Glow-Up

Harmonic filter · CLAP and VST3 plugin · free and open source



Glow-Up listens for the strongest notes and overtones in a sound and brightens it at chosen intervals above them: an octave, a fifth, or any ratio you set. It does this with narrow filters that boost what is already there, so it adds shimmer and focus without adding notes, until you turn up its resonance and the filters start to sing.

It adds no delay. Start with the Quick start on the next page.

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Quick start

Put Glow-Up on a guitar, a synth, a voice or a pad and play. At its defaults, boost A brightens each strong pitch an octave up and boost B a fifth up, each at a quarter of its strength. The sound gets a gentle glow; the screen shows the input in red and, in amber, where Glow-Up is lifting it. Then try:

- **AMOUNT** in BOOST A and BOOST B: up for more glow. Turn one down to zero to hear the other alone.
- **MULT** and **DIV**, under each **AMOUNT**: the boost's interval, as a ratio. MULT 3 over DIV 1 is an octave and a fifth up; MULT 1 over DIV 2 is an octave below.
- **FOCUS**, top right: towards TRACK, the boosts follow bends and vibrato exactly; towards GRID they stay put and a bend sweeps through them.
- **RESONANCE**: up towards SING for a ringing, vocal tone. Past SING, strong notes make the filters sing at their own pitch.
- **DRY CUT**, bottom left, to hear only what Glow-Up adds.



Figure 1. The controls, at their defaults, with a note playing. BOOST B has the same three controls as BOOST A.

1 **MIX**	The whole of Glow-Up's sound against the clean one.	2 **MONO**	Left input to both outputs. The default.
3 **STEREO**	Each side boosted on its own.	4 **DRY CUT**	Hear only the boosts.
5 **AMOUNT**	How strong the boost is.	6 **MULT**	The boost's ratio: times this…
7 **DIV**	…divided by this.	8 **Screen**	The input, the boosts, and the pitches found.
9 **GRID**	Where the resonances sit at GRID: LIN, IRR or TET.	10 **RESONANCE**	How sharp and ringing the boosts are.
11 **FOCUS**	Fixed resonances (GRID) or exact tracking (TRACK).	12 **WIDTH**	How narrow each boost is.
13 **SPEED**	How quickly boosts come and go.	14 **TONE**	Favour the low or the high boosts.
15 **THRESHOLD**	How strong a pitch must be to be boosted.		

What Glow-Up does

Glow-Up finds the strongest pitches in the sound, then puts a narrow boost at a chosen ratio above (or below) each. It brightens what is already there.

A note from a guitar, a voice or most synths is not one pitch but many: the note itself and a row of overtones above it, at two, three, four times its pitch and so on. Glow-Up keeps a running picture of the sound's pitches and picks out the strongest: the peaks. For each peak, each boost aims a narrow filter at the peak's pitch times its ratio. Where the sound has something there, an overtone, or another note, the filter lifts it.

So an octave boost (2/1) on a note lifts its second overtone, its fourth, its sixth: everything an octave above something strong. The result is brighter and more focused, a glow around the note rather than a new note on top. It is not a pitch shifter or a harmoniser: where the ratio lands on nothing, nothing is added. The exception is **RESONANCE** past its SING mark, where strong peaks make their filters sing on their own (see below).

Glow-Up uses at most twelve filters at once, given to the strongest targets, so on a thick chord or a full mix it concentrates on what stands out.

The sound itself is never delayed. Finding the peaks takes a moment, so a boost arrives a few hundredths of a second after its note (how quickly is up to **SPEED**).

The boosts

Two boosts, A and B, each an **AMOUNT** and a ratio, **MULT** over **DIV**. The defaults are an octave (2/1) and a fifth (3/2) up, each at 25%.



1. **A AMOUNT** 0 to 100%, default 25%.
2. **A MULT** 1 to 8, default 2.
3. **A DIV** 1 to 8, default 1.
4. **B AMOUNT** 0 to 100%, default 25%.
5. **B MULT** 1 to 8, default 3.
6. **B DIV** 1 to 8, default 2.

AMOUNT sets how strongly the boost lifts its targets. At 100% a filter boosts its target by up to 14 dB, about five times; a boost on a quieter peak is gentler. At 0 the boost is off.

