Icebreaker Audio's

CALC-U SYNTH

HEAVYOCITY
RAW INSPIRATION®

1 TABLE OF CONTENTS

2 WELCOME TO CALC-U-SYNTH

Thank you for purchasing **CALC-U-SYNTH** from **ICEBREAKER AUDIO** and **HEAVYOCITY**. This guide will show you how to use the instrument, give you an overview of the controls, and offer some useful hints and tips along the way.

I personally hope you enjoy this release and find it to be an inspirational addition to your musical toolkit.

2.1 SYSTEM REQUIREMENTS

- PC/Mac running Native Instruments **REAKTOR 6.2** or later.
  CALC-U-SYNTH will also run in the latest version of the free **REAKTOR PLAYER**.
- Native Instruments **NATIVE ACCESS** is also required for installation and activation.

More information on REAKTOR can be found on the Native Instruments website:
http://www.native-instruments.com/en/products/komplete/synths/reaktor-6/

More information on REAKTOR PLAYER, including download links, can be found here:
https://www.native-instruments.com/en/products/komplete/synths/reaktor-6-player/

2.2 INSTALLATION

To install your REAKTOR instrument follow these steps:

1. Place the downloaded and unzipped product folder in the location you would like to have it installed.
2. Open **NATIVE ACCESS** and sign in to your account.
3. Click on the **Add a serial** button to the top left of the interface.
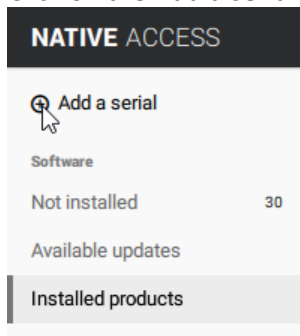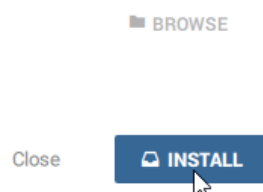

4. Enter the serial number you received and then click **ADD SERIAL**.

5. You will then be prompted to locate the location of the product on your computer. Click **BROWSE** to open a window from where you can specify this location.
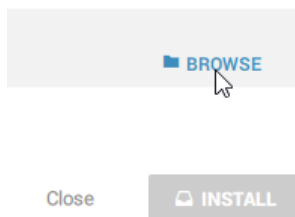
6. Click **INSTALL**.

7. After a moment, your new REAKTOR instrument will be ready to use.

2.3 BROWSING AND LOADING

You can find your installed REAKTOR product in the **Browser**, under the **Library** sub-tab.

In the Library Browser there are two icons, the icon on the left displays Installed REAKTOR PLAYER Libraries, the icon on the right displays User content.

- To see libraries from Heavyocity, you need to make sure the left icon is selected.
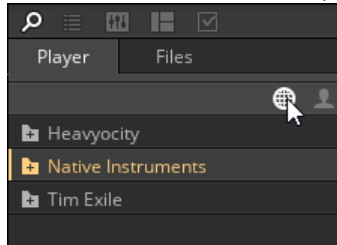
Clicking on the Heavyocity Folder will display all installed REAKTOR products from Heavyocity.
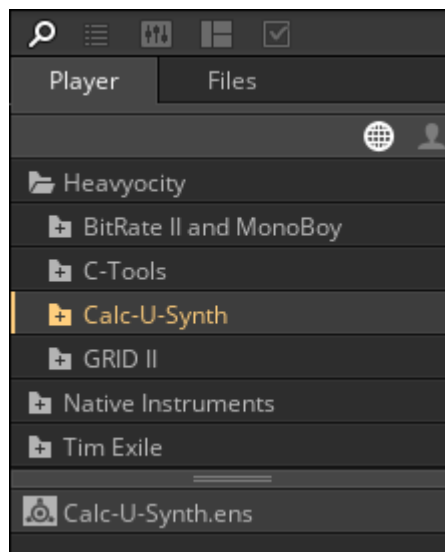
1 CALC-U-SYNTH IN THE LIBRARY BROWSER

You can load **CALC-U-SYNTH** by either double-clicking on the **Calc-U-Synth.ens** file, or by dragging it into the main REAKTOR window.

3 GETTING STARTED

3.1 USING REAKTOR

For help and guidance with using REAKTOR, either as standalone or in a host, please refer to the REAKTOR user manual. The full details of REAKTOR's features will not be covered in this manual.

