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# Connecting Your External Hardware Components

# Connecting Your External Hardware Components

This chapter contains descriptions of your DSP board's physical inputs and outputs, some notes and tips, and examples of some hardware configurations.

**Because the SCOPE Fusion Platform can operate with any of our DSP boards, this chapter includes descriptions of the connections available for all our boards.**

The first thing to do after installing the CreamWare hardware and software is to connect your external studio gear to the card's inputs and outputs.

With the Luna card and the first version of the Pulsar card, the inputs and outputs (hereafter referred to as I/Os, for „Inputs/Outputs“) are located on a board mounted on the DSP card itself. With Pulsar II and SCOPE, the I/Os are located on an attached auxiliary card called an I/O Plate. Several I/O variations exist, all of which are described here.

The printed Installation Guide contains additional information on the I/O Plates and their assembly. This guide is also installed on your hard drive during the software installation. Open it from the manual's start page.

## Pulsar and SCOPE Inputs and Outputs

### The „Classic“ 20 Version

This version contains 20 audio inputs and outputs in addition to a MIDI interface:

- 2 analog I/Os
- 2 digital I/Os in the S-PDIF format
- 16 digital I/Os in the ADAT format



18 of the 20 inputs and outputs are digital. These are ideal for connecting your stereo digital components to provide lossless audio data exchange. With the 2 analog I/Os you can connect a single stereo analog device. To connect additional analog components you'll need to use either an external AD/DA converter or another digital device with digital/analog conversion capabilities between the analog device and the digital I/Os.

## Analog I/O

The version “Classic” 20 provides two analog inputs and outputs in the cable assembly (4 RCA jacks). Use these for line-level signals such as those from an analog mixer, a microphone preamp, or an electronic keyboard’s audio output. You can use the analog outputs to connect to an audio monitoring system.

**Note that you cannot connect a microphone directly to the inputs. A microphone signal must first be amplified to line level using a mixer or microphone pre-amplifier.**

## S/P-DIF I/O

The cable assembly also provides two audio I/Os in the S/P-DIF (Sony/Philips Digital Interface) format. Each coaxial (RCA) cable handles two channels of input or output. Use these to connect compatible digital devices such as DAT recorders, CD players, digital effects processors or digital mixers. Note that according to this standard, receiving equipment must be configured as word-clock slave, and transmitting equipment as word-clock master (see also Sample

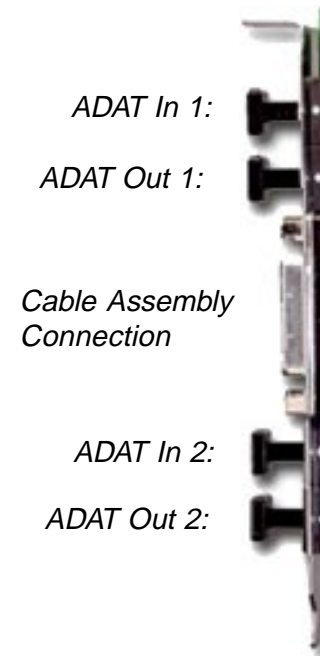
Rate Settings in the chapter Configuration Dialogs and Work Techniques).

**The S/P-DIF interface specifies two possible connection types: electrical coaxial cables or optical cables. To connect stereo optical devices, you can switch an ADAT interface, which uses the same optical cable, to operate as S/P-DIF I/O. You’ll find more information in the Sample Rate Settings section of the chapter Configuration Dialogs and Work Techniques and in the description of the S/P-DIF I/O modules in the chapter *Hardware I/Os and drivers*. You can also use an optical/electrical converter to connect optical devices to the RCA jacks. These are available at specialized retail outlets.**

**You can also connect the cablewhip’s S/P-DIF output to the AC3 input of your Surround system to transmit multichannel audio from a software DVD player. For more information see the description of the Digital Wave Source and [...] S/P-DIF modules in the chapter *Hardware I/Os and Drivers* of the reference manual.**

