The NTH Music Synthesizer

Thank you.

Congratulations on purchasing the Nth Music Synthesizer.

We hope that the NTH will put a smile on your face for years to come.

John Staskevich

Kevin Holland

NTH Quick Start Guide

1 **Power**
0 [   ] 1

2 ◯ TURN   ☐ CLICK | SLIDE

3 ☺

Contents

Introduction

We designed the NTH so that a user manual would be unnecessary. The NTH is so simple to use that a novice can quickly craft a variety of timbres. For the synth veteran, the NTH is a fun tool without layered menus and obscured features. Every synthesis parameter can be altered by simple manipulation of a knob, button, or slider.

If you are interested in the specifics of NTH operation, read on. We are excited to share.

Top Panel
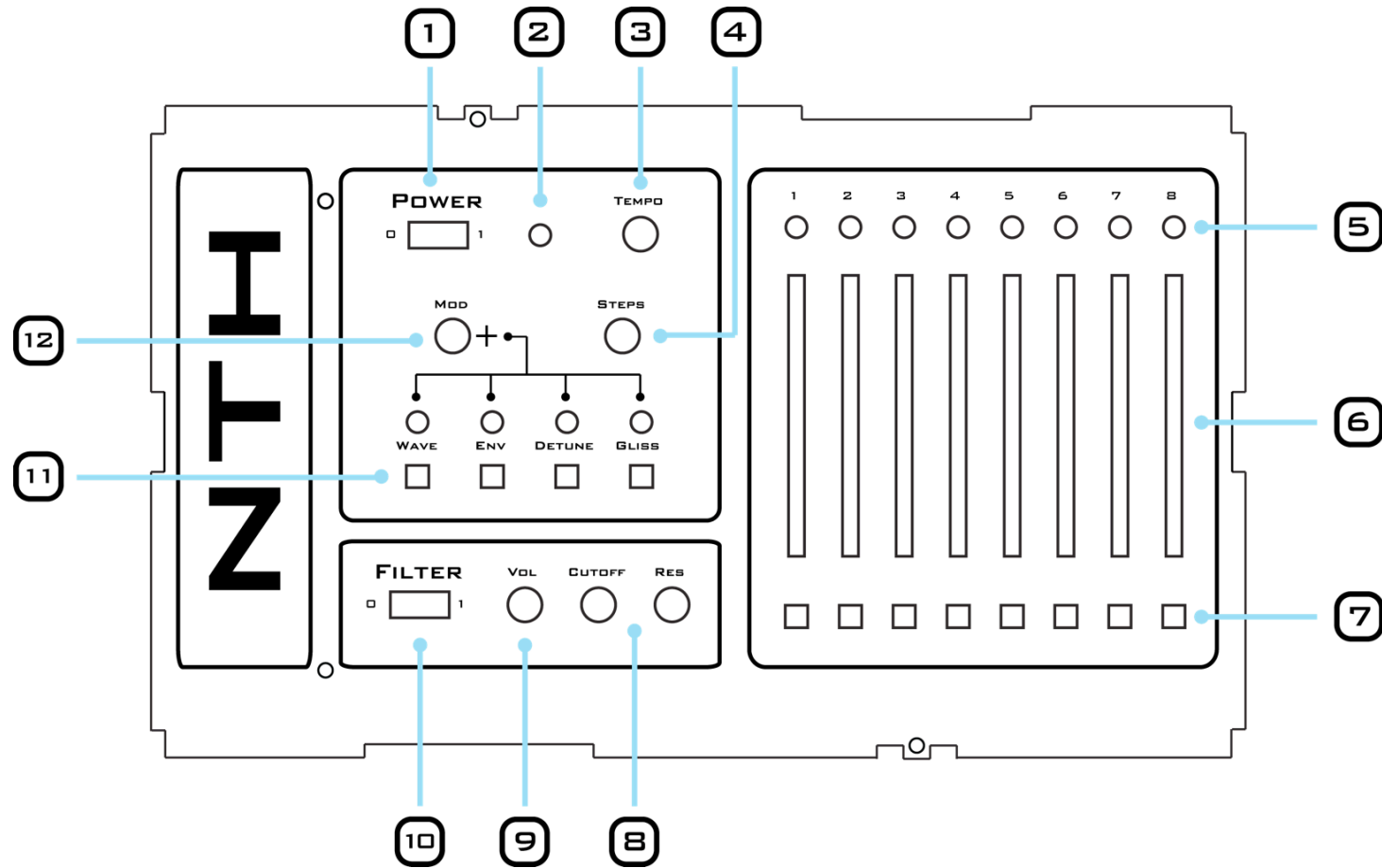
1 Power Toggle	7 Step Toggles
2 Power indicator LED	8 Filter (Cutoff/Resonance Knobs)
3 Tempo Knob	9 Volume Knob
4 Steps Knob	10 Filter Bypass Toggle
5 Step Indicator LEDs	11 Modulation Toggles
6 Pitch Sliders	12 Modulation Knob