MULT and **DIV** set the boost's ratio: the boost sits at each peak's pitch times **MULT**, divided by **DIV**. Some useful ratios:

MULT / DIV	Interval	On a single note it lifts	Character
2 / 1	an octave up	the 2nd, 4th, 6th… overtones	bright, open; the default A
3 / 2	a fifth up	the 3rd, 6th, 9th…	rich, organ-like; the default B
3 / 1	an octave and a fifth	the 3rd, 6th, 9th, 12th…	hollow, reedy
4 / 1	two octaves up	the 4th, 8th, 12th…	airy, glassy
5 / 4	a major third up	mainly the 5th	subtle on one note, more on chords
1 / 1	the peaks themselves	the strongest pitches	focused, nasal
1 / 2	an octave down	the lower overtones	fuller, warmer

Table 1. A few ratios. Any **MULT** from 1 to 8 over any **DIV** from 1 to 8 works.

Ratios that land on a note's overtones (2/1, 3/2, 3/1, 4/1) are where the effect is strongest. A ratio such as 5/4 mostly lands between a single note's overtones and lifts little; on a chord or a mix, where other notes fill those gaps,

it can do much more. A ratio below 1 boosts below each peak, where there is something there to boost: a lower overtone, or another instrument. Two boosts at the same ratio act as one.

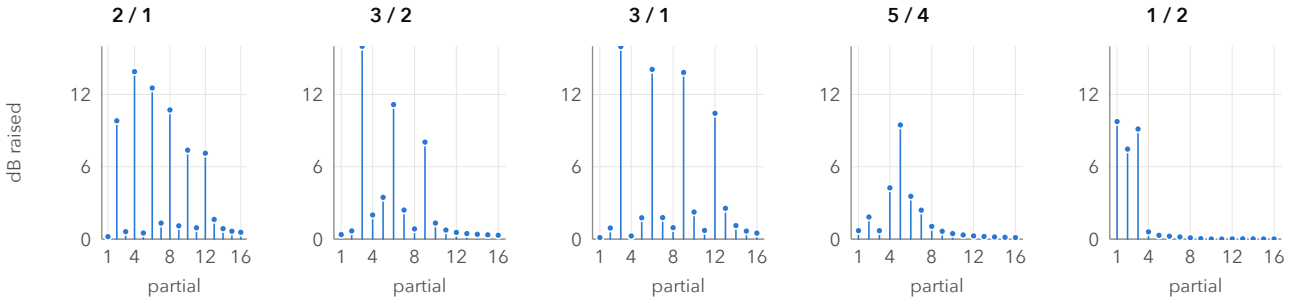


Figure 2. How much each overtone of a held note (a 200 Hz sawtooth, sixteen partials shown) is raised by boost A alone at full **AMOUNT**, at five ratios, with B off. Partial 1 is the note itself.

The filters

The FILTER section shapes all the boosts at once: how sharp they are, whether they stay put or follow the notes, how quickly they react, and which pitches get them.



1. **RESONANCE** 0 to 100%, default 0. SING is half way.
2. **FOCUS** GRID (0) to TRACK (100%), default GRID.
3. **WIDTH** 10 to 200 cents, default 50.
4. **SPEED** SLOW (0) to FAST (100%), default 80%.
5. **TONE** −6 to +6 dB an octave, default 0.
6. **THRESHOLD** 0 to 30 dB, default 6 dB.

Focus and grid

FOCUS decides where the filters sit.

- At **GRID** (fully anticlockwise, the default) the filters sit on fixed pitches, the points of a grid, and never move. A target excites the grid points nearest it. Play a bend or a slide and the overtones sweep through these fixed resonances, swelling as they pass: the character of a resonant body, or a room.
- At **TRACK** (fully clockwise) each filter sits exactly on its target and follows it, through bends and vibrato, within a cycle or two. The boost stays even whatever the note does.
- In between, each filter is pulled from its grid point towards its target, part of the way.