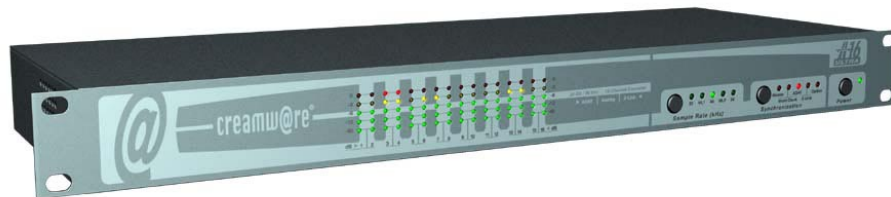
## ADAT I/O

The “Classic” 20 provides two ADAT inputs and two ADAT outputs located directly on the mounting flange attached to the I/O plate. Each connector either transmits or receives 8 channels of digital audio. If you remove the protective dust plugs, you can recognize the outputs by the red light they emit. Use these I/Os to connect devices with ADAT-compatible interfaces, such as ADAT recorders, external AD/DA converters like our A16 Ultra, or digital mixers.



Unlike the S/P-DIF specification, ADAT receiving equipment is not necessarily required to be configured as word clock slave. However, an appropriate word clock master-slave relationship among the devices in your studio setup is still necessary in order to avoid distortion, clicks and pops, or sometimes even to establish a valid signal at all (also see Sample Rate Settings in the chapter Configuration Dialogs and Work Techniques).

**The ADAT specification limits the maximum sample rate to 48kHz. However, with Pulsar2 or SCOPE boards two channels can be paired to achieve a sample rate of 96kHz (see the description of the SMUX source/dest modules in the chapter Hardware I/Os and Driver Interfaces).**



*CreamWare A16 Ultra converter with 16 channels of 24/96 quality conversion: connect using either ADAT or Z-Link I/Os.*

## PLUS Version

This version corresponds to the “Classic” 20 in most respects but differs in two ways:

- The analog inputs and outputs are balanced rather than unbalanced, with XLR connectors replacing the RCA jacks. The input sensitivity is also different and is appropriate for balanced signals.
- The S/P-DIF I/O is replaced by the AES/EBU digital I/O format. This format also uses XLR connectors that replace the respective S/P-DIF RCA jacks on the cable whip.



*PLUS Cable Assembly*

**The circuitry on the PLUS board is different than that on the “Classic” 20. You cannot upgrade to a PLUS by simply exchanging the cable assembly.**

Note: It is sometimes possible to use plug adapters to connect S/P-DIF devices to AES/EBU signals. Consult the documentation supplied with the S/P-DIF device to see if this is supported.

## 24ADAT Version

This I/O plate provides Pulsar2 or SCOPE cards with 24 audio inputs and outputs configured as 3 digital ADAT ports, each supporting 8 channels of I/O. See the description of the ADAT I/O interface in the “Classic” 20 section.

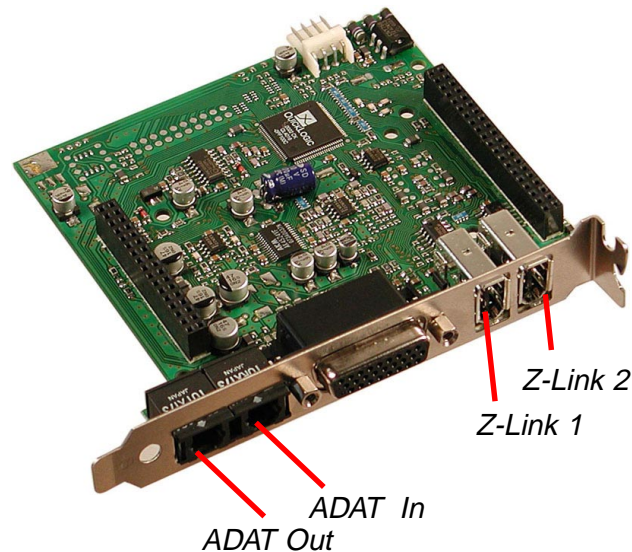
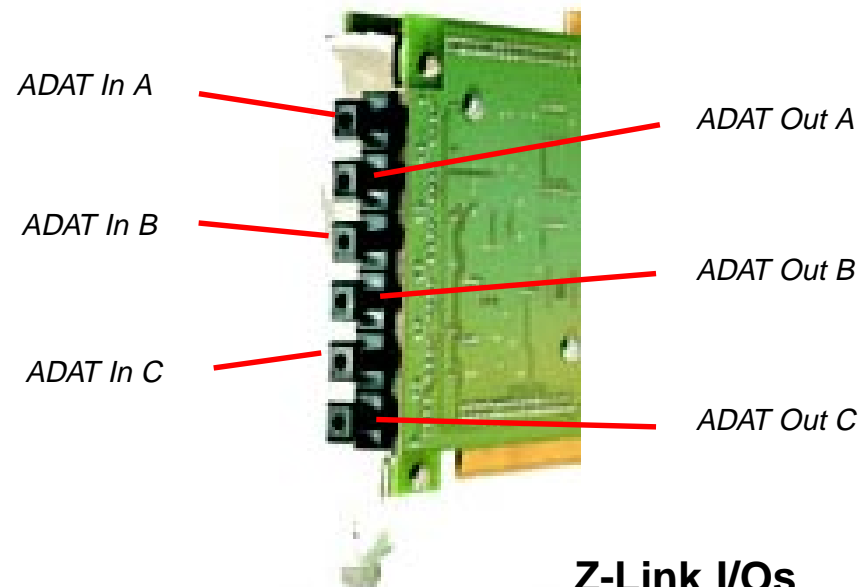
**This interface also incorporates two MIDI interfaces. See section *MIDI Wiring* for additional information.**

