INDEX

v1 March 2005

1. Introduction

Thank you for choosing the ESI EX8000, part of the MaXiO XD system.

EX8000 is a high performance 24-bit, 192 kHz AD/DA converter that features 8 balanced inputs with microphone preamps, XLR/TRS combo connectors and 10 step LED metering lights for each input channel. EX8000 also provides 8 analog output channels, multi-channel AES/EBU and S/PDIF digital I/O, ADAT I/O and a headphone output for monitoring.

You can use EX8000 either as a very powerful standalone device or in combination with the MaXiO PCI host card as a high-end multi-channel recording solution for the PC.

1.1 Key Features

- E.D.I Connector
- high-end quality 24-bit / 192 kHz ADC with 123dB(a) dynamic range
- high-end quality 24-bit / 192 kHz DAC with 120dB(a) dynamic range
- 8 balanced analog inputs with combo (XLR / TRS) connectors
- high precision & ultra low noise 'XD-PRE' microphone preamplifier (-135.5dBu) on each analog input channel with support for +48V phantom power
- Mic/Line selection switch and gain control for each analog input channel
- 8 inserts (one for each analog input channel) with 1/4" connectors
- 8 balanced analog outputs with XLR connectors (+4dBu)
- 8 balanced/unbalanced analog outputs with TRS connectors (-10dBV)
- headphone amplifier with volume control
- 8 channel digital I/O in AES/EBU (XLR connectors) and coaxial S/PDIF (RCA connectors) format, supporting up to 24-bit / 192 kHz
- 8 channel ADAT optical digital I/O with S/MUX support
- 10 step LED level meters on front panel for all channels (input and output)
- supported sample rates: 44.1, 48, 88.2, 96, 176.4 and 192 kHz
- Word Clock Input: Fs / 256*Fs (via BNC connector)

1.2 Safety Instructions

Caution: To reduce the risk of electrical shock, do not remove the cover of this unit. Please refer servicing to qualified personnel only.

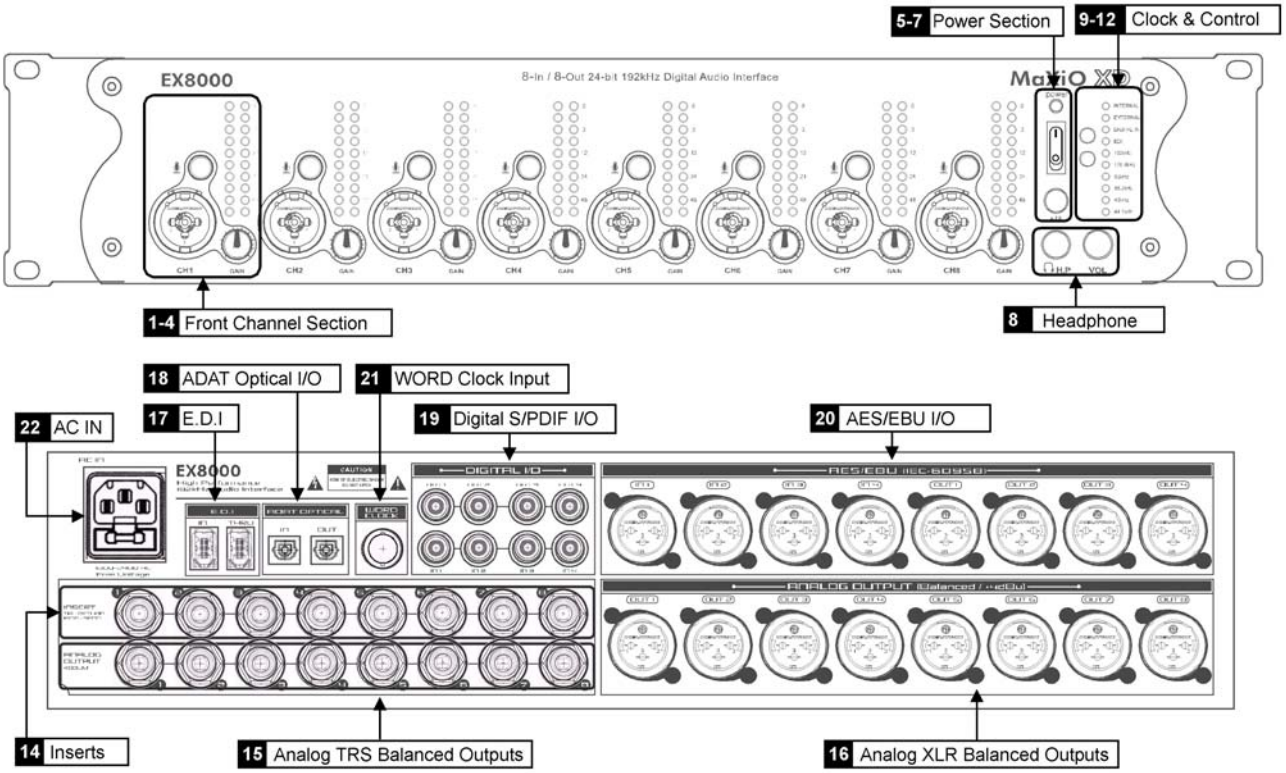
Warning: Do not expose this unit to rain or moisture.

Retain Instructions: Please retain all safety and operating instructions for future reference.

Heat: The unit should be placed away from other heat sources such as heaters, radiators, ovens or other studio equipment such as power amplifiers that produce heat.

Periods of inactivity: The power cord of the unit should be unplugged from the outlet when left unused for a long period of time.

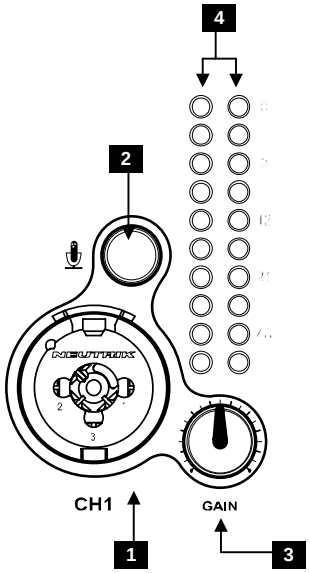
2. Description of EX8000



2.1 Front Channel Section

1 Analog Balanced XLR / TRS (Combo) Input Connector

EX8000 provides 8 combo connectors (XLR and 1/4" TRS) on the front panel that are used as balanced analog inputs for line level signals and microphone connection (via XLR).



