

CIRCUIT-HACKS

A guide in plain words, illustrated

RC2.11 · RC2.11S

First draft by reddit.com/u/luxurysoft1337



First draft by reddit.com/u/luxurysoft1337, whom we thank. This guide explains the CIRCUIT-HACKS mod in plain words, view by view, with drawings of the panel. It follows the structure and the plain style of the community guide «Circuit Tracks mod manual, in plain English» by reddit.com/u/luxurysoft1337, written for RC0.9 and Beta 1.3. This edition is rewritten for **RC2.01** and **RC2.01S**, keeps the names of the mod's own manual (capture, step-drummer, slots...), corrects what that guide got wrong or left open, and adds every feature that came after Beta 1.3. The detailed references are the [guide by views](#) and the [feature list](#).

Nothing here has been tested on a real unit unless the [CHANGELOG](#) says so. The mod is not affiliated with Novation.

1 What the mod is

The mod is Novation's own Circuit Tracks firmware (1.2.1, build 4486) with extra features patched in. Whatever this guide does not mention works exactly as on a stock unit, so **Novation's user guide still applies**.

- Features with no mark are in every build.
- Features marked (**since RC2**) are new compared with RC0.9; (*since RC2.02*), compared with RC2.01; *Beta 3.43 only*, only in the beta with the new features (not in RC2.11). Many of them have not been tried on a real unit yet: keep a copy of your card.
- Novation's bootloader (the part that installs firmware) is never modified, so you can always go back.

2 Before you install

1. **Back up the SD card** (copy it to a computer). Do this before installing any version.
2. Back up your projects with Novation Components as well.
3. Pick a build:

Build	What it is
RC2.11	The release candidate: everything in this guide (RC2.01 + the mod matrix, the split keyboard with any pair and the new LFO shapes, and the fixes of RC2.03-RC2.11).
RC2.11S	The <i>safer</i> build: RC2.11, but nothing of the mod writes files to the card on its own: saving captures into the pack, copying samples, patches or projects between packs, the own-synth patches and deleting packs do nothing (the Save LED turns red).
RC2.01 / RC2.01S, RC2 / RC2S, RC0.9 / RC0.9S	The earlier ones: RC2.01 without what is marked (<i>since RC2.02</i>); RC2 with the sample after the master filter; RC0.9 without what is marked (<i>since RC2</i>).
Beta 3.43	The test build: RC2.11 + the new features marked <i>Beta 3.43 only</i> , not tried on a unit. It writes to the card like RC2.11.

Installing

1. Download Novation's official firmware 1.2.1 (the update file from Components).
 2. Open `tools/rc_uploader.html` (in the project's repository) in **Chrome**, with the Circuit Tracks connected over USB.
 3. Give it the official file, pick the version and send it. The page patches the official firmware in your browser and checks the result; it contains none of Novation's code. Older versions are listed too, and «Official» sends the untouched firmware.
- `tools/ct_uploader.html` sends a ready-made `.syx` and checks it against known checksums. The public repository has no `.syx` files of the RCs: they are always made from the official firmware.

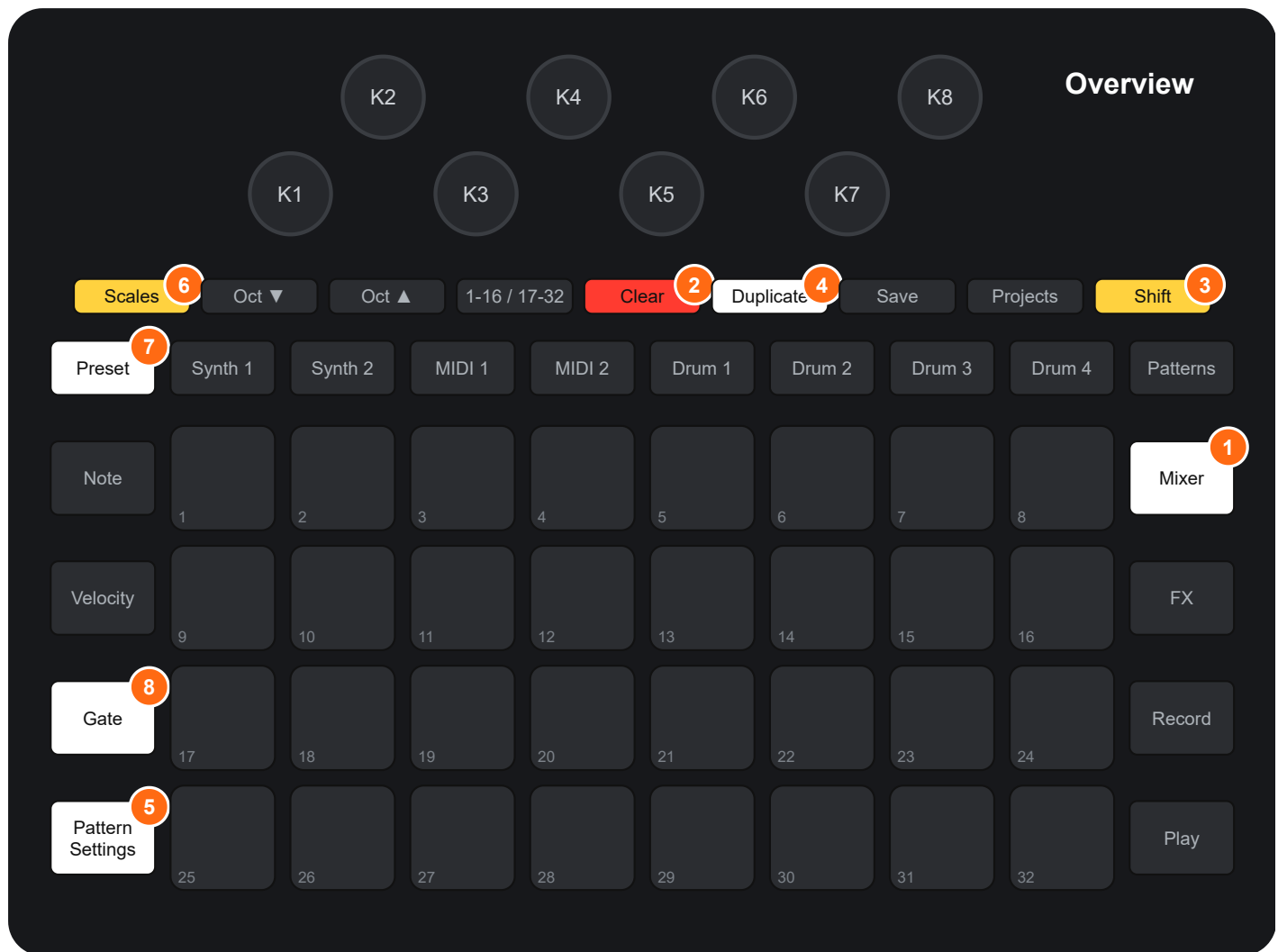
The internal memory

The pack in the Circuit's internal memory (the first pack) is **read-only for the mod**: nothing of the mod writes or deletes there (saving captures or patches, copying samples or projects, deleting the pack). It is refused and the **Save** light turns red for about 1.5 s. The device's own saves still work. With any build that does not end in «S», keep your projects on the card, not in internal memory (the installer asks you to confirm this).

Going back

Send «Official» (or any other version) from the same page. If the unit does not start, hold **Scales + Preset + Note** while switching it on: that is Novation's bootloader mode, where you can send any firmware again.

3 How to read the instructions



The panel: the numbers are the gestures of the quick finder (section 5).

- **Pads** are numbered 1-32 from left to right and top to bottom: row 1 = pads 1-8, row 4 = pads 25-32.
- **Knobs:** K1-K4 on top, K5-K8 below (on the panel they are staggered: K2 K4 K6 K8 above, K1 K3 K5 K7 below).
- «**Shift + X**» = hold Shift while you use X. The same with **Clear** and **Duplicate**.
- **Shift lights the way:** while Shift is held, the shortcuts the view offers light **yellow**, and the option already chosen shows in another colour.
- **Two-step confirm:** several actions ask first. «Clear + pad» makes the pad blink (the unit asks «are you sure?»); «Clear + the same pad» again within about 5 s confirms. Another pad moves the question there; waiting cancels it.
- **Knob LEDs** show the value of the new functions with their **brightness** (brighter = more). Knobs that go both ways are dark in the middle.
- A drum, a synth or a MIDI track is chosen with its **track button**; «its view» is the view that button opens.

4 Words this guide uses

These are the names of the mod's own manual.

