

USER MANUAL

for **Synclavier Go!**

Copyright ©2019 Synclavier Digital Corporation Limited, Nova Scotia, Canada



The legendary **Synclavier® VPK**

“the power of **Synclavier® II** and much more...”



Synclavier® Go!

Contents

Contents	2
1. Introduction	4
2. Interfacing	5
2.1. The New Knob	6
2.2. Comms to other Apps	6
3. Timbre Store/Recall	7
3.1. Quick Recall	7
3.2. Search	8
3.3. Soundfiles	8
3.4. Saving	9
3.5. iCloud Integration	10
3.6. Ableton Link	11
3.7. AUv3	11
4. Timbre Design	12
4.1. Partial Timbres	12
4.2. Partial Management	12
4.3. Volume Envelope	13
4.4. FM Harmonic Envelope	14
4.5. Frames	15
5. Expression and Dynamic Pan	17
5.1. Vibrato	17
5.2. Tremolo / Pan	19
6. Volume, Modulation and Intonation	20
6.1. Volume	20
6.2. Panning	20
6.3. Tuning & Modulation	20
6.4. Chorus	22
6.5. Frame Settings	23
6.6. Keyboard Tracking	23
6.7. Character Controls	23
7. Timbre and Keyboard Effects	25
7.1. MIDI	25
7.2. Repeat / Arpeggiate	26
7.3. Portamento	27

7.4. Polyphony Mode	27
7.5. Keyboard Envelope	28
7.6. Dynamic Envelope	29
7.7. Overall Settings	30
8. Additive Synthesis	32
8.1. Sine Waves	32
8.2. Harmonics	33
8.3. FM Modulation	35
8.4. FM Harmonic Envelope	35
9. Tracks Tab	37
9.1. Active Mix	37
9.2. Managing Multiple Tracks	37
9.3. In the Mix	38
9.4. Saving Mixes	39
9.5. MIDI Settings	39

1. Introduction

With Synclavier (pronounced sync-la-veer) Go!, you have the power of Synclavier II and much more.

This manual will tell you what you need to know about Synclavier Go! It contains a lot of the same information from the in-built tour. We figured this would be useful to have in one continuous, searchable pdf document that you can look at online or print out, so here it is.


Synclavier Digital Corporation has invested much time and effort into the development of Synclavier Go! We're really excited for the release of this product. As can be seen from the picture below, with today's hardware, it's possible to put the computational power of a room into a tablet. Not only does this Application run the same core DSP engine as any Synclavier from the 1980s, but it goes further: we've added features from 4 decades of sound design expertise to our powerful DSP engine, and we've taken advantage of the highly-responsive touch screen of the iPad, iPhone, and iPod Touch, implementing best practises for a modern user-interface.



2. Interfacing

You can connect Synclavier Go! up to other audio and MIDI equipment in a number of ways. For instructions on how to do this, please see the Synclavier Connection Guide, available from our website, at <https://www.synclavier.com/connection-guide/>

With the proper set-up, you can enjoy high-fidelity stereo audio output from Synclavier Go!, and use MIDI interfaces, such as a MIDI keyboard, and pitch bend wheel. You can even use a DAW or sequencer to supply MIDI messages Go! tracks, and collect the audio it produces.

Click on  at any time to see what MIDI devices are recognized by Synclavier Go!
NB: Go! supports multiple channels from its MIDI interfaces, for more information, see section 9 of this guide.

In addition to the keyboard used for playing notes, the original Synclavier consisted of many panels of illuminated buttons that fulfilled various input and indication purposes. These interfaces were engineered to aircraft standard and were highly responsive. Running a finger over several buttons in a row, would light or extinguish those functions, which made the Synclavier quick and fun to use. In a way, this was like using a touchscreen before such a thing was invented! Much care and attention has been afforded the app interface, so that it behaves and feels just like an authentic Synclavier.

Besides the keyboard, and the many buttons, the original Synclavier had a knob, which was used to quickly dial in values for use in timbre design and effects. This has been soft-simulated on the iPad app. At the left of the screen is the knob, activated by press-and-hold and then moving up and down to turn. Several “jog” buttons are arranged above & below the knob, to quickly plus or minus magnitudes of ones, tens, hundreds, thousands, to the currently dialled-in value.



2.1. The New Knob

A hardware Synclavier Knob product is available from Synclavier Digital. This can be connected concurrently with a MIDI keyboard, through the interface.

The Synclavier Knob, has been re-engineered from the original control knob of the Synclavier II. The weight and feel of the knob is identical, and when you turn it left or right, the soft-control on Synclavier Go! moves accordingly. Many users will find this authentic experience easy and quicker to manipulate accurate values than the simulated knob.



2.2. Comms to other Apps

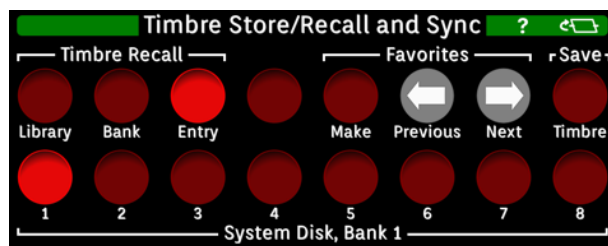
Synclavier Go! supports AUv3, InterApp and InterDevice audio, as well as Audiobus 3, so the app needn't work in isolation. Go! can receive MIDI information from other sequencing apps. The sounds created can be sent to other apps running within the iPad or multiple Go! instruments can be hosted in AUv3 host apps, DAWs such as Garage Band and Nano Studio 2. MIDI to Go!

And Synclavier Go! can also talk to external hardware and computers.

See the walkthrough guides on our website for full instructions.⁸

3. Timbre Store/Recall

A timbre (pronounced tam-ber) typically consists of multiple partial timbres, which in turn, consist of sampled sound files or FM sounds.



Synclavier Go! comes preloaded with several preset libraries of timbres, many from the original Synclavier II machine, used on countless hit records. A Timbre library has up to 8 banks, and each bank can store up to 8.

There are several ways to call up a timbre for use on the keyboard. The buttons adjacent to the keyboard cycle through all available timbres.

> Try pressing these now. You will notice that the timbre name at the top-left of the screen (called the VK display) changes as you cycle. Also, the illuminated button in the Timbre Recall panel changes to show which timbre is selected.

NB: When using the next timbre button, you cycle past the end of the current bank, you will change to the adjoining bank, and if you are at the end of the current library, you will switch to the next. The current library and bank are given at the foot of the Timbre Store/Recall panel.

When you have a lot of libraries, or even if you have a few, it can get tedious to cycle through every timbre to find the one you want. If you know the identifier number of a sound, you can punch it in. Or if you know the name of a timbre, you can use the search function to find it.

Selecting the Library tab, shows the library browser, where you can scroll through all available libraries of timbres.

> After reading this section, switch to the Library tab. Select the Presets sub-tab if not already selected. Scroll through the available libraries on the left of the browser. Pressing one of the libraries will select it: the timbre list to the right will change.

Scroll through the timbre list and you will see they are arranged in 8 banks of 8. Pressing a little number in the middle panel will scroll the timbre list (jumping) to the desired bank. Ignore the top row of numbers for now if they're shown.

Pressing a red button next to the timbre name, will recall that timbre to the keyboard for you to play. If you find one you really like, you can swipe-right on its name to set it as a favourite.

3.1. Quick Recall

To punch in a new timbre to the keyboard quickly, press the Bank button. It will light to show it was selected. Now press one of the number keys to enter the desired bank. Then press the Entry button; it will light. Press one of the number keys to select the desired timbre. You will be your selection, at the footer of this panel, change. > Try this now.

You have at your fingertips, the complete catalogue of Synclavier® FM factory timbres from Synclavier II: over 900 interesting and authentic eighties sounds. Additionally, Go! contains featured Artist timbres libraries that were created by some of the best sound designers working today, especially for Synclavier Go!

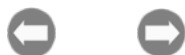
Of course, you can also create and edit your own sounds, and when you save them, they will appear under the Workspaces sub-tab — more on that later.

The Tags subtab organizes timbres by tag. Every preset has at least one tag — its category — e.g., percussion or pad (nouns). And many have additional descriptiveOf course, you can also create and edit your own sounds, and when you save them, they will appear under the Workspaces sub-tab.

3.2. Search

Also take a look at the Search sub-tab. Hitting Search will bring up a keyboard. > Try typing “vibe” then press return (the blue Search). All timbres containing this keyword are shown in the right panel, and can be recalled to the keyboard from there.

PRO-TIP: The Favorites subtab collates your favorite timbres from across all libraries. This makes for super-fast recall when working on a composition or performing at a gig.



If you have made favorites, selecting **Previous** and **Next** will cycle through them in the order they are in found in the libraries. It's easy to set favourites — just swipe right across the preset name. Swipe left to unset.

> Switch back to the Timbre tab when finished with the library browser.

3.3. Soundfiles

The ability to play soundfiles (or samples) wasn't on the original Synclavier II machines, but was added as an extra in the early 80s. This opened up a world of possibilities to Synclavier owners, such as polyphonically playing sampled monophonic synths and playing life-like orchestral instruments traditionally difficult to synthesize (such as a grand piano). A single soundfile could be transposed in pitch by the DSP depending on what key was pressed, or groups of keys could be assigned to different soundfiles for more accurate modelling. And special effects could be easily uploaded and used in film scores.

