DOODOV DIGITAL DESIGN

KGB-G

Kinetic Gate Bouncing Generator

A physics-driven CV gate generator for Reason. Four balls bounce inside an arena — every wall hit, collision, and trip-line crossing fires a velocity-scaled CV gate. Free-running or locked to the transport.

User Manual · Version 1.0 · Rack Extension
Device type: CV Processor (helper) · 4U · Requires Reason 14 or later

Contents

1 · What KGB-G Is

KGB-G turns a bouncing-ball simulation into a source of musical triggers.

Inside the device, four balls fly around a rectangular arena, ricocheting off the walls and off each other. KGB-G watches that motion and, at every impact, emits a **CV gate** — a short control-voltage pulse you can route anywhere in the Reason rack: to fire a drum, open an envelope, advance a sequencer, ping a delay, or trigger any Player or CV-responsive device.

Because the balls carry momentum, transfer energy when they collide, and speed up or slow down over time, the stream of gates is organic and evolving rather than a fixed pattern. You steer it with a handful of musical controls — how fast the balls move, how the impacts map to gate strength, whether hits fire freely or snap to the project's tempo grid, and how much chance is involved.

> **KGB-G is a CV device — it makes no sound of its own.** It is a CV Processor (a "helper" that sits beside instruments in the rack). Patch its gate outputs into the CV or gate inputs of the devices you actually want to hear.

What comes out

- **Five impact gates** — one for each of the four walls, plus one for ball-to-ball collisions.
- **Four trip-line gates** — fire when a ball crosses a line you place anywhere in the arena.
- **Eight position outputs** — the live X and Y position of each ball as a continuous 0–1 CV, perfect for modulating filters, pan, pitch, and more.

Every gate's **level** tracks how fast the ball was moving on impact, so a lazy tap and a hard slam produce different velocities — ideal for driving velocity-sensitive sounds.

2 · The Panel at a Glance

The front panel is organised into four working areas.

CONTROLS — left

The global transport and timing controls: **RUN** and its indicator, **KICK**, the **MODE** switch (Free / Quant), and the **SYNC**, **RECOVERY** and **GATE LEN** knobs.

ARENA — centre

The live physics field. You watch the balls bounce here, see walls and collisions flash as they fire, and drag the trip-line tabs to reposition them.

BALLS — right

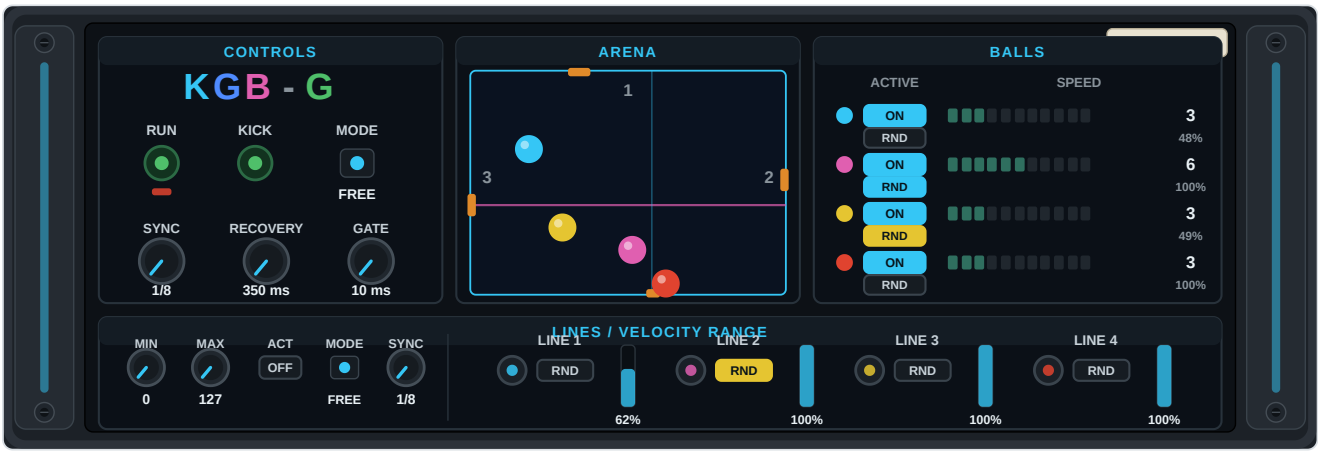
One editor row per ball: switch it on or off, set its **Speed**, and arm per-ball **Random** probability. A live speed read-out tracks each ball.

