

DOODOV DIGITAL DESIGN

KBN-G

Kinetic Bouncing Note Generator

A physics-driven melodic CV generator for Reason. Four balls bounce inside an arena; every wall they strike sounds a pitched note in your chosen scale, and trip lines fire ratchet arpeggios. Four monophonic voices, endlessly evolving.



User Manual · Version 1.0 · Rack Extension

Device type: CV Processor (helper) · 4U · Requires Reason 14 or later

Contents

1	What KBN-G Is	3
2	The Panel at a Glance	4
3	How the Engine Works	5
4	Pitch: Zones, Root, Octave & Scale	6
5	Front Panel — Controls Section	7
6	Front Panel — The Arena	8
7	Front Panel — The Balls Editor	9
8	Front Panel — The Pitch Strip	10
9	Ratchet Trip Lines	11
10	Timing: Free & Quantized Modes	12
11	Randomness & Probability	13
12	Back Panel — Inputs & Outputs	14
13	CV Modulation in Depth	16
14	Patch Ideas & Tips	17
15	Parameter Reference	18
16	MIDI CC & Remote	19
17	Specifications	20

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1 • What KBN-G Is

Turn bouncing balls into melodies that always land in key.

KBN-G is the melodic member of the kinetic family. Four balls fly around an arena, ricocheting off the walls and off each other — and every impact sounds a **pitched note**. Each wall is divided into three zones, and the twelve zones across the field climb the scale you choose, so however wild the bouncing gets, the result is always musical.

Each ball is a **monophonic voice** with its own gate + note output pair, the standard Reason sequencer-control convention. That means KBN-G can play up to four instruments at once — four independent lines weaving around each other — with velocity taken from how hard each ball hits. Drop a trip line across the arena and it becomes a **ratchet**: a ball crossing it fires a quick run of notes stepping through the scale.

KBN-G makes no sound of its own. It is a CV Processor (a "helper" that sits beside instruments in the rack) that outputs gates, notes, and CV. Patch its gate + note pairs into the synths you actually want to hear.

What comes out

- **Four voice pairs** — a gate and a note output for each ball, driving up to four monophonic instruments.
- **Eight position outputs** — the live X and Y of each ball as a smooth 0–1 CV, ready to modulate filters, pan, or pitch.

Wall hits play scale steps; ball-to-ball collisions play the **root** as a natural anchor; trip-line crossings fire ratchet bursts.

2 · The Panel at a Glance

The front panel has four working areas.

CONTROLS — left

Transport and timing: **RUN** and its indicator, **KICK**, the **MODE** switch (Free / Quant), and the **SYNC**, **RECOVERY** and **GATE** knobs.

ARENA — centre

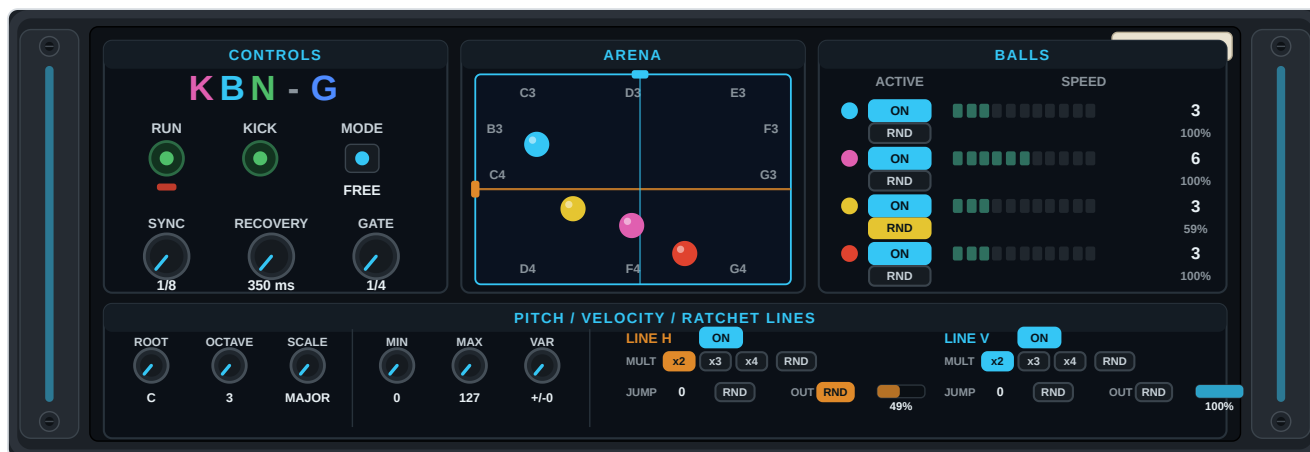
The live physics field, with each zone labelled by the note it will play. Watch the balls, see zones flash as they fire, and drag the two trip-line tabs.

