 8 outputs in 'x2' SR mode.



This example uses the following:

All monitoring is done by the front panel monitoring selection and output and/or the analog output modules.

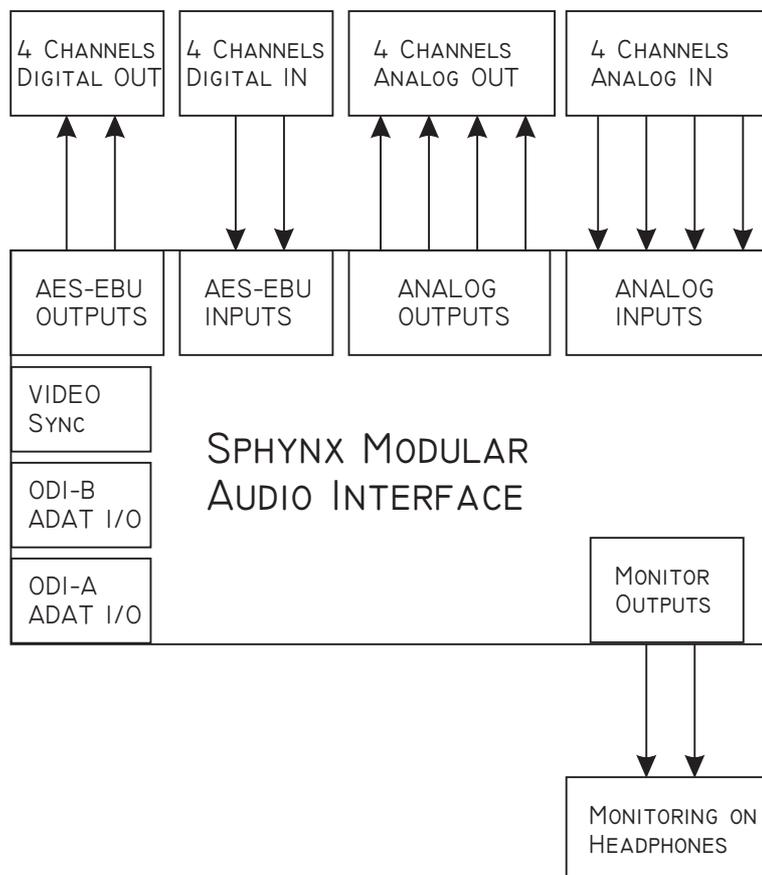
The Sphynx is fitted with analog input modules and AES-EBU output modules.

The Sphynx is set to INT Sync mode

STAND ALONE Analog/Digital Audio Setup

This example is based on a stand-alone audio converter application.

This configuration allows having 4 ANALOG-to-AES-EBU and 4 AES-EBU-to-ANALOG converters.



This example uses the following:

All monitoring is done by the front panel monitoring selection and output

The Sphynx contains analog input modules and AES-EBU output modules.

The Sphynx is set to INT Sync Mode.

The parameter 6 in the Settings Menu must be set, to enable the Stand Alone mode. See Chapter 7 on how to use the Settings Menu.

Chapter 6 - Power-Up

Once all of the needed audio and power connections have been made, the Sphynx can be safely powered up.

Power-up Sequence

When the Sphynx is powered up, the initialization sequence progress is displayed on the REMOTE, INT and ODI LEDs. If the initialization sequence stops with one of those LEDs blinking, it indicates that the Sphynx is not working properly.

In this case, please contact Merging.

Display of Sphynx Configuration

After a normal initialization sequence, which should take around 4 seconds, or after having pressed the MONITOR SELECT button for more than 2s, the MONITOR LEDs will display the current Sphynx configuration for 5 seconds:

Each installed input or output module will light its corresponding LED.

The CPU board version is displayed on the X1 and X2 LEDs (see details in Appendix 3).

The firmware version is displayed on the INPUT LEVEL METERS LEDs (see details in Appendix 3).

Note that upon power-up, the Sphynx front panel controls are restored to the last settings used before power down.

I/O Modules Placement Mismatch

Please note that if an I/O module is incorrectly inserted into an I/O slot, the corresponding MONITOR LED on the will flash to indicate the mismatch, and the initialization sequence will stop.

This will occur if an input module is inserted into an output slot, or if an output module is inserted into an input slot. In this case switch the Sphynx OFF, unplug the power cable, open the Sphynx and check the placement of all installed modules.

Analog Modules Calibration

In order to guarantee optimum specifications from some of the analog audio converters used in the Sphynx (mainly the 96kHz analog input modules), there is a "warm-up" time of about 30 seconds after power is switched on before the software conducts its final calibration procedure. During this "warm-up" time, input signals are muted. It is therefore recommended to wait for this initialization phase to be complete before attempting to use the Sphynx.

Note: As those thirty seconds were found not to be a sufficient warm-up time for the converters used in Sphynx modules to yet be at full thermal equilibrium, the Sphynx firmware automatically launches a second re-calibration process after about 5 minutes. In order to avoid disrupting any recording that may be occurring at that time, the software checks that all audio levels on input modules are consistently below -60 dB for a minimum duration of 2 seconds before initiating this re-calibration process during which all input audio is fully muted. This second re-calibration process gives an additional improvement in the signal/noise specs of about 2-3 dB.

