USER MANUAL

_MINIFREAK V

ARTURIA

_The sound explorers

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Special Messages

This manual covers how to use MiniFreak V, provides a comprehensive look at its features, and details how to download and activate it. First, some important messages:

Specifications Subject to Change:

The information contained in this manual is correct at the time of printing. However, Arturia reserves the right to change or modify any of the specifications or features without notice or obligation.

IMPORTANT:

The software, when used in combination with an amplifier, headphones or speakers, may be able to produce sound levels that could cause permanent hearing loss. DO NOT operate for long periods of time at a high volume or at a level that is uncomfortable.

If you encounter any hearing loss or ringing in your ears, please consult an audiologist.

NOTICE:

Service charges incurred due to lack of knowledge relating to how a function or a feature works (when the software is operating as designed) are not covered by the manufacturer's warranty, and are therefore the owner's responsibility. Please study this manual carefully and consult your dealer before requesting additional support.

Epilepsy Warning – Please read before using MiniFreak V:

Some people are susceptible to epileptic seizures or loss of consciousness when exposed to certain flashing lights or light patterns in everyday life. This may happen even if the person has no medical history of epilepsy or has never had any epileptic seizures. If you or anyone in your family has ever had symptoms related to epilepsy (seizures or loss of consciousness) when exposed to flashing lights, consult your doctor prior to using the software.

If you experience any of the following symptoms: dizziness, blurred vision, eye or muscle twitches, loss of consciousness, disorientation, any involuntary movement or convulsion, while using this software, discontinue use IMMEDIATELY and consult your doctor.

Precautions to Take During Use

- Do not stand too close to the screen. Sit a good distance away from the screen.
- Avoid using if you are tired or have not had much sleep.
- Make sure that the room is well lit.
- Rest for at least 10 to 15 minutes per hour

Congratulations on your purchase of MiniFreak V!

Excellence is placed at the heart of every Arturia product, and MiniFreak V is no exception. Explore the presets, tweak a few controls, get lost in the features - dive as deeply as you like.

Be sure to visit the www.arturia.com website for information on all our other inspiring hardware and software instruments, effects, MIDI controllers, and more. They have become indispensable tools for many visionary artists around the globe.

Musically yours,

The Arturia team

Table Of Contents

1. WELCOME TO MINIFREAK V!

Congratulations on purchasing Arturia MiniFreak V!

You might be familiar with the MicroFreak, Arturia's compact digital/analog hybrid synthesizer. It combines a versatile digital oscillator with a semi-modular signal flow, and fun performance features, all in a unique tabletop format with a 25-note touchplate keyboard.

Building on the MicroFreak's concept and architecture, the MiniFreak synthesizer has taken freakiness to the next level in many different ways... and MiniFreak V gives you all of its power, *plus* the ability to sync with a hardware MiniFreak for massive performance and editing power!

1.1. What's so freaky?

At the heart of both the MiniFreak and MiniFreak V are two digital Oscillators with expanded capabilities. One offers 16 different oscillator types, from simple synthesizer waveforms and virtual analog modeling to speech synthesis, wavetables, and much more. The other has 21 different modes, not only various oscillators but other processing such as ring modulation, digital filter modes, and more.

The oscillators are fed into a multi-mode Filter, and then a set of three independent digital effects processors (FX), each with a selection of multiple effect types.

In addition to a dedicated ADSR Envelope, there's a Cycling Envelope that can be used as either an extra 4-stage envelope or as a looping waveform with a variety of complex shapes. This is in addition to a set of two Low Frequency Oscillators (LFO) with multiple waveshapes (including hand-drawn ones!) and the ability to sync to a global tempo. Modulation sources can be assigned to multiple destinations with different amounts, thanks to an easy-to-use Modulation Matrix.

The software mimics the hardware's two capacitive Touch Strips with multiple assignable functions for intuitive real-time control, and a powerful built-in arpeggiator and sequencer top off the package.

MiniFreak V's features perfectly mimic what you get in the hardware synth. As a result, when hardware and virtual instruments are synced, you can freely exchange and edit/save presets, load sequences, control the software from the hardware front panel (including the keyboard and Touch Strips), perform operations easily in the software that are a bit more tricky on the hardware alone, and much more.

Put it all together and you have one major freakout of a synthesizer, capable of all kinds of inspiring tonalities. It can do ordinary sounds like other synths, of course... but who wants *that*?

Get ready to get freaky like never before, with a virtual synthesizer like never before.

Musically yours,

The Arturia Team

1.2. Getting started

MiniFreak V breaks a number of (other people's) rules about "what a digital synthesizer can do", but in order to learn how to *break* the rules in a musical way, it helps to *learn* the rules first. While this manual will introduce basic concepts in many places, there's a lot more to know about synthesis – and fortunately, there's this thing called the Internet that places a lot of good information in your hands.

Between online videos to give you step-by-step advice, online forums where you can talk to other synthesists, and websites and blogs on electronic music, you can build up a vocabulary of synth terms and techniques that will help you out with a wide variety of synthesizers – and, of course, get the most out of your MiniFreak.

1.3. Diving in (suggestions on using this manual)

In this manual, you'll be introduced to all of MiniFreak V's functions, step by step. It's organized so that you can quickly find what you need, whether it's a detailed list of parameters for a given FX preset or just figuring out the difference between a Style and a Genre.

The Table of Contents is laid out by section, with some general information at the beginning and end. Inside each section, you can click on topic and page references to quickly find what you need.

One important bit of advice: the more you learn in depth about MiniFreak V, the more you can do with it. Take your time and go through the manual, either in order or by chapters that interest you, until you know what every function does. When you're really comfortable with MiniFreak V, you'll be able to do a whole lot of freaky stuff without having to refer to this manual as often.

And above all: have fun! Ultimately, that's what music is all about.

1.4. MiniFreak V3.0: Added content and features

1.4.1. New Engines : Granular and Sample Engines

Version 3.0 of MiniFreak V adds a Sampler as well as 7 Granular Engines to the MiniFreak.

> The Granular and Sample engines are only available on the first oscillator slot (Oscillator 1).

1.4.2. Sample

On MiniFreak V, you can use the following parameters to control the Sample engine:

- **Start** : Sets the Start Point of the Sample.
- **Length** : Allows you to set the length of the sample and how it plays back.

At 50 and above it will play the sample forward, ranging from short around 50 to longer around 100.

From 49 to 0 the sample will play backwards, ranging from short around 49 to longer around 0.

- **Loop** : Controls the Loop start point of the sample, relative to the Sample start position.

> When playing the sample in reverse do remember that the start control will condition its starting point, so in order to get the full sample playback in reverse, Start should be set at max value.

Selecting a Sample

You have two ways to browse through the factory Samples:

1) Using the Sample browser menu: Click on the loaded Sample name to open the drop down menu listing all available factory Samples, select the desired one and it will be immediately loaded.

2) Using the next/previous arrows: Located next to the Sample drop down, these allow you to advance through the Sample library while keeping the focus on the panel.

1.4.3. Granular Engines

Besides the Sample Engine, the V3 update introduces 7 Granular Synthesis based engines, which we will look into further now.

What's Granular Synthesis?

Granular synthesis is a synthesis method that processes samples by splitting them into smaller fragments called grains, which in turn creates a new sound depending on the playhead position, density (how many grains is generated by second or synced to the clock), length of each grains, shape of the grains, their pitch, and the forward/reverse playback. Including all these factors, new sounds are endless from a single sample. Various modulations can also be applied to either disrupt each of these factors and bring in more chaos.

We will now go through the different Engines using Granular based synthesis :

1.4.3.1. Cloud Grains

The Cloud grains engine is ideal for making textural grain effects.

On MiniFreak, you can use the following knobs to control the Cloud Grains engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the speed at which the grains are being generated.
- **Chaos** : Introduces grain randomization.

1.4.3.2. Hit Grains

The Hit grains engine has a sharp volume envelope. It's been designed to generate rhythmic stutter or rapid-fire bursts of grains for a blasting sound effect.

On MiniFreak, you can use the following knobs to control the Hit Grains engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the speed at which the grains are being generated.
- **Shape** : Controls grain length, attack length and hold.

1.4.3.3. Frozen

This Engine relies on fast grain generation to create an Ice-like effect where the size and shape of the grains plays a huge part on this ethereal and icy feeling.

On MiniFreak, you can use the following knobs to control the Frozen engine:

- **Start** : Controls the Start Point of the Sample.
- **Size** : Defines the length of the grains.
- **Chaos** : Introduces grain randomization.

1.4.3.4. Skan

The Skan engine scans through the sample while generating grains around the playhead, playing it from start to finish at a user-definable speed. Ideal for stretch like effect.

On MiniFreak, you can use the following knobs to control the Skan engine:

- **Start** : Controls the Start Point of the Sample.
- **Scan** : Sets the speed of the playhead.
- **Chaos** : Introduces grain randomization.

1.4.3.5. Particles

Particles generates intricate layers of random sound particles creating hypnotic and psychedelic effects.

On MiniFreak, you can use the following knobs to control the Particles engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the density of the grains being generated.
- **Chaos** : Introduces grain randomization.

1.4.3.6. Lick

The Lick engine is aimed at creating fast-paced percussive rhythmic groove grains synced to your music.

On MiniFreak, you can use the following knobs to control the Lick engine:

- **Start** : Controls the Start Point of the Sample.
- **Size** : Lengthens the size of the grains while the grain generation is synced to tempo at 1/16
- **Chaos** : Introduces grain randomization.

1.4.3.7. Raster

The Raster engine is aimed at more rhythmical approaches, with grain generation being tempo synced. Perfect for creating beat repeat/chopping and hypnotic randomized sequence.

On MiniFreak, you can use the following knobs to control the Raster engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the rate of the generated grains, which is a sub division of the tempo which goes from 1/2 to 1/32 rates.
- **Chaos** : Introduces grain randomization.

1.5. Improvements

- Added transpose for Hardware in Side Panel, this allows you to save a transpose for the hardware unit directly on the MiniFreak V.
- CC7 supports now added for master volume, the preset volume is subsequently moved to the side panel.
- UX Improvements.
- Connectivity with MiniFreak Hardware improved.

1.6. MiniFreak V 2.0: added content and features

1.6.1. New Engine : Wavetable

Version 2.0 of MiniFreak V comes with a Wavetable Engine.

What's Wavetable Synthesis?

Wavetable Synthesis has been discovered in the 80s, and allowed for sound manipulation that was previously not possible with a single cycle waveform. A Wavetable is a series of waveform cycles.

On MiniFreak V, you can use the following parameters to control the wavetable engine:

- **Scan** : Scans through the cycles and alters the waveform.
- **Width** : Controls the Symmetrical Pulse Width.
- **Tone** : Controls the LPF/HPF 1 pole filter.

> Please note that the Wavetable engine is only available on Oscillator 1.

Selecting a Wavetable

You have two ways to browse through the factory wavetables:

1) Using the Wavetable browser menu: Click on the loaded wavetable name to open the drop down menu listing all available factory Wavetables, select the desired one and it will be immediately loaded.

2) Using the next/previous arrows: Located next to the Wavetable drop down, these allow you to advance through the Wavetable library while keeping the focus on the panel.

1.6.2. New Effect : Super Unison

The Super Unison is a Chorus type effect, with up to 6 copies of the source signal stacked over the dry signal.

These copies are modulated by an LFO to vary the detune, and create a chorus-like unison-style effect.

Here is how the knobs work for Super Unison:

- **Detune**: Detunes the copies of the signal in relation to the dry sound.
- **LPF/HPF** Manages the Low Pass and High Pass filtering.
- **Dry/Wet**: Balance between dry and processed signal.
- **Subtypes**: Classic, Ravey, Soli, Slow, Slow Trig, Wide Trig, Mono Trig, Wavy.

> The Super Unison presets conditions how certain controls operates and their ranges. The presets labelled Trig will for instance reset the phase of all the copies of the signal in a Legato fashion.

> Did you know ? Detune affects the speed of LFO and the amount (some presets only affects the amount). For Filter, some fx presets have different ranges for different results.

1.6.3. Macro Controls (Side Panel)

Additionally to the 2 originally already available Macros on the main Panel of the MiniFreak V, the V 2.0 introduces the standard 4 Macro controls found on all our software instruments. These can be assigned from the side panel, in the Macro section.

By default the last two Macros are assigned to the original ones from the main panel, the other two are dedicated to Cutoff and Resonance.

You can edit their assignations from the side panel, as well as remove the default routing.

To assign a Macro:

- Select the Macro knob in the Side Panel.
- Enter the "Learn" mode by clicking on the "Learn" button.
- Select a destination from the MiniFreak Main Panel and click on it.
- Once paired you can edit the range of the macro over the destination from the lower section of this page.

These are applied on a per preset basis so ensure that you save your preset before moving on.

1.6.4. Macro Assign to Mod Amounts (Advanced Panel)

Using this feature, you can now assign the Macros to control modulation amounts in the matrix. By enabling you to adjust the modulation amounts at your fingertips, your patches will come to life like never before.

In order to assign a Macro to control a modulation amount, you will need to :

- Open the Advanced Panel.
- Click on "Macro/Matrix".
- In the "Macro 1" or "Macro 2" section, click on a destination.
- Click on the modulation you want to connect.

This also applies to the corresponding Macro 1 and 2 controls found at the bottom right of the Graphic interface.

1.6.5. Shaper Rate

The rate set on a shaper was determined by the rate knob, and it was per step. It meant that a 16-step shaper at 1/16 LFO Rate took 16/16ths = 1 bar for the whole Shaper.

All steps means the rate of the shaper is now on all steps. With a 16-step shaper at 1/16, the whole shaper is actually 1/16 (16x times faster).

This setting can be found in the LFO Shaper Window, under the Grid Length.

1.6.6. Store

You can now browse dedicated Sound Banks through the in-App store of the MiniFreak V, download free Banks, or purchase paid Banks.

To access the Sound Store, click on the Store Icon on the left side of the preset browser view.

You can sort the Preset Banks by type, style and subtypes under each of the main categories.

Additionally once selected for purchase, the banks will be listed in the Cart section on the top right of the interface, next to the Master Volume Control.

1.6.7. Sequencer Refinements

Dice, Ratchet, Repeat, Rand Oct and Mutate are now VST parameters, and can therefore be automated.

BPM shortcut is also now available from the Sequencer panel.

Finally, Overdub is now supported for recordings within the Sequencer itself.

1.6.8. Integration

- NKS M1 VST3 support.
- AAX Native M1 compatible.

2. ACTIVATION AND GETTING STARTED

2.1. Compatibility

MiniFreak V works on computers and laptops equipped with Windows 10 or later or macOS 10.13 or later. It is compatible with the current generation of Apple M1, M1 Pro/Max/Ultra, and other Apple Silicon processors, as well as Macs based on Intel processors. You can use it as an Audio Unit, AAX, VST2, or VST3 plug-in within your favorite recording software.

2.2. Download and Install

You can download MiniFreak V directly from the Arturia Products Page by clicking either the Buy Now or Get Free Demo options. The free demo is limited to 20 minutes of operation.

If you have not already done so, now is a good time to create an Arturia account by following the instructions on the My Arturia webpage.

Once you install MiniFreak V, the next step is to register the software. This is a simple process that involves a different software program, the **Arturia Software Center**.

2.2.1. Arturia Software Center (ASC)

If you haven't installed ASC yet, please go to this web page: Arturia Downloads & Manuals.

Look for the Arturia Software Center near the top of the page, and then download the installer version for the system you're using (Windows or macOS). ASC is a remote client for your Arturia account, letting you conveniently manage all your licenses, downloads, and updates from one place.

After you complete the installation, proceed to do the following:

- Launch the Arturia Software Center (ASC).
- Log into your Arturia account from ASC's interface.
- Scroll down to the **My Products** section of ASC.
- Click on the **Activate** button next to the software you want to start using (in this case, MiniFreak V).

It's as simple as that!

2.3. Working with MiniFreak V as a plug-in

MiniFreak V can be used as a *plug-in* within all major Digital Audio Workstation (DAW) programs including Cubase, Digital Performer, Live, Logic, Pro Tools, REAPER, Studio One, and more.

Plug-ins have numerous advantages over hardware, including:

- You can use as many instances on different tracks as your computer can handle.
- You can automate the plug-in's settings via your DAW's automation feature.
- All settings and changes are saved with your DAW project, letting you pick up right where you left off.

Audio and MIDI settings for MiniFreak V as a plug-in

When MiniFreak V is used as a plug-in, settings for audio and MIDI routing are handled in your recording software or DAW. They are generally located in some type of Preferences menu, though each product does things a bit differently. So, consult your recording software's documentation for information on how to select your audio interface, active outputs, sample rate, MIDI ports, project tempo, buffer size, etc.

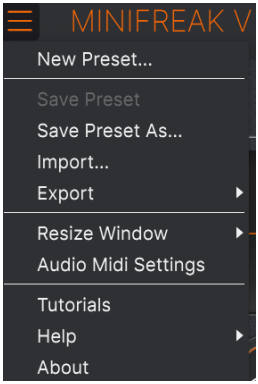
2.4. Initial setup for standalone use

If you would like to use MiniFreak V in standalone mode, you will need to ensure that MIDI input and audio output are being routed properly to and from the software. You'll generally only need to do this once, unless you change your MIDI controller or audio/MIDI interface. The setup process is the same on both Windows and macOS.

> ! This section only applies to readers that plan to use MiniFreak V in standalone mode. If you are only going to use MiniFreak V as a plug-in inside a host DAW or other music software, you can safely ignore this section – your host music software handles these settings.

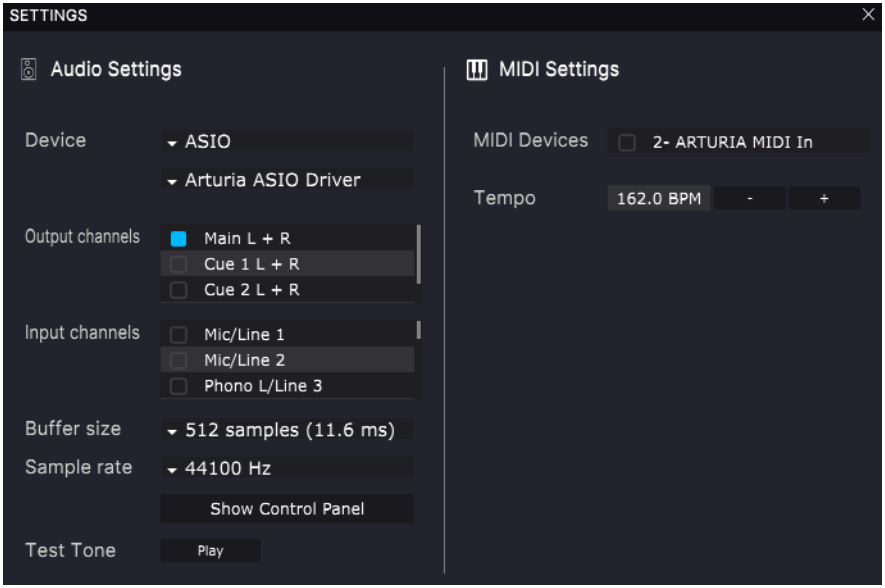
2.4.1. Audio and MIDI settings: Windows

At the top left of the MiniFreak V application is a pull-down menu. It contains various setup options.



