



Advanced Bit Crusher User Guide

2009-01-09

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Model Number: ABC-1

Thank You!

Thank you for purchasing this Frisco Audio Technology product. We hope you will be pleased with your purchase and with our mutual relationship, as fellow owners and product users.

This user guide is one of our ways of further introducing the product and giving you some insight and perspective into our intent and purpose for creating this product.

In your possession

You have something very special; a hand-crafted product which is unique in its appearance and sound.

This hand crafted device was made with sweat, fierce concentration and love. And this product was made for a special and unique musical purpose.

Every incarnation of our products have a special place in Frisco Audio Technology's history as they also have a special value to the people who designed them and helped bring them to life



Figure 1 – Overview Photo of product

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Introduction to the ABC-1

The Frisco Audio Technology Advanced Bit Crusher

The ABC-1, FAT Advanced Bit Crusher, is a device with many voices whose purpose is to transport us back in time to the birth of digital music, it will effectively give any audio plugged into it the distinct sound of 8 bits or less and of low sample rates. The ABC-1 is not designed to make your music sound melodious, pretty, or sweet, but in fact it's aural intentions are quite the opposite!

The effects produced by the ABC-1 are not limited to a single expression but range from howling mad distortions to ring modulator like sounds; and from murky, digital thunder to a shimmer of digital artifacts.

By utilizing the Advanced Bit Crusher's on-board Sample Rate Control and Bit Depth Control inputs the variations are practically endless, whether in live performance or in the studio. The control inputs can be connected either to an expression pedal or a CV (Control Voltage) source, the latter allowing for things like sequenced bit depth etc.

The Advanced Bit Crusher will not only work its magic effects on audio, but in fact can be applied to any small-signal voltage, including Control Voltages (CV). As a Control Voltage-processor, the ABC-1 produces numerous effects not unlike those of quantizers, random-voltage generators, and sample-and-hold effects.

The bit discrimination circuitry in the ABC-1 is quite different from other similar effects in that that bits can be turned down in volume rather than just turned on or off, the ABC-1 produces a totally unique sound due to this.

The initial idea behind the FAT Advanced Bit Crusher came to life in early 2000 as a reaction to the fact that at the time - while there were similar products in software form - next to nothing was available in hardware. The first (unreleased) version of the FAT Advanced Bit Crusher was similar to what we have today, with a few huge exceptions: FAT has added remote control of the circuit parameters and the seamless bit discrimination not found in other products, this to create an Advanced Bit Crusher.

The Frisco Audio Technology Advanced Bit Crusher is a Tonebuilder[©] Series Component

Frisco Audio Technology has developed a series of audio and control system components which are being made available as system modules and stand alone devices. The ABC-1 is one of our first such modules to be released into production.

How to work with the ABC-1

The ABC-1 has two audio jacks, one input jack to be connected to an instrument, microphone etc. and one output jack which is to be connected to an amplifier, recording device or other signal destination.

Furthermore it has two inputs for remote-control of the bit depth and sample rate parameters, these inputs can be used with either expression pedals or instruments producing control-voltage.

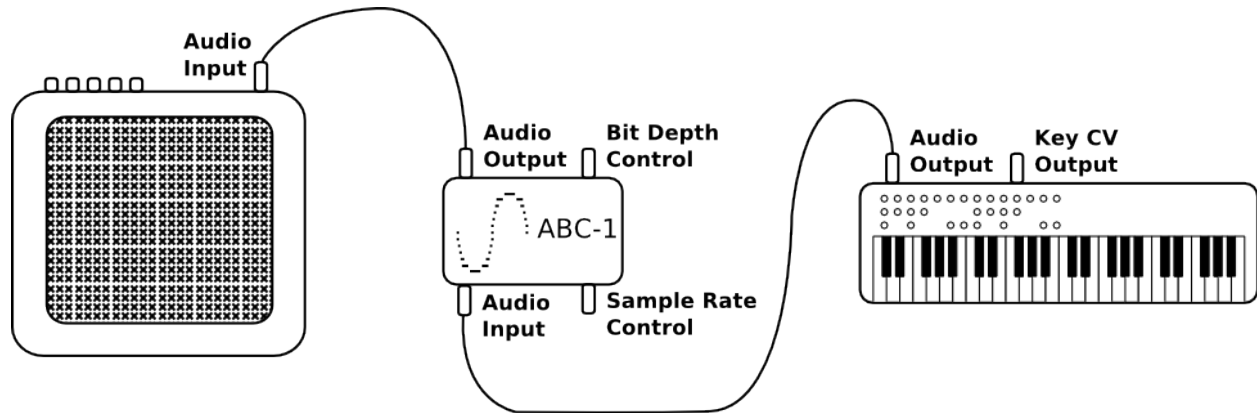


Figure 2 – ABC-1 audio path hookup diagram

There are five controls on the ABC-1;