The calibration can still be manually initiated at any time by pushing on the MONITOR SELECT button while simultaneously pushing once the SAMPLE RATE SELECT button before releasing the MONITOR SELECT button.

Chapter 7 - Settings Menu

The 'Settings Menu' allows for Sphynx parameters changes.

To enter the 'Settings Menu', push on the MONITOR SELECT button while simultaneously hitting once the SYNCHRONIZATION SELECT button before releasing the MONITOR SELECT button.

Warning: If holding the MONITOR SELECT button for longer than 2s, the Sphynx enters the 'Display Configuration' mode, as described in Chapter 6.

Using the SYNCHRONIZATION SELECT button, to change the parameter number (1-8) displayed on the OVL leds.

Using the SAMPLE RATE SELECT button, to change the value of the selected parameter (1-8), displayed on the LVL leds.

Once you have set all parameters as you want, press once the MONITOR SELECT button to exit the 'Settings Menu'. The new configuration is stored and applied immediately.

The different parameters are defined as in the following table:

OVL LED	Parameter	LVL LED	Value
1	Analog I/O Level	1	Calibrated Level
		2	Custom Level
2	Analog Input Dither <i>(Note 1)</i>	1	No Dither (24 bit)
		2	Dither 20 bit
		3	Dither 18 bit
		4	Dither 16 bit
3	AES-EBU Input SRC	1	Without SRC(24 bit)
		2	With SRC (20 bit)
4	AES-EBU I/O DUAL Mode	1	OFF
		2	INPUT Only
		3	OUTPUT Only
		4	INPUT and OUTPUT
5	ODI-B OUT Routing Selection	1	ODI-A IN
		2	ODI-A OUT
		3	SPDIF OUT <i>(Note 2)</i>
6	STAND ALONE Mode	1	Normal mode
		2	Stand Alone mode
7	WCLK I/O in 'x2' SR Mode	1	WCLK @ FS/2
		2	WCLK @ FS

Note 1: Only available on S96IM Modules.

Note 2: Not available on CPU Rev. A Version.

Default Ex-factory settings are in bold.

1 - Analog I/O Level

This parameter chooses between Calibrated analog I/O level (+24 dBu for 0dBFS) or Custom analog I/O level. The Custom I/O level allows the analog I/O levels to be set, using the top trimmers, to match any studio needs. This selection is global to all analog I/O modules. It is not possible to configure each module separately.

By default, the Sphynx unit is set to Custom I/O level. All analog module trim-pots are set at the factory to the following values:

Input Level = + 18 dBu for 0 dBFS (+4 dBu with +14 dB of headroom).

Output Level = + 18 dBu for 0 dBFS (+4 dBu with +14 dB of headroom).

Using the Trim Pots

The Sphynx top cover has drilled holes, which allow the analog level trimmer pots to be adjusted without the need to remove the top cover. Any small standard tip screwdriver can be used to adjust the desired trimmer pot. The layout pictured below is also silk-screened on the Sphynx top cover. The number below corresponds to the associated module, marked IN for input module and OUT for output module.



2 - Analog Input Dither

When enabled, this provides real-time noise shaped dithering on all S96\IM analog input modules, by adding a psychoacoustic noise-shaping filter, which subjectively truncates the A/D converter outputs to 16, 18 or 20 bits, while 24-bit sound quality is preserved.

To remove the distortion associated with the truncation to a word length lower than 24 bits, a noise shaped dither adds some noise energy to the incoming analog signal. To minimize the audibility of this added noise to the human ear, a noise shaping filter is used to minimize the noise level where the human ear is most sensitive (500 to 4000 Hz), and augment it in where the human ear is less sensitive. One side effect of such a process is however to significantly increase the peak noise level as measured by most digital audio peak meters (as those used in Pyramix).

A peak noise of about -60 dBFS is therefore normal for a 16 bit dithered signal.

This option should only be used when the destination digital format is limited to 16, 18 or 20 bit word length.

3 - AES-EBU Input SRC

This enables or disables the Sample Rate Conversion available on the AES-EBU input modules.

This selection is applied to all the AES-EBU input modules. It is not possible to configure each module separately.

Note that, for obvious reasons, it is not possible to lock to an AES-EBU input module when the SRC is selected.

In the latter case, only locking to an AES REF sync input is supported.

Using the Sample Rate Conversion

The Sample Rate Converter is very easy to use, as you just have to set the parameter 3, and all AES input modules will be configured in the SRC mode.

Once in this mode, all incoming AES-EBU signals connected at the input modules will be converted to the Sphynx sample rate.

Example:

The Sphynx working sample rate is set at 48 KHz

Any AES-EBU input signal of 32 KHz, 44.1 KHz or 48 KHz can be used and will be converted to 48 KHz.

Current SRC limitations are:

- The upsampling has a limitation of a sample rate input/output ratio of 1:5. This allows any sample rate five times lower than the current Sphynx sample rate to be converted.
- The downsampling has a limitation of a sample rate input/output ratio of 1:0.85. This allows 48 KHz material to be downsampled to 44.1KHz.
- Does not currently support 'x2' SR mode.

