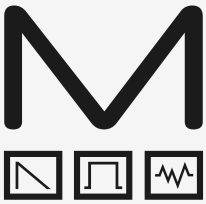

CARBON8X

8-voice experimental synthesiser

User Manual

OS Version - 1.1

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 PSU POLARITY - FAILURE TO DO SO MAY CAUSE PERMANENT DAMAGE - RECOMMENDED USE WITH PROVIDED POWER SUPPLY

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.

FC This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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00
Introduction

Modal CARBON8X is an eight voice polyphonic experimental synthesiser.

It features two digital oscillators per voice that can generate fifty-six different Cores. Incorporating the XCore with a number of different wave modification methods, various ways to produce a variety of new and interesting sounds opens the door to creative sound design.

There are 34 flexible multi-mode filters and three dedicated flexible envelope generators for AMP, MOD and FILTER that can be accessed independently or all three simultaneously on board.

CARBON8X also boasts a hugely powerful "Mod Matrix" with eight assignable slots and four additional fixed routes, 12 mod sources and 58 destinations.

The 4-axis joystick can be assigned to a huge range of modulation destinations and can be 'locked' in place when desired.

There are three LFOs with tempo sync (two poly, one global).

CARBON8X has 26 on board FX in three incredibly powerful, independent and user configurable stereo FX engines that can create sophisticated Delays, lush Reverbs, Flanging, Phasing, and Rich Choruses to name a few.

The hardware has been manufactured with high-quality components: a powder coated black steel case, anodized aluminium top panel, endless encoders and a super bright white on black OLED screen.

Among the many connections, Modal CARBON8X features a USB port to connect your synth to the MODALapp user interface on a computer, tablet or phone. This can be used for preset design and management as well as updating the firmware on your CARBON8X (please see 'Updates' section).

Specification

Polyphony

- True 8 voice polyphony with option to polychain any two CARBON8X synthesisers for 16 voice polyphony.

MPE

- Supports MPE-compatible MIDI controllers, allowing you to apply polyphonic control and expression to individual notes

Oscillators

- 16 high-resolution Core oscillators, 2 per voice
- 56 Core Waveshapes with real-time generated digital algorithms and Wavetables
- Six XCore static oscillator modifiers including Ring Modulation, Amplitude Modulation, Filtered Cross Modulation, Shaper, and others can be applied to the 56 Core Waveshapes to give a mind-boggling array of permutations and new waveshapes
- Vintage Parameter and Oscillator Free Run to emulate the behaviours of vintage analogue synths

Filter

- 34 filter types including two two-pole state variable filters, six morphing dual peak filters and 26 types of ladder filter with drive
- Cutoff Scaling with three distinctive modes

Modulation

- 3 dedicated envelope generators for AMP, MOD and FILTER that can be accessed independently or all three simultaneously including negative (reverse) versions and multiple envelope curve options
- 3 assignable LFO's with tempo sync (two poly, one global).
- 8 assignable modulation slots and 4 additional fixed modulation routings for common assignments with 12 modulation sources and 58 modulation destinations

Sequencer and Arpeggiator

- Polyphonic Real-time and Step sequencer with 512 notes and four recordable/editable parameter animations (Delay FX, LFO's, sequencer and arpeggiator can be either clocked internally or externally)
- Step Sequencer holds up to 64 steps, 8 notes per step, 4 lanes of Parameter-Lock style animation, Step Input mode, multiple playback modes including gate modes and rest function
- Built-In sophisticated programmable arpeggiator of 32 steps with rest capability and random up to 2048 steps before repeating, multiple Arpeggiator direction modes

FX

- Three incredibly powerful independent and user-configurable stereo FX engines for 26 Effects algorithms, incl. Drive, Chorus, Phaser, Flanger, Tremolo, LoFi, Rotary, Stereo Delay, Ping-Pong Delay, X-Over Delay and Reverb.

User Memory

- 500 patch memories, all fully editable and ships with 300 factory programs
- 100 sequencer presets that can be linked to any patch for quickly loading arrangements
- 100 FX presets
- 8 Quick Recall slots accessible from the panel for quickly loading your favourite patches

Enclosure and Display

- Road-ready steel and aluminium enclosure with economical stained bamboo end cheeks
- 1.54-inch large OLED display for instant visual feedback at all times of playing/editing

Controls and Performance

- Premium FATAR 61-key Keyboard with velocity and channel aftertouch
- 29 endless encoders, 24 buttons
- 4-axis joystick that can be assigned to a huge range of modulation destinations and virtually 'locked' when desired
- Multiple keyboard modes, Mono, Poly, Unison 2, Unison 4, Unison 8, Stack 2 and Stack 4
- Glide/Portamento with both legato and staccato modes
- Chord Invert control to easily create chord inversions and variations

Specification

Inputs and Outputs

- 6.35 mm / 1/4" TS dual-mono line outputs
- 6.35 mm / 1/4" TRS headphone output
- 3.5 mm / 1/8" TRS stereo audio input
- MIDI DIN In and Out
- 3.5 mm / 1/8" TS Analogue clock sync In and Out
- Class compliant MIDI over USB connection
- 6.35 mm / 1/4" TRS expression pedal input
- 6.35 mm / 1/4" TS sustain pedal input

Power

- Power: DC-9.0V – 1.5A centre-positive

Editor Software

- Free MODALapp software editor available for macOS, Windows, iOS and Android
- MODALapp can also be run within your Digital Audio Workstation (DAW), with VST3 and AU versions available

Dimensions (L x W x H)

- 885 x 300 x 100 mm / 34.8" x 11.8" x 4"

Weight

- 9 kg / 19.9 lbs

01
Getting Started

Powering on

Connect the power lead to your CARBON8X then connect the outputs of the CARBON8X to your mixer, or if you prefer, connect your headphones. Optionally connect a USB cable from your computer or tablet device to the CARBON8X for MODALapp communication.

Then power on.

You will see a loading animation on the screen. When the synth has loaded it will change to show the main patch page.

Screen Control

The Modal CARBON8X interface is designed to be extremely intuitive and easy to use, so that all the most important parameters are easily accessible and tweakable directly from the top panel, however, all functions are also accessible and tweakable on-screen using the two detented encoders.

These two switched-encoders are located either side of the screen are used for screen navigation and control and can be clicked to either switch mode or trigger / modify the selected function:

- **Page/Param** - When this encoder is in 'Page' mode (top row of on-screen text) it cycles through the parameter pages / groups (e.g. Osc1, Osc2, Filter); when it's in 'Param' mode (bottom row of on-screen text) it cycles through the parameters on that page / group. Use the switch by clicking the encoder to toggle between the two modes, where the mode is displayed on the screen with a line at top for 'Page' mode and at the bottom for 'Param' mode.

- **Preset/Edit (/Bank)** - This encoder/switch is used to adjust the currently selected value or 'trigger' the currently displayed parameter. When the panel is in 'Shift' mode the 'Load Patch' encoder is used to select the patch bank number, jumping up or down in increments of 100.

Secondary functions

CARBON8X is a comprehensive and fully featured synthesiser. Therefore there are a number of user interface combinations that are required to access some of the deeper functions of the synth.

The top panel UI has 4 buttons that can access secondary functions. These are the 'Shift', 'Patch', 'Velo' & 'Arp' buttons.

To access the functions labelled in light blue text you may either press 'Shift' to latch shift mode or use it momentarily by holding 'Shift' and turning an encoder or pressing a button. Once let go the panel will return automatically to its regular non-Shift state.

To access the functions on the panel labelled in white text (3 buttons bottom left, 3 buttons and 2 encoders bottom right), hold the button in that section that has a white ring ('Velo' button or 'Arp' button) and press the relevant button. NOTE: These combinations are momentary, not latch-able.

The 'Patch/Seq' button is primarily used to switch the screen to either the 'Load Patch' or 'Load Seq' param for loading patches or sequences, entering the panel into either 'Patch' mode or 'Seq' mode. When in 'Patch' mode the 'Save' and 'Init' buttons are used for patch preset management, however when in 'Seq' mode the 'Save' and 'Init' buttons are used for sequence preset management. When the white LED above this button is lit, it signifies that the panel is in 'Seq' mode.

When held the 'Patch/Seq' button can also be used to select the Filter Type by turning the 'Cutoff' encoder, to select the 'Arp Gate' length by turning the 'Arp' encoder or, to dial in the amount of dynamics processing being applied by the 'Patch Gain' function by turning the 'Volume' encoder, and to select the Chord Inversion type by turning the 'Vintage' encoder.

The 'Init / Rand' button/functions respond to a button hold.

Navigating and Loading Preset

To navigate through and load patches first press the 'Patch/Seq' button to return to the Patch page and use the 'Preset/Edit' encoder to scroll through presets. Click this encoder (if Preset Auto-Load is not enabled) on the desired preset to load it. An asterisk will appear next to the current preset name to indicate unsaved edits.

Init Preset

Press and hold the 'Init' button, a confirmation message will appear on-screen however the preset will not be overwritten until saved.

Randomize Preset

Either when in 'Shift' mode or while momentarily holding 'Shift' press and hold the 'Rand' button, a confirmation message will appear on-screen however the preset will not be overwritten until saved. Randomize is only available for patches.

Save Preset

First press the 'Save' button to enter the 'full' save procedure (setting preset slot and/or name - see below), or hold the 'Save' button to perform a 'quick' save (saving preset directly into the current slot with the current name).

Once you are in the 'full' save procedure, presets are saved in the following way:

Slot Selection

Use the 'Preset/Edit' encoder to select the preset bank/number to save into, and press the 'Edit' switch to select it.

Naming

Use the 'Page/Param' encoder to select the character position, and use the 'Edit' encoder to select the character. Press the 'Preset/Edit' switch to finish editing the name. There are a number of panel shortcuts here:

- Press 'Oct-' to jump to lowercase characters
- Press 'Oct+' to jump to uppercase characters
- Press 'Transpose' to jump to numbers
- Press 'Chord' to jump to symbols
- Press the 'Page/Param' switch to add a space (increment all above characters)
- Press 'Init' to delete the current character (decrement all above characters)
- Hold 'Init' to delete the entire name

Confirming

Press the 'Preset/Edit' switch to confirm the settings and save the preset.

At any point during the save procedure hold the 'Page/Param' switch to move back a step.

To exit/quit the procedure without saving the preset, press the 'Patch/Seq' button.

Quick Recalls

CARBON8X has 8 Quick Recall slots for quickly loading presets. Quick Recalls are controlled using the following button combos:

- Hold 'Patch' + hold one of the eight buttons on bottom left of the panel to assign the currently loaded patch to a QR slot
- Hold 'Patch' + press one of the eight buttons on bottom left of the panel to load the patch in the QR slot

LFO

- Turn the 'Rate' encoders into the negative range to access synced rates
- To access LFO3 parameters enter 'Shift' mode and press the LFO2/LFO3 button

Filter

- Hold the 'Patch' button and turn the 'Cutoff' encoder to control the Filter Type parameter
- Hold the 'Patch' button and turn the 'Reso' encoder to control the Cutoff Scaling parameter

Envelopes

- Hold either the FILT-EG or AMP-EG button for one second and then turn the ADSR encoders to adjust all envelopes simultaneously
- Press the 'MEG' button when MEG is already selected to latch MEG assign

Sequencer

- Hold the 'Mute' button to clear the sequencer notes
- Hold the Anim1 / Anim2 / Anim3 / Anim4 buttons to clear an animation lane
- When the screen is displaying the 'Linked Sequence' parameter, hold the 'Edit' switch to set the value to be the currently loaded sequence.
- Hold the 'Patch' button and press the 'Record' button to enter the Step Sequencer 'Edit' Mode, if the currently loaded sequence is in 'Step' mode

Keyboard/Voice

- Press ‘Unison’ repeatedly to cycle through the different unison modes; press ‘Stack’ repeatedly to cycle through the different stack modes
- Press ‘Chord’ whilst holding a chord on the internal or an external keyboard to set the chord mode chord.
- Hold ‘Transpose’ and press a key on the internal keyboard to transpose all notes, where the central C key is the root note. Press ‘Transpose’ with no keyboard interaction to reset the transpose value back to 0.
- Hold the ‘Sustain’ button for one second when turning on Sustain to enable Sustain ‘Latch Mode’
- Hold the ‘Patch’ button and turn the ‘Drift’ encoder to control the Chord Invert parameter.
- Hold the ‘Patch’ button and turn the ‘Mix’ encoder to control the Vintage parameter.

Modulation

- To assign a Mod Slot either hold (momentary) or latch the desired Mod source button - then set a depth by turning desired modulation destination parameter encoder
- When latched in a Mod Source assign mode pressing the flashing Mod Source button again will exit assign mode
- Mod source button + ‘Depth’ encoder - set global depth for that mod source
- Press ModSlot repeatedly to cycle through and view all mod slot settings on the screen
- When the screen is displaying a mod slot ‘Depth’ parameter (most easily accessed via assigning modulation using the panel or via the ModSlot button), hold the ‘Edit’ switch to clear the mod slot assignment.
- To assign a mod source to an osc’s global frequency destination, use either of the fine tune controls. ‘Tune1’ will be assigned to Osc1 tune, ‘Tune2’ will be assigned to Osc2 tune.

