

# Bitcrusher

Audio Signal Modification Unit  
User Manual And Technical Reference

ACOUSTIC RESEARCH





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I wish you the greatest success in your research

*James Chaffinch*  
James Chaffinch, CEO

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# Description

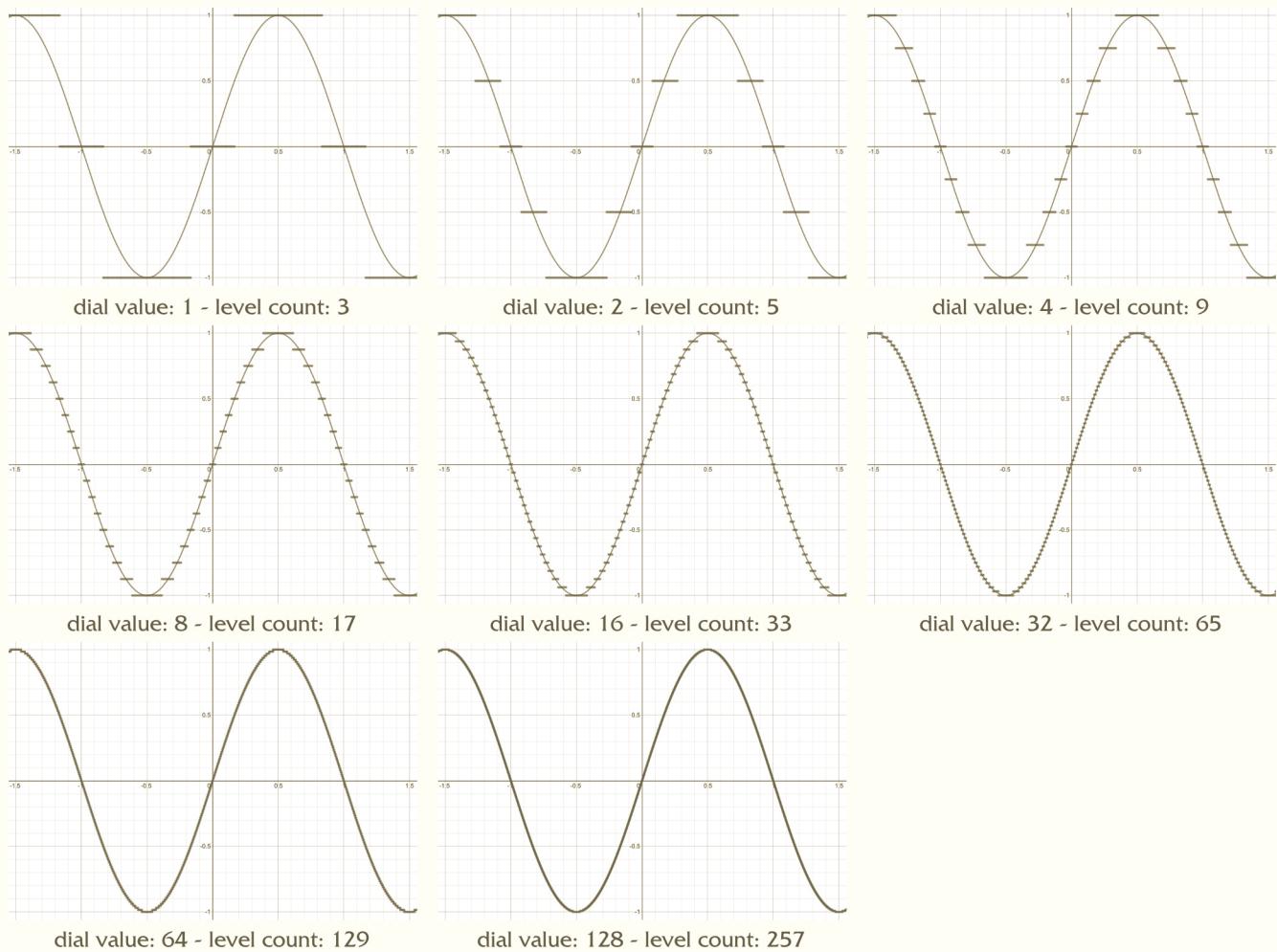
The Bitcrusher unit is an audio signal modification device which implements a digital down-sampling algorithm to both the amplitude of a signal, and the temporal opportunities for registered change in that signal known as the sample frequency.