Word	Meaning
Held / latched	A held effect sounds while your finger is down; a latched one (Shift + pad) stays on until you touch it again.
Capture (captured sample)	A short recording of the Circuit's own output (up to about 3.5 s), made with pad 32 in Master FX. You can play it, put it in a slot, replace a drum with it or use it as a granular source. It lives in memory: it is lost at power-off unless it replaced a drum and you saved the project.
Step-drummer	A layer over a track's pattern: the pattern still decides when notes play, and the eight knobs give each pair of steps a value (a pitch shift, a velocity, a macro position...).
Send	How much of a track goes into the shared delay or reverb.
Master FX	Live effects on the whole output, opened with Mixer twice.
Slots (bottom row)	Pads 26-30 of Master FX and of the FX view: each stores an effect with its knob settings.
Song pointer	Pads 9-24 of Master FX = steps 1-16, to repeat or loop parts of the pattern live.
Engine	The sound a MIDI track can have on the Circuit itself, chosen with pad 27 of its Preset view.
FX sequencer	An engine that makes no sound: each pair of steps triggers a Master FX slot.
Own-synth patch	A saved setting of a MIDI track's engine, kept in the pack.
Chain mode	The project-wide mode in which patterns follow their chain rules (play n times, then jump).
Pack	Novation's set of samples, synth patches and projects.
Strips 3 and 4	The mixer strips where the MIDI tracks' own sounds (and the routed returns) come out.

5 Quick finder: I want to...

I want to...	Do this
Open Master FX	Mixer , then Mixer again (badge 1).
Reset a knob to its default	Hold Clear and turn the knob right (badge 2).
Delete a knob's automation	Hold Clear and turn the knob left (drums; MIDI engine <i>(since RC2)</i>).
Play a drum like a keyboard	Choose the drum, Shift + Preset (or Preset again <i>(since RC2)</i>) (badge 7).
Record the Circuit's own output	Master FX, pad 32 . Play it with pad 7 .
Replace a drum with that capture	Drum Preset view, Clear + pad , then Clear + the same pad .
Swap two drum samples	Drum Preset view, hold Duplicate , tap pad A then pad B (badge 4).
Kill every latched effect	Master FX, pad 8 .
Set a track's level to 100 or 0	Mixer, Shift + turn the knob right or left.
Loop part of the pattern live	Master FX, hold two song-pointer pads.
Give a MIDI track its own sound	MIDI 1 / 2, Preset , pad 27 .
Rotate a pattern (Nudge)	Pattern Settings: choose the first step, then pad 26 <i>(since RC2)</i> (badge 5).
Arpeggiate a track	Pattern Settings, Shift + pad 25 <i>(since RC2)</i> .
Quantize a recorded pattern	Shift + Play <i>(since RC2)</i> (the selected track).
Use my own scale	Shift + Scales <i>(since RC2)</i> (badge 6); <i>Beta 3.43 only</i> : also Scales twice .
Metronome / count-in	Shift + Clear <i>(since RC2)</i> (badges 3 + 2).
Gate = how long I hold	Gate twice (Micro Step), pad 32 <i>(since RC2)</i> (badge 8).
Go back to stock	Send «Official» from the uploader.

6 Effects: sends and the FX view



FX view: Octave ▲ / ▼ choose delay / reverb sends; Shift + knob, the effect itself.

The Circuit has **one delay and one reverb** shared by all tracks; each track's **send** decides how much of it goes in (0 = dry). **Master FX** (next section) is a separate set of live effects on everything at once: use sends to set how wet each track sounds, and Master FX to play with the whole mix.

Press **FX** to open the FX view:

Gesture	What it does
Octave ▲ / ▼	The 8 knobs = the delay sends / the reverb sends, one per track.
Shift + knob	The effect itself, for every track: reverb K1 type, K2 decay, K3 damping; delay K1 time, K2 sync, K3 feedback, K4 width, K5 ratio, K6 slew. Saved with the project.
Duplicate	Reset: sends to 0, master filter centred, Master FX off.
Shift + Octave ▲ / ▼	<i>Beta 3.43 only:</i> master filter resonance, 16 up / 16 down; it stops at the top and the bottom. In RC2.11 it is on 1-16 / 17-32 (green LED).
Shift + pad 25	<i>Beta 3.43 only:</i> switches the master filter off: it sounds as with the filter at the centre even if you move its knob; again, it switches it on wherever the knob is at that moment. While off, the filter knob's light is red.
Bottom row	The same as in Master FX: slots, mechanical gesture, recording the capture.

- If Setup routes the reverb / delay return through strip 3 or 4 (section 14), the sends of those strips stop at half range and move at half speed.

7 Master FX



Master FX (Mixer twice). RC0.9: pad 6 Vinyl, pad 31 Glitch; RC2: pad 6 Glitch, pad 31 mechanical gesture.

Live effects on the whole output. **Hold** a pad to hear its effect; **Shift + pad** latches it (touch it again to release). Open it with **Mixer, Mixer**; any other view button leaves.

Pad	What it is	K1-K4 while you hold it
1	Gater	division, depth, width, smoothing
2 / 3	Auto-Filter, low pass / high pass	speed, depth, resonance, centre
4	Digitise	sample rate, bits; (<i>since RC2</i>): K3 = a momentary throw into the delay, K4 = envelope of the amount
5	Phaser	speed, depth, feedback, mix
6	Glitch (<i>since RC2</i>) (in RC0.9, the Vinyl)	Glitch: speed, repeat, delay, chaos / overload
7	Play the capture	pitch, mode, start, end
8	Release everything latched (effects, slots, song pointer, capture) and bypass	—
9-24	Song pointer : steps 1-16	—
26-30	Slots	the stored effect's
31	Mechanical gesture (<i>since RC2</i>) (in RC0.9, the Glitch)	gesture: moves, kind, stop time, start time
32	Record the capture	—

- **Clear + knob right** = that knob back to its default. RC: while Clear is held the knobs show lavender at their default and red elsewhere; (*since RC2*): only lavender (Master FX has no automation to delete).
- (*since RC2*) Each project keeps its own Master FX: the 20 knobs of the effects, the slot assignments and the compressor. Latched effects are not saved.

Song pointer (pads 9-24)

- **Hold one step**: it repeats while you hold it.
- **Hold two steps**: the pattern loops between them while you hold.
- **Shift + two steps**: that loop stays (latched); pad 9 turns white and touching it removes the loop.
- **Phrase mode**: Shift + a step = a phrase from that step to step 16; touching another step moves the end; Shift + another step moves the start; Shift + the start step (or the white pad 9) leaves.
- The playing step shows white; the pointer starts off when a project loads.

The capture (pads 32 and 7)

- **Pad 32 (red)**: hold = record while held (up to about 3.5 s); a short tap = record until the next tap; **Shift + pad 32** = armed: with the sequencer running it records the next bar, stopped it waits for Play and records the first bar. Since RC2.01 the capture and the playing sample sit before the master filter: the filter acts on the sample and the capture does not hold it.
- It records the output **without** the Master FX effects; when it plays, it goes through them.

- **Pad 7 (yellow)** plays it: K1 pitch (± 24 semitones), K2 mode by colour (yellow one-shot, green gate, blue loop: the loop sounds while you hold the pad), K3 start, K4 end (end before start = backwards). **Shift + pad 7** keeps it playing in any mode until pad 7 again (or pad 8).
- Hold pad 7 and touch a slot to store it there; replace a drum with it (section 8); use it as a granular source (section 10).

Glitch

The output becomes a tape head over the last seconds of audio. K1 speed (top = normal, lower = tape brake, centre = stopped, below = backwards), K2 repeat size (maximum = no repeat), K3 delay (up to about 2.6 s), K4 lower half = chaos (jumps, cuts, reversals), upper half = overload (late blocks and clicks, slowing down from about three quarters up). Hold the Glitch pad and touch a slot to store a Glitch with these settings (turquoise).

Mechanical gesture (*since RC2*)

Pressing pad 31 slows the audio to a stop; releasing it starts it again. K1 = moves per gesture (1-8), K2 = the kind, blended continuously and shown in colours (tape stop → baby scratch → tear → back spin → rattle), K3 = stop time, K4 = start time. It uses the Glitch's engine: while a gesture plays, the Glitch waits.

Slots (pads 26-30)

Hold an effect (pads 1-6), pad 7 (the capture) or the Glitch / gesture pad and touch a slot: the slot keeps that effect with a copy of its knobs. Touch the slot = on while held; **Shift + slot** = latched. Slots are saved with the project. An empty slot is the stock performance effect of the FX view. The FX sequencer (section 10) triggers these slots.