2 Microphone Input Selection Switch

Every input channel can be used for line level or microphone signals. When this switch is enabled, a microphone can be connected via XLR. In this case phantom power is supplied (when enabled, check no. 7). When the switch is not enabled, the XLR and TRS inputs are used for balanced line level signals.

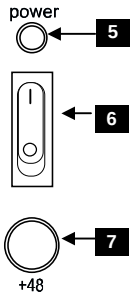
3 Input Gain Control

Controls the amount gain applied to the input signal from the XLR or TRS connector of specific channel. Microphone signals can be amplified with 48dB maximum, line level signals with up to 30dB.

4 Analog Input / Output Level Meter

The two level meters indicate the signal level for the analog inputs and outputs. The level meter on the left shows the input signal; the level meter on the right shows the output signal of the corresponding channel. A range from 0dB to 60dB in 10 dB-steps is displayed.

2.2 Power Section



5 Power Indicator LED

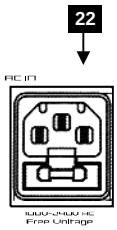
6 Power Switch

7 Phantom Power Switch

+48V DC phantom power (for balanced condenser microphones) will be supplied via every XLR input connector when this button is enabled. Note that this affects only those input channels that are set to receive microphone signals (check no. 2).

CAUTION

- Before you turn on the phantom power switch, you must make sure to connect your microphones to the XLR inputs (with balanced cables).
- After you have turned on the phantom power switch, you should not connect or disconnect a microphone to any of the input connectors.



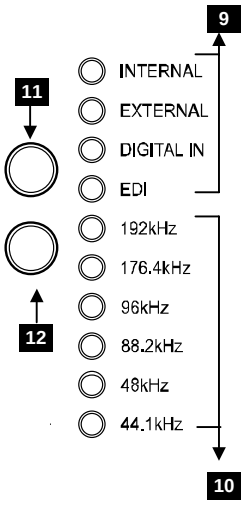
22 AC IN

EX8000 needs external AC power. It supports 100~240V AC (free voltage). There is a spare fuse (5X20mm Glass Fuse) below the connector.

2.3 Clock & Control

9 Clock Source Indicator

Displays the current clock source of EX8000:
- Internal: EX8000 uses its internal clock.
- External: EX8000 works with the clock from the Word Clock input.
- Digital In: EX8000 works with the clock supplied from the AES/EBU, S/PDIF or ADAT input.
- E.D.I: EX8000 works with the clock from the MaXiO PCI host card.



10 Clock Frequency Indicator

Displays the current sample rate of EX8000.

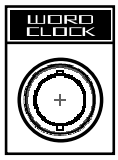
11 Clock Select Button 1

When EX8000 is working in stand alone mode, you can choose the clock source with this button (Internal, External, Digital In). This function is not available when EX8000 is connected to the MaXiO PCI host card.

12 Clock Select Button 2

When EX8000 is working in stand alone mode, you can choose the sample rate with this button (44.1 ~ 192 kHz). This function is not available when EX8000 is connected to the MaXiO PCI host card.

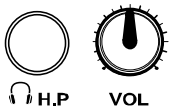
21 Word Clock Input



The Word Clock input allows you to synchronize EX8000 with other devices. When EX8000 is connected to a Word Clock source, EX8000 will synchronize to it.

2.4 Analog Outputs & Inserts

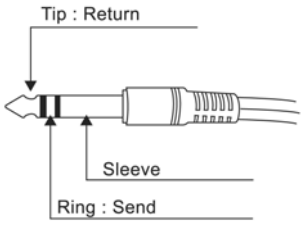
8 Headphone



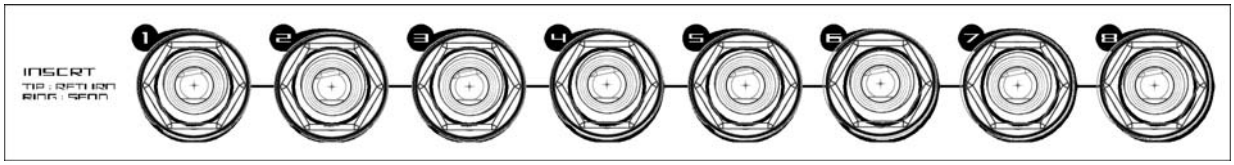
You can monitor the playback signal from output 1, 2 through the headphone output. The output level can be adjusted with the pot.

14 Inserts

The inserts allow you to use the microphone preamps of EX8000 for incoming signals, then run the signal through external hardware effects before the AD-converter processes the signal. In order to use the inserts, you typically need a so-called "insert-cable" with a 1/4" TRS connector on one and two 1/4" mono connectors on the two other ends. Here is a description of the insert connector:

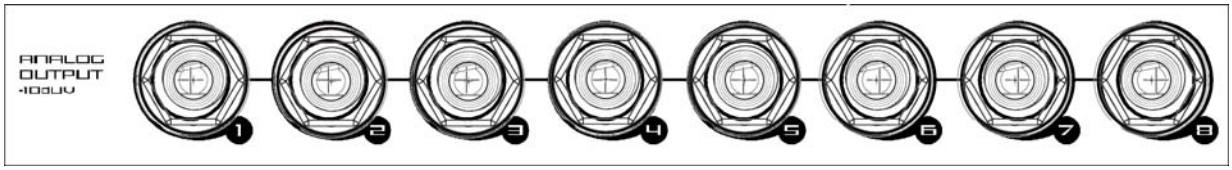


- Tip: return signal (input from effect processor)
- Ring: send (output to effect processor)
- Sleeve: common ground



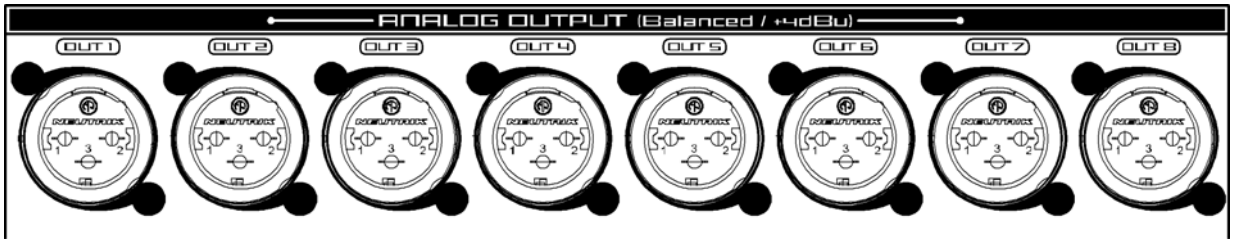
15 Analog Balanced TRS Output Connectors

EX8000 has 8 balanced/unbalanced analog outputs (-10dBV) with TRS connectors.

