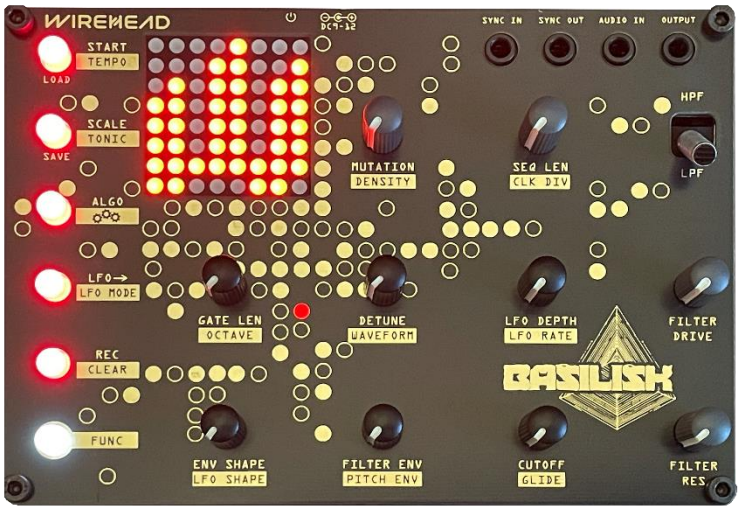
WIREHEAD INSTRUMENTS

BASILISK

ANALOG-HYBRID GENERATIVE BASSLINE SYNTHESIZER



USER MANUAL

HARDWARE REVISION **1.00**
FIRMWARE REVISION **1.00**

CONTENTS

INTRODUCTION

The **Basilisk** is a hybrid synthesizer featuring dual digital oscillators driven through a 12dB resonant analog filter and paired with a build-in generative sequencer.

The Basilisk will take you on a sonic exploration adventure – from driving basslines and melodic leads to Vangelis-inspired brass or thumping tribal percussion, the Basilisk is a powerhouse of sound design packaged with a melodic and intuitive generative sequencer inspired by the likes of Elektron & Music Thing.

With analog sync and external audio input, it plays great by itself or with your favourite external gear.

SOUND SYNTHESIS

- Dual digital oscillators (saw, square, pulse)
- Slide and detune
- Attack/decay EG for cutoff and/or pitch
- LFO with sample&hold, multiple waveforms and selectable destination, eg cutoff, modulation envelope, detune, octave note length

FILTER

- 12dB analog low-pass/high-pass MS20-style filter
- Saturated input-drive section (-20dB - +20dB gain) with soft-clipping
- Analog resonance control from none to screaming self-oscillation
- External audio input (route through the drive & modulated filter section)

SEQUENCER

- Built-in generative sequencer with 1-16 steps, clock division, multiple scales, tonics & algorithms
- Sequence mutates/evolves at user-defined rate & note-density
- Selectable tonic, octave & scale – Ionian (Major), Minor (Dorian), Pentatonic, Phrygian, Octaves, Fifths
- Control tempo by tap-tempo, manual dial or external sync
- Analog sync input & output (Eurorack and Volca / Pocket Operator compatible)
- 16-step parameter-lock recording of synth parameters

HARDWARE

- Digital oscillators (32KHz 14-bit)
- Sync input / output (0-5V rising-edge)
- Powered by an Arduino Nano V3
- 142mm (w) x 100mm (d) x 40mm (h)
- 7-12V DC or micro USB powered.
- Current draw 70mA @ 12VDC (v1.0 hardware)

QUICK START

SOUND SYNTHESIS

- [CUTOFF] is the celebrity here – tweak this!
- Use [ENV SHAPE] & [FILTER ENV] to shape the modulation envelope and adjust how much is applied to the cutoff.
- To set the LFO destination, hold [LFO->] and turn [MUTATION]
- Use [DETUNE] to control the spread between the two oscillators. By default, this is quantised to musical intervals but can also be set to be unquantized
- Use [FUNC]-[WAVEFORM] to select saw or square-wave, then keep turning clockwise to turn the square into a pulsewave
- The filter cutoff is digitally controlled, but some functions are pure analog: [FILTER RES], [FILTER DRIVE] and [LPF/HPF]
- The enthesis engine is quite deep with all controls having 2+ functions – read more for how to change waveforms, glide, octaves and LFO settings