8 Drums

Ring

K2

Env→F

Reso

Drive

K8

Pitch

K1

Decay / attack

K3

Filter

K5

LFO

K7

Scales

Oct ▼

Oct ▲

1-16 / 17-32

Clear

Duplicate

Save

Projects

Shift

Preset

Synth 1

Synth 2

MIDI 1

MIDI 2

Drum 1

Drum 2

Drum 3

Drum 4

Patterns

Note

1

2

3

4

5

6

7

8

Mixer

Velocity

9

10

11

12

13

14

15

16

FX

Gate

17

18

19

20

21

22

23

24

Record

Pattern Settings

25

26

27

28

29

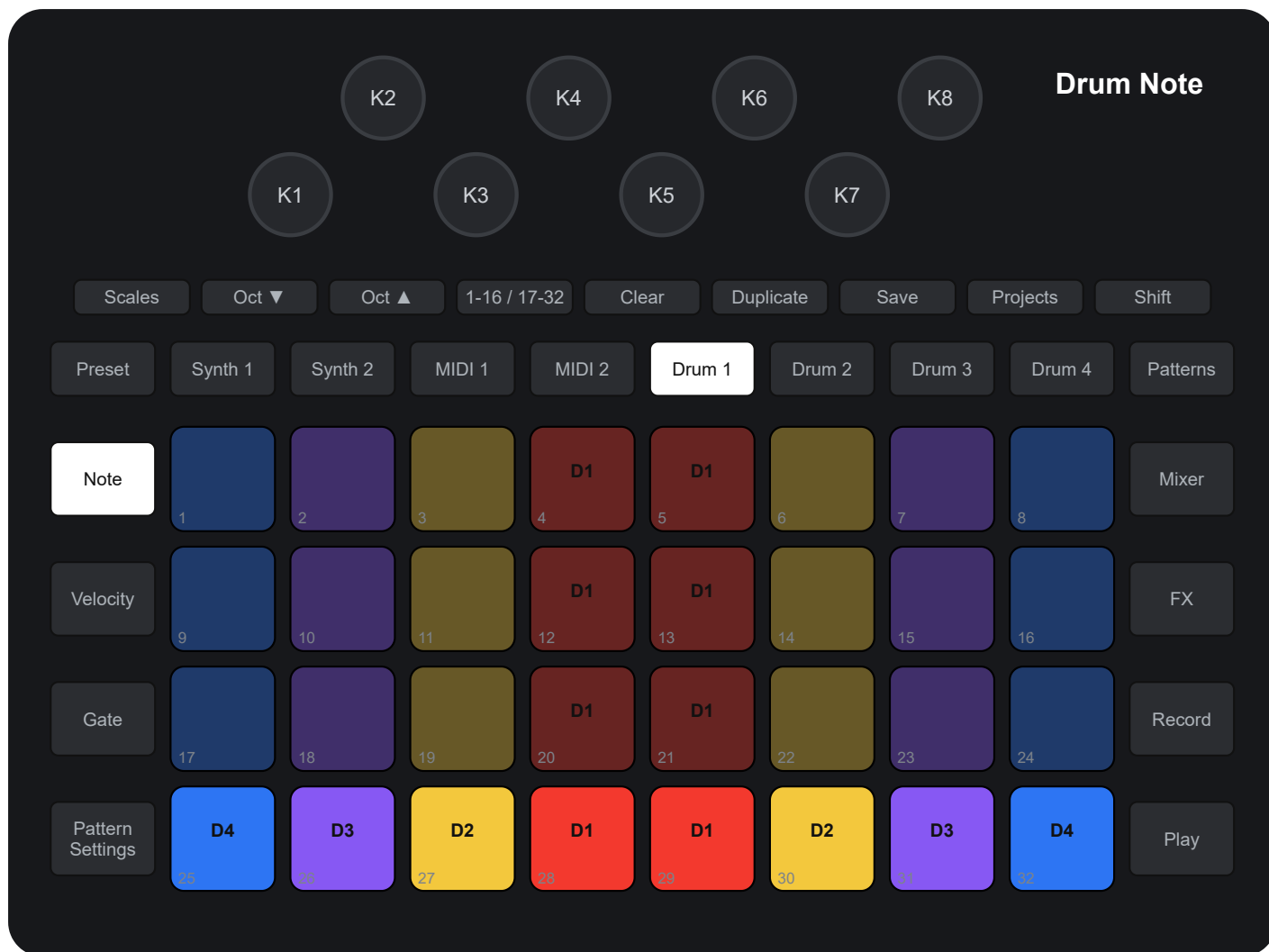
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31

32

Play

Drum track view: the knobs follow the panel labels; Shift gives the second layer.



The drums' Note view: rollers on rows 1-3 (RC2); the drum boxes below.

The drum knobs

Each knob does what its panel label says, with a second layer under Shift. Everything is saved with the project and goes out over MIDI (NRPN, section 18). With every knob neutral a sample sounds as on a stock unit.

Knob	Alone	With Shift
K1 Oscillator	Pitch ((<i>since RC2</i>): the stock one, continuous; the chromatic pads transpose on top)	Pitch envelope amount
K2 Osc mod	Ring mod frequency	Ring mod amount
K3 Amp envelope	RC: decay; left of zero, the sample's start point. (<i>since RC2</i>): left = decay (the stock one), right of the maximum = attack (fade-in up to 1 s)	(<i>since RC2</i>): left = sample start, right = cut from the end
K4 Filter envelope	Envelope → cutoff	Envelope shape
K5 Filter frequency	Filter / EQ	Filter mode: EQ tilt (stock), band pass, notch, comb, DJ
K6 Resonance	Resonance	—
K7 Modulation	LFO amount (right, tremolo; <i>Beta 3.43 only</i> : left, every hit starts at another point of the sample, like a scan)	LFO speed
K8 FX	Distortion; left of zero, bitcrush	Distortion type: stock, soft, hard, folded

- **Reset:** Clear + knob right = default (both layers; LED lavender, as on the original); Clear + knob left = delete that knob's automation (red), as on the original. (*since RC2*): Clear + K3 right also puts attack, start and cut to 0; Clear + K8 right also removes the bitcrush; **Clear + the drum's button** (with its view on screen) puts all its knobs back to their defaults.
- **RC0.9:** a new or untouched project starts with the filter mode in DJ, which removes the stock EQ: drums can sound different from a stock Circuit. Shift + K5 to «EQ tilt» brings the stock sound back. (*since RC2*): fixed (the default is the stock EQ).
- *Beta 3.43 only*: **stereo pair**: hold Drum 1 and press Drum 2 (or Drum 3 + Drum 4). Drum 1 / 3 sounds on the left and Drum 2 / 4 on the right with the next sample; both follow Drum 1 / 3's knobs and pattern, and Drum 2 / 4's knobs open the stereo (K2), detune (K1) and fine-tune. The same gesture undoes it; saved with the project.

Play a drum like a keyboard

Choose the drum and press **Shift + Preset** ((*since RC2*): or **Preset again** in its Preset view). Three rows of pads play its sample at different pitches, in the scale and root of the Scales view. K1 = offset in semitones, Shift + K1 = fine tuning in cents. When recording, each pitch goes only into its own step ((*since RC2*): the pads transpose on top of K1's pitch and, while recording, stay on their step; Clear + K1 to the left, held, deletes them with K1's automation).

Drum Preset view

Gesture	What it does
Clear + pad, Clear + the same pad	That drum now plays the capture . Temporary until you save the project: saving writes it into the pack (<code>PCM/NN_PCM.wav</code>) if it fits in the sample memory. Not in the safer build (there it lasts until the pack reloads) nor in the internal memory's pack.
Duplicate + pad A + pad B (same pack)	Swaps the two samples (files and table); you hear it at once.
Duplicate + pad A , load another pack, Duplicate + pad B	Copies sample A over B in the other pack (A's pack is untouched; B may be empty). It goes into B's place if it fits, else into the free import memory; it never overwrites a sample that plays.
Several pads held (<i>since RC2</i>)	With the drum's arpeggiator on, the arpeggio of the samples held (section 11).

- Swapping and copying write to the card: not in the safer build. Synth patches swap and copy the same way in the Synth 1 / 2 Preset view (a pack's 128 patches are shared by both synths).

Micro-step rollers (*since RC2*)

In the drums' Note view (press **Note** until rows 1-3 show dim pads), rows 1-3 are **rollers**: each column belongs to the drum of the box below it (columns 1-4 = drums 4-1, columns 5-8 = drums 1-4); a drum's left column is its micro steps 1-3 and its right column micro steps 4-6 (drum 1 = pads 4, 12, 20 and 5, 13, 21). While you hold one or more, that drum plays on **every step** at those micro steps. Playing it follows the pattern; stopped it plays at the project's tempo. **With Record** the hits are recorded into the pattern.