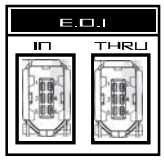


16 Analog Balanced XLR Output Connectors

EX8000 has 8 balanced analog outputs (+4dBu) with XLR connectors.



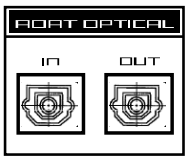
2.5 Digital I/O



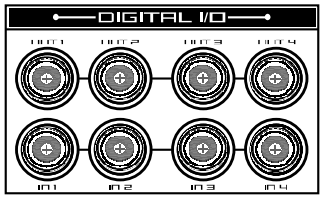
17 E.D.I Connector

E.D.I Connector IN: connection to MaXiO PCI (with a standard IEEE1394 cable).
E.D.I Connector THRU: this connector is reversed for future expansion.

18 ADAT Optical Input / Output



EX8000 has 8 channel ADAT optical I/O connectors. You can connect EX8000 to devices such as digital mixers or ADAT multichannel reorders equipped with optical ADAT connectors. One ADAT cable transfers 8 channels with max. 48 kHz. EX8000 also supports different S/MUX modes to transfer signals with 96 kHz and above (S/MUX 2: 96 kHz, 4 channels / S/MUX 4: 192 kHz, 2 channels).

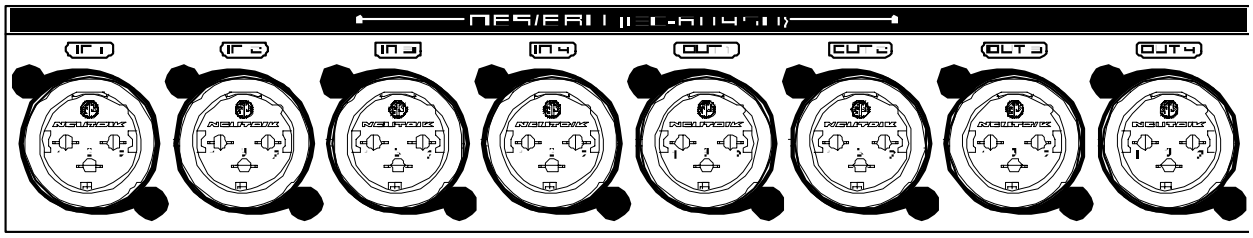


19 Digital S/PDIF (RCA) Input / Output

EX8000 has 4 S/PDIF inputs and 4 S/PDIF outputs (RCA) for coaxial digital connection.

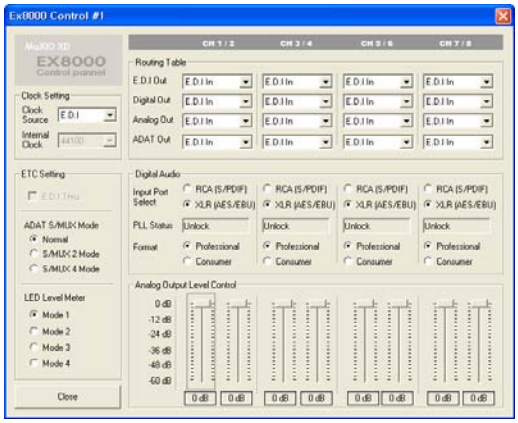
20 AES/EBU (XLR) Input / Output

EX8000 has 4 AES/EBU inputs and 4 AES/EBU outputs (XLR) for balanced digital connection.



3. Usage of EX8000

3.1 Control Modes



3.1.1 E.D.I Control Mode

When EX8000 is connected to the MaXiO PCI host card, it is controlled via the E.D.I connection from the PC. EX8000 automatically detects if it is connected to a PC when power is switched on. In that case, it can only be controlled via the MaXiO XD Control Panel software on your PC. Check the MaXiO XD system manual for more information.

3.1.2 Standalone Mode

When EX8000 is not connected to a MaXiO PCI host card, it works as a standalone device. EX8000 automatically switches to this standalone mode when there is no active E.D.I signal when power is switched on.

You can set up the internal audio routing and the system clock with the two clock selection buttons (11 12) on the front panel.

3.1.3 Reset Internal Configuration

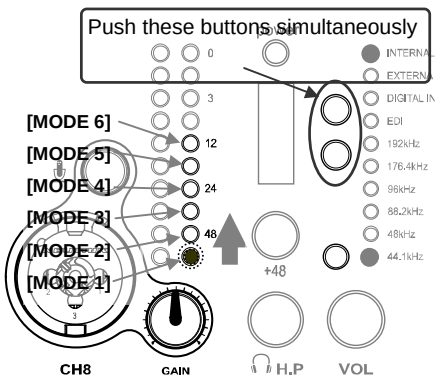
EX8000 will automatically keep the last configuration in standalone mode. If you want the reset this value, press the first clock selection button (11) when all lights on the front panel are on during the initialisation of EX8000 after power has been switched on.

The system clock will be set to the default (internal, 44.1 kHz); audio routing [MODE 1] will be selected as default (see below).

3.2 Audio Routing

3.2.1 Audio Routing Mode selection

EX8000 has various digital and analog I/O connectors. In E.D.I Control Mode, the audio signal routing is controlled the MaXiO XD Control Panel software on your PC. In standalone mode, there are 6 different audio routing mode presets available that can be selected via the two clock selection buttons (11 12) on the front panel.