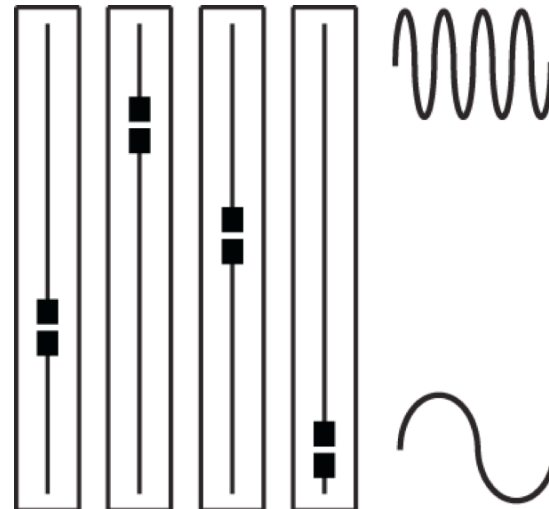# Sequencer

Power

0 [____] 1

Power up the NTH. The sequencer begins running.

1 2 3 4 5 6 7 8

Change the pitch of each step with the sliders.

STEPS   1   2   3   4   5   6   7   8

Select the number of steps in the sequence.

Toggle each step on or off.

1   2   3   4   5   6   7   8

TEMPO

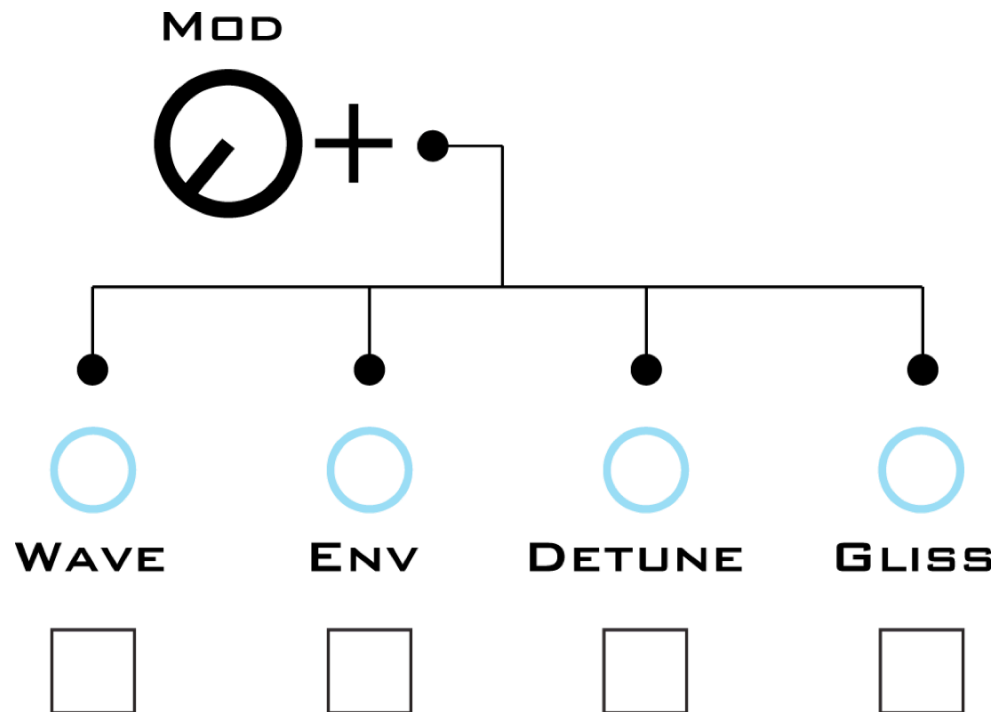Reverse ||||||||||||||||||| Forward

Adjust speed and direction of playback.

Modulation

Select any of the modulation parameters (Wave, Env, Detune, Gliss) by pressing the corresponding toggle. Adjust the sound by turning the Modulation Knob.

