



Modal CRAFTsynth 2.0
Monophonic Wavetable Synthesiser

User Manual

OS Version - 1.0



Important Safety Information



WARNING – AS WITH ALL ELECTRICAL PRODUCTS, care and general precautions must be observed in order to operate this equipment safely. If you are unsure how to operate this apparatus in a safe manner, please seek appropriate advice on its safe use.

ENSURE CORRECT BATTERY POLARITY - FAILURE TO INSTALL BATTERIES CORRECTLY MAY CAUSE PERMANENT DAMAGE

This apparatus **MUST NOT BE OPERATED NEAR WATER** or where there is risk of the apparatus coming into contact with sources of water such as sinks, taps, showers or outdoor water units, or wet environments such as in the rain. Take care to ensure that no liquids are spilt onto or come into contact with the apparatus. In the event this should happen remove power from the unit immediately and seek expert assistance.

This apparatus produces sound that could cause permanent damage to hearing. Always operate the apparatus at safe listening volumes and ensure you take regular breaks from being exposed to sound levels

THERE ARE NO USER SERVICEABLE PARTS INSIDE THIS APPARATUS. It should only be serviced by qualified service personnel, specifically when:

- The apparatus has been dropped or damaged in any way or anything has fallen on the apparatus
- The apparatus has been exposed to liquid whether this has entered the apparatus or not
- The power supply cables to the apparatus have been damaged in anyway whatsoever
- The apparatus functions in an abnormal manner or appears to operate differently in any way whatsoever.

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Introduction

Modal CRAFTsynth 2.0 is a portable monophonic 8 oscillator wavetable synthesiser.

It features 45 morphable waveforms, 16 oscillator modifiers, a state-variable filter, a 36 destination modulation matrix with 8 modulation slots, two audio rate LFOs and a programmable sequenced arpeggiator.

SPECIFICATION:

- Monophonic wavetable synthesiser
- 8 oscillators in total with 2 selectable waveforms and mixer stage
- 40 unique waveforms available split into 8 banks of 5 morphable waveform sets plus a sine/noise bank available on Wave 2 only
- VA, digital and generative waves are available along with selections from the Modal 002
- Process and cross modulate waveforms with 1 of 16 oscillator modifiers including Frequency / Phase Modulation, Hard / Window Sync, Ring / Amp Modulation, Derez / Bitcrush, Wavefolders and Waveshapers - Oscillator modifiers are applied to Wave 1. In some cases, such as for FM or AM, Wave 2 is used as the modulating signal for Wave 1
- Multi option Unison / spread to detune the 8 oscillators for a huge sound
- 3 x envelope generators for Filter, Amplitude and Modulation
- 2 x audio rate LFOs
- 8 slot modulation matrix with 8 sources, each source can have 1 destination. (LFO1, LFO2 and MOD-EG assignable from CRAFTsynth, Velo, Note, ModW, AftT and Expression assignable from MODALapp)
- Program and transpose patterns with the built in sequenced arpeggiator
- 2-pole resonant filter that can be morphed from low pass, through band pass, to high pass
- Delay and distortion (waveshaping overdrive, not bitcrushing) effects
- Optional MIDI clock sync for LFOs and Delay
- 64 preset storage locations
- 8 key touch MIDI keyboard with 8 selectable scales and root note selection
- MIDI DIN in and out
- Analogue clock sync in and out (configured to the KORG / Teenage Engineering specification)
- Class compliant MIDI provided over USB connection to host computer or tablet
- Headphone and line output Powered by USB or 3 x AA batteries
- Optional software editor available for macOS, Windows, iOS and Android
- Portable and compact design
- Dimensions: 150mm x 135mm x 68mm (6" x 5 1/2" x 3")

01

Getting Started

Basic Functions

Powering on

CRAFTsynth 2.0 can be powered either through the micro USB socket, or by 3 x AA batteries installed in the underside battery compartment.

To use USB power, simply connect the supplied Micro USB cable to a power source, and slide the power switch to the bottom "USB" position.

To use batteries install 3xAA the battery compartment on the underside of the unit, and slide the power switch to the top "BAT" position.

PLEASE ENSURE CORRECT BATTERY POLARITY - FAILURE TO INSTALL BATTERIES CORRECTLY MAY CAUSE PERMANENT DAMAGE.

Before powering up ensure the volume control is at minimum. Electronics during first power-on create a 'pop' and this may cause damage to your speakers and the sound guy's ear drums.

Power on by using the power toggle on the rear of the unit to select to correct source as outlined above the toggle.

Touch Pads

Playing notes

The 8 touch pads allow you to program and play the synthesiser without sending it MIDI from another device. The octave can be configured using the - and + buttons. The touch pads also send MIDI notes out, which you can use to control other instruments or features on your DAW.

The touch pads can be configured into various user selectable scales. The root note can also be changed.

Secondary functions

The touch pads can also be used to load or save presets by holding the PRESET button and tapping to load or holding to save.. (See UI Combinations)

UI Combinations

CRAFTsynth 2.0 is a comprehensive and fully featured synthesiser despite it's small size. Therefore there are a number of user interface combinations that are required to access some of the deeper fuctions of the synth:

SHIFT + DIAL = BLUE PARAMETER
PRESET + DIAL = GREY PARAMETER

Presets

PRESET + KEY 1-8 = LOAD PRESET
PRESET + HOLD KEY 1-8 = SAVE PRESET
PRESET + KEY+ = PRESET BANK UP
PRESET + KEY- = PRESET BANK DOWN
PRESET + KEY- + KEY+ = INIT PRESET

Sequenced Arpeggiator

ARP-SEQ = ARPEGGIATOR ON/OFF
ARP-SEQ + KEY 1-8 | EXT MIDI NOTE = INPUT NOTE IN ARPEGGIATOR PATTERN
ARP-SEQ + EG = INPUT REST IN ARPEGGIATOR PATTERN

Clock

TURN RATE/TIME DIAL BELOW ZERO = MIDI SYNC (LFO1, LFO2 + DELAY)
CLOCK PRIORITY = 1) SYNC 2) EXT MIDI 3) INTERNAL

Modulation

MOD SOURCES ON CRAFT = LFO1, LFO2 + MOD-EG
MOD SOURCES ON MODALapp = NOTE, VELOCITY, AFTERTOUCH, MODWHEEL + EXT CC
HOLD LFO1 | LFO2 | MOD-EG = ASSIGN MODE
ASSIGN + PARAMETER = MOD SLOT PARAM + DEPTH
ASSIGN + LED FLASH = INVALID DESTINATION

Other

KEY- + KEY+ = SUSTAIN ON/OFF
EG + A/D/S/R = ALL ENV A/D/S/R
LFO1 | LFO2 = SWITCH RATE/SHAPE DIAL TO EFFECT LFO1 OR LFO2
HOLD SHIFT + PRESET FOR 4 SECONDS - USE KEY- | KEY+ = MIDI CHANNEL

UI Combinations

There is a latch-able shift state (see blue text on panel) and, a holdable preset state (see grey text on panel) that the panel can be set to to allow the the encoders and touchpads to control alternative functions.

- If the SHIFT LED is on, the panel is latched in 'shift mode' for accessing the secondary functions of the encoders and buttons (see blue text on panel). Simply press the SHIFT button to unlatch this state and return to the regular state.

LED Animations

- Loading a preset - Key LED right to left scroll
- Saving a preset - Key LED flash
- Assigning mod slot - Key LED flash - Invalid Assignment
- Fill in = sustain on, empty out = sustain off

Polychain

If you have multiple CRAFTsynth 2.0's you can polychain them to add more polyphony to your sound. Up to 4 CRAFTsynth 2.0's can be used together.