4 - AES-EBU I/O DUAL Mode

The default Sphynx AES-EBU mode in 'x2' SR mode is HSR, where both left and right channels are conveyed on the same single AES-EBU signal.

To provide compatibility with some early digital systems using two separate AES-EBU connections at x2 sampling rate, we have implemented the following selection:

- 1) When INPUT Dual AES-EBU mode is selected, all AES-EBU input modules are configured as DUAL whenever the 'x2' SR Mode is selected:

Slot IN1/2 (Dual AES-EBU Mono)	⇒	CH 1 (ADAT ODI-A OUT)
Slot IN3/4 (Dual AES-EBU Mono)	⇒	CH 2 (ADAT ODI-A OUT)
Slot IN5/6 (Dual AES-EBU Mono)	⇒	CH 3 (ADAT ODI-A OUT)
Slot IN7/8 (Dual AES-EBU Mono)	⇒	CH 4 (ADAT ODI-A OUT)

Note: If a non-AES-EBU input module is present, its associated input channels are muted while in this mode.

- 2) When OUTPUT Dual AES-EBU mode is selected, and when the 'x2' SR mode is selected, three different Dual mode configurations can exist depending on the output modules present in the Sphynx:

- a) Dual AES-EBU MIXED 1/2 (AES-EBU Output modules installed in slots 1/2 and 3/4):

CH 1 (ADAT ODI-A IN)	⇒	Slot 1/2 (Dual AES-EBU Mono)
CH 2 (ADAT ODI-A IN)	⇒	Slot 3/4 (Dual AES-EBU Mono)
CH 1/2 (ADAT ODI-A IN)	⇒	Slot 5/6 (DA24 96K Stereo)
CH 3/4 (ADAT ODI-A IN)	⇒	Slot 7/8 (DA24 96K Stereo)

- b) Dual AES-EBU MIXED 3/4 (AES-EBU Output modules installed in slots 5/6 and 7/8):

CH 1/2 (ADAT ODI-A IN)	⇒	Slot 1/2 (DA24 96K Stereo)
CH 3/4 (ADAT ODI-A IN)	⇒	Slot 3/4 (DA24 96K Stereo)
CH 3 (ADAT ODI-A IN)	⇒	Slot 5/6 (Dual AES-EBU Mono)
CH 4 (ADAT ODI-A IN)	⇒	Slot 7/8 (Dual AES-EBU Mono)

- c) Dual AES-EBU FULL (AES-EBU output modules installed in slots 1/2, 3/4, 5/6 and 7/8)

CH 1 (ADAT ODI-A IN)	⇒	Slot 1/2 (Dual AES-EBU Mono)
CH 2 (ADAT ODI-A IN)	⇒	Slot 3/4 (Dual AES-EBU Mono)
CH 3 (ADAT ODI-A IN)	⇒	Slot 5/6 (Dual AES-EBU Mono)
CH 4 (ADAT ODI-A IN)	⇒	Slot 7/8 (Dual AES-EBU Mono)

5 - ODI-B OUT Routing Selection

This parameter selects the signal to output on ODI-B OUT in 'x1' SR mode. Three different configurations are possible:

ODI-A IN: The signal present at the ODI-A IN connector is routed to ODI-B OUT (loop through).

ODI-A OUT: The signal present at the ODI-A OUT connector is routed to ODI-B OUT (copy).

S/PDIF OUT: The signal present at the S/PDIF OUT coaxial connector is routed to ODI-B OUT (copy).

6 - STAND ALONE Mode

This parameter allows for stand-alone operations, such as AD to AES-EBU, AES-EBU to DA, AES-EBU to AES-EBU Sample Rate Conversion, etc...

In the STAND ALONE mode, ADAT outputs are routed internally to ADAT inputs.

The 8 input signals still are conveyed to ODI outputs in ADAT format, but the signals present at the ODI inputs are ignored.

7 - WCLK I/O in 'x2' SR Mode

This parameter selects the WordClock input and output frequency in 'x2' sample rate mode.

When this parameter is set, the WCLK Ref. input will only accept an FS/2 frequency.

The WCLK OUT output will provide a FS/2 frequency.

(Example: WCLK I/O = 48KHz while working at 96KHz sampling rate).

When this parameter is cleared, the WCLK Ref. input will only accept an FS frequency.

The WCLK OUT output will provide a FS frequency.

(Example: WCLK I/O = 96KHz while working at 96KHz sampling rate).