Each modulation parameter is described in the pages that follow.

Mod

WAVE   ENV   DETUNE   GLISS

Waveforms

Wave   Env   Detune   Gliss

Select one of 16 oscillator waveforms.

Amplitude Envelopes
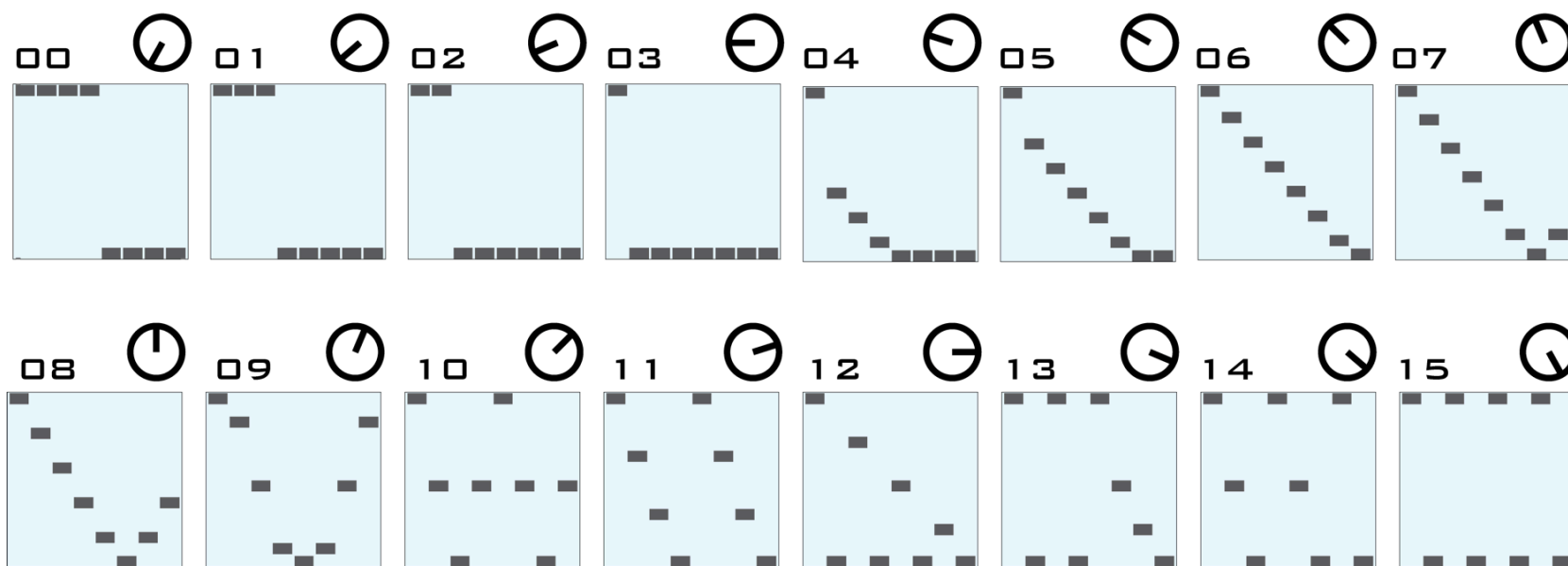
Wave   Env   Detune   Gliss
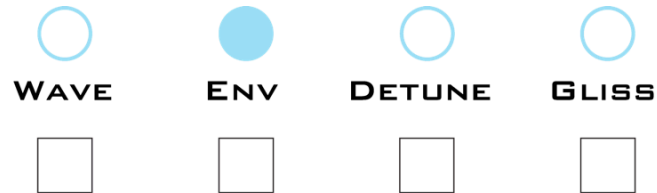
Select one of 16 amplitude envelopes. When the sequencer runs in reverse, the envelopes are reversed.

