

Nebulæ

Granular Sampler / DSP Platform

Manual V1.1



QU-BIT

ELECTRONIX

Description

Nebulæ is a voltage controlled granular sampler / DSP platform in the Eurorack modular synthesizer format. Expanding upon techniques pioneered by 1980's era samplers and Curtis Roads in his book *Microsounds*, Nebulæ uses recorded audio for generating granular clouds, microtonal drones, loops and otherworldly sounds from any source material. It is also capable of acting as a classic keyboard style MIDI sampler/drum machine while in one-shot mode.

Nebulæ is capable of running Csound and Pure Data Vanilla code. There is an extensive library of instruments to download at:

<http://www.qubitelectronix.com/alternateinstruments>

The module uses a Raspberry Pi as a CPU.

For more information on the Raspberry Pi:

<http://www.raspberrypi.org/>

For more information on Csound:

<http://www.csounds.com/>

For more information on Pure Data:

<http://puredata.info/>

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Installation

To install, locate 20HP 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 Nebulæ with the red band facing the bottom of the module

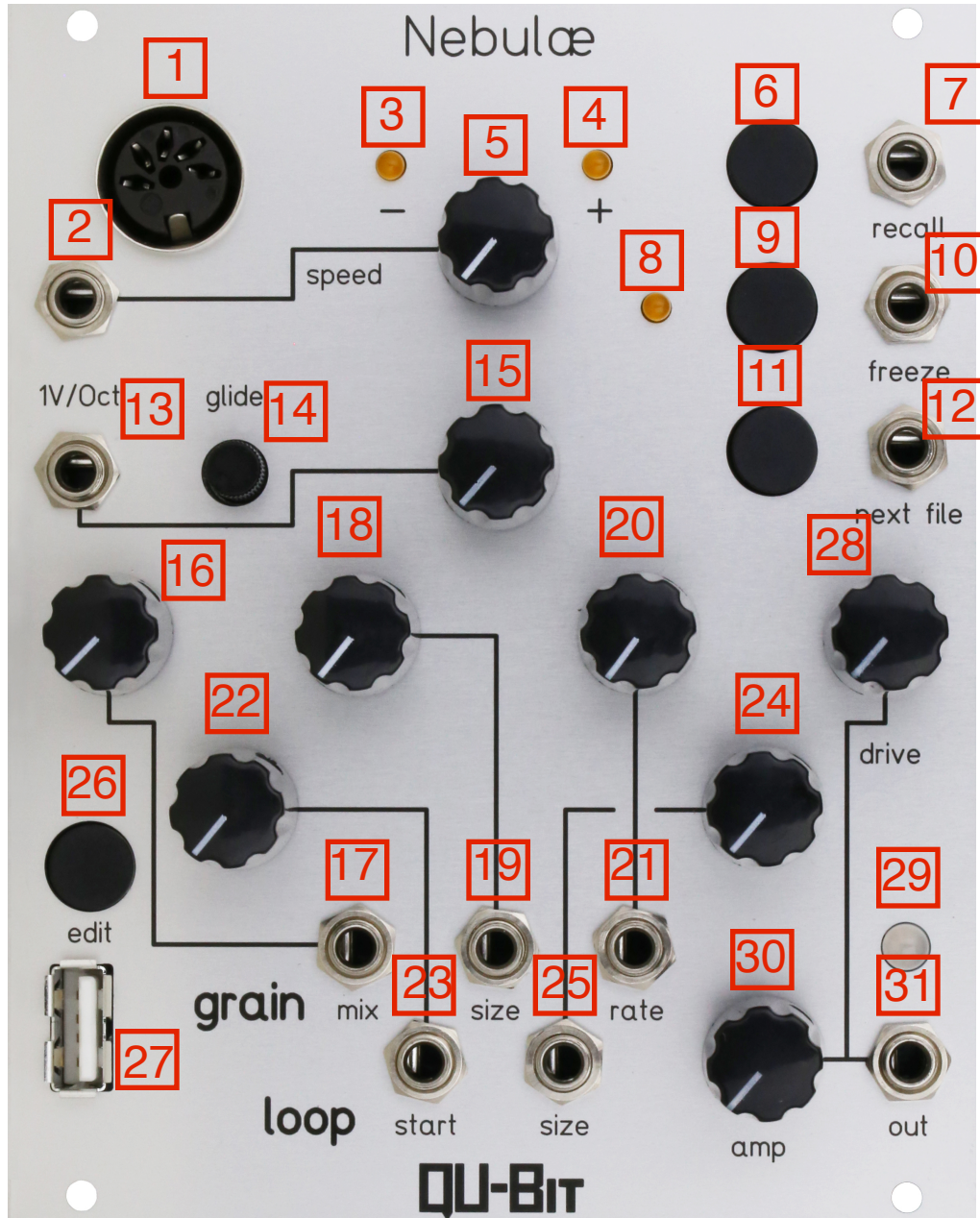
Specifications

Format: 20 HP Eurorack module

Dimensions: 40mm deep (skiff friendly)

Max current: 320mA

Looping Mode



Looping Mode Functions

- 1. MIDI Input** - MIDI input jack for 5 pin MIDI cable. Note-on events set pitch to note on value. Specified CCs correspond to every parameter excluding drive and amp. See MIDI implementation chart on page 17 for CC numbers associated with looping mode parameters.
- 2. Speed CV** - Bipolar control voltage input for speed of playback. Range is +/- 2.5V.
- 3. Speed Negative LED** - LED indicating the current value of speed when speed is negative.
- 4. Speed Positive LED** - LED indicating the current value of speed when speed is positive.
- 5. Speed** - Control for speed of playback. If speed is positive the file will play forwards. If speed is negative the file will play backwards. The current range setting sets the maximum and minimum values for speed. To adjust the range, hold down the edit button and move the knob. Far left will set the maximum range at the original speed of the file. Far right will set the maximum range at twice as fast as the original speed. The default is twice as fast as the original speed.
- 6. Loop Start Recall** - Retrigger the beginning of the currently selected loop.
- 7. Loop Start Recall Gate Input** - Gate input for recall. Threshold voltage is 2.5V.
- 8. Freeze LED** - LED indicating the current state of freeze. If lit up, freeze is activated. If not lit up, freeze is not activated.