SEQUENCER

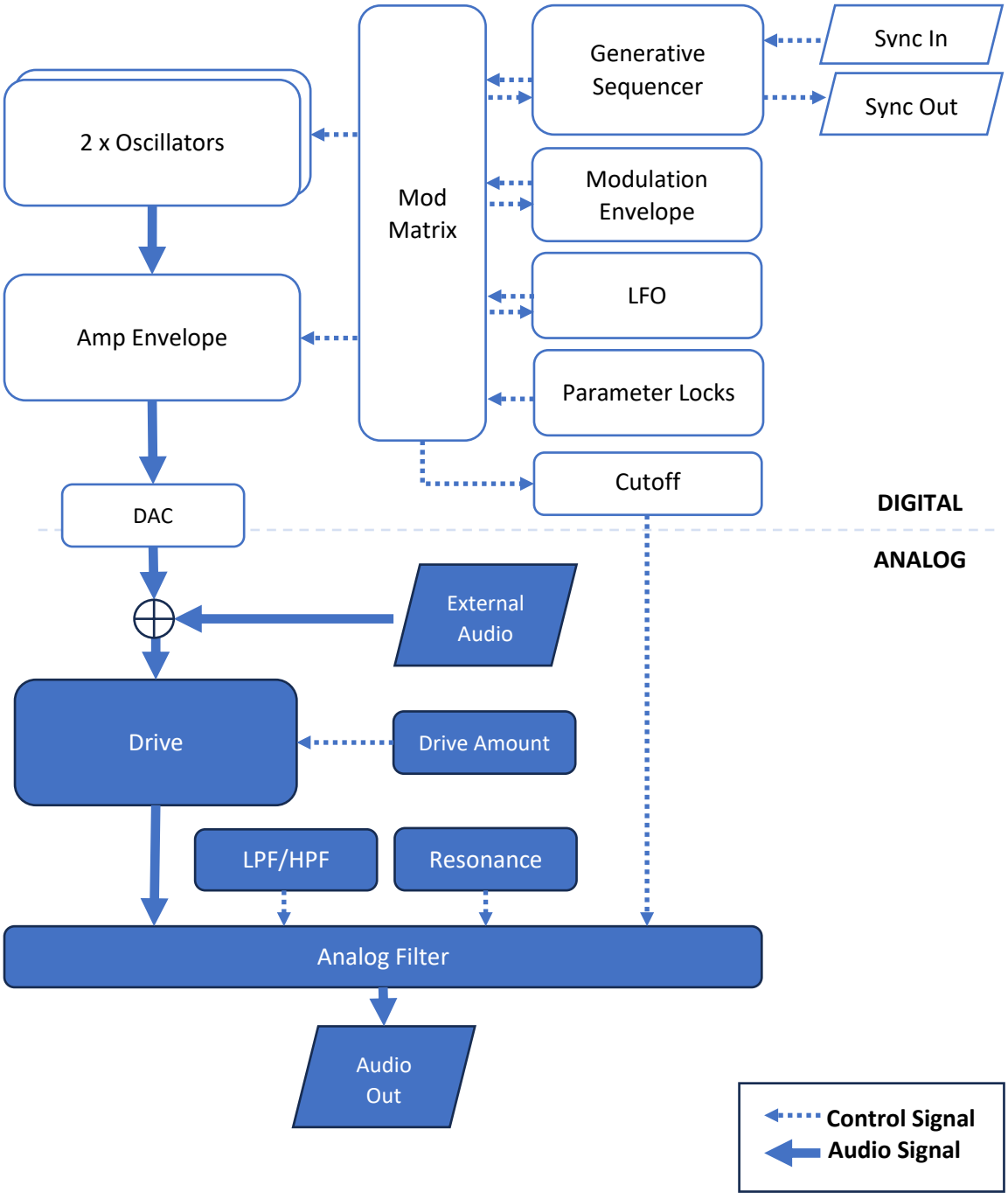
- To set the tempo, hold [FUNC] and tap [TEMPO], or hold [START] and turn [MUTATION] to set the BPM
- To set the scale hold [SCALE] and turn [MUTATION]
- To set the tonic, hold [FUNC] and press [TONIC]
- To set the generative algorithm, hold [ALGO] and turn [MUTATION]
- To set how fast the sequence changes, turn [MUTATION]
- To set how many steps are played or not, turn [DENSITY]
- To set how many steps are in the sequence (1-16) turn [SEQ LEN]
- Other sequencer settings include the scale, tonic, algorithm and clock division