00   01   02   03   04   05   06   07

08   09   10   11   12   13   14   15
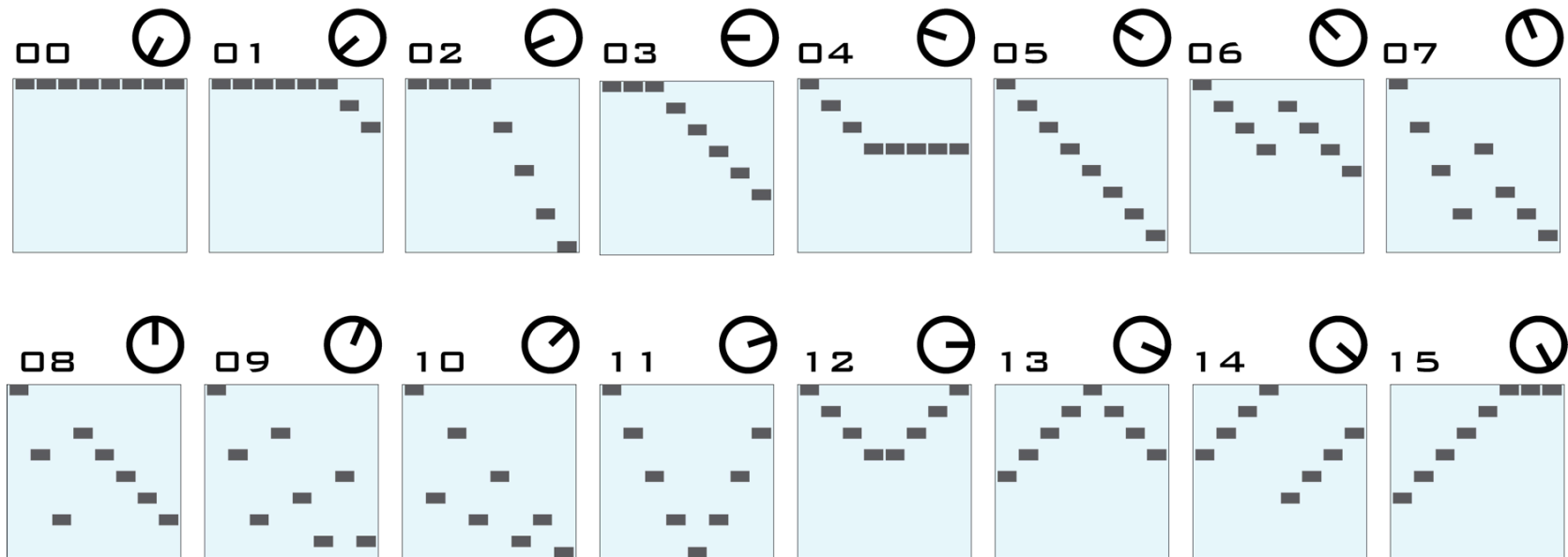
Detune
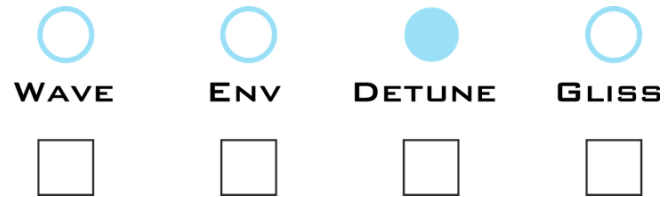
Raise the pitch of the secondary oscillator chromatically, relative to the primary oscillator: unison at full counter-clockwise, one octave at full clockwise.