Control Parameter	Designator for the control
Input Volume	1
Output Volume	2
Bit Depth	3
Sample Rate	4
Bypass	5

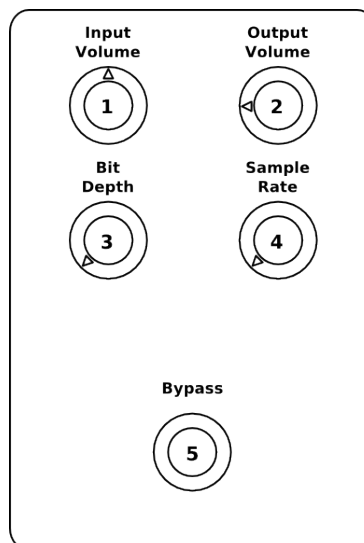


Figure 3 – Representative panel layout

Input Control

The Input Volume control is not to be overlooked as something you set once and then never touch again as it has a lot to do with how bit data is discarded and processed thus affecting the sound greatly.

The Input Control sets the gain of a immense overdrive circuit capable of ~1000 times amplification. This humongous overdrive capacity is necessary to be able to get the most out of the ABC-1 follow-on circuits.

You must experiment in depth to fully appreciate the range of subtle and extreme effects the Input Volume control manages on the Advanced Bit Crusher.

Output Control

The Output Volume knob does exactly what it implies – it sets the output volume.

Since the output gain of the unit is very high, care is to be taken with this control, therefore start out at a low output setting. For tube-based guitar amplifiers especially, a high setting here could result in serious, and in many cases, unwanted amounts of distortion.

Bit Depth Control

The Bit Depth Control sets the number of bits that are outputted, as the control is moved from its highest setting (all bits on) it will turn down the volume of the lest significant bit until it's quiet. Turning the knob further will result in the next bit being turned down in volume until that one is also turned off. Turning off bits will result in a "grittier" sound and give it more character as well as distortion, gating and compression.

Sample Rate Control

The Sample Rate Control sets the sampling speed of the Advanced Bit Crusher's Analog-to-digital converter.

Note, however, this is not primarily to be used as a digital low-pass filter even though it can be used to create similar effects.

Best explained, a sample-rate setting of 2kHz will result in all sound at or below this frequency being passed unaltered, while all frequencies above this point will be subject to digital artifacts to various degrees, up to the point of the sound being completely unrecognizable.

By-pass Feature

The By-pass switch has two modes, one in which will pass the sound from input to output unaltered by the ABC-1 and the other mode in which the unit will pass the sound through the unit's audio processing circuit.

The Control Voltage / Expression-pedal inputs

The ABC-1 is fitted with two Control Voltage (CV) / Expression-pedal (EP) inputs that can be connected to any gear following the two standards.

The inputs will have the same functions as the above listed and described knobs; for example a Bit Depth CV / EP input is a remote-control input that performs the exact same function as your directly setting the Bit Depth control knob and like-wise for the Sample Rate control input.

Control Voltage

As we have stated, CV stands for Control Voltage and in fact it is a standard interface invented in the 1970's for the purpose of remotely controlling the many different parameters of electronic music equipment. The CV inputs allow external voltage control parameters to be accessed within the unit. The CV standard can be thought of as predecessor to MIDI, although the two standards are quite different and can hence perform quite different tasks.

The ABC-1 CV / EP inputs can for instance be connected to an analog synthesizer's CV output. Most commonly this will mean that the selected parameter will change with whatever key is depressed on the synthesizer.

Further automating the Control Voltage inputs

Additionally, the CV / EP inputs can also be connected to – for instance – the output of a synthesizer's LFO or ADSR output which in turn will periodically or a-periodically change the parameters of the Advanced Bit Crusher's CV controlled circuit.