LINES strip — bottom

Output **Velocity range** (Min / Max), the optional **line quantize** block, and the four coloured **trip-line** enables — each with its own Random toggle and Probability slider.

The back panel carries all patching: gate outputs, ball-position outputs, and a generous set of CV inputs for modulating speed, position, on/off state and randomness. Section 10 covers it in full.

> The **KGB-G** lettering at the top of the panel lights up per ball while the device is running — a quick visual "am I live?" check.



Front panel — Controls (left), Arena (centre), Balls (right), and the Lines / Velocity strip along the bottom. Illustration; on-screen values vary.

3 · How the Engine Works

Understanding the simulation makes every control obvious.

The arena and the four walls

The balls live in a rectangular field. The four walls are numbered so you always know which gate a hit will fire:

Wall	Position	Fires
1	Top	`GATE 1`
2	Right	`GATE 2`
3	Left	`GATE 3`
4	Bottom	`GATE 4`

Ball-to-ball collisions fire a fifth gate, `GATE 5`.

Motion, energy and recovery

Each ball travels at the **Speed** you set for it. When two balls collide they exchange momentum like real billiard balls (an equal-mass elastic collision), so one may briefly speed up while the other slows down. After a collision each ball gradually **recovers** back toward its set speed. The **RECOVERY** knob sets how long that settling takes — from a near-instant 50 ms snap-back to a slow 5-second drift. Short recovery keeps the tempo tight; long recovery lets collisions leave a lasting mark on the groove.

Impacts become gates

Every wall bounce, every collision, and every trip-line crossing opens the matching gate output for a moment. Three things shape that gate:

- **Level (velocity)** — proportional to the ball's speed at impact, scaled into the window you set with **VEL MIN / VEL MAX**. Faster ball = higher CV. A collision's level tracks the closing speed of the two balls.
- **Length** — how long the gate stays open, set by **GATE LEN** (2 ms to 500 ms).
- **Timing** — either the instant of impact (Free) or the next beat-grid boundary (Quant). See Section 8.

Position outputs

Independently of the gates, KGB-G continuously outputs each ball's X and Y position as a 0–1 CV. Y is inverted so that "ball moving up" reads as "CV going up." These are smooth, ever-changing modulation sources.

> **KICK** gives every ball a new random heading without changing its speed — an instant way to shuffle the pattern when things get predictable.

4 · Front Panel — Controls Section

The left-hand block governs when the device runs and how its gates are timed.

RUN & indicator

RUN starts and stops the simulation. It is a momentary button that toggles the run state, and it works hand-in-hand with the Reason transport:

- **Transport stopped:** press RUN to free-run the balls on their own. Gates fire immediately (Free timing). Press again to stop.
- **Transport playing:** pressing Play automatically starts KGB-G; pressing Stop stops it. RUN toggles the device on or off within a running transport.

The **indicator lamp** is lit whenever the device is actually running — whether that's from the transport or from a manual RUN press.

KICK

Re-randomises the direction of all four balls, keeping their speeds. Use it to break up a pattern that has settled into a loop. KICK can also be triggered from the back panel (see Section 10).

MODE — Free / Quant

Selects how gates are timed. **Free** fires each gate the instant the impact happens. **Quant** holds hits and releases them on the SYNC grid while the transport plays. Full detail in Section 8.

SYNC

Sets the quantize grid used in Quant mode — the same musical rate ladder found on Doodov's sequencers, 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 knocks it off pace. Eight steps from 50 ms to 5 s. Default 350 ms.

GATE LEN

The length of every gate pulse, eight steps from 2 ms to 500 ms. Short values suit percussive triggers; longer values suit envelope gates that need to stay open. Default 10 ms.

5 · Front Panel — The Arena

The central display is a real-time window into the simulation. It is both a monitor and a control surface.

