User Manual v1.3.1

Living Memory Software

Contents

Intro

LayR is a massively polyphonic, multi-timbral synthesizer for iOS devices, optimized for modern 64 bit CPUs and capable of delivering up to 256 voices of rich, multi-layered and textured sounds.

LayR's primary sound components are called Performances where a Performance is a set of Instruments and each Instrument is a set of Layers and each Layer is a complete synthesizer. A performance can consist of any number of instruments each with its own MIDI channel and crossfading keyboard span. Each Instrument can consist of any number of Layers to a maximum of 128.

Each Layer has a dual oscillator that can morph with modulation between two shapes and phase states, two rich and warm state variable filters, a wave folder and a mixing section to blend oscillators and filters in any serial/parallel combination.

For modulation (frequency, amplitude and phase) there are two Low Frequency Oscillators ranging from DC to audio frequency switchable to optionally follow keyboard pitch and restart phase when a note is started. Two loopable ADSR envelopes ranging from fractions of a second to over 100 seconds, an amplitude ADSR and a random number generator with a smoothing filter. With stereo delay, reverb and EQ on the output section LayR excels at not only emulating normal analog synth sounds but also at creating massive pads and huge spacy ambient textures with extremely long evolution cycles.

Focused at keyboard players looking for a mobile synth that can be reliably used live on stage LayR is equally at home in the studio. An extensive selection of usable instrument and performance presets are included which can be loaded using MIDI bank select and program change messages in the same manner as hardware synths.

LayR sports almost unparalled and extremely flexible MIDI control. Every parameter in the synth engine can be assigned to any MIDI Control Change number and parameters spread across multiple Layers can be grouped and controlled by a single MIDI cc with assignable range and direction.

There is also an 8 track, 16 step Arpeggio Sequencer which can be used to create all sorts of exciting polyrhythmic looped patterns or even ambient generative music. Each track can have it's own speed, playback mode and length.

On top of all that LayR has a MIDI Controller Mixer that can be used during performance to control the synth engine in real time and can also transmit MIDI cc's from LayR's output port to other destinations.

Full IAA, Audiobus, Audio Unit and Link compatibility means LayR can be used with all hosts and other music apps on iOS and desktop DAWs.

If you use LayR and like it please take the time to leave a review on the App Store. Living Memory do not pay for reviews or insert annoying nag screens into our apps and we rely on the goodwill of our customers to rate our app on the store which, in turn, gives us the ability to continue to maintain the code and produce updates.

If you find a bug, know that we really do hate bugs just as much as you! Reporting a bug via the support link on the website is far more productive than leaving a complaint on the App Store! All bugs are squashed quickly and updates rapidly issued.

https://www.livingmemorysoftware.com

About This Manual

This manual will attempt to explain LayR's user interface but it will not teach you audio synthesis or how to use a synthesizer. It is assumed you have purchased or are thinking about purchasing LayR[1] because you already have a good understanding of synthesis and know what you want from a performance synthesizer.

The manual is divided into various sections that relate to sections of LayR's user interface. To aid quick access to information there are many indexed diagrams and illustrations with associated links that can be quickly and easily identified.

Where possible brevity takes priority over verbosity.

For quick reference there is a table of contents and a chapter on the various swipe gesture shortcuts designed into the UI for use as you become an expert with LayR. To browse the manual in a better PDF reader, it can be exported from LayR by tapping the export icon on the top right. Or you can also find it in **Files.app/On My iPad/LayR**.

The manual mainly shows illustrations taken from the full screen interface. The phone and audio unit versions of the user interface use the same graphic style as the full screen version but are layed out horizontally instead. There is a small section discussing the differences between the versions but the UI is essentially exactly the same.

[1] - *"I sincerely hope you get as much enjoyment and fulfilment from using LayR as I have from creating, implementing and using it myself!"*
Andy - Living Memory Software.

UI Shortcuts & Optional Swipe Gestures

LayR makes use of as many touch screen gestures as possible. For example, double taps are used to set default values or to quickly zoom in and out of the UI. Long Press gestures are used to access useful panels that needed less frequently than the main editors.

As you become proficient with LayR's user interface you may want to enable the "**Editors: Swipe to Open/Close**" option in LayR's settings. This option turns on the ability to move quickly from panel to panel by swiping on the background of the views in various logical directions. Bear in mind the swipe option requires precise and expert aim on the screen in order to execute the swipes without interfering with the rest of the UI. Not everyone will like this feature which is why it's a option in the app Settings. However when executed with skill it makes using LayR easier, quicker and more comfortable.

Here is a list of the available taps, double taps, swipes and long press gestures at time of writing this manual. (v1.2)

- In the Layer Editor, long press on a dial or slider to access the MIDI assign and Layer Parameter Link panel.
- Long press on the background of a section in the Layer Editor to reveal the pasteboard for that section.
- Tap on green values and numbers to enter a value from the numeric keyboard.
- Double tap dials to set a default value (often zero).
- Double tap the outer (Fine Tune) dial in the Oscillator to set the nearest semi-tone. Tap 4 times to set zero on this dial.
- Double tap the inner (Coarse Tune) dial in the Oscillator to set the nearest octave. Tap 4 times to set zero on this dial.
- Double tap the background of the Layer Editor to zoom into the tapped position, double tap again to zoom back out.
- Swipe horizontally on the Layer Editor menu bar to change layer in the direction of the swipe.

With the swipe option enabled in LayR's settings:
- Swipe down in the Master Strip to open the Load Performance Panel.
- Swipe up in the Master Strip to open the Save Performance Panel.
- Swipe down on background of the Instrument Mixer to open the Load Performance Panel.
- Swipe up on the background of the Instrument Mixer to open the Arpeggio Sequencer.
- Swipe up on an Instrument Strip to open the Save Instrument Panel.
- Swipe down on an Instrument Strip to open the Load Instrument Panel.
- When the MIDI CC Mixer is covering the keyboard, swipe down on the mixer to reveal the keyboard.
- Swipe up on the MIDI CC Mixer to reveal the Arpeggio Sequencer.
- Swipe down on the MIDI CC Mixer to close the mixer.
- Swipe left to right along the top of an instrument strip to reveal the Layer strips.
- Swipe right to left along the top of an instrument strip or layer strip to hide the Layer strips.
- Swipe right to left along the top of the key span editor to hide the editor.
- Swipe up on a Layer strip to reveal the Layer Editor for that layer.
- Swipe down on the Layer Editor to close the editor.
- Swipe up on the Layer Editor to reveal the Arpeggio Sequencer.
- Swipe up on the Mod Matrix panel to close the panel.
- Swipe left to right on the Effects panel to close the panel.

iOS 11 only:
- Long press on Instrument strips to initiate drag and drop.
  - drop an Instrument on another closed instrument to move the dragged instrument before the one it's dropped on.
  - drop an Instrument on an expanded instrument to copy its Layers into the destination.
  - to move an Instrument to the end of the list drag it all the way to the right to empty space in the Instrument Mixer.

- Long press on any control within Layer strips[1] to initiate drag and drop.
  - Drag Layer strips within their owning Instrument to reorder the strips.
  - Drag Layer strips to other expanded Instruments to copy the layer to the other Instrument.
  - Drag Layer strips to the background of the Instrument Mixer to create a new Instrument with the layer.

[1]- The reason you need to long press on a control in a Layer strip is to differentiate the drag & drop gesture from the Instrument Mixer scrolling gesture.

Instrument Mixer

This panel is usually the first part of the UI you see when you launch LayR. It is the base from which all other sections are accessed and is referred to as the *Instrument Mixer.*

The Instrument Mixer has 3 main parts:
The Keyboard (3) at the bottom, one or more Instrument Strips (6) in a horizontally scrolling view above the keyboard and the Master Strip (1) fixed to the right of the scrolling instrument strips.

Performances & Instruments

The view represented by the Instrument Mixer shows what in LayR's parlance is called the current *Performance*. A Performance is one or more Instruments set to receive MIDI on any number of MIDI channels along with the current effects programs and Arpeggio Sequencer program. Some other synths might also refer to this as a "multi" as it's basically a multi-timbral setup.

Each Instrument is a self contained preset sound generator that can be loaded from one of 128 banks of 128 programs either manually using the Load Preset panel or via MIDI with bank and program change messages. There is almost no practical limit to the number of Instruments that can be active in the current Performance with the maximum currently being set at 128!

Just as Instruments[1] can be loaded and saved from preset files so a Performance is also a preset file type. A Performance Preset is the entire current state of LayR and is loaded and saved from the buttons in the Master Strip (1) or via MIDI with bank and program change messages on a specific channel specified in LayR's settings, or via LayR's special Performance MIDI input port.

Hint
- Browsing the built-in factory Performance Presets is the best way to get to know LayR's capability quickly!

The Instrument Mixer Panel

(1) - **The Master Strip**
Provides access to LayR's settings, Virtual MIDI connections, Macro, Tempo, Arpeggio Sequencer and Performance Presets.
The master strip also contains the master volume control, a Panic button (all notes off) and a pair of output level LEDs.

(2&3) - **Keyboard**
Enables you to play LayR on screen using various modes and scales.
Provides buttons for all keyboard related options, sustain pedal and key scale/mode editor.
Also provides convenient access to the **MIDI Controller Mixer**.

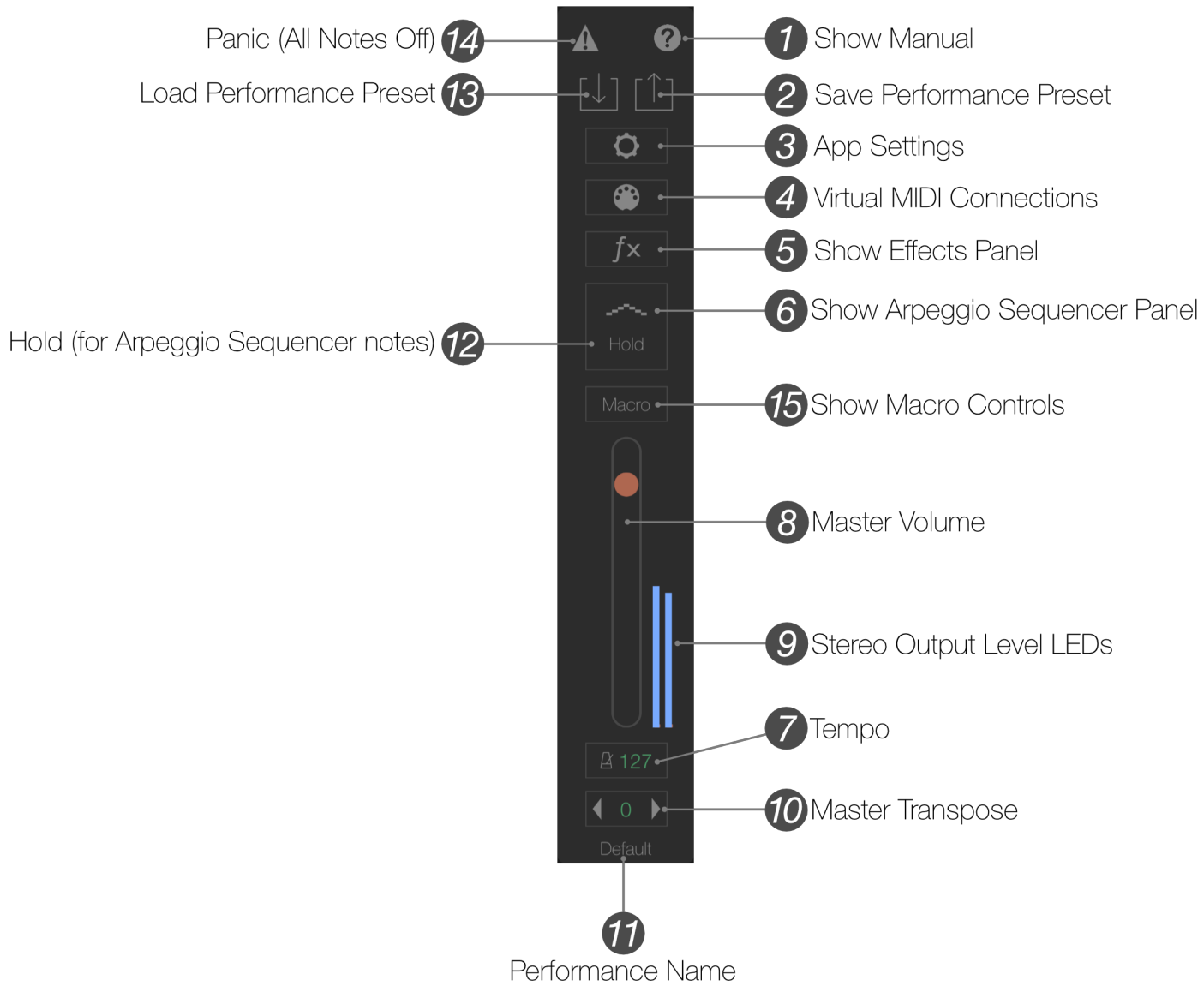
(4&5) - **Pitch Bend & Mod Wheel**
These provide the usual modulation controller (cc1) and pitch bend function found on most synthesizers.

(6) - **Instrument Strips**
Provide access to all Instrument related settings and editing.
Can be expanded to reveal their **Layer Strips** and the **Key Span Editor** for the instrument.

(7) - **Add Instrument Button**
A convenient button, located to the right of the last instrument, to quickly add another instrument to the performance.

[1]- An instrument can also be thought of as a collection of one or more Layers where Layers are LayR's fundamental building block, but we'll come to that shortly 😉

The Master Strip



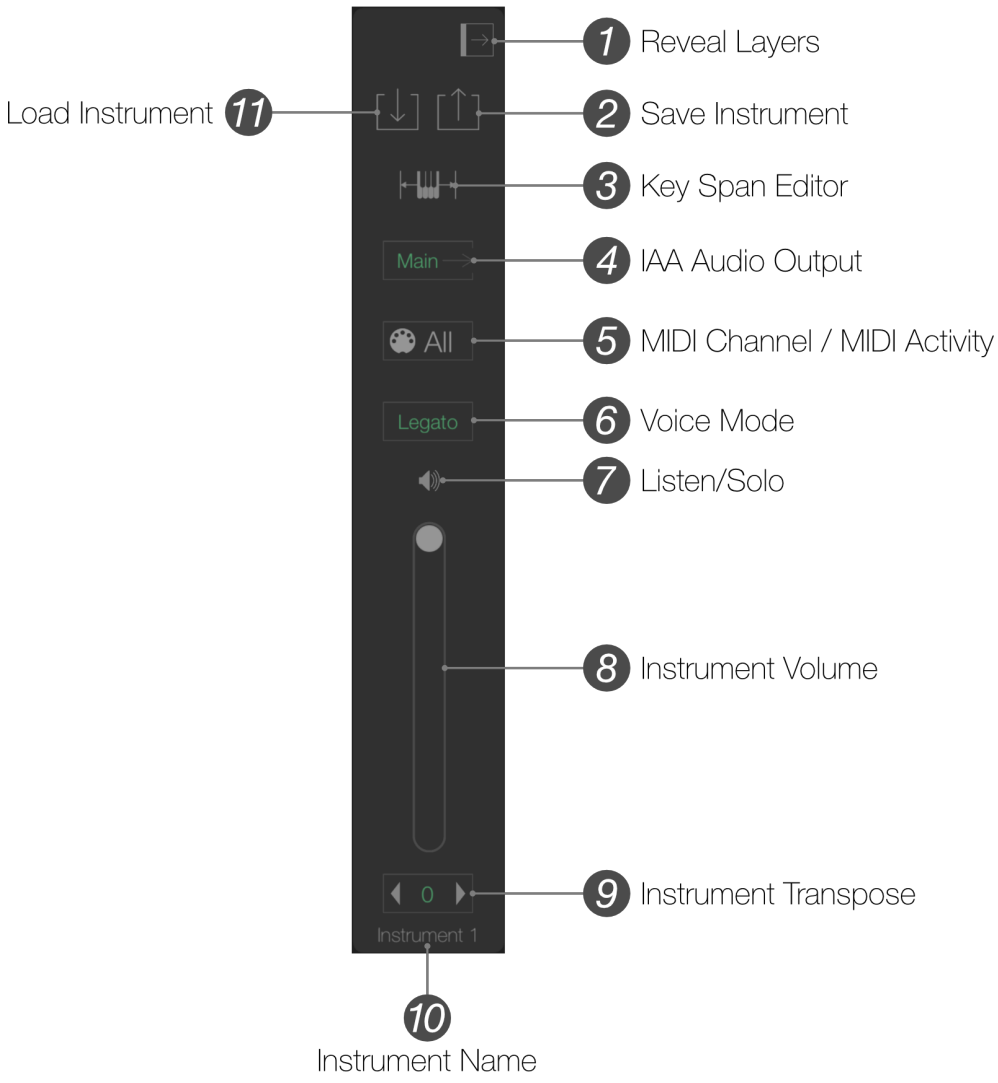
The Master strip provides access to Performance Presets, LayR's global settings, Effects, Tempo, Arpeggio Sequencer, Panic button and master volume control. The Master strip is always visible on the right hand side of the Instrument Mixer Panel.

Master Strip controls

(1) - **Help**: Shows this manual
(2) - **Save Performance**: Tap this button to save the current Performance to a bank as a preset program.
(3) - **Settings**: Reveal the App Settings Panel.
(4) - **MIDI**: Reveal the panels for connecting LayR's virtual MIDI input and output ports.
(5) - **Effects**: Opens the Effects Panel for editing delay, reverb, eq parameters.
(6) - **Arpeggio Sequencer**: Tapping the top half of this control reveals the Arpeggio Sequencer Editor
(7) - **Tempo**: Drag or tap on this control to set the internal tempo. Also sets Ableton Link tempo when enabled in settings.
(8) - **Master Volume**: Set the master volume. An option in settings can turn off changing master volume when a Performance is loaded.
(9) - **Audio Level**: LEDs to show the current output level, turn yellow at -3dB and red at 0dB
(10) - **Master Transpose**: Drag or tap on this control to set a MIDI transpose value that affects all instruments. (semi-tones)
(11) - **Performance Name**: Shows the current performance name. To change the name save the performance using a new name.
(12) - **Arpeggio Sequencer Hold:** Tapping the bottom half of this control toggles hold on/off for the Arpeggio Sequencer.
(13) - **Load Performance**: Tap this button to load a Performance preset from a bank and program.
(14) - **Panic**: Tap this button if MIDI notes get stuck or voices refuse to stop playing. Sends All Notes Off to the synth engine.
(15) - **Show Macro Controls**: Tap to open the Macro Control Panel for making global changes to parameters in all layers.

Tip
- see the shortcuts section for info about swipe gestures in the master strip.

Instrument Strips



Instrument strips provide access to all editing parameters for Instruments in the current Performance. Instrument strips can be expanded to reveal their Layer Strips, giving access to the Layer Editor. If there are many Instruments in the Performance you can scroll through them by holding the background and dragging horizontally.