Arp

- Hold the ‘Arp’ button and press keys on the internal or an external keyboard to add pattern notes or press the ‘Rest’ button to add a rest to the pattern
- Hold the ‘Patch’ button and turn the ‘Division’ encoder to control Arp Gate

FX

- Press FX1 / FX2 / FX3 button repeatedly to change the FX type of the slot
- Hold FX1 / FX2 / FX3 button to reset the FX type of the slot to ‘None’
- Turn the ‘B’ encoder into the negative range for the slot with a Delay FX assigned to access synced delay times
- Press FX1 + FX2 + FX3 to jump to the ‘FX Preset Load’ parameter

Global Settings

- When the screen is displaying the ‘Reset’ option, press the ‘Edit’ switch and follow the confirm instructions to reset all global settings to the factory default settings. Please note that this will also reset the Main Volume and Tempo parameter values.
- Hold the ‘Patch’ button and turn the ‘Volume’ encoder to control the Patch Gain parameter.

Screen Parameter List

- If a screen parameter is crossed out this means that it is ‘inactive’ (and can’t be controlled) due to the value or state of other parameters or settings.
- If a screen parameter value is underlined to indicate the currently selected value, you will need to use the Edit encoder switch to apply newly selected values.

Patch Preset
Load Patch
Save Patch
Init Patch
Randomize Patch
Linked Sequence

Keyboard / Voice
Voice Mode
Glide
Octave
Transpose
Chord Latch
Voice Drift
Vintage
Voice Width
Chord Invert
Sustain
Velo Assign
Velo Depth
AftT Assign
AftT Depth
Note Assign
Note Depth
Expr Assign
Expr Depth

Osc1
Core
Contour
Level
Tune
Fine

Osc2
Core
Contour
Level
Tune
Fine

Osc (General)
XCore
XMod
Drift
Free Run

Filter
Cutoff
Reso
Morph
Type
Cutoff Scaling

Filter EG
Amount / Depth
Attack
Decay
Sustain
Release
Type

Amp EG
Amount / Depth
Attack
Decay
Sustain
Release
Type

Mod EG
Amount / Depth
Attack
Decay
Sustain
Release
Type
Assign

LFO1
Shape
Rate
Depth
Transform
Mode
Sync
Assign

LFO2
Shape
Rate
Depth
Transform
Mode
Sync
Assign

LFO3
Shape
Rate
Depth
Transform
Mode
Sync
Assign

Mod Slot 1
Status
Source
Destination
Depth
Clear

Mod Slot 2
Status
Source
Destination
Depth
Clear

Mod Slot 3
Status
Source
Destination
Depth
Clear

Mod Slot 4
Status
Source
Destination
Depth
Clear

Mod Slot 5
Status
Source
Destination
Depth
Clear

Mod Slot 6
Status
Source
Destination
Depth
Clear

Mod Slot 7
Status
Source
Destination
Depth
Clear

Mod Slot 8
Status
Source
Destination
Depth
Clear

Mod (General)
Note -> Cutoff
Y+ -> LFO1 Depth
AftT -> Cutoff
Velo -> AEG Amount

Joystick
XYLock
Pitch Bend Status
X+ Assign
X+ Depth
X- Assign
X- Depth
Y+ Assign
Y+ Depth
Y- Assign
Y- Depth

FX Preset
Load FX
Save FX

FX (General)
Level

FX-1
Type
A
B
C
D
E
F
Swap

FX-2
Type
A
B
C
D
E
F
Swap

FX-3
Type
A
B
C
D
E
F
Swap

Arpeggiator
Status
Division
Direction
Octave
Swing
Gate

Sequence Preset
Load Sequence
Save Sequence
Init Sequence

Sequencer
Play
Record
Mode
Length
Step Length
Num Steps
Step Mode
Step Overdub
Note Mute
Note Clear
Anim1 Status
Anim1 Param
Anim1 Clear
Anim2 Status
Anim2 Param
Anim2 Clear

Sequencer (continued)
Anim3 Status
Anim3 Param
Anim3 Clear
Anim4 Status
Anim4 Param
Anim4 Clear
Loop
Hold

Clock
Tempo

Audio
Main Volume
Patch Gain
Headphone Level
Gain Boost
Audio In Volume
Audio In -> FX

Settings - MIDI
Channel
Omni
Pitch Bend Range
MPE Mode
MPE Master Channel
MPE Num Channels
MPE Pitch Bend Range
DIN In Filters
DIN Out Filters
DIN Thru
USB Thru
Arp / Seq Out
MIDI-in Oct Offset
MIDI-in Monitor

Settings - UI
Screen Brightness
Screen Switch Mode
Screensaver Idle Time
LEDs Brightness
Keyboard Local
Velocity Curve
Aftertouch Curve
Mod Wheel Out
Pitchbend Out
X+ Calibration
X- Calibration
Y+ Calibration
Y- Calibration
Center Calibration
Expr Pedal - Type

Settings - Sequencer
Metronome
Pre-Roll
Quantize
Transport

Settings - General
Clock Source
Global Tune
Polychain Master
Preset Auto-Load
Reset Settings
Firmware Version

02
Connections

Audio In

Audio Input on 1/8" stereo/TRS jack.

Expression Pedal over standard 1/4" stereo/TRS jack from an external expression source.

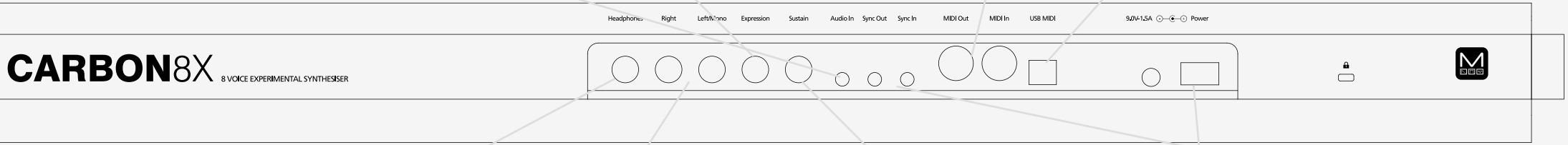
CARBON8X works best with expression pedals that use the TRS polarity and have a resistance of 10k or above. However CARBON8X has a software configuration option for providing basic compatibility with RTS polarity pedals as well as for improving the compatibility with different resistances. If your expression pedal has a polarity switch we recommend setting it to the 'TRS' polarity (the default setting on most pedals). For setting maximum compatibility with your expression pedal's polarity and resistance value, please see the 'Settings - Pedal Type' section. If you are unable to configure CARBON8X to work adequately with your expression pedal, you may need to use a TRS Polarity Adapter. Please note that expression pedals with the TS polarity will not work with CARBON8X.

MIDI (In, Out)

MIDI In / Out on MIDI 5-pin DIN cable. These outputs can be used to communicate with any other MIDI devices. The MIDI Out can be set to Thru using MODALapp or MODALplugin (See the MIDI section)

USB MIDI

CARBON8X is a class compliant USB MIDI device and connects to a USB host via USB B Connection for MODALapp communication, MIDI input and MIDI output. Simply connect CARBON8X to a USB socket, such as on your computer or tablet with a standard USB cable and find 'CARBON8X' listed as a MIDI port on your computer or tablet.



Clock Sync (In, Out)

Clock Sync In / Out on 1/8" mono/TS jack. Simply plug into your clockable gear as desired. (See the Sync section)

Headphones

Headphone output on 1/4" stereo/TRS jack. The volume can be adjusted using the VOLUME knob or the dedicated Headphone Level control on the screen.

The headphone output will match the audio output so it can be either stereo or mono depending on the current audio out configuration.

Line Out

Line level stereo outputs on 1/4" TS dual-mono jacks.. The left jack only will break the stereo circuit and collapse the signal to mono. These outputs 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. The Line out level can be adjusted using the 'Volume' knob.

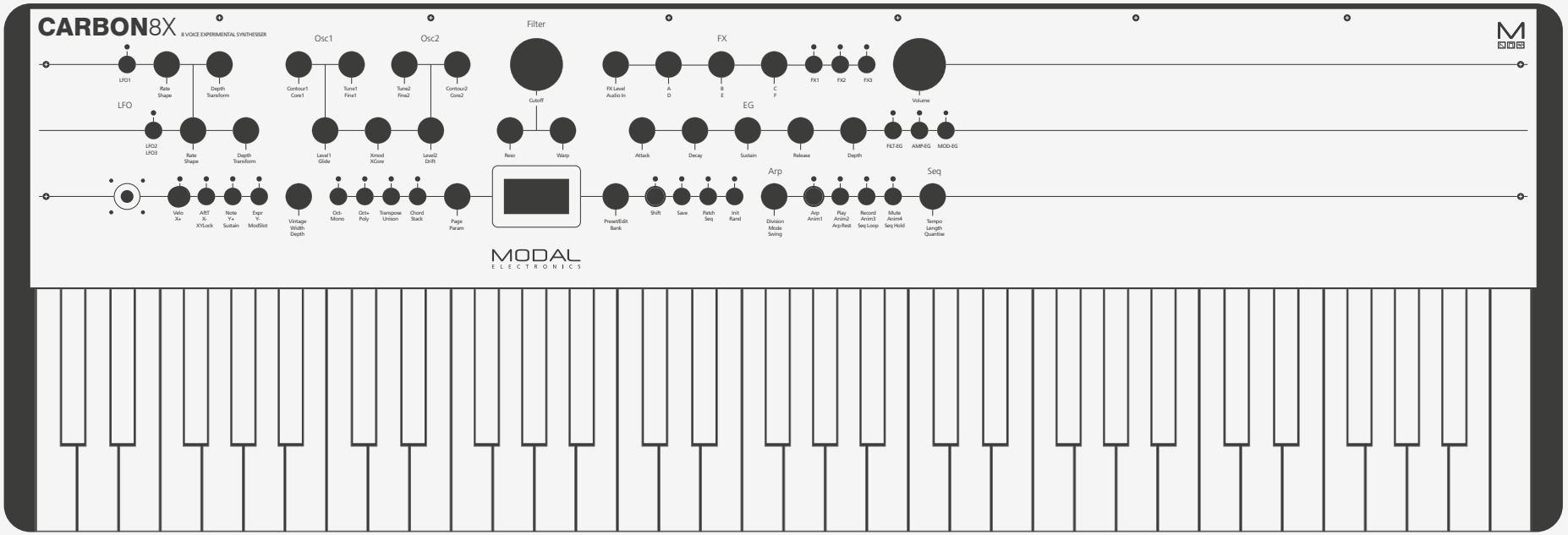
Sustain Pedal over standard 1/4" mono/ TS from an external sustain pedal.

Note: CARBON8X supports both types of sustain pedal polarities. "Positive / Normally Open" pedals can be connected / disconnected whilst CARBON8X is powered on, however "Negative / Normally Closed" pedals must be connected before powering on the device and disconnected after powering off the device in order to work correctly. If your sustain pedal has a polarity switch we recommend setting it to the "Positive" polarity. If you are unsure of your pedal's polarity type, it is recommended to only connect / disconnect the pedal whilst the device is powered off.

Power

Power switch for CARBON8X. Power via DC-9.0V - 1.5A centre-positive PSU (supplied)

03
Synthesis engine



CARBON8X features 56 Core types available. Remember, each voice has two oscillators, so you can use any two Core types in one voice.

The Core types fall into thirteen categories, each applying the same modification type to either simple saw/square/triangle waves, or to more complex wavetables chosen because they work well with a particular type of wave modifier. There are two additional Core types, PWM and Clocked Noise, that don't fit in any of these categories.

Each Core type has an additional 'Contour' control to vary the timbre of the sound. This control is named Contour on the front panel, but when you scroll through different Cores on the CARBON8X the display will show the actual name of the wave modifier, and this will change from core to core.

Note: The wavetables here are used as static wave sources and not, for instance, morphed from one shape to another as they are in ARGON8. The variation in timbre comes from how the Contour parameter is used in each Core.

Here is the full list of cores grouped by modification type.

Classic Oscillator Sync – in all four cases, the Contour parameter controls the pitch of the synced wave.

- Hard Sync Saw
- Hard Sync Sqr
- Hard Sync Tri
- Hard Sync Rand, a combination of multiple square waves at different frequencies

Wave Folding – a form of distortion where the wave is deliberately clipped, and as the amplitude of the wave passes the clipping point, it is reduced by the amount that it would otherwise exceed the clipping point. In all four cases the Contour parameter controls the amount of folding.