Wave   Env   Detune   Gliss

Oscillator 2
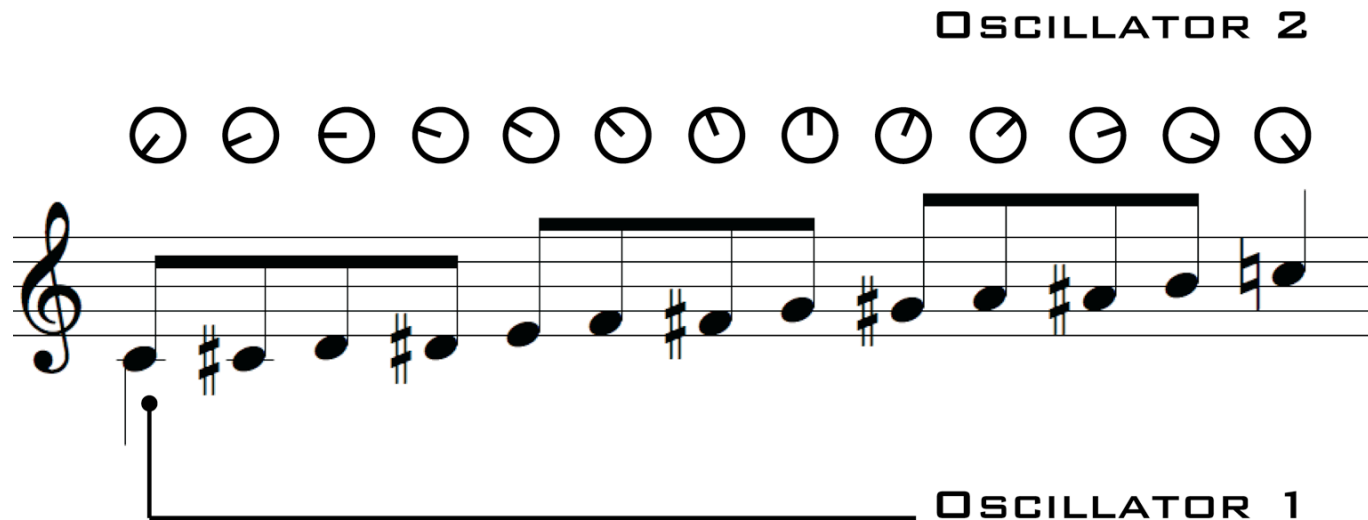
Oscillator 1

Glissandi / Scales

Select one of 16 patterns. These patterns change the oscillator pitch relative to the slider position. When the sequencer runs in reverse, the patterns are reversed.

Wave   Env   Detune   Gliss

00   01   02   03   04   05   06   07

08   09   10   11   12   13   14   15
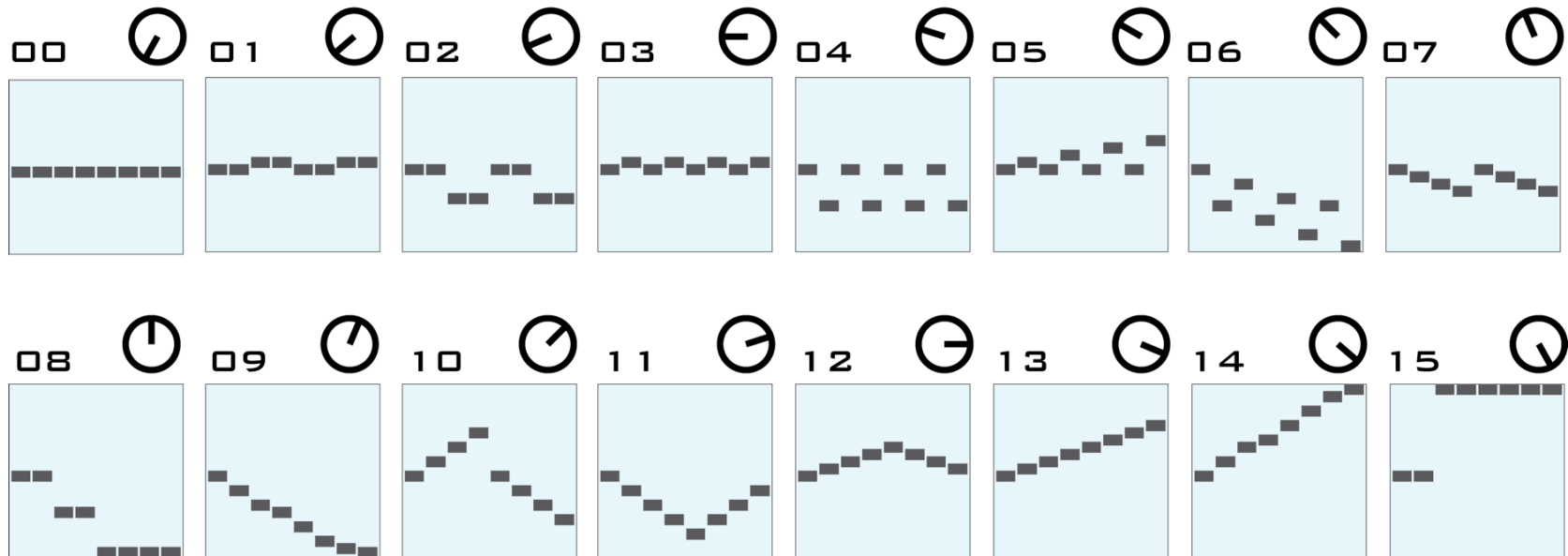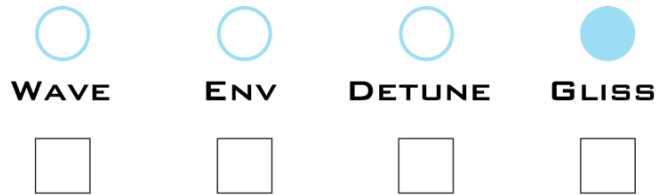
Filter

Adjust the NTH's sound with the analog low-pass filter based on the Sallen-Key design.