Synclavier Go! now presents these features to the user. And included in Go! is a set of 116 original NED soundfiles in lossless format.

If you navigate to the Soundfiles subtab of the Library, all soundfiles available for use are listed by library. If you select one of these, it recalls an empty timbre to the keyboard and places the sample on partial 1 ready for auditioning. We haven't discussed partials yet, but just know that each timbre is made up of 1 to 12 “partials” and each of these can be an (additive) synthesized sound or a soundfile.

Additionally, each partial, including soundfiles, can be modified by an individual FM carrier wave and effects such as vibrato, tremolo and chorus can be added. The creative possibilities for sound design with Synclavier Go! on an iPad are truly phenomenal.



PRO-TIP: If you select the disclosure triangle to the left of the Library subtab menu, it will reveal further controls. The 12 numbers correspond to the partials. More on those later. Select the inner disclosure triangle to reveal a group of timbre “character” controls and a group of soundfile-specific control. This is where you tune and loop your sample on the selected partial/s.

3.4. Saving

As you progress through this manual, you will learn how to modify existing presets, and create your own timbres. At some point you will want to save those timbres, but since the Save button is on the Timbre/Store recall panel, we will cover saving now. When you save a timbre, it will save in one of your workspaces. You will always have the preset Synclavier Libraries, and cannot overwrite them.

> Recall a timbre you like to the keyboard, using one of the methods above; for instance, search for Wooden pipe and select it.

Hitting the Save button will bring up the Library tab with the Save sub-tab already selected, but you can of course just navigate to that sub-tab.

Each Workspace has 64 timbre slots (just like a library).

You can navigate timbres in your workspaces from the Save sub-tab, by scrolling on the names, as usual. Hitting one of the red buttons will Save the current timbre (the one you’re playing with) to that slot, overwriting any information already in that slot. Remember, each library or workspace has 8 banks of 8.

Before you hit a save button, it’s advisable to Change the name, to something you’ll remember, e.g. “Wooden Pipe Modified,” hit return/Done and enter a description if you desire, again hit return/Done. The text changes will then be stored when you Save.

If you use up all the space in your default workspace, you can create more. You may find it useful for organizing your sounds and mixes (discussed later) to have multiple workspaces.

If you use up all the space in your default workspace, you can create more. It may be useful for organizing your sounds and mixes (discussed later) to have multiple workspaces.

You can (and should) backup your saved work to your computer using iTunes File Sharing — see: <https://support.apple.com/en-ca/HT201301> for info on this method.

3.5. iCloud Integration

Alternatively, if you have iCloud drive enabled on your iPad, you can create a workspace in iCloud. Anything you save here will show up in a folder entitled Synclavier on your iCloud drive. What's nice about this method is that this folder will be sync'd across all your iOS devices, so if you have multiple iPads you can resume work where you left off, or if you also have an iPhone you could create timbres on Synclavier Go! and then play them later on Synclavier Pocket!

When you create a new workspace on Synclavier Go! (from the Save subtab) ensure the correct type is shown on the green button (iCloud or iTunes FS).

NB: Using either method will also enable you to share timbres you create with friends and there are some social media pages devoted to timbre swapping.

iCloud or iTunes File Sharing also works for upload and is the method in which you can load your own samples. Synclavier Go! accepts a variety of file formats at a variety of bit-depths and sample rates. Just drag some of your own samples into a workspace folder you've created inside iCloud or iTunes File Sharing and Synclavier Go! will list anything it's capable of playing.

Remember that whether iCloud or iTunes file sharing, the files in your workspace — custom timbres, samples, and custom mixes (discussed later) — will take up room on your device. The limit of what you can store, is the limit of available space on your device.


NB: Multiple timbres can utilize the same soundfile. When a soundfile is loaded onto a partial, the timbre holds a reference to the workspace or library folder and the soundfile name. As long as the soundfile exists in the place it did when it was first loaded, it will be found again when you reload the timbre.


PRO-TIP: Using Partial Recall you can recall parts of a timbre from disk to the keyboard. Partials are explained in the next section, but basically, each timbre can contain multiple partials. If you recall only some Partials from a saved sound, you're mixing them in with the current keyboard sound. This is a quick and powerful way to create new sounds, and a was very popular feature on the original machines.

> Select Preset Timbres from the Library tab. Select the System Disk library. Then call up some of the timbres using the red buttons and play them. Notice that some sounds are more complex than others. The row of numbered buttons across the top represent the Partials 1-12. The ones that are active are underlined. Press the red button for "Hammond w/fft", recalling it to the keyboard, and play a few notes. It's a fairly basic sound, having 2 partials. Press and hold the Partial 3 button, then press "Galactic Cymbal", then release. The VK display will show "1 Partial Recalled." You can see that 3 is now underlined, and if you play a note on the

keyboard, you will hear that the sound is now more complex. It's important to realize, you haven't changed the Hammond timbre on disk, you've just recalled, first the Hammond timbre to the keyboard, and then one partial from the "Galactic Cymbal" on top of it, in this case adding to the sound, since "Hammond w/fft" didn't have anything active in Partial 3. If you want to save this new sound you're playing, you have to switch to the Save sub-tab and find a slot in one of your workspaces for it. Use the same method to recall a soundfile to a desired partial slot.

3.6. Ableton Link

The "flip" () side of the Timbre Store/Recall panel provides controls for Ableton Link. Link is a technology that keeps devices in time over a local network, so you can forget the hassle of setting up MIDI clocks and focus on playing music. That is a shorthand way of saying Link is a lot of fun and it's also easy to use!

 brings up the Ableton Link preferences panel. Link will stay on once it has been enabled.

The Start and Stop controls will start and stop the network-wide Link session, and changing the Tempo will keep all devices in the session at the same tempo and in sync. The Beat control sets the "Beat Multiplier", so you can control whether the Arpeggiator does eighth-notes or sixteenth-notes or a more unusual settings like fifth-notes or triplets.

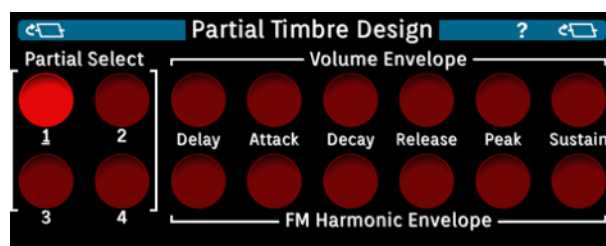
The Repeat and Arpeggiate functions from the Ableton Link section apply to all the Timbres you call up, so you can easily browse Timbres and stay in sync.

3.7. AUv3

Synclavier Go! can also be used as an AUv3 client. Once Go! is installed, a suitable host, such as Garage Band, can find Go! and load it. It looks a little different, but the same panels and functionality is present. NB: The AUv3 unit can only work with iCloud workspaces. For more info, see the host documentation.

4. Timbre Design

With Synclavier Go! it's possible to create and modify timbres, just like the classic 1980s Synclavier. In fact, the core sound-design engine is identical to the original, but with added power!



When designing a timbre, very complex and dynamic sounds can be created by choosing different sound files for two or more partial timbres. For example, to strengthen the attack of a brass instrument, you might put a percussive sound on one of the partial timbres. Each of these partial timbres can be modified in a variety of ways, including changing the volume envelope, adding vibrato, portamento or real-time effects.

The whole timbre with its multiple layers can be further modified by adding effects such as chorus or vibrato. Depending on whether you're working in music, sound effects or vocal effects, timbre design can be used in many ways.

4.1. Partial Timbres

The numbered buttons on the Partial Select subpanel each represent a partial. A timbre can have any number of partials up to 12, typically up to 4. If you need access to all twelve, you can flip (🔄) the Partial Select subpanel. The underlined numbers show the active partials for the selected timbre.

> Select a timbre with multiple partials. Then press one of the unlit Partial Select buttons. It will light to show that partial is currently selected. Now, changes you make to partial settings, will effect only that partial. If you press the lit partial button again, it will toggle to solo mode. Solo mode, means you only hear the soloed partial/s when you press a key on the keyboard. You can still make changes to partial settings in solo mode, and they only effect soloed partials. In solo mode, the partial buttons flash. Press again to unsolo the partial.

More than one partial can be selected or soloed at one time, with a swipe of several buttons, and this is a skill you should master, if you are to progress at sound design.

PRO TIP: Just like on the library tab, if you press and hold a partial button (or swiped partials) then call up a new timbre from the Timbre Store/Recall panel, only partials in the selected positions will be recalled to the keyboard, leaving the unselected partial/s intact. This is a great fun way to quickly mix and match partials to create a new sound. This is a great fun way to quickly mix and match partials to create a new sound and this is the technique to load a soundfile onto one of the partials.

