Missed Opportunities

Missed Opportunities (or as we often call it, “Missed Ops”) can be described as a slim, convenient way to add life and randomization to drum beats. At its core, it’s a set of probabilistic gates for pulse signals (similar to a Bernoulli gate). But like any module focused on a particular function, it can easily be mixed into all kinds of non-percussion patches to add a bit of spice. The on-board random generator means that it can be used as a source of four channels of distinct pulses, but it really shines when spliced between two modules in a conventional patch to mix things up. And because it has four channels, it can easily do a bit of both simultaneously.

Missed Ops offers not only four channels of probabilistic gating, but also a random pulse generator that’s normaled to channel 1 with no input connected. It features a Density input to add CV control over the likelihood of skipping a pulse and a Reset input to jump to the start of the current random sequence (more on that later). The input of each channel is normaled to the output of the prior channel, with the exception of channel 1 which is fed by the random generator if nothing is plugged in. The Density input controls the probability of each channel, and even more probabilities can be obtained by chaining the channels. But what makes Missed Ops really special is the Missed/Match switch, which allows interesting channel patterns to be created through normaling.

Technical Stuff

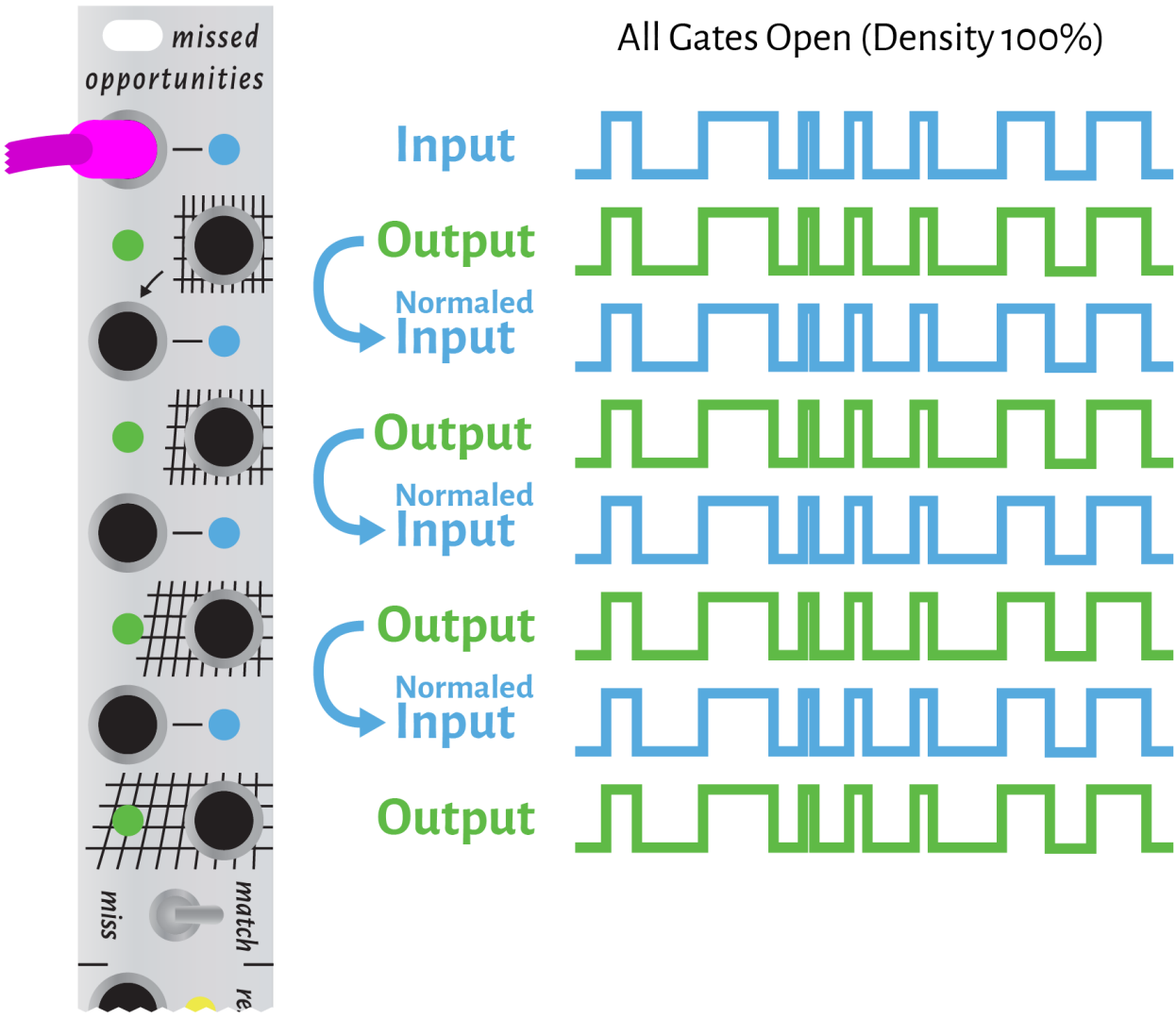
Missed Ops is powered by the +12V rail. It draws ~40mA. It uses a standard keyed 10-pin connector. Please follow the markings on the module to ensure that the red stripe on the cable is aligned to the -12V rail on both the module and your bus board.