For additional help and support with using REAKTOR, use the Native Instruments' user forum, or contact the Native Instruments' support team. Only contact **ICEBREAKER AUDIO** if you are having a problem with the **CALC-U-SYNTH** instrument specifically.

3.2 REAKTOR BLOCKS

CALC-U-SYNTH was constructed using the REAKTOR Blocks format.

For users of the full version of REAKTOR, the Blocks that were built to create **CALC-U-SYNTH** are also provided individually so you can incorporate them into your own Block creations.

The Blocks are located in the main product folder as .ins files. For ease of browsing you can move these to the same folder as the other REAKTOR Blocks in the REAKTOR 6 Library folder.

3.3 CONTROL HELP

All controls in **CALC-U-SYNTH** have info text. You can use this to better understand what each control in **CALC-U-SYNTH** does without the need to refer to this manual. You can view these by activating **Info Hints**, either by clicking on the **i** symbol beside REAKTOR's transport controls, or by pressing [Ctrl] + I ([Cmd]+I on OSX). With Info Hints active, you can view the info text by hovering your mouse pointer over any control.

4 ABOUT CALC-U-SYNTH

CALC-U-SYNTH is an emulation of the Casio VL-Tone, the classic digital calculator/synthesizer hybrid released in the summer of 1979 and manufactured until 1984. It was created using the **REAKTOR BLOCKS** framework, which means that if you own the full version of REAKTOR, you can incorporate the blocks into your own creations.

The VL-Tone can be run in one of two main modes: calculator or synthesizer. The synthesizer is a monophonic instrument that has 5 preset sounds as well as a user programmable 6th slot called ADSR. The ADSR slot was programmed by entering 8 digits into the calculator's memory, then returning to synthesizer mode. Needless to say, this is a rather inconvenient way to program a synthesizer.

CALC-U-SYNTH was designed to present the full capabilities of the VL-Tone's programmable features in a more convenient interface, while retaining the character of the instrument. Great care was taken to measure and reproduce every aspect of the original accurately.

The VL-Tone had its own built-in speaker, which was analysed and modelled for an authentic tone. For added lo-fi realism, the key-click sounds of playing the instrument were also sampled and included. You can dial in as much, or as little as you like.

The sound was then expanded using a number of effects and performance options including an arpeggiator, circuit-bending glitch controls, and a filter & delay effect module.

5 THE CALC-U-SYNTH BLOCKS

CALC-U-SYNTH includes seven Blocks to add to your collection.

Four of the blocks are emulations of different parts of the VL-Tone:

- **Calc-U-Synth** – the main synthesis block. Includes an oscillator, volume envelope, tremolo, vibrato, as well as "circuit-bending" controls.
- **Key Clicks** – plays back sampled key-click sounds based on MIDI note on and note off messages.
- **C-U-S Speaker** – an emulation of the VL-Tone's built-in speaker.
- **C-U-S Envelope** – the Calc-U-Synth envelope, without any of the additional synthesis features. This Block is not part of the main **CALC-U-SYNTH** Ensemble, as it is a sub-section of the main **Calc-U-Synth** Block.

The other three blocks were designed to complement the core block set:

- **Calc-U-Seq** – a 16-step modulation sequencer based on the Calc-U-Synth look and feel.
- **Arp Basic** – an easy-to-use arpeggiator block.
- **Effigy** – an analogue modelled effect block with a lowpass filter and a stereo delay.

Even if you are not planning to use the Blocks individually to build your own modular creations, the following section of the manual will explain the various controls of each Block, and thus of each segment of the main Ensemble.

5.1   CALC-U-SYNTH

The Calc-U-Synth Block includes an emulation of the VL-Tone's full synthesis engine. The output of the Block could be considered what you would get from a VL-Tone's direct output.