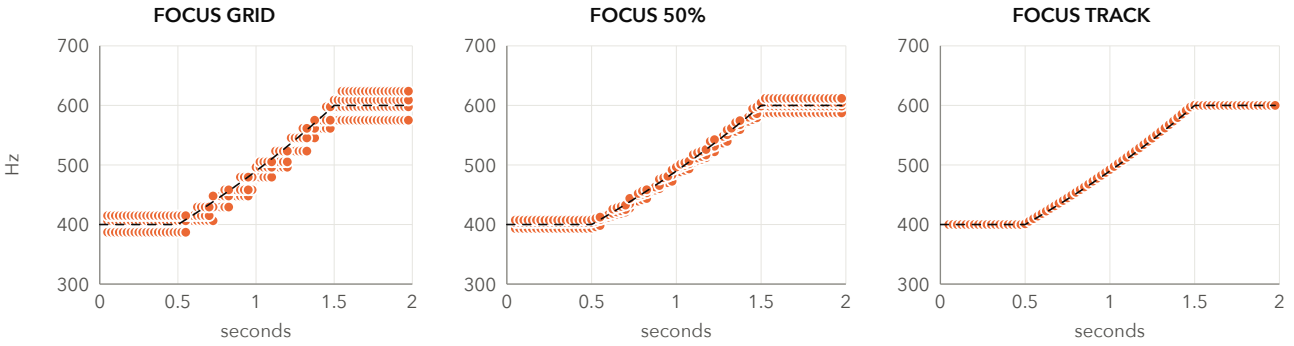


Figure 3. A note held at 200 Hz, bent up to 300 Hz over a second, then held, with boost A at 2/1: the dashed line is the octave the boost aims at, the dots the filters boosting near it, every 25 ms. At GRID the filters stay on fixed pitches and the note passes through them; at TRACK one filter rides the octave exactly.

The **GRID** keys under the screen choose the grid. They matter only while **FOCUS** is short of TRACK.

- **LIN**: evenly spaced pitches, about 23 Hz apart, so the grid is sparse in the bass and dense in the treble.
- **IRR** (the default): an irregular pattern, densest through the midrange, like the resonances of a room or a wooden body.
- **TET**: the notes of the ordinary twelve-note scale, tuned to A = 440 Hz. Boosts land on notes, which suits music in tune with it.

Resonance

RESONANCE sharpens the filters around strong targets, so the boosts ring rather than glow. Up to the SING mark (half way), the stronger a peak, the sharper and louder its boost. Past SING, a strong peak makes its filter sing on its own at the target's pitch: a pure, whistling tone that follows the note and stops when the note does. The screen marks a singing filter with a white dot. Its level is kept to a share of the note that drives it, so it never runs away.

Use it sparingly on a mix, and freely on a lead line or a drone.

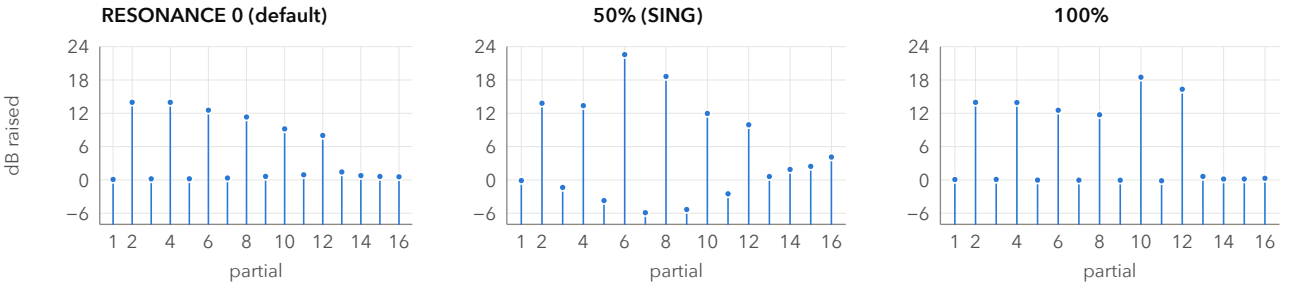


Figure 4. The same note and boost at three **RESONANCE** settings, the axis taller than the others'. At 50% the octave boosts rise by up to another 10 dB and the partials between them dip by up to 6 dB. At 100% the filters on the strongest partials sing, held to a share of the partial that drives them, so the boosts there are no louder than at 0; the weaker upper ones ring louder.

Width

WIDTH is the width of each boost, in cents (a hundredth of a semitone), the same at every pitch. Narrow, a boost lifts only its target; wide, it spreads to the overtones beside it and sounds more like a broad tone control. Half travel is about 45 cents.

