Resonators User Manual

Guide to the dual-resonator delay firmware for kxmx_bluemchen.
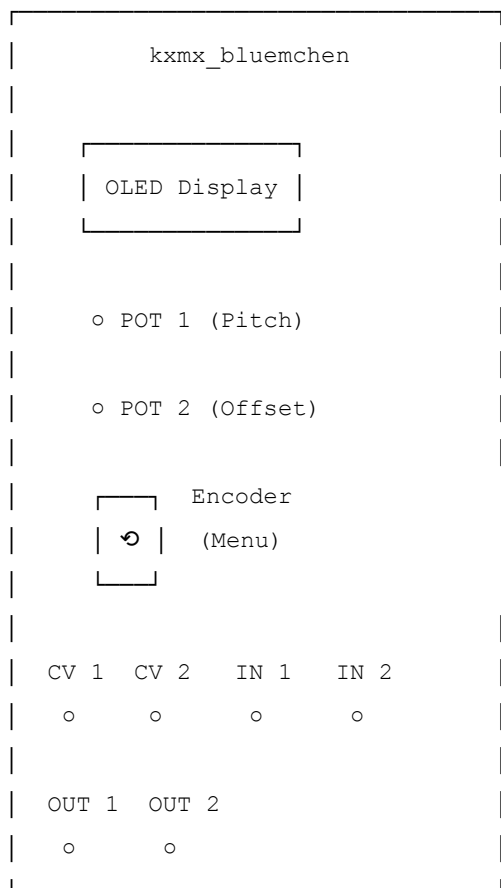
Overview

This firmware turns the module into a pair of tuned delay-line resonators. Each channel takes its own audio input and output, with delay lengths set so the resonant pitch tracks 1V/oct via CV 1. Cross-feedback, input injection position, damping, and wet/dry mix are available from the encoder menu.

Key Specifications

- **Audio Rate**: 48 kHz
- **Resonator Range**: ~20 Hz - 2 kHz (base), V/Oct tracking via CV1
- **CV Inputs**: 2x 0-5V
- **Audio Inputs**: 2x (one per resonator)
- **Audio Outputs**: 2x (one per resonator)
- **MIDI**: not used
- **Power**: Eurorack +12V/-12V

Front Panel Layout

```
┌─────────────────────────────────────────┐
│  ┌───────────────────────────┐           │
│  │       kxmx_bluemchen       │           │
│  │                           │           │
│  │  ┌─────────────────┐      │           │
│  │  │   OLED Display   │      │           │
│  │  └─────────────────┘      │           │
│  │                           │           │
│  │    o POT 1 (Pitch)        │           │
│  │                           │           │
│  │    o POT 2 (Offset)       │           │
│  │                           │           │
│  │    ┌───┐  Encoder         │           │
│  │    │ ↻ │  (Menu)          │           │
│  │    └───┘                  │           │
│  │                           │           │
│  │  CV 1  CV 2   IN 1   IN 2 │           │
│  │   o     o      o      o   │           │
│  │                           │           │
│  │  OUT 1  OUT 2             │           │
│  │   o      o                │           │
│  └───────────────────────────┘           │
└─────────────────────────────────────────┘
```

Basic Operation

1. **Patch audio** to IN 1 and/or IN 2.

2. **Turn Knob 1** to set the base resonant pitch.

3. **Patch CV 1** for 1V/oct pitch control (5 octaves).

4. **Turn Knob 2 / CV 2** to offset resonator 2 relative to resonator 1.

5. **Rotate the encoder** to adjust the current menu item.

6. **Short press the encoder** to cycle through menu pages.

Control Summary

Control	Function	Range	Notes
Knob 1	Base pitch	~20 Hz - 2 kHz	Exponential mapping
CV 1	V/Oct pitch	5 octaves	Applies to both resonators
Knob 2	Resonator 2 offset	-2 to +2 octaves	Added on top of resonator 1
CV 2	Resonator 2 offset mod	-2 to +2 octaves	Adds to Knob 2
Encoder rotate	Menu value	Depends on page	See menu below

Control	Function	Range	Notes
Encoder short press	Page select	CAL → FB → X12 → X21 → INP → DAMP → MIX	Cycles pages
Encoder long press	Overlay	On/Off	Shows cross-feedback values

Menu Pages

The top-right label shows the active page:

- **CAL**: Calibration mode (scale + offset).
- **FB**: Feedback amount for both delay lines.
- **X12**: Feedback from resonator 1 into resonator 2.
- **X21**: Feedback from resonator 2 into resonator 1.
- **INP**: Input injection position in each delay line.
- **DAMP**: Feedback damping (lowpass).
- **MIX**: Wet/dry mix per output.

Calibration Mode (CAL)

Use CAL to fine-tune pitch tracking. While in CAL, the module outputs a 440 Hz sine tone on both outputs.

- **Knob 1**: Pitch scale (0.8–1.2)
- **Knob 2**: Pitch offset (±1 octave)

Settings are saved to flash automatically after about one second of inactivity.

Feedback and Cross-Feedback

- **FB** sets the internal feedback gain for each resonator.
- **X12** and **X21** add cross-feedback between the two resonators for stereo interactions and coupled resonances.

Tip: use high FB with low cross values for stable resonant tones; push X12/X21 for chaotic, evolving textures.

Input Position (INP)

INP controls where the input signal is injected inside each delay line, from the input tap to deeper inside the buffer.

- Low values = traditional input at the head (more predictable)
- Higher values = darker, more complex resonances

Damping (DAMP)

DAMP applies a lowpass filter to the feedback path.

- Low DAMP = brighter, longer resonance
- High DAMP = darker, shorter resonance

Mix (MIX)

Sets dry/wet output balance for both channels.

- 0.0 = dry input
- 1.0 = full resonator output

Tips

- Patch noise or short percussive hits to excite the resonators.
- Tune resonator 2 a fifth or octave above resonator 1 for stable intervals.
- Cross-feedback can create stereo "chorus" effects when lightly applied.
- Use CAL before serious tracking work, especially if CV source is not perfectly scaled.