Appendix 1 – Technical Specifications

Sphynx unit

Dimensions (WxDxH): 485 mm x 250 mm x 87 mm (19" 2U height)

Parameter	Conditions	Value	Unit
Weight	max. fitted with 8 I/O modules	5.2	Kg
Power consumption	max. fitted with 8 I/O modules	22	VA
Internal Sampling Frequency Accuracy	25° Celsius	+/- 5	ppm
Internal Sampling Frequency Accuracy	0° to 50° Celsius	+/- 25	ppm
Internal Sampling Frequency Jitter	WordClock @48 KHz	< 2	ns p-p

48kHz Analog Input Module

Parameter	Conditions	Value	Unit
Resolution		24	Bit
Max. Sampling Rate		48	KHz
Max. Input Level			
- Calibrated	Differential	+24	dBu
- Custom Min.	Differential	+4	dBu
- Custom Max.	Differential	+25	dBu
Input Impedance	Differential	> 20	KOhms
Common Mode Rejection		> 40	dB
Interchannel Isolation (Crosstalk)	1kHz	> 110	dB
Dynamic Range	A-weighted	102	dB(A)
	Unweighted	99	dB
THD+N	1 KHz @ 0 dBFS	-88	dB
	1 KHz @-20 dBFS	-80	dB
Frequency Response	20 Hz – 20 KHz	± 0.1	dB

48kHz Analog Output Module

Parameter	Conditions	Value	Unit
Resolution		24	Bit
Max. Sampling Rate		48	KHz
Max. Output Level			
- Calibrated	Differential	+24	dBu
- Custom Min.	Differential	0	dBu
- Custom Max.	Differential	+25	dBu
Output Impedance	Differential	< 50	Ohms
Common Mode Rejection		> 40	dB
Interchannel Isolation (Crosstalk)	1 KHz	> 110	dB
Dynamic Range	A-weighted	110	dB(A)
	Unweighted	106	dB
THD+N	1 KHz @ 0 dBFS	-98	dB
	1 KHz @-20 dBFS	-81	dB
Frequency Response	20 Hz - 20 KHz	± 0.1	dB

96kHz Analog Input Module

Parameter	Conditions	Value	Unit
Resolution		24	Bit
Max. Sampling Rate		96	KHz
Dither and Noise Shaping		16/18/20	bits
Max. Input Level:			
- Calibrated	Differential	+24	dBu
- Custom Min.	Differential	+4	dBu
- Custom Max.	Differential	+25	dBu
Input Impedance	Differential	> 15	KOhms
Common Mode Rejection		> 50	dB
Interchannel Isolation (Crosstalk)	1 KHz	> 110	dB
Sampling Rate 48 kHz			
Dynamic Range	A-weighted	117	dB(A)
	Unweighted	114	dB
THD+N	1 KHz @ 0 dBFS	-102	dB
	1 KHz @-20 dBFS	-93	dB
Frequency Response	20 Hz – 20 KHz	± 0.1	dB
Sampling Rate 96 kHz			
Dynamic Range	A-weighted	117	dB(A)
	Unweighted	111	dB
THD+N	1 KHz @ 0 dBFS	-101	dB
	1 KHz @-20 dBFS	-90	dB
Frequency Response	20 Hz – 40 KHz	± 0.1	dB

96kHz Analog Output Module

Parameter	Conditions	Value	Unit
Resolution		24	Bit
Max. Sampling Rate		96	KHz
Max. Output Level:			
- Calibrated	Differential	+24	dBu
- Custom Min.	Differential	+0	dBu
- Custom Max.	Differential	+26	dBu
Output Impedance	Differential	< 50	Ohms
Common Mode Rejection		> 40	dB
Interchannel Isolation (Crosstalk)	1kHz	> 110	dB
Sampling Rate 48 kHz			
Dynamic Range	A-weighted	114	dB(A)
	Unweighted	110	dB
THD+N	1 KHz @ 0 dBFS	-97	dB
	1 KHz @-20 dBFS	-90	dB
Frequency Response	20 Hz – 20 KHz	± 0.1	dB
Sampling Rate 96 kHz			
Dynamic Range	A-weighted	114	dB(A)
	Unweighted	110	dB
THD+N	1 KHz @ 0 dBFS	-97	dB
	1 KHz @-20 dBFS	-90	dB
Frequency Response	20 Hz – 40 KHz	± 0.2	dB

AES-EBU Input Module

Parameter	Conditions	Value	Unit
Without SRC			
Resolution		24	Bit
Max. Sampling Rate		96	KHz
Input Impedance	Differential	110	Ohms
With SRC			
Resolution		20	Bit
Max. Sampling Rate		48	KHz
Input Sampling Rate Converter Range	Upsampling 1:5 max.	8-48	KHz
Input Sampling Rate Converter Range	Downsampling 1:0.85 max.	37-48	KHz
Dynamic Range		120	dB
THD+N	1 KHz @ 0 dBFS	<-100	dB
Input Impedance	Differential	110	Ohms