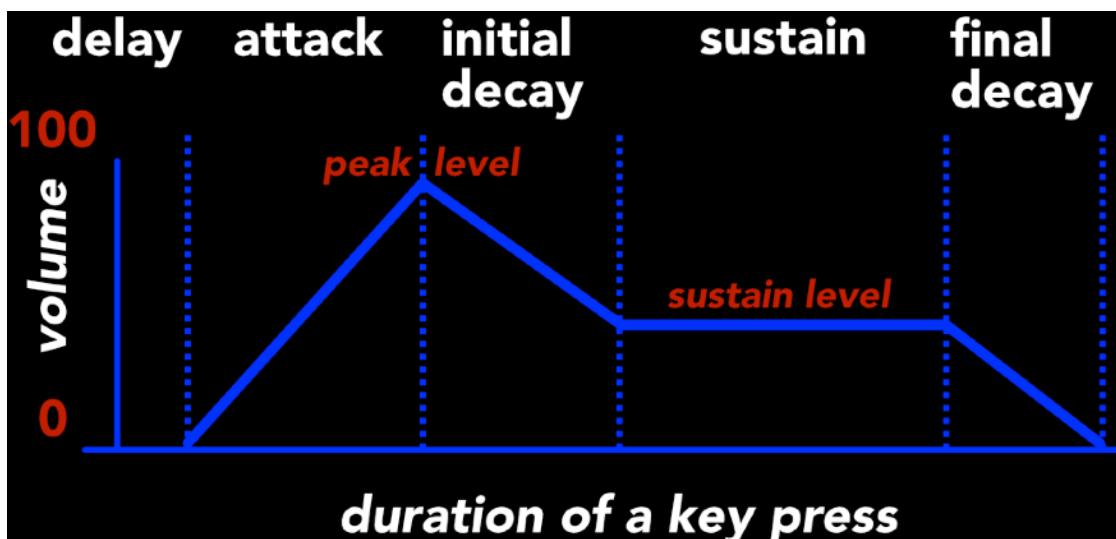
4.2. Partial Management

Copy & Paste functions are available on the back of the panel, flip the panel to access them.

- To copy a partial, you can press the Copy button, and the VK display will indicate the the currently selected Partial/s were copied to the clipboard. Press the destination partial select button/s then Paste to complete the copy. If the destination has a partial, it will be overwritten.
- The cut button will copy the partial to the clipboard, and erase the original. A useful function for organizing partials, just remember to save your timbre when you're done.
- To erase a partial, typically it's enough to set the peak and sustain levels to zero, or use cut.

4.3. Volume Envelope

The key parameters of the volume envelope can be easily modified. Select the partial/s you want to modify (all of them if you want to modify the whole timbre). Then press the envelope parameter you wish to change (top row of panel). The button will light and its value will be shown in the VK display. It's now adjustable by turning the Synclavier Knob. **Caution:** When you're done, pressing the envelope button again won't extinguish it. It will stay in that mode until you select another modal button. **NB:** If you don't have a Synclavier Knob, you can use the simulated knob, by pressing and sliding up or down. You will see the value change on the display. Release when you reach your desired value. You can also press the jog buttons below and above the simulated knob to plus or minus the parameter. value by stepped amounts.



NB: Several parameters can be modified at once, by swiping more than one for modification. For instance, Peak and Sustain are often modified together to quickly change the shape of a sound.

> Try soloing a partial and modify its volume envelope parameters. You should hear the difference in the level of the sound generated when playing notes. If the change sounds subtle, you may need headphones.

Volume Envelope Parameters

DELAY	Time from key depression to beginning of sound. If you want the sound to start after the key is depressed, turn the control knob to select a time between 0-30,000 milliseconds. Using different delays on multiple partials to offset them, means the sound evolves as the different partials come in and out.
ATTACK	Time from beginning of sound to peak volume. Turn the control knob to select an interval between 0-15,000 milliseconds.
DECAY	Time from peak volume to beginning of sustain volume. Turn the control knob to enter a time interval between 0-30,000 milliseconds.
RELEASE	Time from key release to end of sound. Turn the control knob to enter a time interval between 0-30,000 milliseconds.
PEAK	Relative volume at the change from attack to decay. Press this button and then turn the control knob to set a level between 0-100.0%. Zero is no volume and 100.0 is maximum volume.
SUSTAIN	Relative volume from end of initial decay to key release. Press this button and then turn the control knob to set a volume level between 0-100.0%. Zero is no volume and 100.0 is maximum volume.

4.4. FM Harmonic Envelope

The harmonic envelope of a partial or partials, governs how the partial's sound is frequency-modulated over time. You can introduce some brightness to your sound quickly, by selecting peak and sustain in a swipe, and dialling the their parameters up.

> Try this now for all partials of a simple timbre, and you'll hear the difference some modulation makes to the character of the sound.

NB: A full grasp of the FM Harmonic Envelope is not necessary now, as we will be revisiting it in the section on Additive Synthesis: just know that you can dramatically alter sounds by applying a small amount of modulation, sculpted over time, by the FM Harmonic Envelope.

The amount of modulation a sound is processed for, depends not only on the FM Harmonic Envelope parameters, but on the FM Amt button from the Volume, Modulation and Intonation panel. This parameter scales the envelope up or down by a percentage, and can go from 0% (no modulation) to 250% (envelope overdrive).

Once you find your way around Synclavier Go!, you'll use FM Amt in conjunction with the Harmonic Envelope, and FM Ratio & Octave buttons, to quickly shape sounds. More on these later!

Harmonic Envelope Parameters

DELAY	Time from key depression to beginning of any frequency modulation, variable from 0-30,000 ms.
ATTACK	Time from beginning of sound to peak frequency modulation.
DECAY	Time from peak frequency modulation to beginning of sustain modulation, variable from 0-30,000 ms.
RELEASE	Time from key release to end of frequency modulation, variable between 0-30,000 ms.
PEAK	Peak level of frequency modulation of partial/s, between 0-100%
SUSTAIN	Sustain level of frequency modulation, between 0-100.0%.

4.5. Frames

A partial can have multiple frames. Frames execute contiguously, from zero to n. The flipside of this panel has frame controls. To create a new frame, press the Clone button: it copies the currently selected frame and creates a new frame to the right (timeline).

> Try this now. Select "Sine Wave" from the System Disk library. Swipe Peak and Sustain on the bottom row to select the harmonic envelope buttons. Hit the top jog button to set the level to 100. Now press a keyboard key and you will hear a sine wave that has been FM modulated. Next flip the panel. Hit Clone and then hit the left arrow to navigate back to Frame 0. Press FM Amt. Now press the lower jog button to set FM amount to 0%. Now when you play a note, you'll hear a sound that morphs from a simple sine wave into a modulated sine wave, for more of a sci-fi effect. **NB:** You will learn more on FM modulation in later sections.

As you can tell, a smooth crossfade occurs from frame 0 to frame 1. The amount to which a frame is cross-faded in is determined by its XFade setting. Go to frame 1 and hit XFade. From the VK display, you can see that this defaults to 1000 milliseconds. Press Delay and you will see there is zero delay by default. So Frame 0 starts fading out from the start of a note press and Frame 1 begins to crossfade in. If Delay is set to x, that frame waits x milliseconds from the start of the previous frame, before beginning its crossfade.

Frames can be soloed, similar to partials: press the frame indicator to toggle between selection and solo modes. The navigation slider will flash to indicate solo mode.

The Delete button deletes the currently selected frame. NB: While Clone copies the current frame to the right, you may want to copy a frame to a different position. In which case, you should use the coefficients Copy and Paste buttons on the rear of the Additive Synthesis panel (discussed on a later tour page). You'll also need to set Delay, XFade, Volume, Tuning and FM Amount manually.

In addition to FM Amt, you can change Volume and Tuning to dictate how a partial's sound evolves over time. Harmonic Information (covered in a later section), is also changeable from frame to frame.

You can add frames to a partial with a soundfile on it. At the start of the note it triggers the sound file, then crossfades to the timbre frames just as expected. You use the delay and fade times for the first timbre frame to control when the transition occurs. If you set the coefficients of a frame all to zero, the soundfile will fade in again. This is most useful for soundfiles that loop.

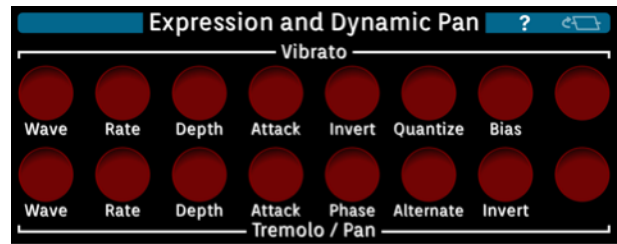
You can get some interesting effects, but this facility is provided in the DSP engine primarily for resynthesized sounds — samples that have had their harmonic information analyzed and been converted into a sequence of frames.

Resynthesis is currently supported by our Synclavier V product. For an example of resynthesis and a demonstration of the power of frames checkout the Hello timbre on Resynth Disk 1. Each of the 42 frames represents a time slice of a spoken "hello." Step through the frames and you'll see the harmonic coefficients are different for each slice.

> Create a few frames and play with the settings on this panel to get a feel for how frames work.

NB: There are a few other settings related to frames that will be covered in the section pertaining to the panel they are on.

5. Expression and Dynamic Pan



Synclavier Go! provides facilities to add time-based expressions to sound, such as vibrato and tremolo. This is key to effective sound design, so it's worth learning about the various tweakable parameters of this section. The top row of buttons pertains to vibrato and the bottom row, tremolo and pan. Changing these parameters acts on the selected partial/s and the effects will vary soundfiles as well as synthesized partials.

5.1. Vibrato

The vibrato feature modifies the pitch of a sound as it's being played. To modify the parameters, press a parameter button, and its value will be shown in the VK

display. Turning the knob now adjusts that value. Be aware that the parameters can be modified in course increments or fine adjustments, depending on the (Fine) button selection. And of course, parameters can also be adjusted by the jog/increment buttons beneath and atop the simulated knob, or a Synclavier® Knob connected via USB.