What you see

- **The balls** moving in real time, each drawn in its own colour so you can match a ball to its editor row and its position outputs.
- **Wall flashes** — the edge of the field flashes at the point of a bounce, so you can see exactly which gate just fired.
- **Collision flashes** — a marker lights when two balls strike each other.
- **Trip lines** — any enabled line is drawn across the field, vertical or horizontal depending on which line it is (see Section 7).
- **Phantom lines** — when a line's position is being modulated by CV, a faint "phantom" line shows where the effective crossing point currently sits, while the solid line stays at its knob position. Phantom drawing is enabled by default and can be switched off on the back panel.

Dragging trip lines

Each enabled trip line has a small tab you can grab and drag directly in the arena to reposition it. Vertical lines slide left–right; horizontal lines slide up–down. Dragging one tab never accidentally grabs another, so lines that overlap stay independent.

> The arena is a visual aid — the gates themselves are generated in the audio engine, so timing is always sample-accurate regardless of screen refresh.

6 · Front Panel — The Balls Editor

The right-hand **BALLS** display gives each of the four balls its own row of controls. Every control here can be clicked or dragged directly in the display. Each ball has a fixed colour so you can track it across the arena, its editor row, and its position outputs:

Ball	Colour	Fires wall / collision gates as
1	Cyan	Any ball can fire any wall gate (1–4) and the collision gate (COL). Colour is only an on-screen identifier.
2	Magenta	
3	Yellow	
4	Red	

Active — ON

The **ON** button switches the ball on or off. An inactive ball is removed from the simulation — it stops moving and fires no gates. Turning a ball back on gives it a fresh random heading. You can run anywhere from one to four balls at once.

Speed

Sets the ball's cruising speed on an 11-step scale (1 = a slow drift, 11 = a fast dart). Higher speed means more frequent bounces and, because level tracks speed, stronger gates. Default 3.

Random (RND) & Probability

Below each ball's ON button is an **RND** toggle, and along its row a **Probability** value (0–100%, shown at the right of the row). With RND armed, that ball's **wall** hits are only emitted with the set probability — turning a steady bounce into a thinned, less predictable pattern. The **SPEED** control is the horizontal bar/number in the middle of the row; a live read-out tracks how fast the ball is actually moving, which is useful when collisions or CV push it off its nominal speed.

> **Probability applies to wall hits only.** Ball-to-ball collisions always fire — they are never thinned by chance — so the collision gate stays reliable. A ball's own trip-line crossings are governed by the line's probability, not the ball's (Section 9).

7 · Front Panel — The Lines Strip

The strip along the bottom of the panel carries the output velocity range, the optional line-quantize block, and the four trip lines.

Velocity range — MIN / MAX

The two left-most knobs, labelled **MIN** and **MAX** (each 0–127, like a MIDI velocity), define the window that ball speed is mapped into for *every* gate. A slow impact lands near MIN, a fast one near MAX. Set both high for consistently strong hits, or open the window wide for expressive dynamics. If MIN is set above MAX, KGB-G simply swaps them. Defaults: MIN 0, MAX 127 (full range).

Trip lines

Four lines can be placed across the arena. Each is enabled by its own coloured button. A ball passing through an enabled line fires that line's gate on the back panel. The lines are oriented in a fixed pattern:

Line	Orientation	Default position	Fires
1	Vertical (moves left–right)	25% across	`LINE GATE 1`
2	Vertical (moves left–right)	75% across	`LINE GATE 2`
3	Horizontal (moves up–down)	35% down	`LINE GATE 3`
4	Horizontal (moves up–down)	65% down	`LINE GATE 4`

All four lines are **off by default**. Position each line by dragging its tab in the arena or from the back-panel Position CV. Each line also has its own **Random** toggle and vertical **Probability** slider, drawn right in the strip, to thin its crossings independently.