- Fold Tri
- Fold Tri Lofii
- Fold Saw Lofi
- Fold TriSaw Lofi, here the first half of cycle is sawtooth, second half triangle.

PWM Basic – Classic pulse width modulation. The Contour parameter controls the width of the pulse.

Window Sync – a form of oscillator sync where amplitude is smoothed at the point where the synced wave resets:

- Win Sync Sin, a simple sine wave
- Win Sync WT1
- Win Sync WT2
- Win Sync WT3

Pinch WT – a simple form of phase distortion that plays back the first half of a waveform cycle at a faster rate than the second. The two rates are linked such that the oscillator will still complete a full cycle in the usual amount of time. The Contour parameter controls the amount of phase distortion.

- Pinch WT 1
- Pinch WT 2
- Pinch WT 3
- Pinch WT 4

Squash – a type of phase distortion that plays through the entire cycle of a waveform at a rate faster than normal. Once the cycle completes the last output value is held until the start of the next cycle. The Contour parameter controls the amount of phase distortion.

- Squash Sine: Simple sine wave
- Squash WT 1
- Squash WT 2
- Squash WT 3

Scrunch – similar to the pinch algorithms, except this time the position in the waveform where the flip from fast to slow occurs will move in relation to the rate difference. The Contour parameter controls the amount of phase distortion.

- Scrunch WT 1
- Scrunch WT 2
- Scrunch WT 3
- Scrunch WT 4

Alt Sync – a variation of window sync where every other cycle is (potentially) played back at either of two alternating rates. This can give interesting asymmetrical pairs of the same basic wave shape. The Contour parameter controls the frequency of the pitched wave.

- Alt Sync WT 1
- Alt Sync WT 2
- Alt Sync WT 3
- Alt Sync WT 4

Derez – sample rate reduction where the downsampling rate is synced to the fundamental frequency of the wave. The Contour parameter controls the amount of reduction.

- Derez Tri
- Derez WT 1
- Derez WT 2
- Derez WT 3

Phase Modulation – classic phase modulation using a triangle wave as modulator. The Contour parameter controls the amount of phase modulation.

- PM WT 1
- PM WT 2
- PM Tri
- PM WT 3

Reverse – another form of oscillator sync where, instead of resetting the oscillator whenever a cycle of the fundamental frequency completes, the oscillator plays the waveform in the reverse direction. The Contour parameter controls frequency of the synced wave.

- Rev WT 1
- Rev WT 2
- Rev WT 3
- Rev WT 4

Shaper – this is an alternative version of phase modulation using a triangle wave as a modulator. The Contour parameter controls the amount of phase modulation.

- Shaper WT 1
- Shaper WT 2
- Shaper WT 3
- Shaper WT 4

Lo-fi Fold – an alternative approach to wave folding which gives different timbres. The Contour parameter controls the amount of folding.

- Lofi Fld WT 1
- Lofi Fld WT 2

Clocked Noise – a noise source fed through a sample rate reduction algorithm. The Contour parameter controls the amount of reduction.

Resonant Noise – a noise source is fed through a resonating state variable filter. The Contour parameter crossfades between lo-pass, band-pass and hi-pass.

Resonance – a series of standard waves with increasing amounts of resonance. The Contour parameter controls the amount and frequency of the resonance.

- Reso Sine
- Reso Saw
- Reso Sqr

Dual Inverter – an inverter where just part of the wave is inverted. The Contour parameter controls the size of the section that is inverted.

- Dual Inv Saw
- Dual Inv Tri
- Dual Inv WT 1
- Dual Inv WT 2

In addition to the two oscillators with fifty six Cores, CARBON8X adds an additional cross modulation stage before the sound is passed to the filter. In all cases, it is Oscillator 2 that is modulated and the Xmod encoder controls the amount of modulation. In some cases, Oscillator 1 is used as the source of the modulation and in others a dedicated (hidden) oscillator is used as the source of modulation for Oscillator 2 and you can use Oscillator 1 for anything you like.

There are six types of modulation, selected by the XCore parameter.

- RM, a simple Ring Modulation where the output of Osc 2 is multiplied by the output of Osc 1.
- Min Mod, a simple variant of amplitude modulation. At any given sample we compare the current output value for the two oscillators and then output whichever of the two currently has the lowest value.
- Mod LP, in this style of cross modulation, Osc 2 is filtered through a one pole low-pass filter and Osc 1 used to modulate the cutoff frequency of this filter.
- Shaper, this style of cross modulation creates two copies of the Osc 2 waveform, one where it plays back normally, and the other where the waveform is multiplied by itself. Osc 1 is used to modulate the amplitude of Osc 2.
- Single RM, another Ring Modulation core, but instead of using Osc 1 as a modulator, we use a 'hidden' sine wave oscillator which follows the root frequency of a voice to modulate Osc 2. This frees Osc 1 to do other things. To find the familiar ring modulation sounds, vary the tuning of Osc 2.
- Single Contour, which is similar to Single RM, but here the 'hidden' sine wave is sent as a control signal to the Osc 2 contour control. What this will sound like depends very much on which Core is selected for Osc 2.

CARBON8X has a wide selection of 34 different filter types to tastefully tailor the sonic content of the algorithms mix.

- **Cutoff:** This parameter controls the 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.
- **Warp**: This encoder changes the frequency response of the filter. See below for how this control morphs each of the different filter types. In any static filter types the 'Morph' encoder is used to control filter drive.
- **Type:** Holding the 'Patch/Seq' button and turning the Cutoff encoder selects the current type of the filter. There are 31 filter types in total, including morphable and static filters.
- **Cutoff Scaling:** This Parameter switches the control curve of the Cutoff as well as the Note > Cutoff behaviour of the filter

  Relative – A scaling curve that is more balanced and changes the note-to-cutoff tracking to behave more closely to analogue synths and tracks portamento / glide and pitch bend. In this mode note-to-cutoff tracks best when the cutoff control is at 0.

  Bipolar – The same cutoff control scaling curve as the 'Relative' mode, except in this mode note-to-cutoff tracks best when the cutoff control is at 64.

Morphable Types:

- **State Variable LP/BP/HP –** Morphs 2-pole lowpass, through bandpass, to high pass
- **State Variable LP/Notch/HP –** Morphs 2-pole lowpass, through notch, to high pass

In each of the six Dual filters, a pair of 2-pole filters with resonance is used in parallel and the Morph parameter controls the difference in cutoff frequency between the two filters.

- **Dual Lowpass**
- **Dual Bandpass**
- **Dual Highpass**
- **Dual Lowpass Alt**
- **Dual Highpass Alt**
- **Dual Peaking –** Highpass and lowpass filters create a notch with resonance peaks

either side of it

A pair of 2-pole filters used to create a phaser where the morph control here affects the associated width of the notches and peaks of the response.

- **Ladder Adjustable Phaser**

Static Types:

Each of the 25 static filter types is a 4-pole ladder filter with resonance. Here the Warp encoder controls the amount of drive applied to the signal before it reaches the filter.

4 pole Lowpass Ladder (with drive)

3 pole Lowpass Ladder (with drive)

2 pole Lowpass Ladder (with drive)

1 pole Lowpass Ladder (with drive)

4 pole Highpass Ladder (with drive)

3 pole Highpass Ladder (with drive)

2 pole Highpass Ladder (with drive)

1 pole Highpass Ladder (with drive)

4 pole bandpass Ladder (12dB Lp /12dB Hp) (with drive)

2 pole Bandpass Ladder (6dB Lp / 6dB Hp) (with drive)

3 pole Bandpass Ladder (6dB Lp / 12dB Hp) (with drive)

3 pole Bandpass Ladder (12dB Lp / 6dB Hp) (with drive)

4 pole Bandpass Ladder (6dB Lp / 18dB Hp) (with drive)

4 pole Bandpass Ladder (18dB Lp / 6dB Hp) (with drive)

Notch Ladder (with drive)

Notch Ladder Alt (with drive)

Lowpass Ladder with Notch (with drive)

Lowpass Ladder with Notch Alt (with drive) - notch closes with resonance

Lowpass Ladder with Notch and Resonance (with drive)

Bandpass Ladder with Notch (with drive) - notch closes with resonance

Bandpass Ladder with Notch and Resonance (with drive)

Phaser Ladder (with drive)

Highpass Ladder with Notch (with drive) - notch closes with resonance

Highpass Ladder with Notch and Resonance (with drive)

Peaking Filter (with drive)

CARBON8X 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 using the 3 dedicated buttons to the right of the envelope depth encoder.

- **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.
- **Depth:** This controls the envelope depth amount of the selected envelope generator (i.e. FILT-EG, AMP-EG or MOD-EG.) This gives bi-polar control of the amount of modulation the envelope has over its destination/s.

- **Type:** There are 8 envelope types. These types are stored per-patch and each envelope type is independent so you can have a different type for MEG, FEG and AEG in the same patch. You can find these settings at the bottom of the AEG, FEG and MEG pages on the screen.

  Expo - classic exponential curve - suited for most sound types

  Snappy - fast attack and decay time curves - best suited for percussive material

  Soft - smoother attack and release time curves - best suited for pads

  Linear - simple linear ramp for each envelope stage - best suited for modulation

  Expo Long – Expo curve with double the maximum time for each stage of the envelope

  Snappy Long – Snappy curve with double the maximum time for each stage of the envelope

  Soft Long – Soft curve with double the maximum time for each stage of the envelope

  Linear Long – Linear curve with double the maximum time for each stage of the envelope

  Long variants possess a maximum release time of 10 seconds.

- **FILT-EG, AMP-EG, MOD-EG:** These buttons select which envelope generator the above controls are representing.

  Pressing the MOD-EG button again latches the assign mode - you will notice the LED blinking to indicate you are in assign mode. Press again to exit assign mode.

  TIP: Holding either the FILT-EG or AMP-EG button and changing the ADSR parameters will alter all three envelopes simultaneously and is a useful shortcut to quickly change all envelopes at once.

CARBON8X features three individual low frequency oscillators. LFO1 is global. LFO2 and LFO3 are polyphonic.

All LFOs can be set to Retrigger, Single and Free mode and have these parameters:

- **LFO1:** This button enters and exits assign mode for LFO1
- **LFO2/LFO3:** This button is used to both toggle between LFO2 / LFO3 (for editing the LFO's parameters) as well as for entering and exiting assign mode for LFO2 / LFO3.

  If the edit mode is currently LFO2 (LED off), use this button to enter and exit LFO2 assign mode (LED slow flash) or use 'Shift' and this button to toggle to LFO3 edit mode.

  If the edit mode is currently LFO3 (LED constantly on), use 'Shift' and this button to enter and exit LFO3 assign mode (LED fast flash) or use this button on its own to toggle to LFO2 edit mode.

  Once in an LFO assign mode, simply turning the knob for the parameter that you would like the LFO to modulate, you will see the LED above the button begin to flash to indicate you are currently in an assign mode.
- **Rate:** This parameter controls the speed of the LFO.

  An LFO in a positive amount is a free rate meaning it will run independently from the synth's tempo / MIDI clock input. In negative amounts it is synced to the synth's tempo / MIDI clock input at various subdivisions.
- **Shape:** Holding the 'Shift' button and (or when latched in shift mode) turning this encoder controls the given LFO Shape. CARBON8X LFOs can be set to one of fifteen different variable shapes, all of which are modified with the Transform parameter. The fifteen different shapes are as follows:

  Sine to Saw, a simple phase distorted sine wave oscillator that is able to approximate a ramp up saw, or a ramp down saw.

  Sine PW, a phase distorted sine wave that is able to play back the first half and second halves of the waveform at different rates, whilst still remaining the same period length.

  Variable Tri, **a simple triangle where the rising edge time and falling edge time** are adjustable whilst keeping the same period length.

  Tri Low Sync, a hard synced triangle LFO that allows for the playback of an incomplete period of a standard triangle waveform. This creates a hybrid shape between a triangle and sawtooth.

  Tri Clamped, a triangle waveform fed through a clamping function that allows for the creation of trapezoidal waveforms.

  Square PWM, a simple pulse oscillator, with adjustable pulse width.

  Square Leaky, a square wave that can be morphed into two sawtooth waves.

  Ramp Up Shaped, a rising sawtooth LFO that can be changed from increasing linearly to either convex or concave curves.

  Ramp Up Dual Rate, a rising sawtooth LFO that has two different rates per cycle.

  Ramp Up Clamped, a rising sawtooth LFO that is fed into a clamping function, creating half trapezoidal like waves.

  Ramp Down Shaped, a falling sawtooth LFO that can be changed from increasing linearly to either convex or concave.

  Ramp Down Dual Rate, a falling sawtooth LFO that has two different rates per cycle.

  Ramp Down Clamped, a falling sawtooth LFO that is fed into a clamping function, creating half trapezoidal like waves.