MiniFreak V Main Menu

Click on **Audio Midi Settings** to open the following window. This works in the same way on both Windows and macOS, although the names of the devices available to you will depend on the hardware you are using. Remember, this option is only available (and needed) in the standalone version of MiniFreak V.



Audio and MIDI Settings for Windows

Starting from the top, you have the following options:

- **Device** selects which audio driver and device will handle playback of MiniFreak V. This can be your computer's internal driver, a generic ASIO driver, or an external soundcard or interface driver. The name of your hardware interface may appear in the field below, depending on your selection.
- **Output Channels** lets you select which of the available outputs will be used to route audio out. If you only have two outputs, this selection box will not be shown. If you have more than two, you can select a specific pair of outputs.
- **Input Channels** lets you select which of the available inputs will be used to route audio into and through MiniFreak V. If you don't select any, your interface will not pass audio to the plug-in.
- The **Buffer Size** menu lets you select the size of the audio buffer your computer uses to calculate sound. The latency in milliseconds is displayed after the buffer size setting.

> ! A smaller buffer means lower latency, i.e. a shorter delay between pressing a key and hearing the note, but loads your CPU more heavily and can cause pops or clicks. A larger buffer means a lower CPU load, as the computer has more time to think, but can result in a noticeable delay between playing a note and hearing it. A fast, modern computer should easily be able to operate at a buffer size of 256 or even 128 samples without clicks, but if you do get clicks, enlarge the buffer size until they stop.

- The **Sample Rate** menu lets you set the sample rate at which audio is sent out of the instrument.

! The options here will depend on what your audio device can support; nearly every device can operate at 44.1kHz or 48kHz, which will be perfectly fine for most applications. If you have a specific need to use a higher sample rate, up to 96kHz, MiniFreak V will happily support that.

- The **Show Control Panel** button will jump to the system control panel for whatever audio device is selected.

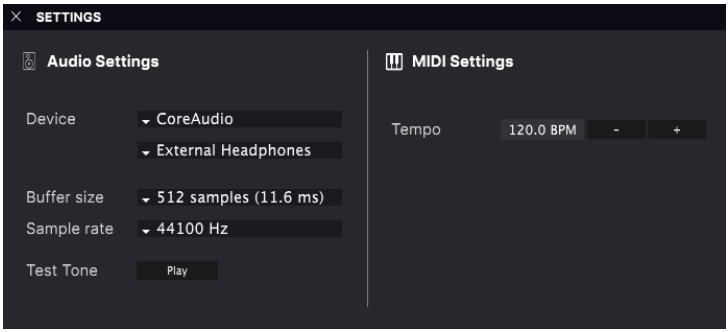
! Note that this button is only available in the Windows version.

- **Test Tone** sends a short test tone when you click the **Play** button, to help you troubleshoot audio issues. You can use this feature to confirm that the instrument is routed correctly through your audio interface and that audio is playing back where you expect to hear it (your speakers or headphones, for example).
- The **MIDI Devices** area will display any MIDI devices you have connected to your computer (if any). Click the check box to accept MIDI from the device(s) you want to use to control the instrument; you can select multiple MIDI devices at once with the checkboxes.

! In standalone mode, MiniFreak V listens for all MIDI channels, so there's no need to specify a channel.

- **Tempo** sets a base tempo for features inside MiniFreak V such as LFO and effects sync. When using MiniFreak V as a plug-in, the instrument gets tempo information from your host software.

2.4.2. Audio and MIDI settings: macOS



Audio MIDI Settings for macOS

The menu for setting up audio and MIDI devices for macOS is accessed in the same way as for Windows, and the setup process is nearly identical. All options work the same way as described above in the Windows section; the only difference is that all macOS devices, including external audio interfaces, use the CoreAudio driver built into macOS to handle routing. In the second dropdown menu under **Device**, choose the audio device you wish to use.

2.5. Connecting MiniFreak V with a MiniFreak synthesizer

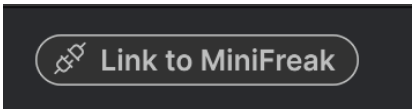
If you own the MiniFreak hardware synthesizer and are setting up MiniFreak V to work with it... first of all, *congratulations*! You've gotten your hands on a truly amazing keyboard, and you're going to find this software to be an amazing power boost when you work with it.

When synced, the hardware and software communicate directly and act as one instrument, with every control change on either one immediately reflected in the other. You'll find programming MiniFreak V's primary features much faster when you use the hardware buttons and knobs on the MiniFreak, and working with MiniFreak's more complex operations like the LFO Shaper [p.77] to be far quicker with MiniFreak's graphical user interface.

Linking to your MiniFreak hardware couldn't be easier. First of all, connect your MiniFreak to the computer running MiniFreak V with a USB cable, as directed in the MiniFreak Owner's Manual. If it is connected properly, when you launch MiniFreak as a plug-in or in standalone mode, you should see the MiniFreak as an available MIDI controller in the Audio Midi Settings pop-up or in your DAW software's appropriate settings window.

> You might have to quit and relaunch MiniFreak V and/or your DAW for this to take effect.

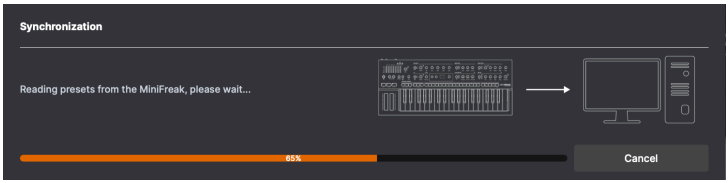
Now, when you launch MiniFreak V, you'll see this button on the Upper Toolbar [p.115]:



The Link button

This shows that the software sees the hardware but isn't connected to it "brain to brain" yet.

To sync the two, just click the button! You'll see this pop-up window appear, showing the progress of synchronizing all of your MiniFreak V presets with those on the hardware:



Synchronization of Presets gives you a progress bar like this one

Once the process is complete, which should only take a few seconds, the button now looks like this:

The button lights to show a good link

Now that you've set up the software, it's time to explore all of the possibilities to be found in MiniFreak V!

3. THE HOME PANEL

Now that we have MiniFreak V installed and ready to run, let's dive into the controls of the virtual synthesizer itself.

When you first launch MiniFreak V, you'll be presented with the **Home Panel**. It contains the elements of the plug-in's audio path from signal generation to output.

The Home Panel has four elements from left to right:

- **Oscillator 1**: This oscillator offers 15 types of waveform generation, representing many different types of synthesis.
- **Oscillator 2**: This oscillator's 21 types include 14 of those in Oscillator 1, plus 7 more unique oscillators and signal processors.
- **Filter**: This is a multimode filter that shapes the tone coming out of the Oscillators.
- **FX**: This set of three digital effects processors provides a final touch to your sound, from gentle to drastic.

(The Home Panel also offers a virtual keyboard and Touch Strips; we'll discuss those in the chapter on Advanced Functions [p.66].)

3.1. The Oscillators

Unlike analog oscillators, which have a rich harmonic character but usually a fairly limited number of basic waveforms, a digital oscillator can create a waveform in many different ways. Some digital synthesizers use physical modeling to emulate basic synthesizer waves. Others use frequency modulation (FM), or wavetables, or the Karplus-Strong mathematics of a plucked string, or sums of harmonics...

With so many options for waveform generation, it's hard to settle on only one or two choices. So MiniFreak V asks the very sensible question:

Why can't we have it all?

The core of MiniFreak V's freakiness is its pair of digital **Oscillators**, which provide all of the synthesis types mentioned above and many more. Some of them are familiar from the synthesizers that made them famous, and others are exciting and new.

While the original MicroFreak synthesizer could create a huge number of sounds from its single Digital Oscillator, the MiniFreak synth (and therefore MiniFreak V) has two of them. That greatly expands the possibilities, because now it's possible for one Oscillator to modulate the other one, or do even more cool tricks. Oscillator 2 takes advantage of this by providing some extra models that are designed to complement Oscillator 1 in various ways.

Arturia would like to extend its thanks to Mutable Instruments, who granted permission to include several different oscillator Types from Mutable's amazing Plaits Eurorack Macro-Oscillator module. These include: VAnalog, Waveshaper, Formant, Chord, Speech, and Modal.

Three of the models – Bass, SawX, and Harm – were contributed by Noise Engineering, taken from their Vert Iter Legio Eurorack module.

3.1.1. Oscillator Controls

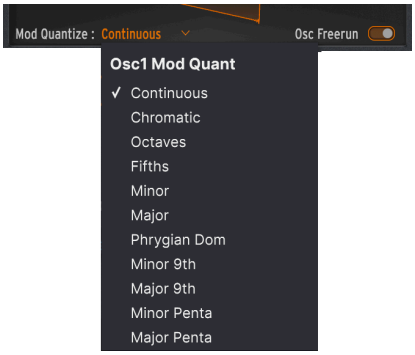
The controls for Oscillators 1 and 2 are identical in layout.

Each Oscillator has the following controls:

- **Type**: chooses the model that the Oscillator will use to generate sound. We'll discuss them all, one at a time, in just a moment.
- **Tune**: sets the tuning of the Oscillator by ±48 semitones and ±50 cents (100 cents = 1 semitone). Click and drag up/down to choose a value; double-click to return the value to 0.
- **Wave**, **Timbre**, and **Shape** (names change according to Oscillator Type): adjust three controllable properties unique to each Oscillator Type.
- **Volume**: sets the level of the Oscillator at its output.

Freak Out!: You can actually modulate the Type, changing models in real time as you play. The modulation source can be anything from Aftertouch to the Wheel strip, from the Cycling Envelope or LFOs to individual Sequencer steps. As you can imagine, with the very basis of the sound changing up to several times per second, things get really freaky really fast.

3.1.2. Mod Quantize and Osc Freerun



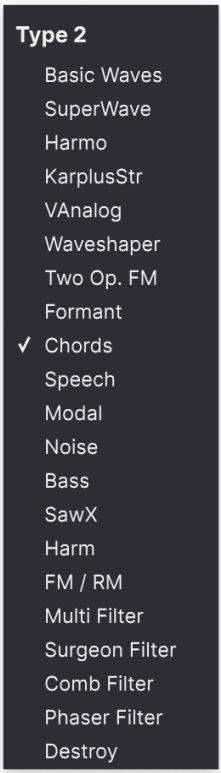
When you hover your mouse over the Oscillator's waveform display, two more controls appear. The first is Mod Quantize, which sets pitch modulation to step through notes in a particular scale rather than be smoothly continuous. This is great for creating melodic transpositions that never stray outside of a particular scale or mode.

Click the current Mod Quantize type to open a drop-down menu of choices. In addition to Continuous (the default), Mod Quantize can be set to Chromatic, Octaves, Fifths, Minor, Major, Phrygian Dominant, Minor 9th, Major 9th, Minor Pentatonic, or Major Pentatonic. Mod Quantize can be different for the two Oscillators.

The Osc Freerun switch determines if the waveform generated by the Oscillator for each note you play will remain locked in phase with other notes, or run freely. Depending on various parameters (including Mod Quantize), one setting or the other may yield a more desirable effect. Experiment!

3.1.3. Oscillator Types

Osc 1 and Osc 2 have 14 Types in common; in addition, Osc 1 has one of its own (Audio In) and Osc 2 has seven unique Types that are designed to process the sound of Osc 1 rather than create a sound of their own.



3.1.3.1. Basic Waves

This Type blends the characteristics of the two traditional analog synthesizer waveforms: the sawtooth wave and the square wave. Simple yet harmonically rich, BasicWaves mimics the oscillator modifications possible with early modular synthesizers.

Morph: smoothly changes the waveform from a square wave (0) to a sawtooth wave (50) to a double sawtooth that sounds an octave higher (100).

Sym: When Wave = 50 (a pure sawtooth), the Symmetry control has no effect. When Morph is set below 50, Sym changes the pulse width of the square wave; above 50, it creates phasing between the two sawtooth waves.

> Modulating Sym with an LFO when Wave = 0 creates classic analog-style Pulse Width Modulation (PWM), but when Sym is set to another number, this modulation creates sounds that would have been tricky to create on a 1960s lead synthesizer!

Sub: adds a sine wave one octave down. This extra sound source, a *sub oscillator*, adds low-end girth to waveforms. It could be generated on 1970s/1980s analog synthesizers at a much lower cost than adding an entire extra oscillator.

3.1.3.2. SuperWave

One of the easiest ways to add thickness to a digitally-generated synth waveform is to make multiple copies of it and detune them against one another. Originally this was done with sawtooth waves, with the Roland JP-8000's pioneering Super Saw wave becoming a sonic icon.

Wave: selects the base waveform. In addition to the usual sawtooth, this Type can start with a square, triangle, or sine wave.

Detune: sets the amount of detuning between the copies, from nearly none to way too much.

Volume: sets the volume of the copies vs. the original waveform. (The black **Volume** knob sets the overall level of the Oscillator, base wave and copies at once.)

3.1.3.3. Harmo

The Harmonic Oscillator applies a form of *additive synthesis*, where an evolving sound is made up of multiple *harmonics* that get louder or softer over time. Every sound we hear, whether natural or electronic, is made up of a very large number of sine waves that change with relation to one another.

The earliest additive synthesizers, such as the Digital Keyboards Synergy used by Wendy Carlos in the 1980s, required that each harmonic and its evolution over time be set individually, a fiddly and time-consuming process. Harmo provides a choice of relative harmonics (up to eight) that can quickly be set, thanks to a large number of preset "tables" of harmonic relationships.

Content: chooses a particular table of harmonic relationships. Higher numbers choose tables with more harmonics in them.

Sculpting: gradually morphs the individual harmonics from the traditional sine wave to a triangle wave, providing a different character impossible on older additive synths.

Chorus: subtly widens and thickens the sound.

3.1.3.4. KarplusStr

The Karplus-Strong Oscillator generates sounds from one of the earliest *physical models* for sound generation. Developed by Kevin Karplus and Alex Strong at Stanford University, the Karplus-Strong model loops a burst of noise through a filtered delay. This can create a realistic model of a bowed string or a struck drumhead. These are two combinations of an *exciter* and *resonator*: the bow excites the string, or the strike excites the drumhead.

KarplusStr starts with a combination of Bow and Strike, with each component controlled by different knobs:

Bow: sets the amount of Bow sound added to the Strike sound – a continuous bowed tone vs. a decaying drum-like tone. (This knob doesn't affect the Strike sound.)

Position: sets the mathematics for where on the drumhead the strike occurs. Any drummer can tell you that striking the center of a drumhead vs. near the edge will produce a very different sound – this control simulates that effect. (This knob doesn't affect the Bow sound.)

Decay: controls how quickly the resonator's vibrations die away.

3.1.3.5. VAnalog

VAnalog is a virtual analog waveform model. It simulates two analog waves – pulse and sawtooth – each with highly variable waveshape.

Detune: changes the pitch of the sawtooth with respect to the pulse. This pitch interval can be very subtle, or up to ±2 octaves.

Shape: changes the waveshape of the pulse, from a very narrow pulse to a square wave to intense high harmonics as heard in hard oscillator sync (where one oscillator forces another oscillator's waveform to reset).

Wave: changes the shape of the sawtooth, from a triangle through a sawtooth with increasing harmonic content.

3.1.3.6. Waveshaper

The Waveshaper Oscillator combines two techniques for waveform manipulation, once again with the goal of creating interesting harmonic content.

A *waveshaper* alters the rise and fall time of a waveform's cycle. For example, applying a waveshaper to a triangle wave and shortening the rise time of each cycle turns the triangle wave into a falling sawtooth wave. Further, a waveshaper can affect the curvature of a rising or falling signal, producing even more unusual harmonic changes.

A *wavefolder*, pioneered by Don Buchla in the 197Os, does what it sounds like: it takes the top and bottom of a waveform and folds it back on itself, rather than simply clipping it off as one might hear on a wave being run at too high a level. This is a different sort of harmonic creation.

Wave: controls the waveform coming out of the waveshaper.

Amount: sets the amount of wavefolding.

Asym: sets the asymmetry of the waveform.

> **Freak Out!**: each of the three knobs causes a wide and distinctive change in timbre over its range. Try modulating all three of them at once, with control signals that all repeat at different rates – for example, the two LFOs and the Cycling Envelope set to Loop.

3.1.3.7. Two Op. FM

The Two Op. FM Oscillator is a two-operator frequency modulation source. That's all fine... but what's an 'operator'?

FM synthesis is based around one oscillator changing the phase of another in a controlled way, using frequency relationships that could be harmonic or inharmonic, meaning not part of the usual series of harmonic overtones. Dr. John Chowning of Stanford University developed FM using collections of sine wave oscillators (called operators) controlling one another. The technology was licensed to Yamaha, who created a wide variety of FM synthesizers that could easily create realistic bell-like tones that were difficult for analog synths to make. One of these was the DX7, one of the most popular synthesizers in history.

While this Oscillator uses only two operators controlling each other's phase (the most common Yamaha synths used either four or six operators), it's still capable of a wide variety of tones ranging from rich organs to clangorous bells.

Ratio: sets the frequency ratio between the two operators. Ratios like 2:1 (an octave) or 1.5:1 (a perfect fifth) will produce relatively clean sets of harmonics, while other ratios will create inharmonic timbres reminiscent of a ring modulator.

Amount: changes the *modulation index*, a fundamental quantity in the math of FM. All you need to know is that turning it up will add more inharmonic frequencies, creating a distinctive bright timbre. Experimentation is key here.

Feedback: sets how much of Operator 2's output is fed back into it to modulate its own phase. Feedback loops like this are a fundamental part of FM synthesis, and can add all manner of extra overtones and even detuning effects. Again, experiment!

> **Freak Out!**: a combination of operators controlling one another in a certain way is called an *algorithm*. One of the most common and useful algorithms in 4-operator FM is a simple mix of two pairs of operators, one in each pair modulating the other. If you set both of the MiniFreak's Oscillators to Two Op. FM and mix them together, you'll have created this exact algorithm, with one important difference: the traditional algorithm has only one feedback loop, but this arrangement on MiniFreak V gives you two of them!

