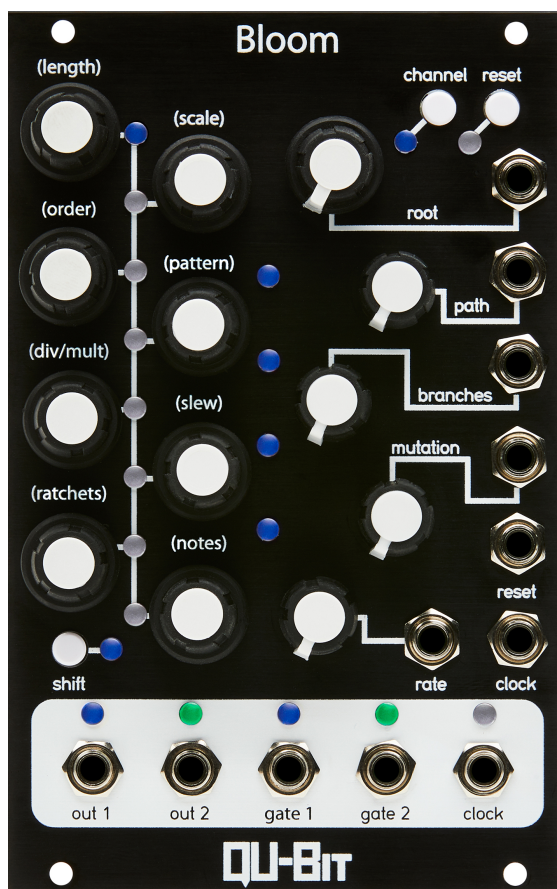


# Bloom



# Contents

<b>Description</b>	<b>4</b>
<b>Specifications</b>	<b>5</b>
<b>Installation</b>	<b>6</b>
<b>Marked Diagram</b>	<b>7</b>
<b>Concept Overview</b>	<b>8</b>
Generative Modifications . . . . .	9
Transposition . . . . .	9
Inversion . . . . .	10
Reversal . . . . .	10
Mutation . . . . .	10
<b>Functional Overview</b>	<b>10</b>
1. Root . . . . .	10
2. Path . . . . .	10
3. Branches . . . . .	11
4. Mutation . . . . .	11
5. Clock In . . . . .	12
6. Rate . . . . .	12
7. Reset . . . . .	12
8. Channel . . . . .	12
Module State Recall . . . . .	13
9. Shift . . . . .	13
Factory Reset . . . . .	13
Unmutate . . . . .	14
10. Step Encoders . . . . .	14
Length . . . . .	14
Scale . . . . .	15
Order . . . . .	15
Pattern . . . . .	15
Div/Mult . . . . .	16
Slew . . . . .	16
Ratchets . . . . .	17
Notes . . . . .	17

11. Out 1 . . . . .	18
12. Out 2 . . . . .	18
13. Gate 1 . . . . .	18
14. Gate 2 . . . . .	18
15. Clock Out . . . . .	19
<b>Calibration Mode</b>	<b>19</b>
<b>Updating Firmware</b>	<b>20</b>
Changelog . . . . .	20
v1.0.6 . . . . .	20
v1.0.5 . . . . .	21
v1.0.4 . . . . .	21
v1.0.3 . . . . .	21
v1.0.2 . . . . .	21

## Description

Bloom is a fractal sequencer capable of generating infinitely evolving melodies with a host of musical features.

At its core is a powerful 32 step sequencer with two independent channels and an intuitive interface. What makes the Bloom come alive are its fractal algorithms which can transform existing sequences into powerful melodies, or even generate new patterns altogether. The base sequence is known as the Trunk and can be programmed by hand, or automatically generated with the Mutate function. Once a Trunk sequence is in place, fractal transformations are only a knob turn away by using the Branch and path controls. Each new Branch adds a complete variation to the base sequence and Path determines its passage through the set of recursively generated sub-sequences, offering a unique take on the melody with each turn of the knob.

Bring your sequencing to life with Bloom.