On iOS 11 Instrument strips can be picked up and reordered or copied using drag & drop, see the shortcuts section for more info.

Instrument Strip Controls

(1) - **Reveal Layer Strips**: Tap this button to reveal the Layers contained in the Instrument. Tap again to close.
(2) - **Save Instrument**: Tap to save the Instrument to a bank and program as a preset.
(3) - **Key Span**: Tap to reveal the Key Span panel for editing the range of notes and set crossfades for the Layers.
(4) - **IAA Aux Audio Outputs**: Drag or tap on this control to set which of 8 audio outputs to an IAA host is in use for the instrument.
(5) - **MIDI Channel**: Drag or tap on this control to set the MIDI channel. Flashes green when the Instrument recieves MIDI.
(6) - **Voice Mode**: Drag or tap on this control to set Poly, Mono or Mono Legato.
(7) - **Solo/Listen**: Tap on the speaker icon to mute other instruments and hear only this one. (Can be grouped with other Instruments).
(8) - **Instrument Volume**: Set the volume of the Instrument with this slider.
See the MIDI section for information on how MIDI cc7 interacts with instruments.
(9) - **MIDI Transpose**: Drag or tap on this control to set the instrument MIDI note transpose[1] value in semitones.
(10) - **Instrument Name**: Long press on the name label as a shortcut to rename an instrument before it's saved.
(11) - **Load Instrument**: Tap to load an Instrument preset into the instrument strip from a bank/program.

Tips

- see the shortcuts section for info about swipe gestures in instrument strips.

- see the MIDI cc Mixer section for information on how LayR uses MIDI cc7 to set all Instrument volumes on a channel as a group while maintaining their relative volumes.

[1] Bear in mind that Master Transpose, Instrument Transpose and Layer Transpose are summed together.

Layer Strips

An Instrument strip expanded to reveal its Layer strips

Expanding an Instrument strip reveals its Layer strips. Layer strips are the first point of contact for the Layers contained in an Instrument. Each Layer is an individual self contained synthesizer with it's own parameters. There can be up to 128 layers in any Instrument although it's highly unlikely you'll ever need that many!

Layer strips contain controls for a few useful Layer parameters and provide access to the full Layer editor.
Details about Layer editing will be discussed later in the manual.

Layer Strip Controls

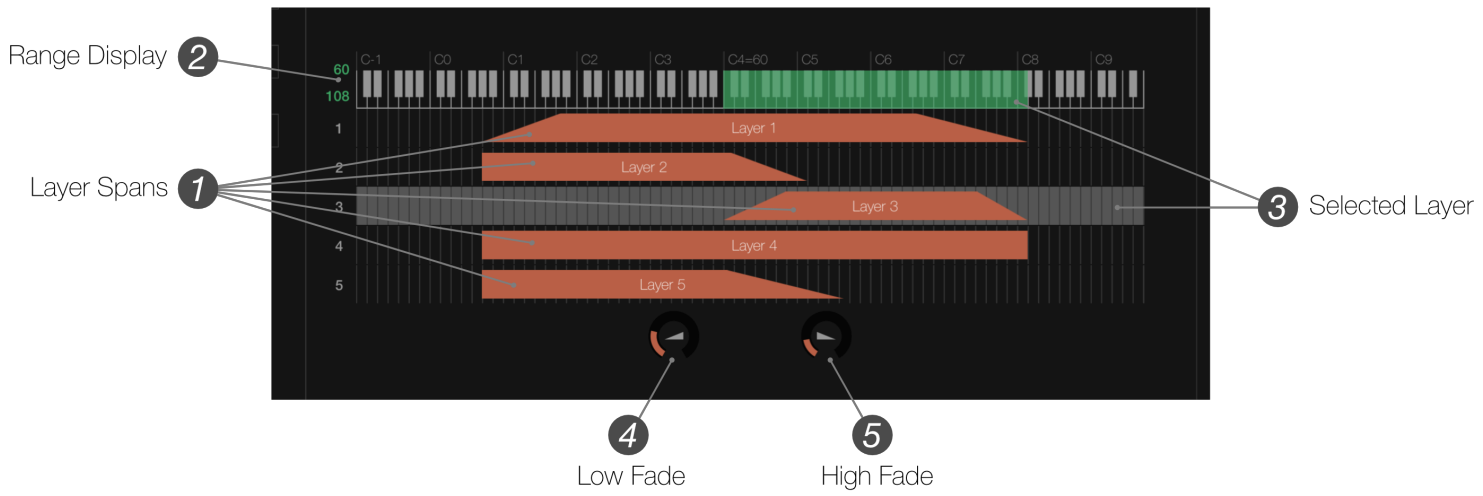
(1) - **Edit Layer**: Tap the arrow shaped button to reveal the full layer synth editor.
This button flashes blue while an active voice is using the layer.
(2) - **Add / Delete Layer**: Buttons to delete (-) the layer or add (+) a new layer to the Instrument.
(3) - **Effects Send 1**: Effects send to Delay. This dial sets the amount of audio signal that is sent from this layer to the Delay effect.
(4) - **Effects Send 2**: Effects send to Reverb. This dial sets the amount of audio signal that is sent from this layer to the Reverb effect.
(5) - **Pan**: This dial positions the audio signal from the layer to left or right sides of the stereo field.
(6) - **Enable Pitch Bend**: Tap this button to set whether or not this layer responds to MIDI Pitch Bend. Green = On.
(7) - **Solo/Listen**: Tap on the speaker icon to mute other layers and hear only this one.
Can be grouped with other Instruments and Layers.
(8) - **Layer Volume**: Set the Layer's audio level with this slider.
(9) - **Layer MIDI Transpose**: Drag or tap on this control to set the layer's MIDI note transpose[1] value in semitones.
(10) - **Layer Name**: To rename a Layer, long press on Layer name label.

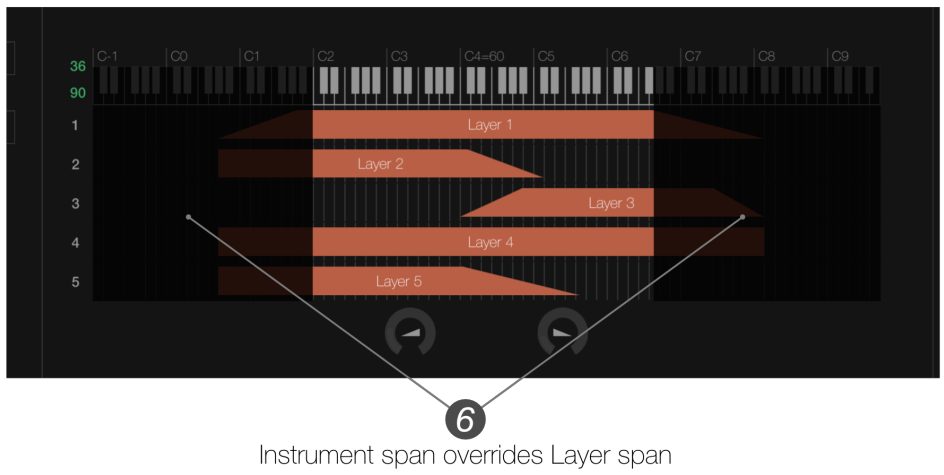
Tips

- see the shortcuts section for info about swipe gestures in layer strips.
- long press on the slider or dials in a layer strip to set Link Group and/or assign MIDI controllers.

[1] Bear in mind that Master Transpose, Instrument Transpose and Layer Transpose are summed together.

Key Spans & Crossfades





Instrument span overrides Layer span

Individual Instruments and Layers can be assigned to a subset of notes across the entire MIDI keyboard range. You can also specify fades and crossfades as layers overlap each other. To reveal the Key Span editor press the Key Span button in the Instrument strip. (Instrument Strips *(3)*)

The key span display can be vertically scrolled if there are a lot of Layers in the Instrument.

Setting Layer Key Spans

To set a Layer span, first tap on a row (1) corresponding to the layer to select (3).
To set the low end, drag from the far left toward the right side off the layer's row.
To set the high end, drag from the far right toward the left side off the layer's row.

The MIDI note numbers of the range end points are displayed in green on the left of the display and the range is overlayed in green on the keyboard above the layers (2).

To set the length of fades and crossfades, tap the layer row to select (3), then use one of the dials (4 or 5).

Setting an Instrument Key Span

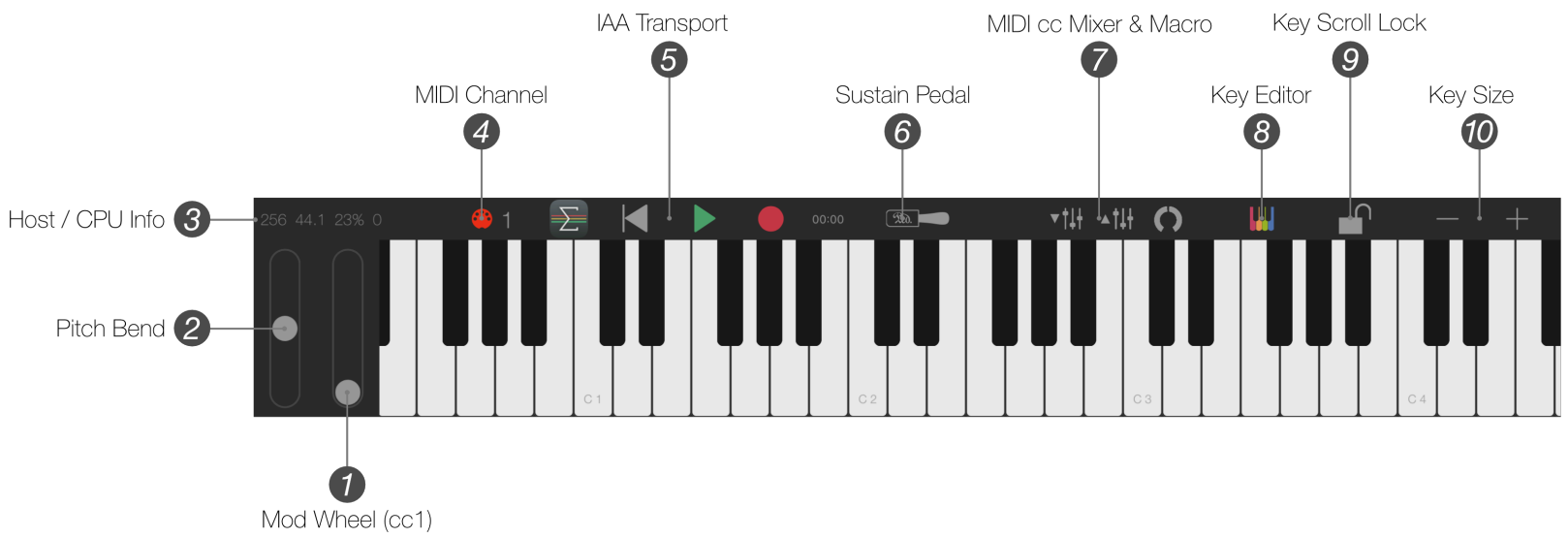
Instruments can also have a span that overrides the Layer spans. This is sometimes useful if you're creating a Performance from preset instruments.

The range of Instrument span is shown by darkening the areas outside of the range (6).

To set the Instrument span, first make sure no layers are selected by tapping on the keyboard display(2) above the layer spans.
To set the low end, drag on the keyboard display from the far left toward the right side.
To set the high end, drag on the keyboard display from the far right toward the left side.

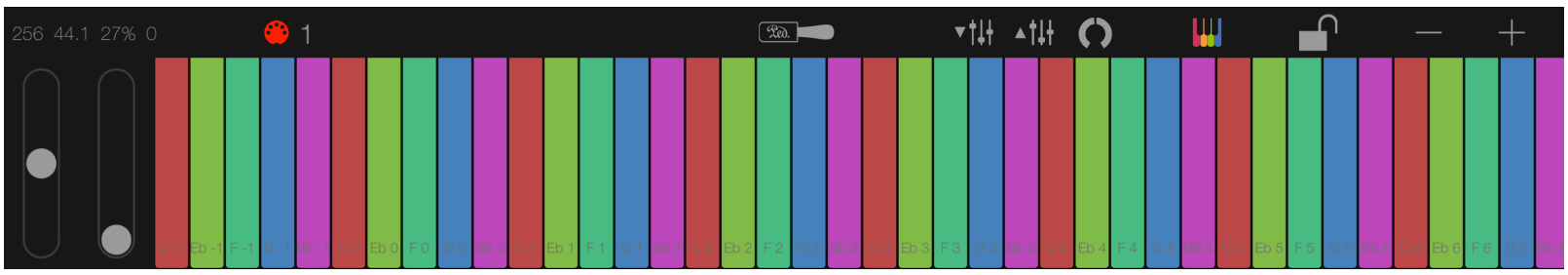
Hint
If you load an Instrument and hear nothing when you press a key, check it's Key Span settings to see if it should respond to the key you pressed.

Keyboard



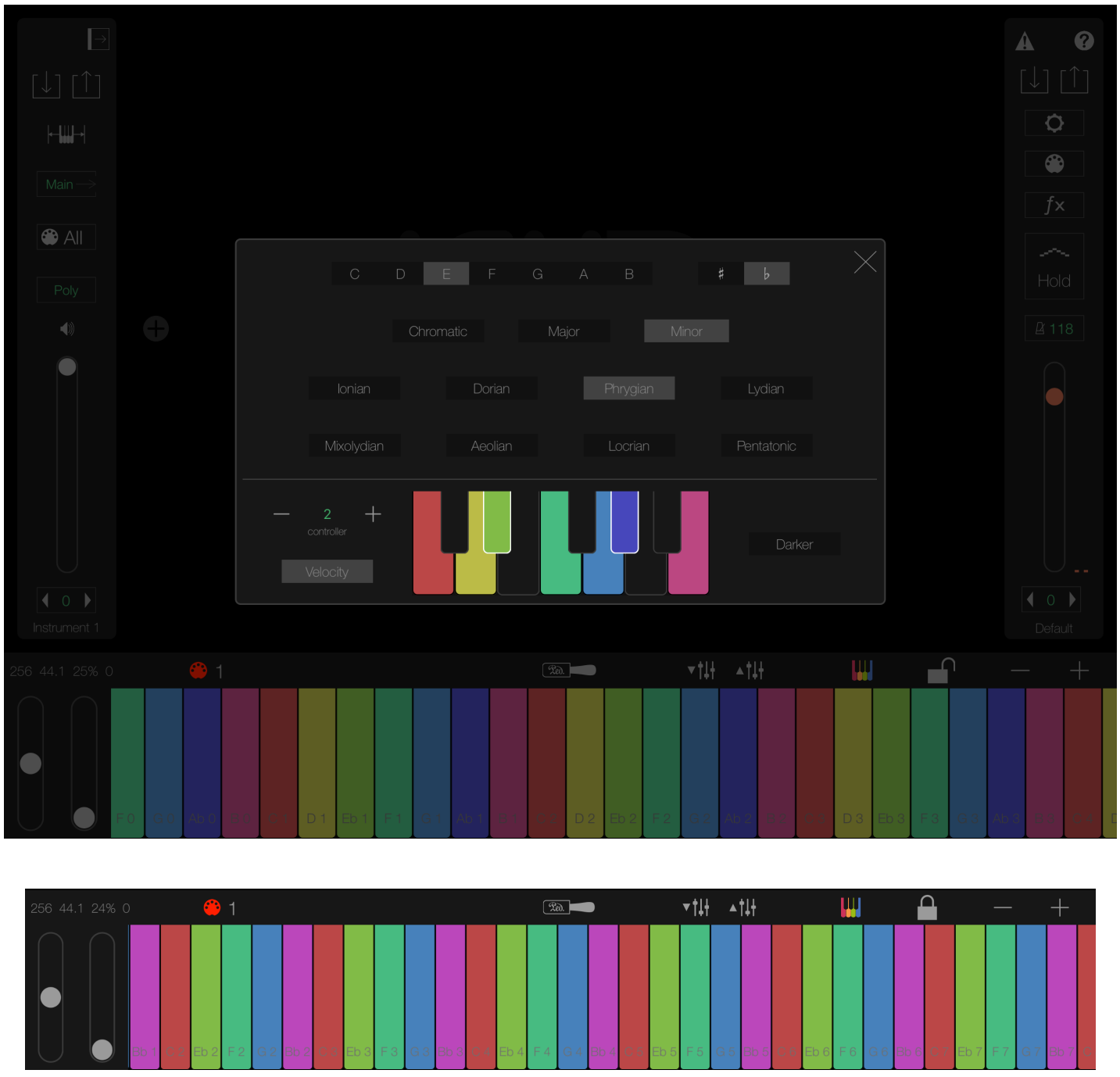
Without an onscreen keyboard Layer editing would be very awkward and in some circumstances it's also good to be able to use the keyboard for performing using the touch screen. LayR's onscreen keyboard features some useful functions.

(1) - This slider represents the Mod Wheel commonly found on most synths, it transmits MIDI cc1 to the engine and MIDI output port.
(2) - This slider represents the Bend Wheel commonly found on most synths, it transmits MIDI Pitch Bend.
(3) - These numbers show some statistics about LayR's usage: Buffer Size | Sample Rate | CPU Percentage | Number of active voices.
(4) - Tap or drag on this control to set the MIDI channel the keyboard uses to transmit MIDI notes, control changes and pitch bend.
(5) - When LayR is connected to an IAA host, the IAA transport bar is displayed here.
(6) - This button can be used to simulate a sustain pedal on screen. It transmits MIDI cc64 to the engine and MIDI output port.
(7) - These buttons control the display of the MIDI Controller Mixer Panel and Macro Panel. (discussed later in the manual).
(8) - This button opens the Key Scale & Mode Editor to let you edit which keys are visible and set keyboard velocity behaviour.
(9) - The padlock icon enables or disables horizontal scrolling. With it locked you slide your finger up and down the keyboard.
(10) - Use the + and - buttons to change the width of the keys on the keyboard.



A view of LayR's keyboard after the key scale & mode editor has been used to specify a C minor Pentatonic scale.
To return to the black & white keyboard use the key editor (8) and select the Chromatic option.

Key Scale & Mode Editor



A view of LayR's keyboard after the key scale & mode editor has been used to specify a C minor Pentatonic scale.

Access the Key Scale & Mode Editor by tapping on the coloured keys button above the keyboard.

This panel gives you options to set which keys are visible on the keyboard. Colours are used to help identify notes and octaves. The "Chromatic" button is (ironically) used to return to the full black & white keyboard.

When the Velocity button is selected, vertical touch position in the main keyboard keys is used to represent MIDI velocity.

You can also assign vertical touch position to a MIDI controller by dragging in the "Controller" view.
To disable the the MIDI controller function choose zero for the control number.

Tapping on keys in the coloured key display in the panel toggles the visibility of keys in the main keyboard, you can use this to create your own scale or mode.

There is also an option to set a "Darker" display mode for the chromatic keyboard.