Gates, Pulses, Clocks, and Square LFOs

Signals between Eurorack modules are voltages, usually between -12V and +12V. To control discrete events, like triggering sample playback, it's convenient to use a signal that jumps to a positive voltage and then drops back down to zero. These can be compared to MIDI note-on/note-off messages. The jump to a positive voltage, called a leading edge, could cause a sample to start playing. The rapid fall back to a neutral voltage could tell the sample to stop. Such a signal can variously be called a gate, pulse, clock, or square LFO, depending on its usage and the particular quality of the signal. More stable changes in voltage are often called gates, while rapid, short-lived changes are usually called pulses. Pulses or gates that repeat at a regular interval are often called clocks or LFOs, which are equivalent. If the pulses repeat fast enough that they become audible, then the signal might be called an oscillator. These signals all look more or less the same, and can all be used for things like triggering an event, modulating an effect, or performing some other function.

Pulse Skipping

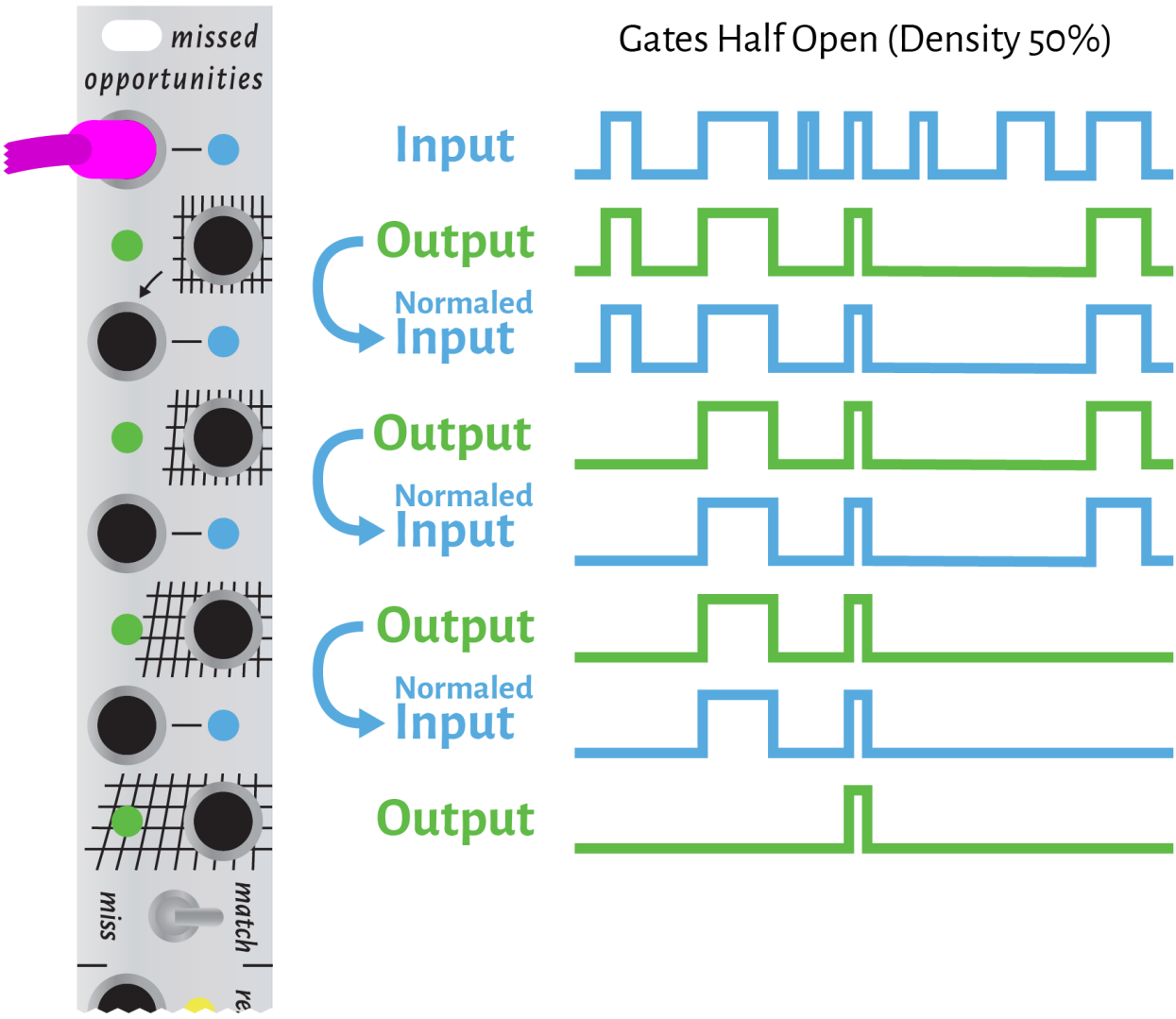
A pulse skipper is essentially a gate for gate signals, as silly as that sounds. It works like a VCA that chooses to open or close each time it detects a new pulse. Missed Opportunities is all about skipping and redirecting pulses. When the module sees a rising edge on one of its input channels, it decides with some probability whether or not to let the input through on that channel. If Missed Ops decides not to let the signal through, it won't change its mind until it detects the rising edge of the next pulse. These decisions happen independently on each channel, so one channel might be blocking its input while another channel is letting the input through normally.