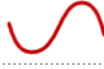





Vibrato is sometimes called frequency modulation, because its use modulates the frequency of the sound waveform.

Vibrato Parameter

WAVE	The shape of the pitch changes. Quickly double-tap, or select then turn the knob / press the jog +1 or -1 buttons, to select one of six vibrato wave shapes. (See the list below.)
RATE	Turn knob to select a vibrato repeat rate between 0.00 and 50.00 Hz.
DEPTH	Turn knob to select a vibrato depth between 0.00 and 25.00 semitones.
ATTACK	Turn knob to select a vibrato attack delay between zero and 30 seconds. The vibrato increases gradually to its full depth from the beginning of the note to the selected attack time.

> Try modifying the vibrato of a partial timbre now. A sine wave vibrato of 6Hz is typically used to create the style of vibrato associated with vocalists and string or wind instruments, so this might be a good place to start your experimentation.

There are six vibrato wave shapes:

vibrato wave#	Wave shape	
1	sine	
2	triangle	
3	ramp (sawtooth)	
4	inverted ramp	
5	square	
6	random	

Normally when vibrato is added to a partial timbre, the pitch of each note fluctuates an equal amount above and below the pitch of the key pressed. The total range in semitones is determined by the depth setting. Press the following buttons to change this fluctuation.

Further Vibrato Parameters

BIAS	Create a vibrato in which the pitch fluctuates entirely above the key pressed. Press Bias and play a note. As a result, the lowest point of pitch fluctuation is the pitch of the note played. The highest point is twice the number of semitones set for the vibrato depth.
INVERT	Create a vibrato in which the pitch fluctuation is entirely below the key pressed. Press Bias, press Invert and then play a note. As a result, the highest point of pitch fluctuation is the pitch of the note played. The lowest point is twice the number of semitones set for the vibrato depth.
QUANTISE	The fluctuations produced by a vibrato are normally smooth and gradual. However, you can quantize, or step, in semitone intervals the fluctuations in pitch. After you set the vibrato wave, depth and rate, turn on the quantize function by pressing Quantise.

5.2. Tremolo / Pan

The tremolo feature modifies the amplitude and/or stereo panning of a sound as it is being played. To modify the parameters, press a parameter button then turn the Synclavier Knob.

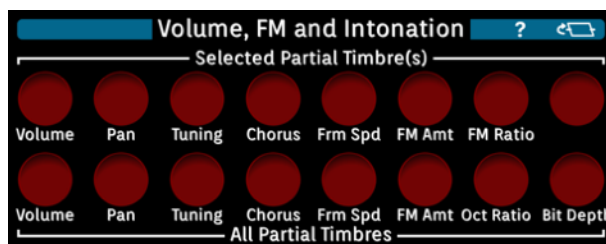
Pure Tremolo is sometimes called amplitude modulation, because its use modulates the amplitude of the sound waveform, but by changing the phase setting, this feature can also be used for stereo panning modulation.

> Try playing with the tremolo settings now. Try changing the phase setting so that you experience stereo panning, as well as pure amplitude modulation.

Tremolo/Pan Parameter

WAVE	The shape of the amplitude changes. Quickly double-tap, or select then turn the knob / press the jog +1 or -1 buttons, to select one of three tremolo wave shapes: sine , triangle , or square .
RATE	Turn the control knob to select a tremolo repeat rate between 0.00 and 50.00 Hz.
DEPTH	Turn the control knob to select a tremolo depth between 0.0% and 100%.
ATTACK	Turn the control knob to select a tremolo attack delay between zero and 30 seconds. The tremolo increases gradually to its full depth from the beginning of the note to the selected attack time.
PHASE	The Phase knob defaults to 180° which allows full Left/Right Stereo panning effects. Turning the knob full down to 0° or full up to 360° will allow Tremolo (Amplitude Modulation) effects with NO Left/Right Stereo panning. Other settings between 0° and 360° will display varying degrees of Left/Right panning depth.
INVERT	The Invert button changes the direction that the Wave starts. When the button is OFF, the stereo position moves to the LEFT first, from the original stereo position. When the button is ON, the stereo position moves to the RIGHT first, from the original stereo position.
ALTERNATE	The Alternate button turns on a function that alternates the starting Left/Right side of a Left/Right Pan for every new MIDI note-on event. (when this is on, invert only affects the first note played.)

6. Volume, Modulation and Intonation



This panel presents more tweakable parameters that effect the nature of the timbre. The top row of buttons affects only the partials that are selected on the Partial Select subpanel. The bottom row of buttons will modify the settings for all partials of the selected timbre.

6.1. Volume

The volume range is from 0.00db at full gain to -50db (off). When you change a timbre's volume, you're changing it internally for Synclavier Go! relative to all the other timbres. Likewise for a partial's volume.

> Press the lower Volume button then dial in a new level with the knob. Play a note on the keyboard. You will hear the new volume of the timbre. As with all tweakable parameters, you can save the settings to the timbre with the Save button.

6.2. Panning

Panning adjusts the stereo positioning of a sound. The range is from -63 (hard left) to +63 (hard right)

> Find a timbre with multiple partials, such as Church Bell.” Now select one of the partials and use the upper Pan button to change the stereo positions of the partials separately. As in an orchestra setting, now when you play a note, you'll now have different sounds coming from different areas of the stage!

PRO TIP: A fast double-tap of the Volume button will reset volume to full, double-tapping the Pan will reset the stereo position to centre.

6.3. Tuning & Modulation

Each partial timbre can be individually tuned to create harmonic relationships, phase shifts or complex modulations. The Tuning buttons affect the frequency of the selected partial/s (or all partials — bottom row). This carrier frequency, dialled in with these parameters, is the frequency that the partial will sound when the note A3 is played. **NB:** This frequency corresponds to the 1st harmonic of the partial. Other harmonics can be added from the Additive Synthesis panel (see its tour page for details). And for soundfiles, the Tuning parameter adjusts the frequency of the soundfile up or down from its Pitch setting for A3.

The Oct Ratio button dictates how the tuning varies across the keyboard. The default is 1: the tuning of played partials varies 1 octave across seven keys. If you wanted the partial to vary by 1 octave across 14 keys, you could set this value to 0.5. Or if you wanted double the octaves of a normal keyboard, you can set this parameter to 2. If you wanted the partial to sound in the same frequency no matter what key is pressed, you could set this to 0. This might seem like a strange thing

to do, but if you are designing sound effects, this might be exactly what you want. As you'll discover later in the manual, the keyboard envelope (range) can be mapped to other parameters, so your playing can add expression to the partials in other ways than pitch!

NB: You can turn on fine adjustment for these parameters (and more), by selecting (Fine) in the top left.

The FM Amt button allows control of the modulator waves. The amount of FM modulation applied depends on this setting. The range is from 0% (no modulation) to 250% (modulation overdrive).

NB: If modulation is set at zero, the harmonic envelope function on the "Partial Timbre Design" panel will have no effect. As explained on section 4 of this document, FM Amt and the Harmonic envelope work in conjunction to affect the amount (and timing) of FM modulation.

NB: If you apply modulation to a soundfile, you will get weird effects unless you have first autotuned it. Of course, weird may be just what you're after.

The FM Ratio sets the ratio of the modulator wave to the carrier wave (or soundfile pitch). E.g., if the carrier wave (Tuning) is set to 440 hertz, and the FM Ratio is 2, the modulator wave will be 880 hz. If you change the ratio to 0.5, the modulator will be 220 hz. In sound design, you often start with a ratio of 1 and explore from there. For best results, the modulator wave should stay within the audible frequency range.

Sound design is a large subject, much of which is covered more comprehensively elsewhere. Any sound we can hear, can be reproduced by a summation of 1 or more sine waves, and this is what the Synclavier DSP Engine exploits. With proper technique (or experimentation) all manner of timbres can be designed on Synclavier Go!, beginning with the proper selection of partial frequencies. More is discussed on the Additive Synthesis panel. > For now, play with the Tuning and FM Amt buttons, so you're aware of how they work.

6.4. Chorus

The Chorus function adds another voice to the selected partial/s or timbre (all partials). The number dialled in establishes the interval above or below the base pitch of the partial, with 1.00 representing unison.

0.500	One octave below	8.000	Eighth harmonic (3 octaves above)
1.000	Unison (no added voice chorus)	9.000	Ninth harmonic (3 octaves plus a major second)
1.500	Perfect fifth above	10.000	Tenth harmonic (3 octaves plus a major third)
2.000	Second harmonic (1 octave above)	11.000	Eleventh harmonic (3 octaves plus an augmented 4th)
3.000	Third harmonic (1 octave plus a fifth above)	12.000	Twelfth harmonic (3 octaves plus a perfect fifth)
4.000	Fourth harmonic (2 octaves above)	13.000	Thirteenth harmonic (3 octaves plus a perfect sixth)
5.000	Fifth harmonic (2 octaves plus a major third)	14.000	Fourteenth harmonic (3 octaves plus a minor seventh)
6.000	Sixth harmonic (2 octaves plus a perfect fifth)	15.000	Fifteenth harmonic (3 octaves plus a major seventh)
7.000	Seventh harmonic (2 octaves plus a minor seventh)	16.000	Sixteenth harmonic (4 octaves above)

You can reinforce the existing harmonics of a tone by dialling in an integer as shown in the table above. Inharmonic frequencies producing harsh effects can be added by selecting certain non-integer values.