Hint
- To return to the black & white keyboard open the key editor and select the Chromatic option.
- To disable the the MIDI controller function choose zero for the control number.

Layer Editor

Every Layer in every Instrument in a Performance is an individual synthesizer. This panel is the editor for a Layer's synth.
Each section in the editor will be explained in more detail in proceeding sections of this manual.

The Layer Editor is zoomable to make it easier to use on small screens. There are two gestures available for zooming.
- Pinch and Pan to zoom and drag at the same time.
- Double tap on the background to zoom into the location you tapped on. Double tap again to zoom out.

Be aware that double tapping is also a shortcut which sets a default value when tapping on dials. (See shortcuts)

Every control can be assigned to a MIDI controller with a range and direction. See Assigning MIDI Controllers for more detail.

As you add more Layers to your instruments you will want to be able to control some of the same parameters in all layers simultaneously you can do that by collecting dials and controls into Link Groups, see the chapter on Parameter Linking for more detail.
Linked controls can be remote controlled as a group using a single MIDI controller.

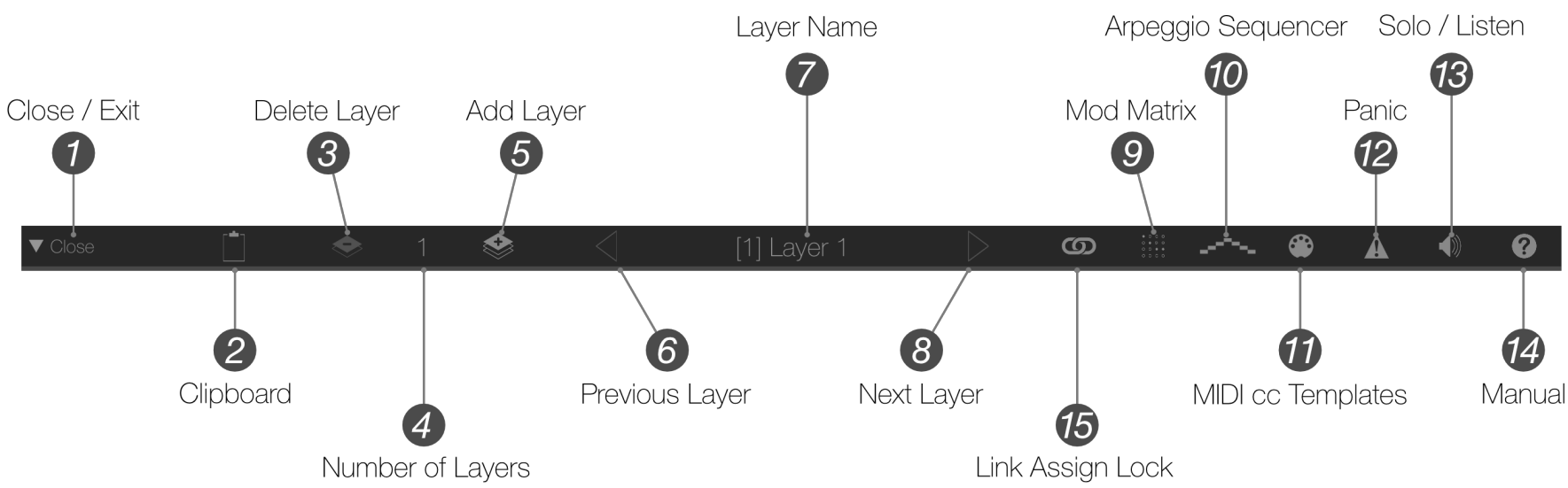
There is also a clipboard for copying and pasting groups of parameters which you can access by long pressing in the background of any section in the editor.

Layer Editor Sections

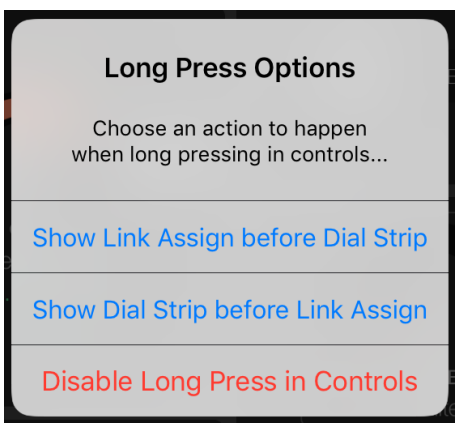
(1) - **Layer Menu Bar**: provides functions that are common or useful while editing a Layer. To exit the editor press the ▼Close button.
(2) - **Oscillator section**: The main sound generator of LayR's synth engine, 2 wave shapes can be morphed between and modulated.
(3) - **Filter sections**: LayR's filters are warm, flexible state variable filters with options for Low Pass, Hi Pass, Band Pass and Notch.
(4) - Filter 2 can take it's input from Filter 1 and add an additional Wave Folding effect.
(5) - **Envelope Section**: LayR has 3 *envelopes*, one for Amplitude and 2 aux envelopes that can be assigned as modulators.
(6) - **Mixer Section**: The oscillators and filters can be mixed to the output in any combination with optional amplitude modulation.
(7) - **Random Modulator**: A random number generator with a smoothing filter great for simulating sample & hold effects.
(8) - **LFO 1**: LayR's Low Frequency Oscillators can follow tempo or range from DC to audio frequency with various phase options.
(9) - **LFO 2**: " "

Tips
- *Dials and controls in the Layer Editor can be linked in parallel across layers. This is extremely useful and is discussed in the section on Parameter Linking.*
- *Long press on the background of any section in the editor to access the clipboard for that section.*

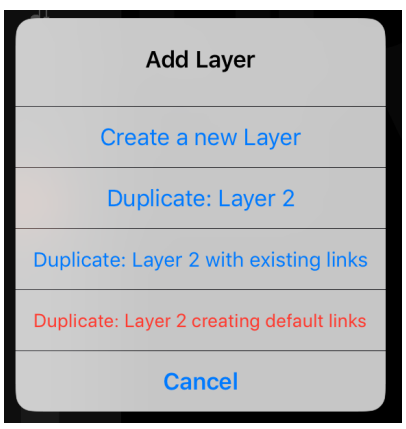
Layer Editor Menu Bar



(1) - Exit the editor and return to the Instrument Mixer.
(2) - Shows the current clipboard contents with an option to copy the entire Layer to the clipboard.
(3) - Deletes the current Layer from the instrument.
(4) - This number shows the number of Layers in the Instrument.
(5) - Offers various options to add another Layer to the Instrument. See the section on Parameter Linking.
(6) - Tap the left pointing arrow to move the editor to the previous layer.
(7) - Layer [number] and name. To rename, long press on the name.
(8) - Tap the right pointing arrow to move the editor to the next layer.
(9) - Shows the Mod Matrix which allows you to re-route modulation sources to other destinations.
(10) - Opens the Arpeggio Sequencer Panel
(11) - Shows the MIDI cc Template list[1]. Also gives the option to delete all current controllers assigned to the Layer.
(12) - Tap the Panic button if voices get struck on. This sends MIDI All Notes Off to the engine.
(13) - Tap the solo button to listen to the current layer in isolation. The button is coloured red when solo is enabled.
(14) - Shows this manual. The manual can viewed in place or can be exported as a PDF to your preferred reader.
(15) - This button provides options for showing the Link/MIDI Assign and Dial Strip panels when long pressing in controls. See below and also the section on Parameter Linking.



Link Assign Options.



The available options when adding a new layer (5).

Menu bar image for Link Assign Lock when disabled.

Shortcuts

- *Swipe left or right on the menu bar to move to the previous or next layer.*
- *Check out other gesture drivien shortcuts available in the Layer Editor by reading the shortcuts section.*

[1]- MIDI Controller Templates (11) for the Layer Editor are an expert feature and tend to be unique to individual workflow. For that reason LayR does not provide any default templates. The list will be empty until you create your own.

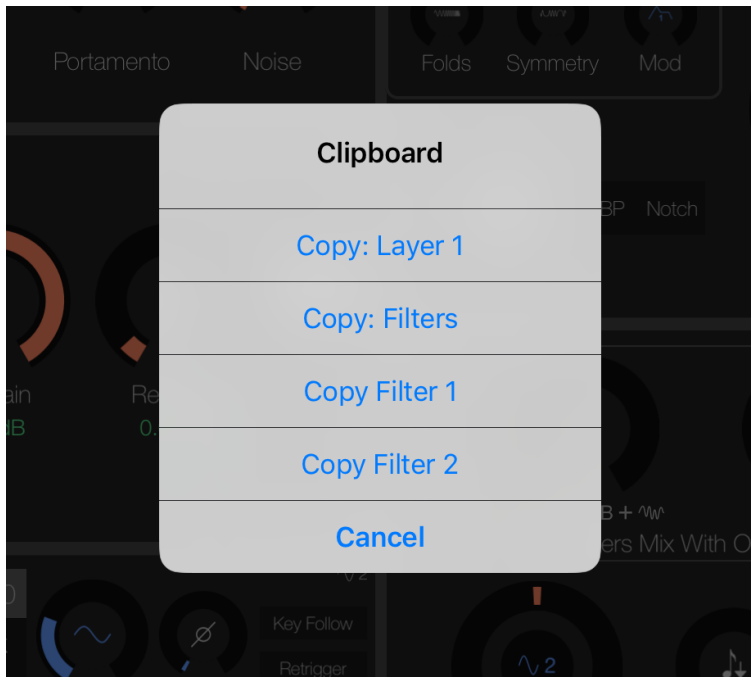
Layer Editor Clipboard

To retrieve copied data from the clipboard for pasting tap the clipboard button (2) in the Layer Editor menu bar.

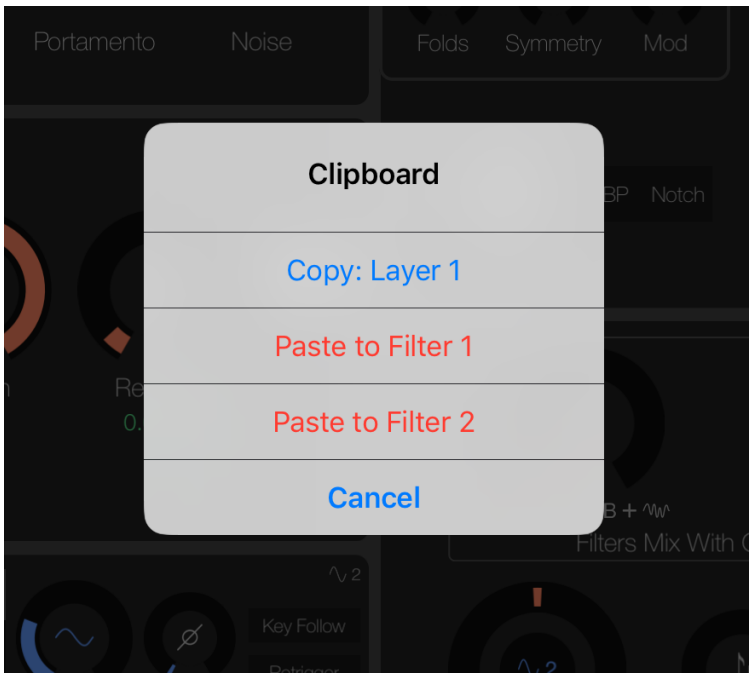
To copy data to the clipboard, long press on the background of any section in the editor. (Remember you can double tap to zoom on smaller screens). The Layer editor has a context sensitive clipboard which offers different copy options depending on where you press your finger in the editor.

For example when you hold your finger on the Filter section background you get an option to copy both filters or either filter.

Then when you tap the clipbboard button in the menu bar you will be offered the choice to paste to either filter.



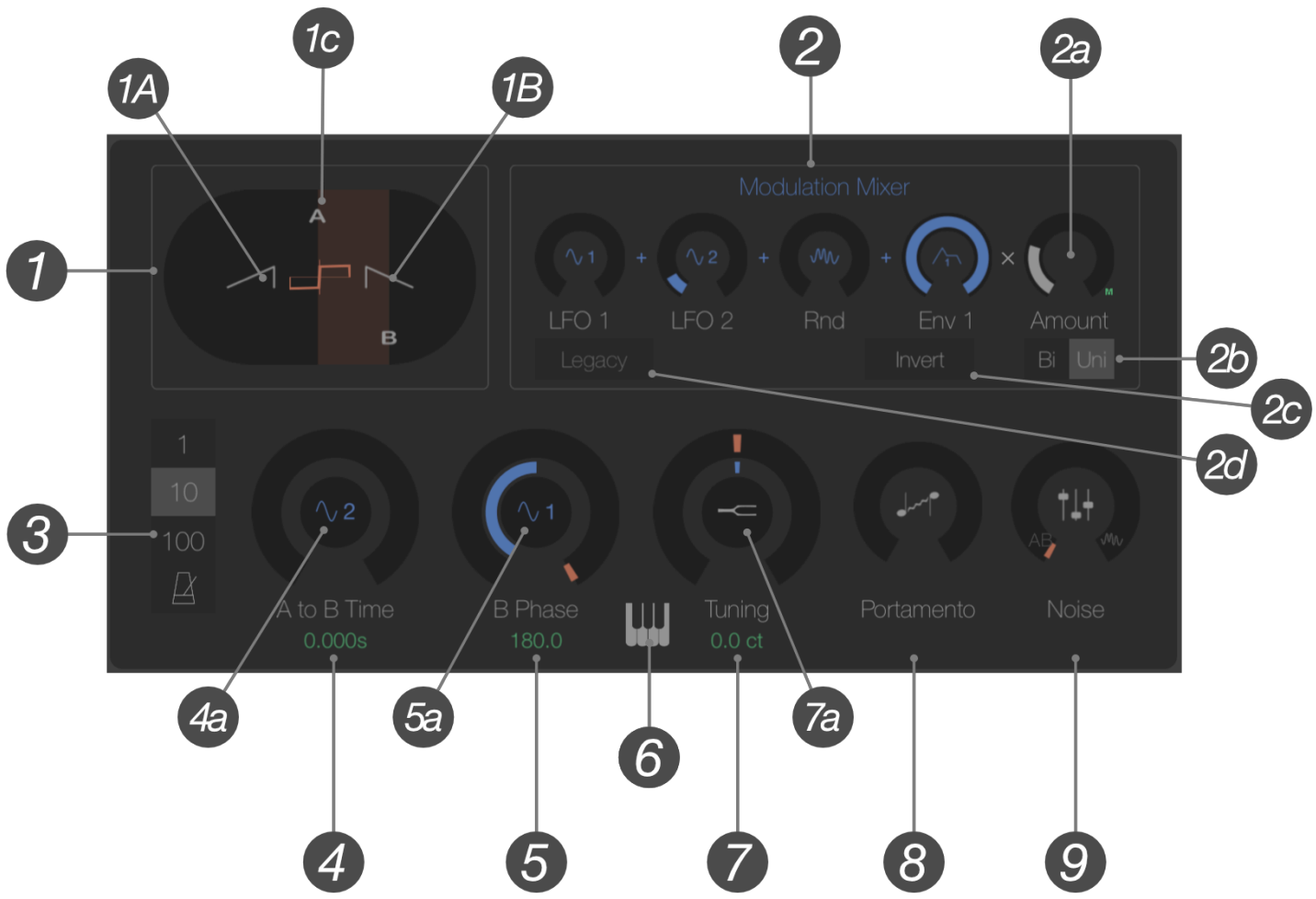
Copy by holding down on a section background.



Paste by tapping the clipboard button in the menu bar.

The clipboard is very flexible and you can copy whole layers or sections of layers between any Instrument.

Oscillator Section



LayR's synth engine features a unique Dual Wave Oscillator. The two waveforms are referred to as A and B. You select the basic shapes of A and B by tapping on the white waveform images (1A & 1B) to reveal the wave selector popup.

By dragging A horizontally toward B the shape of waveform A can be morphed into the shape of waveform B (1c). You can apply any amount of modulation (dial 4a) to A's position to shift it to and from B's position creating a dynamically changing waveform. Finally you can also set a time (dial 4) that can be used to set the speed at which A travels toward B when a note is pressed on the keyboard. Waveform B has a fixed position but it's phase can be changed to a static phase angle (dial 5) or with a modulator (dial 5a).

The center orange wave display shows the shape at A's current fixed location.

The combination of changing the location of A and changing the phase of B along with the various modulation options can create 100s of different harmonically rich waveforms from the two base shapes.

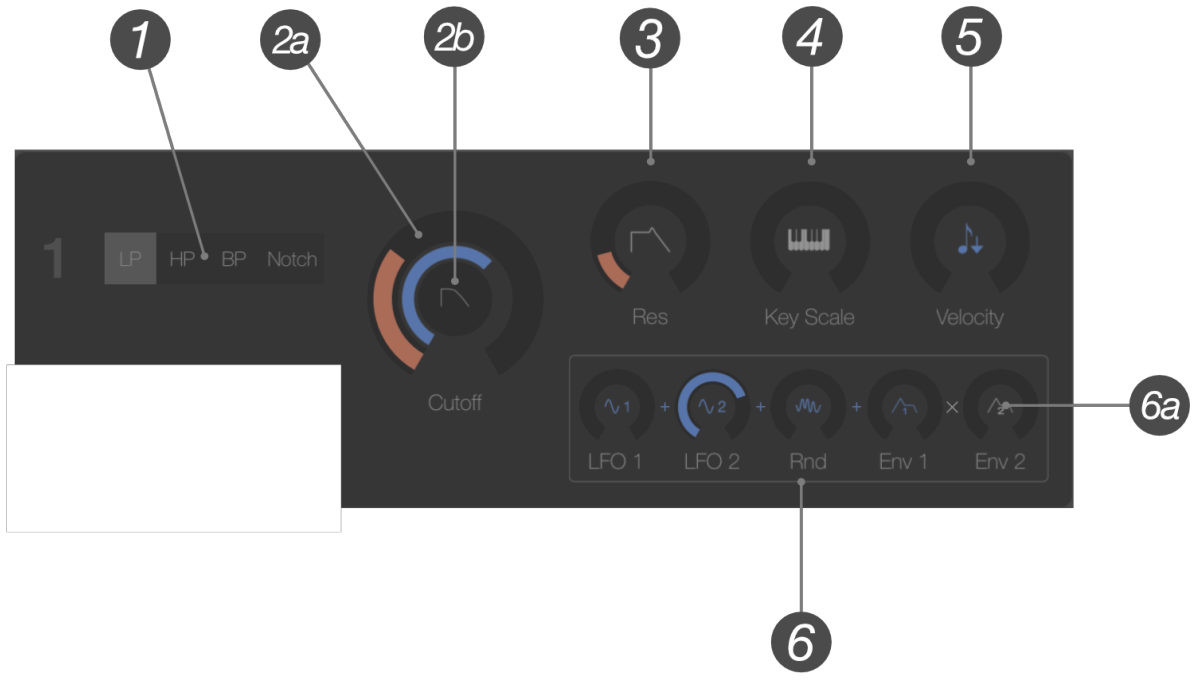
Oscillator controls

(1) - **Dual Wave Oscillator** (as described above).
(2) - **FM Modulation Mixer**: Summed mix of 4 modulation sources to apply as frequency modulation.
(2a) - The amount of the summed modulation to apply as FM.
(2b) - Bipolar or Unipolar modulation selector. In Unipolar mode Envelope 1 can be used for FM.
(2c) - Inverts the polarity of Unipolar modulation, (only available if button 2b is set to Uni).
(2d) - Legacy Mode switches the mod section into an earlier version of the oscillator. It's only required by some older presets.
(3) - **Time Scale**: Buttons to select a time multiplier applied the A to B Time dial value (4). Giving a total range of 0 to 100 seconds.
(4) - **AtoB Time**: Dial to set the time that wave A takes to travel to wave B. When set to zero A remains at the position set by dragging.
(4a) - Amount of modulation applied to A's position. When this dial is set to full A travels all the way to B and back.
(5) - **B Phase**: Sets the starting phase angle for wave B.
(5a) - Amount of modulation applied to B's phase angle.
(6) - **Key Track**: When off, decouples the oscillator from the keyboard turning it into a fixed oscillator ranging from 0Hz to 18KHz.
(7) - **Tuning**: The outer ring of this dual dial is used to set oscillator fine tuning. Double tap to set nearest semitone.
(7a) - The inner dial is used to set coarse tuning. Double tap to set nearest octave.
(8) - **Portamento**: Sets the legato glide time between notes. Zero = off.
(9) - **Noise** Mix: Mixes in some white noise with the oscillator waveform.

