

ABOUT



Kastle is a mini modular synthesizer with headphone output, 2 in/out ports for interfacing other gear and it runs on just 3 AA batteries. It is DIY friendly and ideal for beginners in modular synthesis, but it will add quite some unique functionality to any modular synthesizer systems. It delivers the fun of modular synthesis at cost and fits into your pocket so you can play it everywhere! It has unique digital lo-fi sound and it can be melodic as well as very noisy and drony, soft or harsh. It is designed to be fun on its own but it is most powerful when combined with other modular gear. Kastle is an open source DIY project which runs on two Attiny 85 chips

that which can be reprogrammed with an Arduino (google: “programming Attiny 85 with Arduino”). One chip is dedicated to sound generation while the other handles modulation. Several firmwares for the Attiny chips are available.

The Synth version combines complex oscillator and LFO with stepped waveform generator.

The oscillator section has 3 sound parameters pitch, timbre and waveshape - all under voltage control and with 3 different synthesis modes. It has a main output and a square wave output. Both can be used independently or combined. The 3 synthesis modes are phase distortion, phase modulation (also known as FM) and track & hold modulation. Each mode utilizes two oscillators. The Pitch controls the main oscillator, the Timbre sets the pitch of the modulating oscillator and the waveshape depends on the synthesis mode. The waveshape also controls the pulse width of the square wave output from the main oscillator.

The voltage controllable LFO has a triangle and square output and a reset input. The stepped waveform generator is inspired by the Rungler circuit by Rob Hordijk. It can produce 8 different voltages either in random order or in 8 or 16 step looping patterns depending on how the BIT IN is patched.

FEATURES

- © complex oscillator
- © 3 synthesis modes: phase distortion, phase modulation and track & hold modulation
- © pitch control with offset and CV input with attenuator
- © timbre control with offset and CV input with attenuator
- © waveshape control with offset and CV input
- © voltage controllable LFO with triangle and square outputs and reset input
- © stepped voltage generator with random, 8 step and loop 16 step mode
- © 2 I/O CV ports are available and can be routed to any patch point
- © the main output can drive headphones
- © 3x AA battery operation with power switch
- © open source
- © possibility of exchanging different LFO and OSC chips

what is in the box

- © kastle synth
- © 10 patch cables
- © sticker
- © for environmental reasons we are excluding the batteries in the package

TIPS & TRICKS

A Percussive sounds

Connect the LFO PULSE to the LFO RST socket. This results in SAW waveform at the LFO TRIANGLE output (because as soon as the TRIANGLE starts rising it receives the PULSE and therefore goes to the highest point and starts falling and therefore skips the rising stage). Use the SAW waveform to modulate any or multiple of the oscillator parameters. On top of that connect the STEPPED output to LFO RATE socket. Adjusting the LFO RATE and the RATE MOD knobs will result in different lengths of SAW modulation signals and therefore different rhythms.

B Different rise and fall times

Connect the LFO PULSE to the RATE MOD socket. Now the RATE MOD and LFO RATE knobs set different proportions between the rise and fall time of the triangle. This will also create a swing effect on the STEPPED waveform. You can also use the STEPPED output to connect to the RATE MOD socket to change the slope time with every new voltage generated at the STEPPED output.

SYNTHESIS TYPES

C Thick sound

Connect the OSC PULSE to the OSC OUT socket to mix both oscillator waveforms together. This can result into really thick sound which is great for further filtering.

D Sync

The LFO and STEPPED generator on the Kastle can be synced with other gear. You can use the LFO PULSE out when you want the Kastle to be the master clock or connect clock from another device to the LFO RST when you want it to be the slave. Simply connect the I/O jack to your device and patch the L socket to the LFO RST or LFO PULSE.

E Connect everything to everything!

There are several connections that might surprise you in exploring the sounds. Here is a few of the ones you should try out for sure:

- Connect OSC PULSE to the BIT IN to create varying random patterns.
- Connect OSC PULSE to any of the OSC inputs to see what happens.
- Connect any LFO signal to the MODE pin to change the synthesis mode on the go.
- Connect OSC PULSE to the LFO RST pin to create chaotic modulation waveforms.

TIPS & TRICKS

I Phase modulation

Very similar to FM (frequency modulation) is a method pioneered by John Chowning and later used by Yamaha for their famous DX synths. Kastle implements only two operator sinewave PM with a modulation amount. Pitch sets the main oscillator (carrier), timbre the modulating oscillator (modulator) and waveshape sets the amount of modulation.

II Phase distortion

Was historically first used in 1984 in Casio synths of the CZ range. It is based on two synced ramp oscillators. The synced (higher tuned) oscillator is scanning the sine wave wavetable and is multiplied by the inverse of the lower tuned oscillator. In practical terms this was supposed to emulate sweeps of resonant filter on a sawtooth waveform. The implementation in KASTLE is an adaptation of this method

TIPS & TRICKS

III Track & Hold modulation

This is not so common synthesis method. The main sinewave oscillator is going through a comparator which turns it into a variable pulse width waveform which is gating a track & hold circuit. The second oscillator is being fed through the track & hold which means when the pulse of the main oscillator is high the signal passes and when it becomes low it holds static voltage. The threshold (waveshape) on the comparator sets the pulse width therefore the amount of the modulation and pitch and timbre set the frequencies of the oscillators.