Line quantize block — ACT / MODE / SYNC

Between the velocity knobs and the line buttons sits a small block labelled **ACT**, **MODE** and **SYNC**. By default the four line gates follow the global MODE and SYNC. Turn **ACT** (activate) on to give the lines their own timing: the block's **MODE** (Free / Quant) and **SYNC** grid then apply to the line gates only. This lets you, for example, run the wall gates free-flowing while the line gates lock tightly to 1/16 notes — or put walls and lines on two different grids for polymetric patterns. Each of the four **LINE 1–4** blocks to the right carries the line's enable button, an **RND** toggle, and a vertical probability slider with a live % read-out.

8 · Timing: Free & Quantized Modes

Free mode

In Free mode a gate opens the moment its impact occurs and stays open for the GATE LEN time. This is the most direct, physical feel — the rhythm is exactly the rhythm of the bouncing. Free mode 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*, impacts are not fired instantly. Instead each hit is held and released on the next **SYNC** grid boundary, so the free-flowing physics is snapped into a tight, tempo-locked rhythm.

- When several hits land on the same output between two grid steps, they are queued and played back **one per step** over the following steps, so a fast flurry becomes a run of grid-aligned notes rather than a single blur.
- The queue holds up to four hits per output; if it overflows, the oldest hit is dropped so the output always reflects what the balls are doing now.
- When two hits merge into one gate, the stronger (louder) level wins.

> **Nothing is lost when you stop or switch modes.** If you stop the transport, or flip MODE from Quant to Free, any hits still waiting in the queue are released immediately rather than being silently discarded.

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

Independent line timing

Remember that the four trip-line gates can be put on their own MODE and SYNC using the line-quantize block (Section 7). Walls and collisions always follow the global settings; the lines follow the global settings *unless* their ACTIVATE toggle is on.

9 · Randomness & Probability

KGB-G offers per-ball and per-line probability so you can thin and humanise the gate stream without touching the physics.

Per-ball randomness

Arm a ball's **Random** toggle and set its **Probability** (0–100%). From then on, each of that ball's **wall** hits is emitted only with that chance. At 100% every hit fires; at 50% roughly half do; at 0% the ball's wall gates go silent while it keeps bouncing. Each wall of a corner hit is rolled independently.

Per-line randomness

Each trip line has its own **Random** toggle and **Probability** slider, governing crossings of that line. This is independent of the crossing ball's own wall probability — a line can thin every ball that passes it, or pass everything.

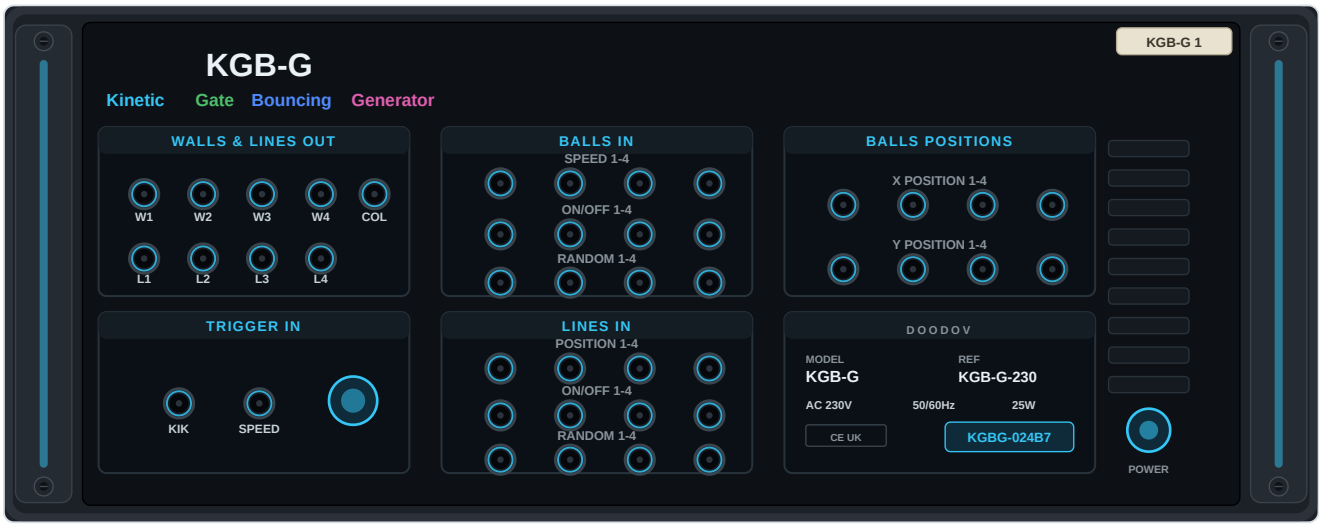
What is never thinned

Ball-to-ball **collisions** always fire. They are the least predictable events in the simulation already, so KGB-G never applies probability to them — the collision gate is something you can rely on.