Tip

- *Tap on any of the green numbers under dials to enter a value using the numeric keyboard.*
- *Double tap on dials to set to default values.*

Filter 1 Section

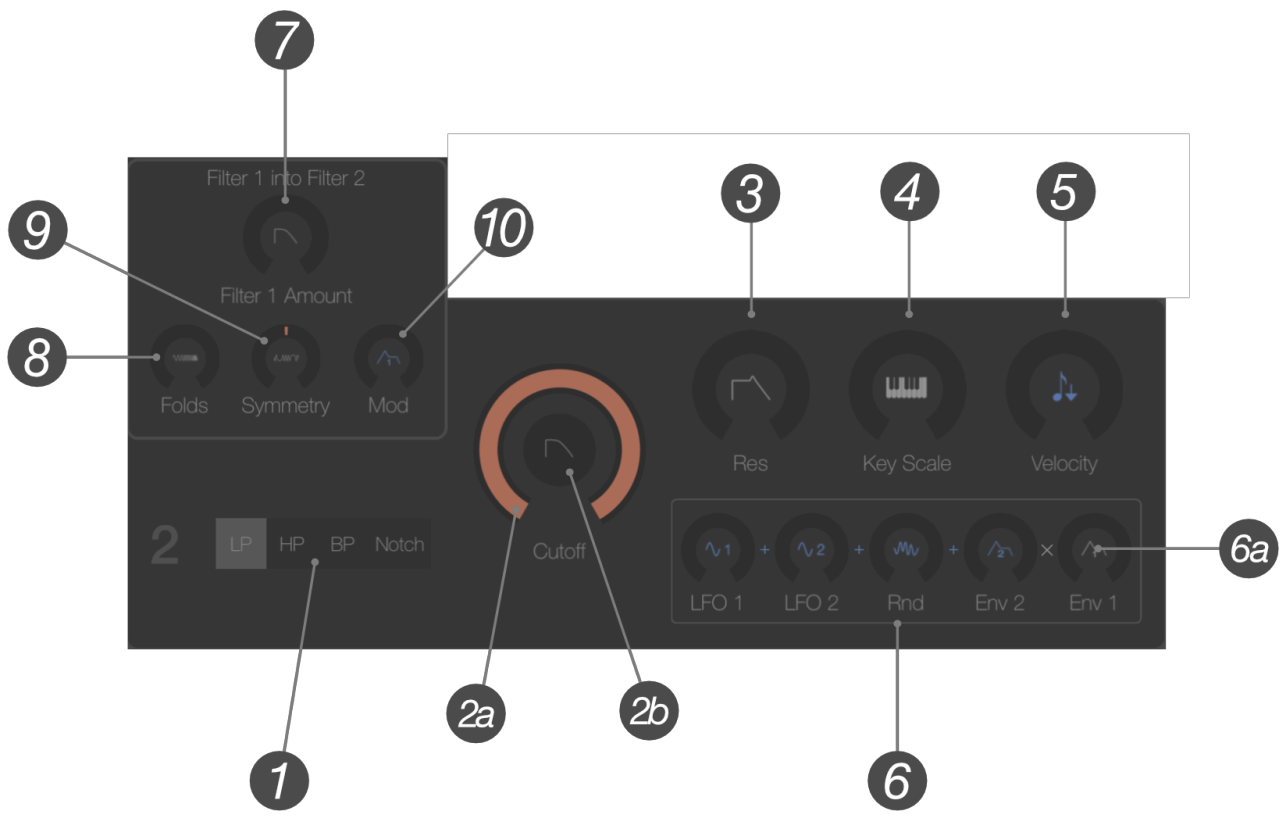


LayR has two tunable State Variable filters that can be mixed in any serial or parallel combination. Each filter has a full set of modulation options. When set to near full resonance the filters can even be played like oscillators on the keyboard. **Although be be warned, turn your speakers down as they can scream at 100% resonance**! But better to allow them to scream rather than not provide the full range of options we think.

Filter 1 controls

(1) - **Filter Type**: Select from Low Pass | High Pass | Band Pass | Notch.
(2) - **Cutoff**: Outer ring (2a) sets frequency. Inner dial (2b) sets modulation amount.
(3) - **Resonance**: Filter starts to ring around 98%.
(4) - **Keyboard Tracking**: Sets the amount the filter cutoff is adjusted by MIDI note position. At full the filter can track at 1:1 ratio.
(5) - **Velocity to Modulation Amount**: Sets the amount which MIDI key velocity is used to adjust the cutoff modulation amount.
(6) - **Cutoff Modulation Mixer**: Summed mix of 4 modulation sources applied to the filter cutoff.
(6a) - **Modulation Contour**: An envelope can be applied to cutoff modulation to vary the mod amount over time.

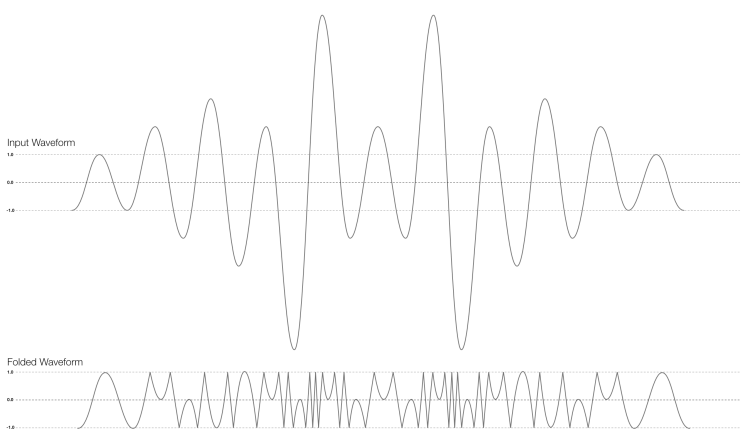
Filter 2 Section



Filter 2 is identical to Filter 1 except that it has an input stage that takes it's signal from the output of Filter 1. The input can also be distorted by a wave folder effect before being fed through Filter 2 to the output mixer.

Wave Folding

Wave Folding is a form of harmonic distortion. The simplified graphic on the right shows an input waveform at the top and the resulting folded waveform underneath. Whenever the input signal exceeds a clipping threshold the peaks above or below the threshold are folded back on themselves with the effect of adding surprising harmonics to the original. The greater the amplitude of the input the more folds happen and more harmonics are created. Low frequency signals such as bass notes and low percussion react really well to wave folders.
The wave folder in the layer's filter section can be used to distort the output of Filter 1 as it goes into Filter 2 and the effect it can have is quite spectacular in creative hands.



Filter 2 controls

(1) - **Filter type**: Select from Low Pass | High Pass | Band Pass | Notch.
(2) - **Cutoff**: Cutoff: Outer ring (2a) sets frequency. Inner dial (2b) sets modulation amount.
(3) - **Resonance**: Filter starts to ring around 98%.
(4) - **Keyboard Tracking**: Sets the amount the filter cutoff is adjusted by MIDI note position. At full the filter can track at 1:1 ratio.
(5) - **Velocity to Modulation Amount**: Sets the amount which MIDI key velocity is used to adjust the cutoff modulation amount.
(6) - **Cutoff Modulation Mixer**: Summed mix of 4 modulation sources applied to the filter cutoff.
(6a) - **Modulation Contour**: An envelope can be applied to cutoff modulation to vary the mod amount over time.
(7) - **Input from Filter 1**: Sets the amount of input from Filter 1 that is fed through the wave folder into Filter 2.
(8) - **Wave Folder Fold Amount**: Sets the amount of folding (distortion) applied to the signal from Filter 1. Zero = off/bypassed.
(9) - **Fold Symmetry**: Sets the DC level of the folded waveform, sometimes creates interesting harmonic effects.
(10) - **Fold modulation**: Sets the level of modulation from a modulation source that is applied to the wave folder amount.

Tip

- *If you've used the Fold amount dial (8). To set it back to zero, double tap on it.*

Mixer Section

The mixer section takes input from 3 sources (the Oscillator, Filter 1 & Filter 2) and it can route those inputs to the output in any combination.

The input stages (1 & 2) are used to blend the filters with the oscillator. The raw output from the oscillator can be mixed with either filter, the filters can be organised into series and parallel or the filters can even be bypassed altogether.

The blending stage (3 & 3a) mixes the 2 input stages into a single output with a modulation option to morph between mix 1 and mix 2.

The output from the blending stage is routed into a panner with optional left/right modulation (4 & 4a) and finally into the gain stage (6) where optional amplitude modulation (AM) can be applied (7).

This setup enables some very creative sound design opportunities!

Mixer controls

(1) - **Mix oscillator with filter 1**: fully anti-clockwise = oscillator, fully clockwise = filter 1.
(2) - **Mix oscillator with filter 2**: fully anti-clockwise = oscillator, fully clockwise = filter 2.
(3) - **Mix/Blend 1 and 2**: Outer ring fully anti-clockwise = mix 1, fully clockwise = mix 2.
Inner dial (3a) - Sets modulation amount to animate from mix 1 to mix 2.
(4) - **Pan**: Outer ring sets Left or Right. Inner dial (4a) sets modulation amount.
(5) - **Velocity**: Sets the MIDI note-on velocity response, adjusts the volume of the Layer according to how hard you hit a key.
(6) - **Volume**: Sets the master output volume of the Layer. (same as the slider in the Layer strip).
(7) - **Amplitude Modulation**: Apply the sum of 2 modulation sources.
(7a) - **Amp Mod Contour**, an envelope can be applied to the modulation to adust the mod amount over time.

Mixer routing examples

Filter 1 to output:
(1) fully anti-clockwise
(2) n/a
(3) fully anti-clockwise

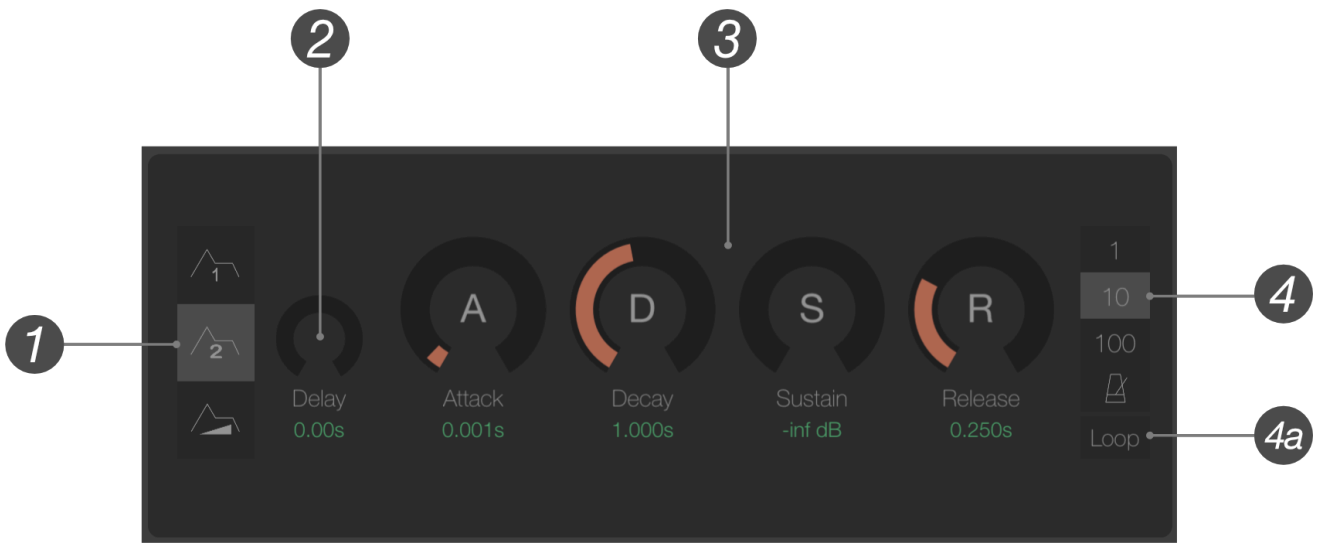
Filter 2 to output:
(1) n/a
(2) fully anti-clockwise
(3) fully clockwise

Filter 1 & Filter 2 in parallel:
(1) fully anti-clockwise
(2) fully anti-clockwise
(3) Mid, 12 o'clock

Filter 1 & Filter 2 in series
- *Set filter 2 to take full input from filter 1. see filter 2 section (7)*
(1) n/a
(2) fully anti-clockwise
(3) fully clockwise

Oscillator direct to output bypassing filters:
(1) fully clockwise
(2) fully clockwise
(3) any position.

Envelope Section



At any time the envelope section is showing one of the 3 available envelopes. The highlighted button (1) on the left specifies which envelope is currently selected.

Envelopes 1 & 2 are modulation sources and can be routed to various destinations in the synth engine.

The amp envelope is used solely to set the volume contour of the voice.

Attack, Decay and Release times range from a fraction of a second up to 100s per stage.

The Attack + Decay stages of envelopes 1 & 2 can be looped to work as a pseudo Low Frequency Oscillator.
Looping is only enabled when the sustain level is zero.
If the sustain level is not zero the Loop button (4a) turns red so show it's not enabled.

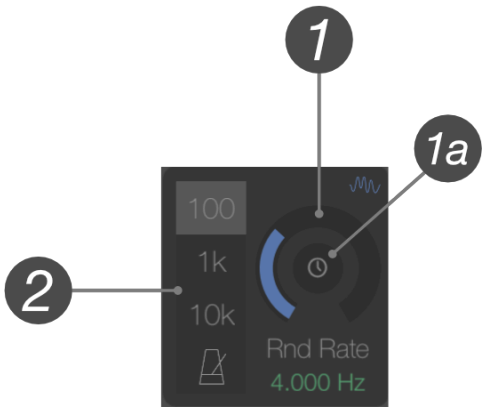
There is also a delay time (2) that can be applied to the start of the attack phase of any envelope.

Envelope controls

(1) - Selects the envelope to edit.
(2) - Sets the delay time.
(3) - Set the length of the Attack, Decay & Release stages and the level of the Sustain stage.
(4) - Buttons to select the multiplier applied the ADR time dial values. Giving a total range of 0 to 100 seconds or tempo based.
(4a) - Loop button, only available for Envelopes 1 & 2 and only enabled when Sustain level is zero.

Hint:
If you hear nothing when you press a key it could be that an envelope has a very long attack or delay applied to it. Wait for a while with a key held down.

Random Modulator

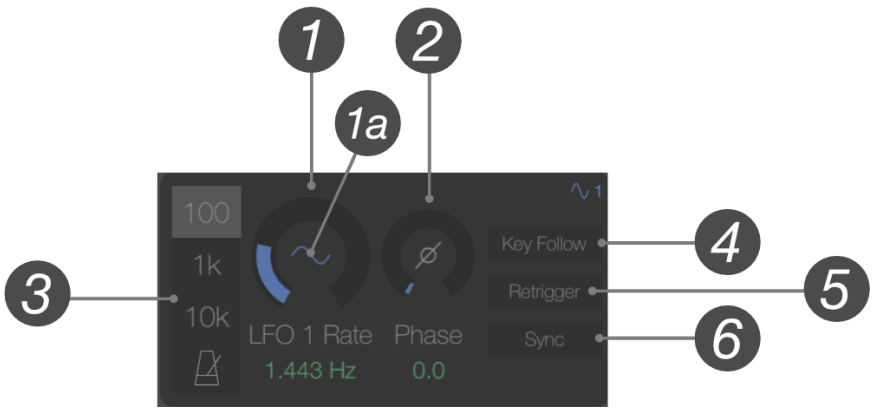


This is a random level generator with a frequency ranging from 1000 seconds to something approaching white noise. It can be routed to any modulation destination. The smoothing control (1a) sets the slope time that it takes to rise or fall to the next level.

Random Modulator controls

(1) Outer ring sets the **frequency**. Inner ring (1a) sets the **smoothing slope** between the random levels.
(2) Buttons to select the multiplier applied the frequency dial value.

LFO 1 & LFO 2



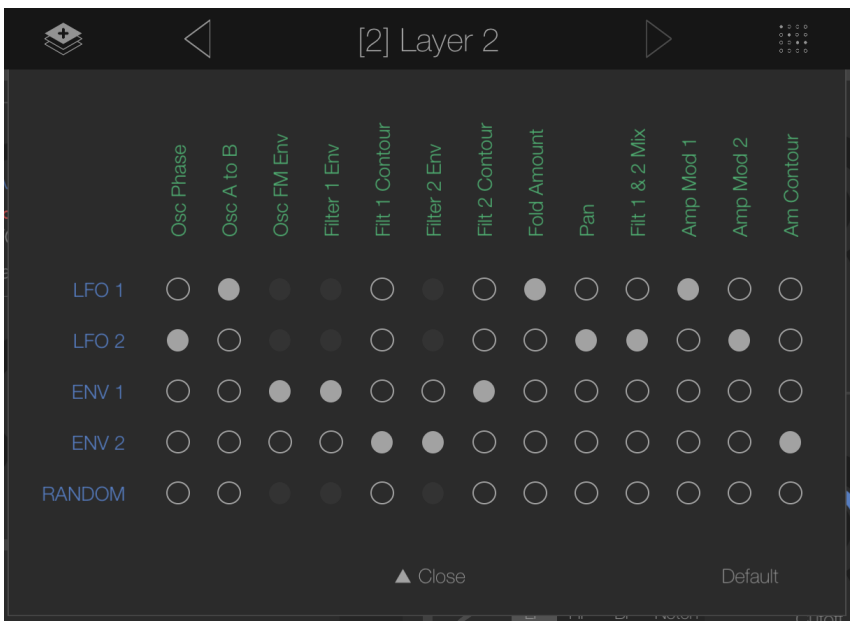
The two Low Frequency Oscillators are both identical with a selection of wave shapes, options to set a start phase angle, track notes on the keyboard, restart when notes are played and stay in sync with other active voices. These oscillators are true LFOs with a frequency range from stationary to 1 cycle every 1000 seconds to as high as 10kHz.