EXTERNAL/INTERNAL SYNC

- Basilisk has an internal clock which you can sync using the SYNC IN input.
- To adjust how many sync pulses per step, press [FUNC]-[] and turn [MUTATION]. The first option (1.) disables the internal clock and only advances when a pulse is received

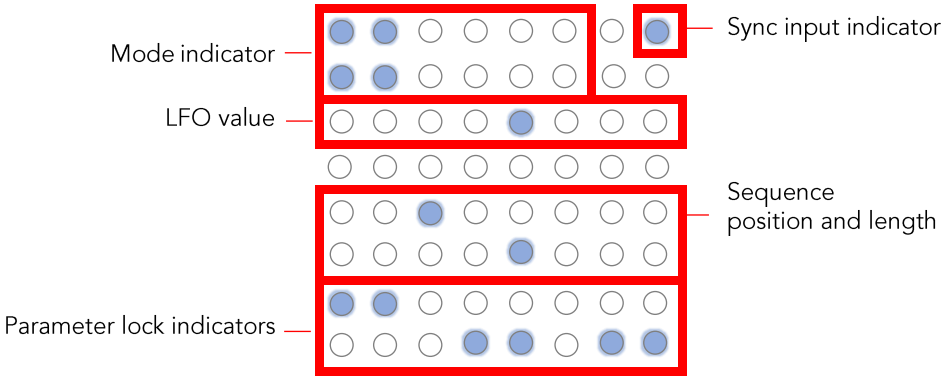
SYNTHESIS ARCHITECTURE

The Basilisk features a hybrid digital-analog architecture, with digital sequencer, dual oscillators and control, paired with an analog drive and multi-mode analog filter.



OPERATIONS MANUAL

DISPLAY



SOUND SYNTHESIS

PITCH & DETUNE

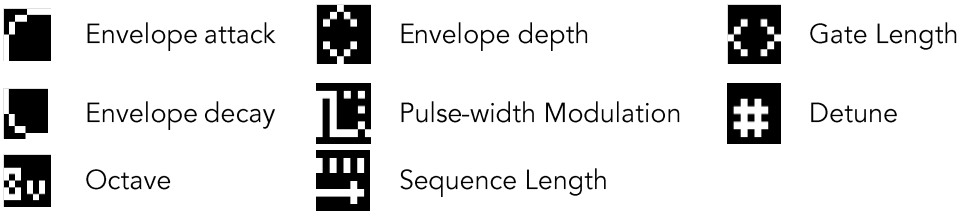
- Hold [FUNC] and turn [OCTAVE] to set the current base octave
    - Note that the generative algorithms may select notes up to +2 octaves above the base
- Use [DETUNE] to control the interval between the two oscillators.
    - By default detune is unquantized between -1 and +1 semitones, then quantised to octaves & perfect-fifth intervals
    - The detune mode can be changed by pressing [FUNC]-[⚙⚙] 3 times and turning [MUTATION] to select:
        - = quantised (standard mode)
        - = free (-12 semitones to +12 semitones)
- Hold [FUNC] and turn [PITCH ENV] to increase or decrease the effect of the modulation envelope on pitch. This shares the same envelope as the filter.
- Hold [FUNC] and turn [GLIDE] to increase the time taken to glide from one note to another.
    - The Basilisk will only glide if the previous note is still playing.
    - To glide on selected steps only, set the [GATE LEN] to shorter than the current step time, then use [REC] to record some parameter locks with longer [GATE LEN] settings