Sidechain view

Shift + FX opens it. (*since RC2*): **K1-K4** = attack, hold, decay and depth of the sidechain of the track whose preset you touched last (Synth 1 if none), in the track's colour; **K7 / K8** = attack / release of the master compressor (switched on in Advanced Setup), saved with the project.

Sidechain between drums: Shift + FX, then **Octave ▼**: rows 3-4 hold the ducking pages for each drum, and pads 5-8 of row 1 pick which drum triggers the ducking ((*since RC2*): pads 1-4, **Synth 1**, **Synth 2**, **MIDI 1 or MIDI 2**: every note of their pattern). (*since RC2*): on a drum page **K1-K4** set attack, hold, decay and depth for the drum whose preset you touched last (in the drum's colour; touching a preset brings back the preset's values). Saved with the project.

Sidechain from patterns (*since RC2*): on the Synth and MIDI pages of the Sidechain view, **row 1 pads 1-4** (next to the drums on pads 5-8) pick **Synth 1**, **Synth 2**, **MIDI 1 or MIDI 2** as the source of the chosen track (the last preset touched): every pattern note of that track ducks it, as a drum hit does. Saved with the project.

9 Synth tracks (Synth 1 and 2)

K1

K2

K3

K4

K5

K6

K7

K8

Source

ScalesOct ▼Oct ▲1-16 / 17-32ClearDuplicateSaveProjectsShift

Preset

Synth 1

Synth 2

MIDI 1

MIDI 2

Drum 1

Drum 2

Drum 3

Drum 4

Patterns

Note

1

2

3

4

5

6

7

8

Mixer

Velocity

9

10

11

12

13

14

15

16

FX

Gate

17

18

19

20

21

22

23

24

Record

Pattern Settings

Noise

In 1

In 2

In 1 inv.

In 2 inv.

Step drum

Macro edit

Play

Synth source view (the synth's button twice).



Step-drummer view: steps on rows 1-2, destination on row 3, pad 32 = pitch-vel (RC2); K1-K8 = the 8 pairs.

Source view

With a synth's view on screen, press **its button again**. Pads 25-29 pick the source of the synth's noise: noise (normal), input 1, input 2, input 1 inverted, input 2 inverted. The patch needs some noise level (CC 56) for the source to be heard. Saved with the project. If Setup routes the reverb / delay returns through strips 3 / 4, that is what reaches the synth. **Pad 30** opens the synth's step-drummer; (*since RC2*) **pad 32** opens the editor of the macro knob destinations. Any button closes the view.

Step-drummer

A layer over the pattern: the pattern decides which steps play; the knobs give each pair of steps a value.

- **Pairs:** K1 = steps 1-2, K2 = steps 3-4... **1-16 / 17-32** = the other half of the pattern.
- **Two pages:** Octave ▲ = the pitch page, Octave ▼ = the velocity page.
- **Pads 1-16** = the steps (bright = a note, white = playing); touch = listen, **Shift + touch** = add or remove a note. With Record, the steps you play are recorded in real time.
- **Opening it:** synth = pad 30 of the source view; MIDI track = pad 30 of its Preset view with an engine on (**Shift + pad 30** turns it off). (*since RC2*): on MIDI pad 30 shows dim when off and bright when on.
- **Pitch page, synths:** pads 17-24 pick one of the patch's 8 macros; each pair's value is that macro's position, written as automation. (*since RC2*): an empty pair starts at 0.

- **Pitch page, MIDI track:** pads 17-24 pick a destination of the engine (pitch of both oscillators, OSC 2 pitch, WAVE, FM, MIX, envelope → filter, SHAPE, decay) and the value (64 = no change) shifts it for those two steps, adding to or taking from the value on the engine's page. (*since RC2*): the knob LED shows the amount (dim at the centre, brighter the further it goes, up or down).
- (*since RC2*) **Velocity page with its own destination:** on the velocity page, pads 17-24 pick a destination for page 2 (the same pad again = none); the knobs then write that destination (MIDI from the destination's point of no modulation, synths from 0). On MIDI page 2 uses the REL automation lane, so REL is not played or recorded while the step-drummer is on.
- (*since RC2*) **Pitch-vel toggle (pad 32 of the view, green):** on top of their destinations, the pitch page moves the **notes** one degree of the project's scale every 8 knob steps (MIDI -8 ... +8 from the centre, synths 0 ... +16) and the velocity page also sets the notes' velocity. With the toggle, pitch destinations of the pitch page no longer detune the own synth (the note moves instead).

RC2 extras

- **Split keyboard:** hold Synth 1 and press Synth 2 (or the other way round): the top two rows play Synth 1, the bottom two Synth 2, each with its scale, octave and velocity. Knobs and Octave follow the synth pressed first; any track or view button leaves. (*since RC2.02*: with any pair of Synth 1, Synth 2, MIDI 1 and MIDI 2; the track you held first on top.)
- *Beta 3.43 only:* with the split keyboard, hold a track button (a drum one too): while you hold it, the knobs are that track's. A short tap closes it, as always.
- **Patch colours** in the Preset view: dark blue = mono, lavender = mono with glide, track colour = poly; the chosen one lighter.
- **Save a patch into the pack:** Preset view, **Clear + pad**, then **Clear + the same pad** within about 5 s: the patch as it sounds goes into that slot (the stock cannot save patches on the device). Refused in the internal memory's pack.
- **Macro destinations:** in the source view, pad 32 opens the editor. Turn a knob to pick its macro; the knob changes the current field and **Octave ▼ / ▲** walk the fields (slot 1-4, start, end, destination, depth); the pads draw the number. Any pad drops the macro; pad 32 closes the editor. Destinations are the CC / NRPN numbers of Novation's Programmer's Reference Guide (for example CC 74 = filter cutoff).

10 MIDI tracks as synths



MIDI 1 Preset view with the engine on.

Normally a MIDI track only sends MIDI. With the mod, MIDI 1 and MIDI 2 can each have their **own engine** on the Circuit itself; the notes still go out over MIDI.

The engine (pad 27)

In the MIDI 1 / 2 Preset view, each press of **pad 27** moves to the next engine; its colour shows which: off (dark) → line input (yellow) → oscillator (green) → VA-drum (red) → granular (magenta) → sample (cyan, *since RC2*) → FX sequencer (blue) → off.

Beta 3.43 only: a tap on pad 27 opens the engines on the third row of pads, in their colours; tap the one you want and pad 27 again goes back to the patches. Shift + pad 27 steps to the next as before.

Engine	In plain words
Line input	The audio input (line 1 for MIDI 1, line 2 for MIDI 2) through the track's VCA, filter, envelope and LFO, triggered by its notes: shape an outside sound with the Circuit.
Oscillator	A two-oscillator synth: WAVE morphs sine (0) → triangle (42) → saw (84) → square (126); SHAPE (centre = the pure wave) folds the sine and triangle (to the right), bends the saw (<i>Beta 3.43 only</i> : turns it into a supersaw of 7 saws, thicker the further right; and to the left it bends the triangle) or narrows the square's pulse; OSC 2 adds FM, ring and bit modes. One note = unison, two notes = one per oscillator (<i>since RC2</i>): with one oscillator, the last note has priority).
FM	<i>Beta 3.43 only</i> : pad 24 of the engine row (violet). A 4-operator FM synth with 16 algorithms: the typical ones, percussive (kick, snare, metal, tom), bells and strings. Its knobs on pad 7: K1-K4 each operator's ratio, K5-K8 its level; with Shift, the attack (to the left, the operator dies away on its own, like a plucked string), the algorithm, the feedback, the noise and the release. Holding pad 7, pads 9-24 are the algorithms: press one and it plays. Clear + pad 7 gives a ready-to-play sound of that algorithm; SHAPE and the envelope of the OSC 1 page change the brightness.
VA-drum	The oscillator as a one-shot percussion voice: Sustain = pitch envelope decay, Release = filter envelope decay, LFO speed = noise level. Kick: sine, Decay ~70, Sustain ~30, envelope → pitch right; snare: more noise, short Decay, band pass.
Granular	Up to 16 grains of a sample at once: textures, frozen or stretched sounds (page 2 below).
Sample (<i>since RC2</i>)	A pack sample one-shot, at the pitch of each note (C3 = as recorded): tunable drums on a MIDI track. Note twice = the picker: rows 3-4 the samples (Octave ▼ / ▲ = 4 pages, all 64), rows 1-2 the steps; hold a step and touch a sample = that step plays that sample (sample flip), also the other way round (hold the sample and touch steps, <i>since RC2.04</i>) and live with Record.
FX sequencer	No sound: each pair of steps of its step-drummer triggers a Master FX slot.