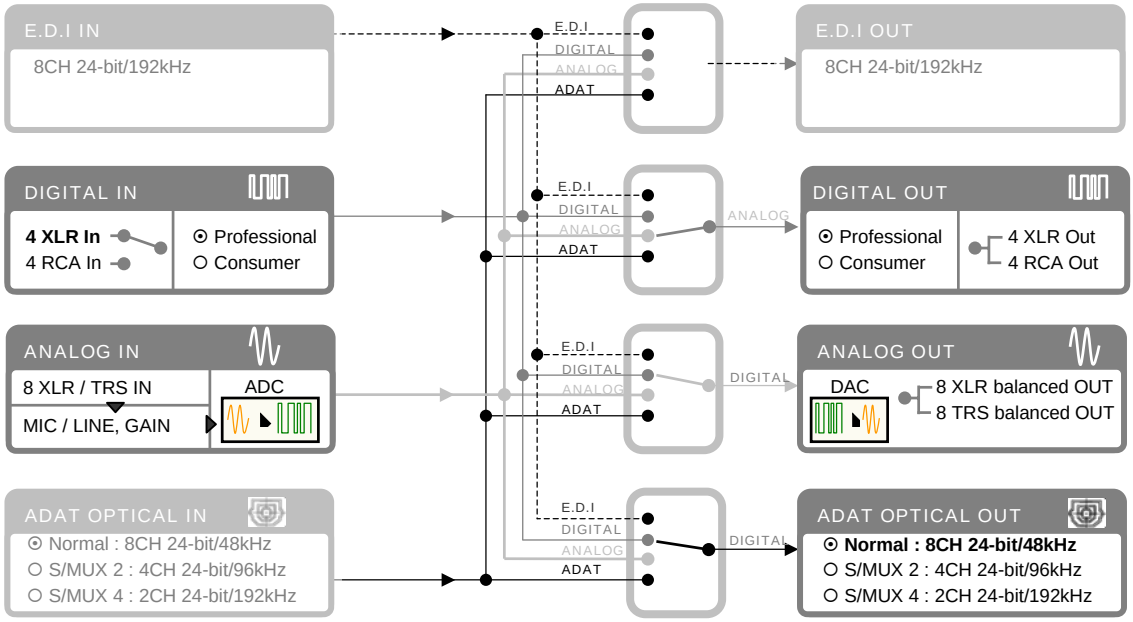


To change the audio routing when EX8000 is in standalone mode, you need to push the two clock selection buttons (11 12) simultaneously. The current mode ([MODE 1] to [MODE 6]) is displayed via the output level meter display of channel 8. Please refer to the picture on the right to see which LED is used to display which mode. A description of each different mode follows in the next sections.

CAUTION

- Please verify your I/O connections before you change the audio routing.
- Please temporarily turn off your amplifier or active monitor speakers when you change the audio routing.

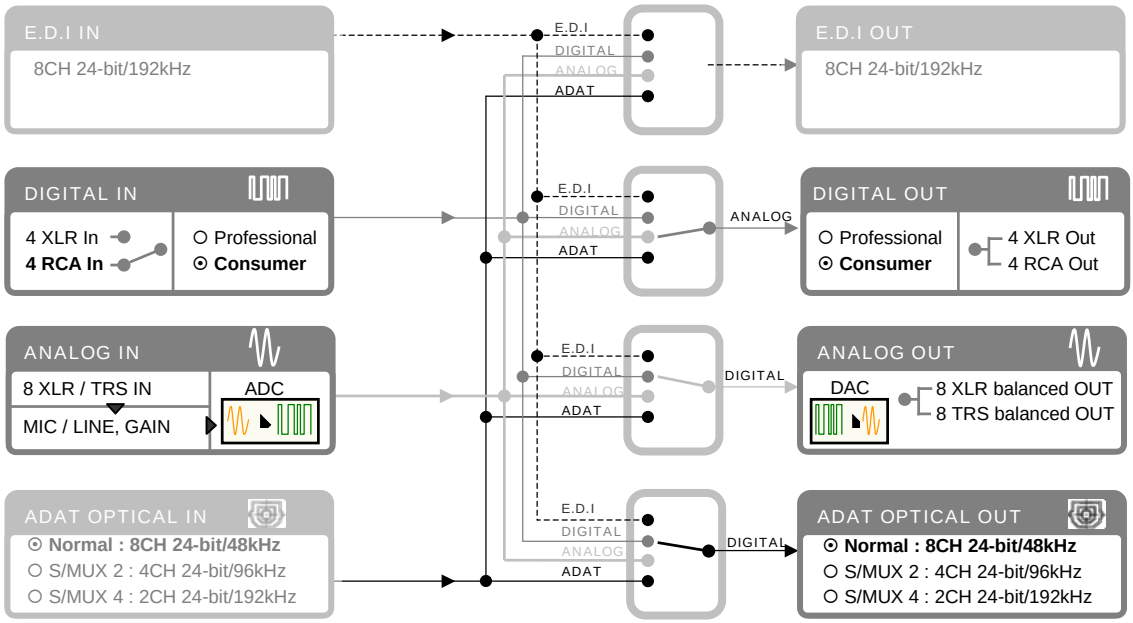
3.2.2 [MODE 1] AES/EBU to analog / analog to AES/EBU



[MODE 1] allows you to use EX8000 as 8 channel AD converter with 4 AES/EBU outputs and simultaneously as 8 channel DA converter with 4 AES/EBU inputs.