These two down-sampling operations can be analyzed individually, as they do not deeply interact with each other beyond modifying aspects of the signal. In effect, one can perform both operations in any order and produce the same output.

## Down-Sampling Of Amplitude Resolution

The amplitude resolution of a signal refers to the number of possible amplitudes that a signal could have. Typically in analogue circuitry this resolution is fine enough to be functionally infinite, but this is not so in digital circuits.

One purpose of the Bitcrusher then, is to quantize the fine resolution signal to a more discrete set of values. The unit achieves this by rounding values to closest available “levels”. Levels are evenly spaced values from -1 to 1. The number of levels is defined as the value of the Amplitude Resolution Dial by 2, plus 1. In essence, an even number of levels either side of zero, plus the zero level itself.

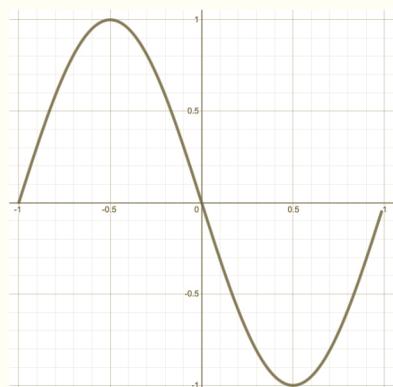


# Down-Sampling Of Sample Frequency

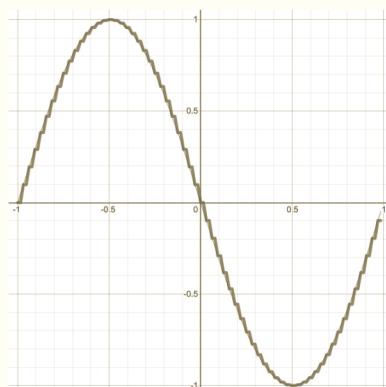
The sample frequency of a signal refers to the number times the unit reads the value of the incoming signal over a second. For example, the unit's maximum sampling rate is 128, which means that every  $1/128^{\text{th}}$  of a second, it will read what the input signal value is and set the output to this value.

Lowering the number of samples that are taken in a second, results in the output signal losing temporal detail. That is to say, that the resolution in time is reduced, leading to what some have described as a blocky graph.

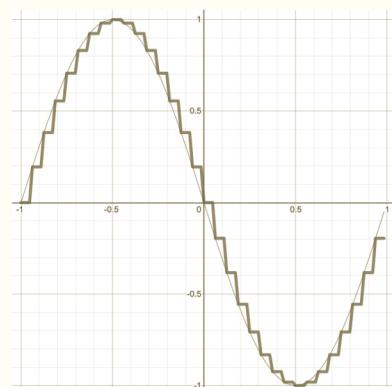
Think of it like pixilation of an image; less pixels means less detail.



