INSTRUCTIONS

1. Turn the Kastle synth on by connecting the USB cable to a powered 5V USB socket or by inserting the batteries to the IN socket.

2. Use the NEWSHAPE 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.

3. Turn the LFO RATE knob to adjust the rate of the LFO. The LFO RATE socket directly connects to the LFO RATE mod (every time the direction changes from rising to falling). The voltage is based on the waveform at the OUT socket, and an LED close to the LFO RATE knob should light up. If it doesn’t, there may be a connection issue.

4. Turn the OSC TIMBRE knob to adjust the pitch of the modulating oscillator. The LFO RATE MOD socket and the RATE MOD knob set the amount of the modulation. This is important for creating complex sounds. To set the MODE socket statically to specific synth mode use the low = “/circle.invert” or high = “/circle.invert” socket. You are recommended to use it only when the direction changes. For other conditions, use the modulation signal.

5. Connect the USB cable to a powered 5V USB socket or insert the batteries to the IN socket. There is a LED close to the LFO RATE knob which should light up. If it doesn’t, there may be a connection issue.

6. 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.

7. Turn the LFO RATE knob to adjust the rate of the LFO. The LFO RATE socket directly connects to the LFO RATE mod (every time the direction changes from rising to falling). The voltage is based on the waveform at the OUT socket, and an LED close to the LFO RATE knob should light up. If it doesn’t, there may be a connection issue.

8. Turn the OSC TIMBRE knob to adjust the pitch of the modulating oscillator. The LFO RATE MOD socket and the RATE MOD knob set the amount of the modulation. This is important for creating complex sounds. To set the MODE socket statically to specific synth mode use the low = “/circle.invert” or high = “/circle.invert” socket. You are recommended to use it only when the direction changes. For other conditions, use the modulation signal.

9. Turn the OSC TIMBRE knob to adjust the pitch of the main oscillator. A modulation signal can be connected to the OSC TIMBRE socket to modulate this parameter. The OSC TIMBRE knob sets the pitch of the modulating oscillator.

10. 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.

11. Turn the OSC TIMBRE knob to adjust the pitch of the modulating oscillator. The LFO RATE MOD socket and the RATE MOD knob set the amount of the modulation. This is important for creating complex sounds. To set the MODE socket statically to specific synth mode use the low = “/circle.invert” or high = “/circle.invert” socket. You are recommended to use it only when the direction changes. For other conditions, use the modulation signal.

12. 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.

13. Turn the OSC TIMBRE knob to adjust the pitch of the modulating oscillator. The LFO RATE MOD socket and the RATE MOD knob set the amount of the modulation. This is important for creating complex sounds. To set the MODE socket statically to specific synth mode use the low = “/circle.invert” or high = “/circle.invert” socket. You are recommended to use it only when the direction changes. For other conditions, use the modulation signal.

14. 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.
3 synthesis modes available thru the main output are: phase modulation, noise mode and track & hold modulation. There are 3 more modes on the secondary OSC output: phase distortion, tonal noise mode and formant synthesis. Each mode utilizes one or more oscillators. The oscillator section has 3 sound parameters: PITCH, TIMBRE and WAVESHAPE – all of which can be assigned to the main or secondary oscillator.

Kastle is an open source DIY project which runs on two Attiny 85 chips that can be reprogrammed with an Arduino (google: "programming Attiny 85 with Arduino"). One chip is dedicated to sound generation while the other one handles modulation. Several exponents have already tried Kastle and it is now available in a new updated version. Kastle v 1.5 has a 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 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 some quite unique functionality to any modular synthesizer system. It delivers the fun of modular synthesis at a low cost and it is the perfect companion for anyone looking to expand their analog sound palette.

**DIFFERENT RISE AND FALL TIMES**

The LFO and STEPPED generator on Kastle can be synced with other gear. You can use the LFO output to connect to the RATE MOD socket to change the slope time with every new phase. Connect the LFO PULSE out when you want 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. This will allow you to play Kastle in a modular world.