## Z-Link Version

In addition to MIDI I/O, this I/O plate for Pulsar2 or SCOPE systems provides 28 audio inputs and outputs:

- 2 analog I/Os
- 2 digital I/Os in the S/P-DIF format
- 8 digital I/Os in the ADAT format
- 16 Z-Link I/Os for connecting optional Luna 2496 I/O boxes or our A16 Ultra.

For a description of the analog, S/P-DIF and ADAT inputs and outputs, see section “Classic” 20 Version.



Version Z-Link

## Z-Link I/Os

Connect the optional Luna 2496 I/O box to the Luna board using the Z-Link port. The Luna 2496 provides 8 analog inputs and 8 analog outputs on RCA jacks.

All inputs and outputs can be used simultaneously with a resolution of up to 24 bits at a 96 kHz sampling rate.



Luna 2496 I/O Box AD/DA Converter



## MIDI Wiring

The “Classic” 20, PLUS, and Z-Link I/O options each incorporate a MIDI interface with connections for *MIDI In*, *MIDI Out*, and *MIDI Thru*. The 24ADAT version adds another to provide two MIDI interfaces.

You can connect a MIDI master keyboard’s MIDI output to the card’s MIDI input, and the input of a MIDI sound module to the card’s MIDI output.

The MIDI input signal is routed directly through to the MIDI Thru output so you can send the master keyboard’s MIDI data to other MIDI sound modules as well.

You can also direct the MIDI input through to the MIDI output (MIDI Thru function) but this must be set up in the software with the appropriate modules. Later chapters describe in detail how to use the software modules to route signals.

*Cable Assembly („Classic“ 20, PLUS, Z-Link)*



*MIDI In/Out/Through*

*24ADAT Plate*



*2 x MIDI In/Out/Through*

## Luna Card I/O

In addition to a MIDI interface, the Luna card provides 4 audio inputs and 4 audio outputs. It also includes a Z-Link port to connect the optional Luna 2496 external converter. The converter adds an additional 8 analog inputs and outputs.

**The Luna card is identical to the previously available Elektra and PowerSampler cards. Elektra and PowerSampler are now supplied with a Luna card.**

**The optional Z-Link/ADAT expansion board provides additional inputs and outputs: two ADAT ports (16 ins and 16 outs) and a second Z-Link port to connect an additional Luna converter unit. Therefore, with a second Luna 2496 box, a single Luna board can accommodate up to 36 I/Os.**