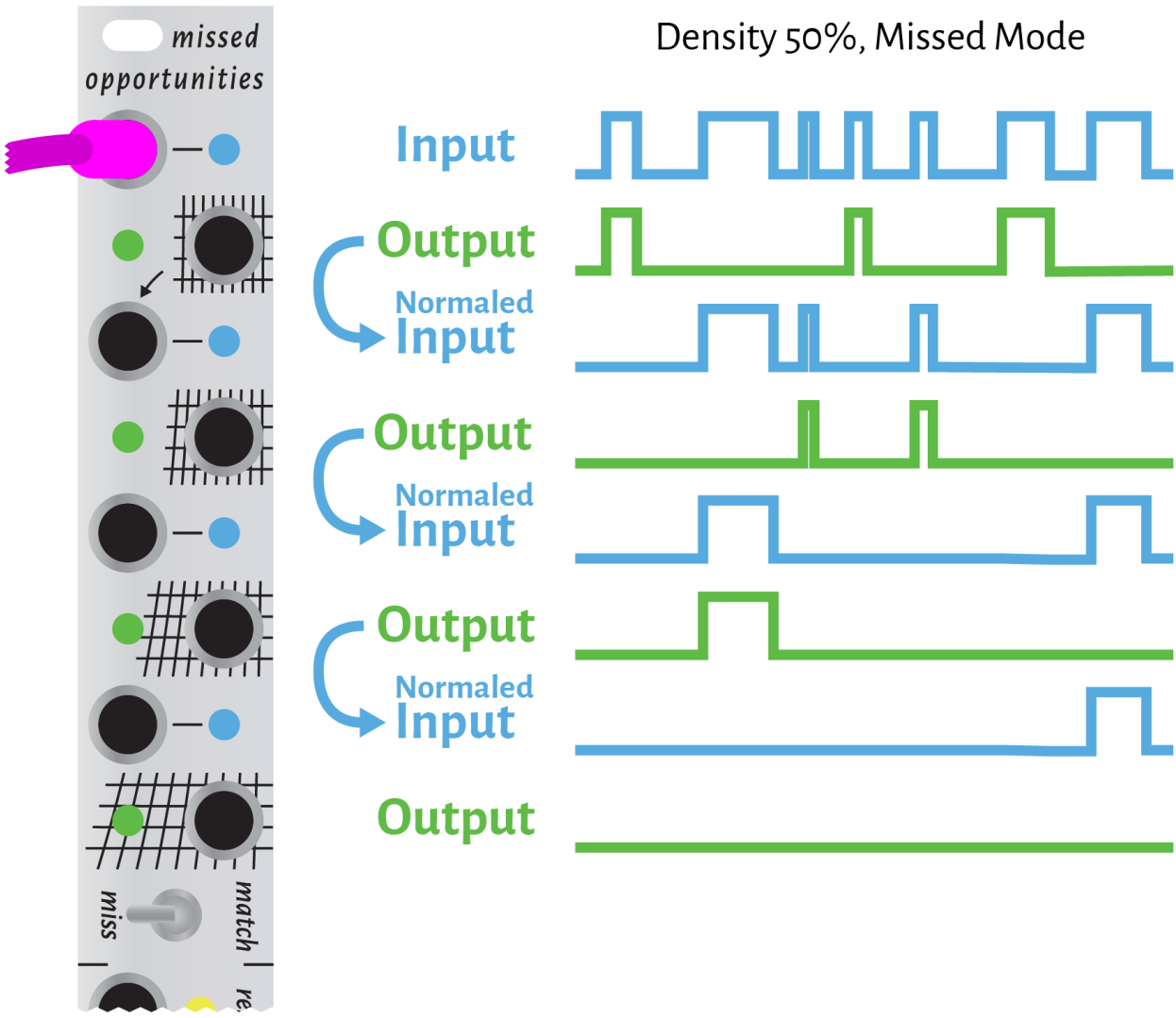
Normaling and the Missed/Match Switch

Rather than offering a knob to set the probability per channel, the channels can be chained to achieve additional probabilities. This works especially well for layered sounds, since you can feed the same clock or pulse source to all four channels and get four distinct but related outputs. In addition, the CV-input labeled "Density" allows simultaneous adjustment of the probabilities of all four channels, as well as the rate of the random generator. With nothing plugged in, the Density defaults to a value set with a trimpot on the back of the module. To set a different fixed value, just connect a fixed voltage between 0V and 5V. Channels 2 and 3 on a Make Noise Maths or any of the outputs on an Intellijel Triatt are well suited to this application.