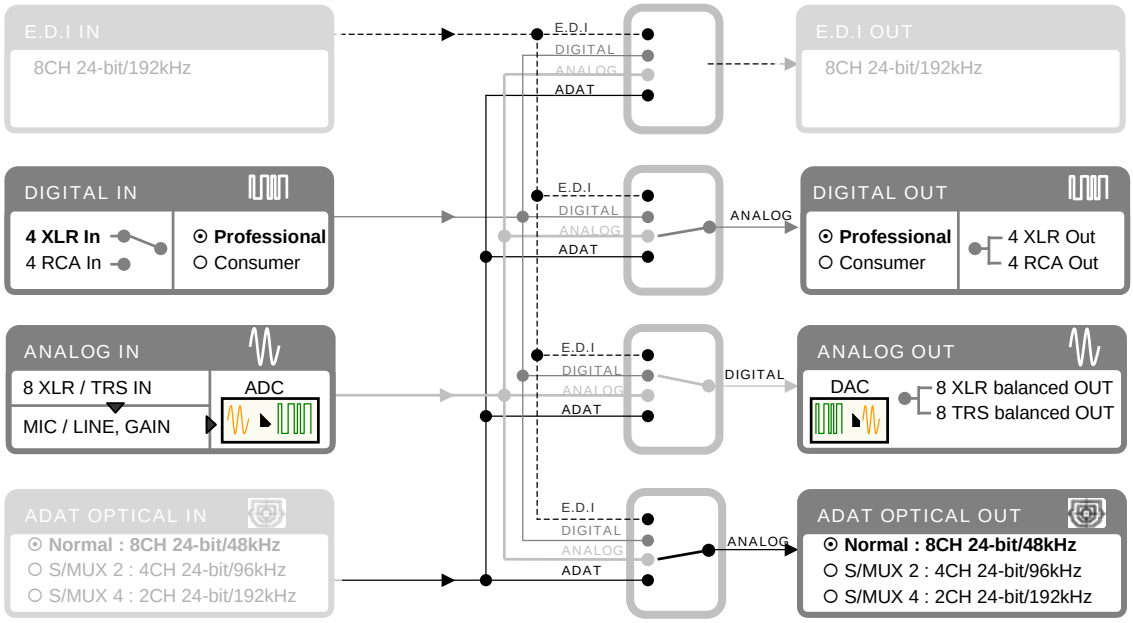
Please note that the system clock can be set to INTERNAL (which means that EX8000 will generate the master clock), to DIGITAL IN (which means that the clock from input 1, 2, 3 or 4 is used) or to EXTERNAL (which means that a Word Clock source will be used as system clock). You must set up the system clock correctly for your specific setup to make this audio routing mode work properly. A detailed description can be found under 3.3 System Clock in this manual.

3.2.3 [MODE 2] S/PDIF to analog / analog to S/PDIF



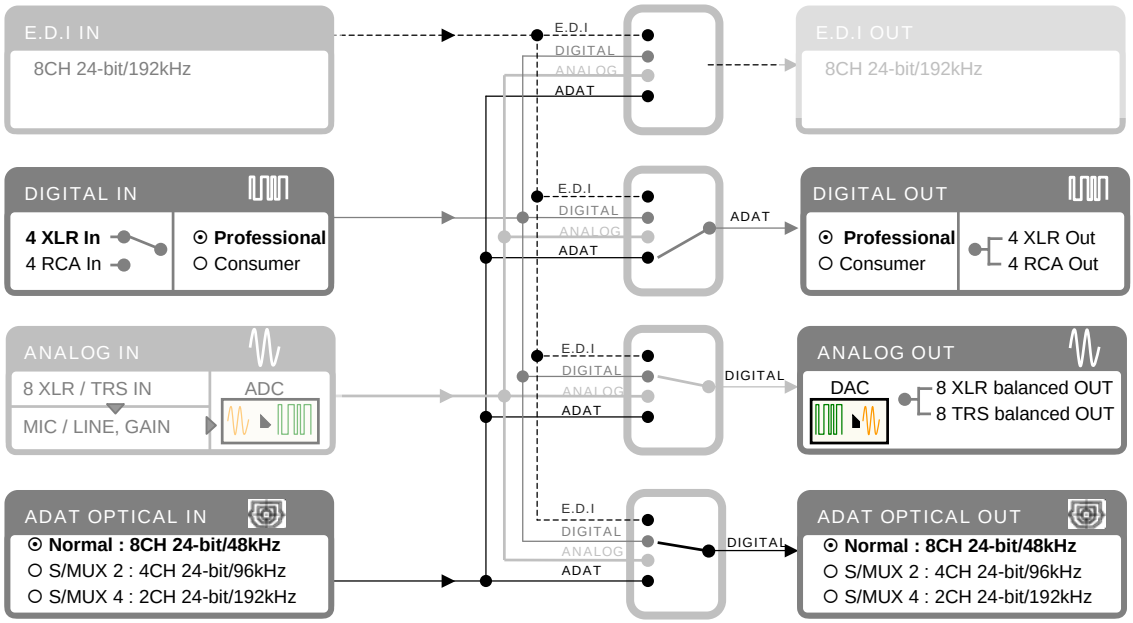
[MODE 2] allows you to use EX8000 as 8 channel AD converter with 4 S/PDIF outputs and simultaneously as 8 channel DA converter with 4 S/PDIF inputs. This is similar to [MODE 1] although the digital I/O is an S/PDIF consumer signal in [MODE 2] while in [MODE 1] it is a professional AES/EBU signal.

3.2.4 [MODE 3] analog to ADAT and AES/EBU



[MODE 3] equals [MODE 1] with the difference that the ADAT optical output will send out an 8 channel signal from the AD converters in addition. This allows you to use EX8000 as 8-channel ADC with microphone preamps and inserts for devices with optical ADAT input.

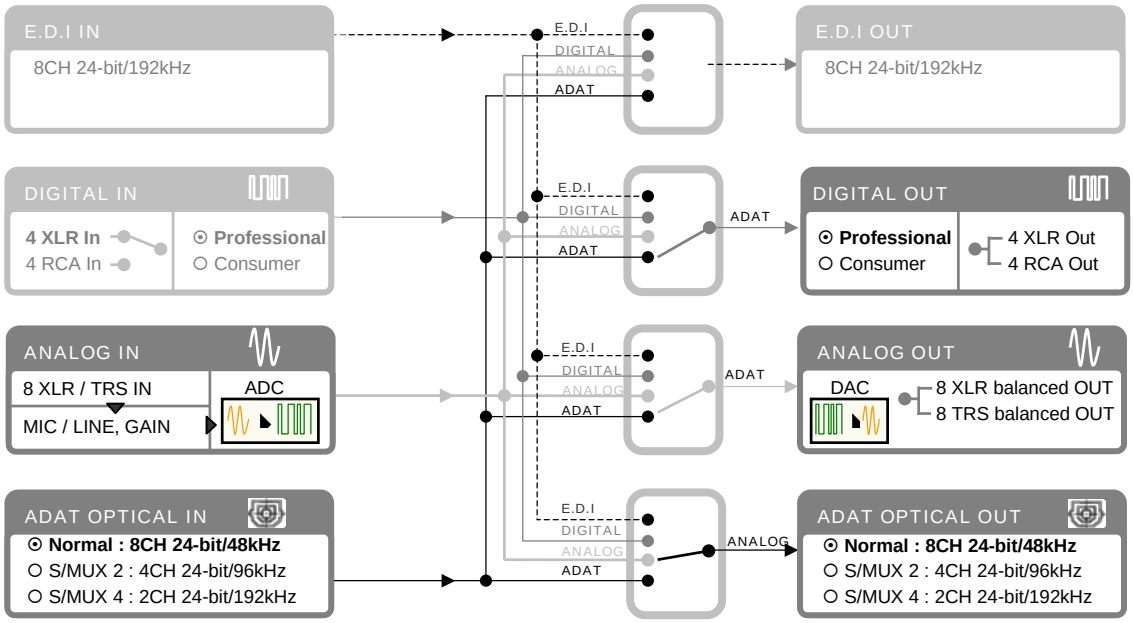
3.2.5 [MODE 4] AES/EBU to ADAT / ADAT to AES/EBU