- Every sound engine goes through a VCA, an effect and a filter (with envelope and LFO) before mixer strip 3 or 4; **pad 29** swaps the order VCA → effect → filter / filter → VCA → effect (*since RC2*): pad 29 in the VCA-VCF page's colour).

Pads of the MIDI Preset view

Pad	Function
1-5	Knob page: 1 VCA-VCF, 2 OSC 1 (the granular controls in granular), 3 OSC 2, 4 the 8 automatable values, 5 modulation. (<i>since RC2</i>): Clear + page pad = that page back to its defaults.
6	(<i>since RC2.02</i>) Mod matrix (below).
9-24	(<i>since RC2</i>) Own-synth patches (below).
25	CC editor of the template's macros.
26	Patch flip: every note goes out as a Program Change ((<i>since RC2</i>): only on the track's channel). Exclusive with the engine.
27	The engine.
28	One / two oscillators (oscillator and VA-drum).
29	Chain order.
Shift + 29	(<i>since RC2</i>): gate retrigger; off (yellow) = legato, a new note while others are held only changes the pitch; <i>Beta 3.43 only</i> : it steps through the seven voice modes of pad 32.
30	Step-drummer.
31	VA-drum: velocity scales the pitch and filter envelopes.
32	<i>Beta 3.43 only</i> : voice mode (it opens on pads 17-24): retrigger, legato, glide (like legato, but the pitch slides between held notes), three unisons (every voice on the same note, detuned): uni retrigger, uni legato, uni glide and uni always-glide (always sliding, after letting go too), and poly (up to 4 notes at once in the oscillator, two oscillators too, the VA-drum and the sample mode; in FM 6 between MIDI 1 and MIDI 2). With the row open, K1 = the glide's amount, K2 = the unison's detune.

The knob pages

- **Page 1, VCA-VCF:** K1 attack (Shift sustain), K2 release (Shift decay), K3 envelope → level (Shift LFO → level), K4 envelope → filter (Shift LFO → filter), K5 filter (Shift filter type: DJ, LP 12, HP 12, band pass, notch, LP 24, HP 24), K6 resonance (Shift VCA gain, up to +18 dB with saturation), K7 LFO speed, K8 effect amount (Shift effect type: soft, hard, folded, wavefold, ring, comb, chorus).
- **Page 2, OSC 1:** K1 tune (Shift fine), K2 shape (Shift mix OSC 1 ↔ OSC 2), K3 envelope → pitch (Shift bitsync), K4 envelope → shape, K5 LFO → pitch, K6 LFO → shape, K7 WAVE, K8 LFO → morph (Shift envelope → morph).
- **Page 2, granular:** K1 pitch ±24 (Shift fine), K2 position (Shift position spread), K3 scan: centre freezes, right forward, left backward (Shift chance of a reversed grain; *Beta 3.43 only*: every LFO rate knob is bipolar: to the right free, to the left synced to the tempo, starting on the bar's first beat. Shift + K3 left = reversed grains, right = pitch spread), K4 grain size 5-500 ms (Shift pitch spread; *Beta 3.43*

only: Shift + K4 = **stereo**: each grain goes to one side, and the track's pan decides how many go to each side), K5 density 1-16 (Shift window), K6 scan zone (Shift note mode: pitch / slicer; (*since RC2*) stretch = from the position to the end over a set number of steps, without changing pitch), K7 LFO → position (Shift LFO → size), K8 envelope → position (Shift source: RC a pack sample or, left, the capture; (*since RC2*) the capture or the current sample of a drum).

- **Page 3, OSC 2:** (*since RC2*): K1 tune 2, K2 shape 2, K3 mix OSC 1 / OSC 2, K4 FM, K5 fine 2, K6 BITSYNC, K7 WAVE 2, K8 ring, all without Shift (RC0.9: K1 tune 2 with Shift fine 2, K2 shape 2 with Shift FM, Shift + K3 ring, K7 WAVE 2). **Page 4:** the 8 automatable values (tune, release, envelope → level, envelope → filter, filter, resonance, LFO speed, effect). **Page 5:** ADSR on top, LFO below ((*since RC2*): **Shift + K8** = the LFO's shape, six shapes in colours; (*since RC2.02*) seven, with a slewed sample & hold, and the triangle to start with).
- **Automation:** with Record + Play, the moves of the **sequenceable knobs** (page 4) are recorded into the pattern. (*since RC2*): **Clear + knob left** deletes that knob's automation (red), **Clear + knob right** = default (lavender). *Beta 3.43 only*: **Shift + knob** on page 4 chooses which parameter that knob records (any of the 33, in the matrix's colours; saved with the patch); **Record held + a step** stores into that step every value you have changed. *Beta 3.43 only*: in the Velocity view, **Shift + a step** makes the automation let go there and everything goes back to where the knobs are.
- *Beta 3.43 only*: the MIDI 1 / 2 own synth is saved with the project: loading it brings it back as it sounded when saved. And picking the destination of a sequenceable knob (or of the **non-sequenceable** ones, Shift + pad 4: 8 knobs that are not recorded) with Shift + knob, the pads show where it lives, as in the matrix.

FX sequencer

Put effects into the Master FX slots first. Then open the step-drummer (pad 30) and put notes on steps (Shift + pad). Each knob picks a slot for its pair: 0 none, 1-5 = pads 26-30, 6 = pad 31; on every step with a note that slot switches on, and the knob LED takes the effect's colour. The knob moves slowly (about 48 steps of turning per slot). (*since RC2*): at the end of the travel, **random** (white): one of the assigned slots at random on each note.

CC editor (pad 25)

Move a knob to pick it; its CC number is drawn on the pads. **Octave ▼ / ▲** walk the fields; turning the knob changes the value. A plain CC has number, start and end; 99 / 98 / 6 = 7-bit NRPN (MSB, LSB...), 38 = 14-bit NRPN. Save with pad 26; any view button or pad 25 discards.

Mod matrix (*since RC2.02*)

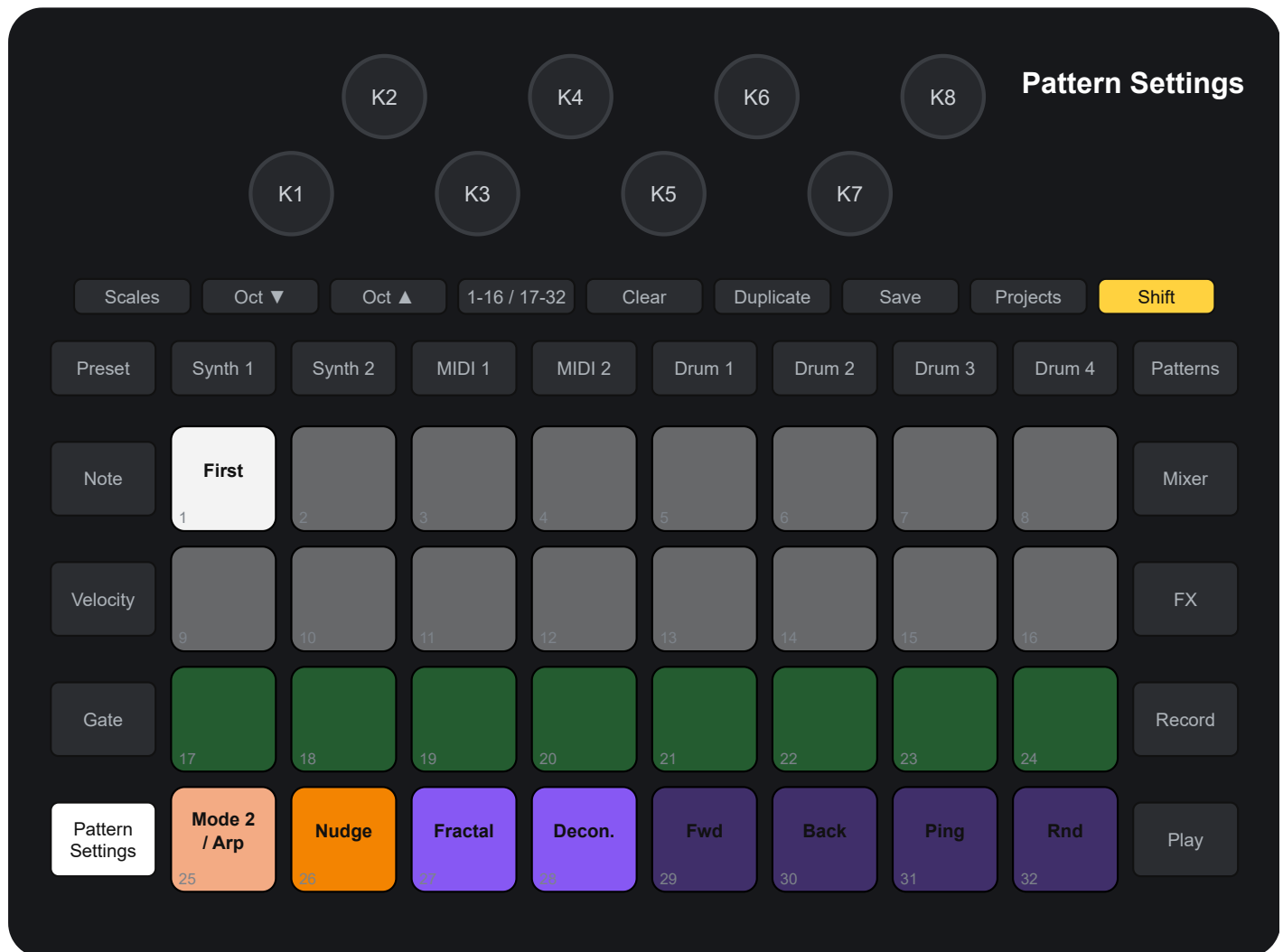
With the engine on, **pad 6** of the MIDI Preset view turns the 8 knobs into **8 sources**: K1 velocity, K2 note, K3 random per note, K4 LFO 2, K5 envelope 2, K6 a drum hit, K7 the pattern position, K8 stepped random.