  Sample And Hold With Ramps, a standard sample and hold LFO generated by clocked noise, that can be morphed into a set of increasing or decreasing sawtooth waveforms with random depths.

  Sample And Hold Slewed, a sample and hold oscillator that fades between different random values instead of jumping directly, with variable slew curve.
- **Depth:** This parameter controls the depth of the given LFOs modulation.
- Transform: Holding the 'Shift' button and (or when latched in shift mode) turning this encoder modifies the given LFO Shape. The exact nature of the modification depends on the LFO shape that is selected.

The operating mode for each LFO can be set from the menu. Turn the Page/Param encoder until the desired LFO page is selected, then click the Page/Param encoder to put the display into parameter mode. Turn the encoder until the Mode parameter is visible. There are three modes:

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 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.

Arpeggiator

CARBON8X features an intuitive programmable arpeggiator. 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 CARBON8X.

For arpeggiator 'hold' functionality please use the Sustain 'Latch Mode' as described below.

- **Arp:** The Arp can be enabled / disabled by pressing this button. Holding this and entering notes using the keys or over USB or MIDI connection will input notes to the Arp. Rests can be input by pressing the Arp Rest button while entering notes.
- **Division:** Turning this encoder allows you to select the clock division of the Arp
- **Mode:** Holding the 'Shift' button and (or when latched in shift mode) turning this encoder allows you to select the octave range and direction of the Arp.
- **Swing:** Holding the 'Arp' button and turning this encoder allows you to dial in swing to the Arp. This setting is bi-polar allowing us to nudge every other note backward or forward in time.
- **Arp Gate:** Holding the 'Patch' button and turning the Arp encoder allows you to set Arp Gate length.
- **Sustain 'Latch Mode':** Holding 'Velo' and holding the 'Sustain' button for one second will enable Sustain 'Latch Mode' - press and release a note / chord to sustain it, press a new note / chord to overwrite the existing one. This also provides the classic arpeggiator 'Hold' functionality.

Note. Programmed patterns in the arpeggiator are temporary and are not saved per patch. They will remain until reprogrammed or until the unit is power cycled.

Sequencer

CARBON8X has an extremely powerful sequencer on board, that can be configured in either real-time or step modes. Both modes feature four recordable / editable parameter animation lanes, allowing you to add parameter motion to your sequences over time.

NOTE: Most screen only sequencer parameters can be found on the Seq page of the screen menu. To navigate to this, Scroll the Page/Param left screen encoder in Page mode to the Seq page. Click the left screen encoder to enter Param mode and scroll through the parameters.

- **Play:** This button starts and stops the sequencer.
- **Record:** This button allows you to record enable and disable. See below for record behaviour in real-time and step modes.
- **Mode:** This is a screen only parameter that sets the current sequence to either real-time (default) or step modes.

  NOTE: switching a sequence from real time to step mode (or vice versa) will initialise the sequence, as the two modes are not compatible. Once a sequence is saved as a step sequence, it will always load in step mode.
- **Mute:** This button mutes all notes in the sequence. Hold the 'Mute' button to clear all the sequencer notes in the currently selected sequence.
- **Tempo:** Turning this encoder selects the tempo of the internal clock.
- **Length:** Holding the 'Shift' button and (or when latched in shift mode) turning this encoder allows you to select the length of the selected sequence.
- **Quantize:** Holding the 'Arp' button and turning this encoder allows you to select an input quantize value for the sequencer.
- **Seq Loop:** Allows you to loop certain parts of the sequencer. When the button is first pressed is the loop start point and when it is released becomes the loop end point. When a loop is active pressing the button again will disable the loop.

  When the sequence is configured in real time mode, the looped portion is quantized to 1/16th of the total sequence length.
- **Seq Hold:** Holds the current sequencer step and repeats it, like a beat repeater. When the button is released the sequencer carries on from the location it should have been before the step was repeated so it will still be in time.

  In real-time mode a 'step' is a 16th of the total sequence length, on release, the sequencer carries on playing from the current position

- **Linked Sequences:** This is a screen only parameter that allows you to link a sequence to a specific patch. This loads this sequence every time its linked patch is loaded. You can access this easily by pressing the Patch button and using the Page/Param encoder to scroll all the way to the right. Simply input the desired sequence number for that patch or select 'Off' for no linked sequence. Like any other patch parameter, the patch must be saved in order to retain the linked sequence number.

  Tip: When selecting a Linked Sequence, hold the Preset/Edit switch to select the current sequence.

Real-time Mode

The Real-time sequencer boasts a 512-note capacity and will record notes as you have played them in making this the ideal sketchpad for your musical ideas.

- **Recording:** Pressing record starts the sequencer recording. If the sequencer is not running when this is pressed and pre-roll is disabled, the sequencer will start. By default, a metronome will play whilst the sequencer is recording.

  Up to four parameters can be recorded while recording, one for each animation lane.

  Tip: You can enable or disable the metronome in the MODALapp or on-screen on the Settings – Seq page.
- **Length (Shift + Tempo):** Allows you to select the length of the selected sequence.
- **Quantize (Arp + Tempo):** Allows you to select an input quantize value for the sequencer. This setting is global and can be found on the screen on the Settings – Seq page.

Holding the Shift button and (or when latched in shift mode) holding the Anim1 / Anim2 / Anim3 / Anim4 buttons clear their respective animation lanes.

The Sequence position LED will always cycle 1 - 16 over the current sequence length. Eg. if the sequencer is set to 4 bars; it will take 4 bars for the sequencer LED to scroll from 1 to 16 (i.e.
not steps) If the sequencer is running, any sequencer length changes will only take effect at the
beginning of a bar.

Step Mode

The step sequencer is a 64-step, 8 note-per-step sequencer giving you full step-by-step control of your melodies and ideas. It also features a number of Step Modes that add powerful flexibility to deploy your sequences in a variety of setups and situations. Entering notes into the step sequencer can be achieved in three ways:

Step Input Mode

- Accessed when the sequencer is not playing, but is recording.
- The first note received will clear all notes in the sequence and reset the number of steps (great for starting again quickly).
- Sequencer step will progress when no notes are held, you can keep adding notes until all notes are released.
- You can also input animation data when in this mode, progressing through the steps by triggering notes or adding rests.
- Enter rest steps using the Arp rest button/shortcut.
- Exit this mode by toggling record or hitting play.

Step Edit Mode

- Accessed using Patch + Record when the sequencer is NOT recording, exit using the same combo or pressing Patch (not in Shift mode).
- Page mode + left screen encoder allows you to scroll through the notes and animator data for each step.
- Shift + page mode + left screen encoder allows you to scroll through only the currently selected page type for each step only (e.g. just notes pages, or, animation).
- Param mode + left screen encoder moves the cursor to change which value is being edited.
- Right screen encoder edits the value highlighted by the cursor.
- Pressing the right screen encoder triggers/previews the currently displayed step.
- Shift + holding the right screen encoder will clear a highlighted note.
- When the cursor is over a note value, note input (keyboard or MIDI) will set the highlighted value
- When the cursor is over an animator value, parameter changes (panel or MIDI) will assign an animation lane and/or set the highlighted value.

Overdub

- While the sequencer is playing, press Record to allow notes to be overdubbed into the sequencer.
- Any animated parameter changed while overdubbing will replace control values on the current step.
- here are two step overdub modes, found on the Seq page of the Screen:
- Replace - Note input will replace notes on a given step when overdubbing.
- Add - Note input will be added to notes on a given step when overdubbing.

The step sequencer also has the following parameters:

- **Num Steps:** Turning the Length encoder on the panel (Shift + Tempo) controls the number of steps that are played back without changing any of the step data, so can be used as a performance tool.
- **Step Length:** Turning the Quantize encoder on the panel (Arp + Tempo) controls the length of each step (globally) when the sequencer is running in clock step mode (see below).
- **Step Mode**: This is a screen only parameter that controls the way in which the sequencer steps advance. The modes are:

  Clock - Step sequencer will follow the same clock as the rest of CARBON8X, with the clock division set by the Step Length control.

  Each step will play until the start of the next step.

  This means you can run the step sequencer and the arp at different clock divisions.

  Gate - Sequence progresses when a note on is received and no other notes are held.

  Sequencer will play the current step until all notes are released.

  Only notes from the sequencer are sent to the voices. This means you can play back a sequence by pressing a single note repeatedly, varying the rhythm.

  You could also play chords and have the sequence progress with each new chord that is played.

  Tip: Using the arp with any of the gate modes allows the step sequencer to follow the rhythm of the arpeggiator exactly, complete with Swing and Gate Amount.

Gate Thru - The same as 'Gate' but all MIDI notes are sent to the voices.

Great for re-harmonising a sequence - record chords into the sequence, then play it back using a single finger to add a bassline.

Also useful for polyrhythms e.g. programming a 7-step sequence, then playing a 3 note arpeggio alongside.

Tip: Try gate triggered animation sequences - mute or clear the note lane and play notes to hear just the animation changes.

Gate Transpose - The same as 'Gate' but the sequence is transposed relative to middle C (note 60 / C4). Pressing note 60 repeatedly will play back the sequence as programmed, playing note 61 will play the sequence back 1 semitone higher than programmed

Great when used in conjunction with the Arp + Arp octave controls, playing back some sequence steps a few octaves above or below normal.

Sync Gate - Sequencer timing driven from the sync in port (rising edge). Allows you to drive the sequencer from external CV sources without affecting timing on the rest of CARBON8X.

CARBON8X will not follow sync timing when this mode is enabled. To use sync as the clock source for the whole synth, step sequencer will need to be in 'Clock' mode.

Sequencer LED's will cycle in groups of 16 steps, with the first four blue sequencer LEDs lighting to signify which group of 16 the sequencer is currently playing.

CARBON8X features 3 incredibly powerful independent and user configurable stereo FX engines and a separate per-voice waveshaping distortion pre-FX engine. These 3 slots can be rearranged in any order in series. 1>2>3. Any effect can go in any slot, but you may only use 1 type of each effect per preset plus any effect with "+" in the name will take up two slots.

- **FX Level:** Holding the 'Shift' button and (or when latched in shift mode) this encoder allows us to control the FX level amount within this patch. This parameter affects the Dry/Wet mix of the FX engine's audio output with the pre-FX signal. When set to minimum, only the dry signal will be heard. When set to maximum, only the FX engine's signal will be heard.
- **A:** This encoder allows us to control the first parameter of the selected effect.
- **B:** This encoder allows us to control the second parameter of the selected effect.

  Tip: Turn the 'FX1,2 and 3 B' encoder into the negative range to access synced delay times with delay type FX.
- **C:** This encoder allows us to control the third parameter of the selected effect.
- **D:** Holding the 'Shift' button and (or when latched in shift mode) this encoder allows us to control the fourth parameter of the selected effect.
- **E:** Holding the 'Shift' button and (or when latched in shift mode) this encoder allows us to control the fifth parameter of the selected effect.
- **F:** Holding the 'Shift' button and (or when latched in shift mode) this encoder allows us to control the sixth parameter of the selected effect.
- **FX1:** This button allows you to select the 1st FX slot for control with encoders A-F with a single click. With multiple clicks it will cycle through the effect type used in that slot.
- **FX2:** This button allows you to select the 2nd FX slot for control with encoders A-F with a single click. With multiple clicks it will cycle through the effect type used in that slot.
- **FX3:** This button allows you to select the 3rd FX slot for control with encoders A-F with a single click. With multiple clicks it will cycle through the effect type used in that slot.

Note: You can hold FX1, 2 or 3 when cycling through FX types to clear that slot.

You can press FX1 + FX2 + FX3 to jump to the 'FX Preset Load' page to save or load FX presets.

- **Delay Mode:** The delay mode control unlocks several different variations of delay, introducing new Clean and Long settings. This setting can also be found on-screen in the relevant FX slot page that any delay is loaded into. The modes are:

  - Colour: The original classic colouring delay that saturates and smears delay tails slightly.

  - Clean: A crystal clear delay with no smear to the feedback tails. Offers the same time scaling as Standard.

  - Long: Our pristine Clean delay with up to 4x Colour or Clean delay times.

FX Presets

CARBON8X can store up to 100 FX presets on board and comes loaded with 60 factory FX presets for you to instantly switch up your sound. FX presets range from simple single-FX presets to complex multi-FX presets.

To easily navigate to the FX preset page simply press all three FX slot buttons (FX1, FX2, FX3) at the same time. Loading an FX preset will apply preset FX settings to the currently loaded patch, but you need to save the patch to save the new FX settings to the patch.

FX Preset saving can be done on-screen once you have navigated to the FX preset pages. Saving here will save the FX settings from the currently loaded patch into the selected FX preset slot.

+ FX Types

Some FX types due to DSP limitations will take up two FX slots instead of one. These are indicated by using "+" in the FX name.