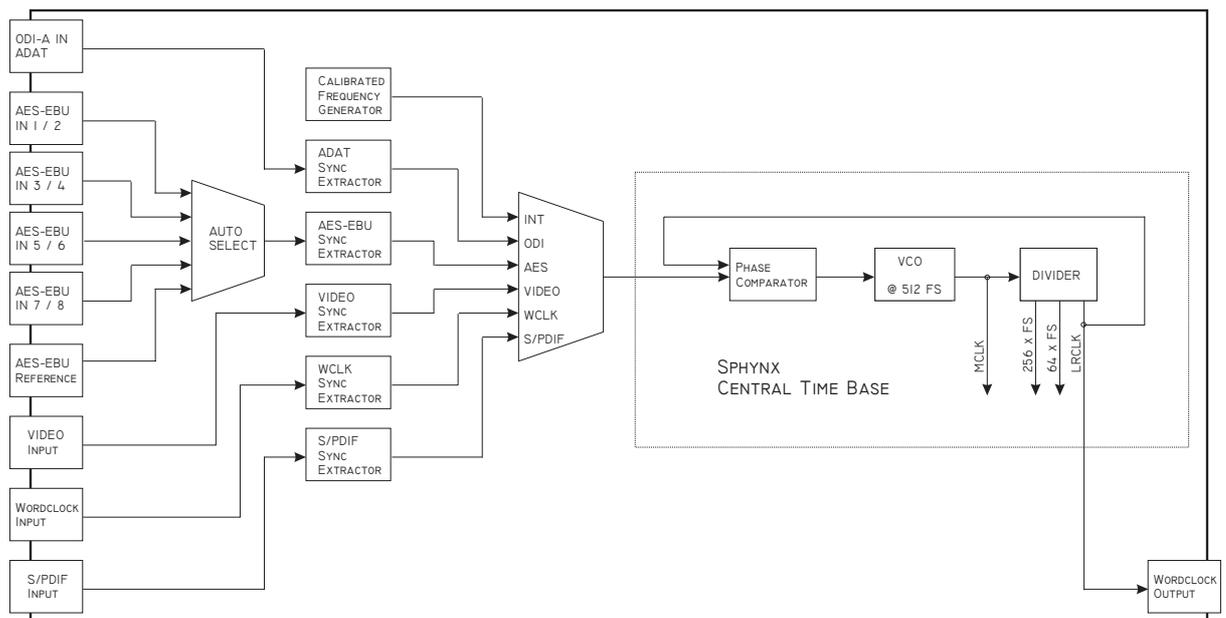
AES-EBU Output Module

Parameter	Conditions	Value	Unit
Resolution		24	Bit
Max. Sampling Rate	Without SRC	96	KHz
Output Impedance	Differential	110	Ohms

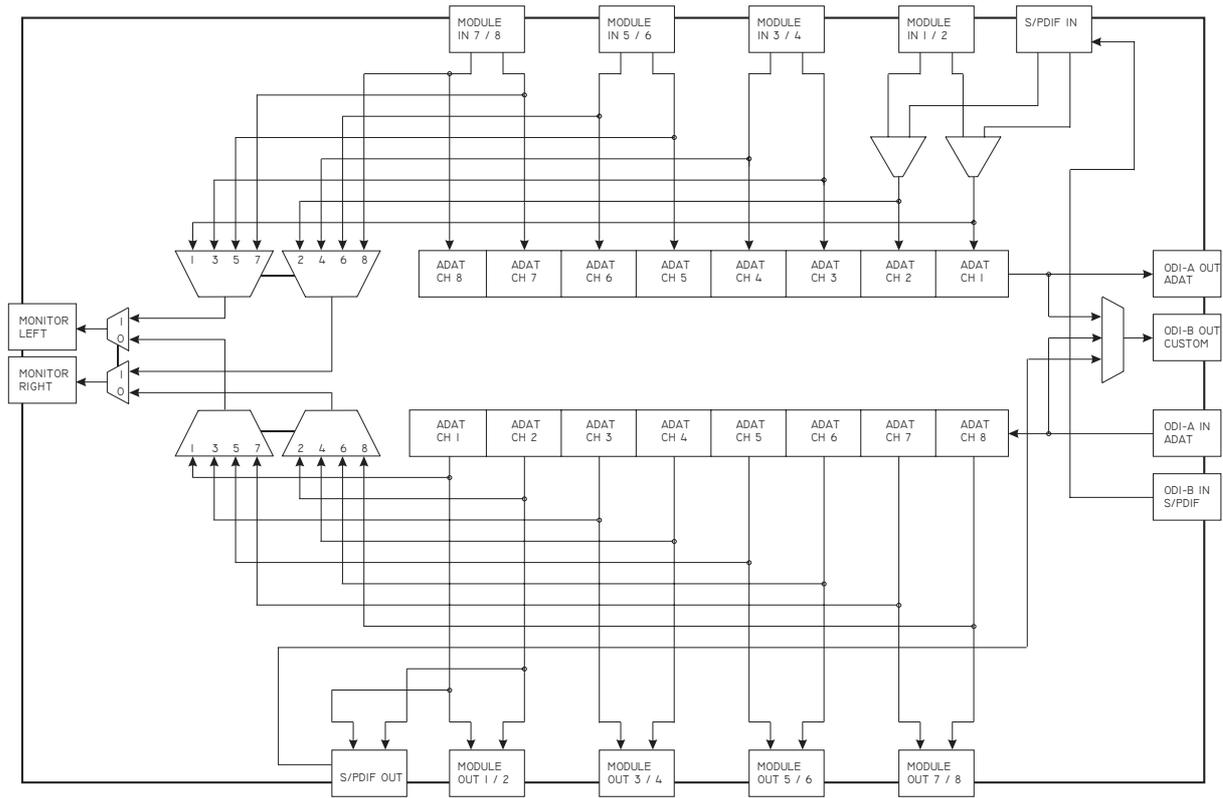
Note: All specifications subject to change without notice.