- 9. Freeze** - "Freezes" the current audio stream.
- 10. Freeze Gate Input** - Gate input for freeze. Threshold voltage is 2.5V.
- 11. Next File** - Selects new audio file according to the current audio file selection mode. [See the edit button for information on how to change the current audio file selection mode.] If the current selection mode is sequential, *next file* will choose the next file in alphabetical order. If the current selection mode is backwards, it will move through the files in reverse alphabetical order. If the current selection is random, it will choose a random file. The default is sequential.

- 12. Next File Gate Input** - Gate input for next file. Threshold voltage is 2.5V.
- 13. 1 Volt Per Octave CV Input** - Unipolar 1 volt per octave input for pitch of playback. 5 octave range from 0V - 5V.
- 14. Glide** - Sets transition time between successive pitch values. Minimum value is 0 seconds. Maximum value is .175 seconds.
- 15. Pitch** - Controls pitch of playback. To adjust the range, hold down the edit button and move the knob. Far left will set the maximum range at the original pitch of the file. Far right will set the maximum range at two octaves higher than the original. As the range is decreased, the accuracy of the 1V/Oct input will decrease. The default range is with the maximum value two octaves higher than the original and optimal 1 volt per octave tracking.
- 16. Grain Mix** - Sets wet/dry mix between granular audio stream and direct audio stream. When the edit button is held down, this knob adjusts the amount of random pitch deviation to the granular audio stream.
- 17. Grain Mix CV** - Bipolar control voltage input for grain mix. Range is +/- 2.5V.
- 18. Grain Size** - Sets the size of each grain in the granular audio stream. Minimum value is .01ms. Maximum value is 78ms. Each grain is enveloped with a Gaussian curve. Holding down edit and turning grain size adjusts the audio file selection mode. When the knob is hard left, audio files will be selected in alphabetical order. When the knob is in the middle, audio files will be selected in reverse alphabetical order. When the knob is hard right, audio files will be selected randomly.
- 19. Grain Size CV** - Unipolar control voltage input for grain size. Range is 0V - 5V.
- 20. Grain Rate** - Sets the rate of grain distribution per second in the granular audio stream. Minimum value is 1 grain per second. Maximum value is 23 grains per second. When the edit button is held down, this knob adjusts the amount of random grain displacement in the granular audio stream.
- 21. Grain Rate CV** - Unipolar control voltage input for grain rate. Range is 0 - 5V.
- 22. Loop Start** - Sets start position of file.