FX List

FX	A	B	C	D	E	F
Chorus	Dry:Wet Mix	Mod Depth	Mod Rate	Time	Feedback	Phase
Chorus V2	Dry:Wet Mix	Mod Depth	Mod Rate	Feedback	-	-
Phaser	Dry:Wet Mix	Mod Depth	Mod Rate	Frequency	Feedback	Phase
Phaser V2	Dry:Wet Mix	Mod Depth	Mod Rate	Frequency	Resonance	Pole Count
Flanger (Pos)	Dry:Wet Mix	Mod Depth	Mod Rate	Frequency	Feedback	Phase
Flanger (Neg)	Dry:Wet Mix	Mod Depth	Mod Rate	Frequency	Feedback	Phase
Unisoniser	Dry:Wet Mix	Detune	Stack Count	Width Reduce	-	-
Tremolo	Dry:Wet Mix	Phase	Rate	Shape	-	-
LoFi	Redux Amount	SR Redux	Bitcrush	BC Amount	Noise	-
Rotary	Dry:Wet Mix	LFO Rate	Vibrato	Balance	Width	-
Stereo Delay	Dry:Wet Mix	Time	Feedback	HPF	LPF	-
Ping-Pong Delay	Dry:Wet Mix	Time	Feedback	HPF	LPF	Width Reduce
X-Over Delay	Dry:Wet Mix	Time	Feedback	HPF	LPF	-
Reverb	Dry:Wet Mix	Time	Size	Dampening	Pre-Delay	Modulation
+ Reverb V2	Dry:Wet Mix	Time	Brightness	HPF	Modulation	Pre-Delay
EQ	Low Gain	Low Freq	Mid Gain	High Gain	High Freq	-
Compressor	Dry:Wet Mix	Threshold	Ratio	Attack	Release	Makeup Gain
Utility	Gain	Pan	Width	Bass Mono	Low Cut	-
Drive-M (Hard)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
Drive-M (Soft)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
Drive-M (Rectify)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
Drive-M (Fold)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
+ Drive-S (Hard)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
+ Drive-S (Soft)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
+ Drive-S (Rectify)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-
+ Drive-S (Fold)	Dry:Wet Mix	Drive	Makeup Gain	-	-	-

NOTE: All of the Drive-M FX are mono - the wet signal of the Drive-M FX will sum the stereo input to a mono output. This means that any stereo elements of the signal that precede a Drive-M FX (e.g. oscillator width, stereo FX placed in lowered numbered slots) will not retain their stereo width in the wet portion of the signal, however the stereo image of the dry signal will not be affected.

CARBON8X has a comprehensive Modulation Matrix with 12 Modulation Sources and 58 Modulation destinations. These Mod slots can be used to assign a combination of modulation sources to destinations, 8 modulation sources can be assigned to a single destination, or any other combination thereof. There are also 4 preassigned slots for common modulation routings. These preassigned modulations are:

- **Note>Cutoff:** Increase or decrease how much key scaling is applied to the cutoff frequency. Use the 'Cutoff Scaling' parameter to select the behaviour of the modulation curve.
- **Y+>LFO1-Depth:** Increases LFO1-Depth with Y+ on Joystick, commonly used to set up vibrato when LFO1 is controlling global pitch.
- **AftT>Cutoff:** Bipolar control to Increase or decrease filter cutoff frequency with aftertouch.
- **Velo>AEG-Depth:** Increases amount of velocity applied to the AEG-Depth. Commonly used as one way to increase velocity sensitivity of patches.

TIP: Try Velo>FEG-Depth for a more consistent, organic sounding velocity sensitivity.

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 of the 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.

LFO1, LFO2, LFO3, MOD-EG, Velo, AftT, Note, Expr, X+, X-, Y+, Y- can all be assigned to destinations from the front panel by holding their buttons on the front panel and turning the desired modulation destination encoder in a positive or negative direction.

Note. An LED flashing is used to indicate that the panel is in assign mode for the relative function to that LED.

ModSlots can be viewed on-screen by using the Velo + ModSlot combination which also gives access to screen only ModSlot Status control which allows you to activate or deactivate that slot.

- **Velo:** Pressing this button enters and exits the assign mode for velocity.
- **AftT:** Pressing this button enters and exits the assign mode for aftertouch.
- **Note:** Pressing this button enters and exits the assign mode for note / keytracking.
- **Expr:** Pressing this button enters and exits the assign mode for the expression pedal.
- **X+:** Holding the 'Shift' button and (or when latched in shift mode) pressing this button enters and exits the assign mode for Joystick X+.
- **X-:** Holding the 'Shift' button and (or when latched in shift mode) pressing this button enters and exits the assign mode for Joystick X-.
- **Y+:** Holding the 'Shift' button and (or when latched in shift mode) pressing this button enters and exits the assign mode for Joystick Y+.
- **Y-:** Holding the 'Shift' button and (or when latched in shift mode) pressing this button enters and exits the assign mode for Joystick Y-.
- **XYLock:** Holding 'Velo' and pressing this button locks the Joystick in the position it is held allowing you to let go and continue playing. Pressing this button again will unlock the Joystick.
- **Sustain:** Holding 'Velo' and pressing this button enables MIDI sustain. Pressing this button again disables MIDI sustain. Holding this button for one second when turning on Sustain will enable Sustain 'Latch Mode' - press and release a note / chord to sustain it, press a new note / chord to overwrite the existing one. This also works with the arpeggiator and provides the classic arpeggiator 'Hold' functionality.
- **ModSlot:** Pressing this button navigates to the ModSlot page on-screen. Repeatedly pressing this button cycles through all mod slot settings pages on the screen.

Holding any mod source button and turning the 'Depth' encoder allows you to set the global depth for that mod source (pre-assigned mod routings are not affected by the source's global depth value). When the screen is displaying a mod slot 'Depth' parameter (most easily accessed via assigning modulation using the panel or via the ModSlot button), hold the 'Edit' switch to clear the mod slot assignment.

To assign a mod source to an osc's global frequency destination, use either of the fine tune controls. 'Tune1' will be assigned to Osc1 tune, 'Tune2' will be assigned to Osc2 tune.

Valid combinations are listed here, combinations marked "•" are possible and marked 'X' are not possible:

Parameter	LFO1	LFO2	LFO3	MEG	NOTE	VELO	EXPR	AFTT	X+	X-	Y+	Y-
Filter Cutoff	•	•	•	X	•	•	•	•	•	•	•	•
Filter Reso	•	•	•	•	•	•	•	•	•	•	•	•
Filter Warp	•	•	•	•	•	•	•	•	•	•	•	•
Osc 1 Contour	•	•	•	•	•	•	•	•	•	•	•	•
Osc 1 Level	•	•	•	•	•	•	•	•	•	•	•	•
Osc 1 Pitch	•	•	•	•	•	•	•	•	•	•	•	•
Osc 2 Contour	•	•	•	•	•	•	•	•	•	•	•	•
Osc 2 Level	•	•	•	•	•	•	•	•	•	•	•	•
Osc2 Pitch	•	•	•	•	•	•	•	•	•	•	•	•
Osc XMod	•	•	•	•	•	•	•	•	•	•	•	•
Voice Glide	X	X	X	X	•	•	•	•	•	•	•	•
LFO1 Depth	X	X	X	X	X	X	•	•	•	•	•	•
LFO1 Rate	X	X	X	X	X	X	•	•	•	•	•	•
LFO1 Shape	X	X	X	X	X	X	•	•	•	•	•	•
LFO1 Transform	X	X	X	X	X	X	•	•	•	•	•	•
LFO2 Depth	•	X	•	•	•	•	•	•	•	•	•	•
LFO2 Rate	•	X	•	•	•	•	•	•	•	•	•	•
LFO2 Shape	X	X	X	X	•	•	•	•	•	•	•	•
LFO2 Transform	•	X	•	•	•	•	•	•	•	•	•	•
LFO3 Depth	•	•	X	•	•	•	•	•	•	•	•	•
LFO3 Rate	•	•	X	•	•	•	•	•	•	•	•	•
LFO3 Shape	X	X	X	X	•	•	•	•	•	•	•	•
LFO3 Transform	•	•	X	•	•	•	•	•	•	•	•	•
FEG Amount	•	•	•	X	•	•	•	•	•	•	•	•
FEG Attack	•	•	•	X	•	•	•	•	•	•	•	•
FEG Decay	•	•	•	X	•	•	•	•	•	•	•	•
FEG Sustain	•	•	•	X	•	•	•	•	•	•	•	•
FEG Release	•	•	•	X	•	•	•	•	•	•	•	•
AEG Amount	•	•	•	X	•	•	•	•	•	•	•	•
AEG Attack	•	•	•	X	•	•	•	•	•	•	•	•
AEG Decay	•	•	•	X	•	•	•	•	•	•	•	•

Parameter	LFO1	LFO2	LFO3	MEG	NOTE	VELO	EXPR	AFTT	X+	X-	Y+	Y-
AEG Sustain	•	•	•	X	•	•	•	•	•	•	•	•
AEG Release	•	•	•	X	•	•	•	•	•	•	•	•
MEG Amount	•	•	•	X	•	•	•	•	•	•	•	•
MEG Attack	•	•	•	X	•	•	•	•	•	•	•	•
MEG Decay	•	•	•	X	•	•	•	•	•	•	•	•
MEG Sustain	•	•	•	X	•	•	•	•	•	•	•	•
MEG Release	•	•	•	X	•	•	•	•	•	•	•	•
FX-1 A	•	X	X	X	X	X	•	•	•	•	•	•
FX-1 B	•	X	X	X	X	X	•	•	•	•	•	•
FX-1 C	•	X	X	X	X	X	•	•	•	•	•	•
FX-1 D	•	X	X	X	X	X	•	•	•	•	•	•
FX-1 E	•	X	X	X	X	X	•	•	•	•	•	•
FX-1 F	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 A	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 B	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 C	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 D	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 E	•	X	X	X	X	X	•	•	•	•	•	•
FX-2 F	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 A	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 B	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 C	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 D	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 E	•	X	X	X	X	X	•	•	•	•	•	•
FX-3 F	•	X	X	X	X	X	•	•	•	•	•	•
FX Amount	•	X	X	X	X	X	•	•	•	•	•	•
Global Pitch	•	•	•	•	•	•	•	•	•	•	•	•

- **Oct -/+:** These buttons control the key range available along the keyboard.

  Tip: You can use this while holding notes to access unavailable notes. Particularly handy when used in conjunction with Sustain and Chord mode.

- **Transpose:** Holding this button enters Transpose mode. Here you can directly transpose the pitch of both oscillators using the keyboard. C2 (directly beneath the Transpose button) is the default position. Keys below this transpose down 1 semitone per key and keys above transpose up 1 semitone per key.

  Note: Using transpose will not trigger a new note. If you are using low EG settings you may not notice the change. This can be used to great effect while sequencing the synth from its Arp or Seq or from external sources.

  Note. Pressing Transpose without entering any key values will reset transposition to 0. Transpose is a performance feature and as such is not saved per patch. It will remain until it is either reset, turned off or the unit is power cycled.

- **Chord:** Pressing this button while holding a chord (input directly from the keys or via incoming MIDI) stores this chord and enables chord mode. This chord can then be played from a single note trigger until the chord is changed, or chord mode is disabled. To change a chord, simply turn Chord mode off and repeat the process holding your new chord shape. To exit simply press the Chord button again. The Chord function is a performance feature and as such is not saved per patch. It will remain until it is either reset or the unit is power cycled.

- **Mono:** This button selects Mono voice mode for the current patch. 4 oscillators will be stacked into a single voice

- **Poly:** This button selects polyphonic voice mode for the current patch. 8 voice stereo true polyphonic path all the way to the stereo FX engine input.

- **Unison:** This button selects Unison voice mode. Cycle through to choose between Unison-2, Unison-4 or Unison-8. These are monophonic voice modes where multiple voices are stacked and detuned, the number reflects the number of voices per note.

- **Stack:** This button selects Stack voice mode. Cycle through to choose between Stack-2 or Stack-4. These are polyphonic voice modes where multiple voices are stacked. Stack-2 offers 4-note polyphony and Stack-4 offers 2-note polyphony.

- **Drift:** This encoder controls the voice drift amount. This is the amount of slop or random detuning of each oscillator's phase and tune per note.

- **Vintage:** Holding the 'Patch' button and turning the 'Mix' encoder controls Vintage. This emulates the behaviour of vintage synths by introducing variation between the voices

- **Width:** Holding the 'Shift' button and (or when latched in shift mode) turning this encoder controls the voice width of the current patch. This sets how far left and right the alternating pan of the voices is from mono at 0 to hard panned & wide at 127.

