

SoftPop SoftPop SoftPop



Bastl Instruments x Casper Electronics

INTRO

*Thanks to the Bastl community for the endless support and constant inspiration through our shared love of synths and music and fun.
High fives to Václav Peloušek for adding the digital brain to softPop and for meeting my impossible feature requests in style.*

SoftPop is a modular analog noise creature.

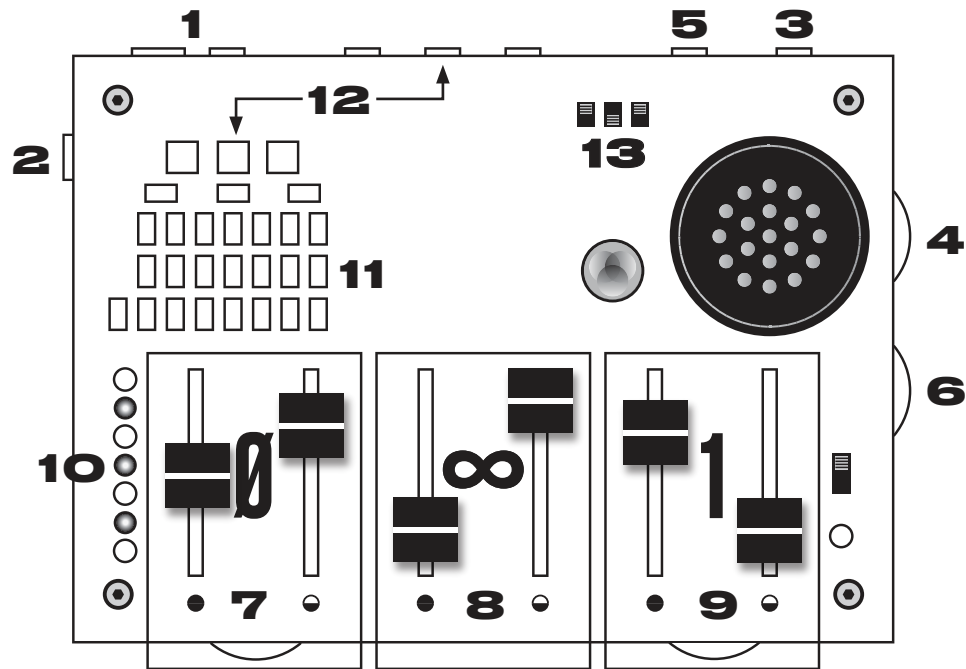
It is playful, stubborn, rowdy and maybe even a little bit wise. The heart of softPop is a wild tangle of feedback, chaos and an oddly familiar organic personality. There is a great amount of complexity in its simplicity and the open architecture enables you to explore all the distant places of its chaotic galaxy. One thing to keep in mind while exploring is that everything affects everything and adjusting certain controls may have a more far reaching impact than you would expect. The patch bay and a *secret* hacking chamber in the back can be used to change the behavior but on its own it's a very sensitive system. I've provided a bunch of examples in this manual that can help you as points of departure. Then it is up to you to trek into the sunset of sonic mayhem.

SoftPop's metal construction, battery power, built-in speaker, and fully modular patchbay make it a truly portable,

experimental sound lab. Take it to the beach or a picnic, let your friends, kids or cats play with it. Connect it to the outside world via the built-in patchbay. Share clocks with your drum machine or let it intuitively sync to whatever signal you feed into its input. Send and receive CVs with your modular synth and configure crazy new sound systems. Process external audio through the analog filter which is full of infinite character. Or use it completely on its own and get to know softPop's unique voice.

**What is it trying to say?
How are 0 and 1 related? Are they alone in the vast blackness of space or will they find a shared purpose in the infinite unknown? Will this bring answers or even more questions?
Maybe you just have to listen... and then explore, connect, unplug and have fun!**

<3, Pete



INTRODUCTION

1 POWER

There are three ways to power softPop:
Wall adapter jack. 7-9 VDC + -
 Plugging in a cable will automatically disconnect the battery power.
Micro USB jack. Power from your computer, power bank or any other USB-format power supply.
Battery compartment (on the back). Takes 4 AA batteries. 10-20 hours run time. Rechargeable batteries are highly recommended.

2 POWER SWITCH

Switches between wall adapter jack or battery and USB power. If one of these sources is not connected (no USB power for instance), then the switch will act as a master power ON/OFF switch. If both are connected, then power will have to be turned off by removing one.

3 OUT JACK

Dual-mono stereo signal suitable for driving headphones or for connecting

to external processors, amps, etc. Plugging a cable into the OUT jack disconnects the speaker. Output comes directly from the Band Pass out of VCF ∞ and is mixed with the AUX socket and external input jack signal via the MIX switch.
See #13 ROUTING section for more info.

4 OUT VOLUME

Adjusts the volume of the speaker and OUT jack.

5 EXT

External audio input jack. Processes external audio signals through VCF ∞. The external signal is also analyzed by the envelope follower (EF) circuit - which intuitively syncs the VCO1.
**See preset "psychic psync" for more details.*

6 EXT VOLUME

Adjusts the volume of an incoming signal connected to the EXT jack. The level can

be adjusted from silence up to 50x gain (34 dB) for amplifying low-level signals (line, piezo, etc.)

7 VOLTAGE CONTROLLED OSCILLATOR 0 (VCO0)

VCO0 has three controls:

● **Pitch fader.** Adjusts the pitch from LFO to audio ranges.

○ **Modulation fader.** Applies modulation to the pitch of VCO0.

The source of modulation is normalized (internally connected) to the output of the Track&Hold. This signal can be partially overridden by patching a signal into the VCO0 MOD socket in the patchbay.

● **Fine tune thumbwheel.** Adjusts the pitch of VCO0 up and down approx. 5 semitones.

**See the Patchbay section for more info on connecting signals in and out of VCO0.*

8 VOLTAGE CONTROLLED FILTER ∞ (VCF∞)

VCF ∞ has 3 controls:

● **Cutoff level fader.** Adjusts the tone of the filter from high to low.

● **Modulation fader.** Applies modulation to the cutoff of VCF. The source of modulation is normalized (internally connected) from a mix of VCO0 \square + VCO1 \wedge . This signal can be partially overridden by patching a signal into the ∞ MOD socket in the patchbay.

Feedback thumbwheel. Use this to increase the “sharpness” of the filter and introduce self-oscillation. Increasing feedback (also known as resonance or regeneration) of the filter will also increase signal distortion at certain cutoff levels.

**See the “Patchbay” section for more info on connecting signals in and out of VCF.*

9 VOLTAGE CONTROLLED OSCILLATOR 1 (VCO1)

VCO1 has 4 controls:

● **Pitch fader.** Adjusts the pitch from LFO to audio ranges.

● **Modulation fader.** Applies modulation to the pitch of VCO1. Modulation will affect pitch and wave shape. The source of modulation is normalized (internally connected) to a mix of VCO0 \wedge + VCO1 inverted \square and the EXT (external input) jack and socket. This signal can be partially

Introduction
overridden by patching a signal into the VCO1 MOD socket in the patchbay.



VCO1/MOD triangle out square out

Mode switch and button.

Switches the running mode of VCO1 from a repeating oscillation to a one-shot envelope. The envelope can be triggered with the mode button as well as the VCO1 SYNC input socket.

**See the “Patchbay” section for more info on connecting signals in and out of VCO1.*



10

PATTERN GENERATOR and QUANTIZER

See “Let’s make a pattern” section for more info.

11

PATCHBAY

(outline = output; no outline = input)
Cross-patch the guts of softPop or connect to external gear to make something crazy happen.

**See the “Patchbay” section for more info on using the patchbay.*

12 SOCKET TO JACK ADAPTERS. (A, B, C)

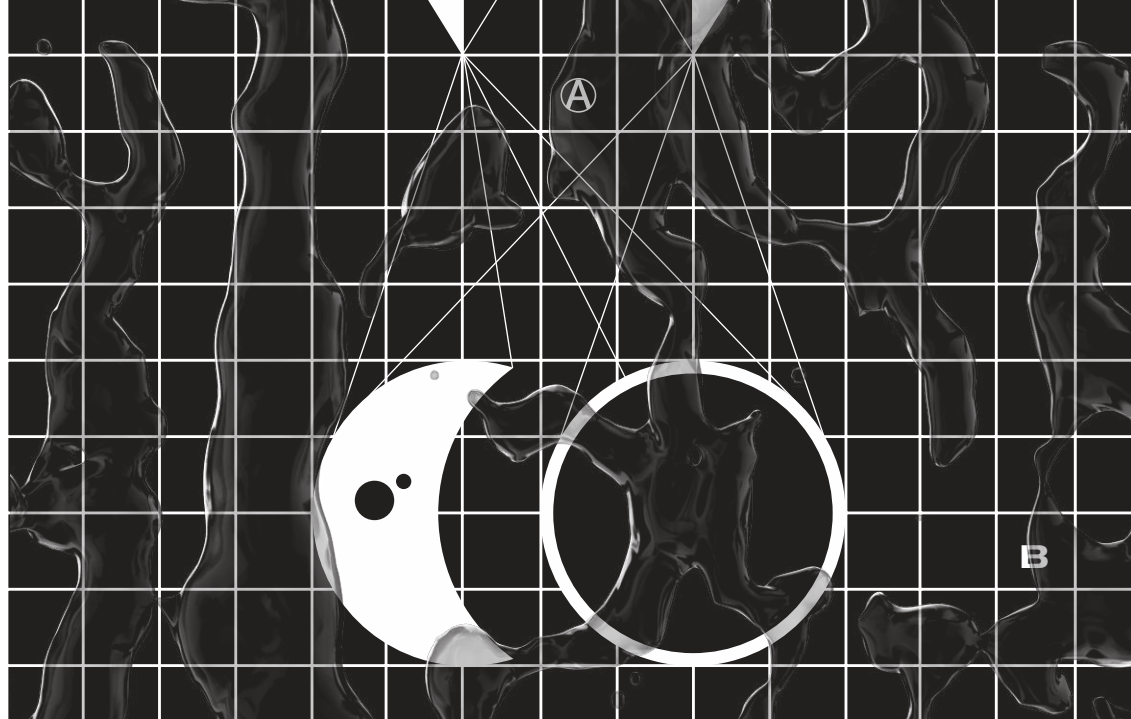
Allows any socket in the patchbay to be connected to external equipment.
**See the “Patchbay” section for more info on using the patchbay.*

