Red Panda™

bitcrusher

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The Red Panda™ bitcrusher is designed for use with all Line 6 ToneCore® pedals and docks.

Controls

1. Wet/dry mix
2. Crush - amount of bit reduction
3. Freq - sampling rate
4. Env - amount of envelope modulation
5. LFO - amount of LFO modulation
6. Speed - LFO rate
7. LED indicator:
    1. Off: analog bypass (not true bypass)
    2. Orange: on / hold mode
    3. Green: on / tracking mode
    4. Blinking red: low battery
8. Tracking switch:
    1. Track -: sampling rate tracks pitch (negative)
    2. Env: sampling rate tracks envelope
    3. Track +: sampling rate tracks pitch (positive)
9. LFO waveform

Overview

A bitcrusher reduces the sampling rate and resolution of a signal without any filtering, resulting in aliasing and quantization noise.

When a digital signal is resampled at a lower sampling rate it creates copies of the signal (*aliasing*). Unlike a fuzz, these copies are not harmonically related to the original signal. Samplers and digital audio workstations use filters to remove the aliased components, but they are essential to a bitcrusher's character.

When too few bits are used to represent a signal, each sample is rounded to the nearest allowed value and no longer matches the true signal level. The rounding errors cause noise, called *quantization noise*, because the actual signal is approximated using a small set of values. 8-bit computer audio is a good example of quantization noise, but the Red Panda Bitcrusher can go all the way down to 1 bit.

Getting Started

Start with these settings:

mix: 100%	crush: 0%	freq: 100%
env: 0%	lfo: 0%	speed: 0%
LED (tap): orange (hold)		
track: env/off		wave: sine

This gives a (relatively) clean sound, with the bitcrusher sampling at 39 kHz/24 bits. Then experiment with each of the following controls

crush

The crush control reduces the number of bits used to represent the signal, from 24 bits (0%) to 1 bit (100%). With quiet guitar pickups, the signal level will increase as the crush control is cranked up.

freq

The freq control sets the sampling rate. Middle settings add inharmonic distortion, lower settings shred the input signal.

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lfo
The lfo knob controls how much the sampling rate is modulated by the LFO. To get a feel for it, start with the freq knob in the middle range and gradually increase the lfo control.

speed
The speed knob controls the LFO rate, from slow modulation (0%) to audio rates (100%). Set the freq and lfo knobs so that the effect is noticeable and gradually increase the LFO speed to hear the effect.

LFO waveform
The LFO waveform can be switched between sine, square, and random step (sample and hold). Sine is good for modulation. Square has a similar sound to ring modulation at higher rates. Random works well for computers in sci-fi movies.

env
The envelope amount knob does two things:
- Modulate the wet/dry mix by the input signal's envelope.
- In "env" tracking mode, it also modulates the sampling rate by the envelope.

Tracking mode
The tracking mode switch has different functions depending on whether tracking is on or off:
Tracking on (green LED):
- **Track -**
  Sampling rate decreases as pitch increases.
- **Env**
  Sampling rate modulated by the envelope detector.
- **Track +**
  Sampling rate increases as pitch increases.

Tracking off (orange LED):
- **Hold (Track -)**: Sampling rate is held at its last value (including modulation).
- **Off**: Sampling rate is unaffected.
- **Hold (Track +)**: Sampling rate is held at its last value (including modulation).

Footswitch
Tap the footswitch lightly to switch the tracking mode on (green LED) or off (red LED).
Press the footswitch **hard** - until you hear a loud click - to turn bypass on (LED off) or on (LED green or red).

Tracking
The pitch tracking algorithm is extremely crude. It swirls instead of accurately following the input signal. We liked the effect, and we had already filled up the ToneCore DSP with bitcrushing code.

Examples
Harpsichord/Clavinet/Video Game Music

mix: 60%	crush: 0%	freq: 70%
env: 0%	lfo: 0%	speed: n/a
LED (tap): orange (hold)		
track: n/a		wave: n/a

Fuzz

mix: 100%	crush: 70-100%	freq: 100%
env: 0%	lfo: 0%	speed: n/a
LED (tap): orange (hold)		
track: n/a		wave: n/a

Envelope modulate frequency with LFO

mix: 100%	crush: 0%	freq: 55%
env: 100%	lfo: 55%	speed: 65%
LED (tap): green (track)		
track: env		wave: square

Tracking with envelope modulation

mix: 0%	crush: 0%	freq: 50-52%
env: 50%	lfo: 0%	speed: n/a
LED (tap): green (track)		
track: track+		wave: n/a

See our web site for downloadable patch sheets to store your favorite settings.

Warranty
We provide a 90 day parts and labor warranty, the same length that Line 6 provides for the programmable ToneCore modules we buy from them. After the warranty period, if you buy a new programmable ToneCore module from Line 6 and send us both the broken and new module, we will be happy to download the code to the new module. Please contact us first.
Line 6 provides the warranty on ToneCore docks. Please send in the included warranty card or register online.

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