Additional *circuit-bending* controls were added to increase the Block's sonic palette.
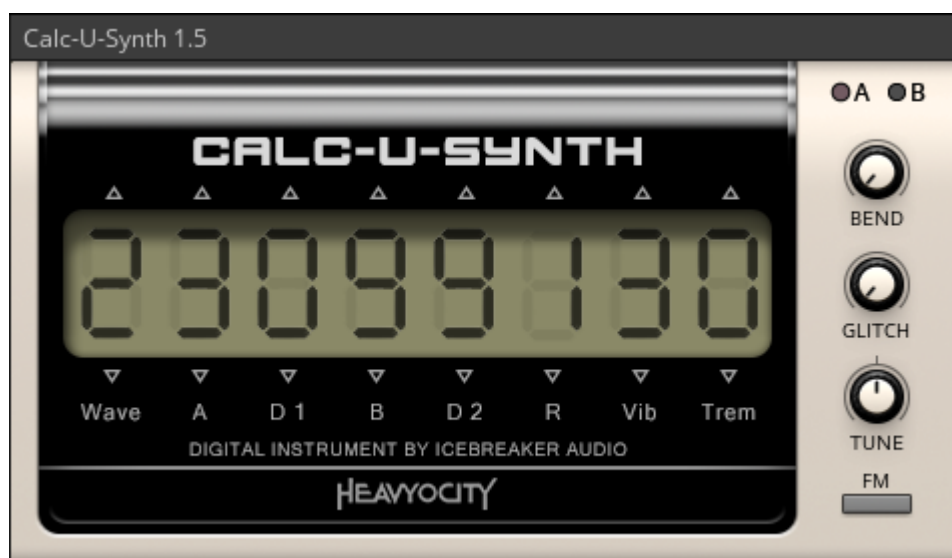
2 THE CALC-U-SYNTH BLOCK

The main synthesis engine of the Calc-U-Synth Block is programmed using eight numeric controls. You can change the value of each parameter by either clicking and dragging on the number itself, or by clicking on the arrows above and below the number to change it by 1.

The controls available to you are (from left to right):

- **Waveform**: Selects from 10 available waveforms. The final three waveforms are pitch-modulated versions of other waveforms.
- **Attack**: Sets the attack time (fade in time) of the volume envelope. Increasing the value increases the attack time.
- **Decay 1**: Sets the time it takes for the volume envelope to go from the peak volume to the breakpoint. Increasing the value increases the decay time.
- **Breakpoint**: (Sustain Level) Sets the level at which the rate of the first decay changes to the rate of the second decay.
- **Decay 2**: (Sustain fade out) Sets the rate at which the sound fades out during the sustain phase. A value of 9 will give an infinite sustain.
- **Release**: Sets the release time of the volume envelope. This is the fade out time of the sound after the key is released.
- **Vibrato**: Sets the vibrato rate. A value of 0 turns the vibrato off; values from 1 to 9 decrease the rate of the vibrato.
- **Tremolo**: Sets the tremolo rate. Like the vibrato, a value of 0 turns the tremolo off, and values from 1 to 9 decrease the tremolo rate.

The Block also includes four additional controls that expand on the original engine; all of these controls are located on the right side of the block:

- **BEND**: One of two *circuit-bending* controls. This control produces a *pulse-width* type result.
- **GLITCH**: The second circuit-bending control, GLITCH produces more noisy and chaotic results.
- **TUNE**: Controls the transposition of the instrument's pitch.
- **FM**: Toggles the block's FM input on or off.

INPUTS AND OUTPUTS

The Calc-U-Synth Block has five inputs and three outputs.

3 THE CALC-U-SYNTH BLOCK IN THE STRUCTURE VIEW

Inputs:

- **Pitch**: Input for controlling oscillator pitch. An increase of 0.1 equals a 1 octave increase in pitch.
- **Gate**: Gate signal input. A positive zero crossing at this input is considered gate on.
- **Gate (e)**: A gate input for event signals.
- **FM**: Frequency modulation input.
- **Mod A/B**: Modulation bus inputs.

Outputs:

- **Out**: The main synthesizer output.
- **Env**: An output for the digital ADBDR envelope.
- **Osc**: The output signal for the oscillator, ignoring the built-in envelope.

5.2 KEY CLICKS

The Key Clicks Block uses samples to produce key clicks in response to MIDI note on and off messages. These sounds can be blended with synth and keyboard instruments to give them an extra organic layer.

The key clicks were sampled from the original VL-Tone. 62 samples are included and randomization is used to avoid repeating samples.

4 THE KEY CLICKS BLOCK

The Key Clicks Block has three controls:

- **ON/OFF**: Toggles the Block on or off.
- **DOWN**: Controls the output volume of the key-down samples.
- **UP**: Controls the output volume of the key-up (or release click) samples.