The Cutoff Knob controls the cutoff frequency of the filter. The Resonance Knob boosts the output around the cutoff frequency.
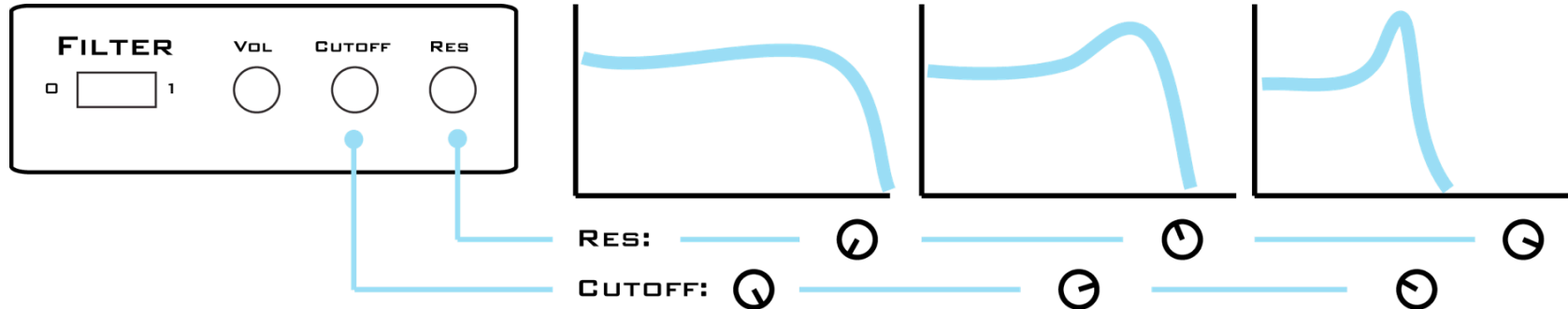
The NTH's filter is very aggressive. High resonance levels can result in distorted, raw, and noisy sounds. For a sweeter tone, roll the resonance knob counter-clockwise.

Bypass the NTH's filter by flipping the Filter Toggle to the "0" position.

NTH Signal Flow

MIDI

The NTH features standard MIDI in and out. It can be used in conjunction with external gear including keyboards, drum machines, samplers, and synthesizers. It can also interface with digital audio workstations on your computer.

At power-up, the NTH operates under control of its internal tempo clock and integrated step sequencer.