BALLS — right

One editor row per ball: switch it on, set its **Speed**, and arm per-ball **Random** probability.

PITCH strip — bottom

Root, **Octave** and **Scale**; the output velocity trio (**Min** / **Max** / **Var**); and the two **ratchet trip line** blocks (Line H and Line V).



Front panel — Controls, Arena (with zone note labels), Balls, and the Pitch / Velocity / Ratchet-Lines strip. Illustration; on-screen values vary.

The **KBN-G** lettering lights up per ball while the device is running — a quick "am I live?" check.

3 · How the Engine Works

Understanding the simulation makes every control obvious.

Balls, walls and collisions

Four balls travel around a rectangular field at the **Speed** you set for each. When two balls collide they exchange momentum like billiard balls, so one may briefly speed up while the other slows; each then **recovers** back toward its set speed over the **RECOVERY** time. Balls reflect off the four walls.

Impacts become notes

Every wall bounce sounds a note whose pitch depends on *where* on the wall it landed (the zone — see Section 4), and whose velocity depends on *how fast* the ball was moving. Ball-to-ball collisions play the **root** note. Trip-line crossings start a ratchet burst (Section 9). Three things shape each note:

- **Pitch** — the zone's scale step, from your Root / Octave / Scale.
- **Velocity** — proportional to impact speed, scaled into the **Min / Max** window with optional per-hit **Var** (Section 8).
- **Length** — a musical duration (1/8 ... 1/1) held at the project tempo, set by **GATE**.

One voice per ball

Each ball owns a gate + note pair on the back panel. The note output holds the last pitch (it latches between gates) while the gate output pulses at the note's velocity — exactly what a Reason instrument's sequencer-control inputs expect. Because a voice is monophonic, each ball plays one note at a time.

Position outputs

Independently of the notes, KBN-G outputs each ball's X and Y position as a 0–1 CV (Y inverted, so "up" reads as higher CV) — smooth, ever-changing modulation.

KICK gives every ball a new random heading without changing its speed — an instant way to reshuffle the melody.

4 · Pitch: Zones, Root, Octave & Scale

This is what makes KBN-G musical rather than merely rhythmic.

The twelve zones

Each of the four walls is split into three equal portions, giving **twelve zones**. The zones are numbered around the field, and zone k plays the k -th step of your scale, ascending from the root — so higher-numbered zones play higher notes:

Wall	Zones (in order)	Plays scale steps
Top (left → right)	0, 1, 2	Root, +1, +2
Right (top → bottom)	3, 4, 5	+3, +4, +5
Left (top → bottom)	6, 7, 8	+6, +7, +8
Bottom (left → right)	9, 10, 11	+9, +10, +11

The arena prints the actual note name in each zone, so you can always see what a bounce will play. Ball-to-ball **collisions** play the root note itself.

Root, Octave & Scale

Three knobs in the Pitch strip set the musical frame:

- **Root** — the key, C through B.
- **Octave** — the base octave, 1–5 (default 3; C3 = MIDI note 60).
- **Scale** — one of ten: Chromatic, Major, Natural Minor, Harmonic Minor, Pentatonic Major, Pentatonic Minor, Blues, Dorian, Mixolydian, Whole Tone.

Steps wrap through octaves: with a seven-note scale, zone 7 is the root one octave up. With the five-note pentatonics the twelve zones span more than two octaves, so the arena covers a wide, always-consonant range.

Change Root, Octave or Scale at any time — even while playing — and every future bounce is instantly re-mapped. It's the fastest way to move a whole generative phrase into a new key or mood.