See

www.bastl-instruments.com

for more information.





INSTRUCTIONS

KASTLE is a mini modular synth and as in every modular synth the sounds are programmed by connecting outputs to inputs. Outputs are labeled by black rectangle around the patch points. Inputs don't have the black rectangle. Feel free to also connect inputs with inputs and outputs with outputs. Nothing bad will happen. And sometimes something interesting can happen with strange connections!

0 Power up. Go to your nearest store and buy 3 AA batteries. You can catch Pokemon on the way, but you don't have to, but the important thing is that by average you will burn 50 calories and also not shipping the batteries to you from us is environmentally friendly. Insert the batteries to the battery holder compartment in the right order - as indicated on the battery compartment. Flip the power switch to the ON position. There is LED close to the LFO RATE knob which should light up. If it doesn't it means you connected the batteries in a wrong way or they are fully discharged.

1 Use the OUT jack to connect your headphones or audio cable to your speaker system. The main output of the complex oscillator is routed to the OUT jack.

2 Turn the OSC PITCH knob to adjust the pitch of the main oscillator. A modulation signal can be connected to the PITCH MOD socket and the PITCH MOD knob controls the amount of the modulation.

3 Turn the OSC TIMBRE knob to adjust the pitch of the modulating oscillator. A modulation signal can be connected to the TIMBRE MOD socket and the TIMBRE MOD knob sets the amount of the modulation.

4 Turn the WAVESHAPE knob to adjust the 3rd parameter of the sound. A modulation signal can be connected to the WAVESHAPE socket to modulate this parameter. The WAVESHAPE also sets the pulse width of the OSC PULSE output.

5 OSC OUT This patch point on the device can be either used as another signal for your patch or when any other output is connected to this output it will be passively mixed with the oscillator output and will go the OUT jack. This is most useful for adding more power by connecting the OSC PULSE.

6 OSC PULSE output provides simple pulse waveform of the main oscillator and the pulse width is set by the WAVESHAPE parameter. It can be either used to modulate parameters within the KASTLE or patched to the OSC OUT socket to mix with the main waveform or it can be output separately via the I/O jack.

7 The MODE socket lets you select the synthesis mode. When nothing is connected the synthesis mode is phase modulation. When a modulation signal plugged into this jack is high the synthesis mode becomes track & hold modulation and when the signal connected here is low the synthesis mode is phase distortion. See the Synthesis Types section for more information.

8 To set the MODE socket statically to specific synth mode use the low =(-) or high=(+) patch sockets. These patch points can be also useful to set the BIT IN pin.

9 The LFO RATE sets the speed of the modulation. The modulation is displayed by an LED close to the LFO RATE knob. A modulation signal can be connected to the RATE MOD socket and the RATE MOD knob sets the amount of the modulation. This is especially useful when creating more complex modulation curves. See Tips & Tricks section for more info.

10 The LFO TRIANGLE socket outputs simple triangle waveform, but it can be altered by modulating the LFO RATE or triggering the LFO RST to get some complex modulation shapes.

11 The LFO PULSE socket outputs PULSE wave in sync with the TRIANGLE wave. When the TRIANGLE wave is rising the PULSE output is high and when it is falling the output is low. This signal can be used for synchronising external equipment.

12 The LFO RST resets the phase of the LFO to the highest point of the triangle and then the triangle begins to fall. This is very useful for creating complex modulation curves or for synchronising with external clock. WAVESHAPE also sets the pulse width of the OSC PULSE output.

13 The STEPPED generator is inspired by the Rungler circuit by Rob Hordijk. It can produce 8 different voltages. It generates new voltage twice per period of the LFO (every time the direction from rising to falling changes). The voltage is based on current state of 3 bits of internal binary 8 bit shift register. The shift register is shifted with every new voltage generated. When this happens - based on the signal at the BIT IN socket the new arriving bit to the shift register remains

the same (BIT IN is low) , is inverted (BIT IN is not connected) or is generated randomly (BIT IN is high). What that means in praxis is that when BIT IN is not connected the STEPPED output generates 16 step pattern. When it is low it generates 8 step pattern. When it is high it keeps generating random pattern and when it is altering it generates semi-random pattern. The STEPPED output is very useful for modulating every parameter in the KASTLE or any external device with the I/O port.

14 The I/O CV port enables you to connect up to 2 modulation/audio/clock signals from KASTLE to external gear or to connect any external signal to modulate the KASTLE synth. The signals are output with a stereo jack and the patch points L and R connect either to the left or right channel. To use both channels with a modular synth you can use stereo to mono splitter adapter or you can just use one channel (L) with a mono cable connected to the I/O jack. When connecting external modulation to the Kastle please note that the signal will be rectified and Kastle will respond only to signals 0-5V.