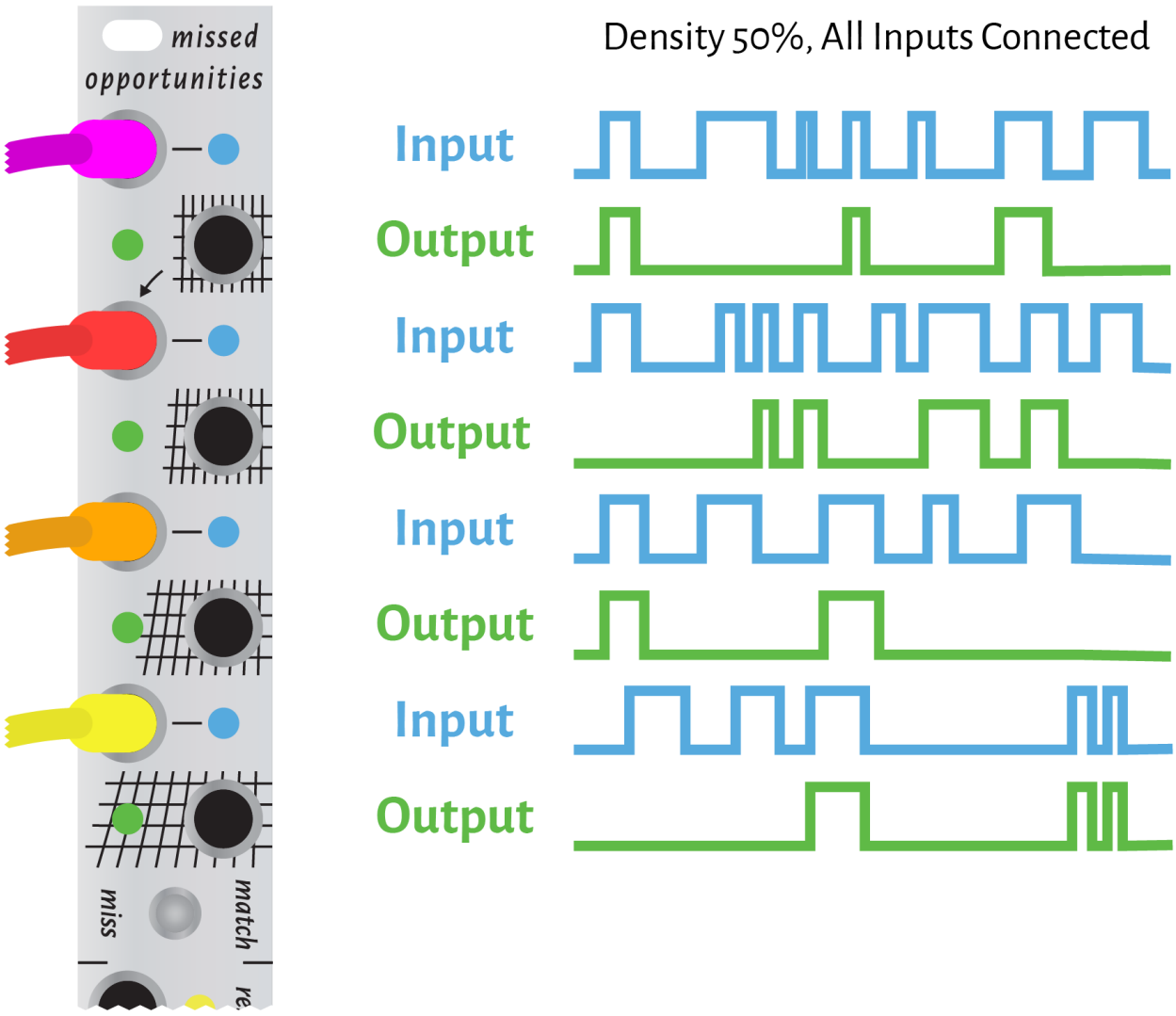
When the toggle is set to Match, the normalization works in the standard way: it matches the output of the previous channel. So channel 2's input is fed by channel 1's output, channel 3's input is fed by channel 2's output, etc. This works great for creating layered sounds that are always perfectly in sync, but where the layering is randomized.



When the toggle is set to Missed, the normalization instead sends the pulses skipped by the previous channel. In this mode, each channel operates as a Bernoulli gate, where the second output of the gate is the normaled input of the next channel. So channel 2 is fed the pulses that channel 1 skipped, and receives no input when channel 1 sends a pulse. This is different from a logical OR because it doesn't just hold an ON signal in the absence of a trigger, it instead outputs pulses based on the input pulses. The result is that the four outputs never overlap, making this mode perfect for creating webs of sound triggered by a single clock or pulse source.



And of course, the switch can be flicked back and forth as sounds play back to create even more variation. The difference feels stark enough that you could create different sections of a track just by switching modes. One important note, if patch cables are connected to all four input jacks, then no channel is receiving normaled input, and so the Missed/Match mode switch will have no effect.