- **Chord Invert:** Holding the 'Patch' button and turning the 'Drift' encoder controls Chord invert. Chord invert looks at the notes that are being played across the voices on the synth, then adds octave offsets to these notes depending on the setting:

  Oct 1 : n - adds 1 octave to the lowest n notes in the chord, inverting the chords in the traditional way

  Oct 2 : n - adds 2 octaves to the lowest n notes in the chord and 1 octave to all other notes

  Even 1 : n - adds 1 octave to the lowest n even notes in the chord i.e. the 2nd, 4th, 6th and 8th notes

  Odd 1 : n - adds 1 octave to the lowest n Odd notes in the chord i.e. the 1st, 3rd, 5th and 7th notes

  Shuffle 1 - adds an extra octave to each additional note in the chord up to 3 octaves. i.e 1 octave added to the 2nd note, 2 octaves to the 3rd note, 3 octaves to the 4th note, 1 octave to the 5th note

  Shuffle n - the same as shuffle 1 but with different orderings of octave offsets

  Note - Chord invert looks at the state of the synth voices rather than MIDI note input, so pressing a 3 note chord with "Stack-2" voice mode will be counted as a 6-note chord. You can take advantage of this for huge stereo pads by combining Chord Invert, Stack and Voice Width/Drift settings.

Joystick + Audio Input

Joystick

The joystick can be assigned to multiple destinations in any of the X or Y directions. The Joystick position can be locked or unlocked using the Velo + XYLock button combination. This locks the joystick at whatever value it was held at while the buttons were depressed.

The X axis controls pitch bend as standard, but this can also be turned off (on-screen: Joystick: Pitchbend status or on MODALapp) it also sends MIDI pitch bend messages which can also be toggled on or off in the global settings.

Y+ sends MIDI mod wheel data (CC1) which can also be toggled on or off in the global settings.

Audio In

The audio inputs route audio directly into the 3-slot stereo FX engine although this can also be bypassed if you want to use the Audio In to only mix in the audio input with the synths output. The Audio In settings (Audio-In Volume, FX Bypass) are temporary and will not be saved so will need to be reset when using upon each boot.

Audio Output + Gain

CARBON8X provides a sophisticated gain structure, for advanced output level adjustments: The Gain Boost setting applies to all patches and increases the average output level.

It also manages the range of the Patch Gain control, allowing you to balance even the quietest patches, and dramatically improves the audio quality while decreasing noise floor, so adding gain from external sources won't introduce unwanted noise.

Because CARBON8X employs a limiter as the final stage before output in its audio signal path, headroom for dynamics might be reduced as a result of higher gain levels.

Note: The main outputs on CARBON8X are designed to output Line Level signals, so existing patches that are already close to the maximum output level will not become dramatically louder with this update.

- **Patch Gain:** Per-patch gain adjustment for balancing patches relative to each other. Values in the range 0-100 should be transparent to use on any patch that needs it, moving the control past 100 can begin to saturate the limiter on some patches. Note that this can be used creatively.
- **Gain Boost:** Global gain boost that increases average output level, there are 3 settings:

  Off - full dynamic range

  Normal - boost to output volume (Default Setting)

  Saturate - a large boost to output volume, potentially saturating the internal limiter. You may notice that dynamic range is reduced with this setting on, although this has creative uses.

  Gain boost setting will be saved automatically
- **Headphone Volume:** Headphone output volume can vary dramatically depending on which model of headphones is connected. This global control adjusts the output range of the headphone out to compensate for this variance and prevent unsafe listening levels.
- **Main Volume:** Master output volume of the synth, post limiter. Controls the output volume of both the headphone out and the main outputs. For the best signal to noise, set this to 127.

General

- **Clock Source:** Sets the clock source for the CARBON8X with the following available options: Internal, MIDI, Sync-In, Auto, Master. If Master is selected then CARBON8X will ignore incoming clock sources and output MIDI clock messages at all times. If 'Auto' is selected then the CARBON8X will automatically use any detected clock source (prioritising Sync-In over MIDI) else it will use the internal clock. Please note that if 'MIDI' or 'Sync-In' is selected whilst there is no MIDI or Sync-In clock present then clocked-synced functions (sequencer, arpeggiator, delay FX, LFOs) may not work correctly or at all.
- **Global Tune:** Sets the global tuning of the CARBON8X with a range of +/- 1 semitone. You may need to adjust this if using the CARBON8X with other synthesisers that are not tuned to the standard tuning (e.g. old analogue synthesisers).
- **Polychain Master:** Sets this CARBON8X to be the master in a polychain setup. When active any changes on this CARBON8X will be mirrored on the others.
- **Preset Auto-Load:** Toggles if presets are loaded with or without confirming with a press of the Preset knob. If enabled when scrolling through presets a preset will be loaded automatically after a short pause.
- **Reset:** Press the 'Edit' switch and follow the confirm instructions to reset all global settings to the factory default settings. Please note that this will also reset the Main Volume and Tempo parameter values.

MIDI

- **Channel:** Sets the MIDI channel that the CARBON8X uses for both MIDI input (the MIDI-in messages channel that the device will respond to) and MIDI output (the channel for the transmitted MIDI messages).
- **Omni:** Enables the CARBON8X to be configured to 'Omni Mode', where it will respond to MIDI-in messages on any MIDI channel.
- **Pitch Bend Range:** Sets the CARBON8X pitch bend range - in semitones - for both MIDI-in Pitch Bend messages and the joystick X axes.

  Note. If MPE Mode is enabled then this sets the pitch bend range MPE master channel messages only, where the MPE Pitch Bend Range setting should instead be used for configuring MPE member channel messages
- **MPE Mode:** Enables / disables MPE Mode for compatibility with external MPE instruments. Please note that you cannot enable both MPE Mode and Polychaining simultaneously.
- **MPE Master Channel:** Sets the MPE Master Channel for MPE Mode. Please note that if using external non-MPE MIDI controllers or software when MPE Mode is enabled, please set their output MIDI channel to match this MPE Master Channel value to ensure correct behaviour.

- **MPE Number of Channels:** Sets the number of MPE member channels to use in MPE Mode.
- **MPE Pitch Bend Range:** Sets the pitch bend range / sensitivity - in semitones - for MPE member notes in MPE Mode.
- **DIN In:** A set of MIDI filter settings for enabling / disabling the CARBON8X from responding to certain types of MIDI-in messages from the MIDI DIN-in port.
- **DIN Out:** A set of MIDI filter settings for enabling / disabling the CARBON8X from transmitting certain types of MIDI-in messages from the MIDI DIN-out port.
- **DIN Thru:** Enables a 'Soft MIDI Thru' mode for the DIN ports, where messages received by the DIN-in port are forwarded to the DIN-out port.
- **USB Thru:** Enables a 'Soft MIDI Thru' mode for all MIDI sources, where messages received by the DIN-in port are forwarded to USB-out and messages received by USB-in are forwarded to DIN-out.
- **Arp/Seq Out:** Enables the CARBON8X arpeggiator and / or sequencer to transmit notes to the MIDI-out ports. When arp out is enabled the internal keyboard notes will not be transmitted to MIDI-out. Please note that MIDI-in notes that are being arpeggiated will also be transmitted to MIDI-out if arp out is enabled, which may cause MIDI loop / echo issues in complex MIDI setups.
- **In Oct Offset:** Enables / disables the Keyboard Octave parameter from transposing MIDI-in notes
- **MIDI-in Monitor:** The MIDI-in Monitor is a useful tool to use if needing to verify if the CARBON8X is receiving MIDI messages. It will display the data of any MIDI message that CARBON8X can respond to and will ignore the current MIDI channel and filter settings.

  The MIDI monitor will provide the following information for each received message:

  Source - USB or DIN

  Message type - Note-on ("NOn"), Note-off ("NOf"), Control Change ("CC"), Program Change ("PC"), Channel Aftertouch ("CAt"), Pitch bend ("PB"), System Exclusive ("Sys"), Clock Start ("Srt"), Clock Continue ("Con"), Clock Stop ("Stp")

  Channel

  Message data / values

  Incoming clock timing messages are displayed in the top right corner of the screen, where a "U" indicates it is receiving USB clock messages and a "D" indicates it is receiving DIN clock messages.

  Please note that it will only display messages that are received whilst the MIDI Monitor screen is being displayed.

  Press the 'Edit' switch to exit the MIDI Monitor.

Keyboard

- **Local:** Enables / disables the internal keyboard's connection with the internal sound engine. If you are using CARBON8X with an external sequencer you may need to set the Local setting to 'Off' to eliminate the double-triggering of notes caused by MIDI loops / echoes.
- **Velocity Curve:** Sets the velocity curve / sensitivity for notes from the internal keyboard. There are six curve options - Very Light, Light, Normal, Heavy, Very Heavy, Fixed. Select 'Light' or 'Very Light' if you play keys lightly but would like the device to respond as though they were played harder; select 'Heavy' or 'Very Heavy' if you play keys heavily but would like the device to respond as though they were played lighter; or select 'Fixed' to have a constant velocity value of 127 (maximum velocity).
- **Aftertouch Curve:** Sets the aftertouch curve / sensitivity for the internal keyboard. There are five curve options - Very Light, Light, Normal, Heavy, Very Heavy. Select 'Light' or 'Very Light' if you want more control over the upper range of values of the aftertouch response; or select 'Heavy' or 'Very Heavy' if you want more control over the lower range of values of the aftertouch response. There are three sets of these curves - 1-3 - if you find you are not able to reach the maximum aftertouch value please increment this set number.

Sequencer

- **Metronome:** Enables / disables the metronome click track for sequence recording. Please note that the sequencer pre-roll (if enabled) will always contain the metronome.
- **Pre-Roll:** Sets the sequence recording pre-roll length to determine how many bars of the metronome click track you hear before the recording starts.

  Note: Metronome and Pre-Roll are only available for realtime sequences
- **Quantize:** Sets the sequencer note recording input quantize value to ensure that played notes can be kept in time. Please note that this is an input quantize setting and therefore cannot be used to adjust previously recorded notes.
- **Transport:** Enables / disables the sequencer transport to be controlled by MIDI Clock Start / Continue / Stop messages from USB-MIDI. You may want to disable this behaviour if using CARBON8X with an external MIDI sequencer.

Joystick

- **Mod Wheel Out:** Enables / disables the joystick Y+ axis from transmitting MIDI Modulation Wheel messages (MIDI CC 1) to MIDI-out. You may want to disable this behaviour if the CARBON8X is connected to other synthesisers that responds to MIDI Modulation Wheel messages.
- **Pitch Bend Out:** Enables / disables the joystick X axes from transmitting MIDI Pitch Bend messages to MIDI-out. You may want to disable this behaviour if the CARBON8X is connected to other synthesisers that respond to MIDI Pitch Bend messages. Please note that if this is disabled the joystick X axes will instead transmit CC messages for MODALapp communication.
- **X+ / X- / Y+ / Y- Calibration:** These are manual calibration settings for adjusting the usable travel range of each axis of the joystick.

  Increase this value if the joystick axis is not reaching the top modulation / MIDI value (especially in the corner positions), however if too large the usable travel range will be massively reduced. Decrease this value if the joystick axis has a small usable travel range, however if too small the joystick may not reach the top modulation / MIDI value.
- **Centre Calibration:** This is a manual calibration setting for adjusting the centering of the joystick.

  Increase this value if the joystick is not properly returning to the 'centre' value (it sends sporadic values when untouched or is too sensitive in its resting position), however if too large the usable travel range of each axis will be reduced.

  Decrease this value if the joystick doesn't respond to small movements around the centre position, however if too small the joystick may not centre properly.

Screen

- **Brightness:** Sets the brightness / contrast of the CARBON8X screen.
- **Switch:** Sets the screen 'Page Switch' / 'Context Sensitivity' mode to determine how the screen responds to certain panel control interactions and MIDI-in messages.

  There are three main Page Switch modes - Regular, Smart, Off; and the first two modes contain three sub modes - All, Panel, MIDI.

  The 'Regular' mode causes the screen to switch to the page of the adjusted parameter and stay on the page until another parameter is adjusted; the 'Smart' mode causes the screen to switch to the page of the adjusted parameter but then switch back to the previous page after two seconds, where the 'previous' page will be the page accessed via either the screen 'Page / Param' control, the Patch / Seq button, or the FX1 + FX2 + FX3 button combination.

  The sub-mode of each mode sets the parameter source - the panel, MIDI-in, or both.
- **Saver:** Sets the idle time for the screen's screensaver. A smaller time will increase the lifetime of the screen.

LEDs:

- **Brightness:** Sets the brightness of the panel LEDs.

Expression Pedal

- **Pedal Type:** Allows you to configure the CARBON8X to work with various types of expression pedals.

  There are two main modes here (TRS and RTS) where each mode has three sub modes (1-3).

  Select a 'TRS' polarity mode if you are using a TRS expression pedal (or an expression pedal with a polarity switch, set to the TRS polarity) - this is the most common polarity of expression pedals. Select an 'RTS' polarity mode if you are using an RTS expression pedal which contains no polarity switch. If your pedal does not contain a polarity switch and you are unsure of its polarity, if the CARBON8X isn't responding to your pedal correctly (e.g. full modulation range can't be obtained, modulation curve is skewed), it is likely that you need to switch the CARBON8X polarity mode. Please note that expression pedals with the TS polarity will not work with CARBON8X.