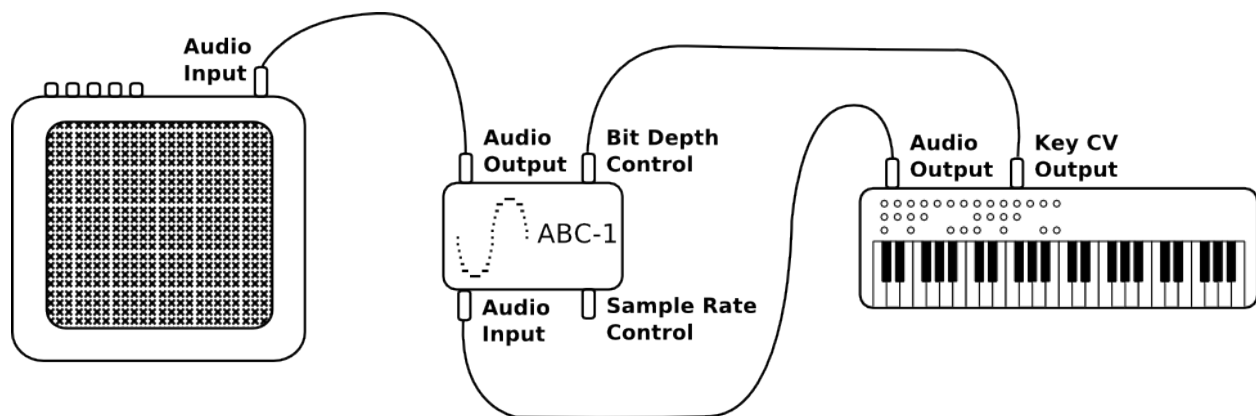


Figure 4 – Automation of the Bit Depth parameter through a keyboard Control Voltage

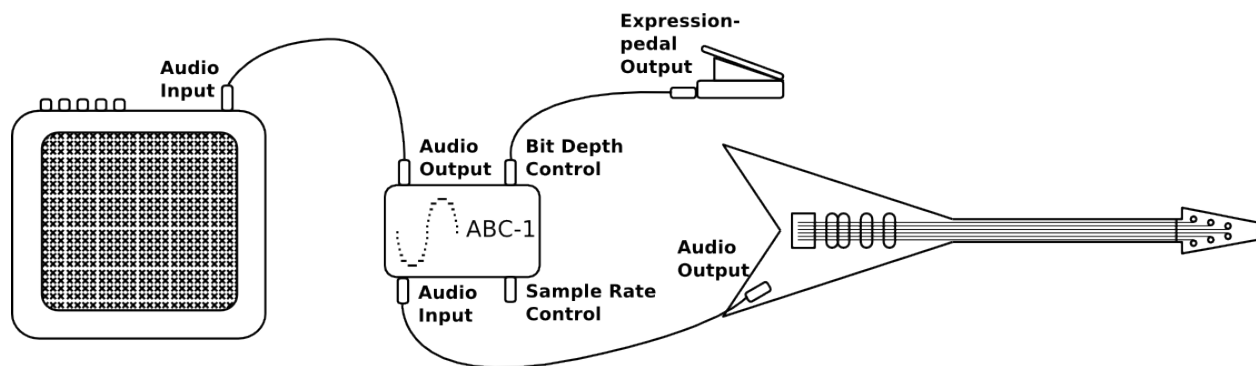


Figure 5 – Automation of the Bit Depth parameter through an Expression Pedal

Typical Settings to start using the Advanced Bit Crusher

This section provides three types of very characteristic settings to use the FAT ABC-1, from which you can setup and then adjust as need to match your individual instrumentation and aural intentions.

These configurations are provided to help new users become familiar with using the Advanced Bit Crusher in the audio chain.

ABC-1 Configuration: Digital Distortion Overload

For guitar the input knob (1) often needs to be set quite high to get the gain needed, as the screen indicates we're aiming for a very low bit depth (1 bit) (3) and to make this work set up the gain to its maximum.

These settings in conjunction with the highest sampling rate (4) will produce a very harsh digital distortion.

Please note that the output knob (2) is set very low, this because the input on most guitar amplifiers is very sensitive and the output of the ABC-1 can be very loud.