LFO controls

(1) - **Frequency**: Sets the oscillator frequency.
(1a) - **Waveform**: Tap the centre of the dial to reveal the LFO waveform shape selector.
(2) - **Phase**: Sets the start phase of the oscillator wave cycle.
(3) - **Time Scale**: Buttons to select the multiplier applied the frequency dial value.
(4) - **Key Follow**: When selected the frequency of the LFO tracks the notes played on the keyboard, getting faster as notes get higher.
(5) - **Retrigger**: When selected the oscillator is restarted from the selected phase angle when a note is pressed on the keyboard.
(6) - **Sync**: When selected the LFOs in all active voices stay in phase synch with each other, otherwise they are free running.

LFO Waveform Shape Selector

Mod Matrix



The default modulation routing in a layer is usually fine for most purposes but occasionally you might want to route a modulation source to another destination. You can do this by tapping on the Mod Matrix button (9) in the Layer Editor menu bar to reveal the Mod Matrix Panel.

This panel is simply a representation of a pin matrix with several columns for destinations and rows for the sources.

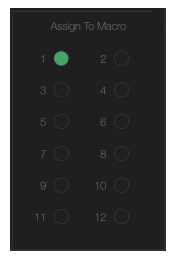
When you select a new routing the images inside the dials in the Layer Editor update to reflect the selection.

Be aware that re-routing makes the preset incompatible with earlier versions of LayR prior to v1.2. While in reality compatibility doesn't matter all that much, it does become an issue when sharing presets with devices that can only run earlier versions of LayR. This will become more of an issue as time passes and LayR starts to take advantage of newer iOS devices with more power.

To reset the matrix to its default state, tap the "Default" button.

Macro Control Panel

The Macro Panel enables you to globally alter Performance parameters. For example, if a macro dial is assigned to Filter Cutoff, turning the dial adjusts the filters in every Layer in every Instrument.



The panel provides 12 dials which can be assigned to any of the synth parameters in the Layer Editor and Layer Strips by simply going into any Layer Editor, long pressing on any dial and setting the macro choice on the right side of the assign panel. Assigned Macro controls are globally saved in LayR's persistent settings.

In the Layer Editor you can tell if a dial is assigned to Macro because it will have a little green M next to it.

LayR will automatically name a macro when first assigned but to rename a dial long press on the label under it.

Macro dials can be assigned to MIDI by long pressing on the dial the same manner as in the Layer editor. The only difference is that they cannot be assigned to a range and the MIDI channel for macro is the same channel specified as the Performance MIDI channel in LayR's settings (default = 16).

Macro dials work from their center point. That is when when a macro dial is pointing straight up at 12 o'clock the dial has no effect.

Turning a macro dial clockwise raises assigned parameters from the current center position to maximum.

Turning a macro dial anti-clockwise lowers assigned parameters from their current center position to minimum.

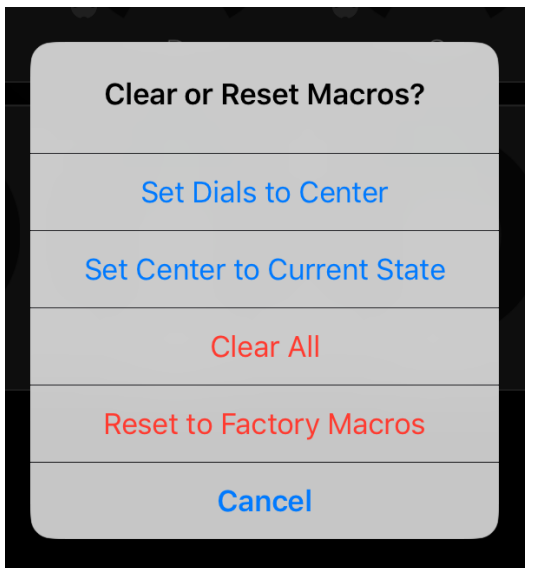
The "center" position is the current state of the performance when all the dials in the macro panel are at 12 o'clock. When a Performance first loaded the Macro panel center is reset to match the Performance state. From that point on any adjustments to the macro affect the entire Performance and at any time you can reset the macro back to it's starting position or set the centers to the changed state of the performance by tapping on the **Reset** button.

Set Dials to Center:
Undoes any macro adjustments and moves all dials back to center.

Set Center to Current State:
Sets the current state of the Performance as the new center state and moves all dials back to center.

Clear All:
Removes all assigned parameters from the Macro. Use with care!

Reset To Factory Macro:
Resets the assigned parameters to the Factory Settings.

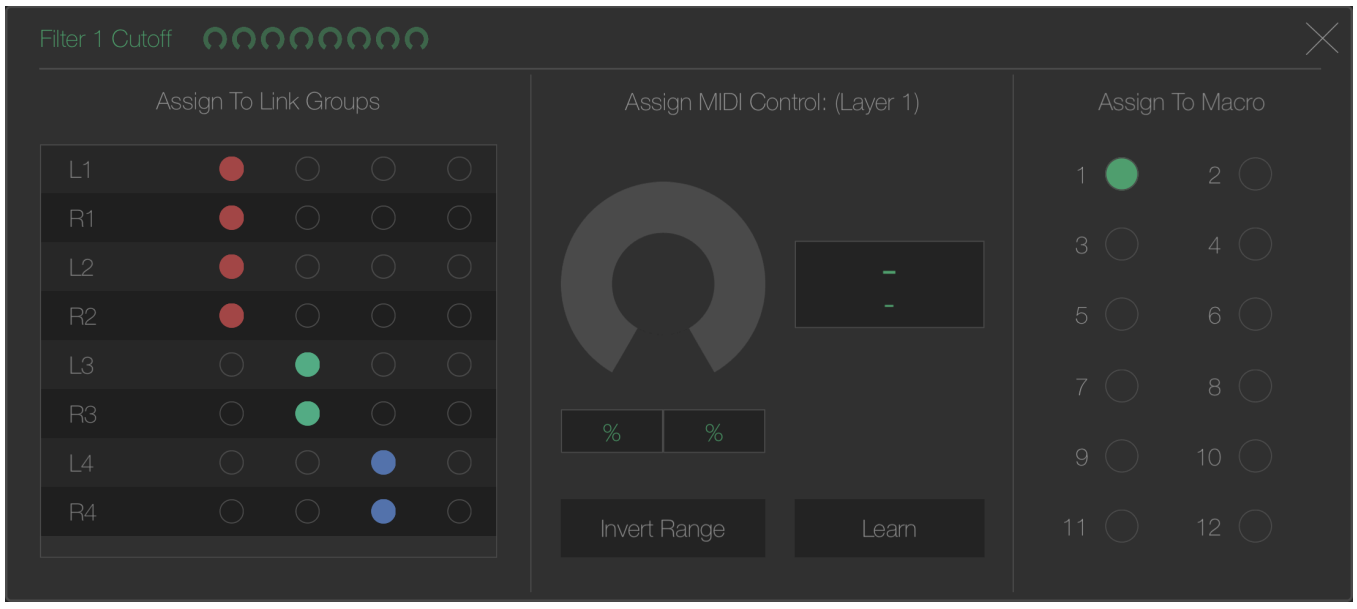


Note:

- Remember that adjusting a macro dial adjusts the entire performance, you should probably not use the macro if you are editing or creating new presets!

- In some Performance Presets, due to the nature of having many filters, envelopes and such, each with different settings, macro adjustments can occassionally produces some really surprising results!

Parameter Linking



The Link & Assign Panel. The left side of this panel is used for setting Parameter Links

Note: From LayR version 1.3.1, the panel will not appear in the Layer Editor if the** Link Assign Lock in the Menu Bar **is locked

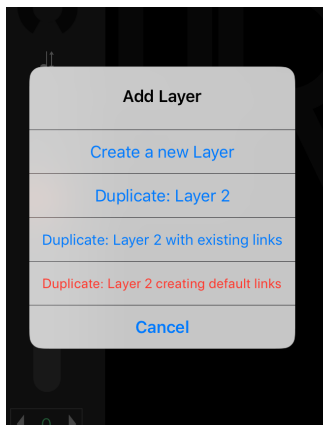
There comes a time during an editing session when you will want to be able to control parameters in other Layers in parallel with the Layer you're working on. Or you might want to link the same parameter in one or more Layers to a single MIDI controller. You can do this by assigning the parameter to any of 4 Link Groups.

All parameters in a group are set to the same value when any one of them changes value. This means when you turn a dial or send a MIDI control change to a parameter in a Link Group, all other parameters in Layers in the same group reflect the same change.

In the Layer Editor, controls that have been linked display a little coloured chain link icon and the colour represents the group it's linked with.

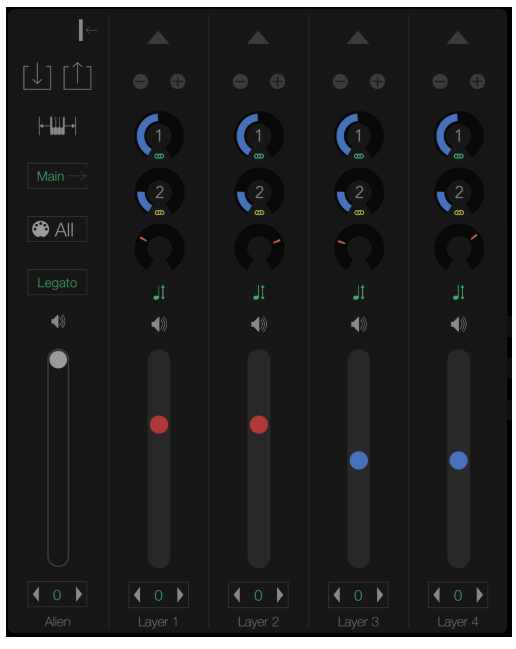
To set a Link Group you use the left side of the Link & Assign Panel[1]. **The panel is revealed by long pressing on a dial or control**. The name of the parameter is shown at the top left of the panel and it's links are shown as columns of dots and each row is a layer in the instrument. The list scrolls vertically if there's a lot of layers. Any parameter can be assigned to up to 4 groups. It is most common to use just one group to link parameters in all layers. Double tapping on a dot in a column is a shortcut to select or deselect the entire column.

When assigning links to dials with an outer ring and inner dial, be careful to make sure you have selected the correct part of the dial. You can do that by checking the parameter name at the top left of the panel.



When you create a Layer you get the option to create the new layer with some default links. Or to duplicate the current layer with the links that already exist. This is a very useful shortcut to get to know as it saves having to manually create links.

Links are available for all Layer Parameters in the Layer Editor and Layer Strips.



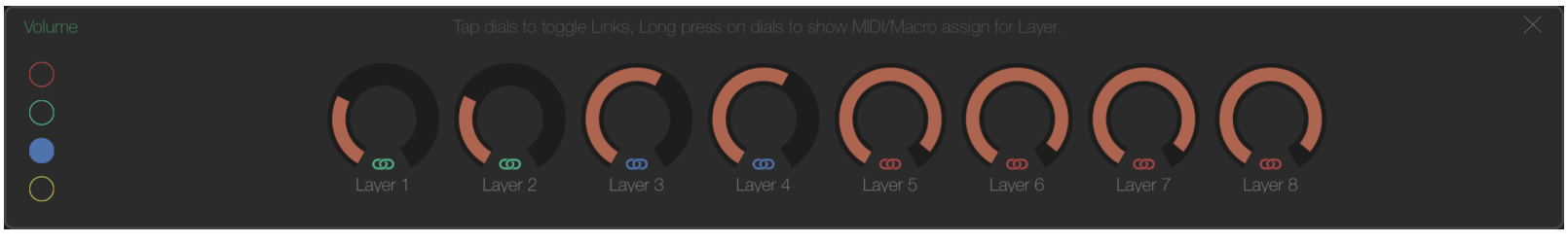
4 Layers in an Instrument, 2 pairs of Linked Volume sliders with effect sends also linked.

[1]- The middle section of the Link & Assign panel is used for assigning MIDI controllers to dials. See Assiging MIDI Controllers.[2]- The right hand sectioin of the Link & Assign panel is used for assigning dials to the Macro panel. See Macrol Panel.

A new feature, introduced with LayR v1.3.1 is the Link Dial Strip Panel. This can be used to create link groups and also to set the values of the same parameter (linked or unlinked) in Layers other than the one being currently edited.

If the Instrument being edited has more than one layer, an image of green dials will appear to the right of the parameter name in the Link & Assign Panel...

... Tap on the image of dials to call up the Dial Strip Panel.



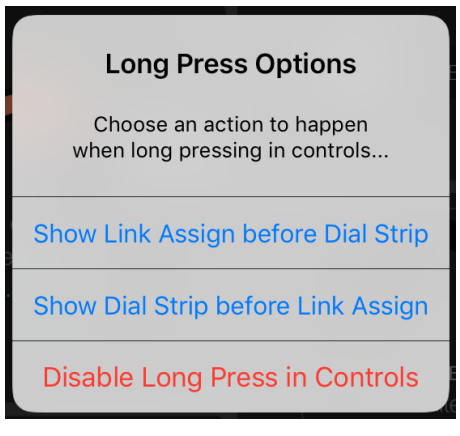
On the left of the panel are 4 Link Group buttons. Select a group and tap on any dial in the panel to add to, or remove from a group.

The dials in the panel are active and can be used to edit the parameter values they represent in their respective layers.

If more layers are present than can be displayed, the dial strip can be scrolled with a left/right swipe.

Long pressing on a dial in the strip will open the Link/MIDI Assign Panel for that Layer.

LayR 1.3.1 also has an option to choose the order of appearance between the new Dial Strip before the Link & Assign Panel.
You can choose to have the Dial Strip appear first before Link & Assign. This can be useful for editing parameters in other layers without having to actually go to the other layer.



This option is available from the Menu Bar in the Layer Editor

Effects

LayR has some simple but high quality effects:

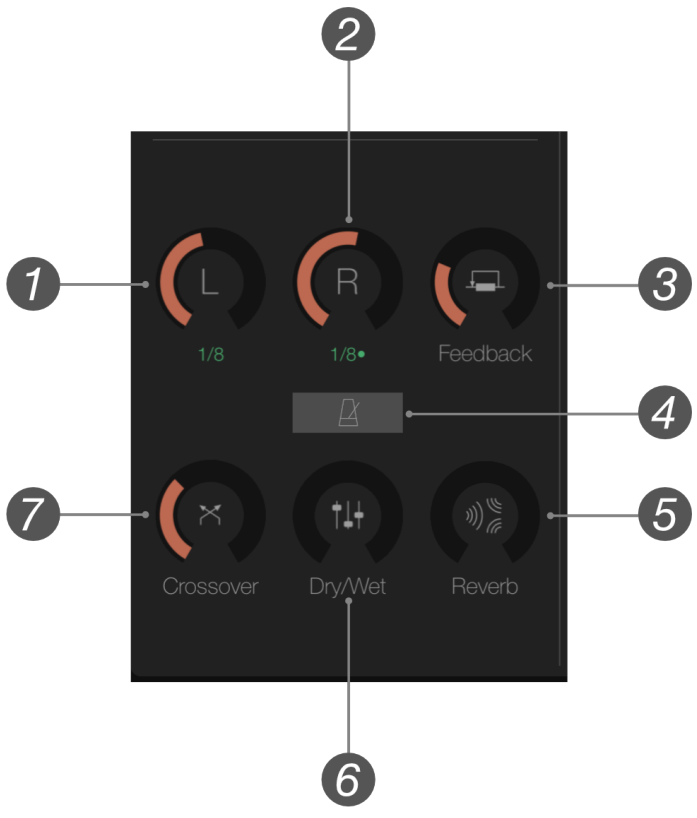
- Stereo Delay
- Reverb
- 3 Band EQ.

These effects are only applied to the main stereo output. Routing an instrument to one of the IAA audio outputs bypasses the effects. To reveal the effects editor tap the **ƒx** button in the Master Strip.

Effects are added to Instruments by using the effect send dials in Layer strips.

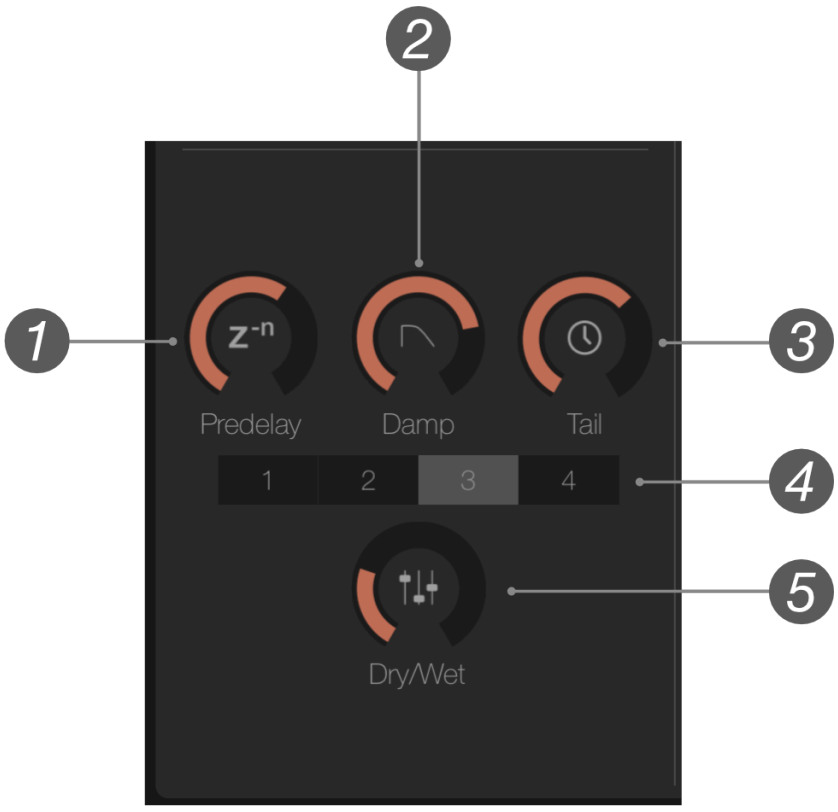
Master Strip expanded to reveal Effects Panel

Delay



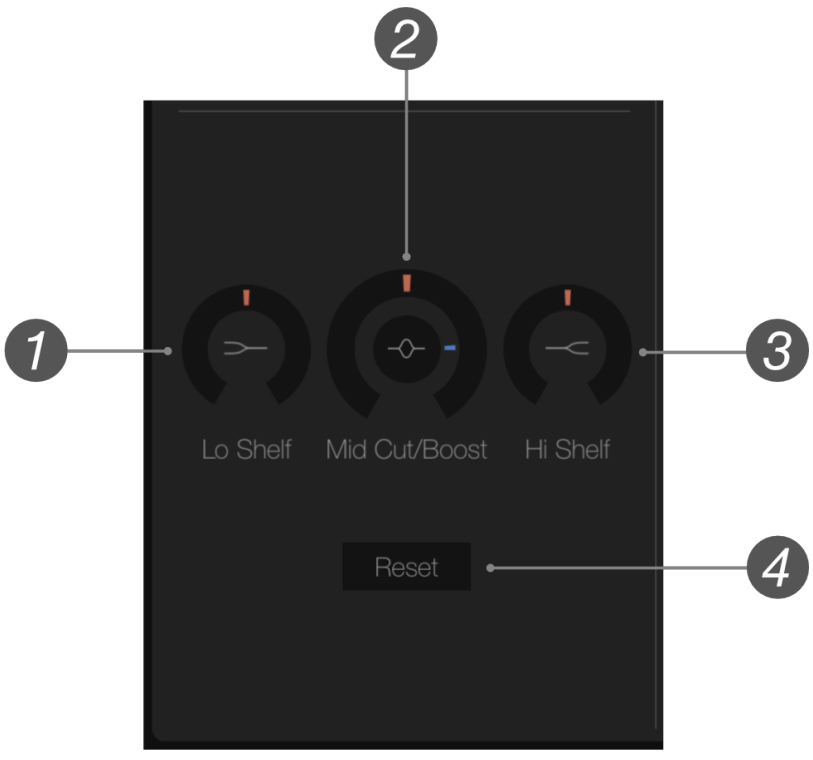
(1) - **Left Delay Time** in seconds or beat divisions if tempo mode is selected
(2) - **Right Delay Time** in seconds or beat divisions if tempo mode is selected
(3) - **Feedback**, increases the number of repeats.
(4) - **Tempo Mode**: When selected the delay sets it's time to divisions of the current tempo.
(5) - **Delay to Reverb**: Amount of delay fed into the reverb effect.
(6) - **Dry / Wet** balance.
(7) - **Crossover**, the amount of left that gets fed to the right and vice versa.