- Connect desired master din out to first drone din in.
- Connect additional drones (Maximum 3 drones per master, 4 CRAFTsynth 2.0s total) in the same way, din out -> din in.
- Power on drone CRAFTsynth 2.0s.
- Power on master CRAFTsynth 2.0 & hold down the PRESET + LFO-2 buttons and select the number of drones on the Touch Pads 1,2 or 3.
- Release PRESET + LFO-2 buttons. An LED animation should run accross all CRAFTsynth 2.0s and will disable the drone CRAFTsynth 2.0s front panel.

Presets

Presets are arranged into 8 banks of 8 giving you 64 slots in total.

LOAD A PRESET

Presets can be easily loaded by holding the PRESET button on the front panel and tapping one of the 8 keyboard touch pads. Each touch pad represents the preset slot in the currently selected bank.

You can change the currently selected bank by holding the PRESET button on the front panel and tapping one of the - or + touch pads.

SAVE A PRESET

Presets can be saved by holding the PRESET button on the front panel and then HOLDING one of the 8 keyboard touch pads. Each touch pad represents the preset slot in the currently selected bank.

INIT PRESET

You can initialise a patch preset by holding the PRESET button and the - & + touch pads together.

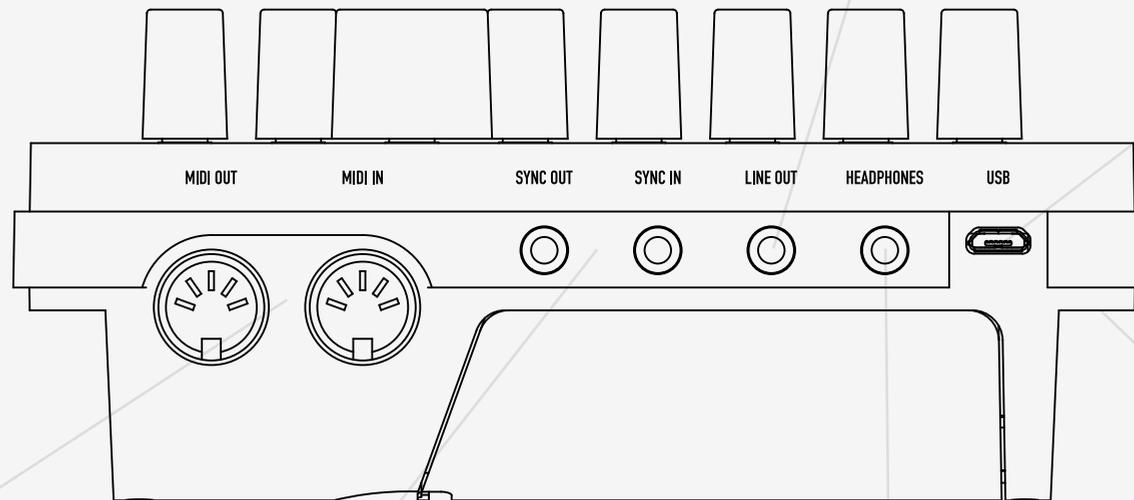
RANDOMISE PRESET

You can randomise a patch preset using MODALapp

02

Connections

CRAFTsynth 2.0 has seven external connections: USB, Line out, Headphones out Clock Sync In, Clock Sync Out, MIDI In and MIDI Out.



Line Out

Line level dual mono output on 3.5mm Stereo jack. This output can be connected to any line level input for monitoring and recording. The line output is higher quality than the headphone output, so always use it when recording or performing.

USB

Micro USB Connection for power, MIDI input and MIDI output. Simply connect CS2.0 to a powered USB socket, such as on your computer, or a powered hub with a standard micro USB cable. To use MIDI, connect to your computer or tablet with a micro USB cable and find 'Craft Synth 2.0' listed as a MIDI port on your computer.

MIDI (In, Out)

MIDI In / Out on MIDI 5-pin DIN cable. These outputs can be used to communicate with any other MIDI devices. (See the MIDI section)

Clock Sync (In, Out)

Clock Sync In / Out on 3.5mm Mono jack. Simply plug into your clockable gear as desired. (See the Sync section)

Headphones

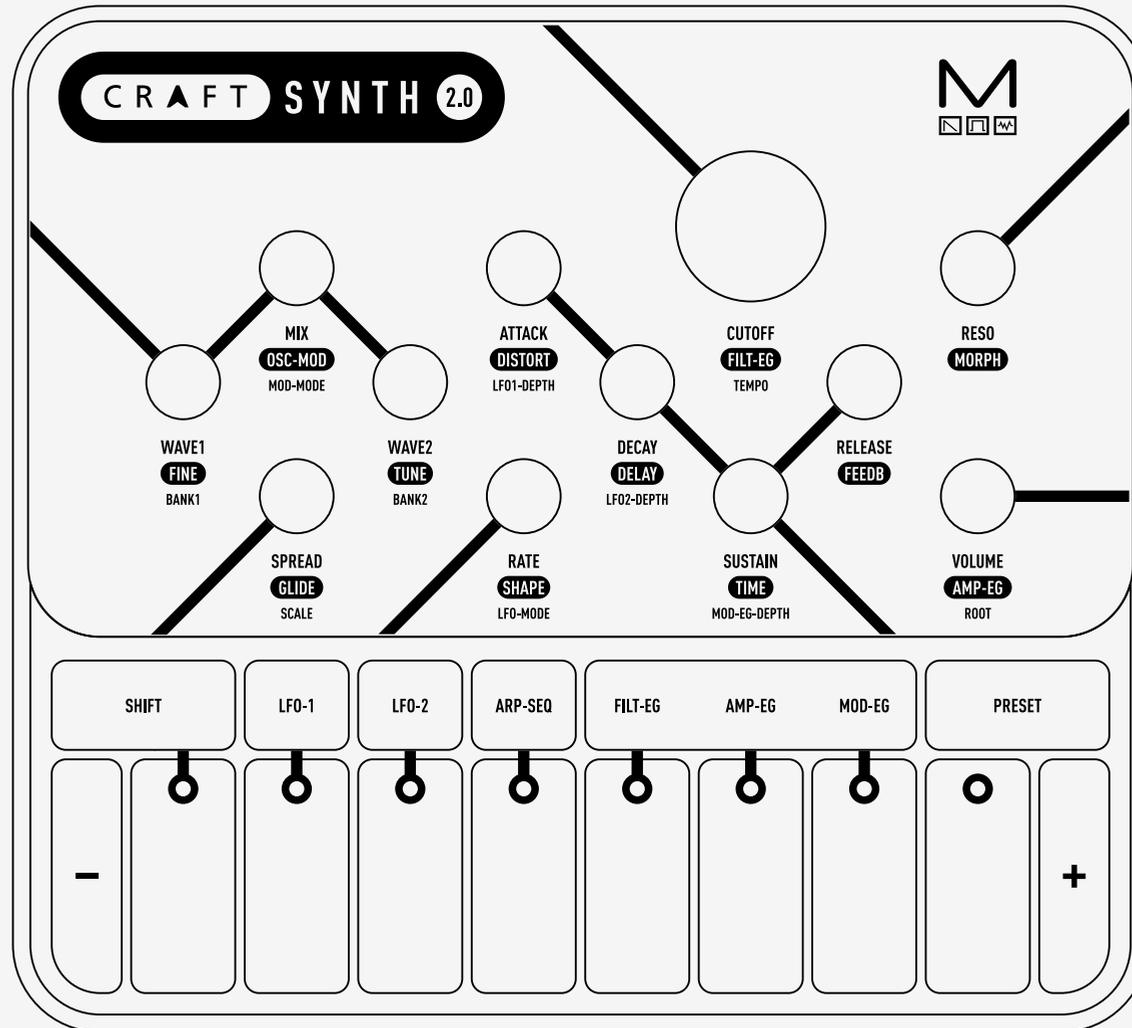
Headphone output on 3.5mm Stereo jack. The volume can be adjusted using the VOLUME knob, the MODALApp, or through MIDI CC. (See the MIDI section)

Power

Power switch for CRAFTsynth 2.0.
SWITCH IN MIDDLE = POWER OFF
SWITCH TO BAT = POWERED BY 3xAA BATTERIES
SWITCH TO USB = POWERED BY MICRO USB

03

Synthesis engine



CRAFTsynth 2.0 features 9 unique morphable waveform banks located on either Wave 1 or Wave 2 labels. It has a total of 8 oscillators inside.