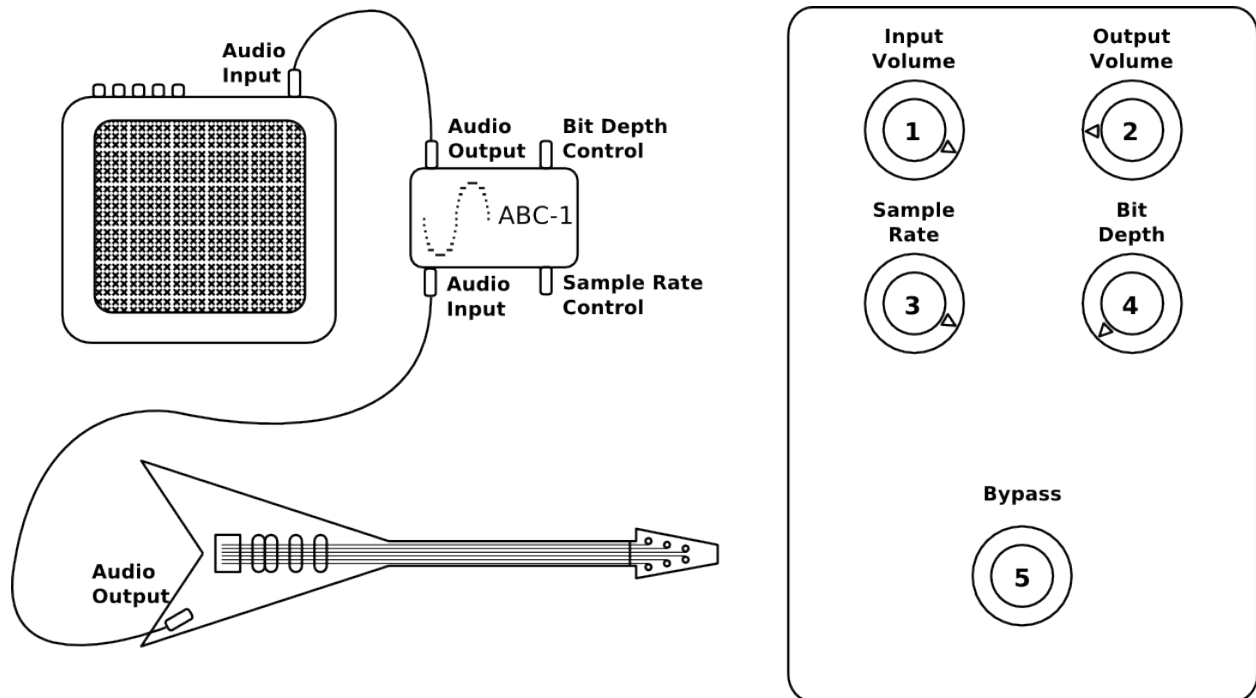


Figure 6 – Typical settings - Digital Distortion Overload configuration

ABC-1 Configuration: Pseudo-Random CV Generator

This setting will produce a pseudo-random effect on a Control Voltage. This is achieved by setting the sample rate (4) very low.

Here is exactly what's happening in this configuration. The output CV from the LFO is connected to the Audio Input jack (Note: AUDIO input, not the CV input). The ABC-1 re-samples the current LFO CV output value and then sends it out through the Audio Output jack. The Audio Output jack is then connected to the Pitch CV Input jack on the VCO, creating random bleeps. The output of the VCO is connected to an amp.

Please note that the ABC-1 Input volume (1) is set to the lowest value, this because the output of the LFO should already be very loud and if we add any gain we will most likely distort the CV value.

The ABC-1 Output volume (2) however is set to the maximum value, this since we want the full voltage output swing. The Bit depth (3) is set to 8 bits and the Sample Rate (4) is set to a very low value; in the range of 1 - 0.3 Hz.