5 · Front Panel — Controls Section

RUN & indicator

RUN starts and stops the simulation and works with the Reason transport. With the transport **stopped**, press RUN to free-run the balls on their own (notes fire immediately); press again to stop. With the transport **playing**, pressing Play starts KBN-G automatically and Stop stops it; RUN toggles the device within a running transport. The **indicator** lamp lights whenever the device is actually running.

KICK

Re-randomises the direction of all four balls, keeping their speeds — an instant variation. KICK can also be fired from the back panel.

MODE — Free / Quant

Free fires notes the instant of impact. **Quant** snaps hits to the SYNC grid while the transport plays. Full detail in Section 10.

SYNC

The quantize grid (also the ratchet's total duration), from 1/1 down to 1/32 including dotted and triplet values. Default 1/8.

RECOVERY

How long a ball takes to return to its set speed after a collision. Eight steps, 50 ms to 5 s. Default 350 ms.

GATE

The **musical** length of each note — 1/8, 1/4, 1/2 or 1/1 — held for that duration at the current project tempo. Default 1/4. (Ratchet notes are shortened automatically so they articulate rather than slur.)

6 · Front Panel — The Arena

The central display is a live window into the simulation and a control surface.

What you see

- **The balls** in motion, each in its own colour (1 cyan, 2 magenta, 3 yellow, 4 red) so you can match a ball to its editor row and its outputs.
- **Zone note labels** around the edges — the note each of the twelve zones will play under the current Root / Octave / Scale.
- **Zone flashes** at the point of a bounce, so you can see which note just fired; collisions flash on the ball itself.
- **Trip lines** — the horizontal (H) and vertical (V) lines when enabled, plus faint **phantom** lines showing a CV-modulated position (phantom drawing is on by default and can be switched off on the back).

Dragging trip lines

Each enabled line has a tab you can grab and drag directly in the arena — the H line slides up and down, the V line left and right. Grabbing one never steals the other.

The arena is a visual aid; the notes are generated in the audio engine, so timing stays sample-accurate regardless of screen refresh.

7 · Front Panel — The Balls Editor

The right-hand **BALLS** display gives each ball a row of controls you can click or drag directly.

Active — ON

Switches the ball on or off. An inactive ball leaves the simulation — it stops moving and plays nothing; turning it back on gives it a fresh random heading. Run one to four balls at once (one voice each).

Speed

The ball's cruising speed on an 11-step scale (1 = slow drift, 11 = fast dart). Faster balls bounce more often and hit harder, so they play busier, louder lines. Default 3.

Random (RND) & Probability

Each ball has an **RND** toggle and a **Probability** value (0–100%). With RND armed, that ball's **wall** notes play only with the set probability — thinning a busy line into something sparser and less predictable.

Probability affects wall notes only. Ball-to-ball collisions — the root notes — always play, so the harmonic anchor is never lost.

8 · Front Panel — The Pitch Strip

The strip along the bottom holds the pitch frame, the output velocity controls, and the two ratchet trip-line blocks.

Root / Octave / Scale

Covered in Section 4 — the key, base octave and scale that map every zone to a note.

Velocity — MIN / MAX / VAR

Ball speed is mapped into an output velocity window:

- **MIN / MAX** (0–127 each) — the softest and loudest a hit can be. A slow impact lands near MIN, a fast one near MAX. Set MIN above MAX and KBN-G swaps them. Defaults 0 and 127.
- **VAR** (0–20) — a per-hit random variation added on top, for a humanised, never-quite-identical dynamic. Default 0.

Line H & Line V blocks

Each trip line has a compact block here: an **ON** enable, the **MULT** ratchet count (x2 / x3 / x4), a **JUMP** value, an **OUT** probability with its own RND, and RND toggles for the count and jump. These are explained next.

9 · Ratchet Trip Lines

The two trip lines turn motion into arpeggios. There is one **horizontal (H)** line, positioned up and down the field, and one **vertical (V)** line, positioned left and right. Enable a line, place it (drag its tab or use the Position CV), and every time a ball crosses it, that ball fires a **ratchet**: a short run of notes.