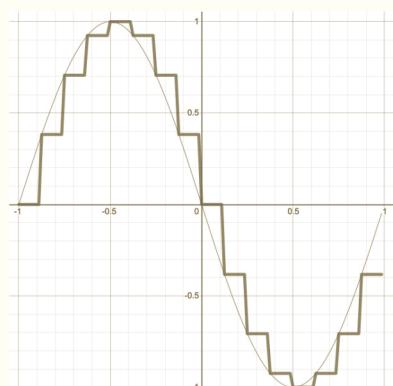
128 samples



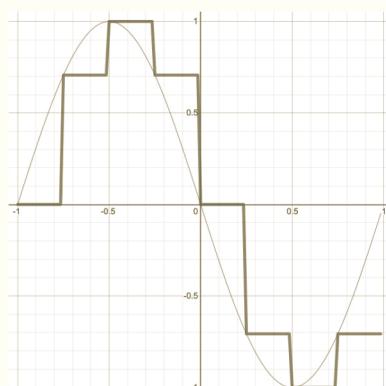
64 samples



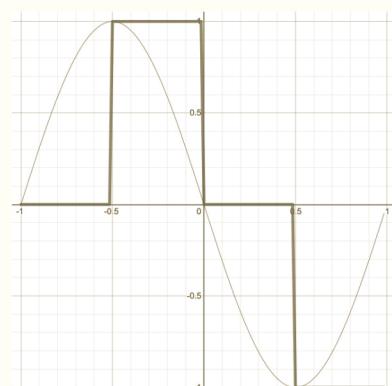
32 samples



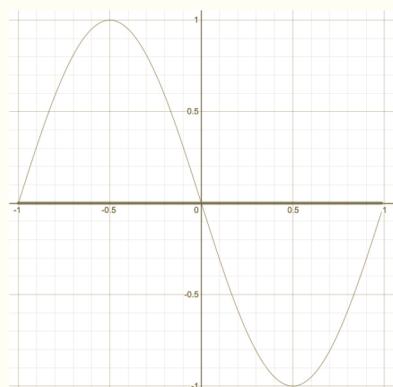
16 samples



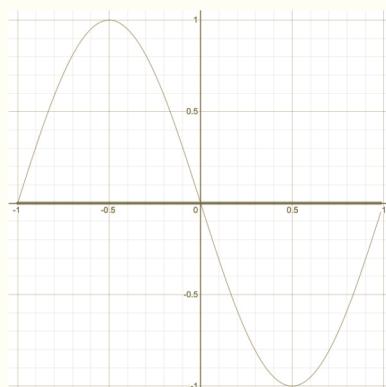
8 samples



4 samples



2 samples

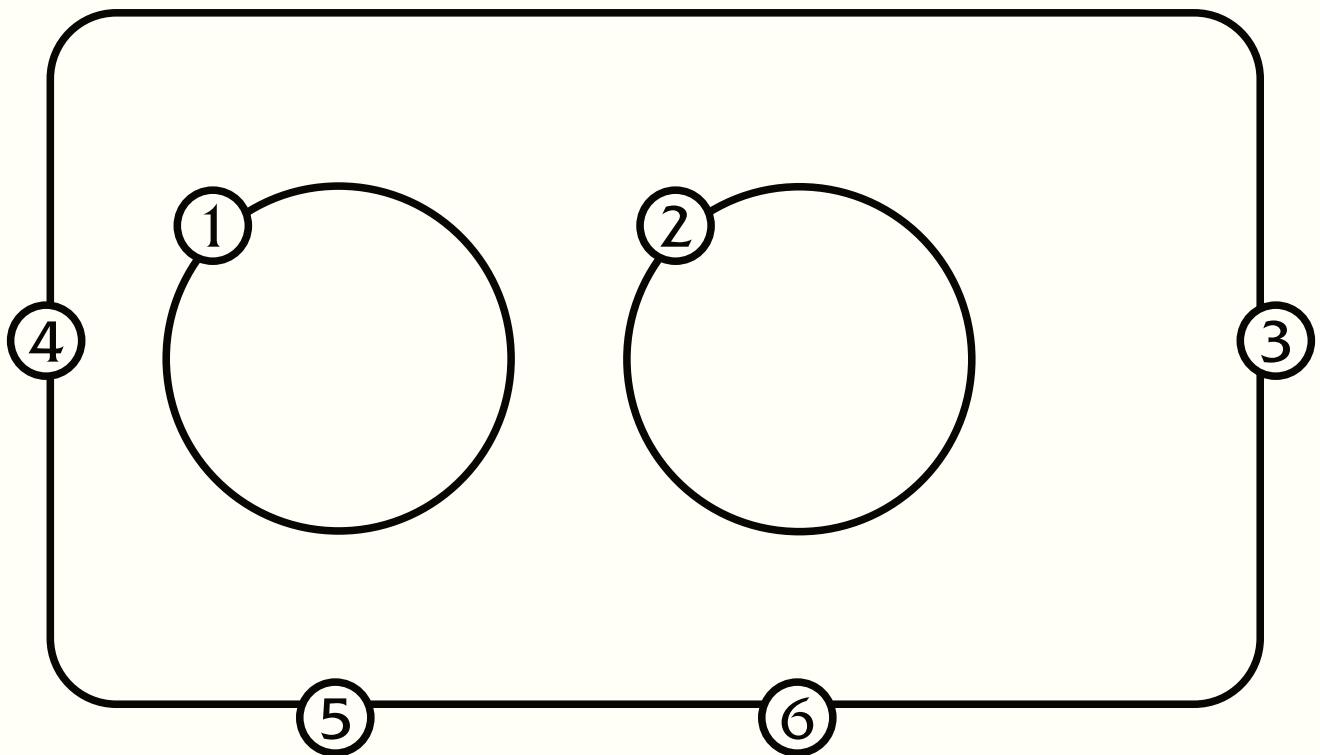


1 sample

Note; the graphs for “2 samples” and “1 sample” are the same, as a result of a trick of math. “1 sample” keeps the value of  $x = -1$ , which is 0.