3.1.3.8. Formant

The Formant Oscillator uses granular synthesis to manipulate sound through a pair of formants, in order to create filtered waveforms and other effects.

Granular synthesis chops up sounds into tiny slices called *grains* or *particles*. These grains can then be rearranged and manipulated in many different ways – just as one example, granular synthesis is one way to time-stretch or compress an audio sample.

A *formant* is a resonant frequency that remains fixed, even when the pitch of the overall sound changes. Formants are why male and female voices sound fundamentally different, and banks of fixed formant filters have been used on many famous synthesizers since the 1960s.

Put these two ideas, and the Formant Oscillator creates a variety of harmonically rich tones with a definite "vocal" quality to them.

Interval: sets the ratio between the two formant frequencies.

Formant: Sets the base formant frequency.

Shape: Sets formant width and shape.

3.1.3.9. Chords [Osc 2 only]

The Chords Oscillator turns every note you play into, well, a chord. You can set up chord voicings with two, three, or more voices, and select pitch range and inversions as well.

Interval: selects the type of chord a note on the keyboard will play, with that note as the root of the chord. The following intervals and chords are available above the root:

- Octave
- 5th
- sus4
- minor (m)
- m7
- m9
- m11
- 6th + 9th (69)
- Major9 (M9)
- M7
- Major (M)

Inv/Trsp: transposes the notes in the chord up or down through a range of pitches, while maintaining the chord shape itself. This is done with *inversions*.

For example, if you set the Wave to M, a Major chord, and play a low C, you will hear a C Major chord: C, E, G. As you turn up the Timbre, the lowest C will be replaced by a C above the E and G – the first inversion of the chord. Turn the Timbre up farther, and the low E will be replaced by an E above the high C (second inversion), and so on up the scale. The chord will always be a C Major, but the order of the notes will change.

Waveform: selects the waveform of the Oscillator. From 0 to about 50, this knob goes through a set of waveforms like those on a 1970s ensemble keyboard, for example the Eminent/ARP Solina or Roland RS-09 Organ/Strings. The various settings produce a mixture of organ and string-ensemble tones. Above 50, there's a wavetable that smoothly morphs between 16 different waveforms.

Note that like any other Osc 2 Type, the Chord Oscillator can't be used in Paraphonic mode [p.74].

> **Freak Out!**: Applying modulation to any of these parameters will produce cool results. If you modulate Interval, you can create some pretty crazy chord progressions depending on how you do the modulation: setting a different amount for each step of a sequencer is quite controllable, while using something like a random LFO or Cycling Envelope will push you into the land of chaos. Somewhat more musically, you can modulate Inv/Trsp to keep chord forms moving through high and low pitches, or modulate Waveform between 50 and 100 to create wavetable sweeps. Every once in a while, it's good to learn (or review) a little music theory. There are lots of online resources to learn what all these chords are, how inversions work, how to use voice leading, and so on. So many electronic music styles rely on single-note lines – throw in some chord changes and stand out from the crowd!

3.1.3.10. Speech

The Speech Oscillator borrows from the technology of the Texas Instruments Speak & Spell, a toy from the 1970s that could talk intelligibly. That's not easy to do; human speech combines *vowel* sounds like "aaaa" or "oooo" with *consonants* that shape words, like *plosives* ("p" and "b" sounds), *nasals* ("mmmm" and "nnnn"), and so on. Getting a circuit to do this was a pretty neat trick, and circuits like these were used everywhere from toys to Kraftwerk albums like *Computerwelt*.

This Oscillator does a lot of the hard work for you; the settings required to synthesize simple sounds and entire words are stored in libraries and sub-libraries, so you can simply choose what you want to speak/sing.

Type: chooses the library of sounds. These include several sets of formants, creating vowels and *diphthongs* ("ai", "ow", etc), followed by lists of colors, numbers, letters, and some synth-related words like "modulator" and "waveform". (Kraftwerk, remember?)

Timbre: shifts the formants of the words up and down to control overall tonality.

Word: selects specific sounds or words inside the library chosen by the Type knob.

As an example: if you set Type to around 80, then play notes as you turn the Word knob up, you'll hear the MiniFreak say "Alpha, Bravo, Charlie" up to "X-Ray, Yankee, Zulu" at the pitch you're playing. It's a lot of fun!

> **Freak Out!**: Assign one of the Matrix modulations to Word, then modulate it with an LFO set to SnH. This will cause the notes you play to select random items from the chosen library, regardless of what pitch you play.

3.1.3.11. Modal

The Modal Oscillator offers a simple way to obtain beautifully clear and realistic percussion tones. It's based around the physical modeling of an object being excited with the input of energy and then resonating – the KarplusStr [p.25] Oscillator Type works in a similar fashion.

Every acoustic musical instrument relies on *excitation*: the player puts in energy by hitting a drum, bowing or plucking a string, blowing into a flute, and so on. The sound of the instrument depends on its shape, size, and materials: Middle C on a guitar won't sound like the same note on a cello – it even sounds different on two different guitars!

The Modal Oscillator creates sounds like this, then adds the function of *damping*: shortening the length of time the sound continues resonating after being excited. Examples include a palm mute on a guitar, or touching a drumhead to shorten the sound of a hit.

Naturally, these parameters can be modulated, giving the effect of resonance that changes within a single note. Acoustic instruments can do this only in a very limited way, but the Modal Oscillator can go from a bass guitar to a xylophone to church bells with just a couple of knob twists.

Inharm: controls how many inharmonic resonances are excited, taking the sound from "woody" to "metallic".

Timbre: sets how bright the exciter is – its balance of low and high frequencies. This affects which harmonics are excited.

Decay: how quickly the resonance is damped.

3.1.3.12. Noise

Noise is a vital component in many sounds. A broad spread of many frequencies, it can do everything from providing grit to the attack of a sound to creating effects like wind or ocean waves. The MiniFreak's Noise Oscillator provides a variety of noise types, including *particle noise*, made up of tiny fragments created by sampling noise and turning down the sample rate.

Noise can be mixed with an oscillator providing several different basic waveforms, so the same Oscillator can provide both noise and a tonal signal at once.

Type: tunes the noise from particle noise, through white noise (with an equal distribution of all frequencies), into high-pitched metallic noise.

Rate: reduces the noise's sample rate. For metallic noise, it controls the pitch of the square waves in the noise output.

Balance: adds other waveforms to the noise. From 0 to 100, the mix goes from pure noise to noise + sine wave, through noise + triangle wave, to noise + square wave.

3.1.3.13. Bass

The Bass Oscillator models a pair of waves – a sine wave and a *cosine* wave (a sine wave that's been moved in phase so that when the sine is at 0, the cosine is at maximum or minimum, and vice versa). These waves are put into a set of two modeled circuits: a balanced modulator for the sine wave, and a quadrature oscillator that mixes it with the modulated cosine wave.

> *Balanced modulators* and *ring modulators* are common ways to create inharmonic content to spice up a simple waveform. A balanced modulator will take two input signals and generate sums and differences of their frequencies. For example, if you put two sine waves into a balanced modulator, one at 300 Hz and one at 500 Hz, you will hear sine waves at 300, 500, 200 (500 - 300), and 800 (500 + 300) Hz. A ring modulator works like a balanced modulator, but you only hear the sum and difference tones, not the original input signals. The FM/RM Oscillator [p.42] includes ring modulation.

This circuit, while simple to build with analog components, is tremendously versatile. The BASS Oscillator adds some very cool ways to tweak the model.

Saturate: sets the saturation of the cosine wave. While a pure cosine wave has only one harmonic, saturation (a form of overdrive) creates more harmonics to play with.

Fold: The Bass Oscillator includes a two-stage asymmetric wavefolder, as described in the Waveshaper [p.26]. This adds still more harmonics to the signal.

Noise: adds a noise signal in between the two stages of the wavefolder, in order to phase-modulate the sine and cosine oscillators. This adds a gritty and somewhat random element to the tone, which doesn't sound like noise at all.

3.1.3.14. SawX

The SawX Oscillator model demonstrates that the good old sawtooth wave can still learn new tricks. In this oscillator, a sawtooth wave has its phase modulated with white noise that's been reduced in sample rate, then thickened with a chorus. This produces harmonically rich variations with a variety of different characters.

SawMod: sets modulation gain, producing drastic changes in harmonics.

Shape: sets the amount of chorus.

Freak Out!: modulate the Shape with a slow LFO to produce a rich sweeping timbre that's unlike traditional width modulation.

Noise: controls how much the noise signal modulates the sawtooth. At higher values, this adds a faint "radio noise" randomness.

3.1.3.15. Harm

The HARM Oscillator starts with a fundamental frequency and adds harmonics, using a different model than the Harmo Oscillator [p.24].

Spread: sets the relationship of the generated harmonics to the fundamental. At a setting of 50, they are in unison; at 0 or 100, they are one octave lower or higher. In between, a dramatic effect somewhat like a balanced modulator is generated.

Rectify: adjusts the rectification of the harmonics. The rectifier is a well-known analog circuit that creates an effect somewhat like wavefolding.

Noise: adds phase-modulated noise and clipping.

3.1.3.16. Audio In (Osc 1 only)

Osc 1 can route any audio signal from the Audio In Jack into the MiniFreak's signal flow. This audio is digitized, then processed by a wavefolder and a decimator, with digital noise mixed in.

A *decimator* throws away input samples at a designated ratio, for example saving one sample out of every five or ten.

Fold: controls the depth of the wavefolder effect. Note that when Decimate is set to 0, this acts strictly as an input level control.

Decimate: controls the amount of decimation.

BitCrush: sets the level of added quantization noise.

3.1.3.17. Wavetable (Osc 1 Only)

What's Wavetable Synthesis?

Wavetable Synthesis has been discovered in the 80s, and allowed for sound manipulation that was previously not possible with a single cycle waveform. A Wavetable is a series of waveform cycles.

On MiniFreak V, you can use the following parameters to control the wavetable engine:

- **Scan** : Scans through the cycles and alters the waveform.
- **Width** : Controls the Symmetrical Pulse Width.
- **Tone** : Controls the LPF/HPF 1 pole filter.

> Please note that the Wavetable engine is only available on Oscillator 1.

Selecting a Wavetable

You have two ways to browse through the factory wavetables:

1) Using the Wavetable browser menu: Click on the loaded wavetable name to open the drop down menu listing all available factory Wavetables, select the desired one and it will be immediately loaded.

2) Using the next/previous arrows: Located next to the Wavetable drop down, these allow you to advance through the Wavetable library while keeping the focus on the panel.

3.1.4. Sample

On MiniFreak V, you can use the following parameters to control the Sample engine:

- **Start** : Sets the Start Point of the Sample.
- **Length** : Allows you to set the length of the sample and how it plays back.

At 50 and above it will play the sample forward, ranging from short around 50 to longer around 100.

From 49 to 0 the sample will play backwards, ranging from short around 49 to longer around 0.

- **Loop** : Controls the Loop start point of the sample, relative to the Sample start position.

> When playing the sample in reverse do remember that the start control will condition its starting point, so in order to get the full sample playback in reverse, Start should be set at max value.

Selecting a Sample

You have two ways to browse through the factory Samples:

1) Using the Sample browser menu: Click on the loaded Sample name to open the drop down menu listing all available factory Samples, select the desired one and it will be immediately loaded.

2) Using the next/previous arrows: Located next to the Sample drop down, these allow you to advance through the Sample library while keeping the focus on the panel.

3.1.5. Granular Engines

Besides the Sample Engine, the V3 update introduces 7 Granular Synthesis based engines, which we will look into further now.

What's Granular Synthesis?

Granular synthesis is a synthesis method that processes samples by splitting them into smaller fragments called grains, which in turn creates a new sound depending on the playhead position, density (how many grains is generated by second or synced to the clock), length of each grains, shape of the grains, their pitch, and the forward/reverse playback. Including all these factors, new sounds are endless from a single sample. Various modulations can also be applied to either disrupt each of these factors and bring in more chaos.

We will now go through the different Engines using Granular based synthesis :

3.1.5.1. Cloud Grains

The Cloud grains engine is ideal for making textural grain effects.

On MiniFreak, you can use the following knobs to control the Cloud Grains engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the speed at which the grains are being generated.
- **Chaos** : Introduces grain randomization.

3.1.5.2. Hit Grains

The Hit grains engine has a sharp volume envelope. It's been designed to generate rhythmic stutter or rapid-fire bursts of grains for a blasting sound effect.

On MiniFreak, you can use the following knobs to control the Hit Grains engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the speed at which the grains are being generated.
- **Shape** : Controls grain length, attack length and hold.

3.1.5.3. Frozen

This Engine relies on fast grain generation to create an Ice-like effect where the size and shape of the grains plays a huge part on this ethereal and icy feeling.

On MiniFreak, you can use the following knobs to control the Frozen engine:

- **Start** : Controls the Start Point of the Sample.
- **Size** : Defines the length of the grains.
- **Chaos** : Introduces grain randomization.

3.1.5.4. Skan

The Skan engine scans through the sample while generating grains around the playhead, playing it from start to finish at a user-definable speed. Ideal for stretch like effect.

On MiniFreak, you can use the following knobs to control the Skan engine:

- **Start** : Controls the Start Point of the Sample.
- **Scan** : Sets the speed of the playhead.
- **Chaos** : Introduces grain randomization.

3.1.5.5. Particles

Particles generates intricate layers of random sound particles creating hypnotic and psychedelic effects.

On MiniFreak, you can use the following knobs to control the Particles engine:

- **Start** : Controls the Start Point of the Sample.
- **Density** : Defines the density of the grains being generated.
- **Chaos** : Introduces grain randomization.

3.1.5.6. Lick

The Lick engine is aimed at creating fast-paced percussive rhythmic groove grains synced to your music.

On MiniFreak, you can use the following knobs to control the Lick engine:

- **Start** : Controls the Start Point of the Sample.
- **Size** : Lengthens the size of the grains while the grain generation is synced to tempo at 1/16
- **Chaos** : Introduces grain randomization.

3.1.5.7. Raster

The Raster engine is aimed at more rhythmical approaches, with grain generation being tempo synced. Perfect for creating beat repeat/chopping and hypnotic randomized sequence.

On MiniFreak, you can use the following knobs to control the Raster engine:

- **Start** : Controls the Start Point of the Sample.

- **Density** : Defines the rate of the generated grains, which is a sub division of the tempo which goes from 1/2 to 1/32 rates.
- **Chaos** : Introduces grain randomization.

3.1.5.8. FM/RM [Osc 2 only]

Frequency Modulation (FM) occurs when one audio signal modulates the frequency of another. A simple but powerful implementation can be found in the Two Op. FM Oscillator [p.27]; here, Osc 1 modulates a waveform generated by Osc 2.

Ring Modulation (RM) is a form of amplitude modulation, where the frequencies of two audio signals are replaced by sums and differences of their two frequencies. For example, if you put two sine waves at 300 Hz and 500 Hz through a ring modulator, you will hear two sine waves at 200 Hz (500 - 300) and 800 Hz (500 + 300). This produces hollow, inharmonic effects that replace the original audio signal.

Wave: selects the waveform of Osc 2 to be modulated by Osc 1.

FreqMod: selects the amount of FM.

RingMod: crossfades from no RM to full RM.

3.1.6. Oscillator 2 Audio processor Types

Aside from FM/RM, Osc 2 features a number of Types that feed the output of Osc 1 is passed through a signal processor that does digital tricks the conventional signal flow can't do.

When this signal flow is selected, the **Volume** knob for Osc 1 controls the level of Osc 1 going into Osc 2, and the **Volume** knob for Osc 2 sets the wet/dry mix for Osc 1 alone and the Osc 1-through-Osc 2 processed sound.

3.1.6.1. Multi Filter

The primary Filter [p.48] shown on the Home Panel is a great-sounding modeled VCF, but there are lots of other kinds of filtering. For example, there are *notch* filters, which reduce rather than boost a particular range of frequencies.

Another variable is the filter's *slope*, which determines how quickly frequencies beyond the cutoff are reduced. Slopes are measured in decibels of level reduction per octave past the cutoff. Some examples: a 6 dB/oct slope is very gentle, while the steeper 12 dB/octave slope of the Analog Filter is a common choice among subtractive synths.

However, there are also steeper slopes – 24 dB/oct (also a common choice), 36 dB/oct, and so on. One extreme example: the anti-aliasing filters used on digital audio recorders and players have very steep slopes – 48 dB/oct and more.

For most filter circuits, the steeper the slope, the more intense the resonance can be.

Since a variety of these extra filters can be very handy, the Oscillator 2 Multi Filter lets Osc 2 provide those to the output of Osc 1.

Cutoff: controls the cutoff frequency.

Resonance: controls the filter's resonance at the cutoff frequency.

Mode: sets the filter's type (Low, Middle, or Band Pass, or Notch) and slope in dB/oct (12, 24, 36). Examples: LP36 is Low Pass with 36 dB/oct slope, and N12 is Notch with 12 dB/oct slope.

In addition to the above, there are Low Pass and High Pass filters with a gentle 6 dB/oct slope.

Note that the 6 dB/octave filters have no resonance control; as shown in the image, the Resonance knob turns grey to indicate it's not doing anything.

Also note that these Osc 2 filters' cutoff can't track the notes played on the keyboard, as the primary Filter can.

3.1.6.2. Surgeon Filter

Sometimes you need a scalpel to cut out frequencies you don't want, such as unwanted resonant spikes ("wolf tones") created in your sound. Other times you'll want to add greatly boosted frequencies for dramatic effect. In a professional studio or in a DAW, this is done with a parametric equalizer, but in the MiniFreak, you'll use the Surgeon Filter.

Cutoff: sets the cutoff or center frequency of the filtering.

Spread: sets the width of the filter peak or cut, from broad to very narrow.

Mode: sets the filter type. Available types are low pass, band pass, high pass, and notch. Band pass and notch work similarly to how a traditional parametric equalizer will boost or cut frequencies. Low pass and high pass filters, when they appear on parametric EQs, are usually set to drastically eliminate very high or very low frequencies. When either of these modes is selected, Spread is deactivated.

3.1.6.3. Comb Filter

A *comb filter* gets its name from the fact that it creates a series of evenly spaced notches in frequency response that look like the teeth of a comb when drawn on a graph. It does this by combining the input signal with a copy of itself that has been delayed by a few milliseconds. The combined waveforms cancel each other out at regularly spaced frequencies. This produces a distinctive hollow tonality.

Cutoff: sets the overall frequency balance of the signal by varying the time delay. Longer delays emphasize lower frequencies and shorter delays emphasize higher frequencies.

Gain: controls the amount of delayed signal mixed with the original signal. When Gain is set to 0, no comb filtering occurs.