Turning a knob picks which parameter it moves (any of the knob pages, one stretch each, in its page's colour) **and how much** (inside the stretch). While you turn, the pads show where that parameter is. **Shift + K4 / K5 / K6 / K8** = the LFO's shape and rate, the envelope's attack and decay, which drum, every how many steps. **Clear + knob** = source off; **Clear + pad 6** = all. Saved with the own-synth patches.

Own-synth patches (*since RC2*)

Rows 2-3 of the MIDI Preset view are 16 patch slots, 4 pages with Octave ▼ / ▲ (64 per pack, shared by MIDI 1 and 2; Beta 3.43 only: 8 pages, 128). Touch = load (the tonic sounds while you hold). **Clear + pad** twice = save. **Duplicate + A + B** = swap; **Duplicate + A**, another pack, **Duplicate + B** = copy. Dim peach = a patch, bright = the last used, violet = empty. A patch keeps the engine, both oscillators, the order, every value and the step-drummer setting (the steps belong to the pattern). **Clear + the track button** resets the whole engine.

11 Pattern tools



Pattern Settings: stock pads plus 25-28; with Shift, the arpeggiator (RC2).

K1

K2

K3

K4

K5

K6

K7

K8

Probability

ScalesOct ▼Oct ▲1-16 / 17-32ClearDuplicateSaveProjectsShift

PresetSynth 1Synth 2MIDI 1MIDI 2Drum 1Drum 2Drum 3Drum 4Patterns

Note

1

2

Step3

4

5

6

7

8

Mixer

Velocity

9

10

11

12

13

14

15

16

FX

Gate

117

218

319

420

521

622

723

824

Record

Pattern Settings

125

226

327

428

529

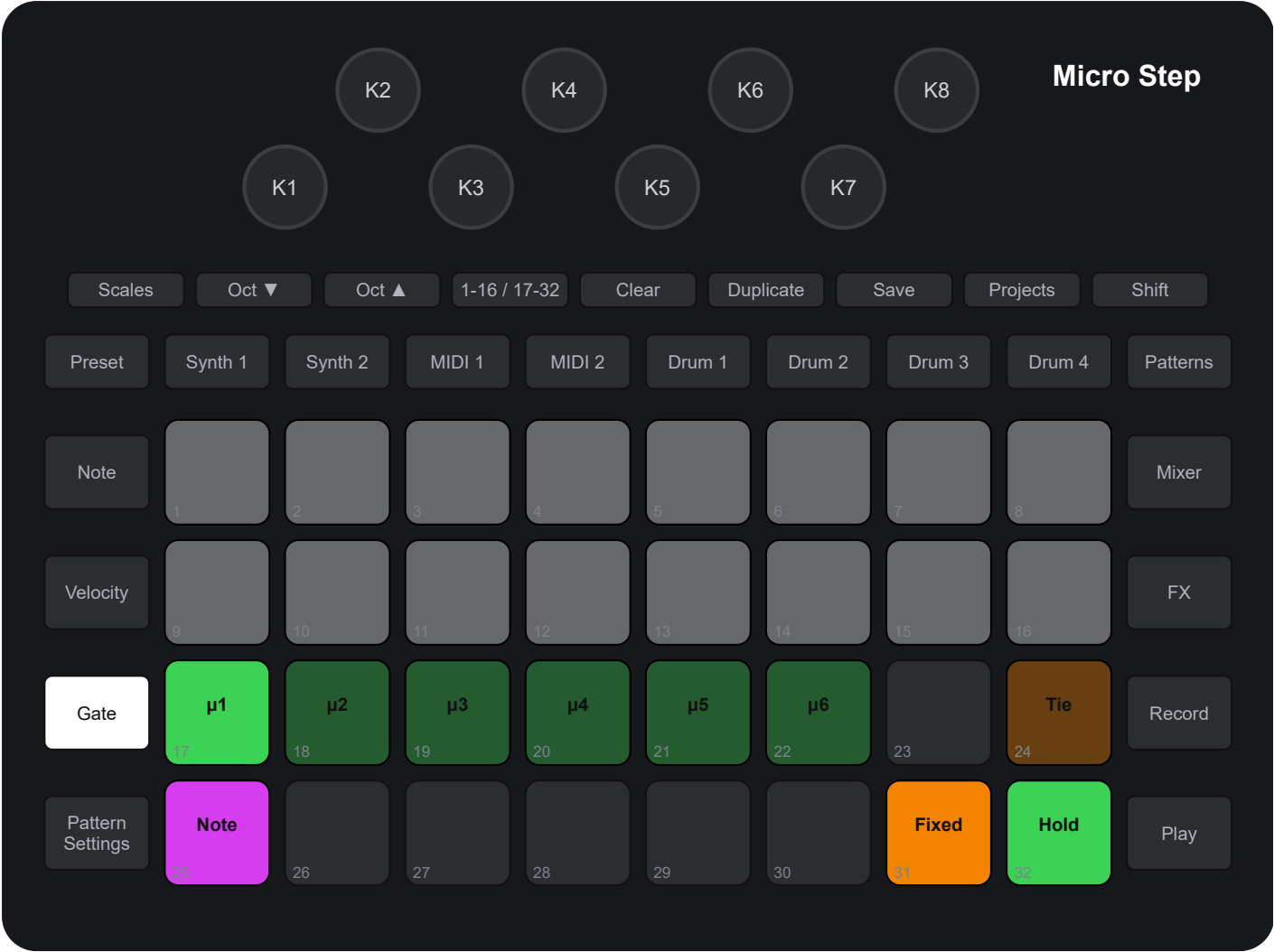
630

731

832

Play

Probability view, mode 2: row 3 = dynamics, row 4 = random-mutate.



Micro Step view (Gate twice): pad 31 fixed length, pad 32 gate by holding (RC2).

Pattern Settings

Press **Pattern Settings** with a track chosen. As on a stock unit: pads 1-16 the first / last step, pads 17-24 the sync rate, pads 29-32 the direction. Added (*since RC2*):

Pad	Function
25	The probability view in mode 2 (below). (<i>since RC2</i>): Clear + pad 25 clears the dynamics and random-mutate of the whole pattern (note tracks).
26	Nudge (orange).
27	Fractal order: 1 · 1 2 · 1 2 3 · ... up to the last step.
28	Deconstructed order: the grid's diagonals (1 6 11 16 · 2 7 12 13 · 3 8 9 14 · 4 5 10 15, the same for 17-32).

- **Nudge, step by step:** 1. in Pattern Settings, choose the pattern's **first step** with pads 1-16 as on the stock unit; 2. press **pad 26**: that step becomes step 1 and what was before it goes to the end (steps and automation, over 16 or 32 steps; the last step moves with them). Choosing step 2 moves everything one step earlier.

- Pads 27, 28 and the four direction pads exclude each other. The order is saved with the pattern; clearing the pattern removes it. Nudge and the orders work on the drums too.