ANALOG FILTER

- Use [CUTOFF] to control the filter cutoff frequency
- Use [ENV SHAPE] and [FILTER ENV] to control the shape and intensity of the envelope applied to the filter cutoff
- Use [FILTER DRIVE] to control the pre-filter gain from -20dB to +20dB.
    - Internal audio sources are overdriven above approximately 10-o-clock position and will become more and more saturated
    - External audio sources will vary depending on their input level. Eurorack sources are generally 10v p-p and will be overdriven above minimum gain setting
- Use [FILTER RES] to control the resonance of the filter, from none, to self-resonant
- Use the [HPF/LPF] switch to switch between filter modes
    - LPF: 12dB resonant low-pass filter
    - HPF: 6dB non-resonant high-pass filter

LFO

- Turn [LFO DEPTH] to control the intensity of the LFO
- Hold [FUNC] and turn [LFO RATE] to control the speed of the LFO
- Hold [FUNC] and turn [LFO SHAPE] to change the waveform for the LFO
- Press [LFO ->] to and turn [MUTATION] to control what parameter is affected by the LFO. The setting is only applied when you release [LFO ->]



- Press [FUNC]-[LFO MODE] to select the LFO mode:
  -  = smooth (default mode)
  -  = sample-and-hold. The value of the LFO is sampled on note-on and held until the next note-on event

SEQUENCER

Basilisk has a built-in generative sequencer which selects which notes to play and when to play them, similar to Music Thing Turing Machine or Moog Labyrinth. You set the tonic note and scale mode, how quickly the sequence should mutate/change, and how many steps should trigger notes.

START, STOP & TEMPO

- Press [START] to start or stop the sequencer
- Hold [FUNC] and tap [START] to set the tempo (averages 4 consecutive taps)
- Hold [START] and turn [MUTATION] to set the BPM directly
  - The display will show the last two digits of the BPM with a single dot if the tempo is 100-199 or two dots if above 200 BPM
- Hold [FUNC] and turn [CLK DIV] divides the clock so the Basilisk only advances every N steps. By default, this is 1, but can be changed up to 64
- Note that if the sync mode is set to disable the internal clock (see below), the Basilisk sequencer will only advance when it receives a pulse on the SYNC IN input

MUTATION - HOW FAST THE SEQUENCE CHANGES

- More often: turn [MUTATION] clockwise.
- Less often: turn [MUTATION] anticlockwise
- To freeze the sequence and prevent changes: turn [MUTATION] fully anti-clockwise
- The display will show the % chance that the sequence will mutate (calculated on each step)

DENSITY - HOW MANY STEPS HAVE NOTES

- More steps have notes: hold [FUNC] and turn [DENSITY] clockwise
- Less steps have notes: hold [FUNC] and turn [DENSITY] fully clockwise
- The display will show the % chance that each step will trigger a note

SEQUENCE LENGTH

- More steps (up to 16), turn [SEQ LEN] clockwise
- Less steps (down to 1), turn [SEQ LEN] anticlockwise

MUSICAL TONIC & SCALE

- To change the scale, press [SCALE] and turn [MUTATION]. The setting is only applied when you release [SCALE]
- To change the tonic, press [FUNC]+[TONIC]

GENERATIVE ALGORITHMS – HOW THE NOTES & RHYTHMS ARE GENERATED

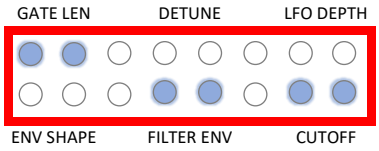
The generative algorithms are at the heart of the Basilisk