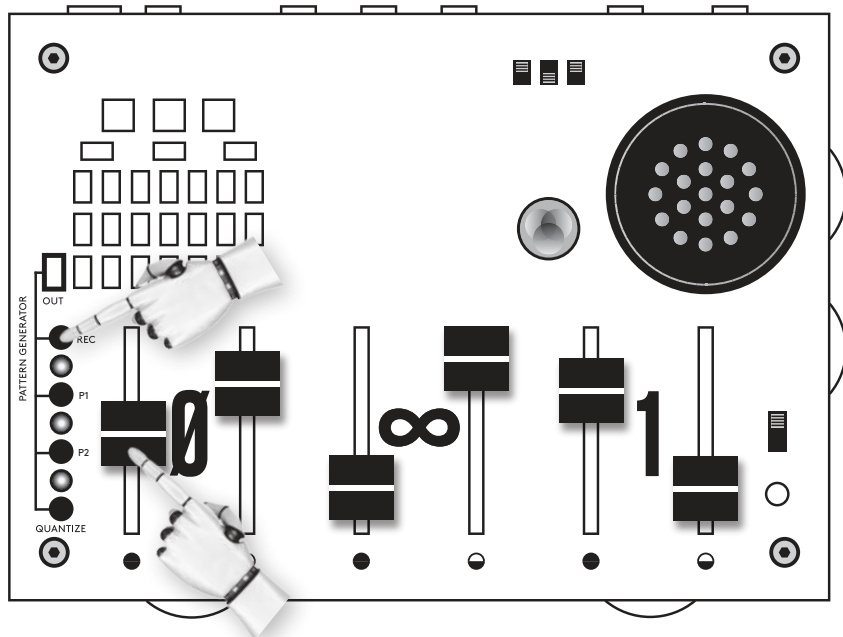
13 ROUTING SWITCHES

Led switch. Turns the little magic color orb on or off.

∞ -(O+1) switch. In the down position, it will disconnect VCO0 and VCO1 from the input of VCF ∞ . This is useful if using softPop only as a filter for external audio signals. VCO0 and VCO1 will still be available as modulation signals but will not enter the audio path of VCF unless manually patched into the VCF ∞ EXT input socket.

Mix switch. In the up position, it routes some of the dry signal from the EXT input jack directly to the final mix. This gives you a mix of the filtered and unfiltered signals.





LET'S RECORD A PATTERN

1. Set faders as shown above. 2. Press and hold RECORD button. 3. Slide VCO0 pitch fader up and down. 4. Release RECORD button

PATTERN GENERATOR

The pattern generator creates looping sequences by recording the behavior of VCO0. These sequences control the pitch of VCO0 and are also available as a voltage source via the pattern generator OUT jack in the patchbay. This signal can be used to modulate various parameters of softPop or even external equipment via the A, B, C jack adapters

**See the "Patchbay" section for more info*

Rec button. Press and hold to record a new pattern.

P1 button. Selects pattern 1. Tap once to activate pattern playback. Tap again to deactivate.

P1 led. Indicates that pattern location 1 is selected and in playback mode.

P2 button. Select pattern 2. Tap once to activate pattern playback. Tap again to deactivate.

P2 led. Indicates that pattern location 2 is selected and in playback mode.

Out socket. Outputs pattern playback as a stepped voltage.

SELECTING A PATTERN

- Tap pattern button P1 or P2 to select a pattern.
- Playback will be activated and the selected pattern LED will turn on.
- Tap the button again to stop playback.
- The light will turn off but the pattern will still be selected in the background.

RECORDING A PATTERN

(diagram on page3)

- Set the rate of VCO1 to a relatively low speed *(see diagram)*. Record and playback are clocked by VCO1.
- Press and hold the RECORD button to activate recording.
- Move the pitch fader up and down. The pattern generator is recording the behavior of VCO0, so make sure it's doing something.
- Release the RECORD button to stop recording and activate playback of the pattern.
- Pattern lengths are quantized to 2, 4, 8, 16, 32, 64 or 128 steps.

- Press RECORD to erase the pattern and create a new one.
- The recorded patterns will be stored in the memory even after softPop is turned OFF and ON again.

!Bonus!

Try patching pattern OUT to VCF ∞ MOD. Try patching it to VCO1 CV. Try both at the same time.

Tech notes

- The pattern generator works by reading the pitch of VCO0 and storing the readings as values in a multi-stepped sequence.
- Pulses from VCO1 trigger the readings and advance the pattern to the next step. If the rate of VCO1 is very high it will trigger several readings and steps in a short time. If it is very low it will trigger very few. Therefore the length of a pattern depends on how long you hold the RECORD button and the rate of VCO1.
- This method gives users an imprecise but extremely fast and flexible way to generate looping patterns. With some practice, it's easy to create deliberate

patterns, but for the most part, it functions best as a random looping pattern source.

QUANTIZER

The quantizer converts the continuously variable pitch range of VCO0 to a stepped scale of chromatically tuned notes.

Quantize button - Tap to activate or deactivate the quantizer.

The Quantizer

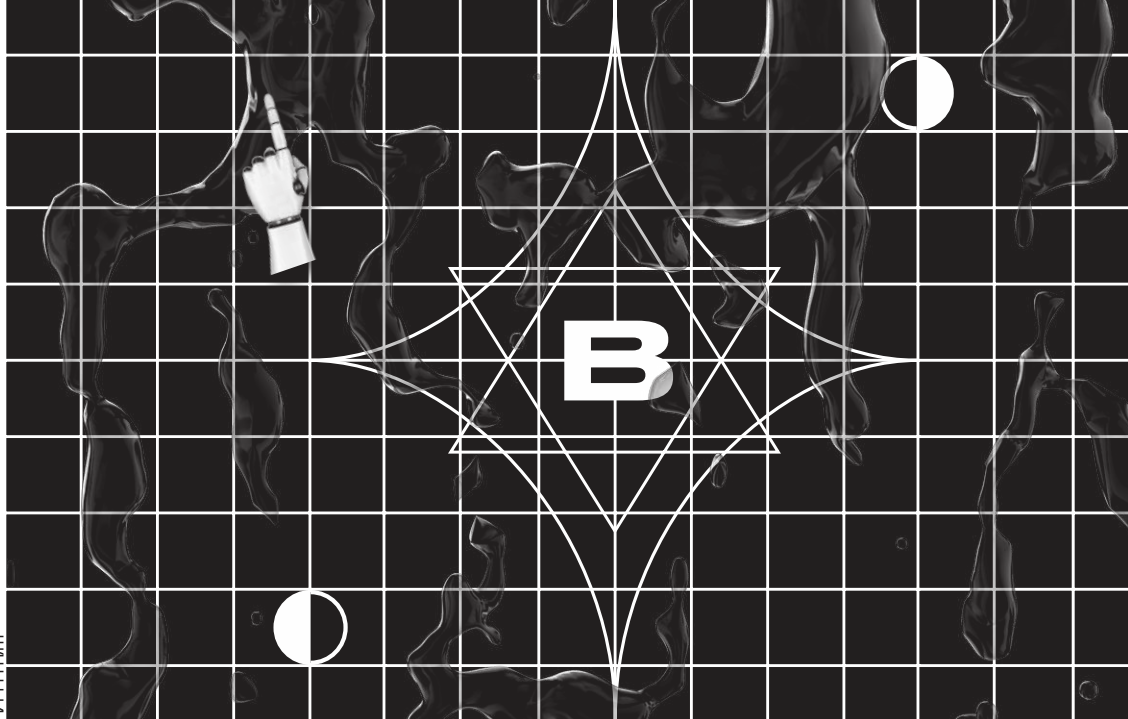
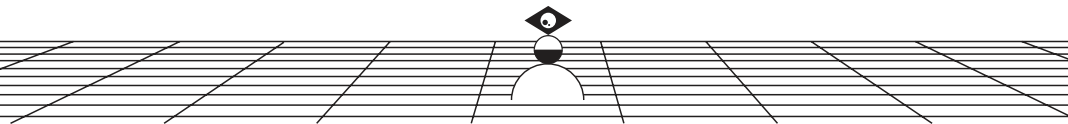
Quantize led - Indicates if the quantizer is on or off.

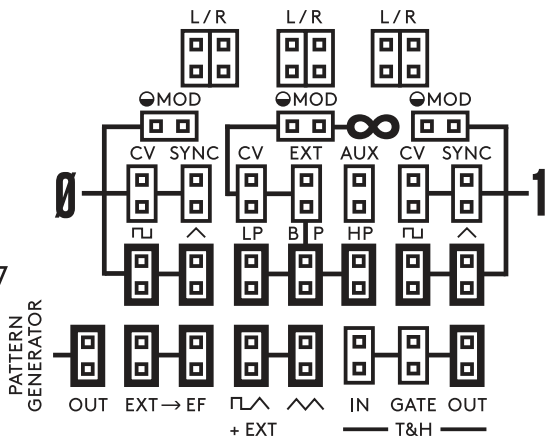
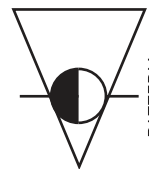
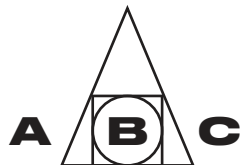
Tech notes

- The quantizer uses a pitch correction method to keep VCO0 in tune. It does this by "listening" to the pitch of VCO0 and bumping it with small CV signals to the closest preset note.
- This method tames the beast (VCO0)

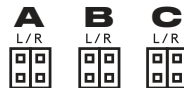
but without removing its analog quirks and sassy style.