NB: You can achieve phase shift effects (flanging) by tuning the added voice to a pitch very near the fundamental or an octave harmonic or subharmonic. A setting of 1.003 or 0.998 results in different tones that are below the audible range, but are noticeable as phase shift in the upper harmonics of the tone.

6.5. Frame Settings

The Frm Spd parameter varies the time spent on each frame of the timbre. At 200%, the sound will progress through its frames twice as fast.

On the flipside of the panel, there are frame settings to govern the looping of frames. If you set the Mode to “Loop Jump Back” when the execution of frames reaches the End frame, execution will jump back to Start frame, and continue. This will happen as long as you have a keyboard key depressed. To change the mode, press the button and use the knob, jog +1/-1 buttons, or quickly double-tap Mode. “Loop Back and Fourth” does as you might expect: when execution reaches the end frame, it reverses direction until it hits the start frame, and then continues again normally, and so on; so this mode is only manifestly different if you’re looping over 3 or more frames. To switch looping off, set the mode to “No Frame Loop.”

6.6. Keyboard Tracking

The flipside of this panel also contains some advanced parameters that can be useful in certain scenarios. Deselecting Pitch will stop the partial from changing pitch as  play different keyboard keys. Rather like setting the Oct Ratio to zero, but this will just change the selected Partial/s. Very useful for placing percussion sounds in a timbre, that would otherwise sound stretched at low notes, or adding a drone sound to an instrument.

You can change how long a partial takes to decay, based on what keyboard note is hit, by raising the Decay from 100%. A4 is considered the baseline for decay. So, first set your desired timbre decay while playing the A4 key, then vary this parameter, if required.

FM Amt defaults to 100%. If you modify this, the amount of FM applied to your harmonics will vary according to what note is played. This can be used to balance out a sound that sounds great at certain pitches, but over-modulated at other pitches. Middle C is the baseline for this feature, so set your timbre FM Amt correct for middle C before varying this parameter.

With these advanced parameters, timbres can be carefully designed to be played in real-life situations. Synclavier has a pedigree of being an exacting instrument, and it is this attention to detail in the DSP engine that has earned Synclavier this reputation among professional musicians.

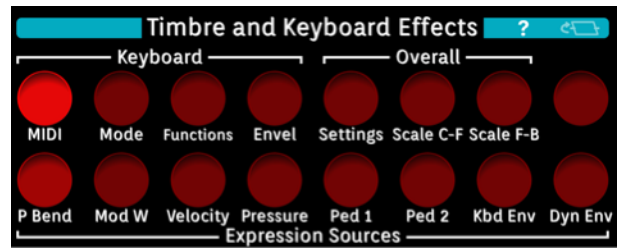
6.7. Character Controls

The character controls discussed in our page 3 also live here, on the bottom row of the flip-side. They affect all partials and can dramatically alter the sound. **Chorus** is discussed above. **Grunge** is another name for bit-depth, sometimes called bit-crush — this control has a greater resolution than the bit-depth parameter found in the Overall Settings (discussed later) and is measure in percentage. In fact, all these are percentage-based controls. The **Swell** and **Fade** parameters affect all partials attack and decay envelope values, respectively, for both harmonic and amplitude envelopes.

NB: The **FM** control here, unlike the **FM Amt** parameter, will add FM to a timbre that doesn't have FM. The **Ratio** button alters the FM Ratio for all partials up or down.

7. Timbre and Keyboard Effects


7.1. MIDI



Many keyboard players add expression to their playing by using other control surfaces in addition to the keyboard itself. For example pitch bend wheels, pedals, breath sensors, etc. These controls can be mapped to parameters of Synclavier Go! to dynamically affect the sound during a performance. **NB:** These mappings were referred to as real-time effects (RTEs) in Synclavier parlance.

NB: The pedals, Ped 1 and Ped 2, are sometimes referred to as Channel Volume and Expression Controller, respectively.

NB: see the [Synclavier Connection Guide](#) for how to connect a MIDI interface device.

Click on  at any time to see what MIDI devices are recognized by Synclavier Go!

> If it is not already lit, press the MIDI button, the bottom row of buttons will show the various expression sources.

Assuming you have a MIDI device that supports it, you can map a source expression by first quickly tapping its button. The selected button will light and MIDI will blink. The other panels will fade out except any functions that are selectable for real-time effects — see list below — any of these undimmed buttons can be pressed to map the selected expression source to that button's function. When a function is selected, it will light, and the RTE mapping will be active for the selected partial/s. Press again to invert the mapping (the function button will blink on and off). Press once more to clear the mapping. You can map more than one function to an expression. When you're finished, press MIDI and the display will return to normal: nothing will be dimmed, the mapped expression source button will extinguish, MIDI will cease blinking.

Function buttons representing mappable parameters for RTEs:

Volume & Pan position, Modulation

Pitch (Tuning), Chorus interval

Vibrato (rate, depth, attack)

Tremolo (rate, depth, attack, phase)

Volume Envelope parameters

Harmonic Envelope parameters

— of selected partial/s.

> Using the above procedure, try mapping the P Bend expression source to the Volume parameter for all partials of a sound. Play and sustain a few notes while moving the pitch bend wheel. And try mapping the Mod W to Pan.

NB: Pitch Bend and Mod Wheel expression sources are soft-simulated on Synclavier Go! touch screen, and will be dual-controlled by a MIDI device that also maps these expression sources. Unfortunately, the soft-keyboard doesn't currently simulate velocity or pressure.

NB: The pedals, Ped 1 and Ped 2, are sometimes referred to as Channel Volume and Expression Controller, respectively.

PRO TIP: It's easy to view existing mappings — just press and hold the expression source you want to check, and the panels dim — any lit buttons are mapped, blinking buttons are mapped inverted. More than one expression can be mapped to the same function. For pitch related RTEs, the input values from the multiple expression sources are added; for other RTEs, the input values are multiplied. Release the selected expression source button when you're done. To change settings, you have tap the button, rather than press and hold.

7.2. Repeat / Arpeggiate

These features allow you to trigger multiple notes with each press of a key. To access these features, press the Functions button: the lower row will show the "Repeat / Arpeggiate" buttons.

- When the Repeat function is on, a note or chord is repeated at the selected rate as long as you hold down the key(s).
- When the Arpeggiate function is on, a chord is arpeggiated once at the selected rate.
- When the Repeat and Arpeggiate functions are on, a chord is arpeggiated and repeated as long as the keys are pressed.
- Synclavier Go! supports various arpeggiate patterns. To change this, press the Pattern button and select with the knob or double-tap: the pattern will be displayed in the VK display. Options are Performance, Ramp Up, Ramp Down, Up-Down, Up-Down no-repeat, Random.

You can vary the rate (sometimes called tempo) at which notes or chords are repeated, by pressing the Rate button and turning the knob. 1Hz is default. 50Hz is max. Faster rates can change the character of the sound, giving your timbre a futuristic effect.

> Try it out: select a timbre with uniform sound, such as an organ, press the Repeat button to turn on this function, and when you press and hold a key on the keyboard, it will sound repeatedly. Try changing the Rate and try the Arpeggiate function when playing a chord.

7.3. Portamento

Portamento makes the pitch "glide" between the notes you play, rather than changing the pitch instantly, as soon as you hit another key. Using portamento, you can more closely simulate playing an instrument such as a trombone or slide guitar, or this might just be the effect you're after on a wholly synthesized timbre.

To switch it on, first ensure you can see the "Portamento" buttons. If you can't, you'll need to press the Functions button. Then press the On/Off button and it will light. > Try it now.

The Rate can be adjusted from 0.00 to 1.00. It sets the speed with which the sound glides from one pitch to another. 0.00 represents almost a minute to transition, whereas 1.00 is almost instantaneous. This setting might require some trial and error to get to the effect you desire.

The profile of the change from one pitch to another can be logarithmic or linear depending on whether the Log/Lin button is activated (lit) or unlit, respectively.

NB: If you hit Save-Timbre on the Timbre Store panel, it will remember your portamento settings the next time you use that timbre.

7.4. Polyphony Mode

To change the polyphonic mode of the keyboard or other MIDI interfaces, first press the Mode button to reveal the "Polyphony Mode" buttons.

Poly Normal

Provides for full polyphony. When a **note on** event is received (either keyboard or sequencer) a new voice is activated for the desired sound in all cases. Earlier notes of the same pitch that are in the final **decay** state are not affected; their decay continues without interruption. With very long final decay settings this can lead to undesirable phase cancellations or overloading the audio output.

Poly Retrig

Allows for full polyphony, however if a **note on** event is received that matches a note that is currently in the final **decay** state, the envelope generators for the matching note are retriggered. The **Poly Retrig** mode is very natural for sounds with a long final decay such as bells or gongs. **Polyphonic Retrig** is the default mode.