23. Loop Start CV - Unipolar control voltage input for loop start. Range is 0 - 5V.

24. Loop Size - Sets size of loop.

25. Loop Size CV - Unipolar control voltage input for size of loop. Range is 0 - 5V.

26. Edit/Load New Files/One-Shot Mode - Holding down this button acts as a “shift” control which allows knobs to have secondary functions. Holding down the edit button and turning speed adjusts the range of speed, turning pitch adjusts the range of pitch, grain mix adjusts the amount of random pitch deviation in the audio stream, grain rate adjusts the amount of random grain displacement in the audio stream, and grain size adjusts the audio file selection mode. Holding down the edit button and pressing the next file button will load new audio files from the flash drive that is currently in the USB port. Holding the edit button down and pressing the recall button will enter One-Shot mode when using samples and will advance to the next .csd or .pd file when using alternate instruments.

27. USB File Load - USB port for loading audio, .csd, and .pd files into the module. Nebulæ will load up to 100 total .wav, .aif, .flac, and .ogg files in the root directory of the flash drive into RAM in alphabetical order. Nebulæ expects 44.1 kHz, 16 bit, mono audio files. Up to 9.5 minutes of audio can be loaded at a time. Any .csd (Csound) and .pd (Pure Data Vanilla) files in the root directory of the flash drive will be loaded into memory and will be selectable in alphabetical order. Csound and Pure Data Vanilla files have priority over samples.

28. Drive - Control of analog distortion applied to output signal.

29. System LED - RGB LED for indication of system state and functions.

During boot: **Pulsing Red** indicates the module is booting up.

Pulsing White indicates that the module is ready to load files

Flashing White/Red indicates that the module has begun to copy files from a USB drive into RAM