Damping: controls the ringing of the filter notches. More damping produces a gentler and less dramatic effect.

> When the Cutoff is modulated with an LFO, the tone of the comb filter sweeps up and down. If this sounds like it would produce a really cool-sounding effect, you'd be right. Fortunately that exact effect is available on MiniFreak V: check out the FX section [p.52] to learn about the Flanger!

3.1.6.4. Phaser Filter

A *phase shifter* (or *phaser*) creates an effect similar to comb filtering, but different in sonic character. It's created by running an input signal through a series of *all pass filters*. These filters don't remove any frequencies, but they do shift the phase of the signal. Recombining these phase-shifted signals with the original creates unevenly spaced notches. The more of these filters the circuit contains (called the number of *poles* or *stages*), the more notches are created.

Sweeping the phase shift over time produces the classic Phaser effect that's available in the Digital Effects chapter [p.52], but because the Phaser Filter only sweeps when and how you modulate it, a wider variety of unusual effects are available.

Cutoff: controls the frequency range of the phaser's notches, emphasizing high vs. low frequencies.

Feedback: intensifies the effect by feeding back some of the filtered content into the filters again.

Poles: sets how many notches will be created by the Phase Filter. Each pair of poles adds a notch, so 2 poles gives one notch and 12 poles creates six notches.

> Choose a number of Poles and then slowly sweep the Cutoff. How many of the frequency notches can you hear distinctly for each Poles setting? As you add more filters, it becomes trickier...

3.1.6.5. Destroy

Destroy does just that: it destroys your incoming signal by subjecting it to three outrageous signal processes: a wavefolder, a decimator, and a bit crusher. Oh, the pain!

Fold: controls the amount of wavefolding, where extremes of the waveform are folded over rather than clipping. Higher values produce noise and sharp resonances – which are often way cooler than clipping.

Decimate: turns up the decimator, which throws away more and more samples out of the digital data stream. This produces crackling and other offensive noises, especially at higher Fold settings.

BitCrush: lowers the number of bits each sample contains. This creates a number of uniquely nasty artifacts.

> Put all of these together, modulate each one differently, and – well, listen for yourself. Sometimes you need a little ugliness in your sound.

3.2. The Filter

For most subtractive synthesizers, the *Voltage-Controlled Filter* (VCF) is the heart of the signal flow. In the days of early analog synths that had a fairly limited range of available raw waveforms, sound designers relied on the VCF to alter the overall timbre over time. The all-important VCF Cutoff knob is considered by many to be the most important control on a synth's front panel... so much so that many synths make the knob a unique color or larger in size, so you can find it quickly!

3.2.1. History: Signposts along the way

Every filter circuit has its own character, producing a sound that is distinctive, which in many cases defines much of the sonic signature of a given synth. The classic example of this is the Moog Minimoog, which relied on a 24 dB/octave transistor ladder filter with wonderful resonant properties and the ability to be overdriven smoothly for more boom.

Other companies are known for their filters' sound and capabilities, and for designs (and happy accidents) that led to unmistakable tones:

- The Roland TB-303 Bassline synth/sequencer got its uniquely "squelchy" sound from a 24 dB/octave resonant low pass filter whose quirky circuitry gave it a slope that sounds more like 18 dB/octave.
- The Oberheim Xpander had a custom filter network that would allow it to create no fewer than 15 different kinds of filters – all from analog circuitry with no digital help.
- Many analog synths used *ladder filters*, a term used to describe a circuit with multiple components arranged like the rungs on a ladder. However, doing this with transistors was a method patented by Robert Moog, so other companies made do with diode ladders instead – not quite the same as a Moog filter, but with a unique sound of their own.
- The Steiner-Parker Synthacon used a Sallen-Key filter circuit. This filter sounded like no other: it distorted in a distinctively gritty way when overdriven, and unlike most other filter designs, it didn't lose its low-end punch as the resonance was turned up. After being nearly forgotten for decades, the circuit was rediscovered, modified and updated with input from Nyle Steiner, the designer of the Synthacon – and named the Arturia Brute filter, becoming a vital element of every Arturia Brute synthesizer.

One other famous filter design deserves a special mention: the resonant 12/dB multimode filter used in the Oberheim Synthesizer Expander Module (SEM). Known for its smooth and rich character, the SEM filter has inspired many new filters over the years since its invention... including the MiniFreak V **Filter** in the MiniFreak.

Understanding a filter isn't all that difficult. Tech-heads love to argue about the details, but nearly every filter has a small set of properties that are easy to understand and work with.

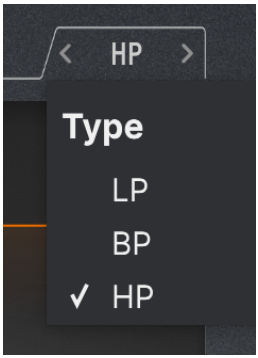
3.2.2. Filter type

What does a filter filter? It filters out frequencies in a certain part of the audio frequency spectrum. We're used to saying that human hearing can pick up sounds from 20 Hz to 20 kHz (20,000 Hz), but that range shrinks as we get older.

A filter's *type* or *mode* determines where in the frequency spectrum it does its work. With a few exceptions, filters are named for the types of frequencies they allow through (pass), not for the frequencies they remove (cut). These include:

- **Low Pass**: The most common filter in synthesizers, the Low Pass (LP) filter allows lower frequencies through, while attenuating higher frequencies. This mimics how objects and materials in the acoustic world absorb higher frequencies more readily than lower ones, so it sounds very natural to our ears.
- **High Pass**: A High Pass (HP) filter lets higher frequencies through and attenuates lower frequencies. When a filter like this is used in audio equipment like microphones and preamplifiers to remove low-frequency rumble and handling noise, it is sometimes given the more practical name "low cut".
- **Band Pass**: Made by combining LP and HP circuits, the Band Pass (BP) filter allows a certain range of frequencies through, and attenuates above and below that range.
- **Notch**: The opposite of a BP filter, a notch (N) filter removes a range of frequencies and lets audio above and below that range pass through. Notch filters are sometimes called Band Reject or Band Stop filters.
- **All Pass**: A filter that lets all frequencies through. Believe it or not, this kind of filter is quite useful! Even if it doesn't remove any audio, passing through an AP filter will shift the phase of the audio, making it a vital component in phase shifters.

Like the original SEM filter, the MiniFreak V Filter can be set to three types: Low Pass, High Pass, and Band Pass. These are chosen by clicking on the tab above the Filter display.



The other two filter types are available in the Oscillator 2 Multi Filter [p.43].

3.2.3. Cutoff

The *cutoff frequency*, or simply *cutoff*, is where the filter begins to do its work. It can also be called the corner frequency or center frequency or sometimes even just frequency. As mentioned above, the cutoff knob is the single most used filter control, and often the most used control on any analog synth.

A *static* filter is one where the cutoff is set manually and changed manually; it's not designed to respond to control signals. These filters have their uses, but they're not nearly as fun to play with as voltage-controlled filters!

Sometimes you'll find a set of filters where each one's cutoff frequency is *fixed* at a certain point. Fixed filter banks and graphic equalizers are two examples.

The **Cutoff** knob on the MiniFreak V Filter ranges from roughly 30 Hz to 15 kHz. Depending on the filter type, extreme settings can eliminate all of the audio signal, muting the synth.

3.2.4. Slope

A filter's *slope* or *rolloff* is a measure of how much audio is attenuated at a certain frequency beyond the cutoff.

A filter doesn't just mute all audio past the cutoff; there are filters like that, but they're not very musical. Instead, as you move past the cutoff, audio is steadily attenuated more and more. This is measured in how many decibels quieter an audio signal is when you go one octave past the cutoff, written *dB/octave*.

Here's an example: a Low Pass filter is set to a cutoff frequency of 1 kHz. We measure that one octave above that (2 kHz), a given signal is 12 dB quieter than at the cutoff frequency, and two octaves beyond it (4 kHz), it's 24 dB quieter. That means our filter has a slope of 12 dB/octave. This is the slope of the MiniFreak's Analog Filter, and of the Filter in MiniFreak V.

> Slope is a function of how the circuit is built. To change the slope of an analog filter requires actually switching between components! That's why analog filters with multiple slopes are uncommon; they require slightly different electronics for each slope. On the other hand, digital filters can change slope easily. That's why the hardware MiniFreak's Analog Filter has a fixed 12 dB/octave slope, but the digital Multi Filter [p.43] in Osc 2 has a wide variety of available slopes, including some that are quite unusual in analog synths.

Slope affects the timbre of a filter significantly. Gentler slopes like 12 dB/octave or even 6 dB/octave give a very different sound than steeper slopes like 24 dB/octave. This is largely because of another property of filter circuits: *resonance*.

3.2.5. Resonance

Nearly every synth's filter circuits will resonate at the cutoff frequency, even if only an inaudibly tiny bit. The steeper the slope, the greater the possibility for high amounts of resonance, which can be very useful for a variety of tonalities. Resonance is sometimes called *emphasis* or simply *Q*, an audio engineering term that describes the *quality factor* (width) of a peak.

As the Resonance (**Res**) control on the Filter is turned up, a resonant peak centered around the cutoff frequency will form. The higher the peak, the narrower it becomes; the sound is perceived as becoming more aggressive and sharper. The tonality of the peak will change with the cutoff frequency.

On many filters, if the resonance is turned up all the way, the filter will start to *self-oscillate*, making a sound even with no input. The filter itself becomes a sound source, with the peak width so narrow that it's effectively one frequency: a sine wave. This adds a hollow, whistling tone to whatever the oscillators are doing, or can be used on its own.

> Try this yourself: turn the Resonance all the way up and turn down the Volume for both Oscillators to 0. You'll hear a whistle every time you press a key. However, it will be the same pitch for every note, which isn't that useful... fortunately there's a solution to that.

3.2.6. Filter modulation

Many different kinds of modulation can control the cutoff, leading to many kinds of effects. Perhaps the most common filter modulation sources are envelopes. They're particularly important, as they shape the timbre of notes as they're played. A note can start out bright and get darker, or stay at the same brightness, or get brighter and then softer, depending on the envelope shape. This can follow the loudness envelope, or a completely different evolution over time.

Unlike many synths, the MiniFreak doesn't have a dedicated filter envelope; however, the Envelope or Cycling Envelope can easily be routed to modulate it using the Modulation Matrix [p.93]. Because envelope modulation is so common, there's a dedicated knob for the amount in the Analog Filter section.

The Filter Cutoff Envelope Modulation Amount (**Env Amt**) knob is 0 at the center, which represents no envelope modulation. Because envelope modulation can be useful in either positive or negative amounts, the knob can be turned either way from the center.

Another common control path is for the amount of the envelope modulation to be controlled by key velocity, so playing harder creates brighter sounds. This amount can be set in the Modulation Matrix.

On MiniFreak V, the Cutoff can also be controlled with LFOs, aftertouch, the Wheel, and one more important source: the note played on the keyboard, high or low. If the filter is modulated by the keyboard, it gets brighter at higher notes, which is common for many acoustic instruments. This is called *keyboard tracking* or *key tracking*.

Key tracking is adjustable; when it's set just right, the filter cutoff perfectly tracks the pitch of the played note. A self-oscillating filter can then follow what you're playing. This is easily set up in the Modulation Matrix; here's how.

Start with a sound that has only one Oscillator playing, and turn Resonance all the way up. Verify that you can hear the resonant whistle by itself when you turn the Osc Volume all the way down. Then go to the Matrix and set Keyboard modulation of Cutoff to about 50, and fine-tune it until octaves are perfectly in tune up and down the keyboard.

When you turn the Osc Volume back up, you'll almost certainly find that while the filter tracks the keyboard, it's out of tune with the oscillator. Just tweak the Cutoff up or down until the pitches match, and now the filter tracks the keyboard along with the Osc.

3.2.7. Developing a feel for the filter

There are only a few controls on the Analog Filter, but they offer so many possibilities: take some time to really appreciate what the Analog Filter can do, preferably with the Digital Effects turned off and a fairly simple Osc Type like BasicWaves to start with. The character of this filter is magical, and easily overlooked with everything else the MiniFreak can do – so be sure to give it plenty of attention.

3.3. FX

MiniFreak V can make all kinds of great sounds just using the Oscillators and Filter with the various modulation options in the Matrix, but sometimes it's nice to put a finishing touch on a sound with a little something extra... or a *lot* extra.

The MiniFreak includes a set of three Digital Effects (**FX**) at the end of its signal path, and they offer a wide variety of tones that can be called up rapidly or tweaked to taste.

3.3.1. FX controls

Digital Effects controls

The FX section is set up to work similarly to the Oscillators section. There are a few basic controls, whose purpose varies depending on the selected effect.

- The **FX 1/2/3** tab chooses whether the Presets selector and the three knobs are controlling FX 1, 2, or 3. Each FX tab has a switchable power button to indicate whether it's turned on.
- The **FX Type** is selected from a drop-down menu accessed at the top left of the display window. There are ten FX Types, which we'll describe below.
- **Presets** selects the Preset of the chosen FX – for example, there are six Presets of Phaser FX, each with its own character.
- **Time**, **Intensity**, and **Amount** have different functions depending on which Type of FX you've chosen.

3.3.2. Insert and Send routings

The three FX are always handled in the same order: FX 1 into FX 2 into FX 3. However, in the case of the Delay and Reverb, there are two available routings: **Insert** and **Send**. These are chosen with two buttons at the bottom left of the display when either of those FX are selected.

Insert is the only available routing for all FX other than the Delay and Reverb. It's like a chain of guitar pedals or a channel strip on a mixing console: the signal goes through FX 1, then FX 2, then FX 3. Pretty straightforward, but as with pedal chains, you have to keep the order of the FX in mind. After all, sending a flanger into a reverb won't sound like putting a reverb through a flanger!

> Remember that each effect has an **Amount** control, letting you set how much dry signal gets through each FX in the chain.

With Send, the FX routing mimics that of a mixing console's Aux buses, where a certain amount of each signal is routed to an effect separate from others, then brought together at the end. This is the default routing for the Delay and Reverb.

> When an FX is switched to Send routing, the **Amount** control becomes the Send Level.

3.3.2.1. An example of how Routings work

Let's say FX 1 is Reverb, FX 2 is Delay, and FX 3 is Flanger.

If the Delay Routing and Reverb Routing are both set to Insert, then you will hear a reverberant sound with echoes, all of which are flanged. It's just like running a reverb pedal into a delay pedal into a flanger pedal.

If you now change the Delay Routing to Send, now you hear a mix of two separate signals: the reverb through the delay, and the reverb through the flanger.

If you set Delay Routing back to Insert and Reverb Routing to Send, you will hear a mix of two separate signals: the reverb on its own, and the delay through the flanger with no reverb.

If you change both the Delay *and* Reverb Routings to Send, then you hear a mix of *three* separate signals: the original audio through the reverb alone, the original audio through the delay alone, and the original audio through the flanger alone.

By choosing your FX order carefully and setting up the Delay and Reverb Routings accordingly, you can decide which FX or combinations of FX treat your original signal. You get even more flexibility when you realize that each effect can have its own Dry/Wet mix.

> Note that you can't run two Delays or two Reverbs – there can only be one of each in the chain. That's how the Delay Routing and Reverb Routing settings can apply to the Delay and Reverb without any confusion, whichever FX slots they're in.

3.3.3. Presets

Every one of the FX Types has multiple Presets. A Preset is a particular group of parameter settings that include not only the three User parameters attached to the **Time**, **Intensity**, and **Amount** knobs, but also several other parameters that can't be adjusted in the hardware. When you call up a Preset, those hidden parameters are loaded, controlling the parts of the FX that are "under the surface."

For example: the Multi Comp has adjustable User parameters for Time, Input (gain), and Amount... but it also has five Presets – OTT, Bass Ctrl, High Control, All Up, and Higher – each of which has its own combination of settings for over 30 parameters ranging from crossover frequencies and individual compression attack and release times for both bands to gain settings, thresholds, ratios, knee width, and more.

There are plug-ins that give you individual control of each of these parameters if you really want them. That's not the point of MiniFreak V's effects – the Presets make a lot of the deeply technical decisions for you while leaving the most critical and intuitive parameters in your hands, so you can get to making music quickly and easily.

> In the descriptions below, we list the various Presets for each effect, but it's better to hear and work with them for yourself than to try and read long lists of specs you can't change. In this case, your ears are more valuable than your eyes!

3.3.4. FX Types and their controls

Any FX can run any Type of effect. If any FX has been set to a Type that can only be used once – Reverb, Delay, or Multi Comp – those choices will disappear from the menus for the other FX, so you'll never get a message saying "Sorry, I can't let you do that."

There are ten FX Types in all; each one has its own set of three adjustable User parameters and its own set of Presets.

3.3.4.1. Chorus

A chorus takes the input signal and makes one or more copies of it, each with a slight time delay, and then changes those delay amounts slowly (or quickly) with an LFO. When recombined with the dry signal, the effect is a wider, thicker version of the sound, one that gives the impression of several instruments playing at once.

The MiniFreak Chorus has the following controls:

- **Rate**: the rate at which the LFO changes the time delay: slower for a richer chorus sound, faster for a vibrato-like pulsing.
- **Depth**: the intensity of the effect, controlled by how much of the delayed signal is mixed with the dry signal.
- **Dry/Wet**: the proportion of dry signal to chorused signal.

> This is not the same as the Depth! Depth mixes the dry and delayed signals to produce the chorused signal; Amount mixes *that* signal with the dry signal. Play with both to help you understand the difference.

- **Presets**: Default, Lush, Dark, Shaded, Single

> Try turning the Dry/Wet mix all the way wet and speeding up the Rate to create a stronger sense of vibrato.

3.3.4.2. Phaser

A phaser combines the dry signal with copies that have had their phase shifted by running them through a series of All Pass Filters [p.49]. This produces frequency notches that have a different character than the evenly spaced ones from a flanger or chorus. An LFO controls the filter behavior to produce a slow sweeping effect.

- **Rate**: controls the speed of the sweep, from a very slow and majestic change to a seasick quasi-vibrato.
- **Feedback**: adds more resonant character and brightness to the signal. The traditional thick phaser sound requires a higher Feedback amount; less Feedback produces a much more subtle effect.
- **Dry/Wet**: Dry/Wet mix.
- **Presets**: Default, Default Sync, Space, Space Sync, SnH, SnH Sync. The Sync variations synchronize the Rate to the master Tempo set on the MiniFreak.

3.3.4.3. Flanger

A flanger creates an intense comb filtering effect. It works the same way as a chorus, but usually has only one delayed signal to mix with the dry signal, and its delay time is very short, only a few milliseconds.