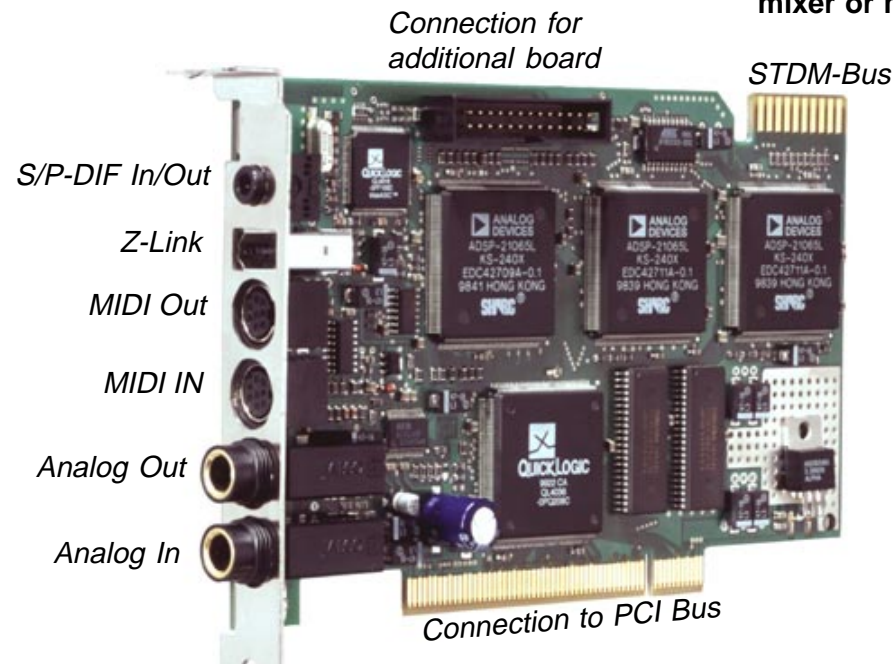
The 4 audio inputs and outputs are implemented as:

- 2 analog I/Os
- 2 digital I/Os, S/P-DIF format

## Analog I/O

Luna provides two analog inputs and two analog outputs as ¼" (6.3 mm) stereo phone jacks on the metal mounting flange attached to the Luna board. These are used for line level signals such as those from an analog mixer, a microphone preamp, a keyboard's audio output, or to connect to an audio monitoring system.

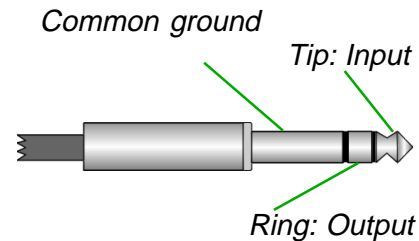
**Note that you cannot connect a microphone directly to the line level inputs. A microphone signal must first be amplified to line level by using a mixer or microphone preamp.**



## S/P-DIF I/O

The Luna board also provides two audio I/Os in the S/P-DIF (Sony/Philips Digital Interface) format. The single 1/8" (3.7 mm) stereo mini-jack handles both the input and the output. Use a cable adapter to connect digital devices such as DAT recorders, CD players, digital effects processors or digital mixers. Note that according to the S/P-DIF standard, receiving equipment must be configured as word-clock slave, and transmitting equipment as word-clock master (see also Sample Rate Settings).

**The following diagram shows the appropriate wiring for a stereo mini-plug:**



**Some equipment manufacturers provide S/P-DIF through optical connections. To use such equipment with Luna you must purchase a coaxial/optical converter, available in specialized retail outlets.**

**You can also connect the cablewhip's S/P-DIF output to the AC3 input of your Surround system to transmit multichannel audio from a software DVD player. For more information see the description of the Digital Wave Source and [...] S/P-DIF modules in the chapter *Hardware I/Os and Drivers* of the reference manual.**

## MIDI I/O

Luna provides a physical MIDI interface with connections for *MIDI In* and *MIDI Out* (see illustration on the previous page).

Connect the Luna MIDI input to the MIDI output of your master keyboard, and the Luna MIDI output to the input of an external MIDI sound source.

You can also pass the MIDI signal directly from the MIDI In to the MIDI Out (MIDI Thru function) in the Luna software by connecting the appropriate modules. Details are found in later chapters.



## Optional I/O

### Luna 2496 Converter

Connect the optional Luna 2496 I/O Box to the Luna board using the Z-Link connectors. The unit provides 8 analog inputs and 8 analog outputs on RCA jacks.

All I/Os can be used simultaneously with a resolution of up to 24 bits at a 96 kHz sampling rate.