Off indicates that the module is playing the audio files

After boot: **Yellow** indicates recall has been triggered

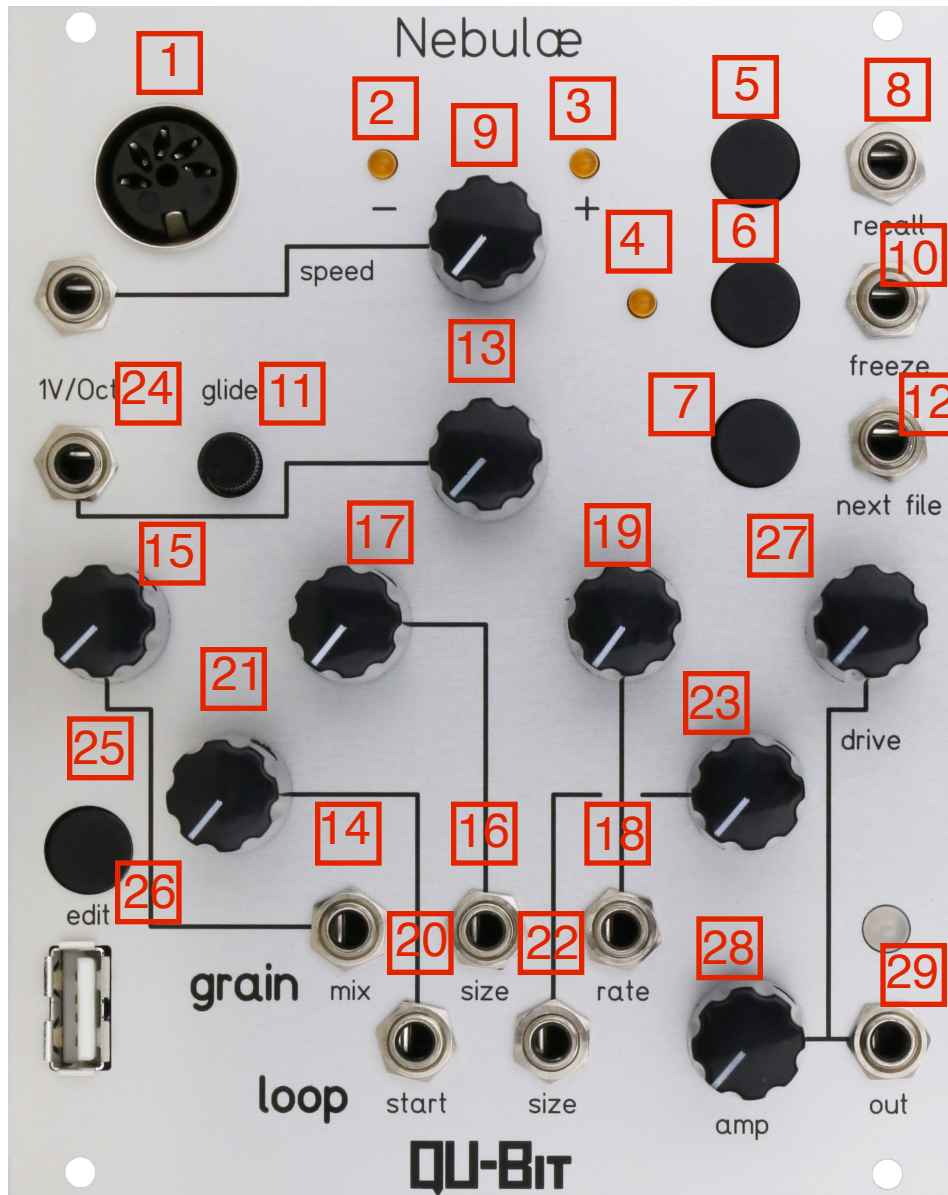
Cyan indicates a new file was selected

Violet indicates the edit button is being held down

30. Attenuator - Analog attenuator of output signal

31. Output - Audio output jack

One Shot Mode



One-Shot Mode Functions

- 1. MIDI In** - MIDI input. See MIDI implementation chart on page 17 for CCs and note numbers for controlling one shot mode.
- 2. Bank 1 LED** - Indicates that buttons will trigger samples 1-3 in memory.
- 3. Bank 2 LED** - Indicates that the buttons will trigger samples 4-6 in memory.
- 4. Bank 3 LED** - Indicates that the buttons will trigger samples 7-8 in memory.
- 5. Trigger For First File of Current Bank** - Triggers the first file in the present bank as indicated by the bank LEDs.
- 6. Trigger For Second File of Current Bank** - Triggers the second file in the present bank as indicated by the bank LEDs.
- 7. Trigger For Third File of Current Bank / Kill All** - Triggers the third file in the present bank as indicated by the bank LEDs. If the current bank is 3, this button becomes a trigger to stop all currently playing files.
- 8. File 1 Gate Input** - Gate input for file 1. Threshold voltage is 2.5V.
- 9. File 1 Varispeed** - Varispeed control of file 1. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.
- 10. File 2 Gate Input** - Gate input for file 2. Threshold voltage is 2.5V.
- 11. File 2 Varispeed** - Varispeed control of file 2. Minimum is four octaves beneath original pitch. Maximum is one octave above original pitch.
- 12. File 3 Gate Input** - Gate input for file 3. Threshold voltage is 2.5V.
- 13. File 3 Varispeed** - Varispeed control of file 3. Minimum is four octaves beneath original pitch. Maximum is one octave above original pitch.
- 14. File 4 Gate Input** - Gate input for file 4. Threshold voltage is 2.5V.
- 15. File 4 Varispeed** - Varispeed control of file 4. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.