1. Standard mode. Creates single notes in the current scale across multiple octaves, with a slight bias to the tonic note.
2. Arp-run mode. Similar to standard, but creates short 3-note runs in the current scale
3. Scale. Sequence loops through all scale notes with no generative algorithm
4. Call/Response. Same as standard mode, except notes only play every alternate cycle
5. Jarreth. This mode is similar to a popular generative synth algorithm 😊. Below 50, the rhythm is kept stable and only notes change. Above 50, both notes and rhythm change

To change the generative algorithm, press [ALGO] and turn [MUTATION]. The setting is only applied when you release [ALGO]

PARAMETER LOCKING

- Hold [REC] while moving a control to record that movement into the sequence
   is displayed when recording mode is activated
- Hold [FUNC]+[REC] while moving a control to delete all recorded parameter locks for that control
   is displayed when recording-delete mode is activated
- The parameter lock section contains 6 indicators which flash when a step contains a parameter lock for the given parameter. These indicators align with the 6 synthesis controls:



SAVE AND LOAD PATCHES

The Basilisk has two types of memory – temporary and permanent

- Save
  - Hold [REC] and press [SCALE] to save to temporary memory
  - Hold [REC] and double-click [SCALE] to save to permanent memory
- Load
  - Hold [REC] and press [START] to load from temporary memory.
  - Hold [REC] and double-click [START] to load from permanent memory

SYNC WITH OTHER GEAR

- Basilisk responds to a rising-edge 5V trigger signal received on the SYNC IN jack
- To control how many steps the sequencer advances see the sync mode global settings section below

EXTERNAL AUDIO

Basilisk can accept external audio signals from 1v p-p (some boutique instruments like Crum Drum) up to Eurorack levels (10v p-p). Audio signals are routed through the drive section and the modulated filter including parameter locks, envelope and the LFO. Basilisk can work as a sequenced-filter when synced with the audio source – for example:

GLOBAL SETTINGS

Press [FUNC]-[⚙] to scroll through the settings pages. On each page, turn the [MUTATION] control to adjust the setting.

Any changes to the settings are saved when returning to the main page and will remain in memory after the device is turned off.

SYNC MODE

Basilisk responds to a rising-edge +5V trigger signal received on the SYNC IN jack.

- Turn [MUTATION] to select the sync mode:
  - = 1 step per pulse, internal clock disabled
  - = 1 step per pulse, internal clock enabled
  - = 2 steps per pulse, internal clock enabled
  - = 4 steps per pulse, internal clock enabled
- Once you have the setting, press [FUNC]-[⚙] until you return to the main screen

DISPLAY BRIGHTNESS

- Icon:
- Turn [MUTATION] to adjust the brightness level of the main display
- Note that the switch LED brightness cannot be adjusted

DETUNE QUANTISATION

- Turn [MUTATION] to adjust the quantisation setting
  - = quantised. This is the default. Detune is unquantised between -1 and +1 semitones, then quantised to octaves & perfect-fifth intervals
  - = free. Detune is completely unquantised (-12 semitones to +12 semitones)

BUTTON CONTROLS

Button	Primary Function	Alternative Function (hold [FUNC])
[START]	Start or stop the sequencer	Tap tempo
[SCALE]	Hold and turn [**MUTATION**] to select current musical scale: Io: Ionian Do: Dorian Pe: Minor Pentatonic Ph: Phrygian 8v: Octave 5v: Octave + 5ths To: Tonic	Select tonic through natural notes A - G
[ALGO]	Hold and turn [**MUTATION**] to select the generative algorithm used to control the sequencer 1. Standard mode. Creates single notes with a bias to the tonic note 2. Arp-run mode. Creates short runs of multiple notes 3. Scale. Sequence loops through all scale notes with no generative algorithm 4. Call/Response: Same as Standard, but sequence only plays notes every second loop	Scroll through the settings pages. On each page, turn [**MUTATION**] to adjust the following settings: 1. Sync mode 2. Display brightness 3. Detune quantisation mode See the global settings section below for more detail
[LFO ->]	Hold and turn [**MUTATION**] to select the destination for the current voice LFO • Cutoff • Envelope Attack • Envelope Decay • Envelope Depth • Note length • Pulse width (PWM) • Detune • Octave • Sequence Length	Switch between LFO modes – normal or sample-and-hold. Sample-and-hold samples the current LFO value on every note-on and keeps that value until the next note-on
[REC]	Hold [**REC**] while moving a control to record those parameter changes to the sequence	Hold [**FUNC**]+[**REC**] while moving a control to delete any recorded parameter changes from the sequence
[FUNC]	Access control's alternative function	n/a