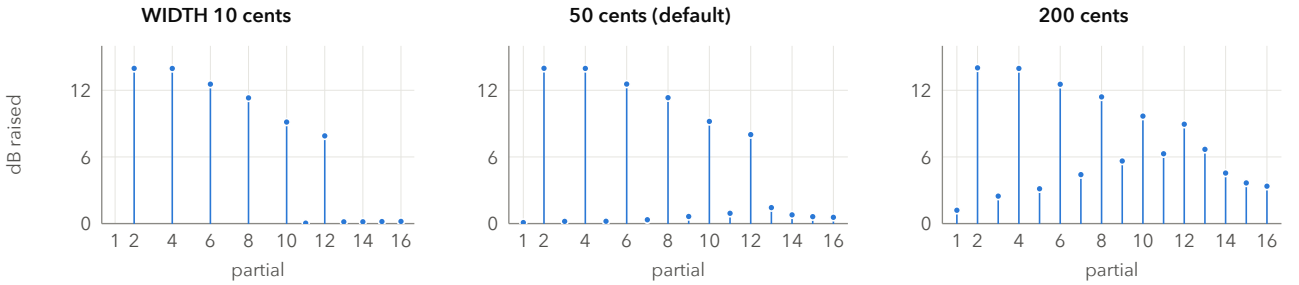


Figure 5. How much each partial of a 200 Hz sawtooth is raised by boost A at 2/1, full **AMOUNT**, **FOCUS** at TRACK, at three widths. At 200 cents the boosts spill onto the odd partials between them.

Speed

SPEED sets how quickly the boosts react: how soon a new pitch gets a filter, how fast it swells and how fast it lets go. Slow is smooth and steady, fast is lively and twitchy. At the default (80%), a boost begins about 40 ms after a note starts and is within a decibel of full some 60 ms later.

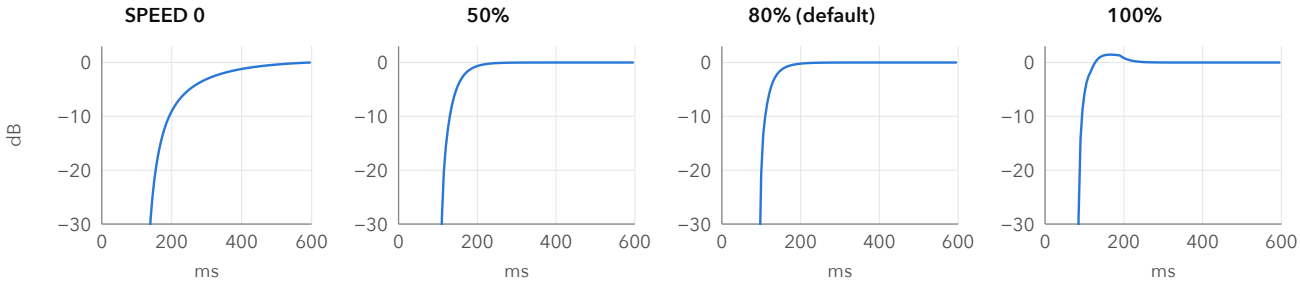


Figure 6. A note starts at 50 ms. The boosts' level (heard with **DRY CUT**), against where it settles, at four **SPEEDs**. At 0 the boost takes about half a second to come in fully; at 100% it is quickest, and briefly overshoots.

Tone

TONE tilts the boosts by pitch, about 1 kHz: turned right, high boosts get stronger and low ones weaker; turned left, high boosts get weaker. A boost already at full strength can't rise further. **TONE** changes the boosts only, not the rest of the sound.