[MODE 4] allows you to use EX8000 has AES/EBU to ADAT and ADAT to AES/EBU converter unit. The signals from the 4 AES/EBU inputs will be sent out through the 8 channel ADAT output. The signal from the 8 channel ADAT input will be sent out through the 4 AES/EBU outputs.

The system clock can be set to INTERNAL, DIGITAL (input 1~4) and EXTERNAL (Word Clock). You must set up the system clock correctly for your specific setup to make this audio routing mode work properly. A detailed description can be found under 3.3 System Clock in this manual. Note that this mode only works with 44.1 or 48 kHz (due to ADAT format limitations).

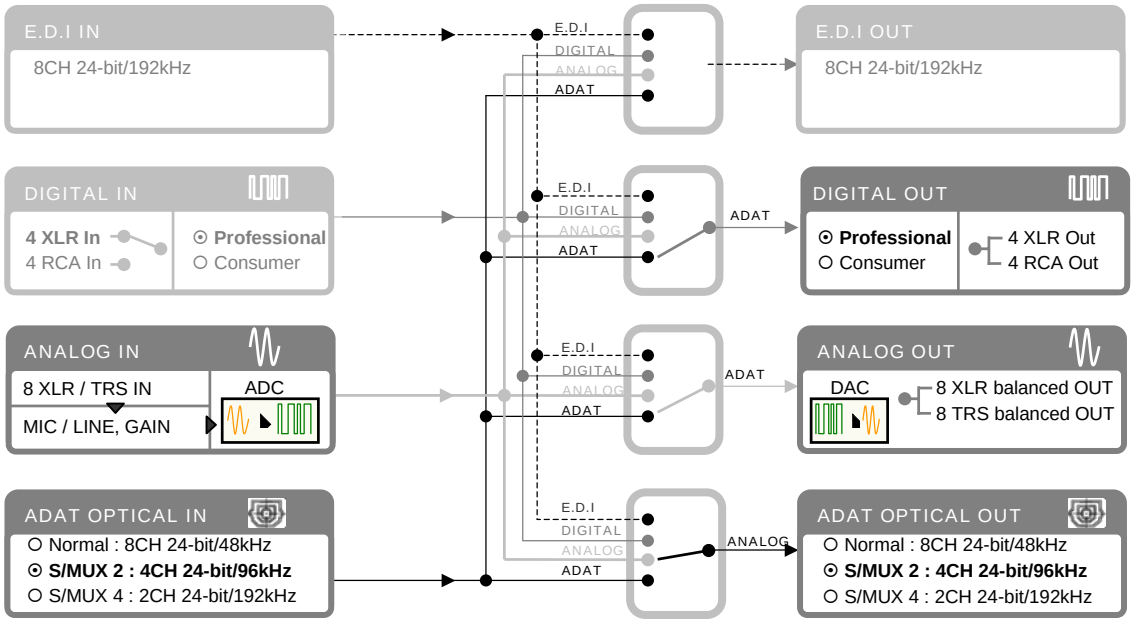
3.2.6 [MODE 5] ADAT to analog / analog to ADAT



[MODE 5] allows you to use EX8000 as 8 channel AD converter with optical ADAT output and simultaneously as 8 channel DA converter with ADAT optical input. This allows you to use

EX8000 as standalone AD and DA converter for any ADAT compatible devices such as digital mixers or ADAT multitrack recorders. [MODE 5] only works with 44.1 or 48 kHz (due to ADAT format limitations).

3.2.7 [MODE 6] ADAT to analog / analog to ADAT (with S/MUX enabled)



[MODE 6] equals [MODE 5] with the difference that S/MUX is enabled. This means that only 4 instead of 8 channels are transferred, but the supported sample rates are now doubled. [MODE 6] only works with 88.2 kHz or 96 kHz.