Reverb



(1) - **Pre-delay** length.
(2) - **Damping**: High frequencies in the reverb fall away quicker.
(3) - **Tail time**: Increases reverberation time.
(4) - **Room size**: 1 = small, 4 = Cavernous
(5) - **Dry / Wet** balance.

EQ



(1) - **Low Shelving** filter: Increases or decrease bass frequencies.
(2) - Outer Ring: **Cut/Boost**.
Inner dial: Selects **Mid Band** frequency.
(3) - **High Shelving**: Increases or decreases high frequencies.
(4) - **Reset**: Flattens the EQ sections and bypasses the EQ.

The Preset Filing System

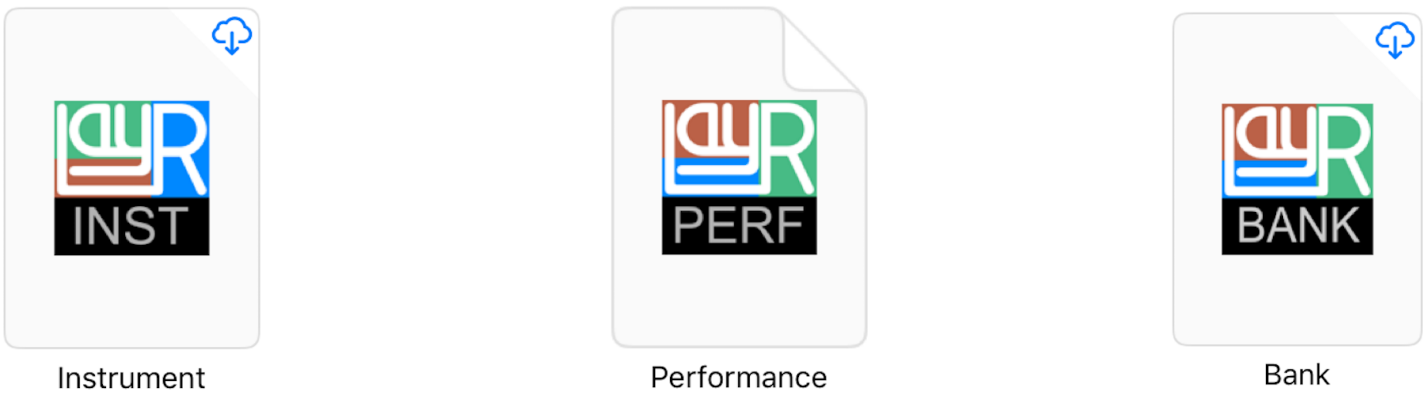
LayR's presets are stored in two sets of 128 banks of 128 Programs. One set of banks for Instruments and another for Performances. The same set of presets are available to the IAA stand-alone app and to the Audio Unit. For example, if a preset is saved in either it is immediately available in the other.

Presets can be recalled by hand by using the Load Preset Panel and stored using the Save Preset Panel.

Of course, presets can also be recalled using MIDI Bank Select and Program Change messages.

Presets can also be imported and exported as files to iCloud Drive / Files.app.

LayR has 3 exportable file types: Instrument, Performance and Bank.

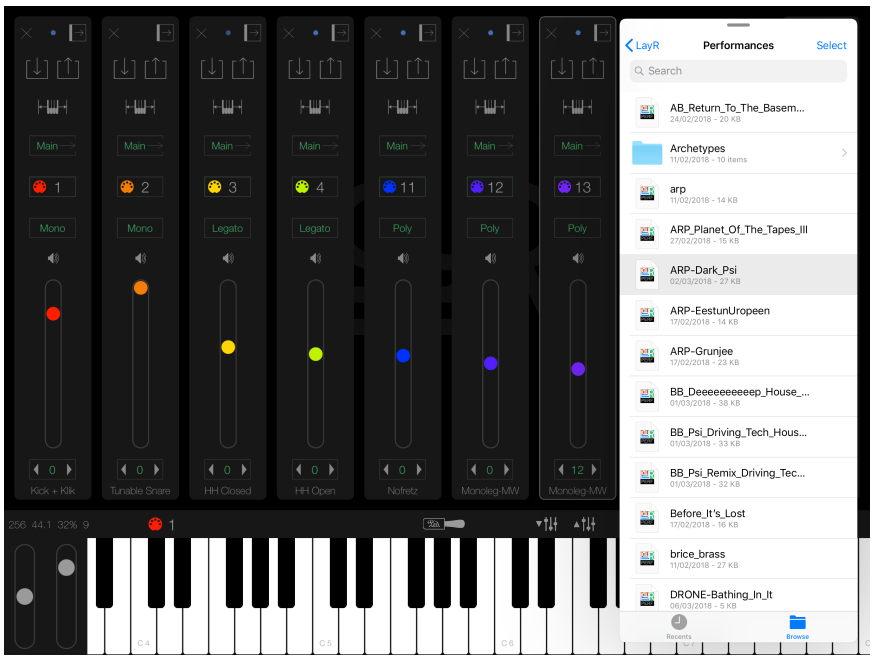


These are the icons that Files.app displays for LayR preset files

Bank files are a special file type introduced with LayR version 1.2 that are used for exporting or importing entire banks of Instruments or Performances.

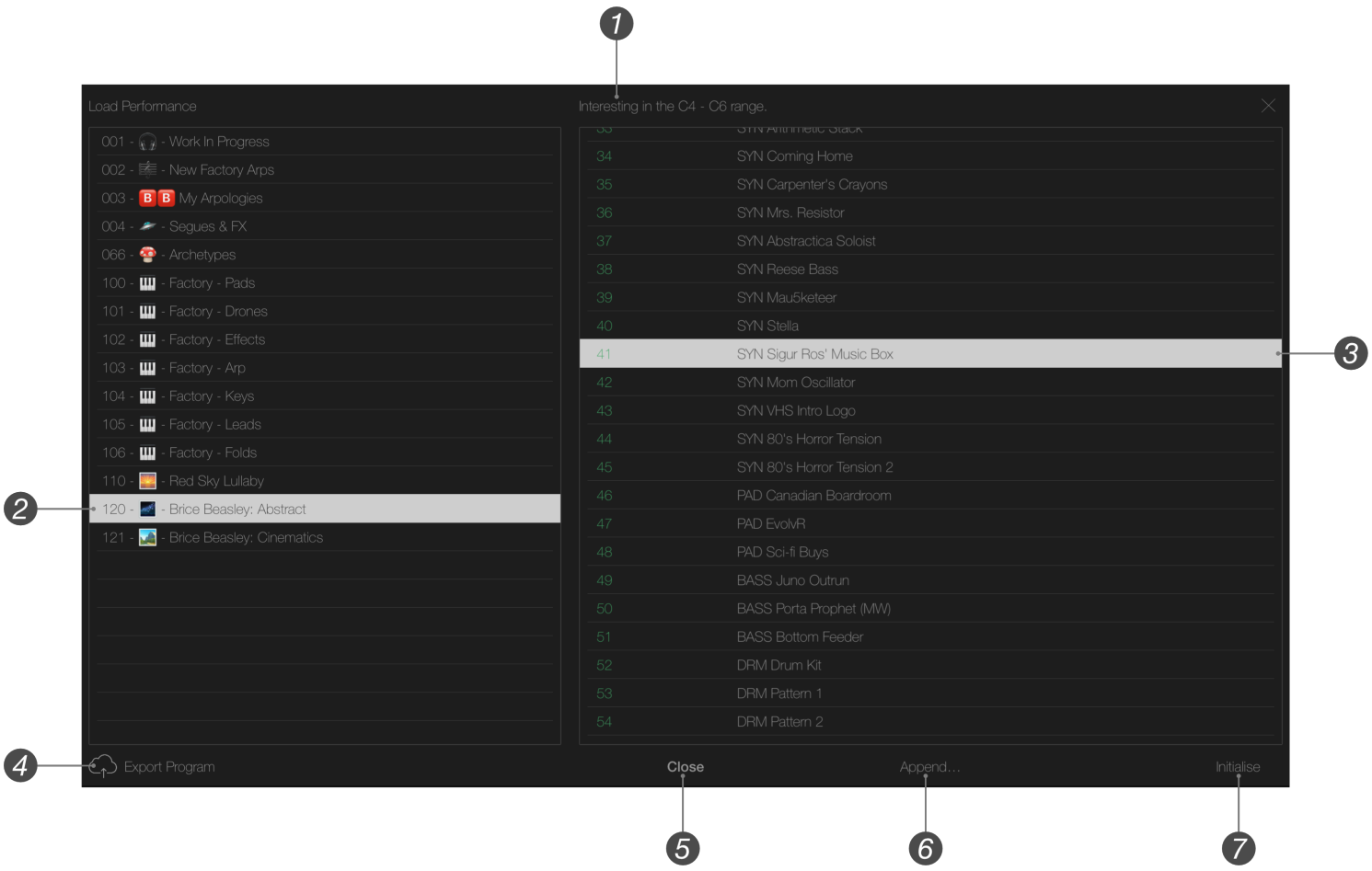
Prior to version 1.2 LayR would export the currently loaded performance and import by replacing the current performance. From version 1.2 this has behaviour has changed. Now, when importing, the currently active performance is left untouched, instead a preset or entire bank of presets is imported directly to the preset storage area. The same applies when exporting, LayR no longer exports the current performance or instrument, instead you select a bank or program in the preset panels and export from there.

There is one case where the old method of replacing the current performance or instrument still applies. On iOS 11 if you tap on or open a file in Files.app the file will load directly into LayR replacing whatever is currently loaded. This gives you the ability to quickly preview or change sounds from the Files.app overlay.



The panel from Files.app floating on top of LayR.
Presets can be loaded into the current performance by tapping on items in the list.

Loading Presets



The Load Preset Panel is used to recall stored presets from the Instrument and Performance banks.
It is also used for exporting Bank and Program files.

To reveal the Load Preset Panel for Performance presets tap on the Load button(13) in the Master Strip.
For Instruments, tap on the Load button(11) in an Instrument strip.

(1) - Text that was saved with the preset appears here when you select a row in the program list.
(2) - The Bank list. Tap to select a bank. Long press to rename a bank. Swipe from right to left to delete a bank.
(3) - The Program list. Tap to select a program. Swipe from right to left to clear a program slot.
(4) - Export button: Tap to export the selected bank or program as a sharable file to Files.app.
(5) - Close button: Tap to exit the panel.
(6) - Append: An expert level feature only available in the Load Performance panel, puts LayR into a mode where Performance programs can be added or appended to the currently loaded performance instead of replacing it.
(7) - Initialise: Resets the selected Instrument or current Performance to a default state.

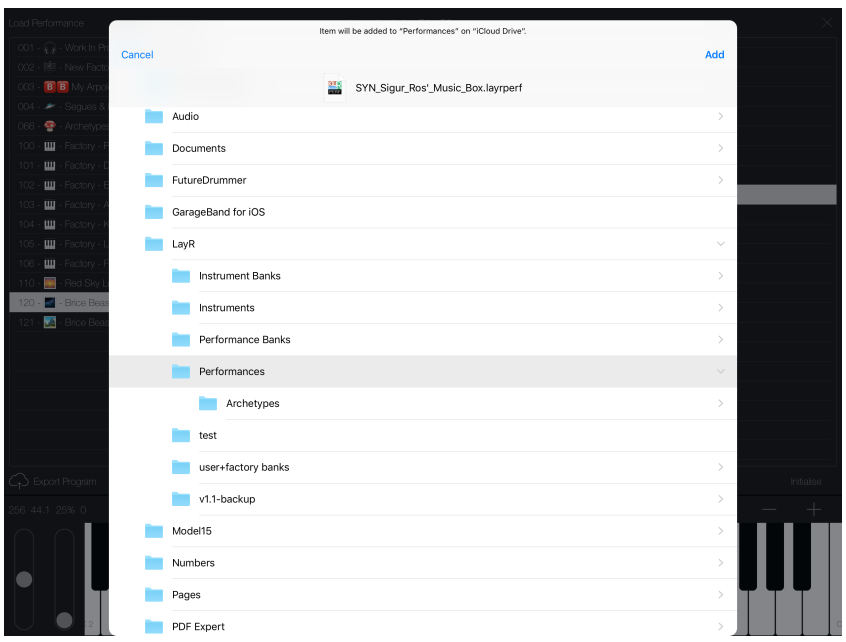
Exporting to iCloud Drive & Files.app

To export a Program select the bank and program you wish to export and tap the Export button (4).

To export an entire Bank, tap on the Bank you wish to export making sure nothing is selected in the program list. The export button (4) will show **Export Bank** instead of **Export Program**.

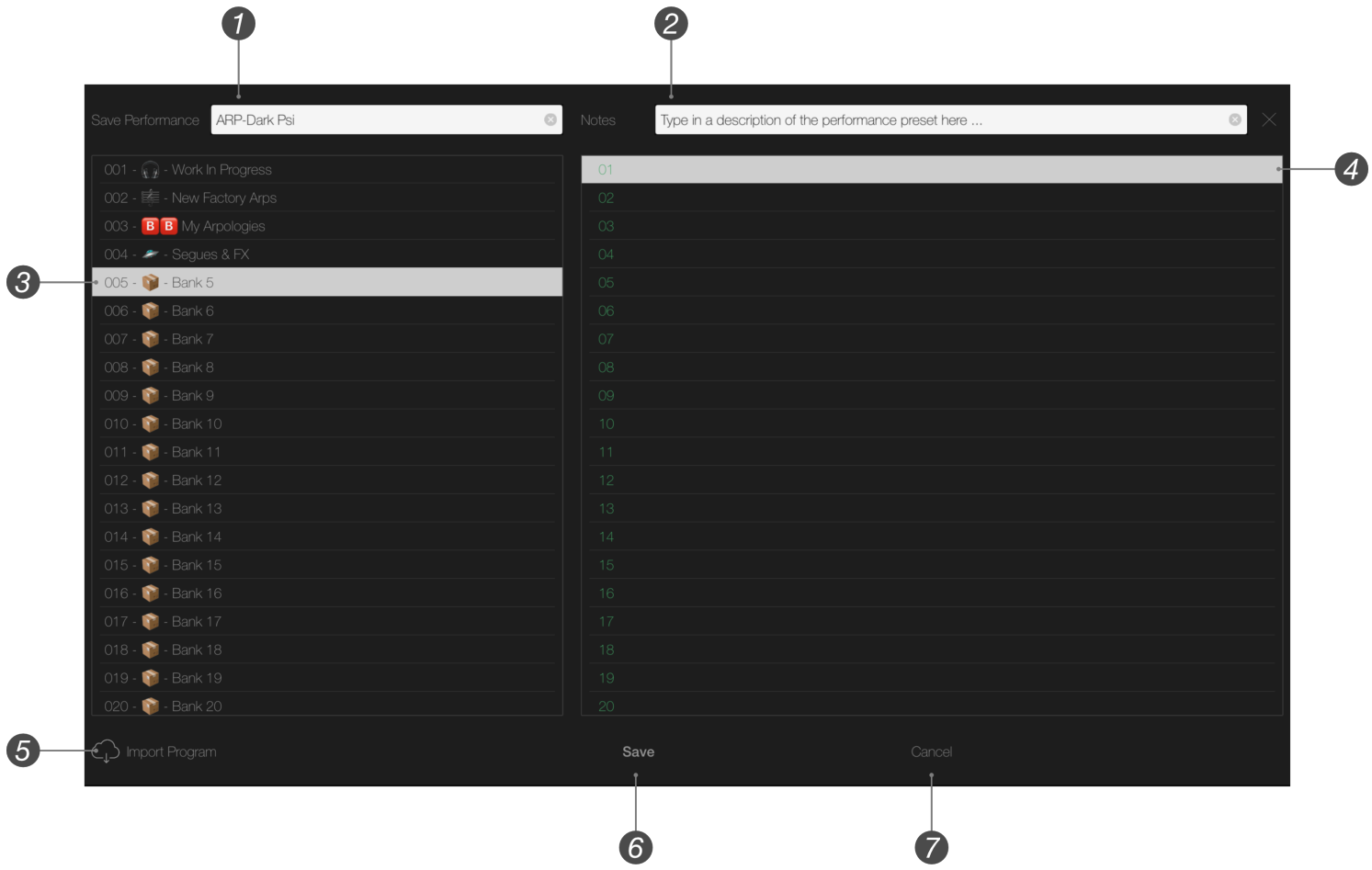
Tap the export button (4) and the system export files panel will appear. Use the panel to select the location to save to and press the **Add** button at the top left of the panel.

LayR will inform you when the preset saves successfully (or will warn of an error if not).



Note:
Exporting from the Load Panel may seem counter intuitive at first but it will make sense when you see that the UI for exporting is correct in this panel. You are exporting a previously saved preset. There are no extraneous rows to confuse the choices. You select a bank, a program and then execute the export.