Appendix 2 – Flow Chart Diagrams

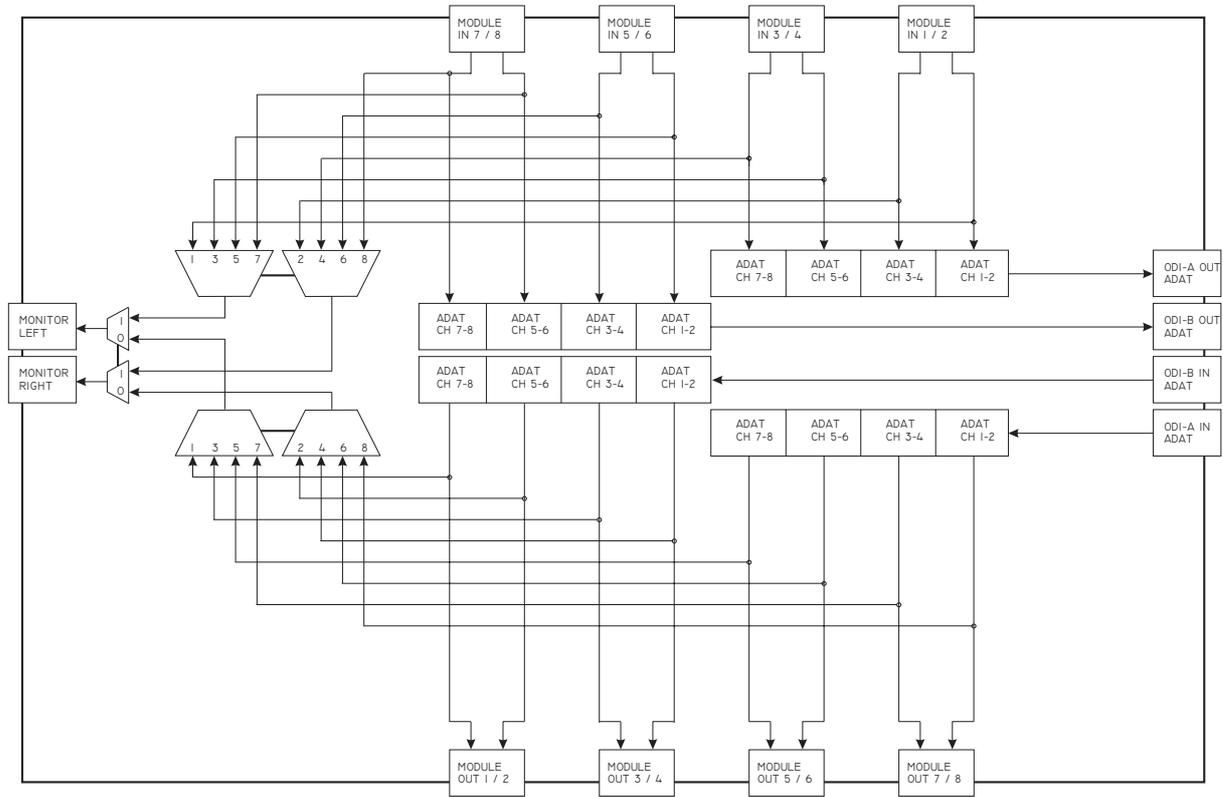
Sphynx Synchronization Flow Chart



Sphynx in 'x1' SR mode Audio Flow Chart



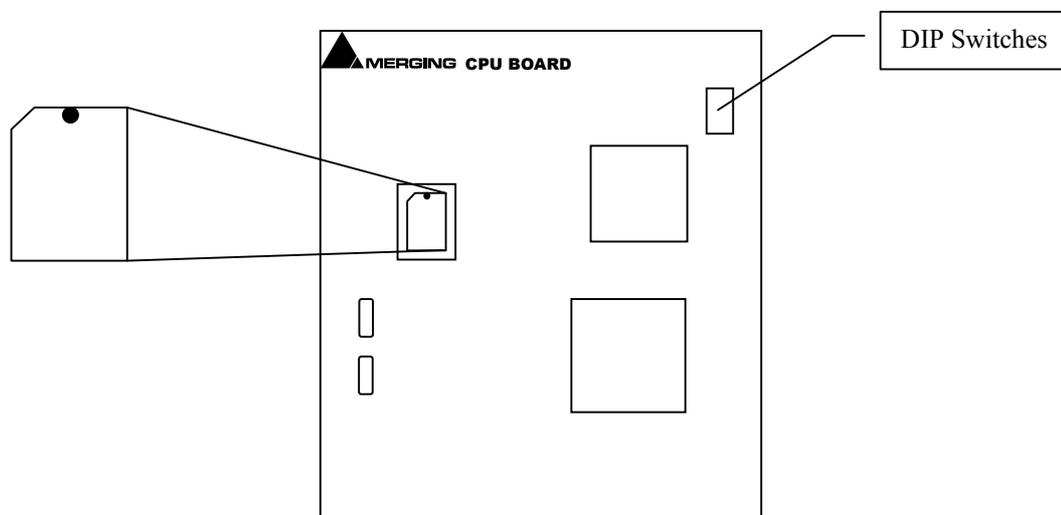
Sphynx in 'x2' SR mode Audio Flow Chart



Appendix 3 - Upgrading the Sphynx Firmware

All Sphynx users will be contacted by Merging in the event of a Sphynx firmware upgrade. This upgrade can be performed easily in the field, by using the firmware removal tool included with the unit. If you are unsure on how to perform this procedure, please contact Merging.