“2 samples” keeps the values of  $x = -1$  and then  $x = 0$ , which are both 0.

# Interface



**1. Amplitude Resolution Dial**

Used to define the value used in the down-sampling of a signal's amplitude.

**2. Sample Frequency Dial**

Used to select the number of samples the unit will take of the incoming signal over the course of one second.

**3. Amplitude Resolution Dial Voltage Control**

A voltage control input connection port which directly modifies the Amplitude Resolution Dial (1). Control is between the values of 0 and 1.

CUIS type: Green

**4. Sample Frequency Dial Voltage Control**

A voltage control input connection port which directly modifies the Sample Frequency Dial (2). Control is between the values of 0 and 1.

CUIS type: Green

**5. Audio Signal Input**

The audio signal input connection

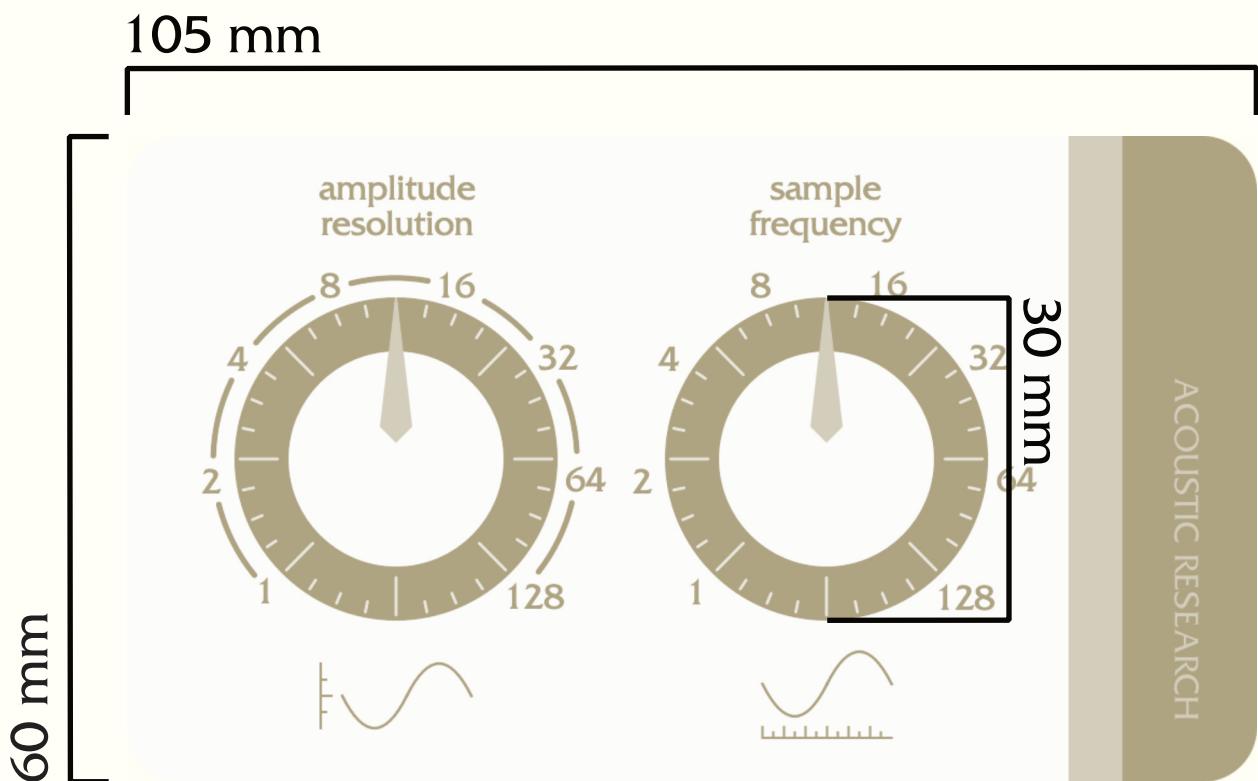
CUIS type: Orange

**6. Audio Signal Output**

The audio signal output

CUIS type: Orange

# Unit Specifications





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