- The quantizer must listen to VCO0 before determining if the pitch should be altered. This introduces a delay to the quantizing operation and means it will have little effect when the pitch of VCO0 is very low or rapidly modulating.





SOCKET TO JACK ADAPTERS (A, B, C)



Converts socket connections in the patchbay to 3.5 mm jacks for connecting with the outside world. Use to share audio signals, control voltages, and clocks with your modular synths, drum machine and beyond. They can also be used to take multiple sounds from the patchbay and output them as separate signals to be independently processed.

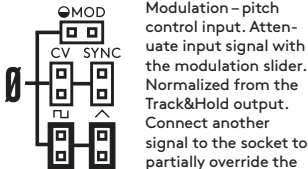
- Each adapter has two sockets which correspond to the right and left channels of the corresponding stereo jack (A, B or C) located on the back of softPop. This means it is possible to patch up to six signals in and out of the patchbay.
- In MOST cases you will only use the "left" socket (mono cables only use the left channel).

PATCHBAY

Tech notes

- When using mono cables only the "left" socket will pass a signal and the "right" socket will be connected to ground.
- When nothing is plugged into the jack, the "right" socket will be normalized to ground. This can be useful for patchbay configurations that rely on a ground connection, such as connecting capacitors from voltage outputs to ground, which will introduce slew to the signal. !!Keep in mind that any sockets connected to any of the "right" sockets will be grounded when the cable is unplugged from the corresponding jack!!

VCO∅ – Voltage Controlled Oscillator ∅

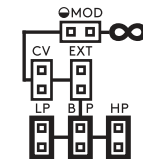


- MOD (input) - Modulation - pitch control input. Attenuate input signal with the modulation slider. Normalized from the Track&Hold output. Connect another signal to the socket to partially override the

normalization.

- CV (input) - Control Voltage - direct pitch control input (no attenuator). 1 volt per octave scaling over 2-3 octaves.
- SYNC (input) - Connect an external signal to reset the oscillator waveform.
- □ (output) - Square wave output.
- ^ (output) - Triangle wave output.

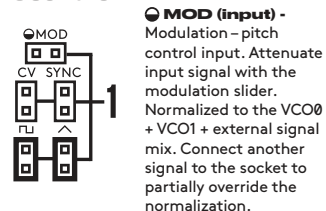
VCF∞ – Voltage Controlled Filter ∞



- MOD (input) - Modulation - cutoff control input. Attenuate input signal with the modulation slider. Normalized from a mix of VCO∅ + VCO1. Connect another signal to the socket to partially override the normalization.
- CV (input) - Control Voltage - direct cutoff control input.
- EXT (input) - External signal - input to the filter. Can be audio or DC signals.

LP (output) - Low Pass – filter output.
BP (output) - Band Pass – filter output.
HP (output) - High Pass – filter output.

VCO1 – Voltage Controlled Oscillator 1



MOD (input) - Modulation – pitch control input. Attenuate input signal with the modulation slider. Normalized to the VCO0 + VCO1 + external signal mix. Connect another signal to the socket to partially override the normalization.

CV (input) - Control Voltage – direct pitch control input (no attenuator).
SYNC (input) - Connect an external signal wave to reset the oscillator waveform.
S (output) - Square wave output.
A (output) - Triangle wave output.



OUT - Outputs looping sequences of stepped voltages.

See pages “Let’s record a pattern” for more info on recording and using patterns.

Patchbay

EXT (output) - External signal. Mix of the external audio input jack and EXT (input) socket.

EF (output) - Envelope Follower. Envelope signal derived from the EXT (output) signal – a control voltage that represents the loudness of the incoming signal. Can be used as a modulation source. Use the EXT (input) in the filter section of the EXT (input) jack as input for the EF.

S + EXT (output) - A mix of VCO0 S, VCO1 A and the EXT input signals.

A (output) - A mix of VCO0 A + VCO1 A waves. Especially useful for filter modulation.

AUX (input) - Patch signals directly to the final output mix (post filter).



T&H Track and Hold

Track&Hold is a circuit that watches a modulating voltage (CV or audio), then either passes that signal directly to the output (tracks – GATE HIGH) or holds the voltage at a steady level (holds – GATE LOW). It is primarily used as a pseudo-random stepped voltage source.

IN - Normalized from the band pass filter output. Connect signal to override normalization

GATE (input) - Normalized to VCO1 square wave output. Connect signal to override normalization.

OUT - Modulating voltage output. See diagram below.



HIGH = TRACK IN

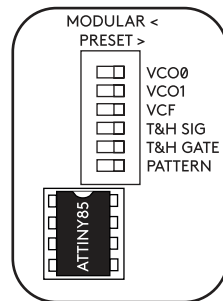


LOW = HOLD OUT

Tech notes

- By default, the T&H is gated by VCO1. Adjusting the VCO1 modulation slider will change the shape (pulse width) of VCO1 and dramatically impact the T&H behavior.
- Slide the VCO1 modulation fader all the way up to achieve a classic Sample&Hold effect.
- Slide the fader down to introduce unstable states, and feedback.
- Try patching T&H OUT to VCF ∞ MOD.

THE SECRET CHAMBER



This section is located on the back of the housing and is for advanced users who want to reconfigure the functionality of their softPop. If you are new here, then leave this section alone and enjoy the deep weirdness of softPop as it is. With the help of the secret

Patchbay

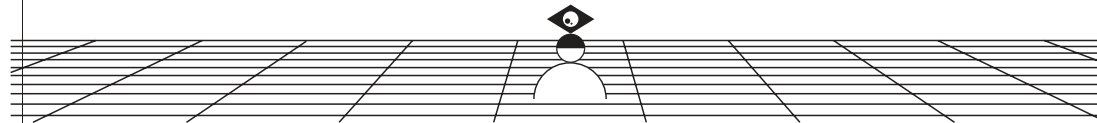
chamber, softPop can be turned from a semi-modular into a fully modular synth – where patch cables are required to produce sound.

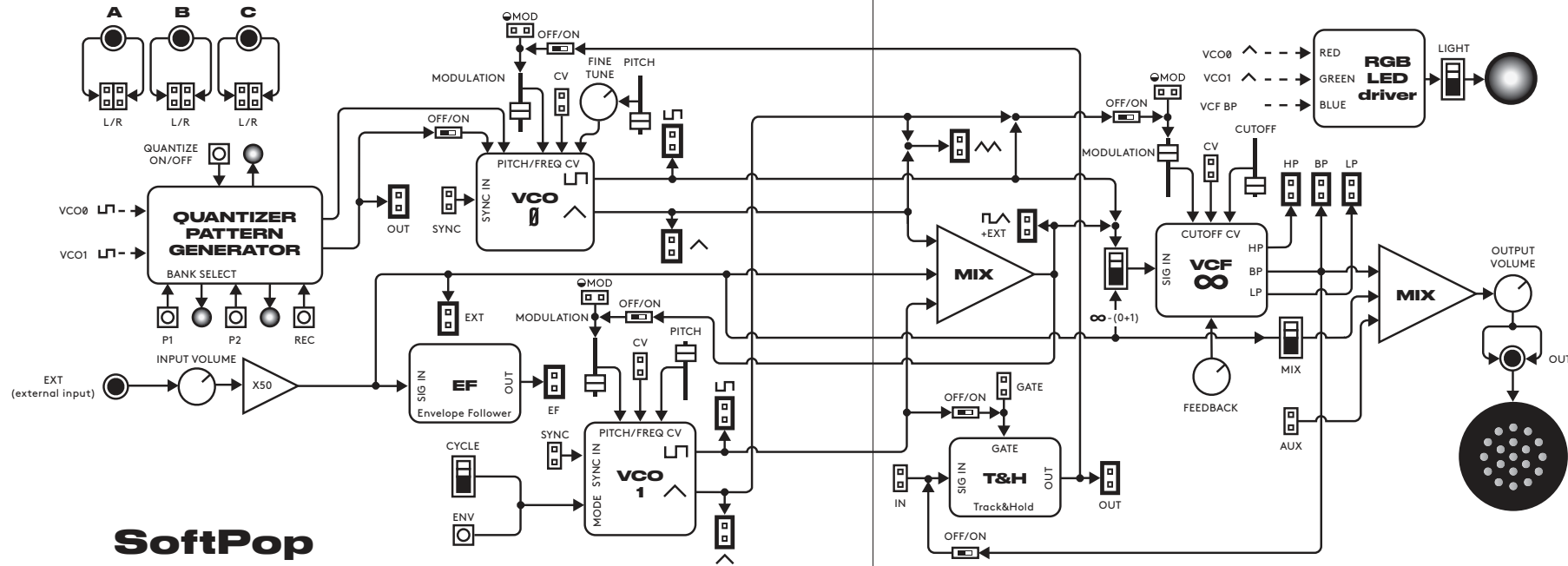
NORMALISATION SWITCHES

At its core, softPop is a fully modular synthesizer. Several connections have been made throughout the system to give it a specific personality, but if these connections are broken, then the system can be reconfigured any way the user likes. I happen to like the way the system is configured;) but for those who know what’s up, here are some switches that you can use to make or break the pre-set normalizations.
VCO0 <- TRACK&HOLD.
VCO1 <- VCO0 A + VCO1 inverted S + EXT jack and socket.
VCF <- VCO0 S + VCO1 A.
T&H SIG <- VCF BP.
T&H GATE <- VCO1.
PATTERN -> VCO0 CV (input).