- **Wave1:** This encoder allows you to sweep continuously thru the selected wavetable (banks 1-8).
- **Wave2:** This encoder allows you to sweep continuously thru the selected wavetable (Banks 1-9).
- **Mix:** This encoder allows you to balance the volume between each wave. All the way to the left you will hear only Wave 1, All the way to the right you will hear Wave 2. In the centre you will hear a balanced blend of both waves.
- **Fine:** Holding the Shift key and turning this encoder allows us to control the fine tuning of Wave 2 (Fine) +/- 100 cents
- **Tune:** Holding the Shift key and turning this encoder allows us to control the coarse tuning of Wave 2 (Tune) at desirable intervals +/- 4 octaves.
- **OSC-MOD:** Holding the shift key and turning this encoder controls the oscillator modifier amount where either, Wave 1 is the carrier and Wave 2 is the modulator or the modifier is applied directly to Wave 1.
- **Bank1:** Holding the preset key and turning this encoder allows you to select which bank of waveforms you want on Wave 1.
- **Bank2:** Holding the preset key and turning this encoder allows you to select which bank of waveforms you want on Wave 2 (there is an extra noise bank on Wave 2).
- **Mod-Mode:** Holding the preset key and turning this encoder allowed you to select which of the 16 oscillator modifiers you want to use.
- **Spread:** This introduces additional oscillators to achieve unison and stacked octaves, intervals and chords. In the first half of the dial, Wave 1 and Wave 2 are split into individual oscillators and spread out over the frequency spectrum to create a fat unison sound. This effect is increased up to the center position. Past half way, the oscillators arrange themselves into chord shapes. A huge variation of chords can be created with this control in conjunction with OSC2 detune.

Note: The average level of the sound will be lower when using the SPREAD control. This is because the combining oscillators are phasing in and out and not constantly re-enforcing each other as they would if the spread is set to zero.

CRAFTsynth 2.0 features 16 oscillator modifiers to change how the oscillators cross modulate each other. In all of the modifiers Wave 1 is the carrier and Wave 2 is the modulator.

1. Phase Modulation:

Effect: The phase of Wave 1's oscillators are modulated by Wave 2's, distorting the shape of the waveform and producing complex frequencies. Phase Modulation is an expanded version of "FM" found on the original Craft Synthesiser.

Control: Controls the Phase Modulation depth (how much Wave 2 affects the phase of Wave 1).

Tip: For more harmonic results it is recommended to set Wave 2's detune value to either Octaves or Fifths. For complex waveforms the sound can get extreme fairly quickly, in these cases a lesser PM depth is recommended.

2. Window Sync:

Effect: Oscillator sync is performed on Wave 1, with an amplitude window applied over the waveform to smooth the jump at the phase reset. Wave 1 is synced to an internal master counter tracking the current playing note, with the slave frequency being controlled via the "Osc Mod" control. This allows sync effects to be created without having to use Wave 2's tuning.

(Note: As the window is always applied to the waveform, this modifier will have an impact on the sound regardless of whether the control is set to zero, this can act like filtering with waveforms that have a lot of variation towards their edges).

Control: Controls the sync playback rate (how much faster wave 1's audible oscillators are playing in relation to the master counter).

Tip: Window Sync is particularly useful for smooth sync effects on simple waveforms.

3. Ring Modulation:

Effect: Wave 1's oscillators are multiplied with Wave 2's causing new frequencies (known as sidebands) to be produced that are the sum and difference of those in the original signals.

Control: Crossfades between the Dry and Ring Modulated signal on Wave 1.

Tip: For more harmonic results it is recommended to set Wave 2's detune value to either Octaves or Fifths. For sounds more akin to Amplitude Modulation set the crossfade value at halfway.

4. Triangle Wavefolder:

Effect: Boosts the amplitude of Wave 1 and whenever the oscillators cross the maximum amplitude limits of the synth the waveform then folds back in on itself linearly.

Control: Controls the amount of gain boost applied to the oscillator (the amount of gain applied affects how many times the waveform folds).

Tip: For West Coast style timbres try setting Wave 1 to a Sine or Triangle (Wave Bank = 1, Wave 1 CC = 0 or 32) and set the ADSR's for Amplitude and Filter to the same values.

5. De-Rez:

Effect: Applies a downsampling algorithm to Wave 1 that reduces the amount of readable points within a wavetable, causing the output to become jagged. The amount of the downsampling scales with frequency resulting in different amounts of the effect per note.

Control: Controls the amount of downsampling applied to Wave 1.

Tip: As the effect scales with frequency it is recommended to use higher control settings for patches that use De-Rez at high octaves.

6. Rise-Over-Run Phaseshaper:

Effect: Reshapes the phase of Wave 1's oscillators so that instead of reading through the wavetable linearly and generating the normal shape, a different output waveform is produced instead. This modifier alters the amount of time it takes per cycle for the phase to reach halfway through the wavetable.

Control: Changes the read curve from linear to fully shaped on Wave 1

Tip: For classic Pulse Width Modulation (PWM) effects, set Wave 1 to a square wave and modulate the control (Wave Bank = 1, Wave 1 CC = 94).

7. Glitchy Sine Waveshaper:

Effect: Applies a wave-shaping distortion to Wave 1's oscillators that has the amplitude curve of a bit-crushed sine wave, altering the final output shape and producing differing harmonics.

Control: Controls the amount of wave-shaping from none to fully processed.

Tip: This effect is subtler than most other modifiers, especially when used with harmonically rich waveforms, in these cases the effect can be used to introduce extra high-end partials.

8. Window Amp Sync:

Effect: Similar to Window Sync where an amplitude window is applied to Wave 1, however the window is played back at a faster rate instead of the waveform which creates notches in the wavetable shape.

(Note: As the window is always applied to the waveform, this modifier will have an impact on the sound regardless of whether the control is set to zero, this can act like filtering with waveforms that have a lot of variation towards their edges).

Control: Controls the playback rate of the amplitude window.

Tip: When heavily modulated this effect works best with simpler waveforms such as Sine waves. Subtle amounts of modulation can produce interesting phaser like effects when used with more complex waveforms.

9. Frequency Modulation:

Effect: Wave 2's Oscillators are added to the frequency calculation of Wave 1's oscillators causing the shape of the waveform playing back on wave 1 to become distorted, producing complex frequencies.

Control: Controls the Frequency Modulation depth (how much Wave 2 affects the frequency of Wave 1).

Tip: For more harmonic results it is recommended to set Wave 2's detune value to either Octaves or Fifths. Whilst Phase Modulation and Frequency Modulation tend to produce mostly similar results, this version of FM has been scaled to be more extreme than PM, if trying to get subtler versions of this effect try Phase Modulation.

10. Hard Sync:

Effect: Oscillator sync is performed on Wave 1, with a sharp jump occurring at the phase reset. Wave 1 is synced to an internal master counter tracking the current playing note, with the slave frequency being controlled via the "Osc Mod" control. This allows sync effects to be created without having to use Wave 2's tuning.