You can also connect 8 channels of the 16 channel A16 Ultra to the Luna card's Z-Link port. To use channels 9-16 you will need an additional Z-Link port, such as the one provided on the Luna ADAT expansion card.



*Luna 2496 I/O Box AD/DA Converter*

## Luna ADAT Expansion

### ADAT I/O

The optional Z-Link / ADAT extension board occupies a spare slot opening on the back of your computer but does not require a PCI slot. It provides two ADAT inputs and two ADAT outputs located directly on the metal mounting flange. Each connector either transmits (outputs) or receives (inputs) 8 channels of digital audio. If you remove the protective dust plugs, you can recognize the outputs by the red light they emit. Use these I/Os to connect devices with ADAT-compatible interfaces such as ADAT recorders, external AD/DA converters, or digital mixers.

Unlike the S/P-DIF specification, ADAT receiving equipment is not necessarily required to be configured as a word clock slave. However, an appropriate word clock relationship among the devices in your studio setup is necessary in order to avoid distortion, clicks and pops, or sometimes to establish a valid signal at all (see also Sample Rate Settings).

**Please note that the ADAT specification limits the maximum sample rate to 48kHz.**

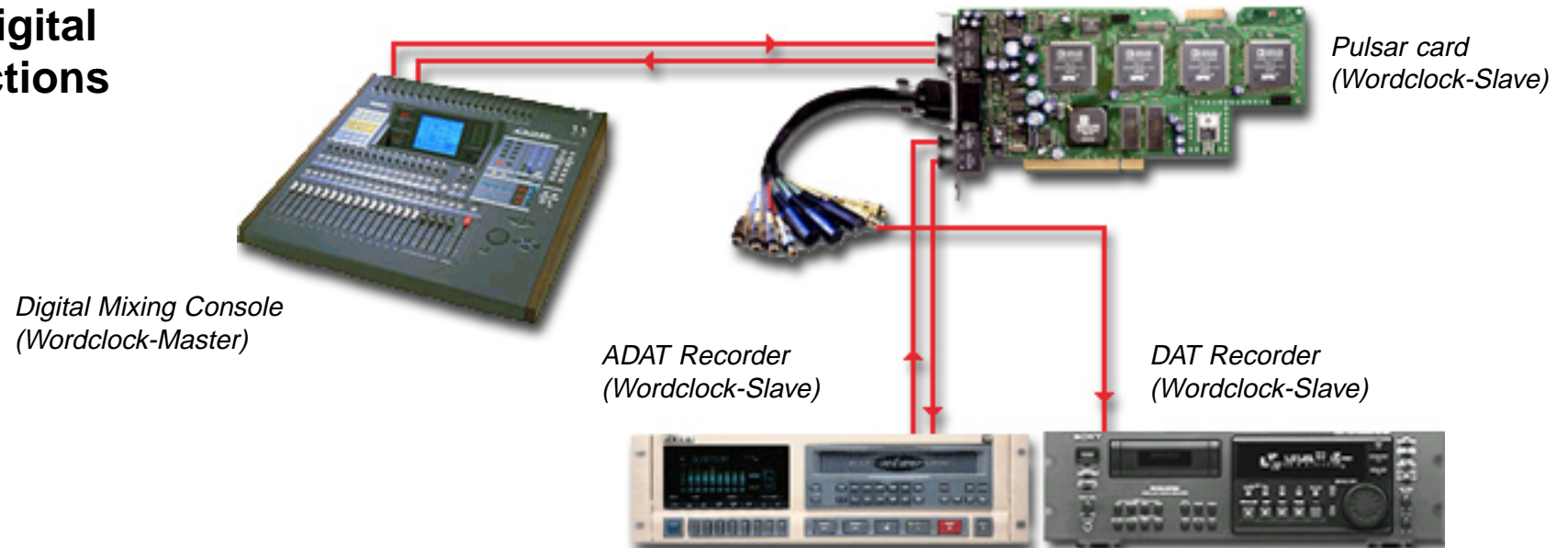
### Z-Link Port

Use this connector on the Z-Link ADAT expansion board to connect a second Luna 2496 I/O box, or 8 channels of an A16 Ultra.