INPUTS AND OUTPUTS

The Key Clicks Block has two inputs and one output.

5 THE KEY CLICKS BLOCK IN THE STRUCTURE VIEW

Inputs:

- **Mod A/B**: Modulation bus inputs.

Output:

- **Out**: The Key Click audio output.

5.3 C-U-S Speaker

The C-U-S Speaker Block is an emulation of the VL-Tone's built-in speaker.

6 THE C-U-S SPEAKER BLOCK

The C-U-S Speaker Block has three controls:

- **MIX**: Controls the blend between the input signal and the speaker signal.
- **RES**: Controls the intensity of the resonant peaks in the speaker.
- **ROOM**: Controls the level of a small reverb effect, designed to add distance to the speaker.

INPUTS AND OUTPUTS

The C-U-S Speaker Block has five inputs and two outputs.

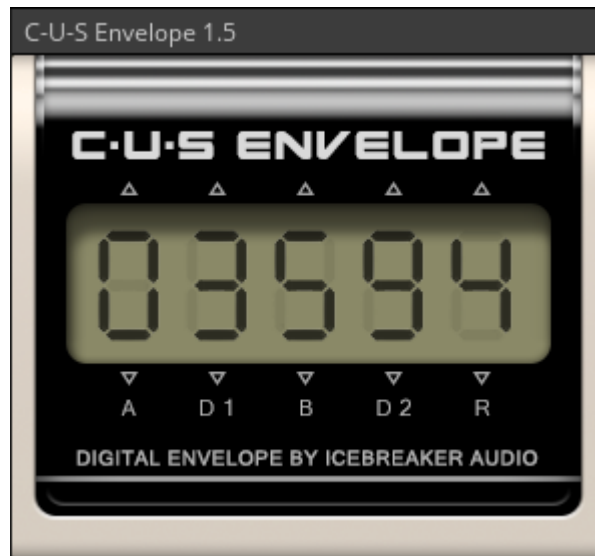**7 THE C-U-S SPEAKER BLOCK IN THE STRUCTURE VIEW**

Inputs:

- **In L/R**: Inputs for a stereo audio signal.
- **Verb In**: An input that bypasses the speaker and is routed directly into the reverb effect.
- **Mod A/B**: Modulation bus inputs.

Outputs:

- **Out L/R**: Stereo audio outputs.

5.4   C-U-S ENVELOPE

The C-U-S Envelope Block takes the digital ADBDR of the Calc-U-Synth Block and offers it as its own unit.

8 THE C-U-S ENVELOPE BLOCK

The Envelope has five parameters (from left to right):

- **Attack**: Sets the attack time (fade in time) of the volume envelope. Increasing the value increases the attack time.
- **Decay 1**: Sets the time it takes for the volume envelope to go from the peak volume to the breakpoint. Increasing the value increases the decay time.
- **Breakpoint**: (Sustain Level) Sets the level at which the rate of the first decay changes to the rate of the second decay.
- **Decay 2**: (Sustain fade out) Sets the rate at which the sound fades out during the sustain phase. A value of 9 will give an infinite sustain.
- **Release**: Sets the release time of the volume envelope. This is the fade out time of the sound after the key is released.

INPUTS AND OUTPUTS

The C-U-S Envelope Block has one input and one output.

9 THE C-U-S BLOCK IN THE STRUCTURE VIEW

Input:

- **Gate**: Gate signal input. A positive zero crossing at this input is considered gate on.
- **Gate (e)**: A gate input for event signals.

Output:

- **Out**: Envelope control signal output.

5.5 CALC-U-SEQ

Calc-U-Seq is a 16 step modulation sequencer designed to be driven by an external clock source (namely the *Util Clock* provided with Reaktor 6 Blocks).

10 THE CALC-U-SEQ BLOCK

The Sequence is edited by clicking and dragging on the main display.

Below this is a secondary display that shows the current playback step in the sequence.

To the right are four controls for the sequencer:

- **CLK DIV** (clock divider): Controls the rate of the sequence by dividing the clock signal. A setting of 2 will have the sequence play a step once every two clock ticks.
- **SMOOTH**: Smooths the changes in values from one step to another.
- **LENGTH**: Sets the number of steps in the sequence.
- **Retrig**: When active, the sequence will reset to the first step any time a positive signal is received at the gate input.