How a ratchet plays

The burst is spread evenly across **one SYNC-grid duration**. The first note sounds immediately; each following note steps by the **JUMP** amount in scale degrees from the previous note, snapped to the current scale. The starting note is the ball's last-played note (or the root if it hasn't played yet). All of it comes out on that ball's own gate + note pair, and — by design — bursts play right away rather than waiting for the quantize grid.

The line controls

Control	Range	What it does
ON	Off / On	Enables the line.
Position	0–100%	Where the line sits (drag in the arena or use Position CV).
MULT (ratchet)	x2 / x3 / x4	How many notes in the burst.
JUMP	–4 ... +4	Scale degrees stepped between notes (0 = repeat the same note).
RND count	Off / On	Randomise the count (2 at 40%, 3 at 40%, 4 at 20%).
RND jump	Off / On	Randomise each step's jump (–4 ... +4).
OUT — RND	Off / On	Arm per-note output probability.
OUT — Prob	0–100%	Chance each note in the burst actually plays.

Because the run spans one grid step, higher counts pack the notes tighter — an x4 ratchet on a 1/8 SYNC is four 1/32-spaced notes. Set a positive JUMP for rising runs, a negative one for falling, and RND jump for scampering, unpredictable figures.

10 · Timing: Free & Quantized Modes

Free mode

In Free mode a note fires the moment its bounce occurs. This is the most physical feel — the rhythm is exactly the rhythm of the bouncing. Free is always in effect when the transport is stopped, whatever the MODE switch says.

Quant mode

With MODE set to Quant *and the transport playing*, wall and collision hits are held and released on the next **SYNC** grid boundary, snapping the free-flowing physics into a tempo-locked rhythm.

- Hits landing on the same voice between two grid steps queue and play back **one per step** ("in turns"), so a flurry becomes a run of grid-aligned notes.
- The queue is generous (16 deep per ball); on overflow the oldest hit is dropped.
- When the queue must collapse — you stop the transport or switch to Free — the **newest** pending note per voice is played (a monophonic voice can't sound a chord) and the rest are cleared, so nothing hangs.

Ratchet bursts ignore Quant — they fire the instant a ball crosses the line, so arpeggios always land tight to the crossing regardless of mode.

Because Quant only applies while the transport plays, stopping always falls back to Free — handy for auditioning the raw physics before locking it down.

11 · Randomness & Probability

KBN-G offers several independent ways to thin and humanise the output.

Per-ball note probability

Arm a ball's **RND** and set its **Probability** (0–100%). Each of that ball's **wall** notes then plays only with that chance — 100% plays everything, 50% about half, 0% silences its wall notes while it keeps bouncing. Each wall of a corner double-hit is rolled independently.

Ratchet randomness

Per line, you can randomise the **count** (2/3/4), randomise the **jump** each step, and gate each burst note with an **output probability** — from tight, fixed arpeggios to loose, sputtering runs.

Velocity variation

The **VAR** knob adds a per-hit random velocity wobble, so repeated notes don't play at a machine-identical level.