Arpeggiator (*since RC2*)

- **Shift + pad 25** = the arpeggiator of the pattern the track plays, on / off (pad 25 green while on). **Shift + pads 27-32** = its order (fractal, deconstructed, up, down, ping-pong, random), apart from the pattern's direction. **Shift + pads 17-24** = its own resolution (from 1/4 on pad 17 to 1/32T on pad 24, as the sync rate; the same pad again = the track's). With Shift, the pads keep their Pattern Settings colours and the chosen ones show green.
- **Sequence:** when two or more notes start on a step, they play one at a time in the chosen order, each lasting its own gate (at most one arpeggio step).
- **Live:** the first note sounds as always; holding another one starts the arpeggio of the held notes until you let them all go (stopped: at the project's tempo, since RC2.10; before it always ran at about 120). With Record the chord is recorded, and the sequence arpeggiates it.
- *Beta 3.43 only:* with the transport stopped, **holding a step** with several notes arpeggiates them too. And if you turn on the **Note button of the Setup view** (off by default), the notes of a MIDI keyboard on the track's channel are arpeggiated the same way. **Shift + a key** of the Note view leaves it sounding until you press that note again; with the arpeggiator, it stays in the arpeggio.
- *Beta 3.43 only:* the notes play in the order you press them; let one go and its place is skipped, and the next one you press takes it. The step's random-mutate changes the arpeggio's notes too, also when playing live (that of the step the track is on).
- Since RC2.04, a chord (or a note) you hold for more than 16 steps while recording keeps sounding after step 16.
- **Drums:** the same gestures in a drum's Pattern Settings. In the drum's Preset view the first sample held is the usual one; holding more makes the drum **jump from sample to sample** in that order. With Record (playing) each hit is recorded with its sample as the step's sample flip.

Probability view

How you open it	Row 3	Row 4
Shift + Pattern Settings	Probability (stock)	Random-mutate (<i>since RC2</i>)
Pattern Settings twice (mode 1)	Probability (stock)	Frequency (<i>since RC2</i>): the step plays on the last of each n passes of its pattern (1-8; counted from Play)
Pad 25 of Pattern Settings (mode 2) (<i>since RC2</i>)	Dynamics	Random-mutate

Choose a step that has notes (pads 1-16) and touch a pad of row 3 or 4.

- **Random-mutate** (*since RC2*) (pads 25-32): none · 6 % octave · 6 % scale · 6 % both · 12 % scale · 12 % octave · 25 % scale · 25 % octave and 50 % scale. «Scale» = another note of the scale in the

same octave, «octave» = one up or down. Without Record it changes only that time; with Record it is written (the sequence drifts). Tied notes do not change; each note of a chord is drawn apart.

- **Dynamics** (*since RC2*) (pads 17-24): none · drunk (± 2 micro steps) · drunk + accents · accents (velocity 0...+32) · dragging + accents ($-1...+3$) · dragging · balanced (velocity ± 32) · accent dynamics ($-32...+64$). With Record and mode 2 on screen, what sounds is written into the pattern.
- **Drums** (*since RC2*): the same view for a drum (Pattern Settings twice = mode 1, pad 25 = mode 2). Frequency and dynamics as above (a drum can only be delayed inside its step); pads 25-28 = **random-mutate of the sample**: none · 25 % ± 1 (the next sample in its row of 8) · 25 % ± 8 (the same column in another row) · 12 % of each.

Micro Step view (*since RC2*)

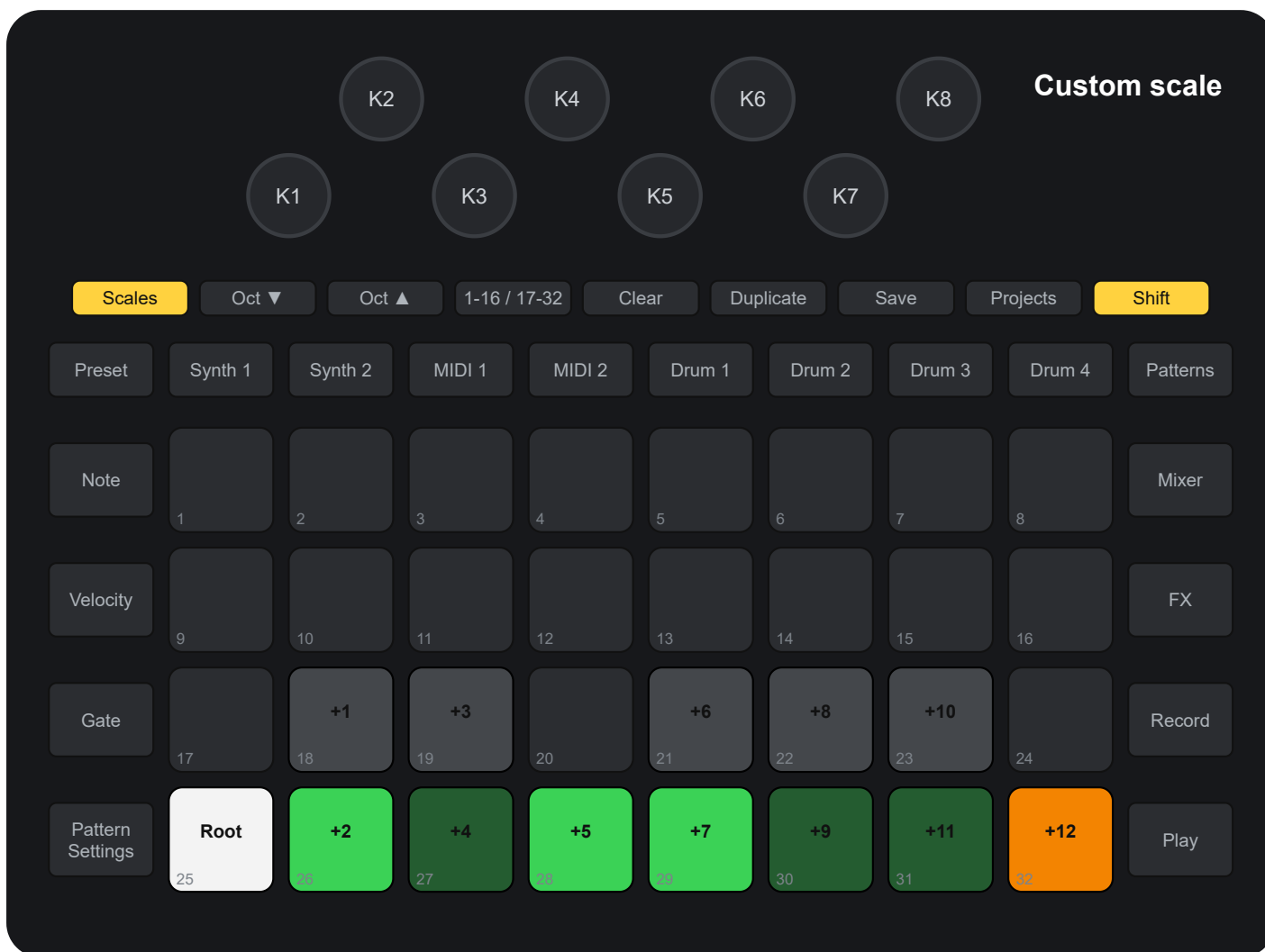
Press **Gate** twice (Gate once is the stock Gate view). As on the stock unit: pads 17-22 = the 6 micro steps of the chosen step, **pad 24 = Tie** (a toggle: ties the chosen notes to the next step), pads 25-30 = the step's notes (touching one chooses it and plays it). **Each note has a single micro step**: touching another moves it there; for several in the step, enter several notes (drums can light several: repeats). Added:

- **Pad 32 = gate by holding** (green): when entering notes by hand, the time you hold the pad is the note's length.
- **Pad 31 = fixed length** (orange): with both off it opens a selector (pads 17-32 = 1-16 steps); picking a length turns it on, and every note entered by hand gets it.
- With one on, pressing it again turns it off; pressing the other one switches.