ATTINY85 (pattern generator and quantizer)

The ATTINY85 is a little microcontroller that analyzes VCO0 and VCO1 and outputs two variable voltages. One goes directly to the pitch CV input of VCO0 and the other is available in the patchbay. The connectivity is relatively simple and the code is open-source. If you are interested in writing your own, you can find diagrams and code online at [bastl-instruments](https://github.com). “github”





Legend

-  = input
-  = output
-  = LED
-  = 3.5mm jack
-  = thumbwheel potentiometer
-  = secret chamber switch
-  = routing switch
-  = push button

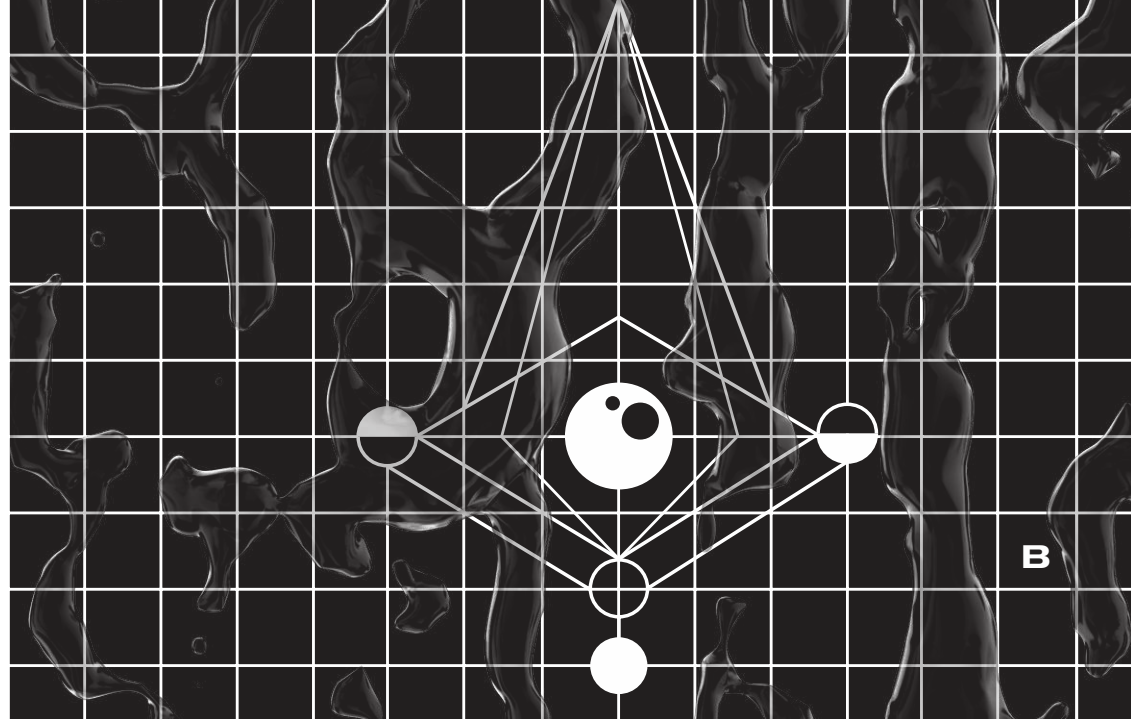
SoftPop

FEATURES

- fully analog core and signal path
- 6 faders for controlling two VCOs and VCF and their cross modulations
- two wide range triangle-core VCOs 0 & 1
- quantizer for VCO 0 (auto-tuner)
- VCO 1 has variable waveshape via the modulation setting
- ∞ resonant state variable VCF (bandpass, lowpass, highpass)
- external input with gain and envelope follower for intuitive sync of VCO 1
- track & hold circuit for stepped modulations
- looping pattern generator with two patterns P1 and P2
- RGB led for psychedelic experience
- 25-point patchbay
- secret hack chamber at the back for adventurers
- built-in speaker
- size 15 x 11 x 5 cm

WHAT'S IN THE BOX

- softPop
- Manual
- Patchcables set
- Poster
- Sticker



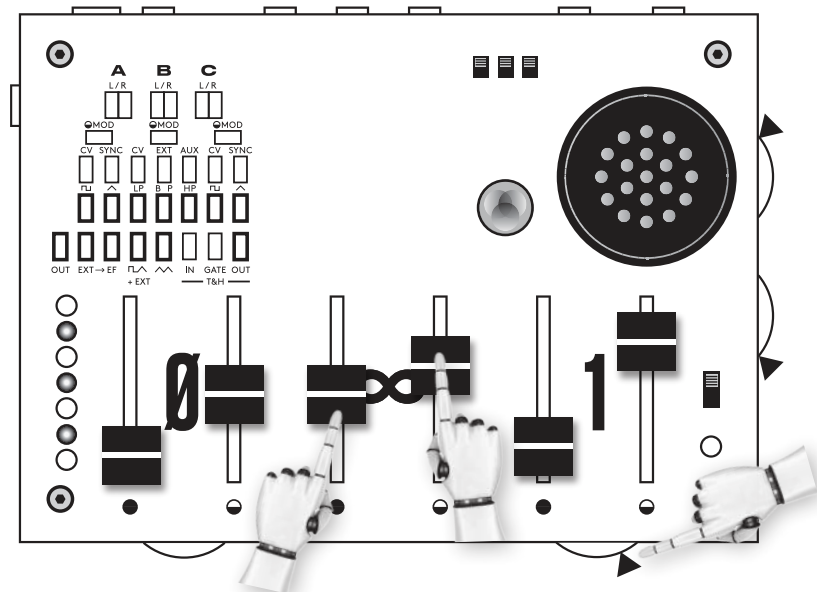
PRESETS:

FIRST

ENCOUNTER

SOFT POPS

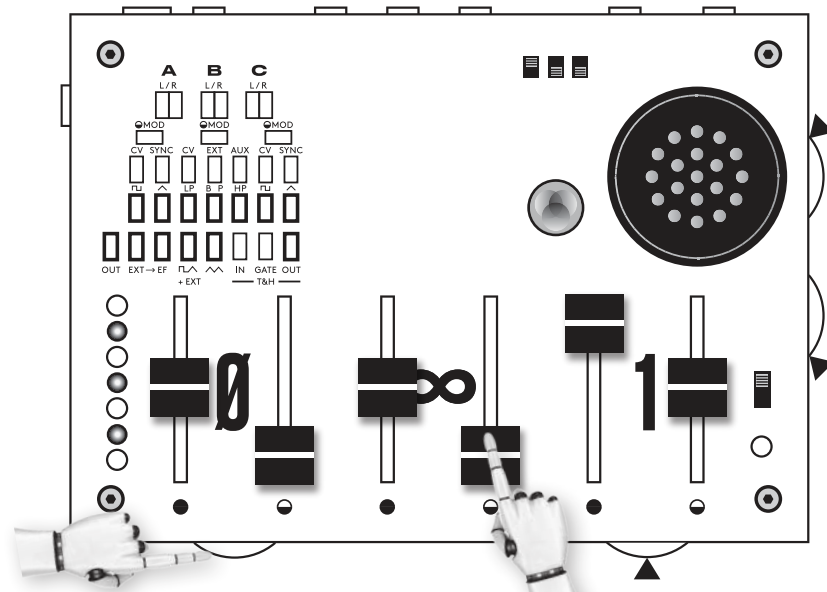
**Carefully adjust the feedback knob to the point just before the filter starts to oscillate.*



DRONE SHOWERS

** Turn VCO0 fine tune to dive into the drone.*

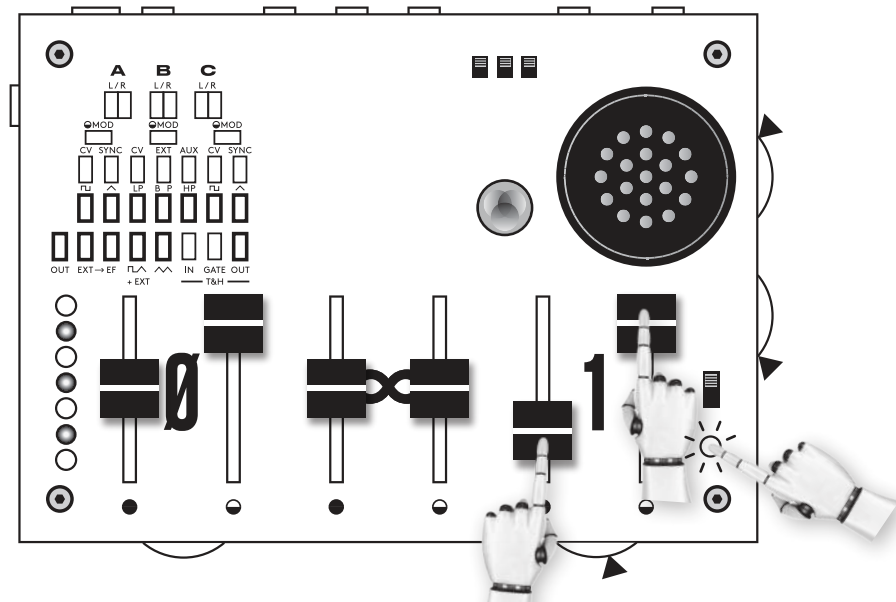
** Adjust ∞ to make the drone more intense.*



BABY STEPS

* Set the rate with 1 ●. * Adjust 1 ● to decide if baby walks forward or backward.

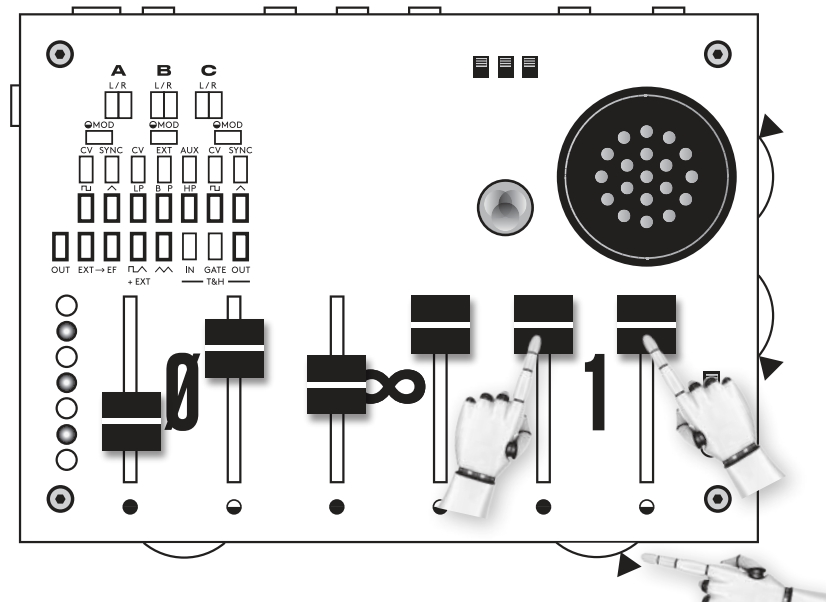
* Press button to make baby stand still and adjust ∞ ● to talk.