Control: Controls the sync slave playback rate (how much faster Wave 1's audible oscillators are playing back in relation to the master counter).

Tip: This style of Sync is the version found on many synthesisers and works best on harmonically rich waves, for classic kinds of synced sounds try using this effect on the Square and Sawtooth waves (Wave Bank = 1, Wave 1 CC = 94 or 127).

11. Min Modulation:

Effect: A form of amplitude modulation where Wave 1 and Wave 2's oscillators are compared against each-other and whichever's amplitude value is lower is then output. If Wave 2 is tuned differently to Wave 1' then both frequencies are often superimposed on to the sound.

(Note: If Wave 1 and Wave 2 are the same waveform with no difference in tuning then there will be no effect as they will both have the same value.)

Control: Crossfades between the Dry and Compared signal.

Tip: Strange sync like effects can be created when detuning Wave 2 to different Octave values than Wave 1. For Spread like effects, try keeping the oscillators at mostly the same tuning, with a small amount of fine detune applied.

12. Sine Wavefolder:

Effect: Boosts the amplitude of Wave 1 and whenever the oscillators cross the maximum amplitude limits of the synth the waveform then folds back in on itself with a sinusoidal response.

Control: Controls the amount of gain boost applied to the oscillator (the amount of gain applied affects how many times the waveform folds).

Tip: This modifier is better suited for "smoother" timbres than the Triangle Wavefolder due to the gentler slope when the waveform folds over.

13. Bit-Crush:

Effect: Applies a continuous bitrate reduction effect independently to each of Wave 1's Oscillators, gradually reducing the resolution of the waveform and resulting in staircase like waveforms.

Control: Controls the amount of bitrate reduction applied to Wave 1.

Tip: This Modifier works especially well when being slowly modulated at low octaves where the gradual amount of information loss is audibly clearest.

14. Scrunch Phaseshaper:

Effect: Reshapes the phase of Wave 1's oscillators so that instead of reading through the wavetable linearly and generating the normal shape, a different output waveform is produced instead. This modifier has the effect of gradually reading through the majority of the wavetable at a faster rate and then playing back the remaining values at a slower speed within a single cycle.

Control: Changes the read curve from linear to fully shaped on Wave 1

Tip: For the most tonally varied results across the range of the control try using asymmetrical waveforms such as those found in Bank 2.

15. Lo-Fi Phaseshaper:

Effect: Reshapes the phase of Wave 1's oscillators so that instead of reading through the wavetable linearly and generating the normal shape, a different output waveform is produced instead. This modifier has a slightly arced read curve with subtle amounts of quantisation applied.

Control: Changes the read curve from linear to fully shaped on Wave 1

Tip: This effect is subtler than most other modifiers, especially when used with harmonically complex waveforms; When used with such waveforms the effect tends to act similarly to an exciter.

16. Vocalized Sync:

Effect: A modified version of Window Sync, where Wave 1 is multiplied by itself and slight Phaseshaping is applied to both the Wavetable and window shape. Whilst this effect can produce some strange formant-like timbres it is primarily designed for creating weird oscillator sync sounds.

(Note: As both the window and some degree of processing is always applied, this modifier will have an impact on the sound regardless of whether the control is set to zero)

Control: Controls both the sync playback rate (how much faster wave 1's audible oscillators are playing back in relation to the master counter) and the amount of Phaseshaping applied.

Tip: For vaguely "realistic" results try using simpler waveshapes, as well as those found in the Formant Bank (Bank 6). For strange results try out the control with various Oscillator Spread chords.

Oscillator Banks

CRAFTsynth 2.0 has 8 banks of 5 morphable wavetables and one extra sine/noise bank available on Osc 2.

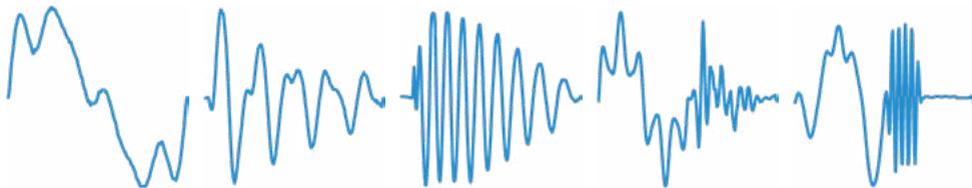
In each bank the waveform can be smoothly morphed between each of the 5 wavetables in a bank with 32 steps in between each wavetable.

Each bank contains different styles of waves including waves from our 002 synthesiser, mathematically generated, polygon and formant wavetables.

1. Virtual Analogue - A standard set of audio waveforms



2. 002 Bank 1 - A bank of waveforms from the Modal 002 synthesiser



3. Math - A bank of mathematically-generated waveforms



4. Polygon - A bank of waveforms based on polygons



Oscillator Banks

5. Modal 1 - A bank of various Modal-curated waveforms



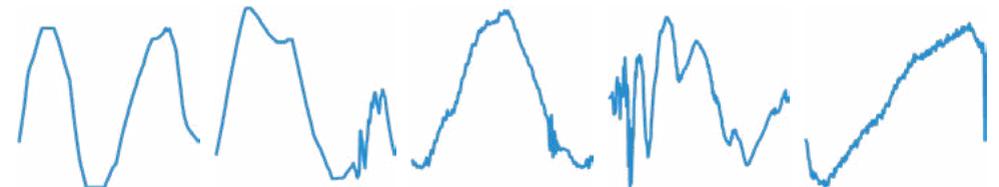
6. Formant - A bank of waveforms derived from various formants and vocal sounds



7. 002 Bank 2 - A second bank of waveforms from the Modal 002 synthesiser



8. Modal 2 - A second bank of various Modal-curated waveforms



9. Sine/Noise - A bank of sine and filtered noise, good for oscillator modifiers



Filter

CRAFTsynth 2.0 uses a Modal designed state variable 2-pole resonant filter (capable of morphing from low pass, through band pass, to high pass).

- **Cutoff:** This parameter controls the low-pass filter cutoff frequency. This affects the cutoff frequency of the filter, from 0Hz up to 22kHz.
- **Reso:** This parameter controls the amount of resonance of the filter.
- **Filt-EG:** Holding the shift key and turning this encoder allows bipolar control of the Filter-EG amount. (See the Envelopes section)
- **Morph:** Holding the shift key and turning this encoder allows control of the shape of the filter: note that the filter is low-pass by default.
 - At it's minimum value you have a low pass filter;
 - We move through a sort of low-shelving;
 - At It's midpoint we have a band-pass filter;
 - At it's maximum value a high-pass filter.

TIP: With this feature at lower settings you can dampen the low frequencies while maintaining a rich high-end texture.

Envelopes

CRAFTsynth 2.0 provides 3 separate 4-stage Envelope Generators (i.e. envelopes), one for the filter (FILT-EG), one for the amplifier (AMP-EG) and one for modulations (MOD-EG). With negative amounts only the attack, decay and sustain levels are inverted, the release phase will still tend to 0.

The envelope generator represented on the encoders can be selected via a single button on the touch pads. This button cycles thru which EG the encoders are currently representing.

- **Attack:** This parameter controls the time passing from the moment you press a key (i.e. 'MIDI Note On' message) until the sound reaches its maximum value.
- **Decay:** This parameter controls the time passing for the envelope to drop from its maximum value to a sustain level (see below).
- **Sustain:** This parameter controls the level of the sustain phase (i.e. the volume of the sound while keeping the key pressed for AMP-EG). If there are no modulations active, this volume keeps constant until you release the key. (The envelope then enters the 'release' phase)
- **Release:** This parameter controls the time passing from the moment you leave a key (i.e. 'MIDI Note Off' message) until the sound reaches silence.
- **FILT-EG, AMP-EG, MOD-EG:** This button cycles through which envelope generator the above controls are representing. (i.e. FLT, AMP, or MOD)

TIP: Holding down the EG select button and changing the ADSR parameters will alter all three envelopes simultaneously and is a useful shortcut to quickly change all envelopes at once.