Pattern chains and scenes (*since RC2*)

- **Chain mode** for the whole project: in the Patterns view **Shift + Octave ▲** turns it on (Octave ▲ green), **Shift + Octave ▼** off (the rules stay stored).
- **Editing a rule** (mode on): a pattern = **A** (yellow); A again = one more play (up to 8; the knob LEDs count); another pattern of the track = **B** (green), the next one = **C** (red). $n = 3$ plays A A B A A A C; B and C play once and the track returns to A.
- **Clear + pattern**: in the mode, removes the rule; outside, clears the pattern with its rule and order.
- **Scenes**: a scene saved in chain mode shows peach and brings the mode back when loaded. In the Mixer, **Shift + pads 9-16** = 1-8 repeats of the current scene (Beta 3.43 only: while playing, with Shift, the one now playing is white); tracks following a rule blink.
- **Drop-ins on the bar** (*since RC2*): in the Mixer, **Shift + a track pad (1-8)** mutes or unmutes it as the next bar starts (it blinks while it waits; again cancels it).
- **Cue mode** (*since RC2*): on the Mixer's pan page (Octave ▼), **Shift + a knob turned right** turns it on (Octave ▼ pink) and **turned left** turns it off. The left output carries the mix in mono; the right one, only the tracks you send to the cue with their pan knob (from the centre to the right). Use it to hear a muted track before bringing it in: it plays in time on the right only.
- *Beta 3.43 only*: with the cue mode on, the metronome's click (and the count-in's) sounds only on the right: you hear it in the cue headphones and the audience does not.

12 Scales and the custom scale



Custom scale editor (Shift + Scales): two octaves of a piano from the root.

Scales works as always (root and stock scale). (since RC2) **Shift + Scales** opens the **custom scale editor** (the Scales button shows yellow with Shift):

- The pads are two octaves of a piano from the root: row 4 = the white keys of the first octave, row 3 its black keys, rows 2 / 1 the second octave.
- Press a key to add or remove it (up to 7). The **highest key is the period**: the root of the next iteration (it does not have to be an octave). The root is white, notes green, the period orange.
- On the note tracks each row of pads is one iteration (two per row with 4 notes or fewer). It also drives which notes light up, the quantising and random-mutate.
- Picking a stock scale switches the custom scale off (the keys are kept). Saved with the project.

13 Metronome and count-in

(since RC2) **Shift + Clear** walks four states, shown by the Clear LED while Shift is held: **red** = no metronome, **green** = metronome, **magenta** = count-in only, **cyan** = count-in and metronome.

- **Count-in**: with Record armed and the transport stopped, **Play** gives one bar of four clicks at the project's tempo (Record blinks), then recording starts. Play during the count cancels it.

- ## 14 Setup and MIDI



Where	What it does
Setup, pad 16	Channel 16 for the project and the FX: receive and send (everything that is not a Program Change).
Setup, pads 22 / 23	Send the reverb return (cream) through strip 3 / the delay return (peach) through strip 4.
Setup, shared channels	MIDI 1 / 2 may use a channel another track uses: what they send also reaches that track internally.
Setup, Record (<i>since RC2</i>)	Yellow = what a MIDI track sends to a synth over a shared channel is also recorded into that synth. Off by default and after power-off. (<i>Beta 3.43 only</i>) While yellow, a note track muted in the Mixer is not recorded: its steps sound and are recorded only into the synth (a chord bank).
Setup, pads 29 / 30 (<i>since RC2</i>)	The Program Change channels of the project: listen (29) and send (30), 16 by default. First touch shows the channel on pads 1-16; a pad picks it; again = on / off. What arrives is sent again on the send channel.
Setup, K4 / K5-K8	<i>Beta 3.43 only</i> : General MIDI mode of the drums: K4 to the right turns it on; K5-K8 pick the note each drum sends (35-81; by default 36 kick, 38 snare, 42 and 46 hats) on the drums' channel. Every new note sounds once and its number shows on the pads; Shift or leaving Setup confirms it; K4 to the left turns it off and closes the number.
Advanced Setup, pad 23	<i>Beta 3.43 only</i> : USB merge : what you play on a keyboard on the DIN In also goes out over USB to the computer, together with the device's MIDI (green = on).
Advanced Setup, Duplicate (<i>since RC2</i>)	MIDI Thru jack: Thru (dim red) → Out 2 (green) → Merge (yellow: DIN In plus the device's MIDI) → Filter (blue: DIN In without the channels the device listens to). No SysEx in Merge / Filter; with Merge, switch Clock Tx off to avoid two clocks.

- **RC0.9 known issue**: opening Setup from the Synth 1 / 2 view, that synth's channel cannot be picked: open Setup from another view. (*since RC2*): fixed.

15 Projects and packs

Copying projects (*since RC2*)

In the Projects view: **Duplicate + pad A** = the source (blinks yellow; Duplicate + A again forgets it), **Duplicate + pad B** = the copy. An empty B is written at once; a B in use blinks white and you repeat Duplicate + B within about 5 s. The loaded project's slot is never written. **To another pack**: pick the source, load the other pack, go back to Projects and Duplicate + B. Save first: it copies what is on the card, and the unit does not respond for a moment while copying. A project keeps patch and sample numbers, not the sounds: in another pack it plays with that pack's patches and samples.

Deleting a pack

In the packs view (**Shift + Projects**) touch **Clear**: for about 5 s the packs that can be deleted blink (never the loaded one, never the internal memory's). Touch the pack, then **Clear** again within 5 s. The slot can be reused after a restart. Not in the safer build.

16 What is saved where

Where	What
The project	New drum knobs, Master FX slots, synth source, reverb / delay settings; (<i>since RC2</i>) also the Master FX knobs and compressor, chain mode and scenes, count-in, arpeggiator, custom scale, gate by holding / fixed length, drum sidechain knobs, the step-drummer's page 2 and toggle.
The pattern	The step-drummer's notes and values, FX sequencer values; (<i>since RC2</i>) chain rules, play order, frequency, dynamics, random-mutate (drums too), recorded rollers and drum arpeggios.
The pack (on save)	Captures used as drums; (<i>since RC2</i>) saved synth patches, own-synth patches.
Device settings	The MIDI track engine (pad 27, pages 1-2), the step-drummer on / off; (<i>since RC2</i>) MIDI Thru mode, Program Change channels.
Not saved	OSC 2 values, the granular Shift parameters, latched effects, the song pointer, the Setup Record toggle, the capture itself (unless it replaced a drum).

17 What the mod does not do

- Patterns are still at most 32 steps, and a track cannot change its type; the closest thing is a MIDI track with an engine (section 10).
- The developer tools (diagnostic builds, DSP internals) are left out of this guide: see the repository's technical notes.

Known issues in RC0.9 (fixed in RC2)

- Drums can sound different from a stock Circuit in new or untouched projects (filter mode DJ): Shift + K5 to EQ tilt.
- Setup opened from the Synth 1 / 2 view cannot pick that synth: open Setup from another view.
- The left part of the drum K3 (sample start) is under investigation.
- In older betas the delay stuttered when moving the MIDI engine's knobs or modes: fixed since Beta 1.12.

18 MIDI reference

Everything new goes out and comes in over CC / NRPN, following the CC Tx / Rx filters of Setup. Full tables: the [MIDI reference](#).

- **Drums** (drum channel): NRPN MSB 5-8 = Drums 1-4; LSB 1 pitch envelope, 2 ring frequency, 3 LFO, 4 LFO speed, 5 envelope → cutoff, 6 resonance, 7 envelope shape, 8 ring amount, 9 filter mode, 10 start point, 11 bitcrush, 12 distortion type; (*since RC2*) 13 cut, 14 attack.
- **Master FX** (channel 16): NRPN MSB 9, LSB = 4 × effect + knob: Gater 0-3, Auto-Filter 4-7, Digitise 8-11, Phaser 12-15, Glitch 16-19 (in RC0.9, Vinyl).
- **MIDI track engine** (the track's channel): filter CC 74, resonance 71, envelope → filter 79, attack 73, decay 75, sustain 70, release 72, effect 91, gain 59, tune 26, fine 27, wave 20, shape 21, tune 2 37, fine 2 39, wave 2 30, shape 2 31, mix 52, ring 54, LFO speed NRPN 0:76; the rest NRPN MSB 4.
- **Program Change** (*since RC2*): the project's listen / send channels in Setup (pads 29 / 30); patch flip on the track's channel.

19 About this edition

Corrected from the community guide: the uploader does not download the official firmware (you give it the file); RC0.9S has no remote diagnostics to leave out (no build has had them since SC36.1); the capture does not survive power-off unless it replaced a drum and the project was saved; Nudge works from the first step chosen in Pattern Settings (the original guide could not find the sequence); the three ways into the probability view are told apart (stock, mode 1, mode 2) and what is beta-only is marked (random-mutate, Nudge, play orders); the original names (capture, step-drummer) are back; the RC0.9 known issues are listed. Added: everything after Beta 1.3 (metronome and count-in, arpeggiator for notes and drums, custom scale, gate by holding and fixed length, drum rollers, the split drum K3, drum sidechain knobs, the step-drummer's page 2 and pitch-vel toggle, frequency / dynamics / random-mutate on the drums, Program Change channels, automation clearing on the MIDI engine, the recording fixes).