FEAR OF THE MAZE

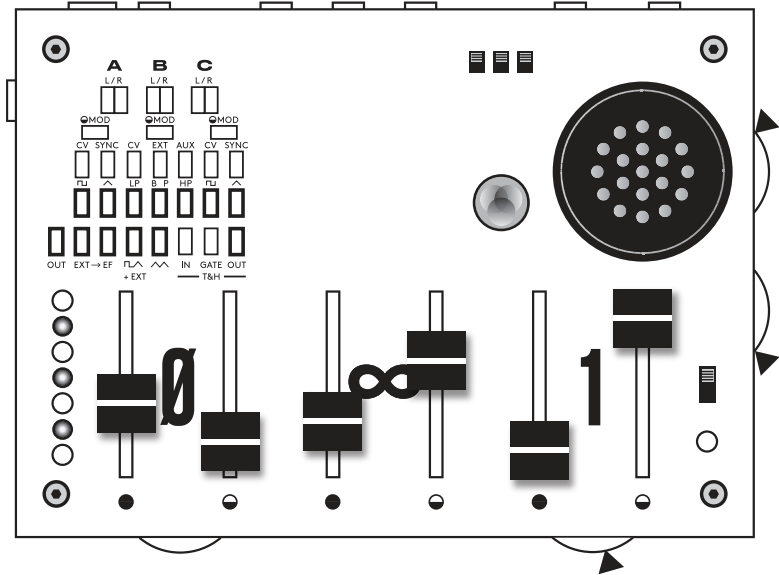
* Conquer your fears!

* Use VCO1 ● and VCO2 ● to navigate the maze.

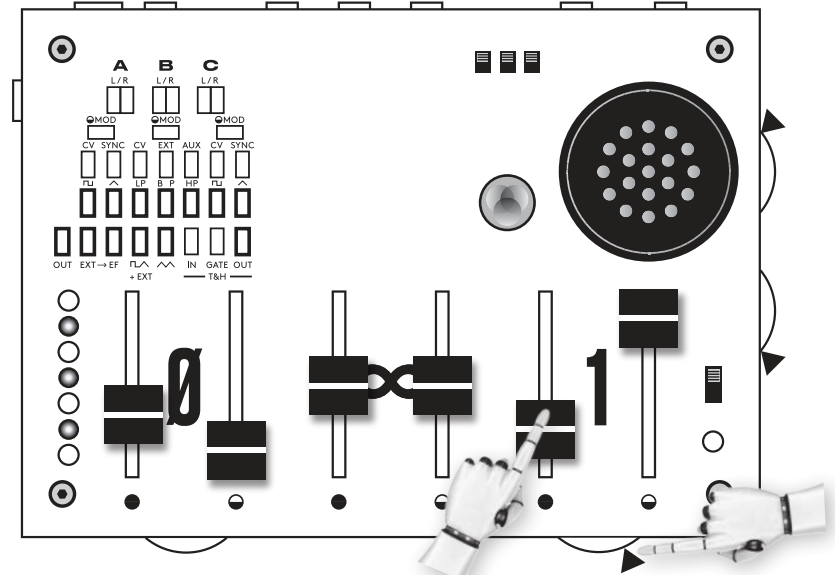


DOOM

**Set and leave until the batteries die * Don't touch * Nothing matters*



MEMORY GUN



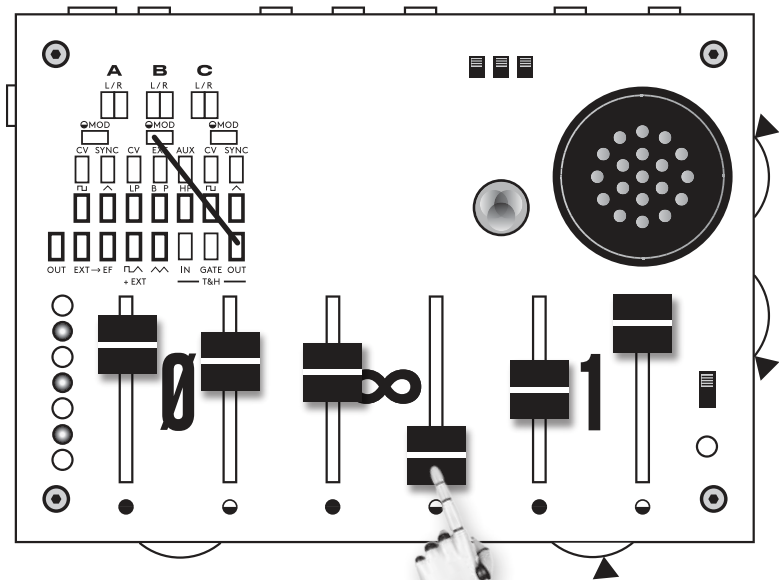
PRESETS:

PATCHBAY

EXPLORATION

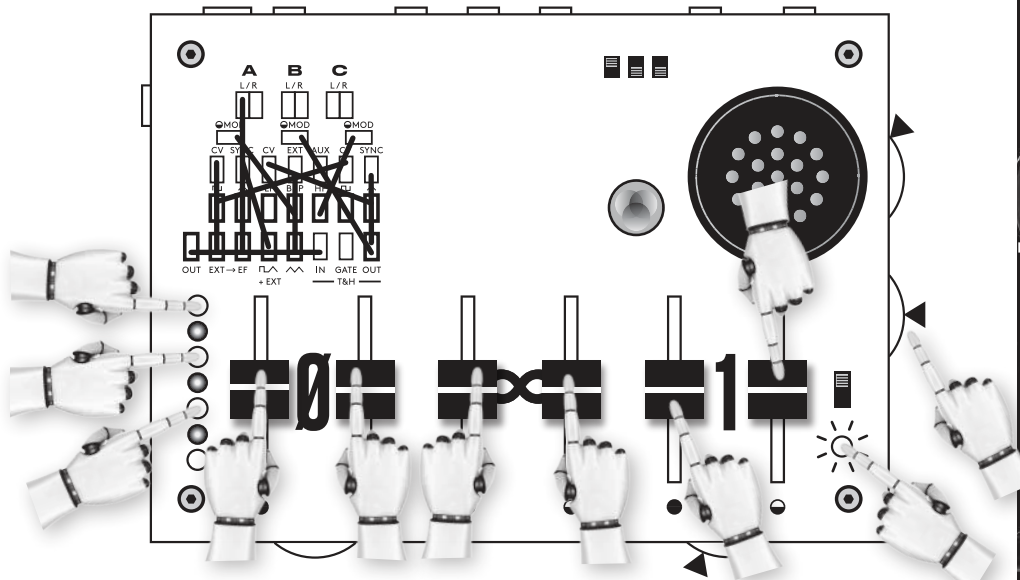
HELLO COMPUTER

*Adjust ∞ to increase data funkiness.



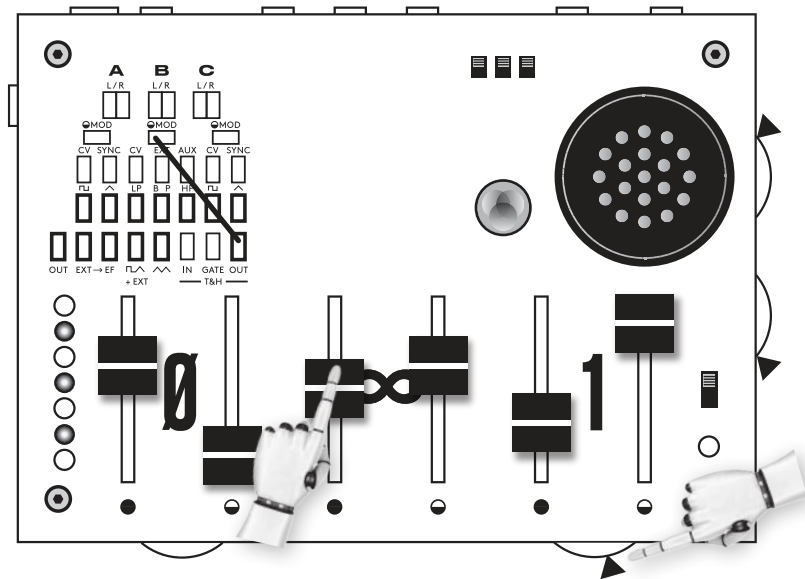
BURGER TIME

*It's burger time.