  Select the '1' sub-mode for expression pedals with a resistance of 10k; select the '2' sub-mode for expression pedals with a resistance of 20k or 25k, or select the '3' sub-mode for expression pedals with a resistance of 50k or above. If you are unsure of the resistance of your expression pedal then select the '1' sub-mode - this will work with the majority of expression pedals but you may find that the maximum modulation happens before the pedal completes its movement (but selecting '2' or '3' instead may improve on this).

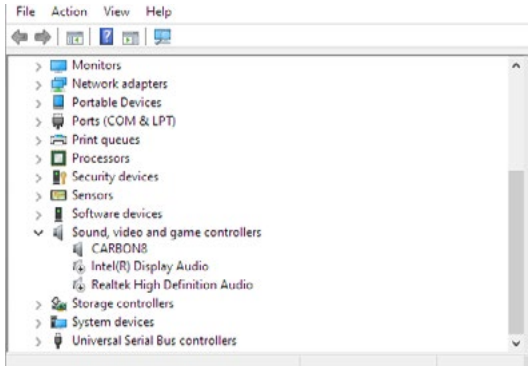
  If you are unable to configure CARBON8X to work adequately with your expression pedal using this setting, you may need to use a TRS Polarity Adapter.

04
MIDI

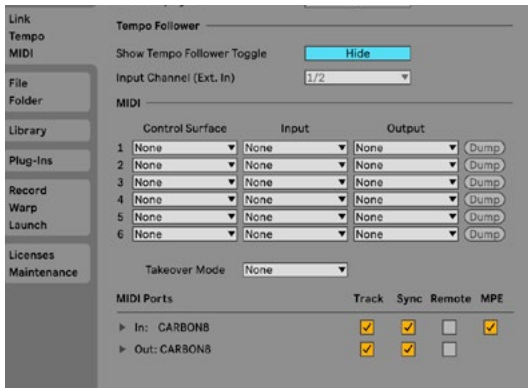
CARBON8X is a fully class-compliant USB-MIDI device, meaning you can plug it into your computer, no drivers required, and gain access to a huge array of extra features. Simply plug the CARBON8X synthesiser into a USB port and it will show up as a MIDI input and output device in any software that supports external MIDI devices.

On macOS, CARBON8X will show up in 'Midi Studio', found in Applications > Utilities > Audio MIDI Setup. (Once open, select Window > Show MIDI Studio)

On Windows, CARBON8X 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 Channel

On CARBON8X the MIDI channel can be set in the on-screen settings, or with the MODALapp. You can also change additional MIDI settings in the on-screen settings pages or in the settings tab of MODALapp.

MIDI Output

CARBON8X can sequence your DAW or any device that can send MIDI notes over USB, MIDI or CV clock using the keyboard, sequencer or the arpeggiator.

The keyboard sends MIDI Channel Aftertouch messages and the Joystick can send MIDI Pitch Bend messages.

All of the encoders on CARBON8X output MIDI messages (The appropriate CC message depending on the SHIFT or panel state). This allows CARBON8X 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 keys also send the appropriate MIDI notes for the Octave range and scale that they are programmed to.

MIDI Input

CARBON8X 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 CARBON8X or control any of the parameters featured in the CC Implementation List.

MIDI Clock

Configure your DAW and MIDI devices to send or receive MIDI clock (Sync) to or from CARBON8X and, when 'Auto' is selected it will automatically configure itself to work in time with your track tempo. When no clock is detected, the CARBON8X will continue to use whatever tempo it is internally configured to. To use CARBON8X as a master MIDI clock, set Clock Source to 'Master'.

MIDI Soft Thru

CARBON8X 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

Program Change

Sending a bank change (0-4) followed by a program change (0-99) to CARBON8X will load the relevant preset.

Sync

The analogue sync connections on CARBON8X are configured to use a 3.3v, rising edge, 1 pulse per 16th note signal. This is used to syncopate any other gear that is CV clock enabled with your device. **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 the 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

CARBON8X has app-configurable midi filters on the Din input and output:

Notes, CC, Program Change, Aftertouch, Pitch Bend, Transport, Clock and Sysex.

By default Din IN allows all message types, and Din OUT allows all message types except clock.

MIDI In Omni

MIDI can be made omni within the Settings pages or in the Settings tab of MODALapp. Omni mode makes CARBON8X listen to all midi channels, for all received midi (din or usb). Transmitted midi is still sent out on CARBON8X's current midi channel.

CC	Function
0	Bank Change
1	Mod Wheel
2	-
3	LFO3 Rate
4	-
5	Glide
6	-
7	Main Volume
8	-
9	Voice Mode
10	-
11	Expression Pedal
12	LFO3 Transform
13	LFO3 Depth
14	Osc1 Tune
15	Osc1 Fine
16	Osc1 Contour
17	Osc2 Contour
18	Osc XMod
19	Osc1 Level
20	Osc2 Level
21	OscMod Mode
22	LFO3 Shape
23	FEG Decay
24	FEG Sustain
25	FEG Release
26	AEG Attack
27	AEG Decay
28	AEG Sustain
29	AEG Release
30	Osc2 Tune
31	Osc2 Fine

CC	Function
32	FEG Amount
33	Filter Warp
34	Filter Cutoff
35	Filter Resonance
36	LFO1 Rate
37	LFO1 Depth
38	-
39	LFO1 Shape
40	Octave
41	Delay Mode
42	Filter Type
43	MEG Attack
44	MEG Decay
45	MEG Sustain
46	MEG Release
47	LFO2 Rate
48	LFO2 Depth
49	MEG Depth
50	LFO2 Shape
51	AEG Depth
52	LFO MIDI Sync
53	Arp Gate
54	LFO Modes
55	Delay MIDI Sync
56	LFO1 Transform
57	LFO2 Transform
58	Arp Status
59	Arp Octave
60	Arp Direction
61	Arp Division
62	Osc1 Core
63	Osc2 Core

MIDI CC Implementation Chart

CC	Function
64	Sustain Pedal
65	-
66	-
67	Seq Length
68	Seq Lane on/off
69	Seq Clear Lane
70	Seq Hold
71	Seq Loop
72	Seq Record
73	Global FX Amount
74	-
75	Transpose
76	Tempo MSB
77	Tempo LSB
78	Swing
79	Seq Quantise
80	AEG Type
81	FEG Type
82	MEG Type
83	Audio In
84	All EG Attack
85	All EG Decay
86	All EG Sustain
87	All EG Release
88	ModSlot 1 Depth
89	ModSlot 2 Depth
90	ModSlot 3 Depth
91	ModSlot 4 Depth
92	ModSlot 5 Depth
93	ModSlot 6 Depth
94	ModSlot 7 Depth
95	ModSlot 8 Depth

CC	Function
96	Chord Mode
97	-
98	-
99	-
100	ModSlot 1 Source
101	ModSlot 2 Source
102	ModSlot 3 Source
103	ModSlot 4 Source
104	ModSlot 5 Source
105	ModSlot 6 Source
106	ModSlot 7 Source
107	ModSlot 8 Source
108	ModSlot 1 Dest
109	ModSlot 2 Dest
110	ModSlot 3 Dest
111	ModSlot 4 Dest
112	ModSlot 5 Dest
113	ModSlot 6 Dest
114	ModSlot 7 Dest
115	ModSlot 8 Dest
116	Joystick X+
117	Joystick X-
118	Joystick Y-
119	Patch Gain
120	All Sound Off
121	Reset All Controllers
122	-
123	All Notes Off
124	Omni Off
125	Omni On
126	-
127	-

MPE

MIDI Polyphonic Expression (or MPE) is a method of using MIDI to enable expressive electronic musical instruments to control multiple dimensions of sound polyphonically. In MIDI, channel-wide messages (such as pitch bend, CCs, and channel aftertouch) are applied to all notes being played on a single channel; therefore, in MPE each note is assigned its own channel so that those messages can be applied to each note individually.

An MPE instrument typically has three dimensions of expression / control – left-right (X-axis); front-back (Y-axis); and pressure (Z-axis) – each axis can be mapped to various parameters of sound and be applied on a per-note basis.

CARBON8X is an MPE-compatible synthesiser, which means any valid MPE instrument / controller can control multiple parameters of CARBON8X's sound engine polyphonically. The majority of the CARBON8X parameters can be controlled by MPE.

Setting up MPE on CARBON8X

Enabling CARBON8X to respond to MPE involves the following steps:

1. Navigate to the MIDI settings controls on the screen
2. Set 'MPE Mode' to 'On'
3. Set 'MPE Master Channel' to match that of your MPE instrument. Your MPE instrument may refer to this as its 'MPE Zone' – 'Lower Zone' uses channel 1 and 'Upper Zone' uses channel 16. Some MPE instruments may not specify a Master Channel / Zone – in this case the most likely value to use here is '1'. Please refer to the MPE instruments settings or documentation for more information.
4. Set 'MPE Number of Channels' to match that of your MPE instrument. It is recommended to set this value as high as possible (on both your MPE instrument and CARBON8X) to take full advantage of CARBON8X's polyphony. Some MPE instruments may not specify a Number of Channels – in this case the most likely value to use here is '15'. Please refer to the MPE instruments settings or documentation for more information.
5. Set 'MPE Pitch Bend Range' to that of your MPE instrument. Your MPE instrument may refer to this as its 'Pitch Bend Sensitivity'. Some MPE instruments may not specify, or use, a fixed Pitch Bend Range – in this case use this value to set your preferred semitone range of the MPE X-axis. Please refer to the MPE instruments settings or documentation for more information.

MPE

Each MPE dimension is mapped to the CARBON8X sound engine as follows:

- Left-right / X-axis (sent as MIDI Pitch Bend) – This controls the pitch of the note, with the range set using the 'MPE Pitch Bend Range' global setting (see above).
- Front-back / Y-axis (sent as MIDI CC 74) – This controls the CARBON8X Y+ modulation assignments.
- Pressure / Z-axis (sent as MIDI Channel Aftertouch) – this controls the CARBON8X Aftertouch modulation assignments.

As the MPE Y and Z dimension assignments are built into CARBON8X's existing modulation matrix, these assignments are saved and recalled with each patch.

Using MPE on CARBON8X

If using MODALapp / MODALplugin please ensure that you are running the version (or above) of MODALapp / MODALplugin released with CARBON8X firmware v2.0 to ensure correct communication between the app / plugin and the CARBON8X.

If using in conjunction with non-MPE MIDI controllers or software, please set their output MIDI channel to match the CARBON8X's 'MPE Master Channel' to ensure correct behavior.

CARBON8X MPE limitations:

- If Y+ or Aftertouch is assigned to any global sound parameters (LFO1 or FX parameters) then these parameters will change for all notes / voices and only the latest / newest MPE note will have control of these parameters.
- MPE is not available in Polychain mode
- MPE expression data cannot be recorded into the CARBON8X sequencer, and any MPE notes recorded into the sequencer are converted into 'master' notes.
- CARBON8X doesn't support MPE 'MIDI Mode 4' ('one channel per string' voice allocation).

Polychain

You can connect any 2 CARBON8X models together to give 16 voices using polychain.

First, connect the desired master CARBON8X DIN MIDI Out to your desired slave CARBON8X DIN MIDI In.

On the master CARBON8X navigate to 'Settings (General) > Polychain Master' and turn this on.

The slave device should now be showing all voice mode LEDs lit and 'Polychain Slave' on-screen.

When In Polychain mode, the slave CARBON8X panel is disabled along with the keyboard.

Polychain mode can be exited by turning off the 'Settings (General) > Polychain Master' setting on the master CARBON8X or by rebooting the synthesisers.

Note: Polychain can only be enabled when not in MPE mode

05
Update

The firmware on CARBON8X can be updated remotely. This means that you will be able to update your CARBON8X to the latest version each time an update is released.

You can update CARBON8X using the MODALapp.

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

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

DO NOT run any other MIDI software that could be sending messages to CARBON8X during the update process.

06
MODALapp

MODALapp adds visual feedback for CARBON8X (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
- Preset Manager page for preset management, backup and import
- Modulation page to quickly view and edit the current patch modulation settings
- FX page for selecting and editing the 3 stereo FX engines on CARBON8X
- Sequence page for live sequence controls and editing the 4 parameter animation rows
- Keyboard page for playing CARBON8X directly from your device as well as access to other keyboard settings
- Settings page to configure MIDI settings and update the firmware

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

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

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.

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 CARBON8X has been detected, at which point you will see the Editor page appear.

Playing CARBON8X

At this point you can play your CARBON8X with any MIDI controller! MODALapp forwards all incoming MIDI to CARBON8X automatically. Just make sure that your MIDI controller is sending to the same MIDI channel you're CARBON8X is assigned to.