ROTARY CONTROLS

Control	Primary Function	Alternative Function (hold [FUNC])	Other
[MUTATION]	Control the likelihood that the sequence will change over time	Control the density of the sequence, i.e. how likely is a step to play a note	Holding [START]: set BPM Holding [SCALE]: set scale Holding [ALGO]: set Algorithm Holding [LFO ->]: set LFO destination In settings pages: set various device parameters
[SEQ LEN]	Control the length of the sequence for the currently selected voice	Control clock division - the number of steps before the sequencer will advance	
[GATE LEN]	Control the length of each note.	Controls the base octave of the currently selected voice	
[LFO DEPTH]	Control the depth of the LFO	Control the rate of the LFO	
[ENV SHAPE]	Control the envelope attack and decay time. Attack is 0ms from minimum to about 3-o-clock. Rotate fully clockwise for maximum attack time	Select the LFO waveform	
[FILTER ENV]	Control the intensity of the envelope applied to the filter cutoff	Control the intensity of the envelope applied to the oscillator pitch	
[CUTOFF]	Controls the base filter cutoff frequency	Controls the speed of the glide from one note to another (if the previous note is still playing)	
[FILTER DRIVE]	Controls the pre-filter gain. 0dB gain is approx. 10-o-clock	Analog control only	
[FILTER RES]	Controls the filter resonance from zero to self-oscillation	Analog control only	

SPECIFICATIONS

VOICE ARCHITECTURE

Voice	
Oscillators	**2 x digital oscillators, digitally mixed**
Octave	0 - 6
Waveform	Saw, Square, Pulse
Amp Decay	~4ms – ~60s
Glide Time	Off – ~1000ms
Mod Envelope	
Destinations	Filter cutoff, oscillator pitch
Depth	0 - ~75% full range
Attack time	0ms - ~3s
Decay time	4ms – ~500ms
LFO	
Depth	± 50% for cutoff. Variable for other settings
Rate	20Hz - ~5mins
Modes	Smooth, Sample & Hold
Waveform	Sine, square, saw, reverse saw, pseudorandom
Parameter locks	
Per step parameter locks	
Gate length, Detune, LFO Depth	
Envelope Shape, Filter Envelope depth, Cutoff	

SEQUENCER ARCHITECTURE

Sequencer Settings	Generative Algorithm
Sequence length	Algorithm Mode
Clock Division	Sequence mutation rate
Current step	Sequence note density
Sequence notes	
Note length	
Root Tonic	
Scale Mode	
Steps per sync pulse	

SPECIFICATIONS (CONTINUED...)

TECHNICAL SPECIFICATIONS

SPECIFICATIONS	
Synthesis	Dual 13-bit digital oscillators Digital VCA Analog filter: 12dB 2-pole Sallen-Key, Lowpass/Highpass
Polyphony	Monophonic
Sequencer	16 step polymetric sequencer
Modulation	Attack/decay envelope for cutoff & pitch Multi-waveform LFO Parameter locking per step
I/O	Audio out External Audio In (pre-gain & filter) Sync in / out Power 9-12v USB (power and firmware update) Eurorack power (with modification)
External sync	Sync in & out +5v sync pulse 1, 2 or 4 steps per pulse
Signal output	14-bit 32KHz DAC Mono output
Microprocessor	Arduino Nano V3 (ATMEGA328P)
Power supply	Micro USB 9-12VDC 2.1mm Positive tip Can be adapted for +12V eurorack power
Display	8 x 8 LED matrix
Power consumption	70mA @ 12VDC (v1.0 hardware)
Dimensions	142mm (w) (~28HP) x 100mm (d) x 40mm (h)