CRITTER PUSH

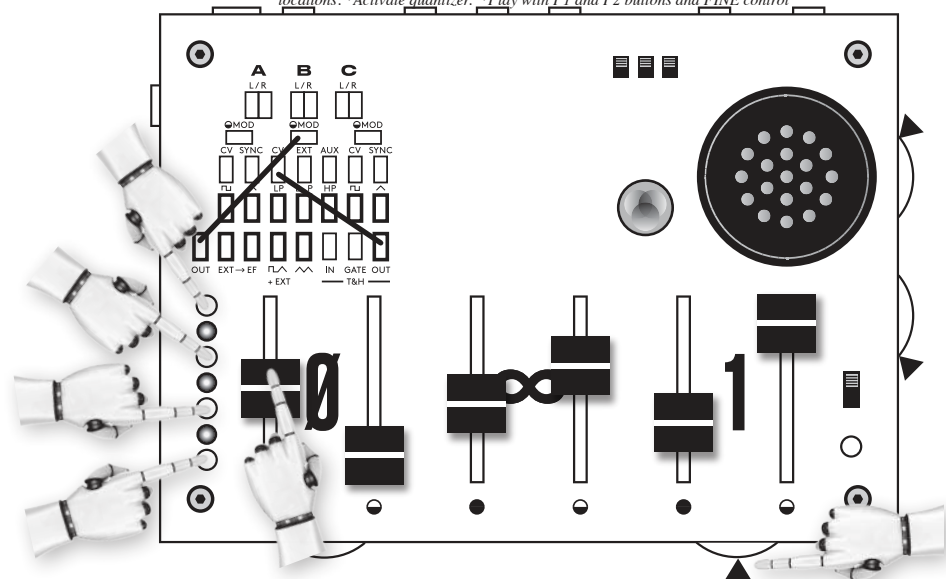
**Let the critters do their work*



CRITTER PULL

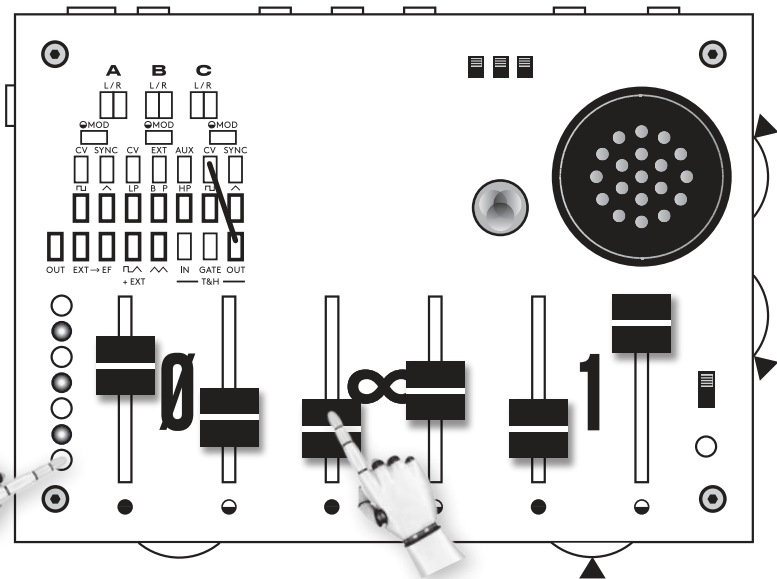
Turn off the PATTERN switch in the SECRET CHAMBER

**Press and hold REC *Slide VCO0 up and down then release REC. *Record a pattern in both pattern locations. *Activate quantizer. *Play with P1 and P2 buttons and FINE control*



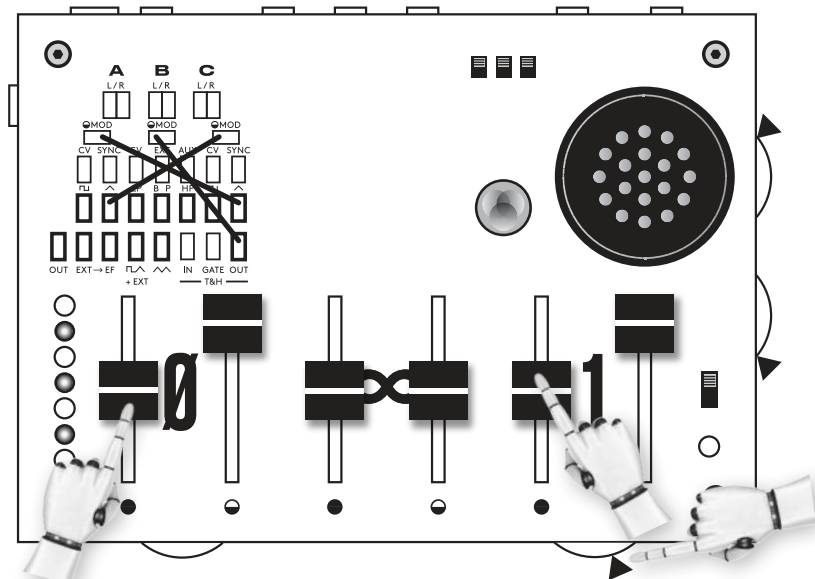
DRUNK DATA

...



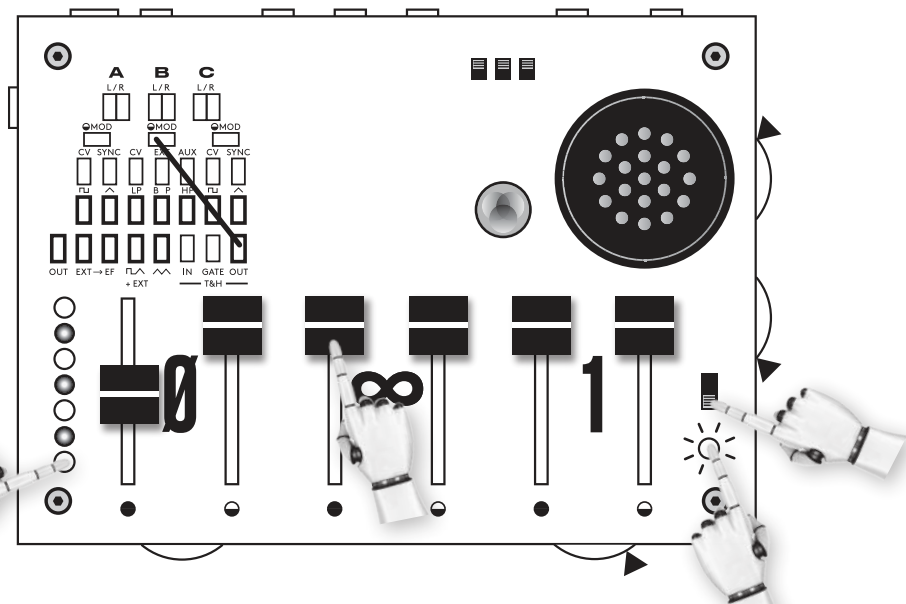
KRISS KROSS

**Play with VCO0 and VCO1 faders to make it jump*

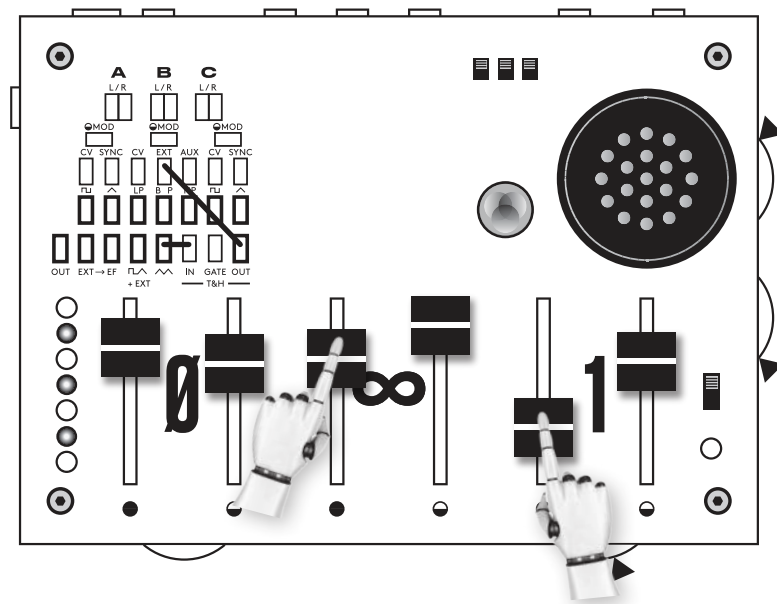


TAP OUT

** Tap it!*

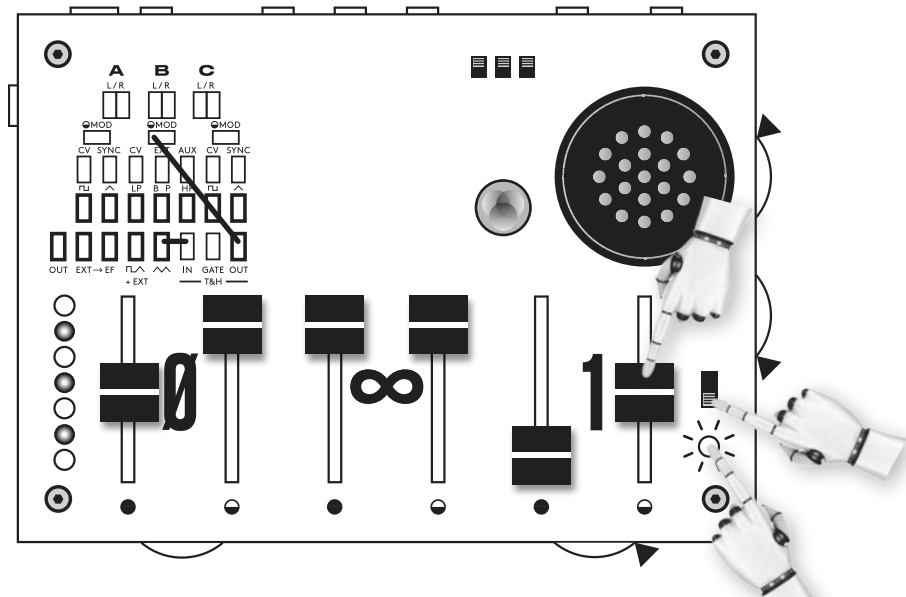


FORMULA ONE



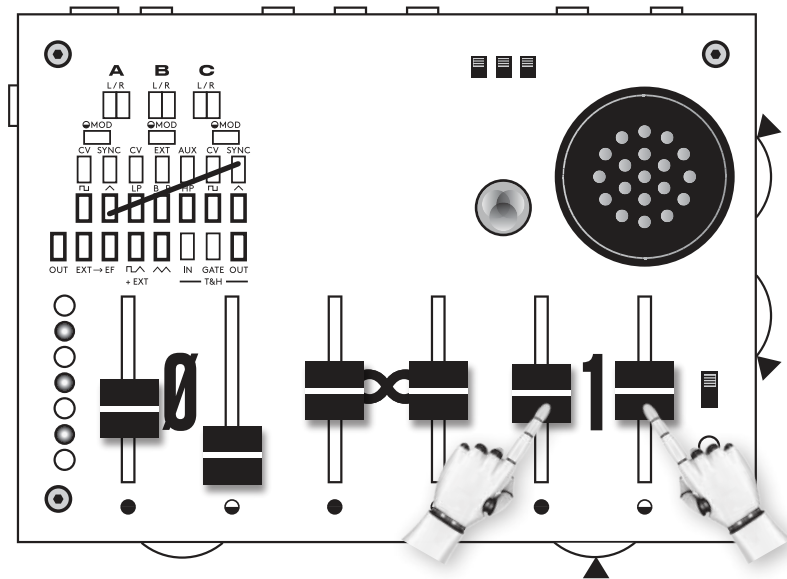
SPACE EXCHANGE

*Switch VCO1 mode to ENVELOPE.
*Tap VCO1 mode button to send a message.