- Fractal sequencer
- Infinitely evolving melodies
- Two independent channels
- 32 steps per channel for base sequence, 256 steps for generated sequences
- Ratchets, per step slew, quantized output, and transpose control
- 8 pattern locations w/ save, load, copy, and erase functionality

## Specifications

Depth: 23mm

Width: 16HP

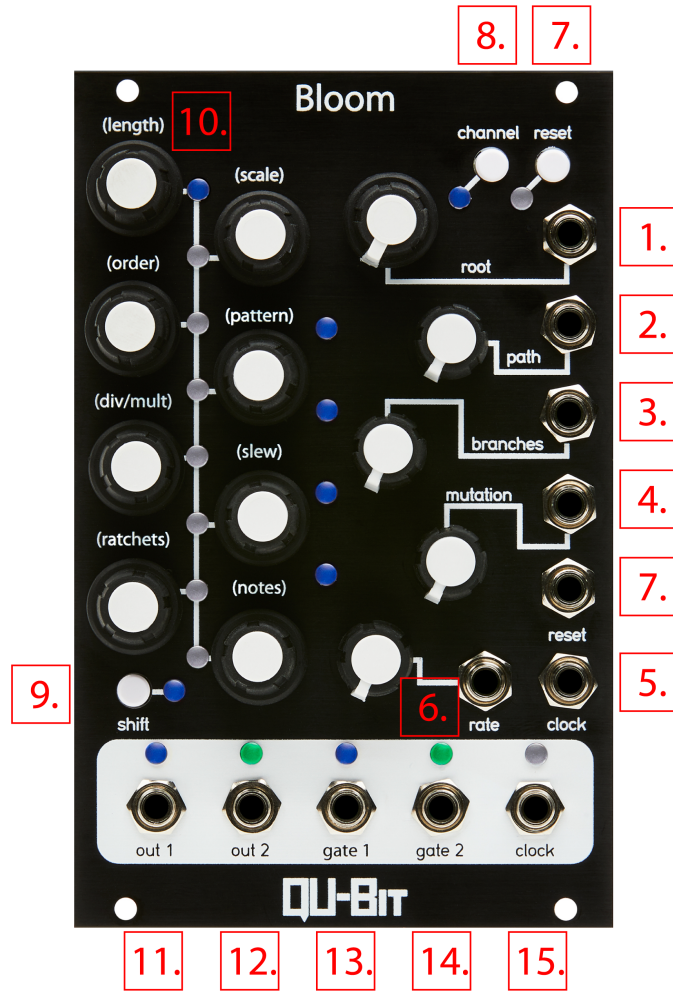
Current Consumption:

- +12V: 82mA
- -12V: 0mA
- +5V: 0mA

## **Installation**

To install, locate 16HP of space in your Eurorack case and confirm the positive 12 volts and negative 12 volts sides of the power distribution lines. Plug the connector into the power distribution board of your case, keeping in mind that the red band corresponds to negative 12 volts. In most systems, the negative 12 volt supply line is at the bottom. The power cable should be connected to the module with the red band facing the left side of the module.

# Marked Diagram



## Concept Overview

Bloom is a fractal sequencer that uses a user-constructed sequence to recursively generate a tree of related subsequences that can be strung together to create large musical sequences that relate back to the originally programmed sequence.

Everytime the trunk is adjusted, or mutated (via the mutation control) the entire tree is regenerated.

First, the user will construct a “Trunk”. In this example, lets say this is simply an eight-step major scale starting at 0V, climbing up to 1V.

For the point of this example, we’ll set Branches to around 11 O’Clock so that the trunk, and two branches play.

The trunk ends at a fork between one of two possible paths. If the path knob is below half, the sequence will continue up and to the left, otherwise it will continue up and to the right.

The subsequence that follows the trunk will be most closely related to the original sequence. This tranformation will be in the form of one of the following modifications which will be described in detail below:

- Transposition
- Inversion
- Reversal
- Mutation

At the end of branch 1, (i.e. the first related subsequence), the Path setting is again checked to see if it follows the path up and to the left or up and to the right from the current branch.