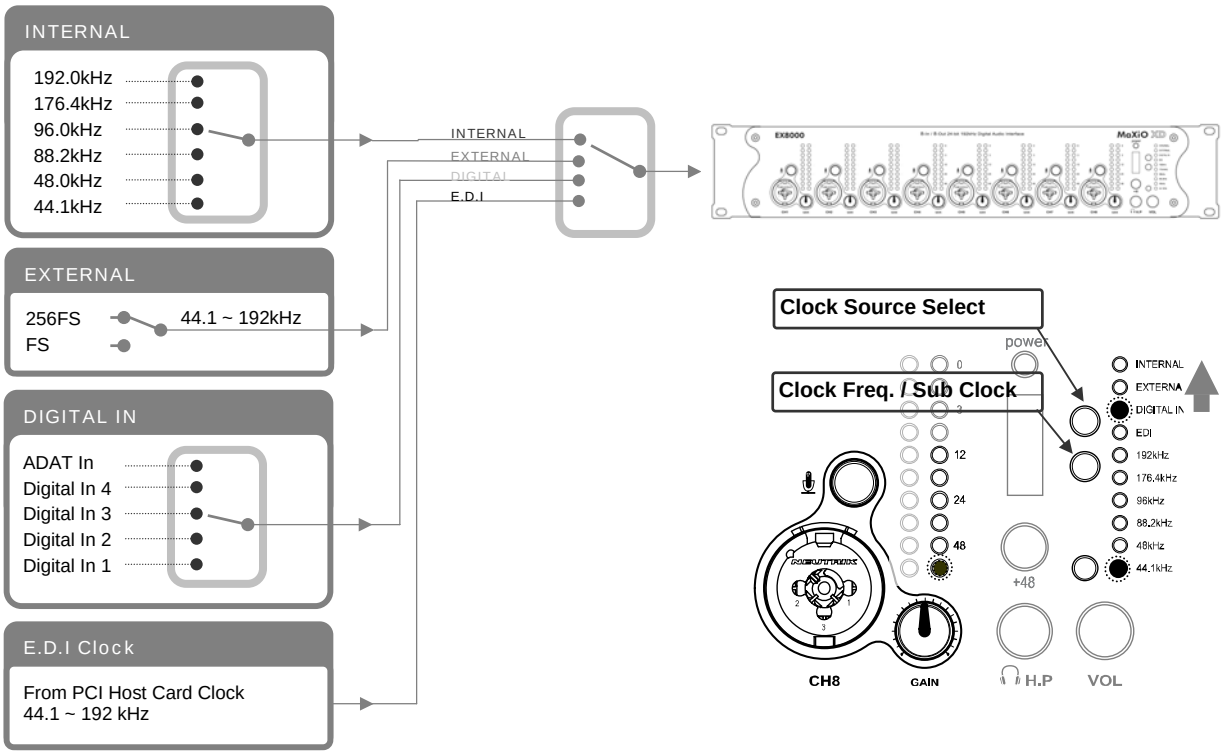
3.2.8 Channel Mapping

The following table shows the mapping of the I/O channel assignment of EX8000. This is especially important when you work with S/MUX enabled. Note that S/MUX 4 (192 kHz) only can be used when EX8000 is connected to the MaXiO PCI host card. In the table, E.D.I refers to the connection to the PCI card.

Analog I/O	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7	CH 8
Digital I/O	1L	1R	2L	2R	3L	3R	4L	4R
ADAT I/O	ADAT –1	ADAT - 2	ADAT - 3	ADAT - 4	ADAT - 5	ADAT - 6	ADAT - 7	ADAT - 8
ADAT S/MUX 2 (96)	S/MUX –1	S/MUX -2	S/MUX -3	S/MUX -4				
ADAT S/MUX 4 (192)	S/MUX –1	S/MUX - 2						
E.D.I	E.D.I –1	E.D.I - 2	E.D.I - 3	E.D.I - 4	E.D.I - 5	E.D.I - 6	E.D.I - 7	E.D.I - 8

3.3 System Clock

The following diagram gives you an overview of the different available clock sources of EX8000.



3.3.1 System Clock Source

When multiple digital audio devices are connected to each other, they must all use the same system clock to work properly. This means that EX8000 needs to be synchronised to all digital devices connected to it. Drop outs, clicks or noise could result from wrong settings. As EX8000 has a huge number of I/O connection possibilities, there are also a number of different options to set the correct system clock for EX8000 in every specific setup. Please read this chapter carefully as it provides the most important basics to allow you to setup EX8000 in your studio environment.

EX8000 can provide its own internal system clock, it can synchronise to an external (Word Clock) source, to another digital source (ADAT, AES/EBU or S/PDIF) or to the MaXiO PCI host card (E.D.I connection).

When EX8000 is connected to the MaXiO PCI host card, the clock and sample rate is determined by the Control Panel software of the MaXiO PCI host card. EX8000 is capable of automatically detecting a clock source in the range between 44.1 kHz and 192 kHz (+/- 3%). The detected clock and clock source will be displayed on the front panel (10). If the clock source indicator LED (9) is red, the clock cannot be used / detected.

In standalone mode, EX8000 can provide its own internal clock and the clock can be supplied from an external source. With the first clock selection button (11) you can choose between INTERNAL, DIGITAL IN and EXTERNAL by simply pushing the button one or several times.

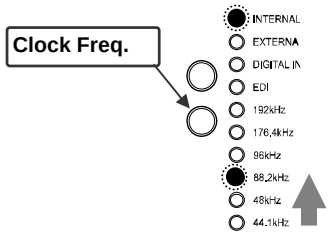
CAUTION

- Never connect / disconnect the connection that provides the clock source while EX8000 is turned on.
- Before making changes to the system clock, always check the full system; e.g. make sure that all

used devices are setup properly.

- Please turn off your amplifier or active monitor speakers when you change the clock source. You might hear noise during the change or if a setting is incorrect.
- Please check that the clock source indicator LED (9) is green after making a change.
- If EX8000 is connected to the MaXiO PCI host card, verify the clock source indicator LED (9). When it is not green, the connection to the PC and the clock settings are not working.

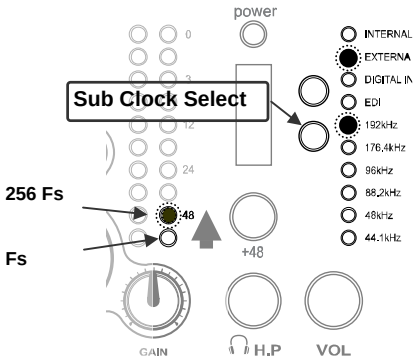
3.3.2 Internal Clock



When EX8000 is set to INTERNAL clock, it can be used as clock master for all digital devices in your setup.

EX8000 can generate the master clock with the following sample rates in kHz: 44.1/48.0/88.2/96.0/176.4/192.0. The sample rate itself can be selected with the second clock selection button (12) on the front panel.

3.3.3 External Clock (Word Clock)



When EX8000 is set to EXTERNAL clock, it works with the system clock from the Word Clock input. This allows you use EX8000 in an environment with master Word Clock signal.

The Word Clock input supports 1xFS and 256xFs ("Super Clock") resolutions. A 1xFs signal can be received in the range between 32kHz and 200kHz, a 256xFs signal can be received in the range between 8MHz ~ 50MHz. EX8000 will detect the sample rate within the +/-3% range.

To use the Word Clock input...

1. Connect a BNC cable from your clock source to the Word Clock input (21).
2. Set EX8000 to EXTERNAL clock source with the first clock selection button (11).
3. Set up the system clock resolution that you want with the second button (12). The two lower LEDs of the output level meter from channel 8 will display either 256xFS or 1xFS (check the picture above).