This is the main section for patch design / editing. You will find keyboard/voice, oscillator, filter, and envelopes here.

The currently selected preset is shown at the top. 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.

There is also access to play, record, tempo options as well as sliders for patch gain and volume.

Across the middle there are the 12 modulation slots with 8 user configurable and 4 pre defined. Only valid modulation destinations for the respective source will be shown in the drop down menu.

In the Preset Manager Tab there are options to curate, move, backup or import presets. There are 100 presets per bank that can be viewed by scrolling in the preset list.

Presets can be loaded with a double click and they can be renamed with two slow clicks. To move a preset simply click and drag it into your desired location. Dragging the preset to either edge of the preset manager window will start it scrolling in that direction. Different banks can be accessed by dragging the selected preset over the bank button.

Multiple presets can be selected by holding shift, ctrl or cmd and clicking. Shift clicking will select a block of presets and cmd or ctrl clicking will select individual presets. Once multiple presets are selected you can start moving them by clicking on a selected preset and dragging. Right clicking on a selected preset allows renaming and exposes the exporting or importing options. Exporting will copy and send all of the selected presets to the selected folder. Importing will overwrite all of the selected presets in the preset manager with the presets selected from your computer.

Preset Manager + Modulation Tab

You may also right click on a bank to expose exporting and importing options of the entire bank (as individual .syx files)

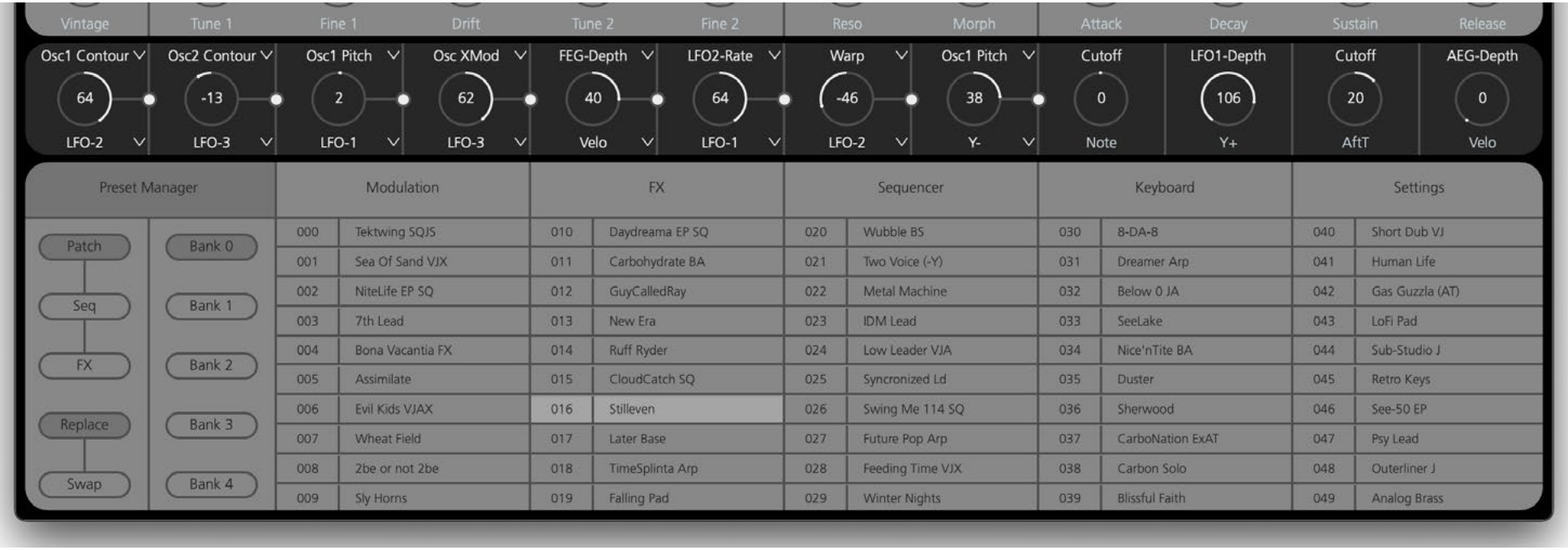
All actions will display a confirmation window unless the yes to all button has been clicked. In which case no confirmation window will appear for the rest of the session.

On touchscreens a single tap will be the equivalent of a cmd or ctrl click. Holding a selected preset will start a move action

In the Modulation Tab there is access to the parameters for LFO1, LFO2, LFO3 and MOD-EG.

There is also an XY pad that will emulate the movements of the Joystick on CARBON8X as well as options for pitch bend and XYLock so that the XY pad will not return to zero on release.

Finally there is also access to the global depths of the 8 modulation sources Velo. Aftertouch, Note, Expression Pedal and the 4 Joystick axes.



In the Sequencer Tab you can choose sequence type, load, initialise and save any of the Seq presets as well access the live sequence controls such as Length, Hold, Loop and Quantize.

When in Step Seq you can also scroll through steps displayed in groups of 16.

There is a drop down to select the current row and to the right of this a clear button for the current row. There are then the 5 mute buttons for the note row or any of the 4 parameter animation lanes.

NOTE: Editing of notes is only available for step sequences & there is no undo functionality.

Assigning some steps: A new sequence won't have any steps assigned to it and it will appear greyed out until you assign some steps using the front panel or by adjusting the 'Steps' control on the panel to the left.

Navigation: The visible key range (vertical) can be controlled using the controls to the left of the piano roll. The +/- buttons can be used to control how many notes are displayed and the slider can be used to set which note range is displayed. You can also move the view up and down by scrolling.

If you have a trackpad then the zooming gesture will have the same effect as pressing the +/- buttons. Visible step range (horizontal) can be changed by clicking the +/- controls on the top bar or scrolling left/right.

Draw Mode: To create some notes, ensure the draw button on the top bar is highlighted (this will be by default) and click or drag on any of the empty slots in the display below. Click on a note to clear it, click and drag on a note to erase a selected area. There are two modes to change the vertical drag behaviour:

Drag: Notes will be created with a default velocity of 63, click and drag vertically to change the pitch of the created note(s)

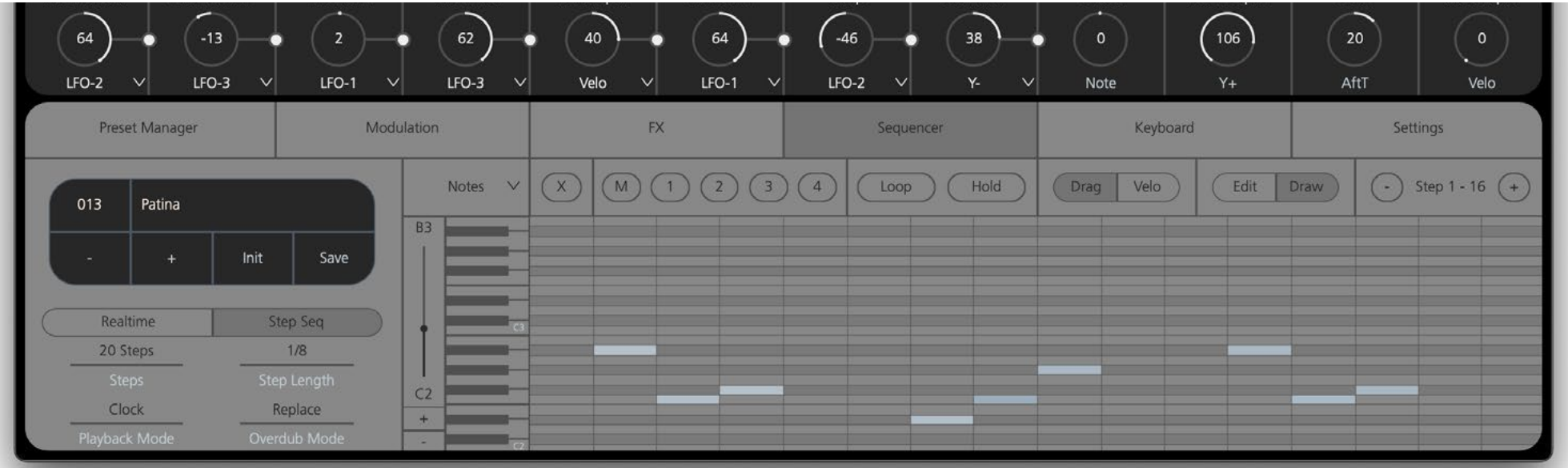
Velo: Dragging vertically will change the velocity of the created notes as you drag

Edit Mode: To edit notes, ensure the draw button on the top bar is highlighted.

It's a lot like you'd expect from any old piano roll, clicking on an untoggled note or dragging over some toggled ones will select them. It is also possible to delete notes by pressing backspace while you have some notes selected. Selected notes will have a bar through them that indicates their velocity. Once they're selected you can click on one of the active ones you just selected and drag it vertically- it'll do one of two things depending on the mode selected:

Drag: Will move all of the notes in pitch and step - if you hold down the alt or option key it will try to copy the notes

Velo: The velocity of all notes will be edited relative to the velocity they had at the start of the operation.



In the FX Tab you can load, initialise and save any of the FX presets as well edit any of the global FX parameters such as Level and Distortion.

The FX preset selection box on the left will display that no preset is loaded if an fx parameter is altered in any way, e.g. changing an fx parameter on CARBON8X or loading a patch.

Also, on this page you will find the external Audio In parameter that controls the amount of Audio In signal sent through the 3 stereo FX engines.

Finally, there is access to the 3 stereo FX engines that show the currently selected FX in each slot and their respective controls.

In the Keyboard Tab there is a MIDI controller that can be used to play notes on CARBON8X from your device. There are pitch bend and mod wheels as well as 3 buttons to determine how many octaves are shown on the screen at one time. The piano keyboard can be scrolled using the top scroll bar.

There is also access to the Arpeggiator controls and transpose/chord options.

In the Settings Tab there are options for updating your CARBON8X to the latest versions. MODALapp will notify you when a new update is available.

To have the app update the screen in realtime, the page switch mode needs to be set to one of the (All) or (MIDI) options.

Finally there is access to the other settings available on CARBON8X. For a list of all settings available please read the Settings section in the Synthesis Engine section of this manual.

07
Warranty Information

Warranty Statement

- The standard warranty period for any Modal product is 12 months from the original date of purchase.
  However, for products purchased after May 8th, 2025, Modal offers an extended 36-month (3-year) warranty, provided the product is registered on our website at: https://modalelectronics.com/register-product/.
- The warranty is not transferable to a second user.
- Modal products are built using the latest manufacturing technology, tested to the highest possible standards and by using premium components this should result in providing you with reliable performance for many years.
- **The warranty is return to base, meaning the unit must be returned, carriage paid, to the Dealer you purchased the unit from or the exclusive territory Distributor responsible for the country in which you purchased the product.**
- Some of the products returned under warranty are found not to exhibit any fault at all when they are retested at our Service Centre's so it's always useful to contact our Support team first to try to avoid inconvenience to you at **support@modalelectronics.com**
- If you suspect that your unit is suffering from a component or manufacturing defect during the warranty period please contact either Modal support or the dealer that you purchased the Modal product from.
- In the event of a component or manufacturing defect becoming evident during the warranty period, Modal will ensure that the product is repaired free of charge or replaced.
- Whilst this warranty is provided by Modal, the warranty obligations are fulfilled by the exclusive territory Distributor responsible for the country in which you purchased the product.
- The Dealer will advise you of the appropriate procedure for resolving the warranty issue.
- In every case it will be necessary to provide a copy of the original invoice or Dealer purchase receipt to the Distributor.
- In the event that you are unable to provide proof of purchase directly then you should contact the Dealer from whom you purchased the product and attempt to obtain proof of purchase from them. The Dealer | Distributor will then advise the procedure to follow.
- This limited warranty is offered solely to products purchased from an Authorised Modal Dealer (defined as a Dealer which has purchased the product directly from Modal in the UK, or one of our Authorised Distributors outside the UK). Please note that if you purchased the product from outside of your country of residence you must return the unit to the original point of purchase for repair.
- The Modal warranty term is additional to any statutory rights in the country of purchase or as offered by the dealer at the time of purchase.

What is meant by a Manufacturing Defect?

- We define this as a defect in the performance or specification of the product as described and published by Modal.
- A Manufacturing Defect does not include damage caused by post-purchase shipping, storage or careless handling, nor damage caused by misuse.

Warranty Limitations

- This warranty does not cover damage resulting from accident or misuse.
- The warranty is void unless repairs are carried out by an authorised service centre.
- The warranty is void if the unit has been modified other than at the manufacturer's instruction.
- The warranty does not cover components which have a limited life, and which are expected to be periodically replaced for optimal performance.
- We do not warrant that the unit shall operate in any other way than as described in this manual.

For further details please contact: **support@modalelectronics.com**