*CreamWare A16 Ultra converter with 16 channels of 24/96 quality conversion: connect using either ADAT or Z-Link I/Os.*

## Example: Digital Interconnections



This example deals only with digital devices, their connections, and word-clock configuration issues.

Here a Pulsar's ADAT-1 ports (In/Out) are connected to a digital mixer. A second pair of ADAT ports (Pulsar ADAT-2) is connected to an 8-track digital recorder. Finally, a DAT recorder with a coaxial input is connected to the Pulsar's S/P-DIF output. You could use the DAT recorder to record the final mix from the Pulsar mixer, for example.

### Word Clock: Master and Slave

**Whenever you connect more than one digital device in a circuit it is essential that all digital devices in the system run in perfect clock sync with each other.**

In most cases, the digital clock required for synchronization can be derived from the digital audio data stream.

One device - in this example, the digital mixer - provides a clock source (word-clock master) that all other digital

equipment must follow (word-clock slaves). All devices must be configured accordingly. The word clock setting for the Pulsar card is found in the Sample Rate Settings dialog, which is detailed in its own section. In this example, Pulsar is adjusted to slave to the ADAT-1 port.

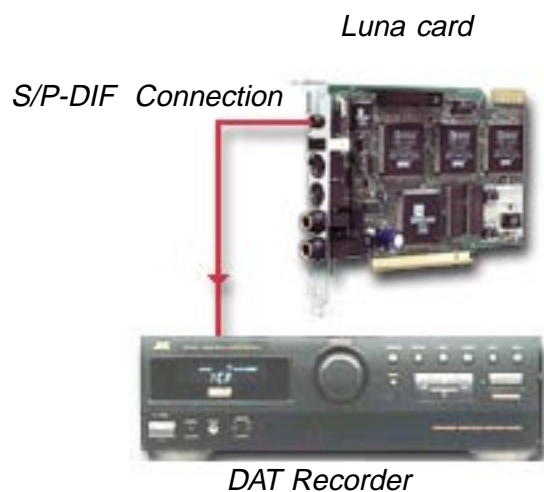
Therefore, in the above configuration the digital mixer serves as the master clock, with the Pulsar connected as a word-clock slave. The 8-track tape machine and the DAT machine then synchronize as slaves to the Pulsar card.

## DAT Recorder

There are various ways to connect a DAT recorder. Generally it makes most sense to use the digital connections as these permit you to transfer audio digitally in either direction for recording and playback, or to use the DAT recorder as an auxiliary AD/DA converter.

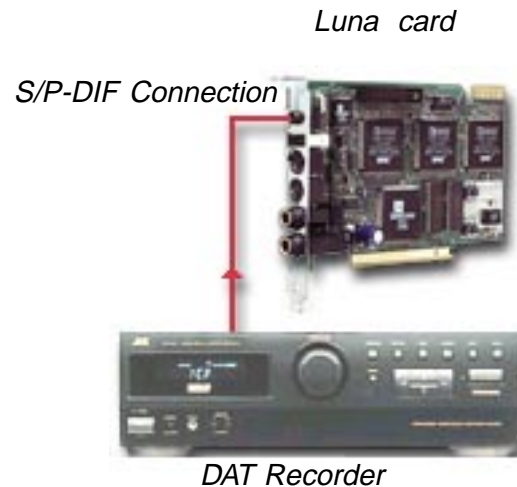
### Recording (Digital)

Connect your DAT recorder's input to the card's S/P-DIF output and select the coaxial digital input as the record source in your DAT. You can now digitally record the card's output into the DAT recorder. The card serves as the word-clock master.



### Playback (Digital)

Connect your DAT recorder's output to the card's S/P-DIF input and synchronize the card accordingly by configuring it to run as an S/P-DIF-Slave. You can now playback audio digitally from the DAT recorder.



## Digital Effects Devices

It's easy to connect a digital effects unit. Connect the effect's digital input and output to the card and set the device to synchronize to its S/P-DIF input.