> Both randomness controls can also be driven from the back panel. Patching a Randomness CV into a ball or line input **arms its Random automatically** and modulates the probability around the slider setting — so you can sweep a pattern from sparse to dense with an LFO or envelope.

10 · Back Panel — Inputs & Outputs

All patching happens on the back. Sockets are gathered into labelled groups; the printed socket names are shown below in `THIS` style.



Back panel — outputs on the left (Walls & Lines Out, Trigger In), modulation inputs in the middle (Balls In, Lines In), and position outputs plus the device plate on the right. Illustration.

WALLS & LINES OUT — gate outputs

Socket(s)	Fires on
`W1 W2 W3 W4`	Wall hits: W1 top, W2 right, W3 left, W4 bottom. Level = ball speed.
`COL`	Ball-to-ball collision. Level = closing speed.
`L1 L2 L3 L4`	A ball crossing trip line 1–4. Level = ball speed.

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 button.
`SPEED`	Global speed modulation for all balls at once (bipolar — see Section 11).

BALLS IN — per-ball inputs (1–4)

Socket row	Effect
`SPEED 1–4`	Bipolar speed modulation around that ball's Speed setting.
`ON/OFF 1–4`	Overrides the ball's ON button (≥ 0.5 = on). Use it to freeze or gate a ball from CV.
`RANDOM 1–4`	Modulates the ball's probability and automatically arms its RND.

LINES IN — per-line inputs (1–4)

Socket row	Effect
`POSITION 1–4`	Bipolar shift of the line's effective position across the field (draws a phantom line).
`ON/OFF 1–4`	Overrides the line's enable button.
`RANDOM 1–4`	Modulates the line's probability and automatically arms its RND.

Phantom toggle

A back-panel toggle (default on) enables the animated **phantom line** drawing in the arena, showing where CV-modulated lines currently sit. Turn it off for a cleaner display.

11 · CV Modulation in Depth

How the speed CVs behave

The **SPEED MOD** (global) and per-ball **SPEED** inputs are *bipolar* modulators centred on the knob setting. A CV of 0 leaves the speed at the knob value; +1 doubles it; −1 slows the ball to a crawl (about 15% of the set speed) but never to a full stop. Global and per-ball speed CVs stack, so you can push a single ball while riding the whole field. To fully stop or freeze a ball, use its ON/OFF input instead.

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 turns it off. This is the clean way to sequence which balls or lines are live — feed it a gate pattern to make balls appear and disappear in time.

Line position CV

A line's **POS** input shifts its effective crossing point across the field (bipolar). The solid line stays drawn at its knob position while a phantom line shows the modulated point — so you can sweep a line with an LFO and watch (and hear) balls trip it as it moves. A crossing registers whether the ball moved across the line or the line swept across the ball.

Randomness CV

The ball and line **RND** inputs modulate probability around the slider, and the act of patching them arms that Random automatically. Drive them from an envelope to open a pattern up on a fill, or from an LFO for slowly breathing density.

> All CV inputs are safe to leave unpatched — each control simply falls back to its front-panel value. You only ever "spend" a CV input on the behaviour you want to automate.

12 · Patch Ideas & Tips

A first drum patch

1. Add KGB-G above a drum device (e.g. a Kong or a set of sound generators).
2. Patch `GATE 1` → kick trigger, `GATE 4` → snare, `GATE 2/3` → hats, and `GATE 5` → a percussion accent.
3. Press Play. Set MODE to **Quant** and SYNC to 1/8 or 1/16 to lock the hits to tempo.
4. Ride the ball **Speeds** to change density; hit **KICK** for an instant variation.