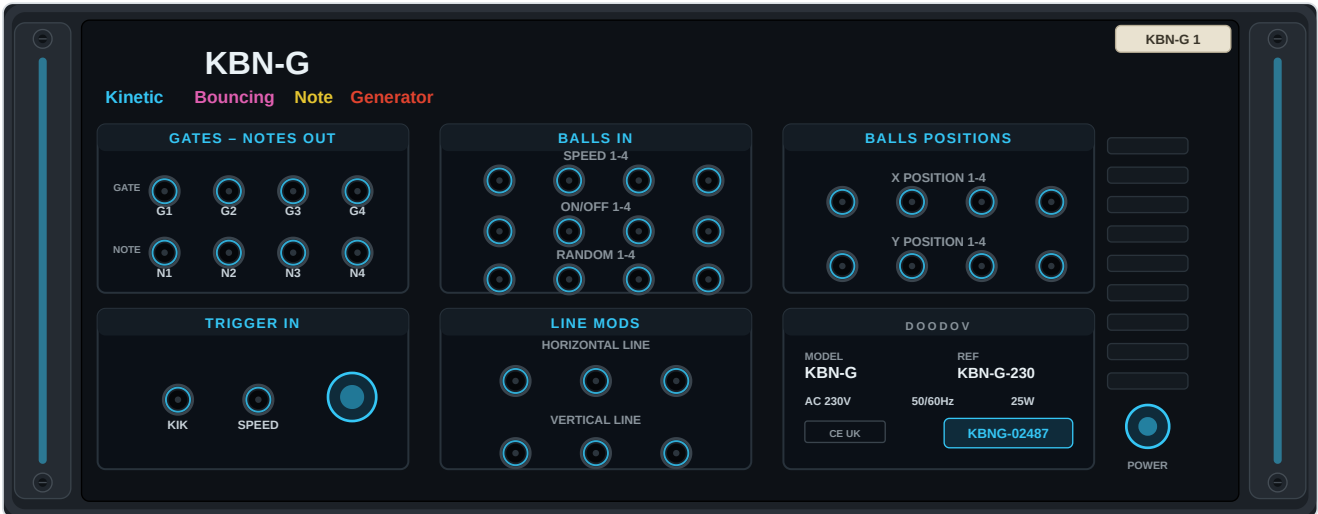
What always plays

Ball-to-ball **collisions** (the root notes) are never gated by probability — the harmonic anchor is always there.

Every randomness control is also a back-panel CV input. Patching a Randomness CV into a ball or line **arms its RND automatically** and sweeps the probability — drive it from an LFO or envelope to breathe density into a part.

12 · Back Panel — Inputs & Outputs

All patching happens on the back, grouped by function. Printed socket names are shown in `THIS` style.



Back panel — voice outputs and Trigger In on the left, modulation inputs in the middle (Balls In, Line Mods), position outputs and the device plate on the right. Illustration.

GATES – NOTES OUT — voice outputs

Socket(s)	Signal
G1–G4	Gate for ball 1–4 — pulses at the note's velocity while open.
N1–N4	Note (pitch CV) for ball 1–4 — holds the last note between gates.

Patch each ball's N + G into an instrument's sequencer-control Note and Gate inputs (e.g. via a Combinator or a synth's CV in) to play it as a voice.

BALLS POSITIONS — position outputs

Socket(s)	Signal
X POSITION 1–4	Horizontal position of each ball, 0–1.
Y POSITION 1–4	Vertical position, 0–1 (inverted: up = higher CV).

TRIGGER IN — global inputs

Socket	Effect
KIK	A rising CV edge re-randomises all ball directions — same as the front KICK.
SPEED	Global speed modulation for all balls at once (bipolar — see Section 13).

BALLS IN — per-ball inputs (1–4)

Socket row	Effect
SPEED 1–4	Bipolar speed modulation around that ball's Speed.
ON/OFF 1–4	Overrides the ball's ON button (≥ 0.5 = on).
RANDOM 1–4	Modulates the ball's probability and arms its RND.

LINE MODS — trip-line inputs (H, V)

Socket	Effect
Position	Bipolar shift of the line's effective position (draws a phantom line).
On/Off	Overrides the line's enable button.
Random	Modulates the line's output probability and arms its RND.

A back-panel **Phantom** toggle (default on) enables the animated phantom-line drawing in the arena.

13 · CV Modulation in Depth

Speed CVs

The global **SPEED** and per-ball **SPEED** inputs are bipolar modulators. They shift a ball across the speed table — a full-swing CV can reach from the slowest step to the fastest — and the global and per-ball amounts add together, so you can push one ball while riding the whole field. To fully stop a ball, use its ON/OFF input.

On/off inputs

Patching a ball or line **ON/OFF** input takes over its front-panel toggle: a CV at or above 0.5 turns it on, below 0.5 off. Feed a gate pattern to make balls or lines appear and disappear in time.

Line position CV

A line's **Position** input sweeps its effective crossing point across the field while the solid line stays at its set place and a phantom shows the modulated spot. A crossing registers whether the ball moved across the line or the line swept across the ball — so an LFO on Position turns a still line into a moving arpeggio trigger.

Randomness CVs

The ball and line **Random** inputs modulate probability around the slider and arm that randomness automatically — envelope them for fills, or use slow LFOs for breathing density.

Every CV input is safe to leave unpatched; each control simply falls back to its front-panel value.