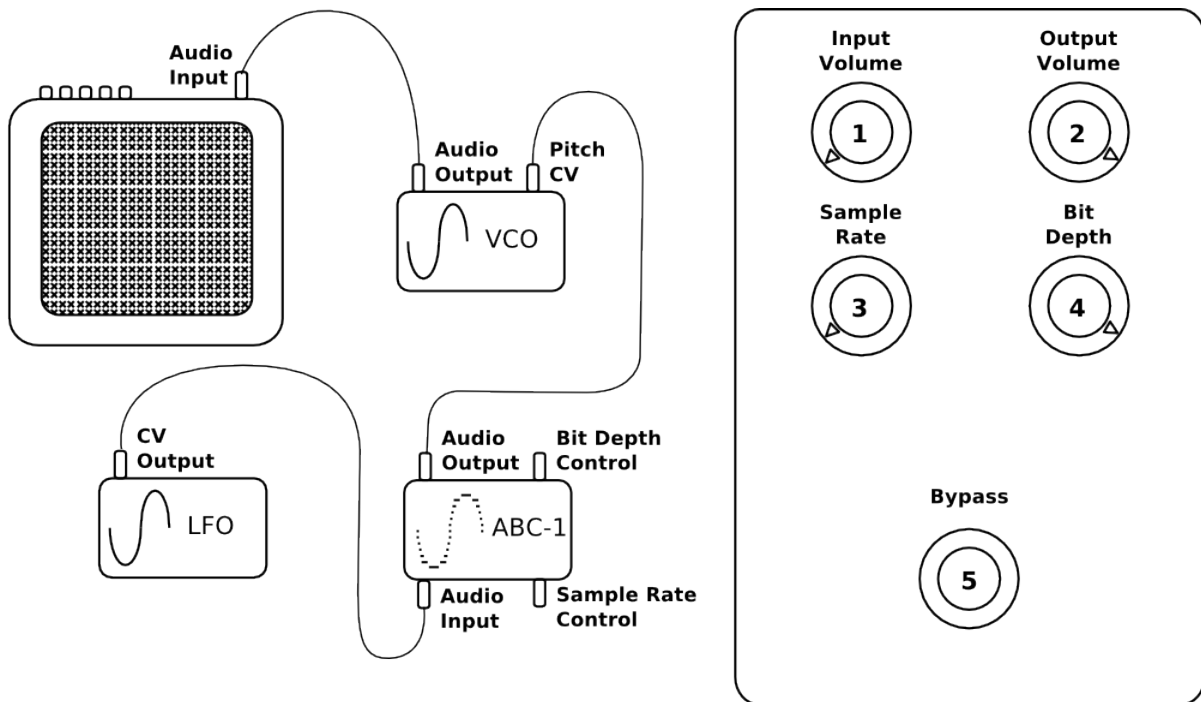


Figure 7 – Typical settings - Pseudo-Random CV Generator configuration

ABC-1 Configuration: Ring Modulator

This setting will produce a ring-modulator effect. This is achieved by setting the sample rate (4) quite low.

For guitar the input knob (1) often will be required to be set quite high to get the gain needed. The ABC-1 Output control (2) is set very low, because the input on most guitar amplifiers is very sensitive and the output of the ABC-1 can be very loud. To get a as clean signal as possible we set the bit depth (3) to 8 bits.