Saving Presets



The Save Preset Panel is used to store presets to the Instrument and Performance banks.
It is also used for importing a preset to any Bank and Program slot.

To reveal the Save Preset Panel for Performance presets tap on the Save button(2) in the Master Strip.
For Instruments, tap on the Load button(2) in an Instrument strip.

(1) - Type in the name for the preset to be saved.
(2) - Type in text to be saved with the preset and displayed when viewed in the Load Preset panel.
(3) - The Bank list. Tap to select a bank. Long press to rename a bank.
(4) - The Program list. Tap to select a program slot to save into.
(5) - Import button: Tap to import to the selected bank or program slot
(6) - Save button: Tap this button to save into the selected program slot.
(7) - Cancel: Tap this button to exit the panel at any time without saving.

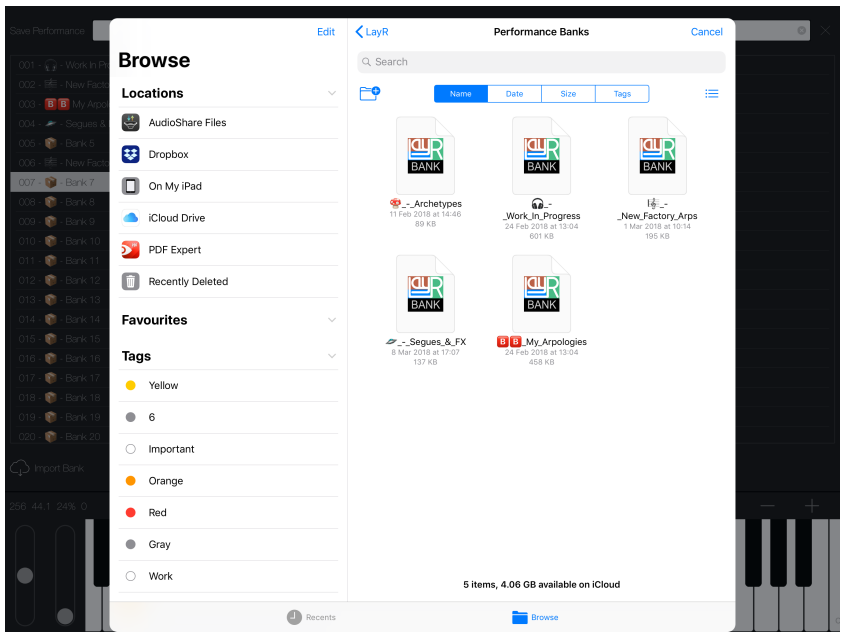
Importing from iCloud Drive & Files.app

To import to a Program slot select the bank and program slot you wish to import to and then tap the Import button (5).

To import an entire Bank, tap on the Bank slot you wish to import to making sure nothing is selected in the program list. The import button (5) will show **Import Bank** instead of **Import Program**.

Tap the import button (5) and the system file browser panel will appear. Use the browser to select the location of the required file and then tap the on file to import it

LayR will inform you when the preset imports successfully (or will warn of an error if not).



Note:
Importing to the Save Panel may seem counter intuitive at first but it will make sense when you see that the UI for importing is correct in this panel. You are importing to a saved preset slot. Here you can select any bank slot, any program slot and then execute the import to the selected slot.

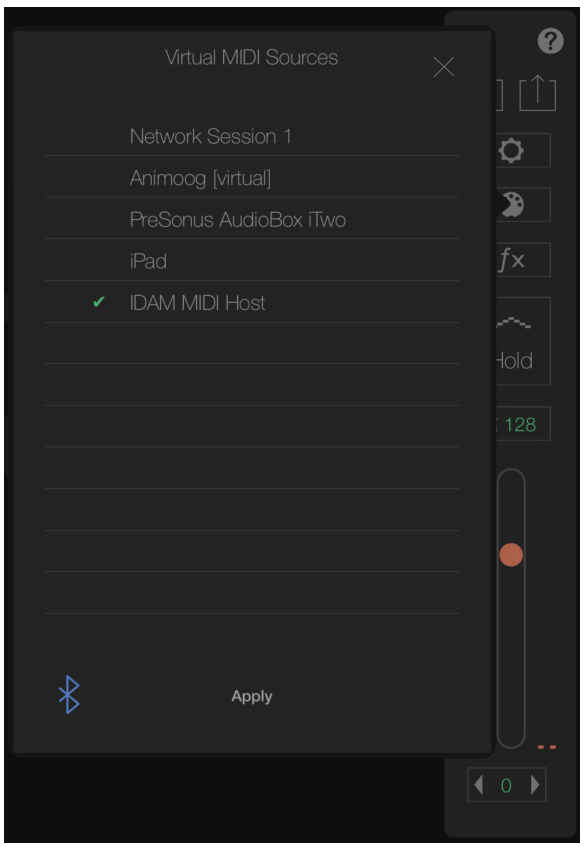
Important Note:
Living Memory Software reserves banks 100 to 128 for factory presets and you cannot save to those banks.

MIDI

Because LayR is designed as a professional synth for use live on stage, reliable remote control is very important. For that reason LayR has an extensive MIDI implementation that lets the app run hidden away working remotely controlled via MIDI Control Change, Bank Select and Program change messages. In fact LayR's MIDI implementation is almost unparalled on iOS at the time of writing this manual. If any bugs are identified or reported they are immediately squashed and updates issued rapidly to ensure smooth operation for users.

When running stand-alone, LayR provides Virtual MIDI ports that you use to connect your external MIDI controller keyboard.

You access the Virtual MIDI Connection Panel by tapping on the MIDI button (4) in the Master strip.



Important Note
When running LayR hosted in an IAA host you should not have anything connected to LayR's virtual input ports, instead you should use the connectivity provided by the host app. Otherwise you might find MIDI data gets duplicated which can cause strange behaviour!

Input Ports

LayR has 2 MIDI input ports:

1 - The main input port for all MIDI Note, Control Change and Pitch Bend data is named: **LayR Instruments**.
This is the port you would connect your MIDI controller keyboard to for live performance.
In LayR's settings you can optionally assign a single MIDI channel on this port for directing to the Performance section.
If the option is ON then the **LayR Instruments** MIDI port will route Bank Select (cc0/cc32)[1], Volume (cc7) and Program Change messages to the **LayR Performance** Port on the specified channel.
This is same as the default behaviour of LayR up until version 1.2.
Basically with the option turned on you have 15 MIDI channels for the Instruments and 1 channel put aside for selecting Performance presets and setting Master Volume.

2 - A second input port is named: **LayR Performance**.
This port only listens to Bank Select, Program Change and Volume messages, all other messsages are ignored, it responds to these messages on all MIDI channels. It is used purely to select Performance Presets and set the Master Volume while leaving all 16 channels free on the **LayR Instruments** port.
If you are using this port then, in LayR's settings you can disable the option to use a channel to select Performance presets.

Tip
[1]- In LayR's settings you can select which form of Bank Select message LayR responds to. MSB (cc0) or LSB (cc32). The default setting uses Bank Select LSB.

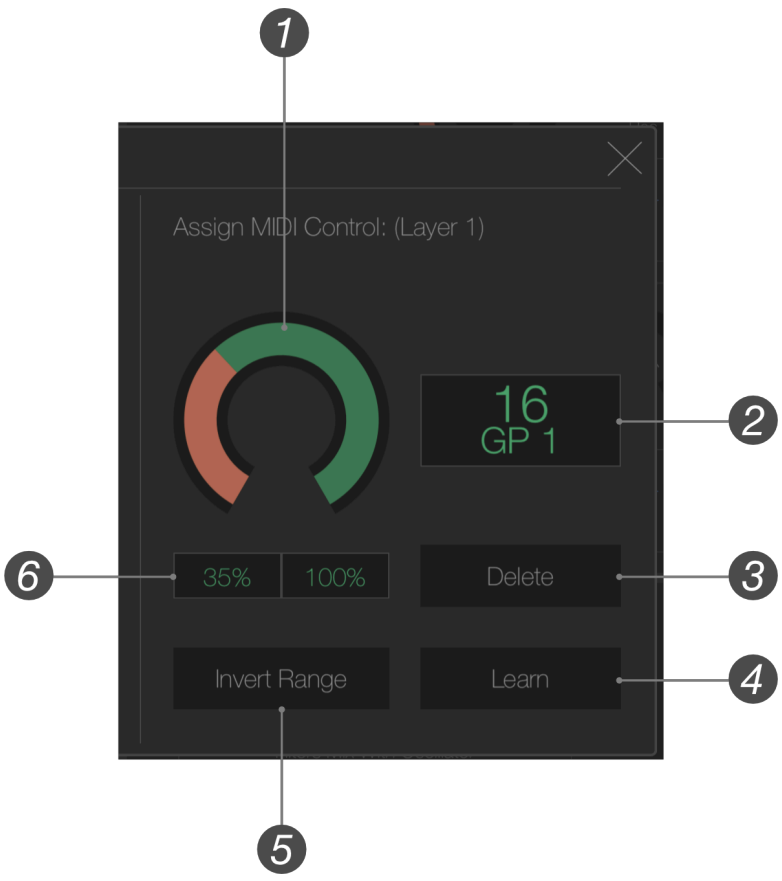
Output Port

LayR has a single MIDI output port that can be optionally enabled in LayR's settings. All MIDI messages initiated from the user interface are also transmitted from the output port. This is particularly useful if you are using the MIDI Controller Mixer.

Assigning MIDI Controllers

MIDI Control Change messages can be assigned to parameters in any Layer and Layer Strip. Any single CC can be assigned to many different parameters simultaneously each with a unique range and direction. Controllers assigned to parameters in Link Groups enable you to control parallel parameters spread across many layers with a single assigned controller. The range 0-127 of a MIDI controller can be assigned to any section of a parameter's range enabling you to achieve very fine control. You also tell a controller to work in reverse direction which lets you design morphs and crossfades.

Assigning a controller is very simple, there are shortcuts to quickly assign range and a MIDI learn feature for picking up control numbers from the MIDI connection:



The middle section of the Link & Assign Panel is used to assign MIDI controllers to Layer Editor parameters. The panel is revealed by long pressing on a dial or control.

In a Layer strip or in the Layer Editor, press down on a dial until the Link & Assign panel appears. The middle section of the panel is for assigning a MIDI Control Change message to the parameter. The left side is for assigning Link Groups, and both work together. You only need to assign a MIDI CC to one of the linked layers if the parameter is linked. In the Layer Editor a small MIDI icon is displayed next to dials that have MIDI controllers assigned to them.

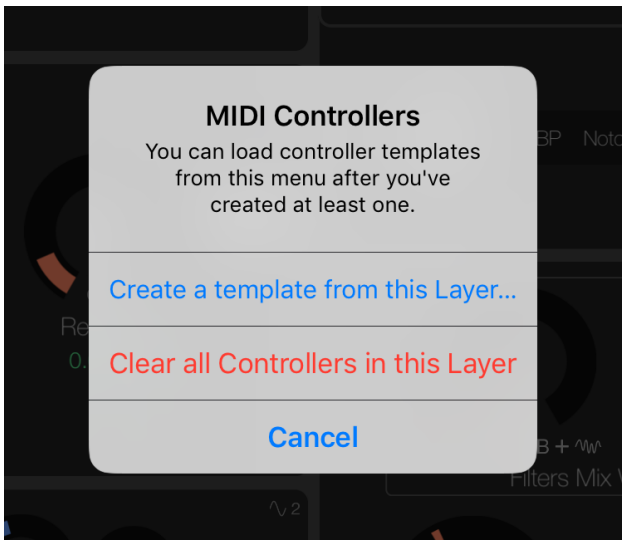
(1) - Set Controller Range:
The orange section of this dial display shows the current value of the parameter.
The green section is the range that the MIDI controller will control. 0 to 127 = the start of the green to the end.
Repeatedly double tapping on this dial will set various useful ranges automatically.
You can drag the green area to set the range or you can type in a parameter range as a percentage (6).
(2) MIDI Control Change controller number: Drag or tap on this control to set the the controller number.
(3) Tap the Delete button to clear the MIDI controller from the parameter.
(4) Tap the Learn button after sending a MIDI Control Change message to LayR on the correct channel.
(5) When the Invert button is selected the MIDI control direction is reversed . The MIDI controller 0 to 127 will change the parameter in reverse from the end of the selected range to the start. Useful for creating crossfades and morphs.
(6) Range display. Tap to enter a value from the numeric keyboard.
Uses percentage values because internally the resolution is far greater than 127.

MIDI Controller Templates

Controller templates are previously saved sets of controllers that have be assigned to layers in the Layer Editor. You can create a template after assigning MIDI controllers to parameters in the layer.

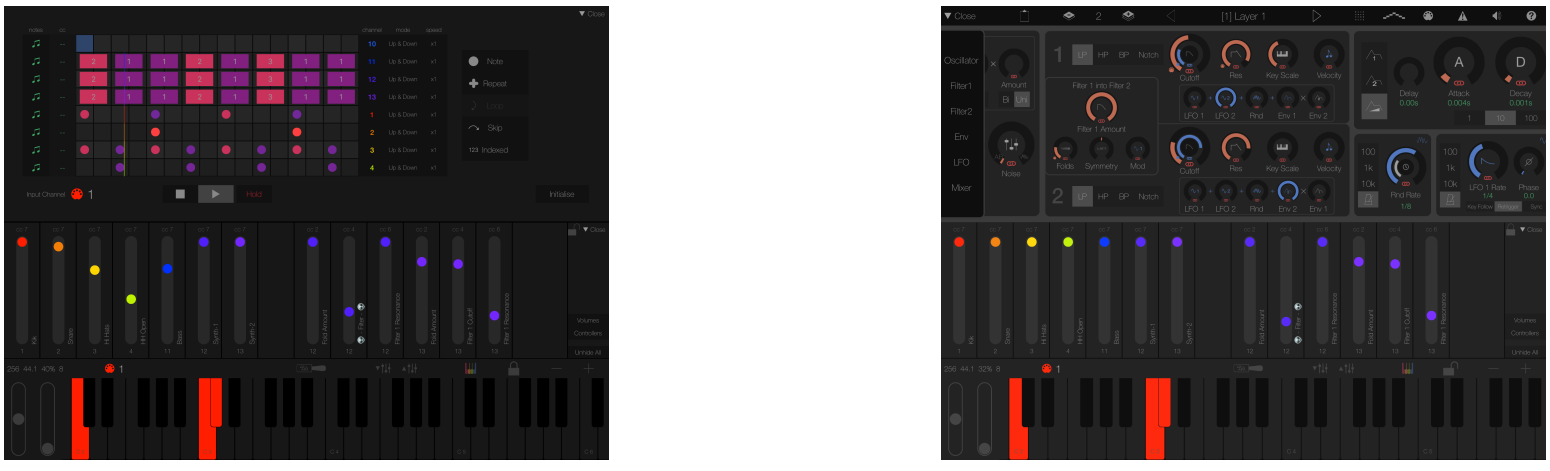
Tap the MIDI icon in the Layer Editor Menu Bar to reveal the template popup.

The popup also contains an option to quickly delete all MIDI controllers from the current layer which can be useful sometimes.



Note
MIDI Controller Templates for the Layer Editor are an expert feature and tend to be unique to individual workflow, for that reason LayR does not provide any default templates. The list will be empty until you create your own.

Master MIDI Controller Mixer



Views of LayR's MIDI cc Mixer Panel in use.

The MIDI cc Mixer Panel can be used on screen to control a Performance in real time. The panel has 2 sets of sliders:
On the left side are Volume strips one for each MIDI channel in use in the currently active Performance.
On the right side are a set of optional sliders, one for every MIDI controller that's been assigned in the current Performance.
Either section can be hidden and the entire panel can scroll horizontally if there's too many controllers to display. The volume sliders send MIDI Volume (cc7) on their specific channel and the other sliders send an assigned MIDI controller. Slider strips can be renamed and the entire state is saved with the current Performance preset.

As you assign more MIDI controllers to parameters in the Layer Editor they will automatically appear in the MIDI cc Mixer panel.

If the MIDI output port is enabled, the MIDI cc Mixer also transmits the controller values from the output port.

About MIDI Volume Messages & LayR's Instruments

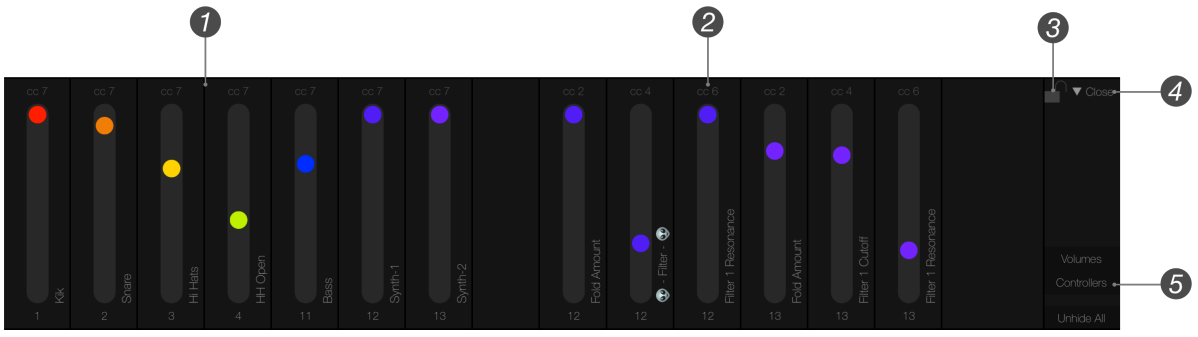
It's important to understand how LayR's Instruments respond to the MIDI volume message:

Every Instrument strip in the Instrument Mixer (that is the main Instrument Mixer, **not** this MIDI cc mixer panel) has a volume slider (8). MIDI Volume messages are interpreted so that 127 corresponds to the position that the volume slider is set to. That is, when you change the volume by hand in an Instrument strip, that volume becomes the full range that is used by subsequent MIDI volume messages. This means that when a MIDI Volume message is recieved by multiple Instruments using the same MIDI channel, they don't all set themselves to the same volume, instead they retain their relative volumes.

The MIDI cc Mixer Panel has one volume slider for each channel in use. These sliders can be used as master sliders to set the volumes of all Instruments on their channel as a group.

Try It !
Create some Instruments, set their volumes to different levels and then send MIDI cc7 on the same channel as the Instruments.
Remember to ensure that all cc volume sliders are set to their top position before saving a Performance.

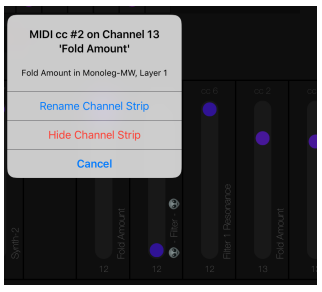
The MIDI cc Mixer Panel



(1) - Volume section: see discussion about MIDI volume above.
(2) - MIDI cc section. One strip for every assigned MIDI controller per channel, these sliders can optionally be hidden & renamed.
(3) - Lock. Prevents the slider strip info panel from popping up while using the mixer. Unlock to hide or rename mixer strips.
(4) - Close button: Hides the MIDI cc Mixer Panel.
(5) - View filters: Options to hide either the Volume strips or the MIDI cc strips.