- **Rate**: controls the speed of the sweep, from a very slow and majestic change to a seasick quasi-vibrato.
- **Feedback**: adds more resonance and high-frequency content. Very high settings produce an intense effect rather like cranking the filter resonance.
- **Dry/Wet**: Dry/Wet mix.
- **Presets**: Default, Default Sync, Silly, Silly Sync

3.3.4.4. Super Unison

The Super Unison is a Chorus type effect, with up to 6 copies of the source signal stacked over the dry signal.

They are being modulated with an LFO to vary the detune, and create a chorus-like unison-style effect.

Here is how the knobs work for Super Unison:

- **Detune**: Detunes the copies of the signal in relation to the dry sound.
- **LPF/HPF** Manages the Low Pass and High pass filtering.
- **Dry/Wet**: Dry/Wet mix.
- **Subtypes**: Classic, Ravey, Soli, Slow, Slow Trig, Wide Trig, Mono Trig, Wavy.

> The Super Unison presets conditions how certain controls operates and their ranges. The presets labelled Trig will for instance reset the phase of all the copies of the signal.

> Did you know ? Detune affects the speed of LFO and the amount (some presets only affects the amount). For Filter, some fx presets have different ranges for different results.

3.3.4.5. Reverb

A reverb places the sound in a simulated reverberant space to give it a sense of presence, whether in a realistic room or the inside of a gigantic cathedral. The sound of a reverb is affected by many different properties, giving the ear hints of how large the space is and even how absorbent the walls are.

- **Decay**: Sets the overall size and shape of the space.
- **Damping**: controls how quickly high frequencies fade away, to give the impression of a less reflective space.
- **Level**: Dry/Wet mix or Send level, depending on whether the Reverb's Routing is Insert or Send.
- **Presets**: Default, Long, Hall, Echoes, Room, Dark Room

3.3.4.6. Delay

The Delay provides a variety of common delay/echo effects.

- **Time**: sets the timing between repeats, either in milliseconds or in subdivisions of the Tempo, depending on the Preset.
- **Feedback**: adds more repeats to the signal by feeding the output back into the input. Setting Feedback to 100 produces repeats that take several minutes to die away; turning it down to 0 produces a single echo, which at shorter delays evokes the *slapback* used on many records by early recording artists like Elvis Presley.
- **Level**: Dry/Wet mix or Send level, depending on whether the Delay's Routing is Insert or Send.
- **Presets**: Digital, Stereo, Ping-Pong, Mono, Filtered, and Filtered Ping-Pong – each one also available in a Sync version.

3.3.4.7. Distortion

The word "distortion" covers a lot of territory, but usually includes *clipping*, where an input signal has higher amplitude than the circuit can handle, and the top and bottom of the waveform are "clipped off." It can refer to overdriven analog circuits of various kinds, signal saturation on analog recording tape, or any number of digital processes such as wavefolding. These can create anything from warmth to grit to all-out screaming chaos.

- **Gain**: sets how powerful the effect is, but also how its overall character changes, since each type of distortion will react differently as the gain increases.
- **HPF/LPF**: shapes the overall tone of the distorted signal. Turning it to negative values controls the cutoff of a low pass filter, whereas positive values do the same for a high pass filter.
- **Dry/Wet**: should usually be set at or near 100% wet for maximum effect.
- **Presets**: Classic, Soft Clip, Germanium, Dual Fold, Climb, Tape

3.3.4.8. Bit Crusher

A bit crusher reduces the resolution of a digital signal, for example from 16 bits (CD quality) to 8 bits (very early samplers) to even lower numbers. Bit reduction takes away clarity and dynamic range, for tones ranging from "vintage" to "disgusting".

This effect also includes a decimator, which further wrecks the sound by throwing away a lot of the samples in the audio stream. It might keep one out of every five samples, or ten, or twenty...

- **Decimate**: sets how much the signal is decimated. Higher values introduce all kinds of digital garbage.
- **BitDepth**: sets the resolution of the signal. Higher knob values equal more crushing, i.e. fewer bits.
- **Dry/Wet**: should usually be set at or near 100% wet for maximum effect.
- **Presets**: none (the Presets menu will vanish)

3.3.4.9. 3 Bands EQ

Equalization is one of the classic tools in professional audio. An EQ can sculpt the frequency response of a signal to bring out certain sonic traits and suppress others. This can be done by boosting (amplifying) a certain range of frequencies, or cutting (attenuating) them.

This effect simulates the simple but useful EQ on an inexpensive mixer with three knobs for **Low**, **Mid**, and **High** bands, each with a single control for gain (-15 dB to +6 dB). The Low and High bands are *shelving* while the Mid band is *peaking*: turn the knobs and watch the display to get a feel for what these terms mean.

Where a fancier EQ might allow you to select the precise frequency and width of the EQ band's effect, this EQ provides a few Presets to cover a surprisingly useful set of basic cases.

- **Presets**: Default, Wide, Mid 1K

3.3.4.10. Peak EQ

This EQ differs from the previous Type in that it provides controls for only one EQ band, but includes all three of the common parameters: Frequency (**Freq**), **Gain**, and **Width**).

Because the user has full control over these parameters, there is no need for Presets.

A common use for this type of EQ is to cut a very narrow frequency range in order to remove an unwanted effect such as an unwanted resonance or external hum.

3.3.4.11. Multi Comp

A *compressor* controls the dynamic range of a signal. A traditional compressor helps keep loud signals from getting too loud, and an *expander* forces low-level signals even lower, suppressing noise.

A *multiband compressor* does all of this, but first divides the input signal into two or more frequency bands. Being able to compress low-frequency signals in a different way than those at higher frequencies can be incredibly useful.

The range of each parameter depends on the Preset. Turning one knob controls many parameters at once, with ranges and proportions kept to scale so the essential character of the Preset isn't lost.

- **Time**: controls attack and release.
- **Tone**: controls the range and effect of the three frequency bands the compressor uses.
- **Amount**: controls the intensity of the effect.
- **Presets**: OPP. Bass Ctrl, High Ctrl, All Up, Tighter

The graphic displays for each Preset don't relate directly to parameter settings; they simply suggest the number of bands, how much compression is being applied, etc.

> Learning to use compression is like learning to play chess: you can get started once you learn the rules, and take a lifetime to master all the nuances. Even for audio engineers used to getting the most out of single-band compressors, multiband compression has its own level of complexity. When using Multi Comp, let your ears be your guide rather than worrying about specs. If you really feel you're missing out on a lot of control possibilities, you can learn more about compression from any number of resources... but remember that for the MiniFreak, the idea is always ease of use with musical results. Enough said.

4. ADVANCED FUNCTIONS

Clicking **Advanced** on the Upper Toolbar adds a row of controls for functions that go deeper than the ones described on the Home Panel.

These functions appear when you click the Advanced button.

Number	Area	Description
1.	Chord/Scale [p.67]	Set the keyboard to play chords with one key, or set a key and scale to constrain what you play.
2.	Voices [p.70]	Determine how MiniFreak V responds to your playing technique, including polyphony and portamento (Glide).
3.	LFO 1 and LFO 2 [p.76]	Set parameters for MiniFreak's two primary Low Frequency Oscillators (LFOs).
4.	Envelopes [p.82]	Set parameters for MiniFreak's Cycling Envelope and Envelope.

In this chapter, we'll cover those functions and explain how they work.

4.1. Chord/Scale

This section covers two functions: one-note chords and allowable notes in a key/scale.

4.1.1. Chord

Click the **CHORD** tab to get this display:

In this image, the selected chord is a minor triad: C, D#, G

The display shows an octave of keys, with the root key (the low C) always lit in white. Click each note in the octave to set whether that interval will also play when you press a key; click again to turn that note off.

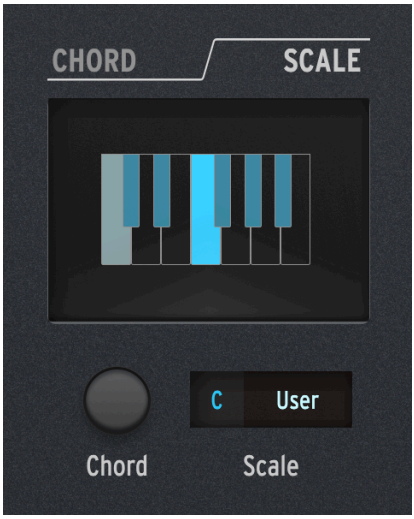
The left and right arrows shift the virtual keyboard up or down, so you can add voices beyond one octave for more complex chord structures and inversions. You can also directly access octaves above and below the root by clicking the boxes numbered -5 to 5.

Activate Chord mode by clicking the Chord button.

> The default chord is a C Major triad. If you change this in a Preset, your choice will be saved with that Preset.

4.1.2. Scale

Click the **SCALE** tab to get this display:

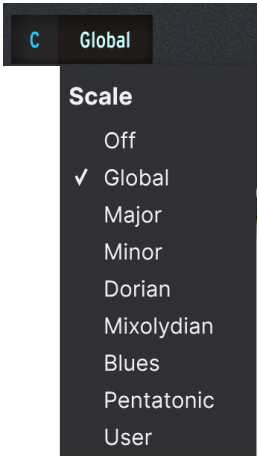


In this image, the selected scale is Locrian mode.

The display shows an octave of keys, with the root key (the low C) always highlighted in grey. Click each note in the octave to set whether that note is part of the User scale (blue) or not (black).

> NOTE: this display will not change when you select other Scales. It only takes effect when the User Scale is selected.

The primary control in this section is actually the pair of **Scale** drop-down menus, which select a Root key and a Scale that includes six common scale types and the User Scale, as well as options to use the Global user scale setting or simply turn the function off.



Once a Scale is set, any out-of-scale note you play will instead sound the closest note within the Scale, so you can't play any "wrong" notes.

NOTE: When you first launch MiniFreak V, all Presets default to the Global setting, which is a chromatic scale.

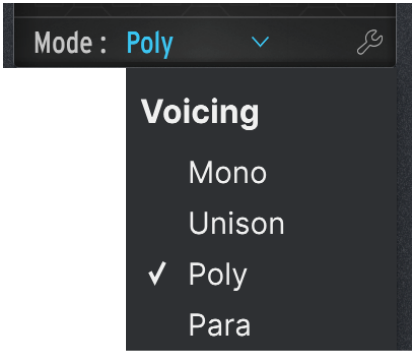
4.2. Voices

This section controls how MiniFreak V responds to your playing, with a variety of settings stored with each Preset to give it precisely the sort of nuance that works best with it.

Along with the **Hold** button, which sustains all played notes until it's turned off, and the **Glide** knob which sets Glide (portamento) time, all the action happens in the display:

In this image, four of the six voices are playing.

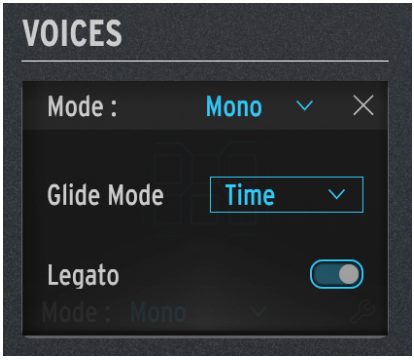
The **Mode** drop-down offers a choice of four different voicing Modes:



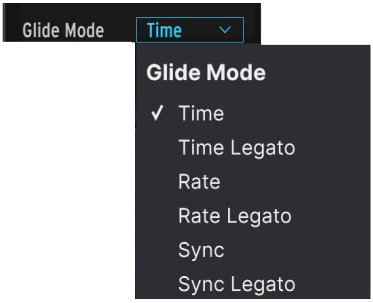
Even when you're working within the settings for a given Mode, there's always the option to pop this menu back up and change it. Just click on the Mode name.

4.2.1. Mono

In Mono mode, only one voice plays at a time, cutting off the previous note's envelope. Clicking the wrench icon pops up this menu of extra settings:



Glide Mode determines how Glide (portamento) behaves.



A drop-down menu gives you a choice of:

- **Time**: Glides always take the same time, so an octave glide won't take any longer than a semitone glide.
- **Rate**: Glides always happen at the same rate, so an octave glide takes 12 times as long as a semitone glide.
- **Sync**: Works like Time mode, but glide time settings are in beats and bars rather than milliseconds.

All of these Glide Modes have a Legato option, where legato playing (playing a new note before releasing the one being held) activates Glide, but staccato playing (a note is released before the next one is played) happens without Glide.

> This Glide Mode drop-down appears in all of the Voicing modes, and is the same for all of them.

There is also a **Legato** switch for Mono and Unison modes. This applies legato control to elements other than Glide, such as retriggering envelopes depending on how you play.

4.2.2. Unison

In Unison mode, multiple voices are played per key you press. This can create simply huge sounds!

There are a variety of ways Unison can be applied. Click the wrench to bring up this menu:

- **Glide Mode** and **Legato** work as previously described.
- **Uni Mode** pops up a menu with several options:
    - **Unison**: plays all voices on every keypress.
    - **Uni (Poly)**: divides up voices between all currently held notes.
    - **Uni (Para)**: divides up voices in a paraphonic [p.74] manner.

> Try this: Load the Default Preset and set this mode to Uni (Poly). Press **Hold** and start playing notes. You will hear that as you add notes, their sound will become thinner, until you have six notes held down with no extra voices stacked on any of them.

- **Uni Count** sets how many voices play per keypress (in case all 6 voices are too much).
- **Uni Spread** sets the detuning between Unison voices in semitones, from 0.001 (one tenth of one cent) to 12.000 (one octave).

4.2.3. Poly

In Poly mode (the default for most MiniFreak V Presets), one voice plays for each note you play, allowing conventional notes and chords. Clicking the wrench icon brings up this menu:

- **Glide Mode** works as previously described.
- **Allocation** controls how MiniFreak V chooses which voice to play next when you press a new key. The choices are:
    - **Cycle**: every keypress starts the *next* available voice. For example, if you hold a chord with voices 2, 3, and 4, and add a note, voice 5 will play.
    - **Reassign**: as Cycle, but if you replay a note you played recently, MiniFreak V will try to use the same voice to play that note.
    - **Reset**: as Cycle, but playing a new note will always start with the *first* available voice. For example, if you hold a chord with voices 2, 3, and 4, and add a note, voice 1 will play.
- **Note Steal**: controls how MiniFreak V chooses which voice to steal when you're already playing all the voices. The choices are:
    - **Oldest**: steals whichever note has been playing longest. However, the lowest note being held will never be stolen.
    - **Lowest Vel**: steals whichever note has the lowest velocity. This is an interesting choice that lets you maintain the most powerful voices in a chord and substitute the quietest ones.
    - **None**: doesn't steal notes until others are released.

4.2.4. Para

In Para mode, MiniFreak V emulates the classic *paraphonic* keyboards of the 1970s and early 1980s, which many keyboardists find a fun alternative to other forms of polyphonic synthesis. The pop-up menu settings for Para are identical to those for Poly, but how the synth engine works is quite different: unlike the other voicing modes, Para mode actually changes the voice structure of the MiniFreak, creating some new options while limiting others.

A paraphonic keyboard is one that can play many notes at a time, but can't *articulate* them individually. For example, a *divide-down* oscillator network can play as many notes as there are keys, but all of the notes are put through one filter with one envelope. This was common on "string ensemble" keyboards from the 1970s, before polyphonic synths with individually articulated voices became common.

Some of these paraphonic synths used *single triggering*: as long as notes were being played, the envelope stayed open, and new voices would sort of "appear" inside the envelope without any articulation of their own (like a pipe organ). Other paraphonic keyboards used *multiple triggering*: every new key retriggered the single envelope, which would then articulate every note, including the ones that were already being held down.

Paraphonic string and brass ensemble keyboards were used on a lot of great music, and made a lot of fans; their approach to articulation suggested a certain style of playing that was expressive in its own way. Playing a paraphonic synth in the 21st Century isn't a compromise – it's a musical choice. That's why Arturia offers it as an option, both on hardware synths like the MatrixBrute and MiniFreak, and in software like MiniFreak V.

4.2.4.1. Paraphonic voice structure

When you select Para mode, the following things happen:

- Osc 2's settings become identical to Osc 1's and Osc 1's controls affect both Oscs the same way. To show this, all of Osc 2's controls are greyed out and the display simply says "PARAPHONY":

- Instead of six voices of polyphony, now the MiniFreak has 12. The Voices display will reflect this, by showing 12 available voice slots rather than 6:

In Para mode, up to 12 voices can play.
This display shows 7 voices playing.

- the 12 voices are organized into 6 *Voice Pairs*. In the display, there are six columns, one per voice pair. As you play more notes, one voice in each pair will play. When you get to playing seven or more notes, the other voices in each pair will join in. You can see this in the image above: one voice has two voices in its pair playing, providing a seventh note.

- Each voice has its own amplitude control: a *Voice Envelope* that's set by the Envelope ADSR controls. These are the envelopes that are used as sources in the Modulation Matrix [p.93].

- In addition, each Voice Pair shares a *Master Envelope*. It's an AHR envelope (which we explain here [p.83]) that stays open as long as either one of the voices in a pair is being played.

The end result is a 12-voice synthesizer with certain limitations on articulation, offering an unusual yet musical alternative to the usual sort of polyphony. Pretty cool, huh?

4.2.5. Hold and Glide

Two other controls appear in this section of the Advanced controls: **Hold**, which sustains any notes you press until it is pressed again, and **Glide**, which controls the actual glide time for any Glide function you have set.

4.3. Low Frequency Oscillators

A Low Frequency Oscillator (LFO) is a constantly changing control signal that is applied to other signals. At very slow rates, an LFO causes gradual changes; the nature of these changes can take on a very different character, especially if the upper end of an LFO's available rates extends above 20 Hz and into the range of human hearing.

LFOs have a huge number of potential uses; that's why MiniFreak V gives you two of them. (Well, actually *three*, but we'll talk about the extra one [p.81] elsewhere...)

All controls and settings for **LFO 1** are identical to those in **LFO 2**.

LFO controls

The front panel controls in the LFO section are as follows:

- **Rate** sets the LFO rate, from very slow up into the range where it can be heard as an audio tone.
- **Wave** lets you choose the LFO waveform.

4.3.1. LFO Waveforms

The **Wave** knob lets you select from the following options:

L to R: Sin, Tri, Saw, Sqr

- **Sin**: Sine
- **Tri**: Triangle
- **Saw**: Sawtooth

A sawtooth wave is usually defined as starting with a vertical jump in voltage followed by a gradual drop until the start of the next cycle. Sometimes this is called a "falling sawtooth".

On the other hand, a cycle that begins with a gradual rise, followed by a vertical drop at the end of the cycle, is known as a *ramp* wave, or "rising sawtooth".