Example: the picture above shows that EX8000 receives a 256xFS Word Clock signal with 49.152MHz (=192 kHz x 256).

3.3.4 Digital Input Clock

When EX8000 is set to DIGITAL clock source, it will use one of the digital inputs (ADAT, S/PDIF or AES/EBU) and derive its system clock from there.

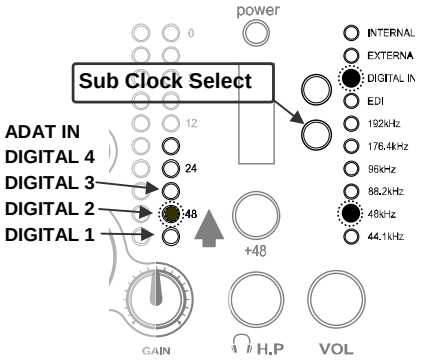
To use one of the digital inputs as clock source...

1. Connect the external device that will provide the system clock via ADAT, S/PDIF or AES/EBU to the digital input of EX8000.

2. Set EX8000 to DIGITAL clock source with the first clock selection button (11).

3. Select the digital input you want to use with the second button (12). The LEDs of the output level meter from channel 8 will display ADAT IN (for the optical ADAT input), or DIGITAL 1~4 (for AES/EBU and S/PDIF) as shown on the picture on the right.

4. As soon as the clock source indicator LED (9) turns green, EX8000 uses the external clock.



Example: The picture above shows that the EX8000 system clock works with 48 kHz, supplied from AES/EBU input 2 with audio routing [MODE 1].

3.3.5 E.D.I Clock

EX8000 will use the clock provided and controlled by the MaXiO PCI host card when connected to it. To change clock settings in that case, you need to use the MaXiO XD Control Panel software which is explained in the MaXiO XD system manual.

4. Technical Specifications

• General		
Type	19" rack mounted, digital audio interface	
Audio	Total 8-in / 8-out, 24bit, audio interface	
System Clock Support	Internal (44.1, 48.0, 88.2, 96.0, 176.4, 192.0 kHz), Word Clock, Digital In, E.D.I	
WORD Clock IN	FS / 256*FS, BNC Connector	
Power	AC IN 100V ~ 240V, 50Hz ~ 60Hz, 30W	
Weight	3.5kg	
Dimensions	482(mm) x 180(mm) x 86(mm)	
• Analog Inputs		
Type	Balanced 1/4" TRS (Balanced XLR) Input	
Level	+4dBu Nominal (@-16.2dBFS) , +20.2dBu max	
Gain Range	0.0dB (@Gain min, +20.2dBu max) ~ +29.0dB (@Gain max, -7.8dBu max)	
Frequency Response	20Hz to 20kHz, +/- 0.1dB	
THD + N	0.0003% A-weighted (@ -3dBFS)	
Dynamic Range	116dB A-weighted	
CMRR	75dB	
Impedance	10K ohm (1/4" TRS), Low impedance : 3K ohm (XLR)	
A/D Converter	Type	24bit, 192KHz, 128X Oversampling
	Dynamic Range	123dB (@ -60dBFS with A-Weighted)
	S/(N+D) Ratio	110dB (@ -1dBFS, measurement method)
	Frequency Response	6.5 ~ 21.768KHz, +/- 0.001dB (@ fs=48KHz)
		6.5 ~ 43.536KHz, +/- 0.003dB (@ fs=96KHz)
		6.5 ~ 87.072KHz, +/- 0.007dB (@ fs=192KHz)
	Interchannel Isolation	123dB
	Gain Mismatch	0.1dB
• MIC Pre-amp		
Type	Balanced XLR (+48V Phantom Power support)	
Level	500 mV max (-3.8dBu)	
Gain Range	+25.0dB (@Gain min, -3.8dBu) ~ +73dB (@Gain max, -51.8dBu)	
Equivalent Input Noise	- 135.5dBu (@ 0 ohm, 20Hz ~ 20kHz)	
THD + N	0.00065% A-weighted (@ gain+35dB)	
Dynamic Range	103dB A-weighted (@ gain +35dB)	
CMRR	90dB	
Impedance	1.5K ohm	
• Analog outputs		
Type	+4dBu Balanced XLR output	
	-10dBv Balanced/Unbalanced 1/4" TRS output	
Level	+4dBu Nominal (@-16dBFS) , +20.0dBu max	
	-10dBu Nominal (@-16dBFS) , +8.2dBu max	
Frequency Response	20Hz to 20kHz, +/- 0.05dB	
Analog Filter	3-pole low-pass filter	
THD + N	0.0001% A-weighted (@ -3dBFS)	
Dynamic Range	118dB A-weighted	
Impedance	110 ohm (1/4" TRS), 110 ohm (XLR)	
D/A Converter	Type	24bit, 192KHz, 128X Oversampling, 8 times digital filter
	Dynamic Range	120dB (@ -60dBFS with A-Weighted)
	S/(N+D) Ratio	100dB (@ -1dBFS, measurement method)
	Frequency Response	0 ~ 21.7KHz, +/- 0.002dB (@ fs=48KHz)
		0 ~ 43.5KHz, +/- 0.002dB (@ fs=96KHz)
		0 ~ 87.0KHz, +/- 0.002dB (@ fs=192KHz)
	Interchannel Isolation	120dB
	Gain Mismatch	0.15dB
• Digital Audio		
AES/EBU, Coaxial (S/PDIF)	Connector	XLR (AES/EBU), RCA (S/PDIF) I/O
	Impedance	XLR : 110ohm, RCA : 75ohm
	Format	IEC-60958 Professional / Consumer
	Sample rate	44.1, 48.0, 88.2, 96.0, 176.4, 192.0 kHz
ADAT	Connector	TOS-Link (Optical) I/O
	Format	ADAT® protocol
	Sample rate	44.1, 48.0kHz (8channel)
		88.2, 96.0kHz (4channel - SMUX)
		176.4, 192.0kHz (2channel - SMUX)
E.D.I	Connector	IEEE1394 compatible
	Format	E.D.I protocol
	Sample rate	44.1, 48.0, 88.2, 96.0, 176.4, 192.0 kHz (8 channel)