

# MSB TECHNOLOGY



## ADD - 1

**Analog to Digital Converter  
Audio Director**

Owners Manual

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# TROUBLESHOOTING

<u>Symptom</u>	<u>Solution</u>
No LEDs Light	Check power supply connection Check voltage of power supply (120V-240V)
No Digital Output	Digital output is present if optical output shows red light
No lock from DAC	Check Digital connections Check operation of DAC or processor with another source Confirm lock on receiver Check sample frequency capability of receiver (44.1 kHz should always work)
No sound	Check input source is active Check proper input is selected Check sample frequency capability of receiver (44.1 kHz should always work)
Level too Low	Input level is too low. Increase input gain.
Output is distorted	Input level is too high. Reduce input gain. Check input level specifications for each input type.

## Warranty

All MSB products carry a one year warranty. No returns accepted with out a Return Authorization Number (RMA). Upon receipt, MSB will repair or replace any defective product. All product shipped FOB La Honda. Shipping damage is the responsibility of the consignee.

# FOREWORD

The MSB Audio Director and Digitizer (ADD) is optimized in every way for the very highest quality digital to analog conversion, and comprises the latest 96k/24-bit A/D technology. The eight line-level analog inputs are selected automatically on a priority basis. The highest priority input that is active will be converted to digital and sent to the outputs. The phono input is selected from the front panel for minimum cross talk and degradation. Differential analog architecture is used with high-quality, high-speed operational amplifiers for excellent noise rejection. DC servos carefully regulate any signal offset. Sampling frequency can also be selected from the front panel, allowing optimum recording on a range of media.

The Crystal™ CS5396 is one of the finest professional A/D chips available. It uses a 7th order tri-level delta-sigma modulator followed by digital filtering and decimation, for an unbelievable 120 dB signal-to-noise ratio. 24-bit resolution means that the ADD provides 256 times more resolution than a 16 bit A/D.

Just as a transport sets the jitter performance for the entire playback system, the A/D clock jitter during sampling defines the ultimate performance of the recording. We generate each clock frequency with separate high accuracy oscillators. The Crystal™ 96K digital output transmitter formats both consumer and professional AES/EBU digital outputs, driven by low skew, low impedance differential drivers. Coaxial, optical and balanced XLR connectors are provided for your convenience.

The MSB ADD is upgradable for future digital formats. As copy protection and a plethora of new audio formats are being proposed, the MSB ADD offers seamless upgradability with an upgrade header that allows a new decoding card to be developed for each new format when it emerges. The MSB Virtual surround processor can also be installed in this upgrade slot. This will allow Prologic encoded audio to be digitally transformed into virtual 3D surround. The virtual 3D encoded audio can then be played back on any DAC and 2-channel setup, providing a “virtual surround” environment and a expanded soundstage of even normal stereo V3D encoded music.

## WHY USE AN A/D CONVERTER?

The greatest benefit derived from using a high quality A/D Converter is improvement of sound quality when used in conjunction with a digital audio system. Two primary groups of digital applications benefit: the digital recorders and Digital Signal Processing Systems (DSPs). DSP based systems are surround sound processors which perform the surround sound calculations in a digital format. All analog audio sources are converted to digital audio, then processed. Following the processing, the digital audio is converted back to analog audio outputs. Two conversions have occurred, Analog to Digital (A/D) and Digital to Analog (D/A). Both conversions are very important to maintaining high quality sound. Popular press has focused more on the D/A side but in reality, the A/D side is more critical. Poor quality conversion at this stage results in poor quality digital data and poor quality surround computations. Even perfect D/A conversion cannot get back the lost data.

The recording situation is similar, but A/D conversion is even more important. The reference clocking for D/A conversion on the playback of any digital recording is derived from the playback device, not the D/A converter. Each playback device depends on the quality of the original clock used to produce the recording. Most digital media like CD was conceived with studio mastering being the only source of software, so much of the quality and cost of the process was intended to be accomplished in the studio. Inexpensive consumer level recorders can seriously compromise the quality of a recording through poor quality A/D conversion. The MSB A/D converter supplies a stable accurate digital source for recording. The quality is already locked in, as the conversion timing is complete. The actual CD recording process is not really affected by the quality of the recorder, short of gross data loss. With the PAD, the recorder can then be chosen for convenient editing and operation, not sound quality.