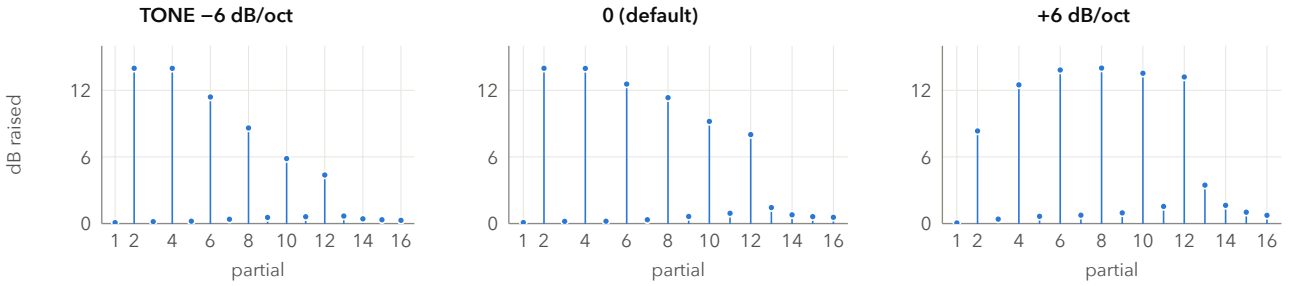


Figure 7. The same note and boost at three **TONE** settings. The note's partials run from 200 Hz to 3.2 kHz.

Threshold

THRESHOLD is how far a pitch must stand out from the sound around it before Glow-Up treats it as a peak, from 0 to 30 dB. Low, more pitches qualify, quieter overtones included; high, only the strongest. Silence and quiet hiss never make peaks, whatever the setting.

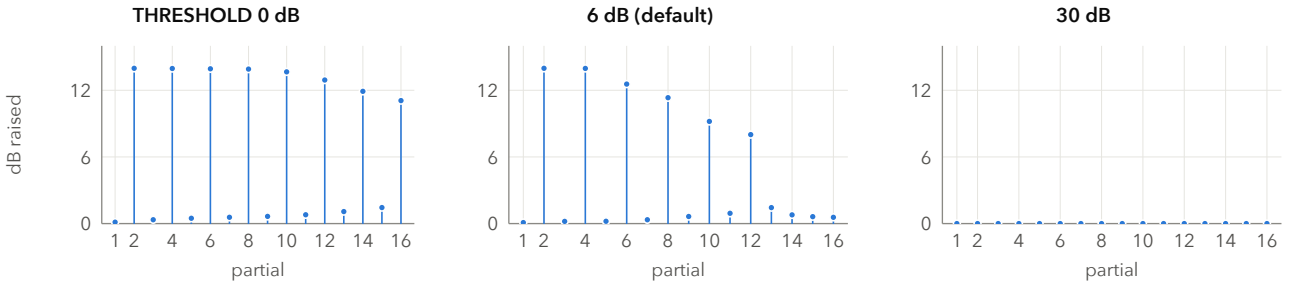
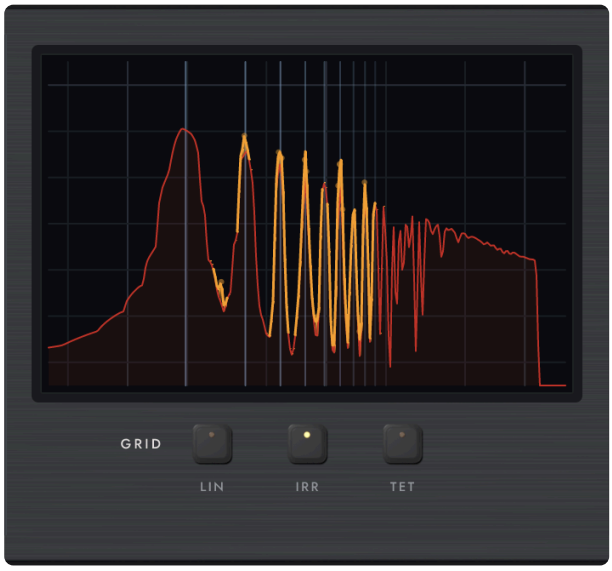


Figure 8. The same note and boost at three **THRESHOLD** settings. At 0 dB the upper partials qualify too; at 30 dB nothing in this note stands out enough, and nothing is boosted.

The screen



The screen shows what Glow-Up is doing, pitch from left to right (40 Hz to 16 kHz), level upwards.

- The **red line** is the input.
- The **amber line** is the output, drawn where it differs from the input. The glow between them shows where each boost lands and how far it spreads.
- The **vertical lines** are the peaks found, brighter the stronger they are.
- The **dots** are the filters, white while one sings.

When the output falls below the input (**DRY CUT**, or **MIX** turned down) the gap shows in dark red. With the host stopped, the screen dims and holds its last picture.