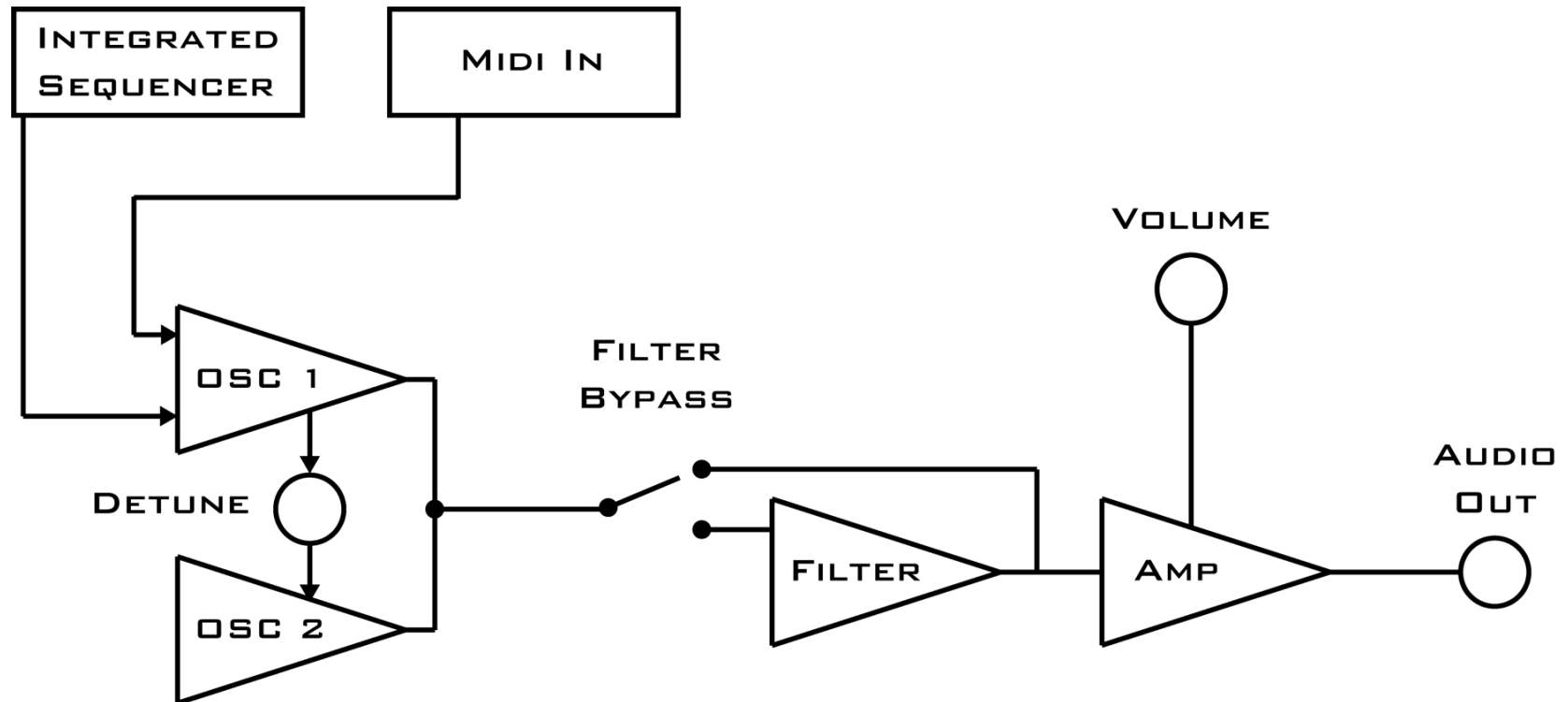When a MIDI note is received, the integrated sequencer is disabled and the NTH enters monosynth mode, allowing you to play the NTH with an external controller. The internal tempo clock is still used to generate amplitude envelopes and gliss/scalar patterns.

When MIDI sync is received, the internal tempo clock is disabled and the NTH's integrated sequencer is controlled by the external MIDI sync.

When both MIDI notes and MIDI sync are received, the NTH operates in monosynth mode with amplitude envelopes and gliss/scalar patterns controlled by the external MIDI clock.

MIDI Implementation Chart

Parameter	Function	CC	Range
Wave	Selects from 16 oscillator waveforms	1	0 - 15
Env	Selects from 16 amplitude envelopes	2	0 - 15
Detune	Detune secondary oscillator	3	0 - 11
Gliss	Selects from 16 glissando / scalar patterns	4	0 - 15
Steps	Selects sequence length	5	1 - 8
Tempo	Rate/direction of sequencer	6	~ 30 - 230 BPM
Gate	Selects looped or 1-shot amp envelope	7	0 - 1
Note	Trigger MIDI notes F0 - G#5	-	17 - 80
Sync	Start / Stop / Continue / Clock	-	-

Programming

The microcontroller programming port is a 6-pin header that adheres to the Microchip In Circuit Serial Programming specification. For details, see the datasheet of the NTH microcontroller (PIC16F1937).

We recommend the Microchip PICkit2 USB programmer and software.

Features & Specifications

- Hackable open source design
  - Electronic prototyping area
  - Additional DAC channel reserved for DIY use
  - PIC16F microcontroller with In Circuit Serial Programming (ICSP) port for firmware DIY & upgrades
- 8-bit digital oscillator
  - 16 oscillator waveforms
  - 16 amplitude envelopes
  - Dual pitch with adjustable detune
  - 16 glissando / scalar patterns
- Analog low-pass filter with resonance (based on Sallen-Key design)
- Integrated 8-step sequencer:
  - 8 pitch sliders with toggle buttons
  - Tempo control knob with reverse
  - Sequence control knob
- Standard MIDI in and MIDI out ports
- 3.5mm line/headphone output with volume control
- Lasercut and etched acrylic enclosure
- Blue indicator LEDs
- Powered by 9V battery
  - Power consumption: 0.9W (100mA @ 9VDC)
- Dimensions: 10.26" x 6.11" x 2.125"
- Weight (Excluding Battery): 21.65 oz.

Credits

NTH created by John Staskevich & Kevin Holland

nthsynth.com
highlyliquid.com
sineqube.com

Photography by Amy Glass

amyglass.dphoto.com