- **Sqr**: Square

L to R: SnH, SlewSnH, ExpSaw, ExpRamp

- **SnH**: short for *Sample and Hold*, which refers to a waveform that randomly changes its value.
- **SlewSnH**: like SnH, but with *slew*, meaning each new cycle's voltage change happens with a slight "glide" to the new value rather than changing instantly.

All of the waveforms mentioned so far are *bipolar*: the waveform is centered around 0, and cycles through both positive and negative values. (That's how you can easily change a sawtooth wave into a ramp wave – just apply a negative modulation amount!)

- **ExpSaw**: a sawtooth wave where the wave falls on an exponential curve rather than a straight line – the initial drop is slightly quicker, but slows at the end.
- **ExpRamp**: as above but a ramp wave.

These two waveforms are *unipolar*: the waveform can't go any lower than 0, and only creates positive modulation throughout its cycle. (That's why you need both sawtooth *and* ramp – negative modulation doesn't do the same thing as it does for a bipolar waveform.)

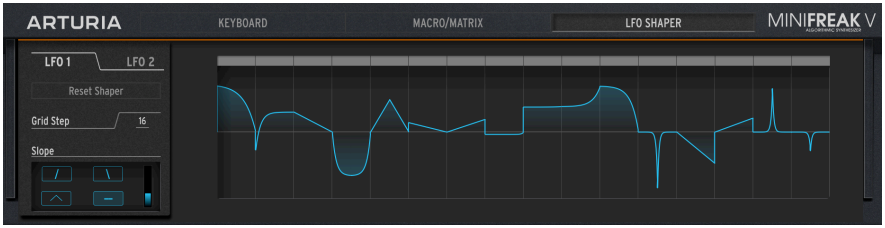
> If you're having trouble imagining these waveforms and what they do, just check the display as you're choosing a wave. The illustrations are very helpful.

4.3.2. LFO Shaper

There is one more LFO **Wave** option: **Shaper**, a waveform that you can create yourself, using the LFO Shaper [p.77]. When you create a Shaper wave, it is saved with your Preset, so you can temporarily use a different waveform and then come back to the Shaper wave without losing your work.

> The workflow for creating a Shaper Wave on the MiniFreak synthesizer is a little bit different than doing it in MiniFreak V, but the results are the same. You can use MiniFreak V's graphical display in conjunction with the MiniFreak's controls to edit these waves intuitively. The workflow for creating your own Shaper Waves makes use of the Touch Strips and the Sequencer Step and Pattern Length buttons. These controls let you quickly define the shape of each stage of the wave, up to 16 stages in all; taken together, these stages form a Shaper Pattern.

When you click on the **LFO SHAPER** tab above the keyboard, the keyboard is replaced by this display:



LFO Shaper panel

The controls on the left are as follows:

LFO 1 / **LFO 2**: chooses which LFO you're creating a Shaper Wave for.

Reset Shaper: resets the entire Shaper Wave to 0 at all stages.

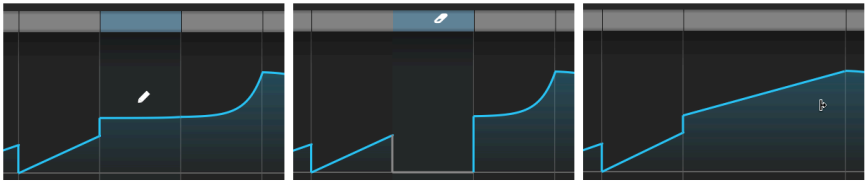
Grid Step: sets the length of the Shaper Wave to be played back, from 1 to 16 steps. All 16 steps are saved with the Preset, even if you're not using all of them at the moment.

> **Freak Out!**: Note that if the LFO is in Sync, each step will be equal to the Sync subdivision, so a 5-step Shaper Wave set to 1/8 notes will repeat in 5/8 time. You can create interesting polyrhythms if the two LFOs are using Shaper Waves with different lengths, say 5 against 7 or 3 against 13.

Slope determines how the LFO will behave within each step, and what curvature the step will have.

On the right, the Shaper Wave is shown as a grid of up to 16 steps, each of which can be set precisely using drawing tools and the Slope controls.

4.3.2.1. Drawing Shaper Waves

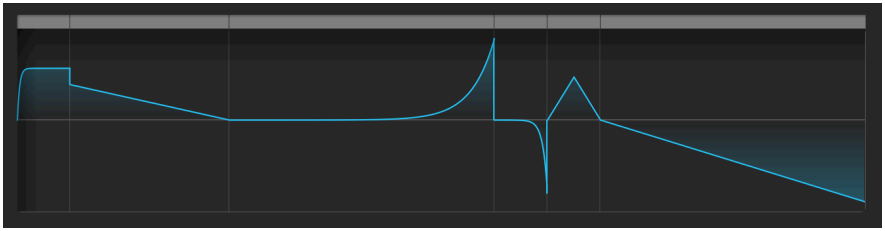


L to R: Pencil (adjust amplitude), Eraser (clear step), and Joiner (create a Segment).

To set the Amplitude (maximum value above or below 0) of a given step, click with the cursor (it will become a pencil). If you hover the cursor over the grey bar at the top of the step, it becomes an eraser, and clicking the bar will clear the existing step.

For some operations, like changing a particular step's Curve value, you might have to clear the relevant step first.

Shift-clicking and dragging over several steps joins them together into a longer Segment. Each Segment counts as the same number of steps as it was before it was joined together; your maximum number remains 16.

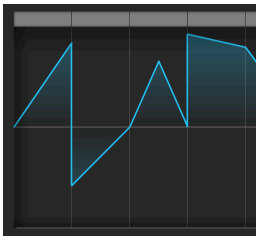


This pattern's 16 steps are joined to make 6 Segments.

4.3.2.2. Slope controls

The four Slope buttons are:

- **Rise**: Over the course of the step, the value goes from 0 to the set Amplitude
- **Fall**: Over the course of the step, the value goes from the set Amplitude back to 0
- **Triangle**: Over the course of the step, the value goes from 0 to the set Amplitude and back to 0
- **Join**: Over the course of the step, the value connects the set Amplitudes of the steps on either side of it



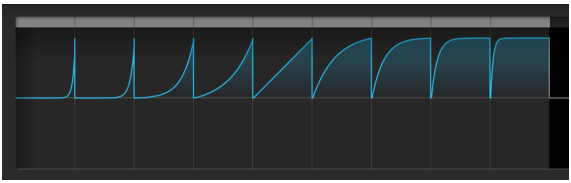
The four Slope types: Rise, (negative) Fall, Triangle, and Join

To change the Slope of a particular step in the LFO Shaper Wave, hover over that step with your mouse and use the scroll wheel to cycle through the four Slope types.

Note that "Rise" and "Fall" refer not to voltage up or down, but to voltage leaving 0 or returning to 0. In other words, going from a negative Amplitude to 0 is still a Fall slope. The second step in the LFO Shaper Wave shown above is an example of this.

The vertical slider controls the **Curve** for each step. At a value of 0.500, the step is *linear* (double-click to get back to this value). Below 0.5, the step's curvature is *exponential*: it changes slowly at first, but then the rate of change speeds up. Above 0.5, the step's curvature is *logarithmic*: it changes quickly at first, but then the rate of change slows down.

In this illustration, each step uses a Rise Slope, and has a higher Curve setting than the one before it, from 0.0 to 0.5 to 1.0:

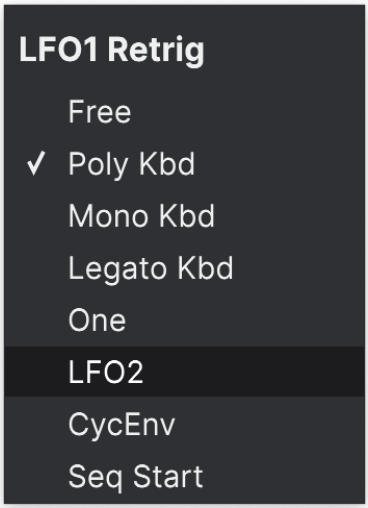


LFO Shaper Curve values from 0.0 to 1.0

4.3.3. LFO retriggering and sync options

Sometimes it's useful for an LFO to start its cycle only when something else happens. For example, a sawtooth wave LFO controlling filter cutoff can give a note an extra punch on the attack if it starts when you play a note. An LFO will give a more precise effect in a sequence if it starts when the Sequence does. Or you might want both LFOs to stay in phase with one another. For any of these cases, you'll want to set up *retriggering*.

Clicking under the waveform display on the **Retrig** brings up the following menu:



Options include:

- **Free**: The LFO runs on its own and doesn't retrigger. Each voice will be affected by the LFO at exactly the same time in exactly the same way.
- **Poly Kbd**: When you play a key, that voice's LFO will trigger. This will happen for any voice played, independently of what all the other voices are doing.
- **Mono Kbd**: The LFO retriggers for all voices at once whenever *any* key is played.
- **Legato Kbd**: The LFO retriggers for the first note played. It does not retrigger for any notes played while the first note is still held down. When all keys are released, the next note will retrigger.
- **One**: The LFO plays one cycle and then stops modulating the sound. When this mode is selected, the sawtooth and square waves become unipolar: they play one cycle and stop at 0 rather than going negative. The sine and triangle waves remain bipolar.

> Note that LFO modulation will always return to 0 at the end of the cycle, even if the waveform is bipolar. In other words, after the single LFO cycle is finished, the note will sustain as if there is no modulation.

- **LFO**: The LFO will retrigger when the *other* LFO starts its cycle. LFO 1 can be retriggered by LFO 2, and vice versa.
- **CycEnv**: The LFO is triggered by the start of the Cycling Envelope [p.86].
- **Seq Start**: The LFO is triggered when the Sequencer [p.103] is started.

There's also a Sync Mode button, which determines whether/how the LFO syncs to your DAW's master tempo. Click it multiple times to cycle through the options:

- **Free**: there is no sync enabled – the LFO runs at whatever Rate you set with the knob.
- **All**: you can set the LFO rate to any subdivision of bars and beats, from 1/32 note triplets to "dotted" 8 bars (12 bars).
- **Straight**, **Triplet**, **Dotted**: as above, but your choices are limited to straight, triplet, or dotted intervals.

4.3.4. Vibrato

The MiniFreak has a third LFO called **Vibrato**. It doesn't have nearly as many features as the others, but it serves a very important purpose.

Of all the ways a modulation wheel on a synthesizer can be used, by far the most common is controlling the amount of LFO modulation of pitch... in other words, adding vibrato. It's such a common yet no-frills usage that it seems a shame to waste one of the MiniFreak's two powerful LFOs on it, right? That's why there's Vibrato.

Vibrato is a free-running triangle wave LFO whose rate and amount (depth) are set with a control panel accessible from the Touch Strips [p.89]. When it's turned on, the Mod strip adds this LFO modulation to the pitch of both Oscillators, in addition to whatever other modulation destinations the Mod strip is assigned to.

4.4. Envelopes

The *envelope* is a fundamental modulation source, perhaps the most important one there is. Without envelope control, a synthesizer's notes would just drone without stopping, or simply turn on at full volume when a key was pressed and cut off the moment the key was released. Not all that interesting (with apologies to pipe organ players). Envelopes allow events like notes to have a distinct shape, letting them imitate a wide variety of acoustic instruments as well as sounds only possible on a synthesizer.

MiniFreak V offers two envelopes: one is simply called the **Envelope**, and the other is the **Cycling Envelope**. These two envelopes have similarities, but are defined by very different modes of operation.

4.4.1. What's an envelope?

An envelope is a control signal that starts when triggered, goes through a series of changes, and then returns to its start point. In the same way that an LFO provides a control signal that repeats regularly, an envelope is meant to play once when triggered.

Every sound in nature has an envelope. A sound starts, proceeds, and ends – and how it sounds when it does that is defined by its envelope. Here are some examples:

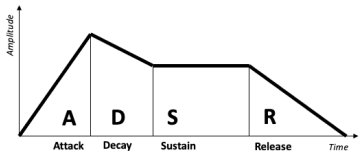
- A drumhead is struck. There's a loud initial sound, which quickly dies away as the drumhead stops ringing.
- A guitar string is plucked. There's a loud and bright initial sound, and a long decay with less and less high-frequency content as the string stops vibrating.
- A violin string is bowed. There's a tiny initial burst of sound as the bow makes contact with the string, then the note gets louder and sustains, even becoming louder and softer over time, depending on the force of the bowing. When the bow leaves the string, the string stops vibrating fairly quickly.

One important thing to note here is that there is not only an envelope for the sound's *loudness*, from silence to sound back to silence again... there is also an envelope for the sound's *timbre* – usually how the sound becomes brighter or darker over time. Most acoustic instruments, when set to vibrating, start with a lot of high-frequency content, which dies away relatively quickly while lower frequencies tend to linger.

A wide variety of realistic sounds can be created from a pair of simple envelopes, one controlling the overall loudness of the sound via the VCA and another controlling the brightness of the sound via the VCF.

4.4.1.1. Envelope stages: ADSR

The way an envelope changes over time is described by sections called *stages*. While there are many different ways to define an envelope, the vast majority of synths use envelopes made up of a few basic stages.



ADSR envelope stages

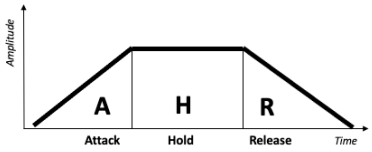
The most common envelope is the *ADSR*, so named for its four stages:

- *Attack*, which starts when a note is played, and runs from the start of the envelope (usually 0) up to the maximum value
- *Decay*, which drops from the maximum value to the sustain value
- *Sustain*, a value that holds steady for as long as a note is held down
- *Release*, which (when the key is released) drops from the sustain value back down to 0.

Note that when these are set by parameters on a synth, the attack, decay, and release are all time values, but the sustain is a level.

The attack time differentiates between the sharp onset of a drum hit or string pluck and the rising volume of a bowed string or tympani roll. Decay time determines how percussive the initial part of a sound is when compared to the sustain level, and release time simulates how long an instrument resonates after it's no longer being excited.

4.4.1.2. Envelope stages: AHR



AHR (or RHF) envelope stages

An *AHR* envelope has three stages: attack and release, with a stage called *Hold* between them. The Hold setting is a time, not a level; during the Hold time, the envelope stays at maximum. (An AR envelope is just an AHR with zero Hold time.)

Arturia uses the terms *Rise* and *Fall* for the Cycling Envelope... making it an *RHF* envelope. This terminology is chosen so that when you talk about "attack" vs. "rise" or "release" vs. "fall", it's obvious which envelope you're referring to.

This naming convention works because the term "AHR" is nowhere near as universally accepted as "ADSR" or even AR. The AHR envelope has also been called an ASR, AHD, or even a Trapezoid! (The pioneering EMS Synthi VCS3 used that term for its Envelope Shaper.

4.4.2. Envelope

Envelope controls

The MiniFreak Envelope is an ADSR, with four dedicated knobs for its four stages: **Attack**, **Decay**, **Sustain**, and **Release**. Remember that Sustain sets a level while the other three knobs set times.

As you turn each knob, the Display will show an envelope curve reflecting the current settings. It will change shape as you adjust the stages, with parameter values shown underneath the curve.

Remember that Sustain is a level, not a time. Changing the Sustain will raise or lower the level of the dot between the end of the Decay stage and the beginning of the Release.

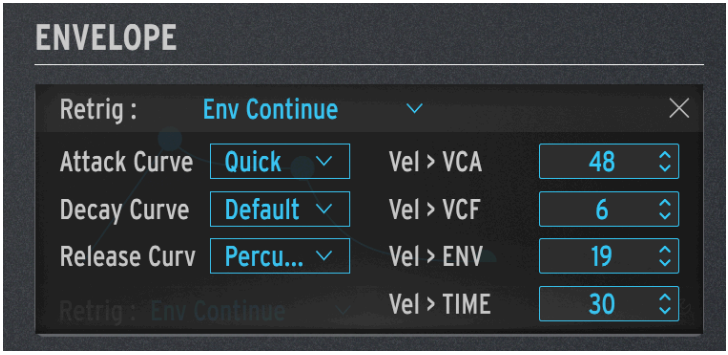
The **Retrig Mode** setting under the display controls how the Envelope is triggered by the keyboard, depending on how you play:

- **Env Reset**: Every time you play a note, the Envelope restarts from the beginning. This is often termed *multiple triggering*.
- **Env Continue**: If you play a note while another note is still playing, the envelope will start from the current value of the old note's envelope, rather than dropping back to 0 first. This is often termed *single triggering*.

The distinction might seem kind of strange – how can playing one note affect another note's envelope? That depends on the Voicing Mode [p.70].

It's true that in Poly mode, where notes don't retrigger unless you play one more note than the number of voices you have (and the MiniFreak has to "steal" one of the voices from a previous note), retriggering might not seem important. However, Retrig Mode is vitally important in the Mono, Unison, and Para modes, as it has a powerful effect on what the sound does as you play.

Clicking on the wrench icon brings up this settings menu:



On the left are three settings for the Attack, Decay, and Release Curves. While many Presets will work fine with the Default curves, sometimes a slightly different curve shape for an envelope stage will yield a more distinctive or musical result. MiniFreak V gives alternate curves for all three timed stages: either Default or Quick (Attack) / Percussive (Decay, Release).

> These curves are subtle! Play with them in a lot of different types of Presets to start to hear what they do.

On the right are four settings for how keyboard velocity modulates the Envelope and its effect on other parts of the synthesizer. It's handy to be able to adjust each of these modulation amounts separately, as a setting that works for one might not work for the others.

- **Velo > VCA**: controls how much velocity adjusts the Envelope's control of the VCA – in other words, how loud a note gets.
- **Velo > VCF**: controls how much velocity adjusts the Envelope's control of the VCF Cutoff – in other words, how bright a note gets.
- **Velo > Env**: controls how much velocity adjusts the Envelope's modulation amount in the Modulation Matrix. This will affect both the VCA and VCF, in *addition* to whatever settings you have for the previous two Velocity modulations.
- **Velo > Time**: controls how much velocity adjusts the Decay and Release of the Envelope - higher velocity extends the Decay and Release times.

4.4.2.1. The VCA (no, we didn't forget about it)

The Envelope has one hard-wired modulation destination: the *Voltage-Controlled Amplifier* (VCA), which controls the volume of the audio signal. It can modulate other things, but those modulation routings have to be set in the Modulation Matrix [p.93] as needed.

While the VCA is the necessary third part of the classic VCO > VCF > VCA routing, it often needs no controls of its own besides a volume envelope. That's why it doesn't have its own dedicated section in this manual like the ones for the Oscillators [p.19] and Filter [p.48].

4.4.3. Cycling Envelope

The Cycling Envelope controls

The other envelope on MiniFreak V is the **Cycling Envelope**. It can work as a traditional envelope, but can also work in ways that almost make it a kind of LFO.