Note that the Calc-U-Seq Block used in the main **CALC-U-SYNTH** Ensemble is a variation on this block that has its own internal 1/64th clock that is automatically synced to the host tempo. This version is provided as *Calc-U-Seq (int clock).*

The Calc-U-Seq Block has five inputs and two outputs.

**11 THE CALC-U-SEQ BLOCK IN THE STRUCTURE VIEW**

Inputs:

- **Clock**: A positive zero crossing at this input advances the sequencer's internal counter by 1.
- **Reset**: A positive zero crossing at this input causes the sequencer's internal counter to reset to 0.
- **Gate**: Input for the Retrigger gate.
- **Mod A/B**: Modulation bus inputs.

The **Clock** and **Reset** inputs are missing in the Calc-U-Seq (int clock) Block, as it has its own clock.

Outputs:

- **Val**: The sequencer value output.
- **Step**: Numeric output of the currently playing step (range: 0…15)

ROUTING EXAMPLE
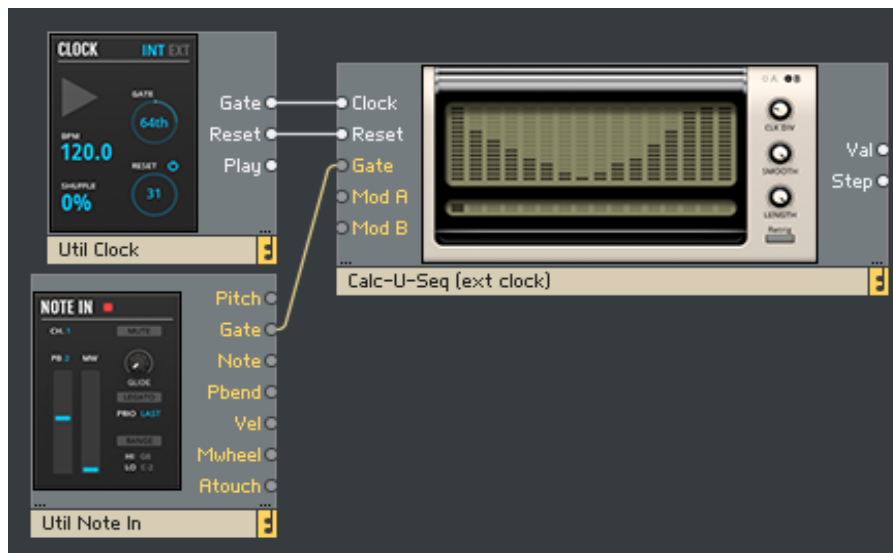
12 A SUGGESTED ROUTING EXAMPLE

14

5.6 ARP BASIC

Arp Basic is an easy-to-use arpeggiator Block. It takes chords played via MIDI and splits them into their individual notes, which it then plays back in order.

The rate of playback is driven by an external clock, and it is recommended to combine this Block with the *Util Clock* Block from the Reaktor 6 Library.

13 THE ARP BASIC BLOCK

The Block has four controls:

- **STATUS**: Toggles the arpeggiator on or off. When off, the signals from the Pitch and Gate inputs are routed to the Pitch and Gate outputs. In other words, this acts as a bypass control.
- **DIRECTION**: The notes in the arpeggiator can be played back in one of two directions:
  - **UP**: from lowest to highest
  - **DOWN**: from highest to lowest
- **CLOCK DIV**: Controls the rate of the arpeggiator by dividing the clock signal. A setting of 2 will have the arpeggiator play a new note every two clock ticks.
- **NOTE LENGTH**: Sets the length of the notes generated by the arp. This is set as a percentage of the playback rate.

Note that the Arp Basic Block used in the main **CALC-U-SYNTH** Ensemble is a variation on this block that has its own internal 1/64th clock that is automatically synced to the host tempo. This version is provided as *Arp Basic (int clock).*

INPUTS AND OUTPUTS

The Arp Basic Block has five inputs and one output.