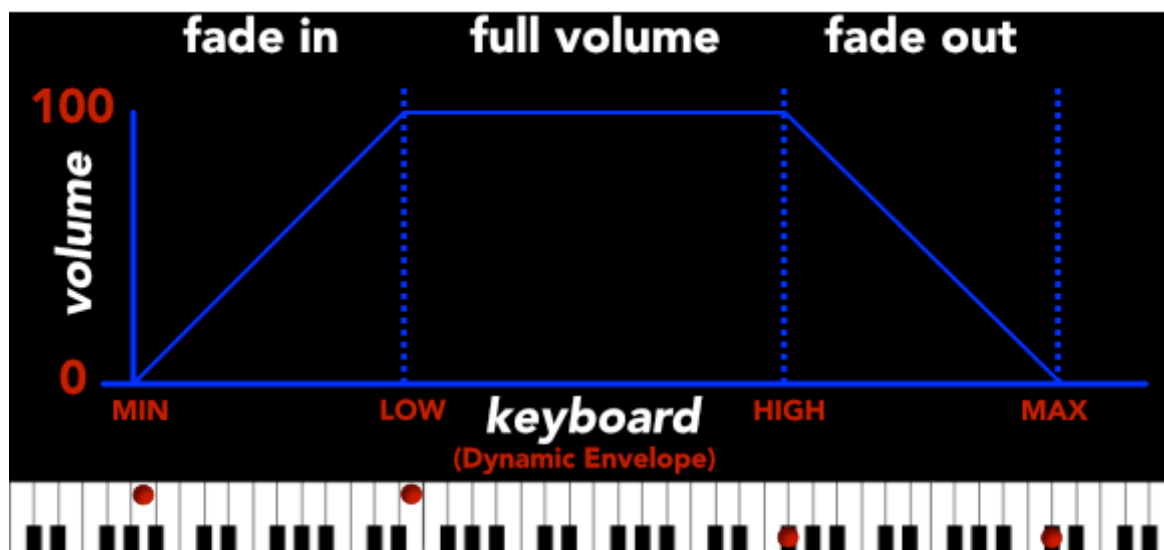
Mono Porta

Restricts the audio output to **one note of the current timbre** at a time. The effect is a legato phrase similar to the tonguing and slurring technique of a wind or brass instrument. The monophonic settings are also useful for recreating the sounds of early analog and digital synthesizers that were monophonic by design.

In this mode, when a new note is played while an earlier note is being held, the previous note ends and the result is a "slur" to the new note. The envelope generators are **not** retriggered. Synthesists refer to this as "Single Triggering."

7.5. Keyboard Envelope

A keyboard envelope controls the volume of a partial timbre across the keyboard. It allows you to define an area of the keyboard where the partial timbre fades in from left to right and an area on the right where it fades out from right to left. In between, the partial timbre plays at full volume.



Keyboard envelopes can be used in different ways. For example, a series of sound effects could be assigned to specific keys, or a series of different percussion sounds, making up a drum kit. Or a set of partials could each reflect a given range of keys from a real instrument, such as a grand piano, whose notes exhibit different character across its scale: using keyboard envelopes to restrict partials to 3 or 4 key ranges would create a more effective simulation of a piano than using one sample and warping the pitch throughout the full keyboard range.

> To map a partial or partials to a keyboard range, select or solo the partial/s you want to map, from the Partial Select group on the Partial Timbre Design panel. Then press the Envel button on the Timbre and Keyboard Effects panel. This will reveal the Envelope buttons on the bottom row. Now to set the perimeters of the envelope: Press and hold the Low button in the "Keyboard CV Envelope" group and it will light. Press the key on your keyboard representing the lowest note you

would want to hear that partial (at a faded volume). Release Low; Staying with the "Keyboard CV Envelope" group, next hold In. If you don't require any cross-fading, for this partial, press the same keyboard key you did before. A shortcut for this is to swipe and hold Low and In at once. If you do require crossfading, select a key of a higher note on the keyboard at which you want the partial to sound at full volume then release In. Complete the procedure for the Out and High notes and you will have set the Keyboard CV Envelope for that partial.

You can change an individual "perimeter" note at any time, by holding its button then hitting a note.

NB: If an error is made, when hitting a key, such as entering a lower note for In than Low, the system will correct the range for you, i.e. it will push the Low key to the In key.

You can overlap partials as much as you desire. Any partials where an envelope is not set, will sound throughout the breadth of your keyboard.

If you're setting up a Keyboard Envelope from scratch, remember to map the Kbd Env RTE to selected partial/s Volume from the MIDI Settings. In most cases it's the volume that you'll want to fade in and out, but there could conceivably be applications for other partial adjustment parameters, such as FM Amt. This is mapped in the same way as other MIDI expressions, and it's likely you'll want to select all partials.

> Try creating a keyboard envelope now. Recall a timbre with multiple partials and set an envelope for the first partial to the righthand side of your keyboard. Map Kbd Env to Volume. Now press a key on the lefthand side, and the other partials will sound. You have restricted partial 1's range, but not effected the other partials. If you press a key to the right of your keyboard, all the partials will sound. You can continue the procedure with another partial/s to assign an envelope to the lefthand side of your keyboard, and in doing so restrict their sounding from the righthand side.

This is a great way to quickly assign keyboard ranges during performances, but if you wish this to be a permanent mapping for the selected timbre, then you should save the timbre.

7.6. Dynamic Envelope

The Dynamic Envelope is a feature whereby you can selectively trigger a number of partials. By default, dynamic envelopes are driven by the velocity expression source. As with many Synclavier features, there will be more than one use for it, but a popular use of a Dynamic Envelope is to better simulate playing stringed instruments. For instance, a double bass may have 4 partials: partial 1 may mimic the sound that a bass is played when a string is softly plucked and partial's 2, 3, and 4 would represent progressively harder plucking noises. By defining a Dynamic Envelope for each partial relating to a given velocity on a keyboard, and mapping to partial volume, you can simulate playing a stringed instrument with

more expression by softly pressing the keys or hammering down on them. This is a most authentic way to play a synthesized instrument.

In some cases, simple ranges of velocity-triggering partials will work well. In other cases, cross-fades between the partials will sound more realistic as you play softer and harder. All this is possible on Synclavier Go!

> Setting-up a Dynamic Envelope, for partial/s is a little different than a Keyboard envelope. Rather than keyboard notes being the envelopes perimeters, any of the MIDI Expressions can drive the envelope, selectable per timbre. Let's set one up for pressure (called after-touch on some keyboards). Select MIDI, then press Dyn Env. MIDI will flash and the parameters that are mappable for this RTE will be undimmed. Ensure all partials are selected, then select Volume, then turn the knob until pressure shows in the VK display.

Once you've done your mapping for the partials, you must remember to press MIDI to return from the mapping mode. Next press Envel and set the Low, In, Out and High for your partials, in a similar manner to that for Keyboard Envelopes, but instead of pressing a particular key for each perimeter, strike any key the desired velocity. It's not a trivial task to strike a key the exact weight you require, so don't be afraid to alter the MIDI value after you've pressed a key with the Synclavier Knob (or start with that approach). The range is from 0 to 127 (hardest).

Test as you go, assuming you have a keyboard with after-touch capability. If not, try mapping velocity to volume, or ModWheel to panning.

NB: Remember, as per Keyboard Envelopes, Dynamic Envelopes are restrictive. This means you're restricting the range that the partial will sound to the range you define, rather than omitting the other partials from sounding in that range. This provides more flexibility for the user, but in order to mimic a stringed instrument as described about, you will have to set each Partial using the same procedure.

7.7. Overall Settings

Press Settings to reveal the "Overall Settings" buttons on the lower row of this panel. Tap any of the buttons and turn the knob to vary these parameters. Overall, means they pertain to the app, Synclavier Go!, and not any particular timbre or partial.

Volume is the volume for this App running on the iPad. It's very unlikely that you'll need to change this, as an iPad has a volume control of its own. But if a voice or group of voices is clipping, it may be quicker to dial down this app volume than fix it in the timbres responsible, so this feature is provided.

Tuning is provided to tune Synclavier Go! up or down. If you're performing with an orchestra, where all the instruments need to be in tune with each other, you might tune up or down a few cents (fractions of semitones). At this level of performance, air temperature can have an effect on wind and string instruments, and it's useful to have the ability to quickly adjust the overall tuning to match other instruments "by ear."

NB: Also see the Scale C-F and Scale F-B groups of buttons. These are used if you want to tune chords of notes to particular frequencies.

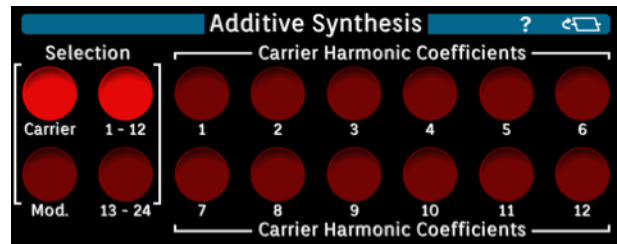
If you have set an overall tuning parameter for Synclavier Pocket! to be something other than default, double-tapping the button will reset its parameter to default.

The Noise Floor is Synclavier Go!'s attempt to simulate the feel of the original synths, by injecting a filtered pink-noise into the final mix from the iPad. The original hardware inherited some noise from its DAC and filter circuitry, and if you're missing that, you can dial some in with this feature.

Bit Depth controls the digital resolution of the DSP engine. The original Synclavier voices were 8-bit, but Synclavier Go! can manage anything up to 24 bit resolution in increments of 2. On the lower end, you'll hear a digital noise or aliasing causing a grittiness to the sound, which may be something you desire in certain circumstances. As you increase the Bit Depth, the sound will, of course, be "smoother" with no aliasing effects.

