

MSB TECHNOLOGY



PAD - 1

Professional Analog to Digital

Owners Manual

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FOREWORD

The MSB Professional Analog to Digital converter (PAD) is optimized in every way for the very highest quality conversion, and comprises the latest 24 bit / 96kHz A/D technology. The three analog inputs are selected from the front panel and are mechanically switched 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 MSB 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 96kHz 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 PAD is upgradable for future digital formats. As copy protection and a plethora of new audio formats are being proposed, the MSB PAD 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 an expanded soundstage of even normal stereo V3D encoded music.

MSB is also developing a video sync option for use in video studio applications.

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 / 96kHz sources to be accurately converted to analog. The Professional A/D is then attached to the analog

outputs of 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 Professional A/D Converter (PAD) operates automatically in most cases. The digital audio format that is selected in the default mode is 48 kHz sampling rate and 24 Bits of resolution. The Professional A/D Converter 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 recorders capability are concatenated. Later when you upgrade your processor or recorder, 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 or recorder. The default 48 kHz sampling rate is the highest accommodated by the vast majority of processors, and the older recorders. A higher rate can be selected on the front panel.

Input Selection

Three inputs are provided. The line level is the most common source, compatible with all consumer electronics. The Professional Studio Input expects to see a much higher signal level and can result in better quality recordings. The phono input has much higher gain and can only be used with a standard MMC phono player.

Line Level Inputs

This input is designed to accept a standard 2V peak-to-peak input signal. This is the THX approved output level and should be found on all sources with RCA type output jacks. 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 controls (with no gain). The higher level of these sources should be attenuated, ideally with a passive volume control (a high quality resistor to ground). Measurements are normally made with a test disc and oscilloscope, but if the output level and impedance is known, the amount of attenuation can be calculated. Finally, most recorders provide a level meter, and the appropriate level can be set by watching the level using representative music.

Phono Input

The Phono Input can only accommodate the type MM cartridge with 2.5 mV/ 47k Ohm. This is the most common type input found on most processors and receivers. Correct phono connection should also include a ground connection between the chassis ground of the phono player and the dedicated phono ground screw on the back of the PAD. For true high quality recordings, a separate preamp should be used on the line level input.

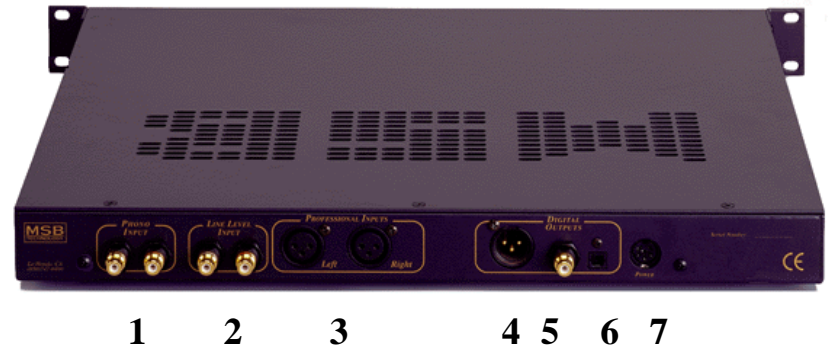
Professional Input

The Professional input uses an XLR connector and expects to see a 13V RMS full scale balanced signal. Studio equipment invariably has many locations for volume control and most recorders provide a level meter. Level setting should be accomplished using either source material or test tones.

SPECIFICATIONS

Resolution	24 bit
<u>Signal-to-Noise Ratio</u>	
Professional Input	144 dB
Line Level Input	120 dB
Phono Input	100 dB
Dynamic Range	120 dB
Total Harmonic Distortion	0.00056%
THD + N	105dB
Channel Separation	120 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 Line Level, 2V P-P full scale Professional, 13V RMS
Weight	18 lb.
Dimensions	17" x 14" x 1.75" Rack mountable

BEHIND THE PAD-1



- 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 provided.
- 2) Line Level Input - used with most common sources with RCA connectors.
- 3) Balanced Inputs - Studio level input for professional use.
- 4) AES/EBU Digital Output - This is the best output format, compatible with the highest quality and professional products.
- 5) 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.
- 6) Optical Digital Output - The optical format is also common on many consumer products.
- 7) Power Connector - Must be connected to the desktop supply included with the PAD. For critical applications, use the P1000 Power Base, sold separately.



FRONT OF THE PAD-1



1 2 3 4 5 6

1) Power Button and Indicator LED - The PAD defaults to the power off position. In actual practice, the PAD is always powered on. The power button actually activates the front display and calibrates the A/D. Allow the PAD to warm up for at least 15 minutes when first applying line level power. Once warm, the PAD can be used immediately after the power button is pressed.

2) Clipping Indicator Light - This light indicates that an analog source has exceeded the input level specifications. Setting the levels too low, to avoid this possibility reduces the resolution of the output signal so care should be taken to run the levels as high as possible without clipping.

3) Sample Frequency Button and Indicator Light - The PAD defaults to a 48 kHz sampling rate. This is the rate commonly output by DVD, DSS and many new digital sources. The 44.1 rate is the CD standard. The 96K rate is common in studios and is used for DAD discs. Select the highest sampling rate the system will allow.

4) Professional (Balanced) Input Selector and Indicator Light - Selects only the Professional Input.

5) Line Level Input Selector and Indicator Light - This default setting selects only the line level input.

6) Phono Input Selector and Indicator Light - Selects only the phono input

TROUBLESHOOTING

Symptom

Solution

No LEDs Lit

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 without 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.

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