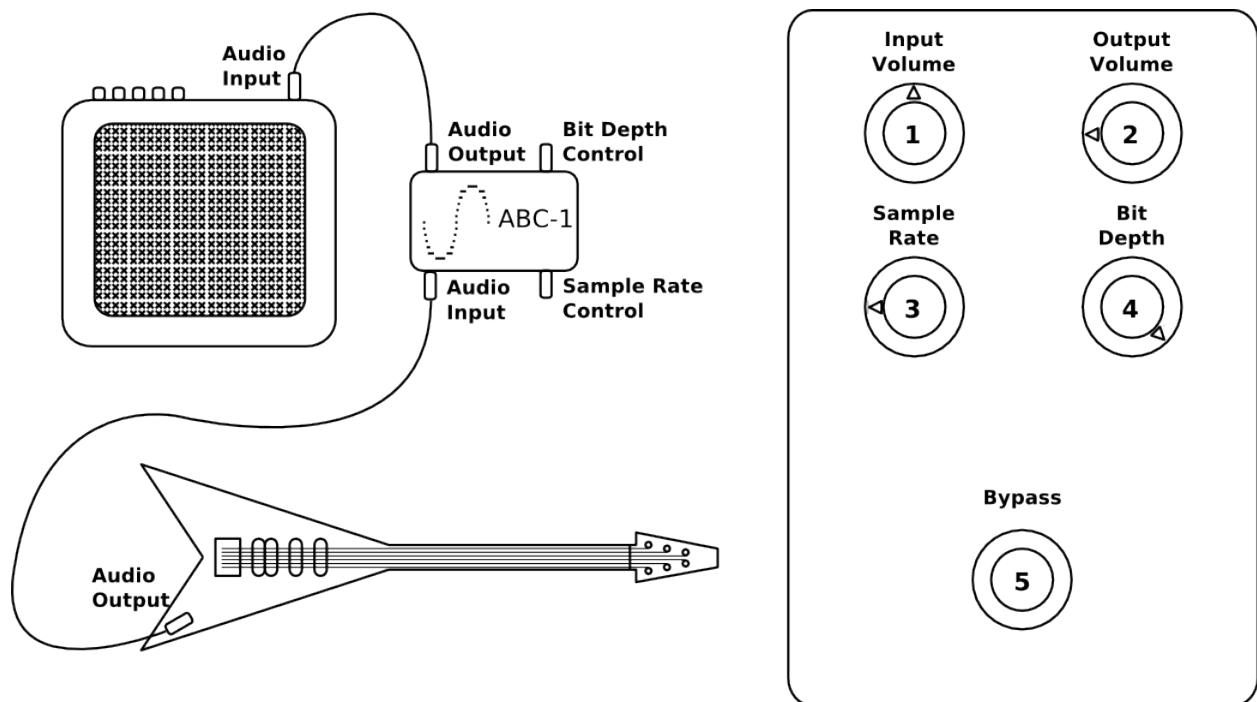


Figure 8 – Typical settings - Ring Modulator configuration

Technical Data

ABC-1 Signal Flow Diagram

The figure below illustrates the signal flow diagram for the Advanced Bit-Crusher.

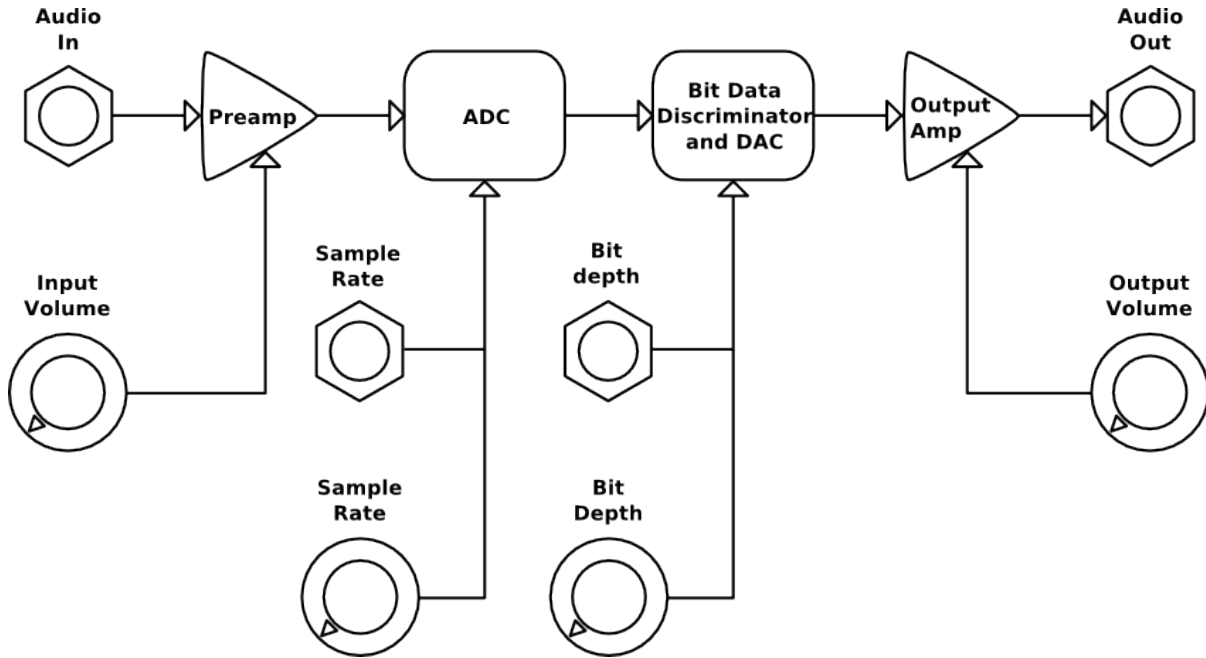


Figure 9 – Advanced Bit-Crusher signal flow diagram

Input sensitivity (for full 8-bit range using max input gain)	100mVolt
Output voltage swing (max)	11.8Vpp
Low frequency -3db point	DC
High frequency -3db point	2.1kHz
Bit Depth (max)	8 bits
Bit Depth (min)	0 bits
Sampling frequency (max)	9.7kHz
Sampling frequency (min)	0.2Hz
Power consumption	(at 9V) 33.4mA
CV input voltage range	+ -4.5V
CV input impedance	100kOhm

Table 1 – ABC-1 Technical Parameters Table¹

¹ These values are approximate and subject to change without notice

Document Revision History

Edition No.	Date	Author	Release Editor	Changes
Version 0.2009.01.09	2009-03-05	K. Ekdahl	L. Schwartz	Original release editor's draft

Table 2 – Revision History Table

End of document