8. Additive Synthesis

Additive Synthesis is what the original Synclavier synth is known for. It was the first digital synthesizer on the market to use additive synthesis, and frequency modulation, with the partial timbre method, and today, many years since its introduction, the Synclavier is still the preferred choice for this method of sound design.



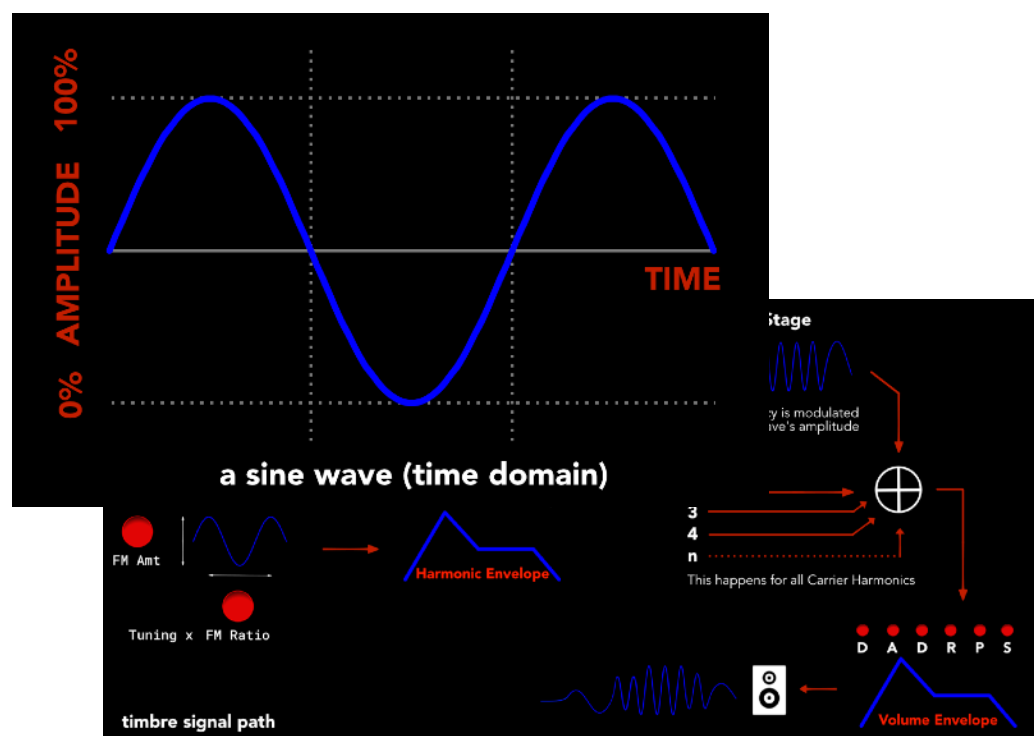
To use Synclavier Go! effectively, you need to understand the features presented in this section and what they all do.

Additive synthesis begins with a simple sine wave. Other sine waves of different frequencies, volumes and phases, are combined with the original to create a complex steady-state waveform. Each sine wave can be modified individually. You can create complex periodic or non-periodic waveforms, or waveforms with inharmonic relationships between the frequency components.

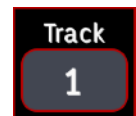
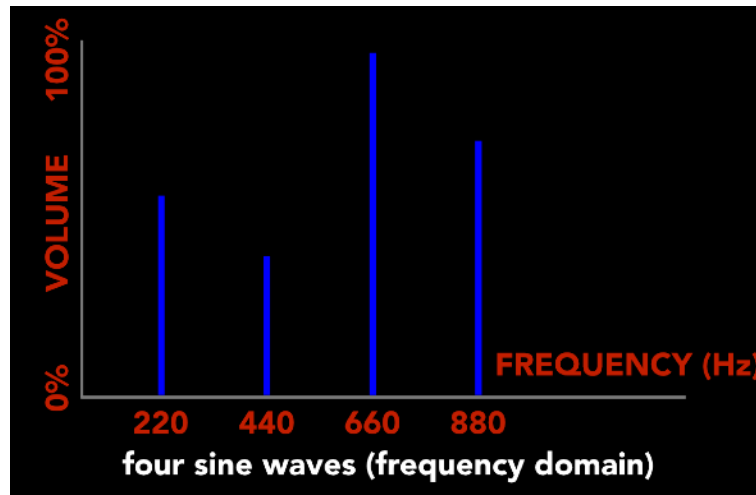
NB: There are many technical articles on Additive Synthesis and comparisons to other methods of sound synthesis, so this is not the place to describe everything going on under the hood. This section will focus on how to design a sound using the Synclavier Go! user interface. If you want to learn more theory than is presented here, search for "Additive Synthesis" on your favourite search engine.

8.1. Sine Waves

The fundamental unit of any synthesized sound is the sine wave, a periodic waveform that can be represented graphically as amplitude changes over time.



Complex waveforms are created when sine waves are superimposed on each other. Joseph Fourier, a 19th-century French mathematician, observed that all complex periodic waves are in fact combinations of sine waves with different frequencies, amplitudes and phases. The sine waves of a complex waveform can be represented on a frequency spectrum, which shows the relative volume of each harmonic.



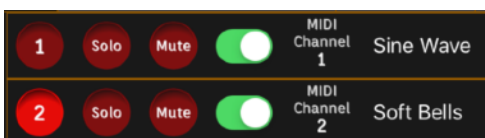
The sounds produced by musical instruments are usually much more complex than the previous example. Each instrument has its own harmonic structure, which can vary according to a note's duration, volume and pitch.

In a steady-state waveform, the first harmonic is the fundamental frequency of the waveform. The second harmonic is a sine wave whose frequency is twice the fundamental frequency; the third harmonic is three times the fundamental frequency, and so on. Each time you change the volume (or phase) of a harmonic, Synclavier Go! computes the waveform and places it in a wavetable in the digital synthesizer.

8.2. Harmonics

Harmonic coefficients determine the relative volume of each harmonic. A coefficient of 0.0% means the harmonic is not present in the waveform. A coefficient of 100.0% means the harmonic is present at full volume.

Harmonic phases determine the relative times at which the sine waves reach their peaks and troughs. Since changing individual partial phases doesn't affect the final timbre greatly, this facility has been left out of Go! but it is present in our flagship



Synclavier V product.

The best way to learn this panel is to dive in and create a new sound:

> Start by recalling “sine wave” from the System Disk library. We are going to create/modify Partial 1, so solo this.

> Press Tuning from the Volume, Modulation and Intonation panel. The base frequency of this partial will be shown in the VK display. (Blank partial's default frequency is 440hz.) If tuning is shown in semitones, you can switch it to hertz form the main settings. Change this to 880hz using the knob or top jog button. If you don't hear a sound, you'll have to set the Volume or Volume Envelope settings.

> Make sure you have Carrier selected, not Mod, on the Selection subpanel. The first harmonic to set is always 1, so next press 1, on the Harmonic subpanel. The coefficient for 1 is shown on the VK display. Change this to 80%. **NB:** All coefficients are normalised against each other.

> Press a key on the keyboard. You should hear a pure sine wave in A.

NB: If you did not start with “sine wave”, you can use the quick-start feature to set a simple sine wave: flip the panel to show the Digital Waveforms buttons. Press the Sine button to overwrite the current Carrier waveform to a sine wave, You may also want to do this for Mod (the modulator wave).

> To make this sound more complex, you can add another harmonic to it. Pick another harmonic and press its button. It should light, the coefficient will be displayed. Turn the knob or use the jog buttons to dial in 60%

> Press a key on the keyboard and you will hear a more complex sound from the pure sine wave from before. Congratulations, you've performed some Additive FM Synthesis. Turn the knob to set the coeff back to 0%. Notice, how, if you play a key on the keyboard, we've reverted to a simple sine wave? This is because the other harmonic has been set to 0 volume.

> You can create evermore complex sounds by adding further harmonics, and tweaking the coefficients (and phases, if available). Try swiping several harmonics at once. Pressing 13-24 reveals the higher order harmonics. **PRO TIP:** Swiping both 1-12 and 13-24 allows you to select Harmonics from both ranges at once.

As discussed earlier, partials can have soundfiles assigned. In this case, instead of the coefficients, you'll see soundfile controls on the Additive Synthesis panel. Autotune analyses the sample and adjusts its Pitch accordingly. If you know the pitch of the sample, you can do that manually. Low Key and High Key can be used to set a keyboard range for this soundfile. Using these parameters is a quick method to assign keyboard envelopes to a set of soundfile partials — a feature used often for polysampled instruments. Choose can be used to swap out the soundfile/s of the currently selected partials with another. Clear is self-explanatory.

The other parameters are used to loop a sample.

On the flipside of this panel are quick-start waveforms buttons. Pressing one causes the current partial's harmonics to be overwritten with values from a Fourier transform of the selected waveform. This can act as a good starting point for you to design a sound if you know what carrier waveform you desire — each one

has different sonic characteristics that you should become familiar with. A crude reduction would be to say that a ramp wave can emulate brass instruments, a square wave string instruments. A triangle wave, like a square wave, contains only odd harmonics.

> Try this now. Press the Carrier button, select Triangle. Values for a triangle waveform are loaded into the partial, overwriting the harmonic coefficients, but they can still be modified. Press the Harmonics buttons to look at the coefficient values. Play a note, notice how it has a more aggressive sound than the pure sine wave.