- 16. File 5 Gate Input** - Gate input for file 5. Threshold voltage is 2.5V.
- 17. File 5 Varispeed** - Varispeed control of file 5. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.
- 18. File 6 Gate Input** - Gate input for file 6. Threshold voltage is 2.5V.
- 19. File 6 Varispeed** - Varispeed control of file 6. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.
- 20. File 7 Gate Input** - Gate input for file 7. Threshold voltage is 2.5V.
- 21. File 7 Varispeed** - Varispeed control of file 7. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.
- 22. File 8 Gate Input** - Gate input for file 8 . Threshold voltage is 2.5V.
- 23. File 8 Varispeed** - Varispeed control of file 8. Minimum is 4 octaves beneath original pitch. Maximum is 1 octave above original pitch.
- 24. Kill All Gate Input** - Silences all currently playing files when a gate signal is detected. Threshold voltage is 2.5V.
- 25. Sample Bank Select / Edit** - Allows for the loading of new audio files and returning to looping mode. Holding down the edit button and pressing next will load new audio files. Holding down the edit button and pressing recall will cause the module to return to looping mode.
- 26. USB File Load** - USB port for loading files. Files can only be loaded into Nebulae from looping mode.
- 27. Drive** - Control of analog distortion applied to output signal.
- 28. Attenuator** - Analog attenuator of output signal.
- 29. Output** - Output jack

Looping Mode MIDI Implementation

CC Number	Channel	Parameter	Range
5	Omni	Portamento Time	0 - 127
12	Omni	Speed (MSB)	0 - 127
13	Omni	Pitch (MSB)	0 - 127
14	Omni	Loop Start (MSB)	0 - 127
15	Omni	Loop Size (MSB)	0 - 127
16	Omni	Mix	0 - 127
17	Omni	Grain Size	0 - 127
18	Omni	Grain Rate	0 - 127
20	Omni	Freeze	0/127 (change state)
21	Omni	Next File	0/127 (change state)
44	Omni	Speed (LSB)	0 - 127
45	Omni	Pitch (LSB)	0 - 127
46	Omni	Loop Start (LSB)	0 - 127
47	Omni	Loop Size (LSB)	0 - 127

Note-on events between MIDI note numbers 32-100 will set the pitch parameter to the pitch value specified in the note-on message relative to the pitch of the sample.

One-Shot Mode MIDI Implementation

Note	Note Number	Channel	Parameter
C4	60	Omni	Trigger File 1
D4	62	Omni	Trigger File 2
E4	64	Omni	Trigger File 3
F4	65	Omni	Trigger File 4
G4	67	Omni	Trigger File 5
A4	69	Omni	Trigger File 6
B4	71	Omni	Trigger File 7
C5	72	Omni	Trigger File 8
D5	74	Omni	Stop all files
C6	84	Omni	Stop File 1
D6	86	Omni	Stop File 2
E6	88	Omni	Stop File 3
F6	89	Omni	Stop File 4
G6	91	Omni	Stop File 5
A6	93	Omni	Stop File 6
B6	95	Omni	Stop File 7
C7	96	Omni	Stop File 8

CC Number	Channel	Parameter	Range
1	Omni	File 1 Varispeed (MSB)	0 - 127
32	Omni	File 1 Varispeed (LSB)	0 - 127
2	Omni	File 2 Varispeed (MSB)	0 - 127
33	Omni	File 2 Varispeed (LSB)	0 - 127
3	Omni	File 3 Varispeed (MSB)	0 - 127
34	Omni	File 3 Varispeed (LSB)	0 - 127
4	Omni	File 4 Varispeed (MSB)	0 - 127
35	Omni	File 4 Varispeed (LSB)	0 - 127
5	Omni	File 5 Varispeed (MSB)	0 - 127
36	Omni	File 5 Varispeed (LSB)	0 - 127
6	Omni	File 6 Varispeed (MSB)	0 - 127
37	Omni	File 6 Varispeed (LSB)	0 - 127
7	Omni	File 7 Varispeed (MSB)	0 - 127
38	Omni	File 7 Varispeed (LSB)	0 - 127
8	Omni	File 8 Varispeed (MSB)	0 - 127
39	Omni	File 8 Varispeed (LSB)	0 - 127

Qu-Bit Electronix is Andrew Ikenberry & Jason Lim
<https://www.qubitelectronix.com>

For samples to play on your Nebulae, go to:
<http://www.qubitelectronix.com/samplelibraries>

For alternate instruments to run on your Nebulae, go to:
<http://www.qubitelectronix.com/alternateinstruments>

This module is open source! Get the code and schematic at:
<http://www.qubitelectronix.com/nebulaesource>

Or clone from git with:
git clone <https://github.com/aikenberry/qubitnebulae.git>

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