If you stop to think about it, LFOs and envelopes aren't all that different in design. The primary difference is that LFOs repeat over and over, and envelopes don't. But what happens if an LFO is set to only play once per key press [p.80], or an envelope can be set to repeat in a loop? The lines get blurry... and we like blurry lines, they leave lots of room for creative exploration!

The three Cycling Envelope knobs are **Rise**, **Fall**, and **Hold**.

The **Mode** button under the display determines how the Cycling Envelope operates within a given Preset. The three Modes are **Env**, **Run**, and **Loop**.

4.4.3.1. Env Mode

In **Env** mode, the Cycling Envelope functions as an ADSD envelope. The Rise knob sets the attack time, the Fall knob sets the decay *and* release times to the same amount, and the Hold/Sustain knob sets the sustain level.

Clicking on the wrench icon in Envelope Mode brings up this display:

Cycling Envelope Env Options

Retrig: pops up a submenu with a choice of what retriggers the Cycling Envelope:

- **Poly Kbd**: When you play a key, that voice's Cycling Envelope will trigger. This will happen for any voice played, independently of what all the other voices are doing.

- **Mono Kbd**: The Cycling Envelope retriggers for all voices at once whenever any key is played.

- **Legato Kb**: The Cycling Envelope retriggers for the first note played. It does not retrigger for any notes played while the first note is still held down. When all keys are released, the next note will retrigger the Cycling Envelope.

- **LFO 1 or LFO 2**: The Cycling Envelope retriggers when the selected LFO does.

The **Rise Curve** and **Fall Curve** select either Default or Quick/Percussive stage shapes for subtle changes in envelope response.

4.4.3.2. Run Mode

In **Run** mode, the Cycling Envelope is a 3-stage envelope, with Rise, Fall, and Hold times. It retriggers itself at the end of every envelope cycle.

In Run mode, the Cycling Envelope is *monophonic*, affecting all voices at the same time. It will always be in phase for every voice, which is a very useful option. Normally it's meant to run freely and never be retriggered.

The wrench icon in Run mode brings up these options:

Cycling Envelope Run Options

Tempo Sync controls whether the Cycling Envelope's stage times will follow your DAW's tempo.

Stage Order determines which of the three stages of the envelope has the Cycling Envelope retrigger.

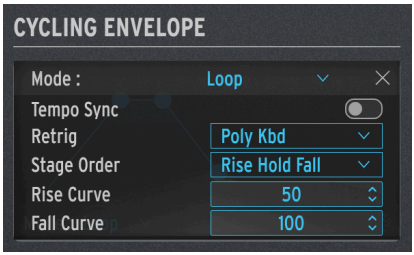
- In **Rise Hold Fall** order, the envelope retriggers at the end of the Fall, and the Hold stage is at maximum.

- In **Rise Fall Hold** or **Hold Rise Fall** modes, the envelope retriggers at the end of the Hold or Fall, but the Hold stage is at 0. This choice means that instead of a series of conventional RHF shapes, the Cycling Envelope creates a series of Rise/Fall spikes separated by the Hold time... like an automated AR envelope.

Cycling Envelope Run Shapes (L to R): Rise Hold Fall, Rise Fall Hold, and Hold Rise Fall

4.4.3.3. Loop Mode

Loop mode is similar to Run mode, but the Cycling Envelope's retrigger at the end of every cycle is *polyphonic*. Because of that, the wrench icon brings up a different set of options for this mode:



Cycling Envelope Loop Options

Tempo Sync and **Stage Order** work as they do in Run mode.

Retrig offers the same retrigger choices as in Env mode.

Rise Curve and **Fall Curve** let you adjust curvature of these two stages, from exponential to logarithmic, with linear (50) as a center default. An exponential curve changes slowly at first, but then the rate of change speeds up; a logarithmic curve changes quickly at first, but then the rate of change slows down.

> NOTE: for Rise Curve, 0 is exponential and 100 is logarithmic; for Fall Curve, 0 is logarithmic and 100 is exponential. To hear this, start with the Default Preset and set CycEnv to modulate Pitch1+2 by 12.0 semitones, then play with the Rise and Fall Curve values in Loop Mode while holding down a note. You'll hear how things work pretty quickly, especially if you experiment with Rise *or* Fall Curve by itself while leaving the other Curve set to 50.

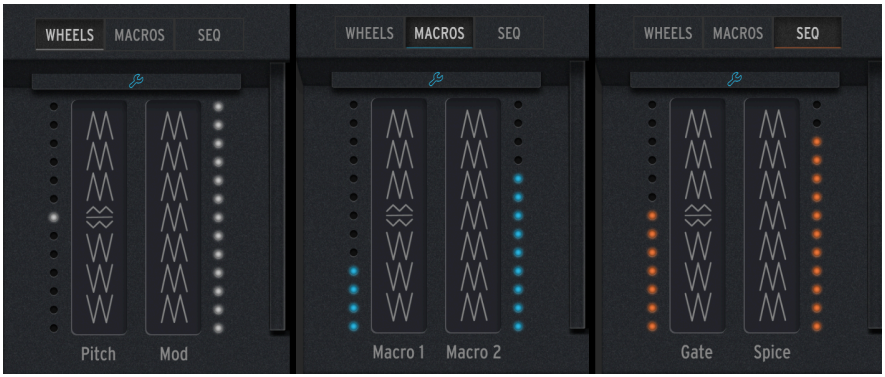
4.5. KEYBOARD tab

Clicking the **KEYBOARD** tab brings up MiniFreak V's 37-note onscreen keyboard. You can click notes with the mouse, or use your computer's QWERTY keyboard as a quick way to trigger notes. The middle two rows, from A to L, form a 14-note chromatic keyboard, and repeatedly pressing the Z or X keys shifts the octave down or up, respectively.

4.6. Touch Strips

While we're here, let's call out the two **Touch Strips** to the left of the keyboard. They are always visible, and can serve multiple functions, depending on which of the three selector buttons above them has been selected.

> The Touch Strips on the hardware MiniFreak are very useful when working with MiniFreak V, because they smoothly control all of the software's functions in a very hands-on way.



The Touch Strips can be used in WHEELS, MACROS, or SEQ modes.

WHEELS has the Touch Strips work as a classic pitch bender and modulation wheel. The Pitch strip shows its travel with white LEDs and snaps to center when released; the Mod strip has a ladder of white LEDs that shows the position, which does not return to 0 when released.

MACROS turns the Pitch and Mod strips into a pair of unipolar Macro [p.91] controllers. The LED ladders for both Touch Strips will turn blue.

SEQ turns the Pitch strip into a Gate control, and the Mod strip into a Spice control, for the Sequencer [p.103].

Click the blue wrench icon to open the Vibrato [p.81] panel, where you can turn the Vibrato LFO on/off, set its rate and depth, and also set the pitch bend range from 1 to 12 semitones:

The Vibrato control panel

In this mode, the topmost LED beside the Mod Strip is blue instead of white.

4.7. MACRO/MATRIX tab

Clicking the **MACRO/MATRIX** tab brings up the Macro and Matrix control panels. These are among the most powerful features MiniFreak V has to offer, because they give you so much power to manipulate sound in easy ways!

4.7.1. Macros

With all of the cool things MiniFreak V can do in real time, you might find yourself wishing that you had more than two hands to play and work the controls. Wouldn't it be cool to be able to simultaneously raise the Cutoff, lower the Resonance, change the Envelope attack a tiny bit, and sweep the Timbre knob, all in one motion? Of course it would... and that's why MiniFreak V offers **Macros**.

Each Preset includes two Macros, which can be controlled by the Touch Strips [p.89] in real time. Each Macro lets a single movement on a Touch Strip change up to four different parameters at the same time, in differing amounts.

Assigning parameters to a Macro is very easy. Click on a Macro slot, and available controls will be highlighted in orange:

Here, one slot in Macro 1 has been assigned to the Volume of Oscillator 2.

You can also right-click on a slot to pop up a complete menu of all available Macro destinations. This is handy for selecting parameters that you can't access by the above method; it's also how you clear a Macro slot (by selecting **None** from the menu).

All of the available Macro destinations, including None.

You can then click and drag the number next to the Macro destination up or down to set a modulation amount, which can be either positive or negative. Remember, that number is an offset to the stored value of the parameter, so be careful that you're not forcing a parameter value beyond its limits or you won't hear any result.

Repeat this for up to four different controls, and one movement of the appropriate Macro strip will make all of the moves at once. You can even assign a Macro as a destination in the Modulation Matrix, so it can be controlled with Velocity or Aftertouch, automated with an LFO... the possibilities are amazing!

> When you're working with Macros, it's a good idea to occasionally stop editing the Macros, turn both Touch Strips down to 0, and then save your Preset. That way, you can always be sure that the Preset will be recalled just as you need it to be, and you will always have a "safe place" to come back to if your Macros get out of hand.

4.7.2. Macro Assign to Modulation Amounts:

Using this feature, you can now assign the Macros to control modulation amounts in the matrix. This will help navigate modulation, and create more lively patches by dosing the amount of mod applied to the destination.

In order to assign a Macro to control a modulation amount, you will need to :

- Enter the Macro Assignation Page using the + icon on top of the desired Macro.
- Select one of the Assignation Slots of the Macro.
- Pick the Modulation Matrix Point you want to assign to pair it by clicking on its position in the matrix. (Ensure that there is currently a modulation set for this point, with a modulation amount)
- Set the amount on the Macro section.
- From there you Macro will control the amount of modulation applied to the set destination.

This also applies to the corresponding Macro 1 and 2 controls found at the bottom right of the Graphic interface.

4.7.3. The Modulation Matrix

The **Modulation Matrix** extends MiniFreak V's sound design power well beyond the range of many synthesizers. It allows you to specify which signals are in control, where they exert their control, and how much.

4.7.3.1. What is modulation?

The word *modulation* (often abbreviated "mod") means "change". When you modulate a signal, you're changing it. That basic definition takes us a long way, as you'll see.

Voltage control... and control voltages

The basic concept surrounding modulation is called *voltage control*. Even though MiniFreak V's architecture is digital, we use this term from the analog world for the sake of clarity. Just like the name implies, voltage control uses some signals' voltage (how strong they are) to control others.

This leads us to an important distinction: audio signals vs. *control voltage* (CV) signals. Audio signals run at a frequency within the range of human hearing, from roughly 20 Hz to 20 kHz, whereas CVs can run at much lower frequencies, with one cycle taking many seconds or even minutes... or just sit at one level forever.

If you can imagine every part of every element of a synthesizer having a knob on the front panel that you can grab and control, you can think of modulation as getting the synth itself to turn the knobs for you, many at once and with precision. Modulation takes that level of control out of the player's hands. This lets you have a much smaller number of knobs, making it easier to focus on actually making music rather than constantly turning knobs up and down to change the pitch of an oscillator or describe the waveform of an LFO.

Gates and triggers

Technically *gates* are a kind of CV, but they're given their own name because they don't change over time the way other CVs do. A gate is either on or off, like flipping a switch or pressing a button. Gates define many different functions: they turn envelopes on and off, activate functions, cause other circuits to behave in different ways, and more.

On analog synths using voltage control, to play a note requires two signals: a CV to tell the synth which note to play, and a gate to start and stop the note. That's why synths have CV and Gate inputs and outputs: to play one another.

Another type of control signal is the *trigger*. Triggers differ from gates in that their length doesn't matter; they are usually short pulses that tell their destination, "Something should happen right *now*." Triggers can start envelopes that don't need to know when to stop, reset the start of waveform cycles, and provide a steady pules to give other circuits a timing reference (sync).

Modulation sources

Every synthesizer has elements designed to send CVs here and there. Certain of these elements are quite common, and have chapters of their own to explain how they are used in the MiniFreak:

- Low Frequency Oscillators [p.76];
- The Envelope and Cycling Envelope [p.82];
- The keyboard [p.88] and Touch Strips [p.89];
- Even the Arpeggiator and Sequencer [p.103] are basically powerful modulation sources.

There are lots more modulation possibilities "under the hood" as well.

Audio signal modulation

Since audio signals inside a synth are just changing voltages, they can be routed the same way CVs can, and can produce very interesting sounds. Here are some examples.

Frequency modulation (FM) uses one audio signal to modulate the frequency of another. This produces new harmonics and overtones that can't be created by simply mixing raw waveforms, and it's easily possible for these harmonic relationships to track the pitch of the notes being played.

FM is possible on any synthesizer that has more than one oscillator; modern digital synths can simulate some FM behavior within a single oscillator, as with the Two Op. FM Digital Oscillator Type [p.27].

Amplitude modulation (AM) uses one audio signal to control the amplitude (level) of another. This produces specific harmonics, often a function of frequency rather than pitch – so they don't track what's played on the keyboard in the same way. Two examples of this are *ring modulation* and *balanced modulation*, which are discussed in the sections on Oscillators [p.19] and FX [p.52].

Phase modulation alters the phase of a waveform, which can turn simple waveforms into much more complex and interesting ones. Variable phase modulation was the basis of several digital synths created in the 1980s and 1990s.

> Note that some synthesizers make a distinction between audio and CV routings, so you're discouraged from patching one kind of signal into the other "in the wrong way." Other synths treat audio and CV on an equal footing, so anything can be patched into anything... even at the risk of damaging the synth. On a plug-in, damaging the synth isn't an issue, but you could still create a sound that might damage your speakers or ears. That's what the PANIC button [p.123] is for!

Modular and semi-modular synthesizers

The earliest analog synthesizers contained their different circuits – oscillators, filters, amplifiers, envelopes, etc. – inside boxes called *modules*. To get modules to interact, the user had to manually connect them with cables. These cables are nicknamed *patch cables* or *patchcords*, which is why the act of using them is called *patching*.

> On a digital synthesizer like the MiniFreak or in a plug-in like MiniFreak V, we don't actually use patch cables, but we still can use the language of "patching one thing into another" or talking about a complete sound (Preset) as a "patch".

A synthesizer that entirely relies on patching between separate modules is called a *modular* synthesizer. (We hope that term doesn't come as a surprise.) In recent years, modular synthesis has enjoyed a resurgence in popularity. Many people enjoy the finely detailed process of patching modules together in highly complex ways.

However, creating a modular patch starting with no cables at all can be time-consuming and even frustrating if you find yourself recreating the same patches over and over. The first, and most classic, example of this was the basic structure of the analog subtractive synthesis voice: an oscillator into a filter into an amplifier, with envelopes controlling the filter and amplifier to shape notes and a CV and Gate connection to a keyboard.

> *Subtractive synthesis* is the most common form of synthesizer architecture. It gets that name because we start with a raw waveform and subtract parts of its frequency content with a filter.

Engineers who saw themselves using that setup over and over again began to wonder if there would be any appeal to a synthesizer that contained those modules permanently connected (*hard-wired*) to one another, with the relevant knobs organized carefully on an easy-to-read front panel.

While there may have been examples of such a design before it, there is no question that the Minimoog was the hard-wired synth that popularized the idea, putting synthesizers in the hands of many more musicians and making Bob Moog a household name. The Minimoog inspired dozens of imitators and established the basic flow of the hard-wired analog synth for the entire music world.

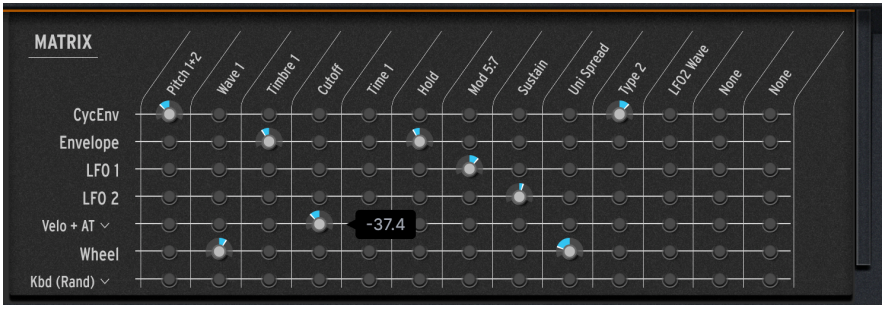
Meanwhile, Alan R. Pearlman (nicknamed "ARP") was pondering the next step past his enormous ARP 2500 modular synthesizer: a smaller and more portable synth that would somehow combine easy use and flexibility. He came up with the idea of a *semi-modular* synthesizer: one that was hard-wired to create sounds without any patch cables, but which also had patch points throughout its design. It could be played just as it was, but an ambitious user could use patch cables to rewire the synth and do more complex things. The result was the ARP 2600, a legend in its own right that still enjoys popularity today.

> Vintage Minimoogs and ARP 2600s fetch astronomical prices, with modern reissues costing less but still very expensive. Fortunately, DAW users can experience those sounds with the Arturia Mini V and ARP 2600 V plug-ins. (Just saying.)

MiniFreak V is a semi-modular synthesizer, although it uses digital connections rather than patch cables. This is done with the **Modulation Matrix**.

4.7.3.2. Modulation Matrix controls and functions

With all of that description as an introduction, the Modulation Matrix itself is fairly straightforward to use, since you now have the background to know what it does.



The Modulation Matrix

The Matrix has seven rows, each representing one of seven modulation *sources*:

- **CycEnv** (the Cycling Envelope)
- **Envelope** (the ADSR Envelope)
- **LFO 1**
- **LFO 2**
- **Velo/AT** (keyboard velocity and/or aftertouch)

- **Wheel** (the second Touch Strip, labeled "Mod" on MiniFreak V – the "Wheel" label carries over from the hardware MiniFreak)

- **Keyboard** (control signals sent by playing keys: a Linear signal based on keyboard note from low to high, an "S" curve with more sensitivity in the middle of the keyboard range, a Random value sent at every keypress, or a signal based on which Voice has just been played.)

There are 13 columns representing modulation *destinations*. The first four are preset to the four most common destinations:

- **Pitch 1+2**

- **Wave 1**

- **Timbre 1**

- **Cutoff**

The other nine columns are assignable to a wide variety of parameters.

Each point on the Matrix, where a row and column intersect, represents a possible *modulation routing* (or *mod routing*) – where the source in that row can be set to control the destination in that column.

To activate and set a particular mod routing, just click and drag. The dark LED indicator will light up and be surrounded by a dial, where you can then set the amount of modulation, either positive (to the right of center) or negative (to the left of center).

Most of the mod routings have an amount range from -100 to +100, but some don't: The **Pitch 1+2** column has amounts from -60 to +60, representing 60 semitones (5 octaves) sharp or flat. Right-click and drag the knob for finer control of the value; in the case of Pitch, values under 12 semitones can be set to within 1 cent.

Double-click the knob to reset it to 0 modulation (effectively turning it off).