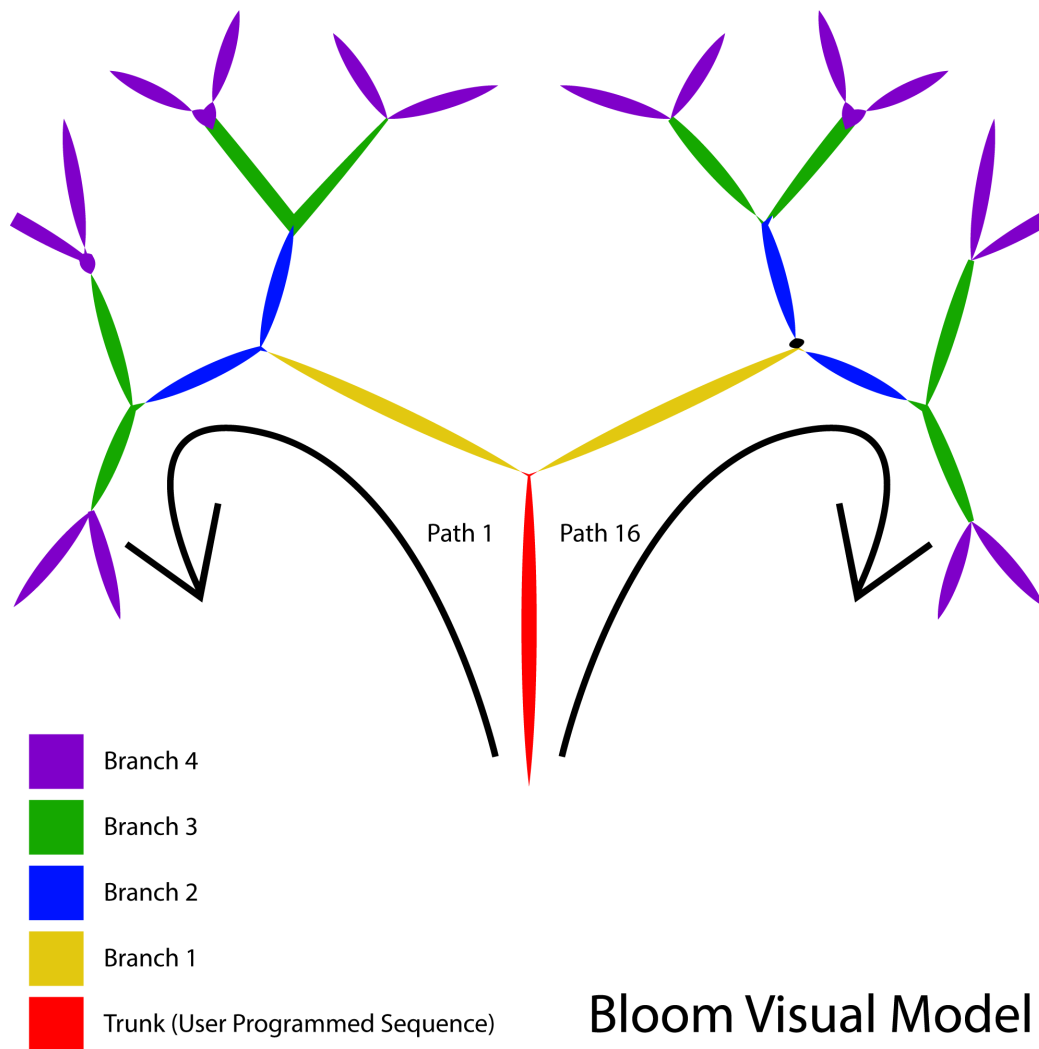
This next branch will be related to the previous subsequence, *not* the trunk sequence. Allowing for the musical evolution of a simple melody.

By crafting an initial sequence, and using path and branches, a huge variety of melodic content can be created.

On top of this, other settings including ratchets, and slew are factored into the generation of these branches.

Below is a figure displaying how the path control works with Branches set to 4. The module is capable of generating a tree up to 7 branches deep, for a total number of 128 paths through the tree.





## Bloom Visual Model

### Generative Modifications

These are the transformations that are applied within the recursive tree generation.

#### Transposition

The previous sequence is transposed up or down by as much as one octave (twelve semi-tones).

### **Inversion**

The previous sequence is inverted so that the highest note in the sequence is now the lowest, and vice versa.

### **Reversal**

The previous sequence is reversed so that the first note in the sequence is now the last, and vice versa.

### **Mutation**

The previous sequence is mutated so that some of the notes are adjusted up or down as much as an octave, if your sequence takes advantage of different gate states, these can also be mutated by this transformation.

## **Functional Overview**

### **1. Root**

Sets the root offset of the entire sequence.