Random Seed and "Reset" Input

Like most digital random sources, Missed Ops is in fact pseudo-random: it generates a seed from ambient noise at startup, and that seed is used until the module is powered off. Rather than trying to hide this limitation, we wanted to get musical results from it. That's the origin of the Reset input, which jumps back to the start of the random sequence when it receives a pulse. This can make Missed Ops function almost as a sort of sequencer. If you repeatedly send a trigger to the reset input, you'll hear the same pattern of skips each time it resets. Self-patching one of the module's outputs to this input works especially well for creating short, semi-predictable rhythmic sequences.

Since the module generates its random sequence from ambient noise, the seed will be different every time the module starts up. We find this gives it a really interesting combination of predictability and randomness. If you stumble on a really amazing random pattern, you can use the Reset input to hear it again. But once you turn off your system, you'll never get that random pattern again, so you better make sure to record it!

So long as the Reset input is held high, the random sequence will remain at its initial value. So a fast pulse will near-instantly reset the sequence, while a long gate will hold the current gate states before reseting. That means that each channel can be held in a fixed state by sending a constant voltage to the Reset input. Whether a given channel will be open or closed depends on the Density value. The Density value can still be changed

while the Reset value is held high. As Density is changed, each channel will open or close depending on the initial value of the random sequence.

Patch Ideas: Drums

By offering four channels, Missed Ops lends itself particularly well to beat-making. Take for example a simple beat of four drum sounds triggered by four outputs on a clock divider. Adding Missed Ops between the divider and the drums will turn a robotically rigid beat into something that feels shifting and alive. For that type of patch, you'd probably want to set Missed Ops to a fairly high density, or else too many hits will be skipped and the drum pattern will become hard to identify — unless of course that's your goal. And modulating the density input with a slow LFO would create a beat that rides the edge of predictability.

In a similar vein, patching a steady clock into Missed Ops will result in a series of random outputs that still fall on the beat. This is great for triggering a particular drum sound within a larger pattern. For example, adding variation to fast hihats, or mixing up some tom fills. Of course, clocks patched to all inputs can be used to create four independently random trigger sources — great for listless soundscapes at slow tempos, or total chaos at fast ones.

Patch Ideas: Fluctuating Layers

When patched between a keyboard or sequencer and an envelope generator, Missed Ops will decide to skip some of the notes you play. This may just seem frustrating, but it makes a lot more sense when paired with a multi-timbral patch. Using Missed Ops with just one of the timbres will activate that layer only occasionally. Admittedly it's a literal hit or miss use case, but it's perfect for improvisation or songwriting where you're trying to land on a happy accident.

A similar idea is to use Missed Ops to control a VCA. With no VCA offset/gain, Missed Ops could randomly mute a signal path for stuttering sounds. Or you could add some offset to the VCA, so Missed Ops just adds some variation to the volume instead. If you want smoother variations, you can add a slew limiter or envelope generator on the output of Missed Ops to avoid clicks when the VCA switches states.

Patch Ideas: Random Modulation Source

A hidden bonus of Missed Ops is that it can function as a source of not only random triggers, but also random modulation, so long as you have a slew limiter in your system. Use the Random Generator with a slew limiter to generate a random "LFO". Or use a clock to create a semi-random LFO that still follows the beat. For a smooth random source with multiple outputs, feed two outputs of Missed Ops to two separate slew limiters, and use them to modulate each other. Since the two slope generators on Maths are essentially just adjustable slew limiters, it's a perfect companion for this kind of patching.

Design Philosophy

The lack of knobs on Missed Ops comes from a love for both limitations and for patching-based music making. One inspiration was early Eurorack sequencers, which still find a place in tons of systems despite the power of computers and groove boxes. One particular Euro sequencer forces the user to pick whether to send triggers out on channel 1 or channel 2, with no option for both.

Working with this sequencer, I often ended up making beats that bounced between sounds, rather than just layering them as I might do on my drum machine. Of course, I could always trigger both at once using a logical

XOR gate, but sometimes it was better just to let the sequencer make the decision for me. In fact I found it interesting to be forced to make that decision.

When we were designing Missed Ops, we decided to add only one input to control the overall probability of all channels. This makes it possible to control the overall character of the whole module with a single control input. And by using the normaling between channels, you can get additional probabilities. We hope that this gives you the right balance between control and limitation for enjoyable and spontaneous music making.