CV NOTE LOOPER

32-Step 1V/Oct CV Sequencer

Quantized 1V/Oct pitch CV recorder, looper and sequencer with scale support and calibration.

Pattern length	Up to 32 steps
Pitch system	1V/Oct with quantized notes
Scales	Chromatic, Major, Natural Minor, Major Pentatonic, Minor Pentatonic
Power consumption	5 V / 50 mA
Dimensions	3U / 3HE high, 12 HP / 12 TE wide

1. Overview

The CV NOTE LOOPER is a Eurorack module that outputs quantized notes as control voltage in the 1V/Oct standard. It is used to record, store, and play back a pattern with a freely selectable length of up to 32 steps.

The module includes an internal scale system with selectable root note, five different scales, and a calibration function for matching the connected 1V/Oct system.

2. Controls and Connections

NOTES

- In normal operation, the NOTES knob selects the pitch within one octave. The twelve semitones from C to B are available.
- In Scale Setup, this knob selects the root note.

OCTAVES

- In normal operation, the OCTAVES knob selects the octave range.
- In Scale Setup, this knob selects the scale type.

REC/PLAY

- The REC/PLAY button switches between Play Mode and Record Mode.
- It is also used to enter or leave Calibration Mode.

NOTE SET

- In Record Mode, NOTE SET stores the currently selected note as the next step.
- In Play Mode, holding this button opens or closes Scale Setup.

clock

- The clock input provides the external timing source for the sequence.
- On every rising edge, the module advances to the next step in Play Mode.

reset

- The reset input resets the sequence.
- After a rising edge at reset, the next clock pulse starts again at Step 0, the first stored step.

cv out

- The cv out output provides the generated pitch CV.

3. Basic Principle

The module converts the selected note and octave into the corresponding control voltage for 1V/Oct systems. This allows an oscillator or other pitch-controlled device to be played or sequenced at the correct pitch.

If a scale is active, the selected note is first mapped to that scale. As a result, live play, recording, and playback all remain musical and stay within the selected scale.

The internal calibration ensures that the output voltage remains in tune.

4. Operating Modes

The module has four main operating modes:

- Play Mode
- Record Mode
- Scale Setup
- Calibration Mode

4.1 Play Mode

In Play Mode, a recorded pattern is played back using the external clock input.

- The sequence advances only when an external clock signal is present.
- Each rising clock edge outputs the next step.
- The LEDs indicate the currently active step.
- The current scale also affects playback in Play Mode.
- A stored pattern is therefore always output according to the currently selected scale.

If a pattern is stored, the module shows the first step on the LEDs immediately after a reset, even before the next clock pulse arrives.

4.2 Record Mode

A short press on REC/PLAY switches from Play Mode to Record Mode.

- When a new recording starts, the previous pattern is deleted.
- During recording, the module works directly from the current knob positions. NOTES and OCTAVES select the note that is currently being output.
- If a scale is active, the note is automatically mapped to the selected scale.
- Press NOTE SET to store the currently selected note as the next step. The step is stored when the button is released.
- The REC LED confirms a stored step with a short blink.
- Up to 32 steps can be recorded. After the 32nd stored step, the module automatically returns to Play Mode.

- If a shorter sequence is desired, you can switch back to Play Mode earlier. The pattern then ends at that point.

4.3 Live Operation

Direct live operation is active whenever:

- the module is in Record Mode, or
- no pattern has been recorded yet.

In this state, the current pitch is generated directly from the knob positions and is sent to the CV output.

4.4 Scale Setup

Scale Setup is opened in Play Mode by holding NOTE SET for about 2 seconds.

In Scale Setup:

- the PLAY LED blinks slowly,
- NOTES selects the root note,
- OCTAVES selects the scale type,
- the note LEDs show the current root note,
- the octave LEDs show the selected scale type,
- the selected root note is output as a preview tone in octave 2.

Hold NOTE SET again for about 2 seconds to leave Scale Setup and save the settings.

4.5 Calibration Mode

Calibration Mode is used to adjust the pitch output of the module accurately to the connected 1V/Oct system.

Entering Calibration Mode

Calibration Mode is activated by holding REC/PLAY for more than 5 seconds.

During calibration:

- normal sequencer operation is paused,
- clock and reset are ignored,
- an alternating test tone is output.

Behavior in Calibration Mode

In Calibration Mode, the offset and scaling are adjusted:

- the NOTES knob adjusts the offset,
- the OCTAVES knob adjusts the scaling.

Soft Takeover

When Calibration Mode is entered, the knobs do not take over their new function immediately.

First, each knob must be moved close to the previously stored value. Only then does the corresponding parameter become active.

This prevents sudden jumps when calibration starts and allows controlled fine adjustment.

Fine Adjustment

The knobs react especially finely in their center range.

Toward the ends of travel, the adjustment becomes stronger. This makes the important fine-calibration range more precise.

Test Tone

During calibration, the module outputs an alternating test tone between C2 and C4.

The tone changes approximately every 600 ms, making octave accuracy easier to check.