Strip Info Panel & Identifying where MIDI controllers are assigned.

When the lock button(3) is unlocked, long press on a slider strip to reveal an info popup. This popup lists all the locations of parameters the MIDI controller has been assigned to. Useful for identifying to which Layers in which Instruments a MIDI cc has been assigned. The popup also gives options to rename the strip with a more useful name and also to hide the strip if you don't want that controller visible in the mixer.



Arpeggio Sequencer

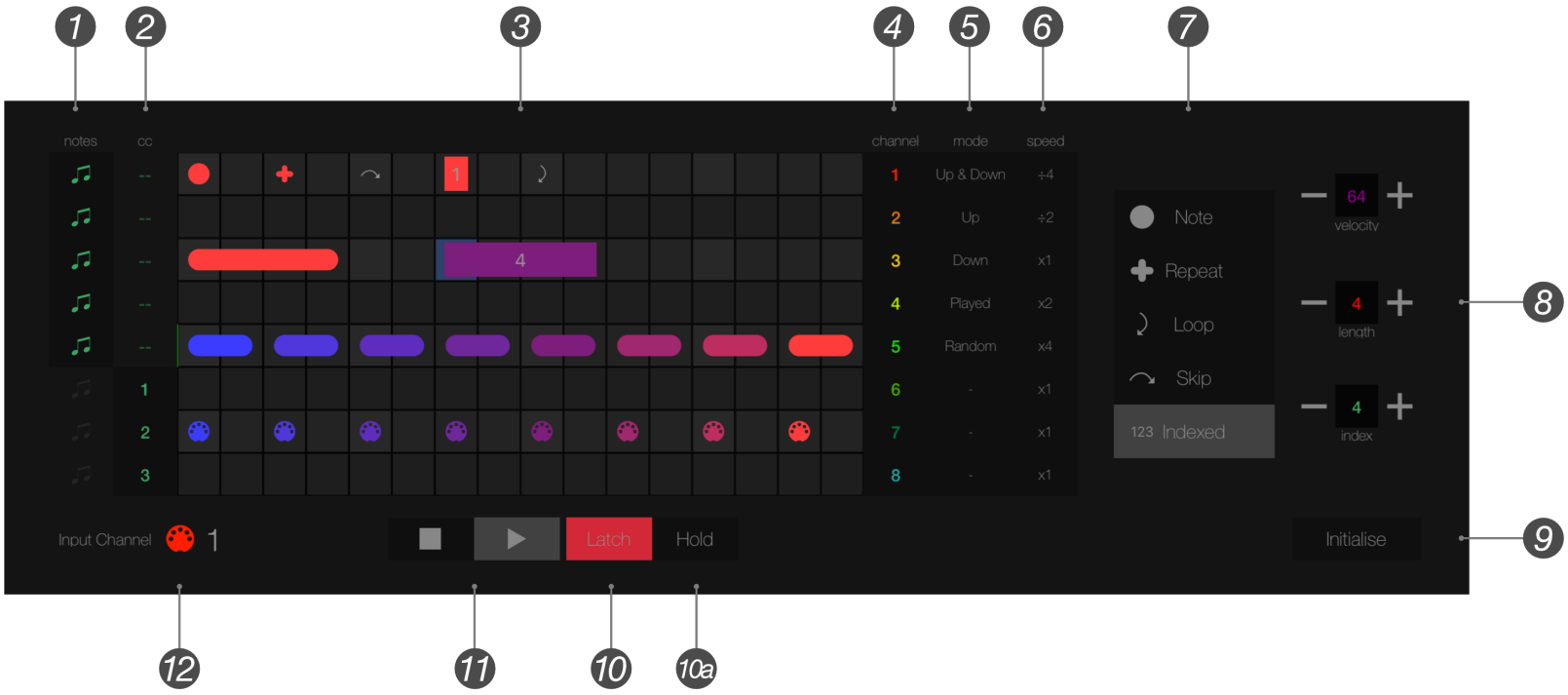
The entity that was known as LayR's Arpeggiator is now renamed to the Arpeggio Sequencer because it goes way beyond a simple arpeggiator.

LayR's Arpeggio Sequencer takes a set of notes, the **Chord** and transforms it into polyrhythmic musical patterns, drum patterns, EDM loops etc, it's even cabable of creating simple ambient generative music.

The sequencer's input comes in on a single MIDI channel and it outputs to as many as 8 different channels. The input is a set of notes referred to as the **Chord** because that's essentially what it is. You play a chord over MIDI or hold a chord on the on-screen keyboard and the Arpeggio Sequencer transforms the notes in the chord by applying rules specified by **Events** on one or more **Tracks**.

Each **Track** can hold as many as 16 **Events**, output to any MIDI channel, have a different length, a different playback mode and a different playback speed. In another mode, sequencer track **Events** can be MIDI controllers instead of notes.

Arpeggio Sequences are stored with Performance Presets and if active when saved they will playback automatically when loaded.



LayR's Arpeggio Sequencer.
There are lots of example sequences in the Performance Presets

(1) - **Track Type**: These buttons toggle track type between Notes and MIDI Controller.
(2) - **CC Number**: Drag or tap on these controls to set the MIDI Controller number for MIDI Controller tracks.
(3) - **Track view**: Explained in more detail below, tap in this area to create events at in any of the 16 grid locations per track.
(4) - **Channel**: Drag or tap on these controls to set the MIDI channel for the track.
(5) - **Playback Mode**: Drag or tap on these controls to set the playback mode for the track. Explained in more detail below.
(6) - **Playback Speed**: Drag or tap on these controls to set the playback speed for the track.
(7) - **Event Type**: Buttons to set type of event at the selected location. Explained in more detail below.
(8) - **Event Values**: These controls are used to set various values depending on the event that's currently selected.
(9) - **Initialise**: Tap this button to reset the Arpeggio Sequencer to it's default starting state.
(10) - **Latch & Hold**: Latch toggles notes on and off when a key is pressed, Hold holds played chords until the next chord is received.
(11) - **Play**: Activates the Arpeggio Sequencer, it will start playing when a Chord is held on the keyboard or over MIDI.
Stop: Deactivates the Arpeggio Sequencer.
(12) - **Input Channel**: Sets the input MIDI channel. MIDI notes played on this channel form the input Chord to the sequencer.

Adding, Editing & Deleting events in Tracks.

To add events to a track tap on one of the 16 square slots in a track. It will highlight  to show the selection.

Press one of the Event Type buttons (7). For example **Note**, and the selected event will be inserted. 

Some events are not possible in certain locations and in that case their related button will be disabled.

To **delete** events, select the slot containing the start of the event and tap on it again. Or tap on the event type button (7).
When you select some events you can set values like **velocity**, note **length**, **index** or **control number** by using the value controls (8).

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Arpeggio Sequencer Event Types

Note

Each time the play head travels over a Note event the next note in the Chord will be played. The notes are played in the order specified by the track playback mode: Up & Down, Up, Down, As Played or Random.
- "As Played" is the same order that the notes were originally played in.

Repeat

When the play head travels over a Repeat event the current note is repeated.

Skip

This event skips over the next note in the Chord, can be used to add more interest to some playback modes especially if the Chord has an odd number of notes.

Indexed

With the Index event you can specify which note in the Chord is to be played by setting the index of the note starting from the first note in the Chord. If the index is greater than the number of notes in the Chord it wraps to start again from 1.
Experimentation will soon make it obvious.

Loop

When the play head comes to a Loop event the track starts playing from the start again. Use this to set the length of a track if you want to use less than 16 steps.

Controller Value

If the track type (1) is set to MIDI controller this event lets you specify the control value (0 to 127) at the event time.
If control value is set to 128 it outputs random values.
Tracks in controller mode only have 2 event types, Controller Value and Loop.

Arpeggio Sequencer Track Playback Modes

Up & Down
Notes are played in a loop from the lowest note in the chord to the highest and then in reverse order back to the lowest.
For Indexed events, the index of the lowest note is 1.

Up
Notes are played in a loop from the lowest note in the chord to the highest.
For Indexed events, the index of the lowest note is 1.

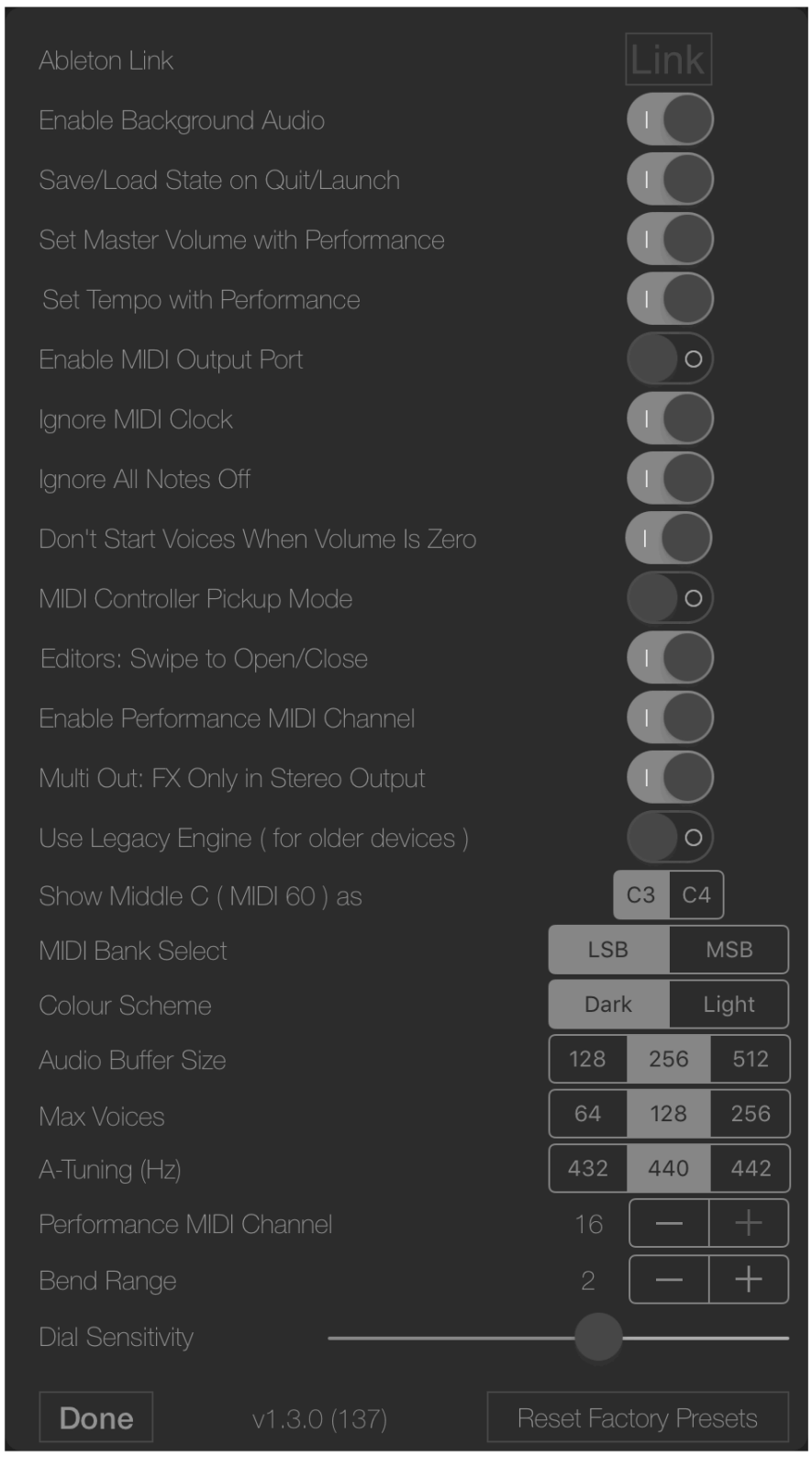
Down
Notes in the chord are played in a loop from the highest to the lowest.
For Indexed events, the index of the highest note is 1.

As Played
In this mode notes are played looped, in the order they were originally played over MIDI.
For Indexed events, the index of the first note played note is 1.

Random
Notes are picked randomly from the chord.
For Indexed events, the index is undetermined but usually the first note played over MIDI.
Indexed events in a track whose type is set to Random don't make much sense!

App Settings

LayR has several global app settings: To access the panel tap the settings button (3) in the Master Strip. Some options require you to quit LayR by tapping the home button and swiping it off the screen before launching it again.



Link:

Enable or disable Ableton Link by tapping on the link icon. Off by default. Only needed when using the Arpeggio Sequencer.

Enable Background Audio

On by default, this lets LayR play when the app is sent into the background or hidden.

Save State on Quit / Restore on Launch

With this option selected, the current Performance is written to storage when LayR goes into the background or is quit and restored the next time LayR is brought forward or launched.

Set Master Volume with Performance

Master volume is stored with Performance Presets.
With this option enabled it is ignored when a Performance is loaded.

Set Tempo with Performance

Tempo is stored with Performance Presets.
With this option enabled it is ignored when a Performance is loaded.

Enable MIDI Output Port

When enabled, any MIDI activity initiated from the User Interface is transmitted out of this port. That includes, the Arpeggio Sequencer and the MIDI cc Mixer.

Ignore MIDI Clock

Rapidly becoming a legacy option. MIDI clock is ignored by default, better to use Link or rely on the tempo & beat clock provided by host apps.

Ignore All Notes Off

Sometimes DAWs or hosts send the All-Notes-Off message at the most annoying times. This option lets you ignore it. Only affects incoming MIDI. It does not bypass the Panic buttons in LayR's UI. Those will still work.

Don't Start Voices When Volume Is Zero

Enables an optimisation that prevents voices from starting if an Instrument or Layer volume is zero.

MIDI Controller Pickup Mode

Currently an experimental option that allows external MIDI controllers to "pick up" an assigned MIDI control as the value passes though the controller's initial value.

Editors: Swipe to Open / Close

An expert level option that speeds up navigating LayR's user interface, see **UI Shortcuts & Optional Swipe Gestures**
Off by default because it requires some delicacy with the touch screen.

Enable Performance MIDI Channel

LayR now has 2 MIDI input ports, the second is dedicated to the Performance section.
This option relates to LayR's legacy and is discussed in detail in the **MIDI Input Ports** section.

Multi Out: FX Only in Stereo Output

IAA only: When any of the 8 aux audio outputs are connected to an IAA host this option turns the Stereo Mix output into an Effects Return.

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Use Legacy Engine

This is an experimental option that hopefully will allow LayR to continue to work on older devices as time passes and LayR is updated with more CPU hungry features.

Show Middle C as

MIDI has several confusing features and the labelling of Middle C is one of them. By default LayR chooses note number 60 = C4.

MIDI Bank Select

Choose your preferred MIDI Bank Select message format. LSB (cc32) or MSB (cc0). LayR's default is LSB.

Colour Scheme

An experimental feature providing a lighter scheme for use when you take your touch device outside into the sunshine!

Audio Buffer Size

Sets the size of the audio buffer when running stand-alone. Otherwise a host determines the size. Defaults to 256 sample frames.

Max Voices

For reducing CPU usage: On the most recent iOS devices LayR can easily support 256 voices, on older devices (iPad Air 2 or older) 128 is more sensible. 64 is really only for use with the smallest phones and iPad Minis. Defaults to 128.

A-Tuning

For those who prefer an alternative tuning for concert pitch here it is.

Performance MIDI Channel

The channel to be used by the first input port to receive Bank Select, Program Change and Volume messages for Performance Presets. This is discussed in detail in the section relating to MIDI Input Ports.

Bend Range

The number of semi-tones LayR assigns to the full range of the MIDI Pitch Bend message.

Dial Sensitivity

A slider for adjusting the rotation speed and sensitivity of dials in the User Interface.

Reset Factory Presets

Restores the factory presets in case they get deleted or lost somehow.

Using LayR with IAA hosts or AudioBus

Important Note
When running LayR hosted in an IAA host you should not have anything connected to LayR's virtual input ports, instead you should use the connectivity provided by the host app. Otherwise you might find MIDI data gets duplicated which can cause strange behaviour!

IAA hosts and Audiobus can take audio input from LayR's special auxillary audio out channels in the Instrument Strips. When an aux output is being used the effects section is bypassed.

When hosted you should usually also disable the Ableton Link option because the host will generally provide an accurate beat clock.

Differences between the IAA and Audio Unit versions

The Audio Unit and iPhone versions of LayR have greatly limited screen space available to them. From version 1.2 LayR's UI has been redesigned to make using these small spaces much more comfortable.

The Instrument Mixer now sports much wider strips and the Layer Editor has a long scrollable and pinch zoomable interface.

In the Layer Editor there are some buttons on the left hand side that when **repeatedly tapped** will zoom into useful preset locations.

You can also double tap on the background in the Layer Editor to zoom into the tapped location.

The keyboard is hidden by default in a semi transparent tab at the top left of the audio unit UI. Tap the tab to reveal the keyboard and CC Mixer.

The keyboard panel can be dragged and **repositioned vertically** by dragging on the keyboard menu bar and the CC Mixer can be moved by dragging on the up and down arrows at the left side of the panel.

In hosts that let you change the size of the view the audio unit version will adapt to use the full screen interface where it can.

Apart from these differences the user interface is essentially identical on all versions.

All LayR's presets are now stored in a location that's shared between the stand-alone app and the audio unit. If you save a preset in one it will be available in the other. The iTunes documents folder is now available on iOS via Files.app "On My iPad/LayR". But the preferred method to import and export presets is now to use the new Bank file format from the Save & Load Preset Panels.

The audio unit has a few settings that can be set per instance but generally, all settings in the stand-alone app are reflected in every instance of the audio unit.

Credits & Thanks

LayR is designed, coded and maintained by Andy Bull.
Living Memory Software is Andy Bull and Jan Deakin.

Thanks to all our beta testers who do a really great job making sure LayR is as bug free as possible.
There now are far too many to mention all by name but one person in particular deserves credit ...

•

Huge thanks to Brice Beasely for his amazing sound design and for pushing LayR beyond it's envelope. (!pun intended!)

•

If you use LayR and you like it please take the time to leave a review on the App Store.
Living Memory do not pay for reviews
or insert annoying nag screens into our apps
and we rely on the goodwill of our customers to rate our app on the store
which, in turn, gives us the ability to continue to maintain the code and produce updates.

If you find a bug, know that we really do hate bugs just as much as you!
Reporting a bug via the support link on the website is far more productive than leaving a complaint on the App Store!
All bugs are squashed quickly and updates rapidly issued.

Website: www.livingmemorysoftware.com
Facebook: https://www.facebook.com/layrsynth/?ref=bookmarks