Output and mode



1. **MIX** DRY to WET, default WET.
2. **MONO** Left input, both outputs. The default.
3. **STEREO** Each side boosted.
4. **DRY CUT** Off by default.

MIX blends Glow-Up's sound with the clean sound, from DRY to WET (the default), keeping the loudness even through the middle. At WET the output is the input plus the boosts.

DRY CUT removes the input from the wet side, leaving only the boosts: a thin, ghostly layer of overtones. Use it to hear exactly what Glow-Up is adding, or with **MIX** to blend that layer back in by hand.

MONO and **STEREO** choose the mode. Glow-Up is chiefly a guitar effect, so it starts in **MONO**: it takes the left input and sends the result to both outputs. **STEREO** finds the peaks in left and right together, then boosts each side with its own filters, so the stereo picture is kept; it costs a little more processing.

Glow-Up's output is kept from clipping harshly: anything above full scale is rounded off smoothly, and the output never goes past twice full scale. The knobs respond smoothly as you turn or automate them. Glow-Up adds no delay, so it can be used while recording or playing live.

Starting points

Each of these changes only the controls it names; leave the rest at their defaults.

Shimmer A **AMOUNT** 50%, B **MULT** 4, B **DIV** 1, B **AMOUNT** 30%, **TONE** +3 dB/oct. An airy octave-and-two-octaves sheen on clean guitar or pads.

Organ body A **AMOUNT** 40%, B **AMOUNT** 40% (the defaults' octave and fifth, stronger). Rich and full on synths and keys.

Warm floor A **MULT** 1, A **DIV** 2, A **AMOUNT** 50%, B **AMOUNT** 0. Lifts what lies an octave under the strongest pitches: fuller chords and basses.

Singing lead **FOCUS** TRACK, **RESONANCE** 70%, **WIDTH** 20 cents. Whistling overtones that follow every bend.

Resonant body **FOCUS** GRID, **GRID** IRR, **RESONANCE** 40%, **WIDTH** 100 cents. Bends and slides bloom as they pass fixed resonances, like an acoustic body.

Vocal air A **AMOUNT** 30%, B **AMOUNT** 0, **TONE** +6 dB/oct, **MIX** 60%. Brightens a voice's upper overtones.

Tips

Nothing seems to happen check the **AMOUNTs**, and lower **THRESHOLD**. A ratio such as 5/4 on a single note lands between its overtones; try 2/1 or 3/2.

The boosts wobble on chords turn **SPEED** down, or move **FOCUS** towards GRID.

Bends sound uneven move **FOCUS** to TRACK.

Too harsh or whistly lower **RESONANCE**, widen **WIDTH**, or turn **TONE** left.

Too boomy turn **TONE** right, or raise the ratios.

Only one side of a stereo track comes through **MONO** is lit; press **STEREO**.

The effect is too much bring **MIX** down rather than the **AMOUNTs**; you keep the character and get the clarity back.

Reference

Controls

Control	From	To	Default
A Amount	0 %	100 %	25 %
A Multiplier	1	8	2
A Divisor	1	8	1
B Amount	0 %	100 %	25 %
B Multiplier	1	8	3
B Divisor	1	8	2
Width	10 cents	200 cents	50 cents
Resonance	0 %	100 %	0 %
Focus	0 %	100 %	0 %
Mix	0 %	100 %	100 %
Threshold	0.0 dB	30.0 dB	6.0 dB
Tone	−6.0 dB/oct	6.0 dB/oct	0.0 dB/oct
Grid	LIN	TET	IRR
Speed	0 %	100 %	80 %
Dry Cut	Off	On	Off
Mode	Mono	Stereo	Mono

Table 2. Every control, as your host lists it for automation. Multiplier and Divisor are **MULT** and **DIV**.

The plugin

- Formats: CLAP and VST3, for macOS (Apple silicon and Intel), Windows and Linux. On a Mac it installs and opens without security warnings.
- Audio: stereo in and out. A mono track works too.
- Delay: none.
- Licence: free, under the MIT or Apache-2.0 licence. The source code is at https://github.com/Vulpus-Labs/vxn-free.
- VST is a registered trademark of Steinberg Media Technologies GmbH.