14 THE ARP BASIC BLOCK IN THE STRUCTURE VIEW

Inputs:

- **Pitch**: The signal that will be routed to the Pitch output when the Arp is bypassed.
- **Gate**: The signal that will be routed to the Gate output when the Arp is bypassed.
- **PBend**: Transposes the output pitch of the arpeggiator (this signal is ignored if the Arp is bypassed)
- **Clock**: A positive zero crossing at this input advances the arp's internal counter by 1.
- **Reset**: A positive zero crossing at this input causes the arp's internal counter to reset to 0.

The **Clock** and **Reset** inputs are missing in the Arp Basic (int clock) Block, as it has its own clock.

Outputs:

- **Pitch**: Pitch signal output.
- **Gate**: Gate signal output.

ROUTING EXAMPLE
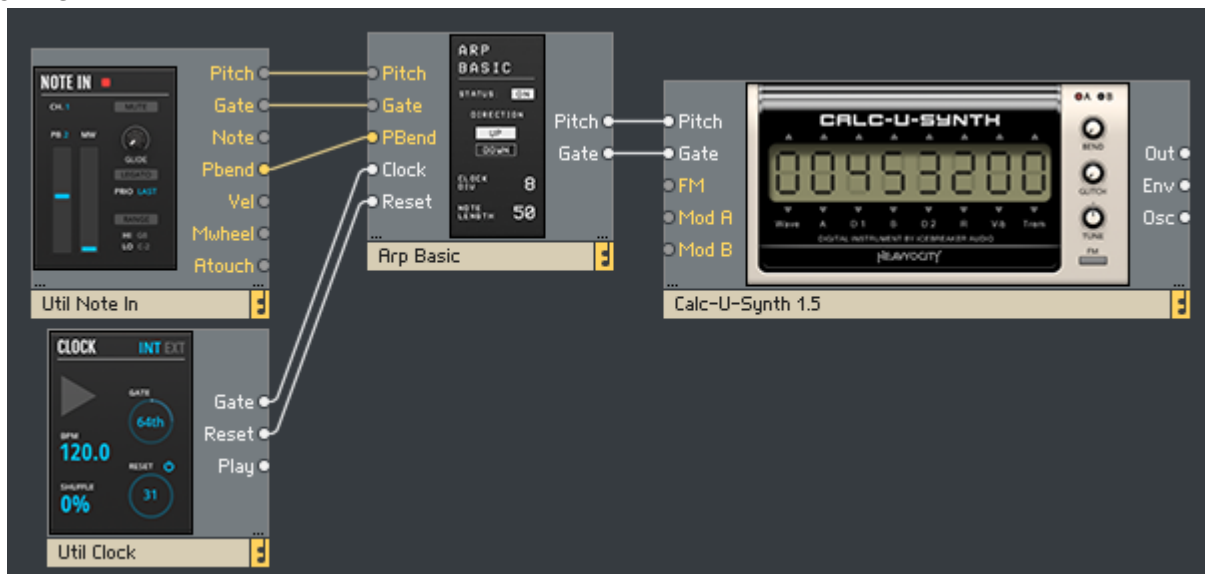
15 A SUGGESTED ROUTING EXAMPLE

16

5.7 EFFIGY

Effigy is an audio effect block that includes both a lowpass filter and a stereo tempo-synced delay. The Block also includes a high-quality saturation stage at the beginning of the signal chain, so hot input signals will saturate and distort if pushed hard enough.

16 THE EFFIGY BLOCK

To the top left of the Block's interface are two switches that relate to the filter's cutoff frequency.

- The left switch toggles key (pitch) tracking on or off.
- The right switch toggles the FM input on or off.

At the bottom of the interface are two switches that toggle the individual effects on or off.

Filter Controls:

- **CUTOFF**: Controls the cutoff frequency of the filter.
- **RESON**: Controls the level of the resonant peak at the cutoff frequency.

Delay Controls:

- **TIME L**: Sets the delay time for the left channel.
- **TIME R**: Sets the delay time for the right channel.
- **FEEDBACK**: Controls the amount of signal fed from the effect output back into the input. In other words: the number of repeating echoes.
- **LEVEL**: Controls the output level of the delay signal.

The Effigy Block has five inputs and two outputs.

17 THE EFFIGY BLOCK IN THE STRUCTURE VIEW

Inputs:

- **In**: The input for the audio that is to be processed.
- **Pitch**: Pitch input for the filter key-tracking.
- **FM**: Filter FM input.
- **Mod A/B**: Modulation bus inputs.