- **Amp-EG:** While holding Shift and turning volume this controls the Amp-EG amount. This controls the amount of modulation the AMP-EG has over the volume.

CRAFTsynth 2.0 features two individual low frequency oscillators.

Select which LFO you want to adjust by pressing either LFO-1 or LFO-2 button on the touch pads.

Holding either LFO-1 or LFO-2 button enters assign mode for the selected LFO.

This is how we route the LFO's to parameters in the matrix. Once in this mode, simply turning the knob for the parameter that you would like the LFO to modulate, you will initially see keys 4 and 5 illuminated, showing there is currently 0 depth. As you continue to turn the parameter knob the LEDs will illuminate to show you the depth. Modulation is bipolar so twisting left achieves negative amounts and twisting right achieves positive amounts.

Both LFO1 and LFO2 can be set to Retrigger, Single and Free mode and have these parameters:

- **Rate:** This parameter controls the speed of the LFO. LFO-1 in a positive amount is free rate meaning the LFO will never retrigger. In negative amounts it is synced to the project tempo at various subdivisions. LFO-2 in a positive direction is free rate for the first half then snaps to divisions of the main frequency of the note being played. This allows the LFO frequency to run into the audible range and maintain harmonious modulations. A massive array of effects can be achieved in this way, including AM and FM. In negative amounts the first half of the dial is synced to the tempo and the second half is synced to divisions of the main frequency of the note being played.
- **Shape:** When holding the SHIFT key this encoder controls the LFO Shape. This allows you to continuously sweep through the four available LFO waveforms (i.e. sine, sawtooth, square and sample & hold).
- **LFO-Mode:** When holding the SHIFT key this encoder selects the Retrigger Mode. The modes are:
 - Retrigger** - in this mode, each new keypress restarts the LFO and it continues to run - particularly useful for Unison/Stack sounds.
 - Free** - in this mode LFO 2 is never reset, so it could be at any phase when a note is pressed.
 - Single** - In this mode, the LFO will start when a new key is pressed, complete cycle and stop, but will not retrigger when a new note is triggered and one is already held.

CRAFTsynth 2.0 features a programmable sequenced arpeggiator.

By default the ARP-SEQ behaves like a regular arpeggiator, however a pattern of notes and rests can be input into the arpeggiator to create note-triggered sequences.

The speed of the arpeggiator is controlled by the current clock which can either be received from the sync in port, external MIDI or from the internal clock in CRAFTsynth 2.0.

- **ARP-SEQ:** the Arp-Seq can be enabled / disabled by pressing this touch pad. Holding this and entering notes using the touch pads or over USB or MIDI connection will input notes to the Arp-Seq. Rests can be input but pressing the FILT-EG, AMP-EG, MOD-EG button (all LEDs will illuminate to indicate a rest has been input)
- **Tempo:** This controls the tempo of the Arp-Seq.

CRAFTsynth 2.0 also has some very flexible voicing and MIDI options

- **Oct +/- :** These touch pads control the key range available along the 8 note pads.
 - Tip: You can use this while holding notes to access unavailable notes.
- **Glide:** When holding the shift button this parameter controls the speed with which the oscillators change their pitch, 'sliding' from one note to the next one pressed. Positive values will achieve normal always active glide and negative amounts will achieve fingered glide and will only glide if another note is already held. Envelopes will be retriggered with every note when the glide control is centred. Moving the control in either direction will enable legato mode, where envelopes are triggered only for the first note in a note stack.
- **Scale:** Holding the preset key and turning this encoder selects the scale applied to the 8 keyboard touch pads. There are 29 traditional scales to choose from and 1 user programmable custom scale that can be customised on the Live page in MODALapp.
- **Root:** Holding the preset key and turning this encoder selects the root note of the scale applied to the 8 keyboard touch pads.
- **Sustain:** Pressing Oct - and Oct+ together will sustain any notes played.

CRAFTsynth 2.0 features two built in effects, a waveshaping distortion and a delay.

- **Distortion:** When holding the SHIFT key this encoder allows us to control the Distortion amount. The distortion is a waveshaping overdrive and as such is incapable of bit-crushing effects.
- **Delay:** When holding the SHIFT key this encoder allows us to control the Delay amount within this patch. This parameter affects the Dry/Wet mix of the of the delay audio effect at the end of the audio signal chain. When set to minimum, only the dry signal will be heard. When set to maximum, only the delayed signal will be heard.
- **Time:** When holding the SHIFT key this encoder allows us to control delay Time of the Delay effect, from 0.022 to 750ms. In negative amounts it will sync to subdivisions of the tempo (1/16, 1/12, 1/8, 1/8D, 1/4, 1/2, 3/4, 4/4, 6/4)
- **Feedback:** When holding the SHIFT key this encoder allows us to control Delay Feedback. This sets the amount of delayed audio signal fed back into the delay input. When at the fully left position, only the first delayed signal will be heard. All the way to the right, almost the entire level of the delayed signal is fed back into the delay. This can be used to create a wide array of effects from an echo or reverb-type effect, to noise and metallic sounds.



Modulation

CRAFTsynth 2.0 has a comprehensive Modulation Matrix with 8 Modulation Sources and 36 Modulation destinations.

These Mod slots can be used to assign a fixed combination of modulation sources to destinations, 8 modulation sources can be assigned to a single destination, or any other combination thereof.

The Mod Matrix is additive - Modulation values are added or subtracted from the modulated parameter value and limited to the parameter range. If a parameter is at 0, negative modulation values will not be audible until the parameter value is increased. The opposite is true for parameters at max value.

All modulation depths are bipolar, meaning sources can be inverted using negative depths.

When multiple mod slots are assigned to the same destination, the modulation from all assigned slots is summed and limited before being applied.

LFO-1, LFO-2 & the MOD-EG can all be assigned to destinations from the front panel by holding their buttons on the touch pad and turning the desired encoder in a positive or negative direction. Depths for these 3 assignments can also be adjusted using PRESET + either ATTACK, DECAY or SUSTAIN for Mod Slot Depth 1,2 or 3 respectively.

Note, Velocity, Modwheel, Expression and Aftertouch can all be assigned within MODALapp when your device is connected.

Valid combinations are listed here:

Parameter	LFO1	LFO2	MOD-EG	NOTE	VELO	AFTT	MODW	CC
Wave 1								
Wave 2								
Mix								
Global Pitch								
Osc2 Pitch								
Osc-Mod								
LFO1 Rate	X							
LFO2 Rate		X						
LFO1 Shape	X							
LFO2 Shape		X						
Cutoff			X					

Modulation

Parameter	LFO1	LFO2	MOD-EG	NOTE	VELO	AFTT	MODW	CC
Reso								
Morph								
FEG Amount								
FEG Attack			X					
FEG Decay			X					
FEG Sustain			X					
FEG Release			X					
AEG Amount			X					
AEG Attack			X					
AEG Decay			X					
AEG Sustain			X					
AEG Release			X					
MEG Amount			X					
MEG Attack			X					
MEG Decay			X					
MEG Sustain			X					
MEG Release			X					
Distortion								
Delay								
Time								
Feedback								
Spread								
Glide			X					
LFO1-Depth	X							
LFO2-Depth		X						
MOD-EG-Depth			X					

Scaling

LFO1 and LFO2 are scaled such that if they are assigned with maximum depth and the modulated parameter is at its centre value, the full parameter range will be modulated. All other modulation sources are scaled such that if they are assigned with maximum positive depth and the modulated parameter is at 0, the full parameter range will be modulated.