**Note: S/P-DIF loops such as this (where digital input and output are operating simultaneously between the two devices) are not a part of the original S/P-DIF specification. However, unlike the earlier Pulsar 1 and SCOPE boards, our current hardware permits this configuration.**

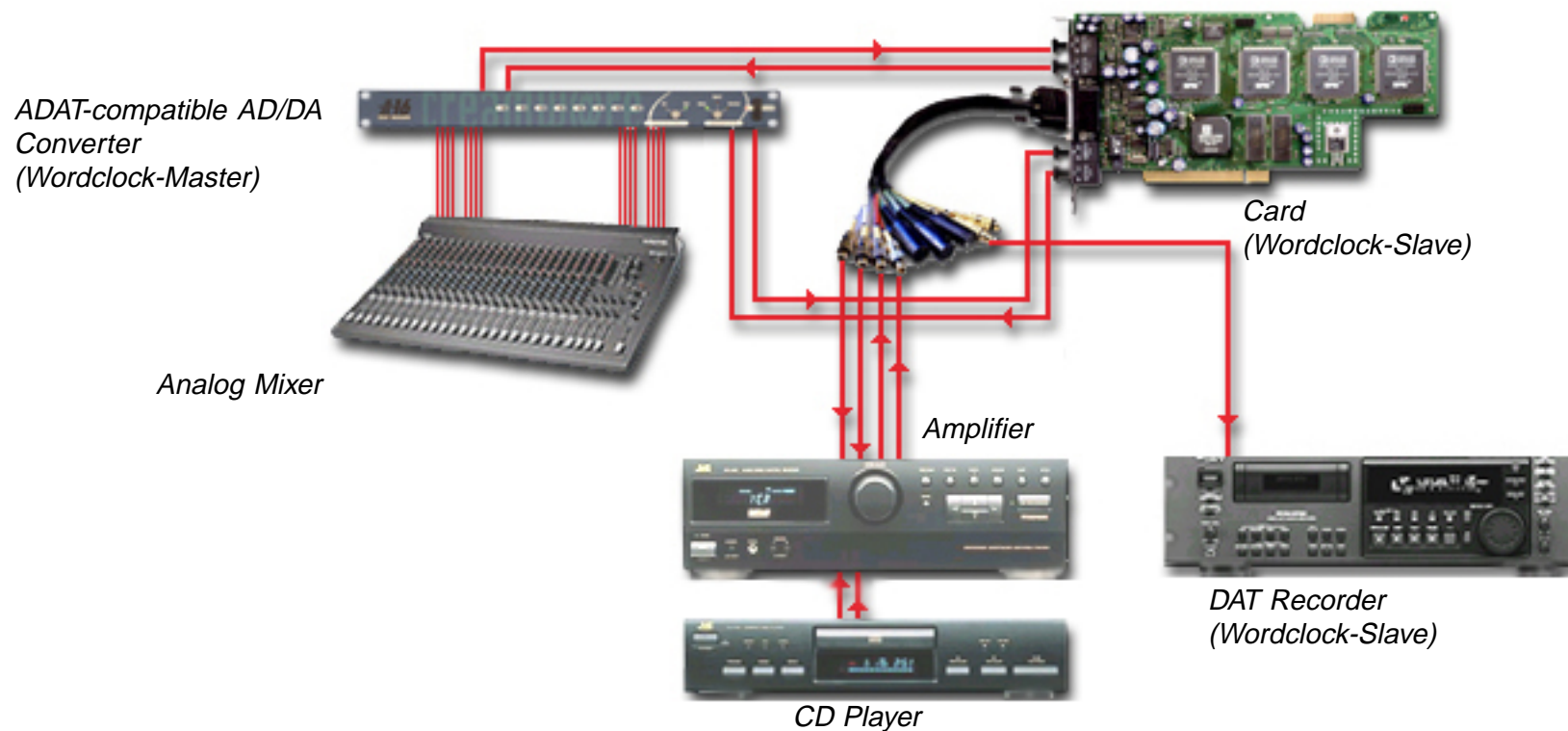


## Example: Analog Interconnections

You can of course also integrate a complex group of analog devices into your setup.

However, note that in this example configuration you will require external analog-to-digital and digital-to-analog (AD/DA) converters to make use of the 16 ADAT I/Os.

If possible, you should configure the AD/DA converters to operate as word-clock master with Pulsar configured as word-clock slave.



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