Velocity-dynamic hits

Open the **VEL MIN / VEL MAX** window wide and route a gate to a velocity- sensitive sound. Slow balls will play soft, fast balls hard — collisions become natural accents.

Evolving modulation

Ignore the gates for a moment and use the **BALL X/Y** outputs as LFO-like modulators for filter cutoff, pan, or pitch. Different ball speeds give different modulation rates that drift in and out of phase.

Polymetric lines

Enable a couple of trip lines, turn on the **line-quantize ACTIVATE** block, and set the line SYNC to a different value than the global SYNC. The walls and lines now run on two grids at once.

Breathing density

Patch an LFO into a ball's **RND** input to sweep its wall hits from sparse to full and back — a hands-off way to keep a groove alive over a long section.

Generative freeze-frames

Sequence the ball **ON/OFF** inputs so only one ball is live in the verse and all four in the chorus, building arrangement dynamics straight from CV.

13 · Parameter Reference

Front-panel controls, their ranges and factory defaults.

Controls section

Control	Range	Default	Notes
RUN	Momentary	—	Toggles run state; follows transport.
KICK	Momentary	—	Re-randomises all ball headings.
MODE	Free / Quant	Free	Gate timing.
SYNC	1/1 … 1/32 (12 steps, incl. dotted & triplet)	1/8	Quantize grid.
RECOVERY	50, 100, 200, 350, 500 ms; 1, 2, 5 s	350 ms	Post-collision speed recovery.
GATE LEN	2, 5, 10, 25, 50, 100, 250, 500 ms	10 ms	Gate pulse length.

Per ball (× 4)

Control	Range	Default	Notes
Active	Off / On	On	Ball in/out of the simulation.
Speed	1 – 11	3	Cruising speed.
Random	Off / On	Off	Arms wall-hit probability.
Probability	0 – 100%	100%	Chance a wall hit fires.

Lines strip

Control	Range	Default	Notes
VEL MIN	0 – 127	0	Low end of output velocity window.
VEL MAX	0 – 127	127	High end of output velocity window.
Line 1–4 enable	Off / On	Off	Vertical: 1,2 · Horizontal: 3,4.
Line Position	0 – 100% of field	25 / 75 / 35 / 65%	Line 1 / 2 / 3 / 4.
Line Random	Off / On	Off	Arms crossing probability.
Line Probability	0 – 100%	100%	Chance a crossing fires.
Line ACTIVATE	Off / On	Off	Give lines their own timing.
Line MODE	Free / Quant	Free	Used when ACTIVATE is on.
Line SYNC	1/1 … 1/32	1/8	Used when ACTIVATE is on.

Back panel

Control	Range	Default
Phantom lines	Off / On	On

14 · MIDI CC & Remote

KGB-G's knobs and switches are available as Remote targets (for the Combinator and hardware control surfaces) and respond to the following MIDI CC messages. The RUN and KICK buttons are deliberately **not** automatable, in keeping with the treatment of transport-style controls across the Doodov range.

CC	Parameter
13	Mode
14	Sync resolution
15	Recovery time
16	Gate length
17–20	Ball 1–4 Active
21–24	Ball 1–4 Speed
25	Velocity Min
39	Velocity Max

CC	Parameter
26–29	Line 1–4 On
30, 31, 34, 35	Line 1–4 Position
33	Line Quantize Activate
36	Line Mode
37	Line Sync

Per-ball and per-line Random and Probability controls are exposed as Remote targets for the Combinator as well; automate them there or via the back-panel Randomness CV inputs.

15 · Specifications

Item	Value
Device name	KGB-G — Kinetic Gate Bouncing Generator
Manufacturer	Doodov Digital Design
Type	CV Processor (helper) — generates CV, no audio
Panel height	4U
Balls	4, independently controllable
Gate outputs	9 total — 4 walls, 1 collision, 4 trip lines
Position outputs	8 — X and Y for each ball (0–1 CV)
CV inputs	Kick, global speed, per-ball speed / on-off / random, per-line position / on-off / random
Timing	Free or transport-quantized; independent line grid
Host requirement	Reason 14 or later
Automation	MIDI CC + Remote / Combinator targets