- Disconnect the power supply cable
- Remove the top cover
- Locate the Flash ROM chip (located on the CPU board -is labeled with a sticker “Sphynx V 1.6”. This number may be different to reflect the current firmware version currently installed in your Sphynx unit.
- Using the removal tool, remove the Flash ROM from the CPU board
- Maintain the tool vertically while removing the Flash ROM chip.
- Take the new Flash ROM chip and plug it into the socket (by hand), in place of the old one.
- Take care to ensure that the firmware chip is inserted in the same orientation as the previous chip. (Follow the drawing below to make sure that the bevel and the point on the firmware chip are properly positioned).
- Replace the top cover.



DISPLAYING FIRMWARE AND CPU VERSION

When the Sphynx displays the configuration on the *MONITOR* LEDs (at startup or when you press the monitor switch for 2 sec), it also displays the firmware version on the level meters, so you can know your current version without opening the top cover.

It is displayed as follow:

Sphynx V X.Y

X is displayed on the OVL LEDs (RED) from 1 to 8,
Y is displayed on the LVL LEDs (yellow) from 1 to 8.

The CPU board version is also displayed on the sample rate LEDs as follows:

LED 'x1' = Rev. A
LED 'x2' = Rev. B

Appendix 4 – Troubleshooting / FAQ

All Monitor OUT LEDs are constantly blinking:

This problem may happen when the signal present at the ODI-A input is not synchronous with the Sphynx clock, or has too much jitter. The most common occurrence for this situation to happen is whenever the Sphynx and the equipment to which it is connected are both set to slave to each other. This is a pretty common user setup problem. Care should be taken in any digital audio studio to always set one (and only one) unit as the master while programming all other units to slave to this “master” clock.

Monitor OUT5/6 and OUT7/8 LEDs only are constantly blinking in ‘x2’ SR Mode:

In ‘x2’ SR mode, this problem may happen when the two signals present at both ODI inputs are not coming from the same device, or the two optical fibers connected to ODI-A and ODI-B have a length different by more than ~1 meter.

When using the Sphynx as a stand-alone unit, how do you route audio through the unit? Can you do it without patching the ADAT INs and OUTs together?

When using the Sphynx as a stand-alone unit, the parameter 6 in the ‘Settings Menu’ should be set to enable the STAND ALONE mode.

This way all input modules signals are routed internally one-to-one to the output modules. There is no need for an ADAT external loop.

Three examples will best describe some of the various possible setups:

- 1) Sphynx is used as a stand alone 8 channels A/D converter.
In that mode, Sphynx would be fitted with 4 stereo analog line input modules and 4 stereo AES-EBU output modules.
 - Analog line signals on inputs 1 and 2 are converted to a digital AES-EBU signal on output 1/2,
 - Analog line signals on inputs 3 and 4 are converted to a digital AES-EBU signal on output 3/4,
 - and so on...

- 2) Sphynx is used as a stand alone 8 channels D/A converter.
In that mode, Sphynx would be fitted with 4 stereo AES-EBU input modules and 4 stereo analog line output modules.
 - Digital AES-EBU signal on input 1/2 is converted to two analog line signals on outputs 1 and 2,
 - Digital AES-EBU signal on input 3/4 is converted to two analog line signals on outputs 3 and 4,
 - and so on...

- 3) Sphynx is used as a stand-alone mixed setup featuring 4 channels A/D converter and 4 channels D/A converter.
In that mode, Sphynx would be fitted with 2 stereo analog line input modules (say in input slots IN1/2 and IN3/4) and 2 stereo AES-EBU output modules (in that case in output slots OUT1/2 and OUT3/4).
Further to this A/D section, the Sphynx would further be fitted with 2 stereo AES-EBU input modules (then in input slots IN5/6 and IN7/8) and 2 stereo analog line output modules (in output slots OUT5/6 and OUT7/8).
In this example, audio signals would be routed in the following way:
 - Analog line signals on inputs 1 and 2 are converted to a digital AES-EBU signal on output 1/2,
 - Analog line signals on inputs 3 and 4 are converted to a digital AES-EBU signal on output 3/4,
 - Digital AES-EBU signal on input 5/6 is converted to two analog line signals on outputs 5 and 6,
 - Digital AES-EBU signal on input 7/8 is converted to two analog line signals on outputs 7 and 8,

Due to the highly modular nature of the Sphynx unit, any other combination of input and output modules can be selected, based on specific user's needs.