This works separately for each channel.

The LEDs will display the current octave and note along the trunk sequence. The Octave will be indicated by the four center LEDs while the note within the octave will be indicated by the 8 Trunk LEDs.

1V/Octave CV input.

-1V to +5V added to pot position.

CV only the currently selected channel.

### **2. Path**

Sets the direction followed by the fractal sequence.

The number of paths is determined by the branch parameter.

For a description of how this control works, see the Concept Overview.

The LEDs will display the number of paths, and the end color when the knob is touched.

-5V to +5V CV input added to knob position.

CV only changes the currently selected channel.

### **3. Branches**

Sets the number of branches to follow the “Trunk” sequence.

When all the way down, only the “Trunk” sequence will play.

When all the way up, the “Trunk” Sequence, and 7 related subsequences of the same length will extend the sequence.

The LEDs will change color to indicate that the Bloom is in one of the branches instead of the “Trunk” sequence.

Channel 1 blends from blue to gold across the branches.

Channel 2 blends from green to purple across the branches.

The LEDs will display the number of branches, and their colors when the knob is touched.

-5V to +5V CV input added to knob position.

CV only changes the currently selected channel.

### **4. Mutation**

Controls the amount of variation introduced into the trunk sequence.

This is a destructive control that replaces the manually programmed sequence.

To undo the effects of mutation, press Reset while holding Shift to revert to the last manually edited sequence values.

When all the way down, the sequence is locked to the programmed notes.

When all the way up, every step of the sequence will be regenerated.

The LEDs will display the amount of mutation when the knob is touched.

This control only changes the notes of the trunk. It will not toggle gate-states or change other settings like slew or ratchets.

-5V to +5V CV input added to knob position.

CV only changes the currently selected channel.

## **5. Clock In**

Clock input to module.

When the Rate knob is all the way down, this jack is enabled, and the internal clock will be shut down.

## **6. Rate**

Controls the rate of the internal clock.

Current range of clock rate is 5 seconds to 10 milliseconds (100Hz)

With Multiplications and Divisions active this can be as slow as 40 seconds per step to 1.25ms (800 Hz)

When Rate knob is all the way down, the internal clock is shut down, and the Clock In jack becomes active.

## **7. Reset**

Reset input.

Pressing the button will reset both channels' sequences to their first step on the next clock.

A trigger to the Reset gate input will reset both channels' sequences to their first step on the next clock.

Holding Shift and Pressing Reset will reset the currently selected channel's sequence to its last edited state, undoing any mutation that may have happened since it was manually adjusted. This also regenerates the tree of subsequences.

## **8. Channel**

Pressing the Channel button toggles between channel 1 and channel 2

When the LED is Blue channel 1 is selected.

When the LED is Green channel 2 is selected.

Holding the Channel button for 3 seconds will switch to the global editor

The global editor is indicated by a white channel LED.

When editing things in the global editor all changes will be made to channels 1 and 2.

The following controls work separately for each channel:

- Root
- Path
- Branches
- Mutation

CV for these controls will always control the channel that is selected.

When returning to a channel with the control set in a different position, the knob will not take effect until a change in its position has been detected. This means that **knob settings may not be accurate after changing channels.**

The following controls are always global, regardless of channel setting:

- Rate

All per-step, and per-pattern settings can be edited for each channel together or separately.

### **Module State Recall**

The state of the module is stored every time a new channel is selected so that it will boot up to that state after power-down.

## **9. Shift**

This button allows access to all of the per-pattern, and per-step settings.

Below are a list of Shift-based edit functions.

Most of the Step Encoders work by holding shift. Those will be addressed below with each encoder.

### **Factory Reset**

Hold Shift and Hold Reset until the LEDs change.

This will reset the currently selected channel (or both if in Global Mode).

This consists of setting all pattern notes to the default pattern:

- 8 Steps
- Major Scale
- Forward Order
- No Div/Mult
- No Ratchets
- No Slew

### **Unmute**

Hold shift and tapping reset

This will revert the current pattern to its state when the last manual edit was done, erasing any mutation changes mutation has caused.

## **10. Step Encoders**

Each of these encoders can be used to tune the notes for the active channel, on the active page.

While holding shift the following actions are associated with each encoder.