Outputs:
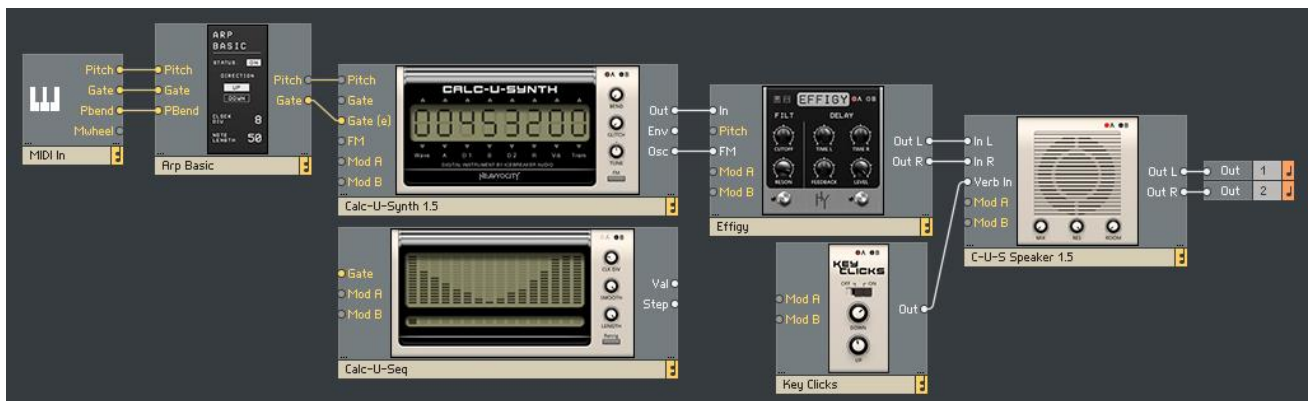
- **Out L/R**: Stereo audio outputs.

6 THE CALC-U-SYNTH ENSEMBLE

18 THE CALC-U-SYNTH ENSEMBLE

The **CALC-U-SYNTH** Ensemble combines the Calc-U-Synth Blocks to create a ready-to-use synthesizer. It also includes a number of preset Snapshots. It lets you jump right in and get that classic calculator sound.

6.1 SIGNAL PATH AND ROUTING

19 THE MAIN CALC-U-SYNTH SIGNAL PATH, WITHOUT MODULATION

Looking at this simplified layout of the **CALC-U-SYNTH** structure, it is possible to see how the main signal path is routed. Note that most modulation and pitch connections have been removed to keep the main signal flow readable.

- MIDI inputs are feeding the main **Pitch** and **Gate** control signals.
- The **Calc-U-Synth** Block is the main sound generator.
- Effigy is then used to process the output of the **Calc-U-Synth** Block, before it is fed into the **C-U-S Speaker** Block.
- The **Key Clicks** Block is then routed into the **Verb In** port of the **C-U-S Speaker**, allowing it to be processed by the reverb, but not the speaker effect itself.
- The **C-U-S Speaker** Block is then routed to REAKTOR's stereo outputs.

6.2 Using Modulation

Virtually every knob on the **CALC-U-SYNTH** interface is modulatable, with each section of the Ensemble having up to two modulation sources (labelled **A** and **B**).

To assign modulation to a knob follow these steps:

1. Select the modulation source by click on the **A** or **B** to the top right of the panel.

2. Slider will appear beside the knobs to which the modulation can be assigned.
3. Click and drag on the slider to set the modulation amount.

4. When the modulation is active, an arrow will indicate the modulated value of the parameter.
5. Click on the **A** or **B** button again to hide the modulation sliders.

6.2.1 Modulation Routing

For the Blocks that can accept modulation signals, here is a quick reference for how they are connected:

CALC-U-SEQ
- **Mod A**: not connected.
- **Mod B**: Modwheel.

CALC-U-SYNTH
- **Mod A**: Calc-U-Seq.
- **Mod B**: Internal Envelope.

KEY CLICKS
- **Mod A**: Calc-U-Seq.
- **Mod B**: Modwheel.

EFFIGY
- **Mod A**: Calc-U-Seq.
- **Mod B**: Calc-U-Synth envelope output.

C-U-S SPEAKER
- **Mod A**: Calc-U-Seq.
- **Mod B**: Modwheel.

7 CREDITS

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