## COPY PROTECTION SCHEMES

Because copy protection information is encoded in the digital outputs of many devices, they can not be successfully recorded to a digital media. The best possible legal solution is to convert the digital source into analog of the highest possible quality, and then convert it back to digital, again with the highest quality. Connecting the MSB LINK DAC to the digital output of the source allows even 24 bit / 96K sources to be accurately converted to analog. The ADD A/D converter is then attached to the analog outputs of

## SPECIFICATIONS

Resolution	24 bit
Signal to Noise Ratio	
Line Level Inputs	120 dB
Phono Input	100 dB
Dynamic Range	115 dB
Total Harmonic Distortion	0.0006%
THD + N	102dB
Channel Separation	110 dB
Interchannel Phase Deviation	0.0001 degrees
Sampling Rate	44.1, 48, 88.2, 96 kHz
Passband ripple	+/- .005 dB
Stopband ripple	>117 dB
Digital Outputs	Coaxial, Optical and Balanced
Analog Inputs	Phono MM, 2.5 mV/ 47 kOhm 8 Line Level, 2V P-P full scale
Weight	18 lb.
Dimensions	17" x 14" x 1.75" Rack mountable

# BEHIND THE ADD-1



1 2 3 4 5 6 7

1) **Phono Input** - use only with a MM cartridge type phono source. Phono sources with MC Cartridges need to be used with an external phono preamp connected to the Line Level Input. A ground screw is included.

2) **Line Level Inputs** - used with most common sources with RCA connectors. Inputs autodetect and autoswitch in priority order. As viewed above, the highest priority input is on the left, the lowest priority on the right. This means that a source to the left will always interrupt a source to the right. A newly activated source to the right will not interrupt an existing source to the left.

3) **AES/EBU Digital Output** - This is the best output format, compatible with the highest quality and professional products.

4) **Coaxial Digital Output** - This is the most common output format and is preferred over optical except where very long runs or very noisy environments are concerned.

5) **Optical Digital Output** - The optical format is also common on many consumer products.

6) **Power Connector** - Must be connected to the desktop supply included with the PAD. For critical applications, use the P1000 Power Base, sold separately.

7) **External Interface** - Allows manual control over all switching.



the LINK and a very high quality digital stream is created, with no copy protection. Although the quality is not as good as the original, it is far better than if the analog outputs of the source were connected to the analog inputs of the recorder.

## OPERATION

The Audio Director operates automatically in most cases. The digital audio format that is selected in the default mode is 48KHz sampling rate and 24 Bits of resolution. The Audio Director always outputs 24 bits of resolution. If your processor or recorder is not capable of using all 24 bits, then the additional bits above your recorder's capability are concatenated. Later when you upgrade your processor, these bits may be able to be used to your benefit. The highest sampling rate should be used that can be accommodated by your processor. The default 48KHz sampling rate is the highest accommodated by the vast majority of processors. A higher rate can be selected on the front panel.

### AUTO SWITCHING

The autoswitching in all MSB products works the same way, with subtle differences. In all cases, when a higher priority signal is detected, the output is switched to the higher priority source. This switching occurs very rapidly. When the higher priority source is switched off, the next highest source is selected. With digital audio and video, this switching is fast, but with audio switching no source is considered off until it is quiet for at least 6 seconds. In this way a signal will not be lost during a quiet spot in a movie. The setup concept is to attach your inputs with the most commonly used inputs such as DSS or Cable attached to the *lowest* priority input. This source can be left on all the time. Occasionally used sources such as LD or DVD are set at a *higher* priority. When you want to watch a movie, put in the disc and play. Its higher priority interrupts the background DSS source. When the movie is done, the system automatically goes back to the lower priority source.

### LINE LEVEL INPUTS

These inputs are designed to accept standard 2V Peak-to-Peak input signal. This is the THX approved output level and should be found on all sources. Most sources can be connected directly to this input with no volume control required. Specialty and high-end products many times provide a higher level output, specifically designed for use with passive volume