You'll note that there are two types of "Shift" interactions.

For per-pattern settings, the setting is affected by holding shift, and turning the corresponding encoder.

For per-step settings, holding shift, and clicking the corresponding encoder will enter an editor for that setting.

The per-step settings can be adjusted globally by rotating the encoders without clicking. This will change the setting for all steps simultaneously.

### **Length**

Length can be adjusted by holding Shift, and rotating the encoder.

Length can be 1-32 steps, and will be indicated by a combination of the eight LEDs in between the encoders, and the four LEDs in the center of the module.

## **Scale**

Scale can be adjusted by holding Shift, and rotating the encoder.

This will be indicated by the LEDs in between the encoders.

Scales are in the following order:

- Chromatic
- Major
- Minor
- Major Pentatonic
- Minor Pentatonic
- Harmonic Minor
- Whole Tone
- Unquantized

## **Order**

Playback order can be adjusted by holding Shift, and rotating the encoder.

The playback order will be indicated by the LEDs in between the encoders.

Playback orders are in the following order:

- Forward
- Backward
- Pendulum
- Random

The LEDs will indicate the selected pattern by illuminating a group of two LEDs from top to bottom.

## **Pattern**

The Bloom can store up to 8 patterns in memory.

A Pattern can be selected by holding shift, and rotating the encoder.

To LOAD the selected pattern, hold shift and click the pattern encoder.

To SAVE the selected pattern, hold shift and hold the pattern encoder for ~3 seconds.

To COPY a pattern, hold the corresponding encoder (1-8 from top to bottom) and click the destination encoder (1-8 from top to bottom).

Unlike the LOAD and SAVE functions, the COPY functions will work regardless of the currently selected pattern. This is intended to speed up composition and performance.

### **Div/Mult**

The Division/Multiplication in relation to the Clock rate can be selected by holding shift, and rotating the encoder.

Divisions and Multiplications are in the following order:

- Divide by 8
- Divide by 4
- Divide by 3
- Divide by 2
- Clock Rate
- Multiply by 2
- Multiply by 3
- Multiply by 4
- Multiply by 8

Each is represented by one of the eight LEDs in between the encoders. When no division or multiplication are selected the two central LEDs will be illuminated.

### **Slew**

Holding shift, and clicking the encoder will enter the per-step Slew editor.

When an encoder is touched, the eight LEDs in between the encoders will indicate the amount of slew, if any, currently set.

Once a step has been touched, further rotations will increase/decrease the amount of slew to the next step.

To move forward a page, press reset.

To loop the page that is being edited press channel.

While looping a page within Tune Modes the Channel LED will pulse between the channels' color and white.



To exit the Per-Step slew editor, hold shift, and click the Slew encoder.

To adjust all steps' slew at once, hold shift and rotate the Slew encoder while the sequencer is running.

The LEDs will indicate the amount of slew from the top down.

## **Ratchets**

Ratchets define the number of clocks that the sequence will remain on the selected step.

The default number of ratchets is one, meaning for each clock pulse, the sequence will advance one step.

For example, setting step four's Ratchets to eight, will cause that step to be repeated for 8 clock pulses before advancing to the next step.

Holding shift, and clicking the encoder will enter the per-step Ratchet editor.

When an encoder is touched, the eight LEDs in the encoders will indicate the number of ratchets, currently set.

Once a step has been touched, further rotations will increase/decrease the amount of slew to the next step.

To move forward a page, press reset.

To loop the page that is being edited press channel.

While looping a page within Tune Modes the Channel LED will pulse between the channels' color and white.

To exit the Per-Step ratchet editor, hold shift, and click the Ratchet encoder.

To adjust all steps' ratchets at once, hold shift and rotate the Ratchet encoder while the sequencer is running.

## **Notes**

Holding shift, and clicking the encoder will enter the per-step Note editor.

When an encoder is touched, the output will update to the voltage for that step.

Once a step has been touched, further rotations will increase/decrease the voltage of that step according to the currently selected scale.

To move forward a page, press reset.

To loop the page that is being edited press channel.

It is also possible to edit the length of the gate for each step both while running and while in Tune Mode.

For each step, the gate length can be adjusted by pressing the encoder and rotating it.

There are 8 gate lengths from 6ms triggers, to tied.