NB: When you are changing selected coefficients, you're doing so for the active timbre frame on all selected partials. If you have multiple partials selected, the selected coefficients may be different, so their values will be changed in step when you turn the knob. You can only modify one timbre frame at a time. And remember, you have copy and paste functions for partials and clone functions for frames on the flipside of the Partial Timbre Design panel: these copy the harmonic coefficients from one partial to another, and one frame to the next.

8.3. FM Modulation

Thus far, we have been modifying the carrier waveform. Things can get really interesting (or weird) when you modulate the carrier wave with another wave. The same features to shape your carrier wave are applicable to a modulation wave: unlike many other synths, Synclavier Go! lets you design complex harmonic behaviour into both carrier and modulator waveforms. The modulation wave defaults to off (all the harmonic coefficients are zero).

> Press the Mod button and it will light. There are two ways to create a modulator — using the quick-start buttons or selecting the harmonic buttons and increasing their coefficients. Try the former method, select Ramp. Now, when you press a key, the carrier waveform is being modulated by the modulator waveform you just created. What this means, is that the frequency of each harmonic in the carrier waveform is being modified in real-time by the changing amplitude of the modulator waveform. In practise, what Synclavier Go! is doing under the hood to achieve this effect, is adding "sideband" components to each harmonic.

NB: If you don't hear any difference, when you set the Mod coefficient/s from non-zero, this could be because the FM Amt is set to zero, or the FM Harmonic Envelope has been set to zero — check Peak and Sustain levels.

8.4. FM Harmonic Envelope

Although this modulation effect is neat, you might not want it throughout the duration of your note being played. It might be more appealing for the modulation to grow and then diminish. That is where the "Harmonic Envelope" comes in.

The number of significant sidebands (sidebands that affect the quality of the tone) depends on the depth of modulation, or volume of the modulator wave. As the

depth of modulation increases, the strength of the carrier frequency decreases relative to the strength of the sidebands.

The depth of modulation is determined by the FM Amt and the FM Harmonic Envelope parameters, which transforms a steady-state modulator wave into a wave that varies over time. Please revisit section 4 for the particulars of this feature.

The diagram shows how all these features work together to create the Synclavier® sound.

9. Tracks Tab

When you start to use the multi-timbral capabilities of Go!, mastery of the Tracks tab will become essential to your workflow. This tour page outlines the features housed under the tracks tab.

9.1. Active Mix

Under the Tracks tab are several sub-tabs. The leftmost is the Active Mix sub-tab. This is so important, it has its own shortcut button: pressing the Track number in the top-left of Synclavier Go! takes you straight to the Active Mix no matter where you are in the app.

The Active Mix sub-tab adopts the title of the current “active mix” on Go! When you first view this tab, it should read *Unnamed Mix*

If you’ve been using Go! mono-timbrally thus far, you’ll have only been using Track 1, represented by the top row of the Active Mix sub-tab. You can switch on more tracks via the green buttons, and have multiple timbres playable at once, up to a total of 16. > Try switching on track 2 now.

By default, a newly-created track contains the timbre from the last selected track, so if you were using the Concertina preset on track 1, and you switched on track 2, this would also be set to the Concertina preset.

An important concept to grasp is which track is currently selected. There can only be one selected at one time. To select a track, you press its numbered red button.

9.2. Managing Multiple Tracks

Whichever track is selected, is the one that will sound when the virtual keyboard is played. And the selected track’s timbre is the one that will be modified when changes are made on the Timbre tab, and then stored if saved from the Library tab.

To change a track’s timbre, double-tap its numbered button. This takes you to the Library tab, and when a new timbre is selected, returns you to the mix page. > Try this now for track 2, selecting a different track. **NB:** You can also just select the track and then change its timbre in any usual fashion (e.g., Bank and Entry buttons on the Timbre tab.)

So why have up to 16 tracks, if you can only play or modify one at a time? Other than being able to switch quickly between a pre-arranged group of timbres, there doesn’t seem much point...

Well, each track, 1-16, is locked to its corresponding MIDI channel. Go! supports MIDI input from keyboards, sequencers, and other apps. Using sequencers, you can send multiple note messages for simultaneous play on Go!

Synclavier Go! implements a single stereo output, either through a headphone jack, or USB audio. Therefore, when more than one timbre is playing at the same time, what you hear is a stereo mix of all the timbres, hence the name mix.

NB: A gotcha to be aware of, is when you play a note on a MIDI keyboard and Go! doesn't produce a sound — it could be that the channel the keyboard is sending has been switched off in Go!

9.3. In the Mix

There are several controls on the right-hand-side of the Active Mix sub-tab that will help you create a desirable-sounding mix, when you're playing Go! multi-timbrally; namely, Vol, Pan and FM.

NB: These parameters are separate from their corresponding base parameters found on the Timbre tab. In fact, these act as modifiers. So for instance, the resultant volume of a track's timbre is its timbre volume multiplied by its mix volume. The mix volume defaults to 0dB — multiplier of 1 — so it doesn't affect the timbre's volume. But if you select Vol on the mix sub-tab, and change it, you can set it all the way to $-\infty$ dB (in which case the volume will be muted) or to +20dB (where the timbre is loud enough it may distort, depending on the selected timbre).

It is, in actuality, more complicated than stated, since a timbre's volume is also a product of its partials' volumes. But moreover, MIDI RTEs can also be mapped to volume — as discussed on page 7 of this tour — for instance, velocity is mapped to volume in many preset timbres.

Pan and FM (Amount) work in a similar fashion as Vol, to move the sound in the mix and brighten it. And several buttons can be swiped at once for quickly changing several sounds.

PRO-TIP: When working on a mix with various Go! timbres, these mix parameters can be modified dynamically. Additionally, they can be modified by incoming MIDI CC messages. For instance, if you're playing multiple MIDI tracks from Logic Pro X into Go! via Inter-Device Audio, changing the volume sliders in Logic will modify the Vol parameter on the mix screen. This is because Logic outputs MIDI Channel Volume messages when you change a slider (07hex). You can configure other DAWs to do the same. Likewise, you can configure keyboards such as Arturia's MiniLab MkII and sequencers such the Elecktron Digitakt to do the same. In this way, once configured, you needn't revisit the iPad screen often, you can just jam it out on your chosen hardware, and Go! becomes a powerful compositional tool.

The Pan parameter is similarly controlled via MIDI Pan messages (0Ahex) and the FM parameter is controllable via MIDI Expression messages (0Bhex). These CC messages can all be switched off via the app settings if you prefer not to have your mix affected. Since you can map Volume and Expression RTEs individually in the Timbre and Keyboard Effects, the ability to turn off the over-arching mapping gives you maximum flexibility.

If you swap timbres in place in a track (via double-tapping a numbered red button or other method), the three mix settings are remembered. In this way, you can quickly try out a number of snare drum sounds, for instance. If you want to reset the mix level to default, simply double-tap the Pan, Vol, or FM button.

DAW-style Mute and Solo buttons are also provided per track that work as expected; and the 16 numbered selector buttons across the top can be used in conjunction with the clipboard buttons to copy, paste and cut tracks; so the Active Mix sub-tab is a very versatile tool for when you're building a song.

9.4. Saving Mixes

When you're happy with your mix — you've selected a set of timbres that play nice together and have levelled and balanced them satisfyingly — you can save the mix. The Save sub-tab works in the same way as the Library's save feature for timbres. In fact, the mixes can be saved in the same workspaces you're familiar with from the Library (tour page 3). These workspaces can be shared across devices (we intend to implement iCloud sharing soon) and backed up, via iTunes File Sharing (<https://support.apple.com/en-ca/HT201301>).

So the workspace is the organizing unit for your work. It should be noted, that when you save a mix, you are also saving the timbre details with that mix, so if you have changed, for instance, vibrato depth on one of your tracks, this data will be saved when you save your mix, but it won't overwrite the original timbre's vibrato depth.

Your saved mixes will appear under the Workspaces sub-tab, in alphabetical order. To recall a previously stored mix, just press its red button. The Search sub-tab enabled you to find mixes across all workspaces.

The Demo sub-tab is where you'll find demos of mixes for various musical genres to spark your creativity. Akin to the Library's preset timbres, these mixes are immutable. Hopefully, these will get you started, and inspire you to create multi-track music on Synclavier Go!

9.5. MIDI Settings

This is another sub-tab that's important enough to have its own shortcut button, ⇐⇒. As already discussed, Synclavier Go! (and Synclavier Pocket!) accept MIDI input. This sub-tab lists all available devices for MIDI input, including network and bluetooth devices.

You can chose to disable these incoming MIDI signals, with the green switches. This may be useful in certain scenarios: for instance, if you are using a MIDI keyboard on channel 1, and recording the sequence into a sequencer app, such as Nano Studio 2: the track you're recording on Nano Studio 2 might be set to send to channel 4 on Synclavier Go! In this case, you won't also want the timbre of track 1 to sound when you play the keyboard for track 4; so can be switched off.

To use bluetooth devices for MIDI input, you will likely first need to pair and connect, so a button is provided, which pops up the iPad's Bluetooth MIDI Devices settings. After connection, your bluetooth device will appear on the list. If you have AudioBus, you can also route MIDI into Synclavier Go! from another app, and this too can be switched off.

If there's a red button with a Synclavier Knob icon to the left of your MIDI device, this can be selected to route the pitch-bend data from that input device to use as the Knob. Of course, if you have purchased the standalone Synclavier Knob hardware and connect it, this will be selected automatically.