What is the best setup (again, stand-alone-no computer) for measuring and testing the audio coming out AES and Analog?

The example c) above should be a pretty good example of how to setup a Sphynx for a stand-alone A/D and D/A quality measurement. This setup allows both a A/D path and a D/A path to be measured, using for example an Audio Precision equipment which can generate test tones in AES-EBU format, while analyzing the returned analog line signals or the opposite as well (generating analog line signals and analyzing returned digital AES-EBU signals)

I want to place the Sphynx in a machine room, what is the maximum cable length I can use for the Optical cables?

When using Keops and the Sphynx for example, we have tested optical runs of up to 10 meters, using standard APF (All Plastic Fiber) cables without problems. The official maximum length recommended by Alesis (the makers of ADAT) is 6 meters.

Beyond 10 meters (and up to 1000 meters), the setup requires the addition of two Merging **Onouris** LDS (Long Distance System) converters.

Contact Merging if you would like to run optical cables longer than 10 meters.

Can you solve the optical cable distance by simply substituting glass optical cables for the plastic cables?

This is not a recommended practice. If you need length, only switching to glass optical cable is not enough. You will need to change the optical 'driver' and 'receiver' as well.

Merging provides the whole system, composed of two glass optical cables and one **Onouris** LDS at each end. This system allows a bi-directional link of up to 1000 meters.

Why AutoDetect SR mode doesn't work on incoming AES-EBU signals in Video sync mode?

The AutoDetect SR mode does work based on an AES-EBU signal, but only when the AES sync mode is selected. In INT, ODI or VIDEO sync mode the sample rate selection is based on the signal present at the ODI-A input.

What are the main symptoms of improper video sync setup?

The first symptom is the LOCK LED, which could blink or stay off in case of an improper video sync setup. Check the video connections and make sure that the signal is properly terminated.

It is not recommended to daisy chain devices. The best is to connect each device directly to the video sync generator and terminate the connection on each device.

A second information is the MONITOR OUT LEDs which indicates whether the incoming ADAT signals present on the ODI-A and ODI-B inputs are synchronous with the Sphynx clock or not.

If the MONITOR OUT LEDs blink, there must be a problem in your synchronization setup.

Note: the Sphynx does not lock to Video reference when operating in 'x2' sampling rates.

What would be a typical use of the AES-EBU reference input on the back of Sphynx?

Some studios are using an AES-EBU reference signal as a house-sync, instead of a Wordclock or a video reference.

How many channels of audio can you get via S/PDIF?

The S/PDIF format allows transmitting up to two audio channels on a single coaxial or plastic optical cable.

Under what circumstances would one want to enable dither?

The dither is disabled by default, which correspond to a use in a 24 bit recording environment.

If your recording system is limited (or that you want to limit it) to 20, 18 or 16 bit, you should set the Sphynx A/D dither to the corresponding word length.

Under what circumstances would one want to disable SRC?

The SRC on AES-EBU input modules is limited to 20 bit.

So if you do not specifically need specifically a sample rate conversion, you should disable it.

Why does the sync LED not light when locked to incoming AES signals?

When set to AES sync mode with the AES LED blinking, it indicates that no valid AES-EBU signal has been detected. It may be that there is no signal at all, or that this signal is not at the same sample rate than the Sphynx. It happens also when the Sphynx is set in SRC mode. In this mode, only the AES-EBU Reference input is available as a valid AES-EBU sync source.

Once a valid AES-EBU signal has been detected, the AES LED is solid.

The LOCK LED should light up, to indicate that the Sphynx is locked to the incoming signal.

If the LOCK LED blinks or doesn't light up, this may be that the incoming signal sample rate is out of the Sphynx crystal's range, or that this signal has too much jitter.

Appendix 5 – Glossary of Terms

Here are some common audio terms used in this document.

ADAT

This is a multichannel optical digital interface. It is a proprietary standard, which is used in the family of Alesis ADAT digital multitrack recorders and many other professional audio devices such as digital mixing desks, multitrack recorders and DAWs. The ADAT data stream contains 8-channels of digital audio data through a single fiber optic cable.

Together with Sonorus, Merging extended this format for 'x2' sampling rates where it provides 4 channels of 24 bit audio in S/MUX format. ADAT is a registered trademark, property of Alesis Corp.

AES-EBU

AES-EBU is a serial transmission format standardized for professional digital audio signals. It is a specification using time division multiplex for data, and balanced line drivers to transmit two channels of digital audio data on a single twisted-pair cable using 3-pin (XLR) connectors.

S/PDIF

S/PDIF (Sony/Philips digital interface format) is based on a consumer version of the AES-EBU digital audio interconnection standard. The Keops and Sphynx can connect to S/PDIF devices via RCA type connectors or via a TOSLINK (Toshiba link) fiber optic interface. The S/PDIF data stream contains a stereo pair of digital audio. The S/PDIF input on Keops will also accept an AES-EBU formatted input signal.

WCLK

WCLK (or Wordclock) is a TTL-compatible square wave signal at a specific sampling rate such as 48 kHz.