LED Indication in Calibration Mode

- REC LED blinking slowly: Calibration Mode is active.
- PLAY LED blinking quickly: at least one of the two knobs has not yet been picked up.
- PLAY LED lit continuously: both knobs have been picked up and are active.

Note

The NOTE SET button has no function in Calibration Mode.

Leaving Calibration Mode

To exit, hold REC/PLAY for more than 3 seconds.

The following actions are then performed:

- the current calibration values are saved,
- Calibration Mode is closed,
- the module returns to normal Play Mode.

5. Scale System

The module provides five selectable scales.

The currently selected scale affects pitch processing during the entire operation of the module. This means it applies to live mode, recording, and playback of already stored patterns.

In Scale Setup, the note LEDs show the selected root note. The octave LEDs indicate the scale type as follows:

Octave LED indication	Scale
No octave LED active	Chromatic
Octave LED 1	Major
Octave LED 2	Natural Minor
Octave LED 3	Major Pentatonic
Octave LED 4	Minor Pentatonic

The individual scales mean:

Chromatic: All 12 semitones are available. No additional scale restriction is applied.
Major: Notes are mapped to a major scale based on the selected root note.
Natural Minor: Notes are mapped to a natural minor scale, also based on the selected root note.
Major Pentatonic: Notes are mapped to a major pentatonic scale.
Minor Pentatonic: Notes are mapped to a minor pentatonic scale.

6. LED Behavior

Note LEDs

Depending on the operating mode, the note LEDs show:

- the currently selected note,
- the root note in Scale Setup, or
- the note currently being played in Play Mode.

Octave LEDs

In normal operation, the octave LEDs show the current octave.

In Scale Setup, they instead show the selected scale type.

REC LED

- Active in Record Mode.
- Short blink when a step is stored.
- Slow blink in Calibration Mode.

PLAY LED

- Lit continuously in Play Mode.
- Slow blink in Scale Setup.
- Fast blink or continuous light in Calibration Mode, depending on pickup status.

LED Behavior in Special Modes

In Scale Setup:

- PLAY LED blinks slowly.
- The note LEDs show the selected root note.
- The octave LEDs show the selected scale type.

In Calibration Mode:

- REC LED blinking slowly = Calibration Mode active.
- PLAY LED blinking quickly = at least one knob has not yet been picked up.
- PLAY LED lit continuously = both knobs have been picked up.

7. Startup Behavior

When the module is powered on, it performs a short welcome animation:

- the note LEDs run once from 0 to 11,
- then from 11 back to 0.

After that, the module enters its normal operating state.

8. Reset Behavior

The reset input resets the sequence so that the next clock pulse starts again at Step 0.

In Play Mode, this first step is already shown on the LEDs before the next clock pulse arrives.

9. Memory Behavior

The module stores important settings in EEPROM. These include:

- calibration values,
- root note,
- selected scale type.

These settings remain stored even after power is removed.

10. Technical Data

- CV output via MCP4725
- 1V/Oct-compatible pitch control
- Maximum pattern length: 32 steps
- 12 notes per octave
- 5 octave ranges
- 5 scales
- External clock input
- External reset input
- Calibration and scale settings stored in EEPROM
- LED indication via 74HC595
- Calibration for offset and scale
- Startup LED sequence at power-on
- Power consumption: 5 V / 50 mA
- Dimensions: 3U / 3HE high, 12 HP / 12 TE wide

11. Operation Examples

Recording a Pattern

- Switch to Record Mode.
- Set the desired note with NOTES and OCTAVES.
- Store the step with NOTE SET.
- Enter further steps in the same way.
- Either record up to 32 steps or return to Play Mode earlier.

Playing a Pattern

- Switch to Play Mode.
- Apply an external clock to clock.
- Optionally apply a reset signal to reset.
- The pattern is played back step by step.

Selecting a Scale

- In Play Mode, hold NOTE SET for more than 2 seconds.
- Select the root note with NOTES.
- Select the desired scale with OCTAVES.
- Hold NOTE SET again for more than 2 seconds to save.

Calibrating

- Hold REC/PLAY for more than 5 seconds.
- Move both knobs gradually into the range of their stored values.
- Fine-adjust offset and scale.

• Hold REC/PLAY for more than 3 seconds to save and exit.

12. Quick Reference

• Short press REC/PLAY: switch between Play and Record Mode
• Hold REC/PLAY for more than 5 seconds: enter Calibration Mode
• Hold REC/PLAY for more than 3 seconds in Calibration Mode: save and exit
• NOTE SET in Record Mode: store the current note as a step when the button is released
• Hold NOTE SET for more than 2 seconds in Play Mode: open or close Scale Setup
• In Scale Setup: NOTES selects the root note
• In Scale Setup: OCTAVES selects the scale type

13. Notes

• Starting a new recording deletes the existing pattern.
• The selected scale affects not only new input, but also already stored patterns.
• In Calibration Mode, clock and reset are inactive.
• In Calibration Mode, NOTE SET has no function.
• In Scale Setup, changes are saved when you leave the mode.
• After a reset, the first step is already shown in Play Mode before the next clock pulse.