14 · Patch Ideas & Tips

A four-voice generative patch

1. Put KBN-G above four monophonic synths (or one Combinator holding them).
2. Patch each ball's **N** → the synth's Note/CV input and **G** → its Gate input.
3. Set a **Scale** and **Root**, press Play, and set MODE to **Quant** at 1/8 or 1/16.
4. Tune each ball's **Speed** for busier or sparser lines; hit **KICK** for a new variation.

Arpeggios on demand

Enable the H line across the middle and set **MULT x4** with a **JUMP** of +2 — every crossing throws a rising four-note run. Sweep the line with an LFO on its Position CV for arpeggios that drift through the field.

Bass + lead split

Give ball 1 a low **Octave** feel by patching it to a bass synth and the others to a lead; slower ball 1 = sparse root movement under busier top voices. (Octave is global, but slow low balls naturally sit under fast high ones.)

Evolving modulation

Use the **BALL X/Y** outputs as LFO-like modulators for filter cutoff or pan — different ball speeds give rates that drift in and out of phase.

Breathing density

Patch an LFO into a ball's **Random** input to sweep its wall notes from sparse to full and back over a section.

15 · Parameter Reference

Controls section

Control	Range	Default	Notes
RUN	Momentary	—	Toggles run; follows transport.
KICK	Momentary	—	Re-randomises all headings.
MODE	Free / Quant	Free	Note timing.
SYNC	1/1 ... 1/32 (12 steps)	1/8	Quantize grid & ratchet span.
RECOVERY	50 ms ... 5 s (8 steps)	350 ms	Post-collision speed recovery.
GATE	1/8, 1/4, 1/2, 1/1	1/4	Musical note length at tempo.

Pitch & velocity (Pitch strip)

Control	Range	Default
Root	C ... B	C
Octave	1 – 5	3
Scale	10 scales (Chromatic ... Whole Tone)	Major
VEL MIN	0 – 127	0
VEL MAX	0 – 127	127
VEL VAR	0 – 20	0

Per ball (× 4)

Control	Range	Default
Active (ON)	Off / On	On
Speed	1 – 11	3
Random	Off / On	Off
Probability	0 – 100%	100%

Each trip line (H, V)

Control	Range	Default
On	Off / On	Off
Position	0 – 100%	50%
MULT (ratchet)	x2 / x3 / x4	x2
Jump	–4 ... +4	0
RND count / jump / out	Off / On	Off
Probability	0 – 100%	100%

Back panel: Phantom lines — Off / On, default On.

16 · MIDI CC & Remote

KBN-G's knobs and switches are Remote targets (grouped for the Combinator into Global, Balls State, Balls Random, Pitch, Line H and Line V) and respond to the MIDI CC messages below. RUN and KICK are deliberately not automatable, in keeping with the family's treatment of transport-style controls.

CC	Parameter
13	Mode
14	Sync resolution
15	Recovery
16	Gate length
17–20	Ball 1–4 Active
21–24	Ball 1–4 Speed
25	Root
26	Octave
27	Scale
28–31	Ball 1–4 Random
33–36	Ball 1–4 Probability

CC	Parameter
37 / 39 / 40	Vel Min / Max / Var
41–48	Line H: on, pos, ratchet, jump, rnd-cnt, rnd-jmp, rnd-out, prob
49–56	Line V: on, pos, ratchet, jump, rnd-cnt, rnd-jmp, rnd-out, prob

17 · Specifications

Item	Value
Device name	KBN-G — Kinetic Bouncing Note Generator
Manufacturer	Doodov Digital Design
Type	CV Processor (helper) — outputs gates, notes & CV, no audio
Panel height	4U
Balls / voices	4 — one monophonic gate + note voice each
Pitch	12 zones, 10 scales, selectable root & octave; collisions play root
Trip lines	2 (H, V) ratchet generators, x2–x4, jump ± 4
Outputs	4 gate + 4 note pairs, 8 ball-position CVs
CV inputs	Kick, global speed, per-ball speed / on-off / random, per-line position / on-off / random
Timing	Free or transport-quantized; ratchets fire immediately
Host requirement	Reason 14 or later
Automation	MIDI CC + grouped Remote / Combinator targets

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