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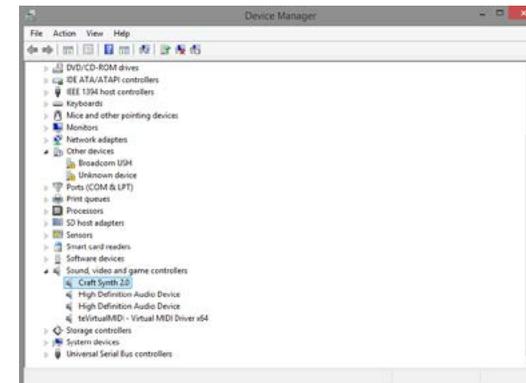
MIDI

MIDI

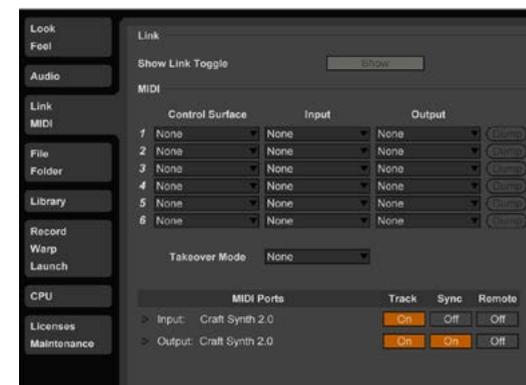
CRAFTsynth 2.0 is a fully USB-MIDI class-compliant, meaning you can plug it into your computer, no drivers required, and gain access to a huge array of extra features. Simply plug in CRAFTsynth 2.0 to a USB port and it will show up as a MIDI input and output device in any software that supports external MIDI devices.



On Mac OSX, CRAFTsynth 2.0 will show up in 'MIDI Studio', found in Applications > Utilities > Audio MIDI Setup. (Once open, select Window > Show MIDI Studio)



On Windows, CRAFTsynth 2.0 will show up as a sound device in the Device manager.



Remember to enable the device input and output in your DAW's preferences.

MIDI

MIDI Channel

On CRAFTsynth 2.0 the MIDI channel can be set from the front panel, or with the MODALapp.

Hold PRESET + SHIFT for 3 seconds to enter midi channel mode. Press the + or - touch pads to change channel. The channel is represented on the LEDs. Channels 1-8 will be the corresponding pad LED lit and all others not. Channels 9-16 the corresponding LED to the channel will not be lit and all other LEDs will be lit.

You can also change MIDI settings in the settings tab of the MODALapp.

MIDI Output

CRAFTsynth 2.0 can sequence your DAW or any device that can send MIDI notes over USB, MIDI or CV clock using the touch pads or the sequenced-arpeggiator.

All of the encoders on CRAFTsynth 2.0 output MIDI messages (The appropriate CC message depending on the SHIFT or PRESET state) This allows CRAFTsynth 2.0 to be used as a fully functional plug and play MIDI controller!

When a change is detected on any of the parameters, a CC message is sent out. See the MIDI implementation chart to find which parameters send which CC numbers. The touch pads also send the appropriate MIDI notes for the Octave range and scale that they are programmed to.

MIDI Input

CRAFTsynth 2.0 can be played by sending it MIDI notes. This means you can use your DAW or any device that can send MIDI notes over USB, MIDI to sequence CRAFTsynth 2.0 or control any of the parameters featured in the CC Implementation List

MIDI Clock

Configure your DAW to send MIDI clock (Sync) to CRAFTsynth 2.0 and it will automatically configure itself to work in time with your track tempo. When no clock is detected, the CRAFTsynth 2.0 will continue to use whatever tempo it is configured to.

MIDI Soft Thru

CRAFTsynth 2.0 has two soft thru settings configurable from the app:

DIN Thru - Forwards Midi received on din in to din out

USB Thru - Soft interface mode which forwards midi received on din in to USB out, and USB in to din out

MIDI

Program Change

Sending a program change to CRAFTsynth 2.0 will load the relevant preset.

Sync

The analogue sync connections on CRAFTsynth 2.0 are configured to use a 3.3v, rising edge, 1 pulse per 16th note signal. **PLEASE DO NOT EXCEED 5V INPUT AND OUTPUT.**

Any signal received by the SYNC IN connection is automatically forwarded to the SYNC OUT.

When running off internal clock or external clock SYNC OUT sends out the received clock.

Sync auto detects incoming clock / sync signals and will select these in priority order:

1) Sync, 2) Ext MIDI and 3) Internal.

Sync will fall back to the next available sync source in reverse priority order after a timeout of 3 seconds.

Din MIDI Filters

CRAFTsynth 2.0 has app-configurable midi filters on the Din input and output: Notes, CC, Program Change, Aftertouch, Pitchbend, Transport, Clock and Sysex
By default Din IN allows all message types
By default Din OUT allows all message types except clock.

MIDI In Omni

MIDI can be made omni within the Settings tab of MODALapp. Omni mode makes CRAFTsynth 2.0 listen to all midi channels, for all received midi (din or usb). Transmitted midi is still sent out on CRAFTsynth 2.0's current midi channel.

Polychaining

- Connect desired master din out to first drone din in.
- Connect additional drones (Maximum 3 drones per master, 4 CRAFTsynth 2.0s total) in the same way, din out -> din in.
- Power on drone CRAFTsynth 2.0s.
- Power on master CRAFTsynth 2.0 & hold down the PRESET + LFO-2 buttons and select the number of drones on the Touch Pads 1,2 or 3.
- Release PRESET + LFO-2 buttons. An LED animation should run across all CRAFTsynth 2.0s and will disable the drone CRAFTsynth 2.0s front panel.

MIDI CC Implementation Chart

Function	CC	Values
Modulation Wheel	1	"
Glide	5	0 - 2.5 seconds, exponential
Headphone Volume	7	Silence - full volume
Expression Pedal	11	"
Distortion	12	Dry - Wet
Delay	13	Dry - Wet
Delay Time	14	No Sync: 0 - 250 milliseconds / Sync: 8 steps, Longest delay time possible divided down
Delay Feedback	15	0% - 90%
Osc1 Wave	16	0 - 127
Osc2 Wave	17	0 - 127
Osc Mix	18	Osc1 - Osc2
Osc-Mod Amount	19	0 - Full
Spread	20	0 - 63 Unison / 64 - 70 Major / 71 - 77 Minor / 78 - 84 Major 6th / 85 - 91 Sus 4th / 92 - 98 5ths / 99 - 105 5th + Oct / 106 - 112 Oct + 1 + 2 / 113 - 119 Oct + 1 -1 / 119 - 127 Oct -1 -2
FEG Attack	22	0 - 4 Seconds
FEG Decay	23	0 - 4 Seconds
FEG Sustain	24	0 - 1
FEG Release	25	0 - 4 Seconds
AEG Attack	26	0 - 4 Seconds
AEG Decay	27	0 - 4 Seconds
AEG Sustain	28	0 - 1
AEG Release	29	0 - 4 Seconds
Osc2 Course Detune	30	+/- 4 Octaves
Osc2 Fine Detune	31	-/+ 1 Semitone
FEG Amount	32	63 (0) +/- 63
Morph	33	0 = LP / 64 = BP / 127 = HP