SINK

*Slide VCO1 up and down to create different syncing sounds.
*Adjust VCO1 for more chaos.



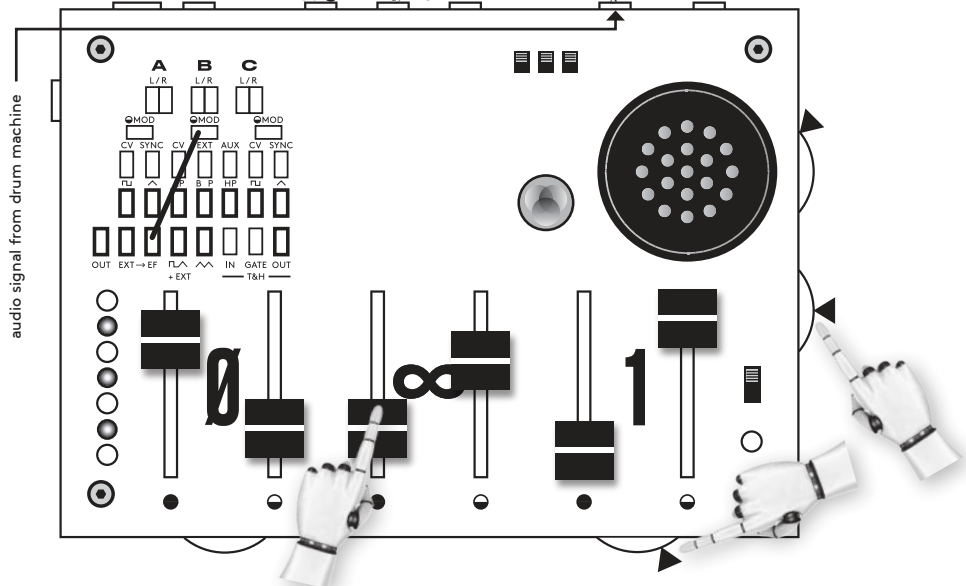
PRESETS:

PLAYING

WITH OTHERS

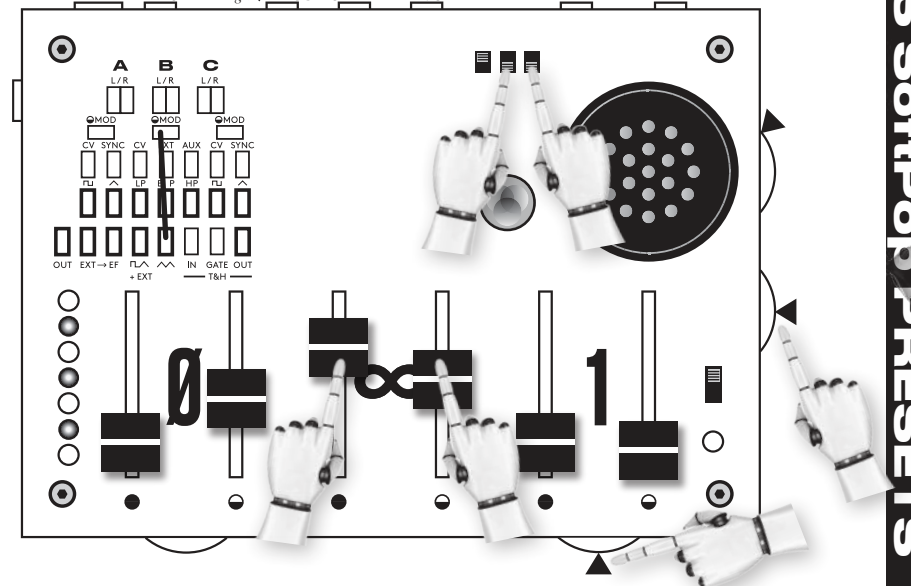
PSYCHIC PSYNC

*Plug audio signal from drum machine into EXT jack.
 *Adjust EXT volume until the signal is loud but not distorting.
 *Tweak ∞ like crazy. *Get into it. No one is watching.



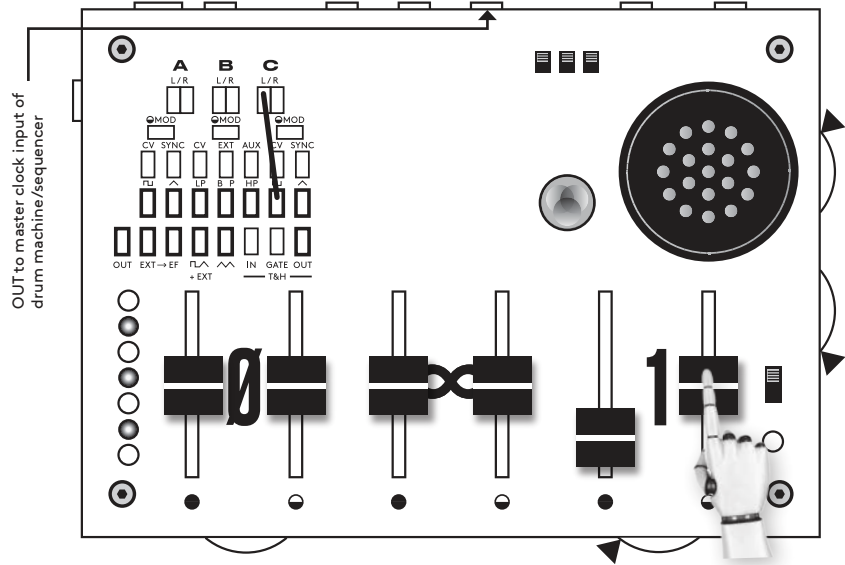
EXTERNAL PROCESSOR

*Turn ROUTING switches OFF.
 *Adjust EXT volume. Can be driven to distortion. *Play with ∞ controls.
 *Connecting \wedge to ∞ MOD will make VCF modulation nice and smooth.



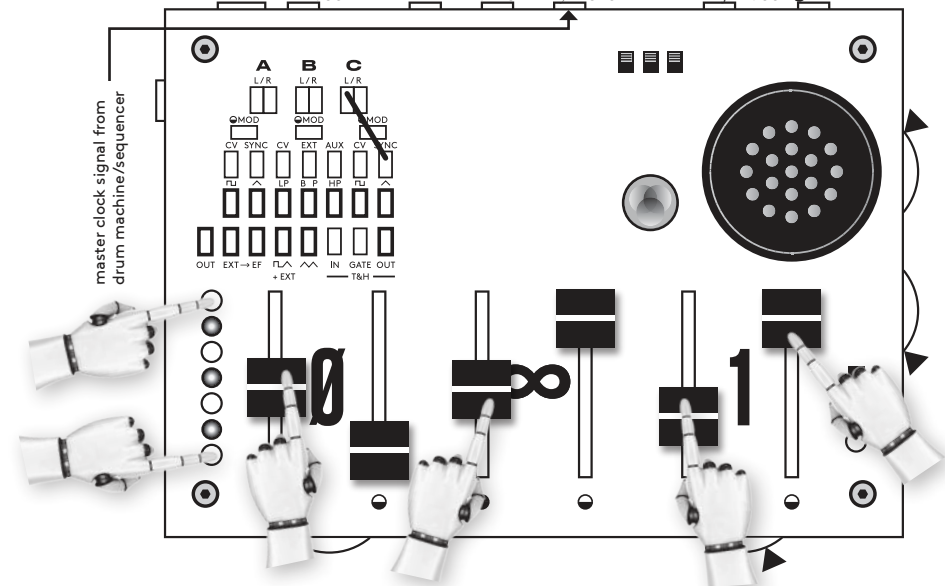
TIME MASTER

*Connect VCO1 **FL** to master clock input of a drum machine, sequencer, etc via the socket to jack adapter.
 *Try moving VCO1 **MOD** fader. The rate will increase and become more unstable as you move it up.