The gate lengths other than trigger and tied notes, are based on a percentage of the length of the note from 10% to 90%.

While looping a page within Tune Modes the Channel LED will pulse between the channels' color and white.

To exit the Per-Step note editor, hold shift, and click the Notes encoder.

## **11. Out 1**

1V/Oct output for channel 1.

0-5V output.

## **12. Out 2**

1V/Oct output for channel 2.

0-5V output.

## **13. Gate 1**

Gate output for channel 1.

6ms 5V pulses.

## **14. Gate 2**

Gate output for channel 2.

6ms 5V pulses.

## 15. Clock Out

Clock Output

50% duty-cycle 5V clock.

## Calibration Mode

All units are calibrated using precise equipment before being sent to users.

Only use this mode if you have a reliable method of calibrating your modules, or need to adjust the inputs to work with a different piece of hardware.

To access calibration mode, hold the Channel button while booting up the module.

To exit calibration mode without saving, power down the module, and boot it up with no buttons held.

The four central LEDs will turn red as soon as the mode is entered.

The Div/Mult and Slew encoders are used to adjust the output voltages by 1V increments (1 octave).

The Ratchet and Notes encoders will adjust the calibration scalar for out 1 and out 2 respectively.

To calibrate the outputs to a VCO, tune the VCO to either a note, or a specific frequency (for example, A1 or 100Hz)

Using the Div/Mult and Slew encoders you get exact doublings of the frequency or the same note 1 octave up.

If the output is not an exact doubling, adjust the Ratchet control for OUT 1, and the Notes control for OUT 2.

For example, if you tuned your oscillator to 100Hz, each turn of the Div/Mult or Slew encoder should increase the frequency to 200Hz, 400Hz, 800Hz, 1600Hz, and so on.

If you have a reliable voltage source you can insert 1V (or use the 1V from the Bloom, once its been fine-tuned) into the Root CV.

Pressing Reset will store the 1V, the Top Central LED will turn Green, and then wait for 3V. Repeat the same process for 3V.

Pressing Reset again will store the 3V, and turn the Top Middle LED Green.

Pressing Reset again will store the values for OUT 1, turning the Bottom Middle LED Green.

Pressing Reset again will store the values for OUT 2, and turn the bottom most LED Green.

To exit the mode, and save these settings between power cycles, hold channel for 2 or more seconds, and then tap shift.

**In the event that the module seems really out of calibration, or the outputs are not changing while the LEDs do change, you can reset to the default calibration values by clicking either the Ratchet or Note encoder for each channel.**

## Updating Firmware

To update the firmware on the bloom, hold the Reset Button while powering the module on.

The LEDs will all begin to blink blue to indicate that it is waiting for a firmware update.

Playback the firmware .wav file into the RATE CV input.

Make sure that no other sounds play during the process otherwise it will fail.

A successful update will change the LEDs to Green, and briefly to white. Once complete the module will automatically enter the new version of the firmware.

If the LEDs begin to blink red at any point, you can reset the audio file to the beginning, and press the Reset button to reset the bootloader.

If the update fails multiple times, adjust the level of the audio going into the Bloom's Rate CV jack.

## Changelog

### v1.0.6

- Added method of resetting the calibration data to its defaults. (Hold SHIFT+LENGTH during bootup). LEDs will blink blue and gold for 3 seconds to indicate the reset.
- Added version indication – Hold Ratchet while booting up. A Pair of LEDs will indicate the version. (Or not for versions prior to 1.0.6)
- Improved internal memory stability

#### **v1.0.5**

- Increased threshold of CV clamping for edge-case on hardware slightly out of tolerance. (should have negligible effect on most units.)

#### **v1.0.4**

- Added minimal CV clamping close to 0V to prevent slight offsets on certain hardware units from having undesirable effects on parameters (particularly mutation).

#### **v1.0.3**

- Reset LED fix
- CV Offset calibration fix.

#### **v1.0.2**

- Moved Calibration Mode to bootup. From now on, hold the channel button during power up to access the calibration mode. The mode can no longer be accessed while the module is already running.
- Added a method of resetting to the default calibration values for each output. These may not be perfect, but for those who have accidentally broken the calibration on their blooms, this will reset them to the pre-calibration default. (Reset calibration by clicking the fine-tune encoder for each channel during calibration).