Function	CC	Values
Cutoff	34	0Hz - 22kHz
Reso	35	None - Full
LFO1 Rate	36	NO SYNC: 0-127 = 0.02Hz - 32Hz SYNC: 0-7 = 1/16 / 8-15 = 1/8 / 16-23 = 3/16 / 24-31 = 1/4 / 32-39 = 3/8 / 40-47 = 1/2 / 48-55 = 3/4 / 56-63 = 1 / 64-71 = 3/2 / 72-79 = 2 / 80-87 = 3 / 88-95 = 4 / 96-103 = 6 / 104-111 = 8 / 112-119 = 12 / 120-127 = 16
LFO1 Depth	37	63 (0) +/- 63
LFO1 Shape	39	0-32 Sine to Triangle / 33-64 - Triangle to Sawtooth / 65-96 - Sawtooth to Square / 97-127 - Square to Sample and Hold
Octave	40	Octaves -2 to +4
Osc-Mod Mode	41	0 - 127 (16 Modes)
MEG Attack	43	0 - 4 Seconds
MEG Decay	44	0 - 4 Seconds
MEG Sustain	45	0 - 1
MEG Release	46	0 - 4 Seconds
LFO2 Rate	47	NO SYNC: 0-63 = 0-32Hz Free / 64-71 Root/8 / 72-79 Root/4 / 80-87 Root/2 / 88-95 Root / 96-103 Root*1.5 / 104-111 Root*2 / 112-119 Root*2.5 / 120-127 Root*3 SYNC: 0-7 = 1/16 / 8-15 = 1/8 / 16-23 = 1/4 / 24-31 = 1/2 / 32-39 = 1 / 40-47 = 5/4 / 48-55 = 2 / 56-63 = 4 (Cycles per beat)
LFO2 Depth	48	63 (0) +/- 63
LFO2 Shape	50	0-32 Sine to Triangle / 33-64 - Triangle to Sawtooth / 65-96 - Sawtooth to Square / 97-127 - Square to Sample and Hold
AEG Amount	51	63 (0) +/- 63
LFO1 MIDI Sync	52	0 - 63 = OFF / 64 - 127 = ON
LFO2 MIDI Sync	54	0 - 63 = OFF / 64 - 127 = ON
Delay MIDI Sync	55	0 - 63 = OFF / 64 - 127 = ON
LFO1 Mode	56	0-41 Retrigger / 42-83 Free / 84-127 Single
LFO2 Mode	57	0-41 Retrigger / 42-83 Free / 84-127 Single
Arp Status	58	0 - 63 = OFF / 64 - 127 = ON
Sustain Pedal	64	0 - 63 = OFF / 64 - 127 = ON

MIDI CC Implementation Chart

Function	CC	Values
Scale	73	0 - 7
Root Note	79	0 - 127
All Envelope Attack	84	0 - 4 Seconds
All Envelope Decay	85	0 - 4 Seconds
All Envelope Sustain	86	0 - 1
All Envelope Release	87	0 - 4 Seconds
Mod Slot 1 Depth	88	63 (0) +/- 63
Mod Slot 2 Depth	89	63 (0) +/- 63
Mod Slot 3 Depth	90	63 (0) +/- 63
Mod Slot 4 Depth	91	63 (0) +/- 63
Mod Slot 5 Depth	92	63 (0) +/- 63
Mod Slot 6 Depth	93	63 (0) +/- 63
Mod Slot 7 Depth	94	63 (0) +/- 63
Mod Slot 8 Depth	95	63 (0) +/- 63
Mod Slot 1 Dest	101	0 - 36
Mod Slot 2 Dest	102	0 - 36
Mod Slot 3 Dest	103	0 - 36
Mod Slot 4 Dest	104	0 - 36
Mod Slot 5 Dest	105	0 - 36
Mod Slot 6 Dest	106	0 - 36
Mod Slot 7 Dest	107	0 - 36
Mod Slot 8 Dest	108	0 - 36
Randomise Patch	121	0
Omni Off	124	0
Omni On	125	0

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Update

Update

CRAFTsynth 2.0's firmware can be updated remotely. This means that you will be able to update your CRAFTsynth 2.0 to the latest version each time an update is released.

MODALapp will provide the most user-friendly way to update firmware, however it is also possible to update the firmware using MIDI sysex messages, meaning you won't need the app.

DO NOT run any other MIDI software that could be sending messages to CRAFTsynth 2.0 during the update process.

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MODALapp

MODALapp

MODALapp adds visual feedback for CRAFTsynth 2.0 (and other Modal devices) and access to a handful of extra settings outlined above. All parameters are accessible from a single interface split into 3 tabs.

- All UI parameters accessible from a single interface
- Editor page to quickly view and edit the current patch
- Live page for selecting and editing scales, choosing the root note of the keyboard touchpads & quick access to 16 assignable parameters
- Patches and Banks can be stored locally into the banks provided, organised using the toolbox and imported or exported locally or to the CRAFTsynth 2.0
- Settings page to configure MIDI settings and update the firmware

MODALapp is available for OSX, iOS, Windows, and Android.

To find the app on your platform, visit www.modalelectronics.com/craft



Connecting devices

MODALapp can be attached to an iPad using a Camera Connection kit, or an Android device using a USB OTG (On-the-go) adapter.

NOTE: If you wish to use more than one USB device with your tablet, phone or computer, or in some cases your mobile device may not be powerful enough to power CRAFTsynth 2.0 please connect CRAFTsynth 2.0 and any other devices through a powered USB hub.

MODALapp can only be connected via USB MIDI and not by MIDI DIN.

Install and open MODALapp. You will see a splash screen until a CRAFTsynth 2.0 has been detected, at which point you will see the Editor page appear.

Playing CRAFTsynth 2.0

At this point you can play your CRAFTsynth 2.0 with any MIDI controller! MODALapp forwards all incoming MIDI to CRAFTsynth 2.0 automatically. Just make sure that your MIDI controller is sending to the same MIDI channel you're CRAFTsynth 2.0 is assigned to.

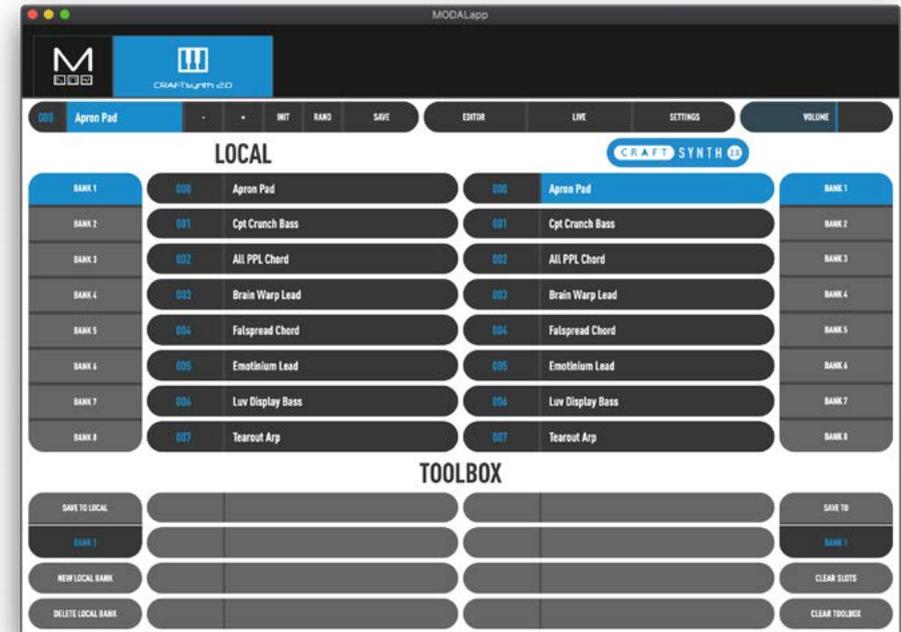


This is the main tab for patch design / editing. You will find oscillator, filter, envelope, LFO, arpeggiator, sustain, modulation and effects sections here.