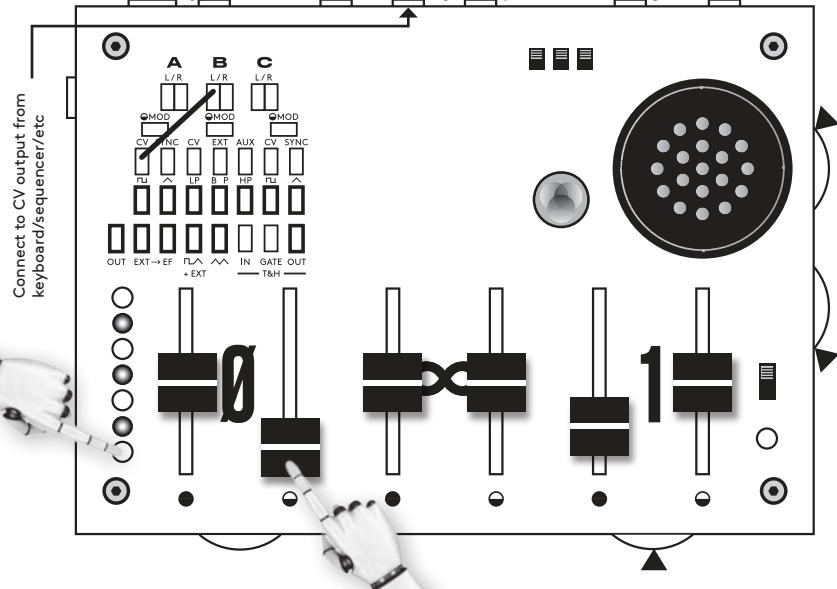
TIME SLAVE

* Connect clock signal from drum machine to VCO1 sync socket via the jack adapter
 * Press and hold REC * Slide VCO0 **MOD** up and down then release REC
 * Turn VCO1 mode switch to ENVELOPE. Try in CYCLE mode and adjust VCO1 **MOD**



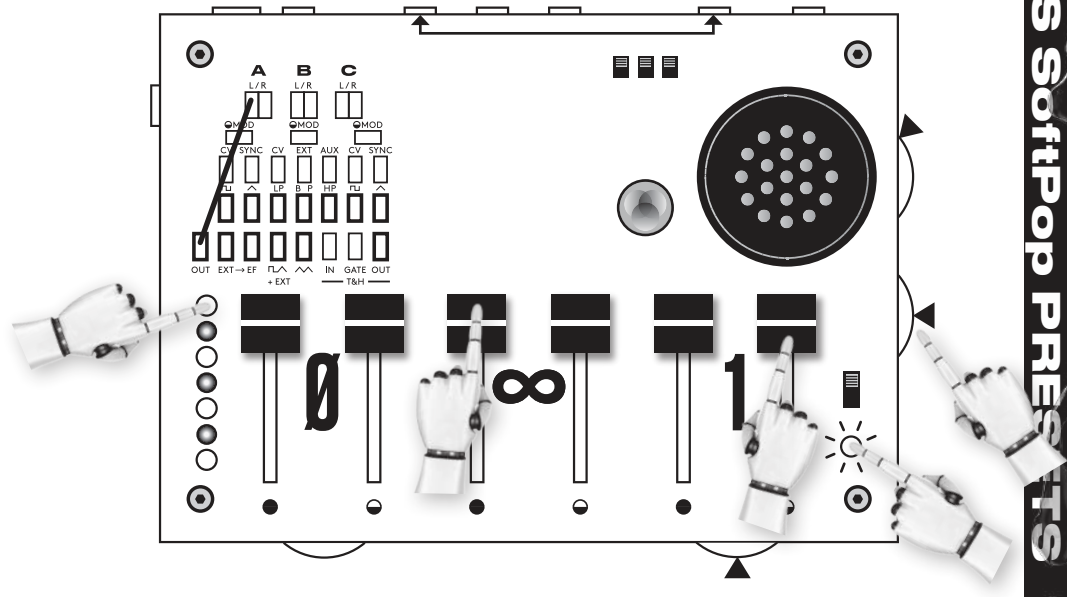
PITCH SLAVE

*Connect CV output from keyboard (or any other CV source) to VCO0 CV input via the jack to socket adapter. *Increase VCO0 to introduce randomize the pitch. *Set VCO1 all the way up for stepped random notes (while VCO0 is up) then try with and without the quantizer.



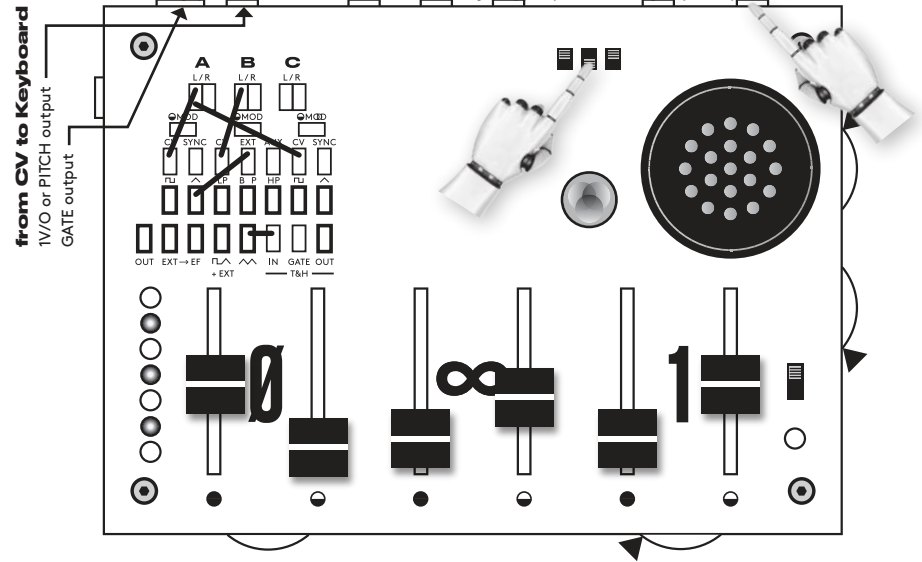
MAX BLAST

*Set all faders at max. *Press and hold REC button. *Release REC and enjoy the max blast. *Tweak the EXT volume control for extra blast.



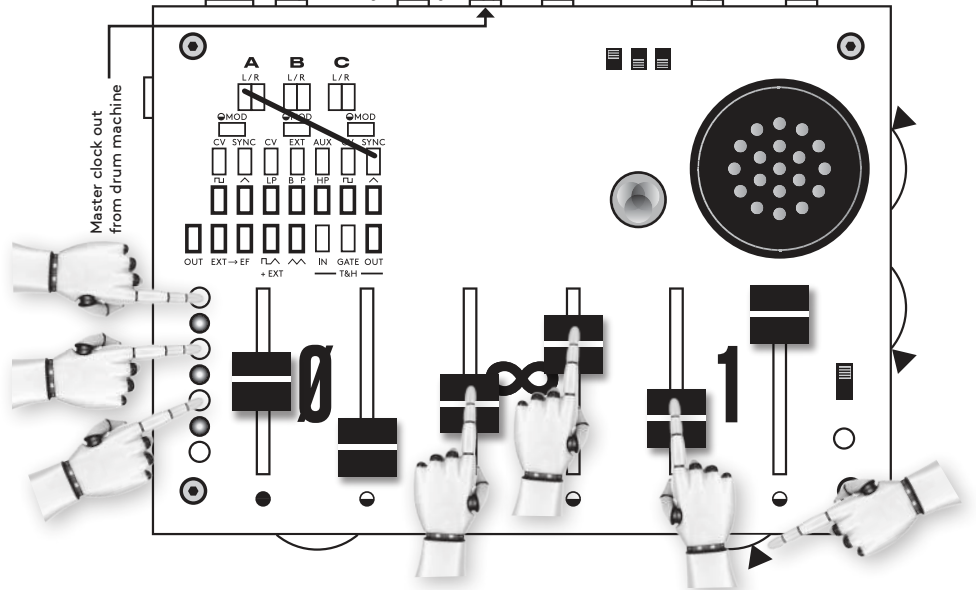
SYNTH VOICE

* Connect CV or PITCH output from keyboard that produces 1 volt per octave CV signals.
 * For a traditional synth voice, plug the main OUT of the softPop to the input of a voltage controlled amplifier (VCA). Control the VCA with an envelope trigger by the GATE output of the keyboard.



ACID

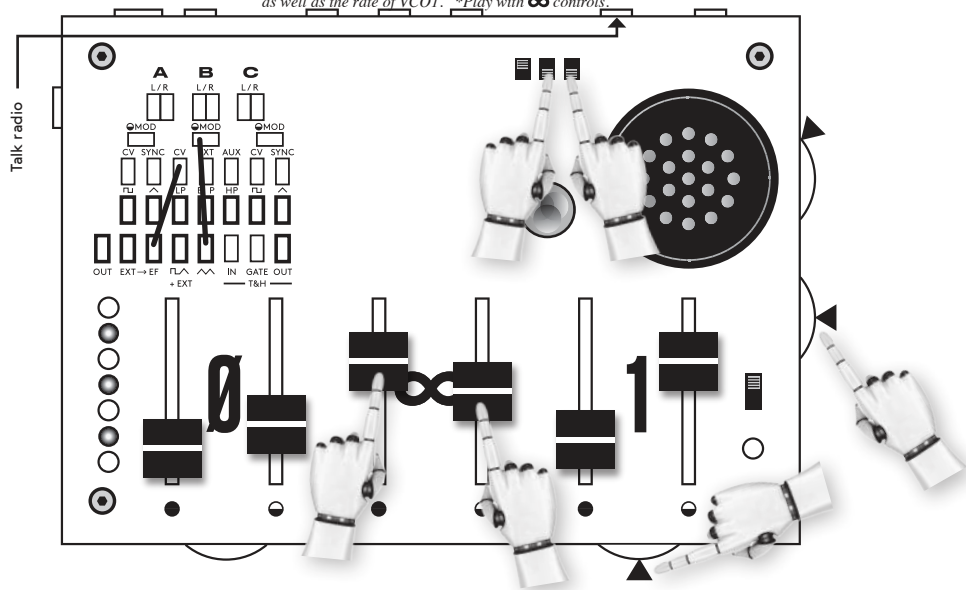
* Press and hold REC. * Slide VCO1 up and down then release REC. 3. Record a pattern in both pattern locations. * Tweak the filter for the acid sass. * Adjust VCO1 to get a softer or sharper envelope. * If you turn it up "too much" it will go nuts.



MIDNIGHT FM

**Turn ROUTING switches OFF.*

**Adjust EXT volume. Amplitude will impact the depth of the envelope from the EF socket as well as the rate of VCO1. *Play with ∞ controls.*



SoftPop is a modular analog noise creature.

It is playful, stubborn, rowdy and maybe even a little bit wise. The heart of softPop is a wild tangle of feedback, chaos and an oddly familiar organic personality. There is a great amount of complexity in its simplicity and the open architecture enables you to explore all the distant places of its chaotic galaxy.