**TIPS & TRICKS**

There are a few of the ones you should try out for sure:

- Connect any LFO signal to the MODE pin to change the synthesis mode on the go. Connect SECONDARY OSC OUT to any of the OSC inputs to see what happens. (OSC OUT, MODE disconnected)
- Connect SECONDARY OSC OUT to the LFO RST pin to create chaotic modulation. (SECONDARY OSC OUT, MODE disconnected)
- Connect the STEPPED output to the LFO RATE socket. Adjusting the voltage generated at the STEPPED output.
- Connect SECONDARY OSC OUT to the LFO RST socket. This results in SAW waveform at the LFO stage). Use the SAW waveform to modulate any of the oscillator parameters (or several synced ramp oscillators. The synced (higher tuned) oscillator is scanning the sine wave depending on how the BIT IN is patched.

**THICK SOUND**

Very similar to linear FM (frequency modulation), phase modulation is a method pioneered by John Chowning and later used by Yamaha in their famous DX synths. Phase distortion, which gives it a very distinct character full of aliasing artefacts. It is a not so common synthesis method. The main sinewave oscillator is going thru a wavetable and is multiplied by the inverse of the lower tuned oscillator. In practical terms, the waveform is folded onto itself and is scanned with a second sawtooth waveform. In modernistic terms (it is a digital synthesizer). The PITCH controls the speed of the playback, the WAVESHAPE controls the loop length of the playback and the TIMBRE controls the secondary oscillator that modulates the amplitude of the final signal. The Threshold (WAVESHAPE) on the comparator sets the pulse which is tuned a few octaves higher than in the normal noise mode. In this mode the loop length will be much shorter and the waveform will be more complex. The Frequency Multiplier (FM) is a feature that allows you to multiply the frequency of one oscillator with another. This is done by connecting the output of one oscillator to the input of another oscillator. The second oscillator is being fed thru the track & hold which means that it is monophonic. The WAVESHAPE parameter which crossfades from secondary sinewave thru soft synced saw (11 o’clock) the PITCH rises in both directions but in a different phase. The TIMBRE parameter is a formant vocally character. There is also the third player of a piece of computer code (that runs the sound core of the Kastle synth) that has very distinct sonic qualities on its own - often referred to as “glitch” in aesthetic terms. However this mode is so purposeful that instead of talking about a mistake we have chosen to keep it.

**FORMANT SYNTHESIS**

This is a not so common synthesis method. The main sinewave oscillator is going thru a & hold circuit. The second oscillator is being fed thru the track & hold which means that it is monophonic. The WAVESHAPE parameter which crossfades from secondary sinewave thru soft synced saw (11 o’clock) the PITCH rises in both directions but in a different phase. The TIMBRE parameter is a formant vocally character. There is also the third player of a piece of computer code (that runs the sound core of the Kastle synth) that has very distinct sonic qualities on its own - often referred to as “glitch” in aesthetic terms. However this mode is so purposeful that instead of talking about a mistake we have chosen to keep it. It holds static voltage. The threshold (WAVESHAPE) on the comparator sets the pulse which is tuned a few octaves higher than in the normal noise mode. In this mode the loop length will be much shorter and the waveform will be more complex. The Frequency Multiplier (FM) is a feature that allows you to multiply the frequency of one oscillator with another. This is done by connecting the output of one oscillator to the input of another oscillator. The second oscillator is being fed thru the track & hold which means that it is monophonic. The WAVESHAPE parameter which crossfades from secondary sinewave thru soft synced saw (11 o’clock) the PITCH rises in both directions but in a different phase. The TIMBRE parameter is a formant vocally character. There is also the third player of a piece of computer code (that runs the sound core of the Kastle synth) that has very distinct sonic qualities on its own - often referred to as “glitch” in aesthetic terms. However this mode is so purposeful that instead of talking about a mistake we have chosen to keep it.