Switch between viewing the currently loaded preset the PRESET buttons on the top left hand side.

The currently selected preset is shown at the top. You can get to the preset management page by clicking on the preset name. There are also options for previous or next preset, init preset and randomise.

To save a preset first click the save button. You can then select the slot you would like to save the new preset with the - / + buttons. You can change the name of the preset by clicking on the preset name. Finally click either SAVE again to confirm or EXIT to discard any name / slot changes.



This page provides a MIDI controller for playing your CRAFTsynth 2.0 with access to keys, pitchbend and modwheel, arp and sustain settings and 16 assignable macro controls.

You can select the number of octaves shown on the playable on screen keyboard using the 3,2 or 1 buttons.

You can select which scale is in the currently selected slot by clicking the dropdown to the right of the 3,2 & 1 buttons and selecting something or you can program your own by selecting custom and editing the notes in the below toolbar

There is also Tap Tempo control and a tempo slider to adjust the tempo of the internal clock.

This page allows you to backup, curate and restore your saved presets. The interface is split into 3 sections:

CRAFTsynth 2.0 - On the right are the current presets on your CRAFTsynth 2.0, there are 8 banks of 8 patches.

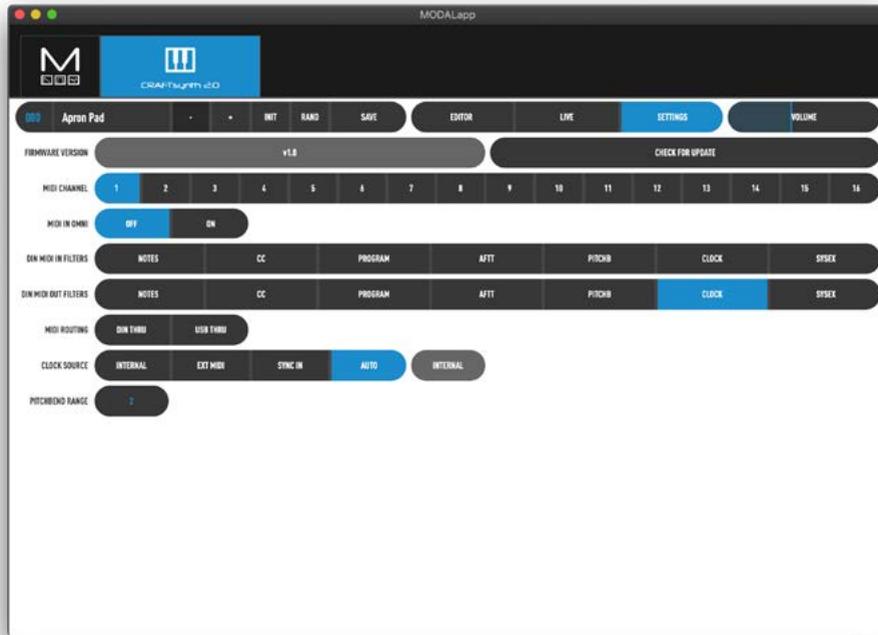
Local - On the left hand side you will find the local storage section. These are presets that are saved to your local storage on the device MODALapp is running on.

Toolbox - The toolbox is an area you can drag patches in to currate new banks and then save them to your CRAFTsynth 2.0 or add to local storage.

The interface is drag'n'drop so you can move presets or banks around to different slots by first clicking on them and then dragging them to the desired location.

Local patches or banks can be imported/exported by right clicking on a preset or bank button. Presets can also be quickly renamed by double clicking on the preset buttons.

Settings Page



Here you can find out your firmware version, update your firmware, select the MIDI channel, toggle omni on / off and configure MIDI and clock settings.

My CRAFTsynth 2.0 doesn't turn on?

When you provide power to CRAFTsynth 2.0 and power on using the power switch, you should see LEDs light up. If this isn't the case, please check the following:

- Check that the switch is selecting the correct power source, USB or BAT (3xAA batteries)

If powering by USB:

- Unplug and plug the USB cable back in.
- Try using a different USB cable.
- Check that you are using a USB port on the computer or powered USB hub, rather than a keyboard or a non-powered hub, which may not be able to provide enough current.

If powering with a batteries:

- Check that the batteries are fully charged and in the correct orientation.

My CRAFTsynth 2.0 turns on and looks like it's working, but there's no sound?

- Check that all the connectors are attached properly.
- Check that your headphones or line connections are connected properly and working as they should (Testing with another device to provide sound is a good way to do this).
- Try sending MIDI to the synth to identify if it is an issue with the touch pads.

The CRAFTsynth 2.0 doesn't show up as a MIDI device?

CRAFTsynth 2.0 uses a class-compliant MIDI over USB connection, which means most operating systems will recognise it as a MIDI device without the need to install additional drivers. If you're not seeing 'CRAFTsynth 2.0' listed as a MIDI device, check the following:

- Check to see if the device shows up on your computer, as described in the MIDI section of this manual.
- Some systems may take some time to search for any required drivers, simply wait until your operating system has finished this process.
- Check that your DAW or other software has enabled MIDI input and output to 'Craft Synth 2.0'. This is usually found in Preferences > MIDI.
- Check that the USB cable is not faulty, and that the USB socket on your computer works properly.
- Make sure that the USB sockets are free from dust or dirt.

My CRAFTsynth 2.0 doesn't respond to MIDI

Please check that you have CRAFTsynth 2.0 set to the same MIDI channel that you are sending MIDI to.

Also please check the current MIDI filters in the MODALapp if using a DIN connection.

The touch pads don't seem to work properly or the sound keeps re-triggering?

The touch pads work through 'capacitive sensing', detecting the presence of your touch in a similar way to your smartphone screen. If you are having difficulty using the touch pads, it's likely to be to do with either your skin contact, or the power source.

- First ensure that all connectors are attached properly and that the synth is not damaged.
- Ensure your hands are clean and dry and that you are not wearing any gloves.
- Try powering the CRAFTsynth 2.0 from an alternate power source. Powering from batteries and listening on headphones will isolate the synth from any other equipment that may be affecting the CRAFTsynth 2.0. If this fixes the issue, try unplugging any other equipment that may be affecting the power, such as your laptop charger.
- Try sending MIDI to the CRAFTsynth 2.0 to identify if it definitely is an issue with the touch pads.

My CRAFTsynth 2.0 hums when powered by USB

A humming noise can be caused by a 'ground loop', which is inherent in any system where a device is connected to the same ground via two or more paths. How loud this noise is will depend on your specific setup.

This is a common issue with all sorts of equipment in various configurations, and there are lots of ways to deal with it, but it really helps to understand the source of the issue in your specific setup, and choose the correct solution, hopefully the below will help.

Firstly, if you have a spare USB or 3.5mm line out cable, try swapping them out. Good connections can help to reduce the noise.

If you are using CRAFTsynth 2.0's USB MIDI and recording / monitoring through a USB interface connected to the same computer, you can either:

- Use a USB isolating dongle such as this one: <https://hifime.uk/usb-isolator>
- Use a D.I box and enable the 'ground lift' such as this one: https://www.studiospares.com/Microphones/DI-Boxes/Behringer-Ultra-DI-DI20-Stereo-Active-DI-Box_370160.htm

If you don't require USB MIDI, it's a bit easier:

- Power CRAFTsynth 2.0 from batteries instead of USB
- Power CRAFTsynth 2.0 from a USB battery pack
- Power CRAFTsynth 2.0 from a tablet or phone (That way you can use MODALapp to play CRAFTsynth 2.0 too)

For any other issues please email support@modalelectronics.com