4.7.3.3. Modulation indicators on the front panel

You can quickly see what a modulation is doing to a particular control.

Each knob on the MiniFreak's control panel is surrounded by a circular arc in a matching color (orange or white) to show where the knob is currently set.

In addition, a small dot in a contrasting color (white on orange, orange on white, or blue on white) shows the parameter value's current position. This dot may be stationary at the same point where the knob is set, or it may be at another position – or even moving – if it's being modulated.

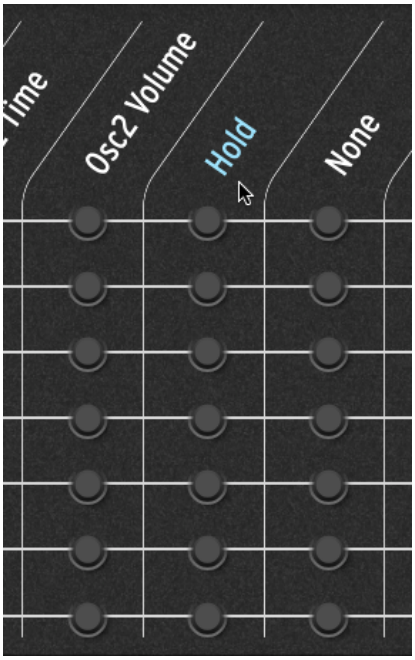
The images below show the color schemes for the top (Home) and bottom (Advanced) rows of knobs. In the center image, you can see that the Cutoff and Resonance are being modulated, as the orange dots don't correspond to the knob positions.

Collars and modulation indicators for Home orange, Home white, and Advanced knobs

4.7.3.4. Assigning modulations

Assigning your own modulation destinations to the last nine columns can be done in a number of ways.

1. If you hover your mouse over an assignable column, whether or not it has been assigned yet, the name will be highlighted in blue:



Hovering over an assignable column in the Mod Matrix

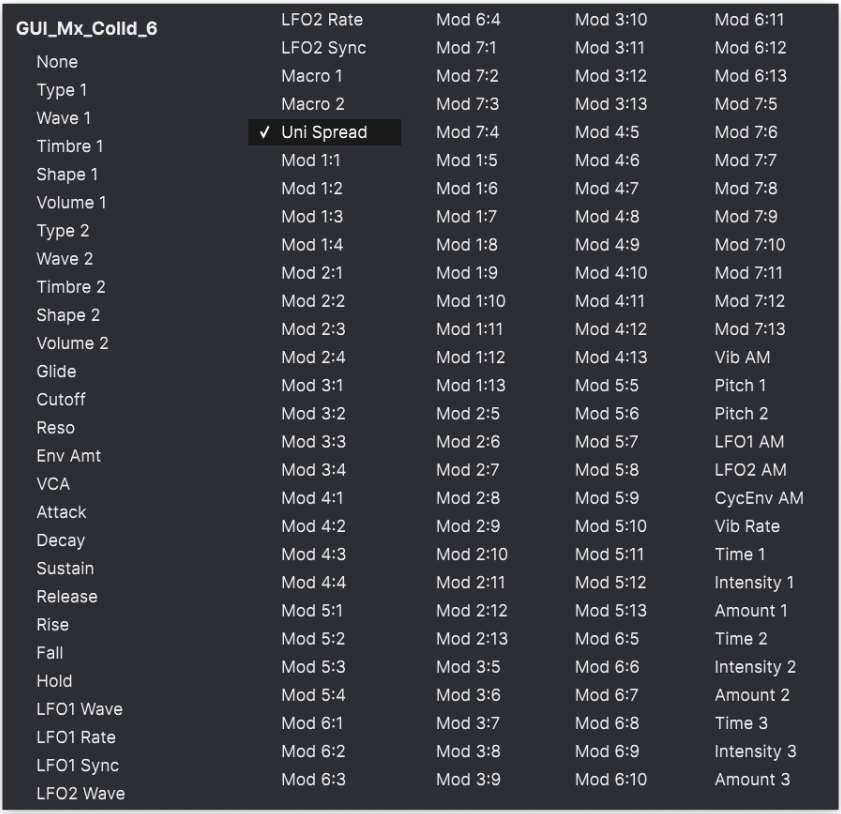
If you click on the name, many of the available destinations will be highlighted in white on the panel, as shown here:

Click any highlighted control to assign it as a Matrix destination

If the column has already been assigned to a control that's visible on the front panel, it will be highlighted in blue, like this:

Then you can simply click on any control to assign it to that column, replacing the modulation destination that was there (if any). The destination will be assigned, and the label on that column will update to show your choice.

2. If you right-click on the name, a complete list of all available modulation destinations will pop up:



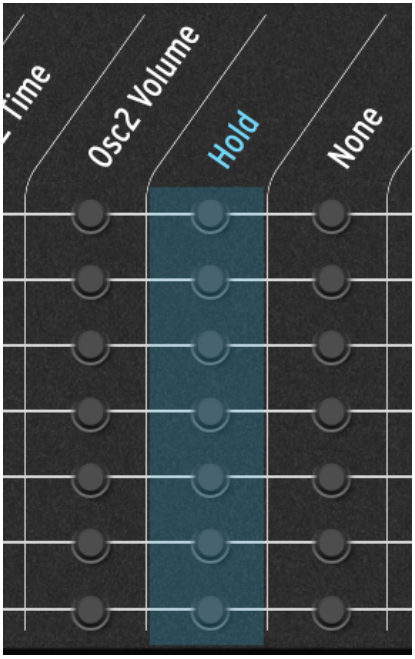
The full list of modulation destinations

This pop-up is important because it shows a number of destinations that aren't visible on the panel. Just click on the destination you want to assign it.

3. An even quicker way to assign a modulation while you work is to hover your mouse over any control and click the + that appears:

Hover your mouse and click the + to instantly assign a Modulation Matrix destination

That control will instantly be assigned to the next open column in the Modulation Matrix. When you do this, the column will momentarily flash blue to show that the assignment has been made.



Sidechaining modulations

Note that other Matrix mod routings can be assigned as destinations! This lets you perform a neat trick...

Let's say you want to control the Timbre knob on Oscillator 1 with LFO 1. That's easy, there's a dedicated routing for it on the Matrix. But once you've set the amount of modulation, it doesn't change unless you go back into the Matrix and tweak it. What if you wanted that amount to *change* in real time – for example, controlling the range of Timbre tweaking with the Wheel?

You can assign a modulation destination to make that easy. In this particular case, there is a special mod destination you can select: LFO1 AM, where "AM" stands for *amplitude modulation* – basically how much control LFO1 exerts. So if you assign a column to LFO1 AM, route Wheel to that column and set the amount, now the modulation wheel or second Touch Strip turns the amount up and down.

You now have something modulating the amount of modulation! This sort of routing, sometimes called *sidechaining*, is incredibly useful for getting more hands-on with playing your sounds.

While there are a few very handy AM destinations premade for you – controlling Vibrato, LFO1, LFO2, and Cycling Envelope – you can create any sort of sidechain you want, simply by setting a particular mod routing (row/column) as an assignable destination. Things can get pretty crazy in a hurry!

4.7.3.5. Getting the most from modulation

Modulation is a huge subject, and there are lots of online resources to learn more about it. But if you just want to dive into MiniFreak V and start exploring, do it! You can't break anything, honest.

But if you're a novice modulator, we'll leave you with a few tips you'll find useful.

- Modulations from different sources sent to the same destination add together for the total effect. If you've turned all your modulation routings off but still hear an effect, go through and make sure that there isn't a modulation happening somewhere else. Remember, not all mod routings require the Matrix to set up, with the Filter **Env Amt** knob [p.51] being a good example.

- If you're sidechaining modulations and the overall effect isn't working the way you think it should, remember that you've got *two* modulation amounts to adjust. Messing with one might not do the job until you get the other one set properly!

- Finally, remember that if you ever get totally lost in your modulations and want to just start over, it's a matter of a few clicks to remove all of your mod routings (while leaving the Assign columns' settings intact). Sometimes it's OK to return to a clean slate.

5. THE SEQUENCER PANEL

Opening the Sequencer Panel reveals MiniFreak V's built-in **Arpeggiator** and **Sequencer**. These powerful tools can create interactive note patterns, complete with automated parameter sequences following the melody. In this chapter, we'll break down how they work and walk you through their features.

The Sequencer Panel, with an active Sequence playing back.

At the top left, the **Mode** buttons select the Arpeggiator, Sequencer, or Off. We're pretty sure you don't need to have Off explained to you, so let's move on!

5.1. Common controls

We'll start by looking at some controls that are important to both the Arpeggiator and Sequencer, starting with the one that's come to define the overall sense of creative fun in the MiniFreak and its smaller sibling the MicroFreak...

5.1.1. Spice & Dice

Spice & Dice were first popularized in Arturia's MicroFreak synthesizer as a way of, well, "spicing up" conventional arpeggios and sequences by adding variation to multiple parameters at once. The more Spice you add, the more variation creeps into the playback; rolling the Dice randomizes everything at once.

The following parameters are varied per step with Spice and Dice:

- Velocity
- Octave (1 octave up or down)
- Gate length
- Step On/Off (i.e. note or rest)
- Envelope Decay and Release

The Spice & Dice controls appear and are used in both the Arpeggiator and Sequencer:

- **Gate**: controls the gate length of each arpeggiated note, from staccato (1% of the Time Division) to legato (99%).
- **Spice**: controls the amount of variation being applied at any given time.
- **Dice**: randomizes all of the affected parameters with every click of the die icon. This only affects playback; stored notes and other Sequence data aren't rewritten or lost.

> How did Gate get into this section? Because playing with Gate length is another common "spice" for arpeggios and sequences. The Gate and Spice controls are shown as vertical bars because they correspond to the two Touch Strips [p.89] in **SEQ** mode. Using the Touch Strips this way lets you control Gate and Spice fluidly as an arpeggio plays back.

5.1.2. Tempo

The Tempo-related controls are as follows:

- **Swing**: sets the amount of swing in the rhythm, which delays every other step to create a bouncy, jaunty feel. Values range from 50% (no swing) to 75% (heavy swing).

> HINT: If you're not sure where to start playing with a Swing value, try 67%. It's a common triplet-feel swing that works well for a lot of music styles.

- **Time Div**: sets the Time Division of each step as a fraction of the Tempo. Options include straight, dotted, and triplet times, from a 32nd-note triplet up to a dotted half note. Drag your cursor up/down to select the desired Time Division.

> It's interesting that the **Tempo** section has no Tempo control! That's because when you run MiniFreak V as a plug-in, it derives its tempo from your DAW or other sync source, and in the standalone version, the Global Tempo is found in the Audio Midi Settings [p.15] pop-up. The MiniFreak synthesizer's **Tempo**/**Swing** knob puts you in direct control of the standalone version if desired, with a tempo range from 30 to 240 BPM.

5.1.3. Hold

This is also a good place to note one control that's not on this Panel, but which is vital for these applications: Hold.

If you click **Hold** in MiniFreak V's Voices [p.70] section or on your MiniFreak, or hold down the sustain pedal on any MIDI controller, it has slightly different effects on the Arpeggiator vs. the Sequencer.

The Arpeggiator will continue to play all of the notes you were playing when you pushed the button/pressed the pedal. As long as at least one note is still held down, you can add notes to the arpeggio at will. If you release all notes on the keyboard and play another, the previous arpeggio will be cleared and a new one will start to build up from the first new note you've played.

The Sequencer will hold whatever transposition value you've set by pressing a key until Hold is released.

5.2. Arpeggiator

Pressing the **Arp** Mode button activates the Arpeggiator, whose features take it well beyond the usual up-down-up-down of traditional designs. It can function as a miniature sequencer, an intelligently randomized playing companion, and an endless source of creative ideas, all with the press of a few keys.

5.2.1. Arpeggiator controls

The Arpeggiator's row of 16 control buttons appears in between the **Mode** and **Spice & Dice** sections.

Arpeggiator controls

NOTE: When the Arpeggiator is selected, the information in the Sequencer's windows [p.107] doesn't affect it. However, that information is preserved for the next time you use the Sequencer.

First there are eight options for arpeggio order:

- **Up**: Notes are played from lowest to highest.
- **Down**: Notes are played from highest to lowest.
- **Up/Down**: Notes are played up and down, with the highest and lowest notes played only once per cycle.
- **Random**: Notes are played at random.
- **Order**: Notes are played in the order in which the keys were pressed.
- **Poly**: All held notes are played at once on every step, creating a pulsating chord effect.
- **Walk**: This is a simple but effective "random walk" pattern. The Arpeggio remembers the order in which keys are pressed; however, it doesn't always *play* them in that order. For any step being played back, the next step could be: the next note in the play order (50% of the time), the current note repeated (25%), or the previous note in the play order (25%). This causes the arpeggio to "wander around" the predictable order of play.
- **Pattern**: This is a mini-sequencer that generates note patterns based on playing technique. Notes being held are used to create a 16-step sequence. Every time you add a new note, the pattern randomizes to something new. The lowest note you play will be played twice as often, to emphasize the root note of the pattern.

Walk and Pattern are not terribly intuitive at first. Take some time to play with each one and get a feel for how they work. Pretty soon, you'll start to hear musical applications for them that go way beyond what a traditional arpeggiator can do!

The four **Oct** buttons determine how many octaves the arpeggio covers. On the **Oct1** setting, only the notes held are played; **Oct2** plays the arpeggio then repeats it one octave higher; **Oct3** adds another repeat an octave higher, and **Oct4** adds yet another octave above that. (Is it any wonder that the poor frog needs more and more air to sing higher and higher... and eventually explodes? Sometimes, music is full of tragedy. *Hélas, pauvre grenouille!*)

The last four buttons provide performance effects for even more spontaneous variations.

- **Repeat**: plays each note twice, one step each.
- **Ratchet**: plays each note twice, one half-length (double speed) step each.
- **Rand Oct**: plays back the arpeggio notes in the selected order, but with each note at a randomly chosen octave.
    - Each note will play back at its usual octave 75% of the time,
    - one octave higher 15% of the time,
    - one octave lower 7% of the time, or
    - two octaves higher 3% of the time. This gives a sort of controlled randomness that keeps close to the original arpeggio rather than flinging notes all over the place!
- **Mutate**: changes the notes being played in the arpeggio from what is being held down. Every time Mutate is pressed, each note in the arpeggio has a chance of being changed:
    - 75% chance to keep the same note
    - 5% chance to change to a note *a fifth above* the original note
    - 5% chance to change to a note *a fourth below* the original note
    - 5% chance to change to a note *an octave above* the original note
    - 5% chance to change to a note *an octave below* the original note
    - 3% chance to swap places with the note following it
    - 2% chance to swap places with the note two steps after it

If that's not crazy enough for you, check this out: if you hit Mutate again, it doesn't go back and mutate the original arpeggio a different way – *it mutates the mutated version!* You can stack up mutations over and over, until what you're listening to has evolved entirely away from where you began.

You can also reset one note in an arpeggio to its original version without affecting the other mutated notes, simply by lifting up that key and playing it again.

> The **Repeat** and **Ratchet** buttons are *momentary*, which means they are in effect only as long as they are held down. This isn't easy to do with a mouse, so these effects are well suited for an external MIDI controller's buttons. Of course, the hardware MiniFreak has these buttons (along with all of the other Arpeggiator controls) ready to go!

5.3. Sequencer

Pressing the **Seq** Mode button turns on MiniFreak V's Sequencer. It's a software version of MiniFreak's amazingly powerful and playable Sequencer, in an easy-to-use graphical user interface. On its own or integrated with the MiniFreak's front panel controls, it takes sequencing fun and creativity to a new level.

5.3.1. Sequencer Controls

Sequencer controls

The Sequencer's row of eight control buttons appears between Mode and Spice & Dice. The controls are:

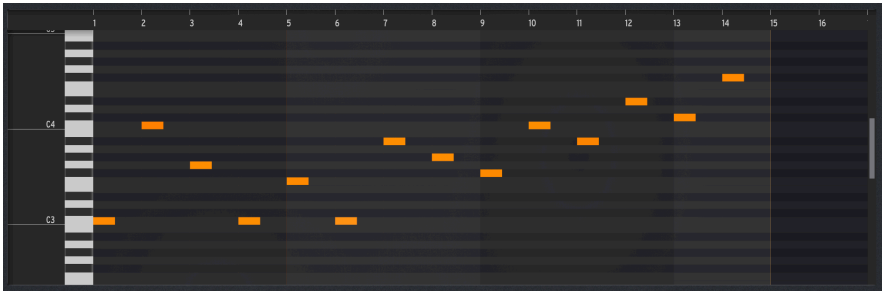
- **Auto Play**: makes the Sequencer respond to your DAW's transport controls, starting and stopping when your DAW does. It doesn't do anything in the standalone version of MiniFreak V.
- **Play/Stop**: plays and stops the Sequence.
- **Rec**: puts the Sequencer in Record mode.
- **Modulation**: replaces the central Note Window [p.108] with an expanded Modulation Window [p.112] for easier editing.
- **1 Bar/2 Bar/3 Bar/4 Bar**: sets the sequence length and maximum number of steps displayed in the Note Window (see below), in 16-step Bars: 16, 32, 48, or 64 steps maximum.

You can always edit information in all 64 steps, even when the sequence is set to a shorter length and/or fewer bars are displayed. These buttons only affect how much of the sequence is shown on screen at one time.

If you want to work in a tighter zoom, you can choose a smaller number of displayed Bars, then scroll through the sequence by clicking and dragging the Step numbers at the top of the window.

5.3.2. Creating a sequence in the Note Window

The **Note Window** is an easy-to-use "piano roll" editor that uses a few simple commands to create sequences.

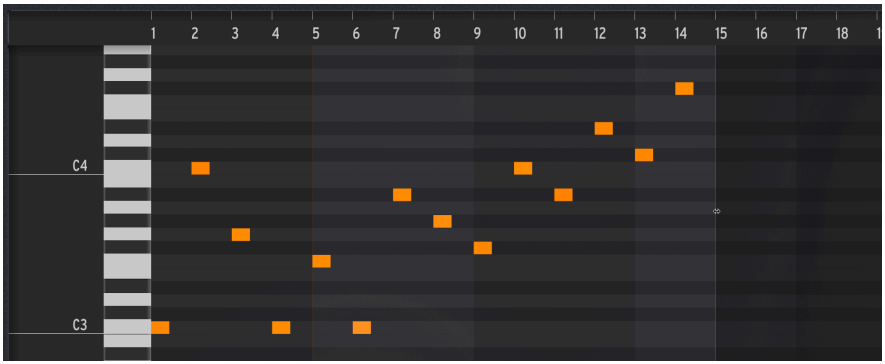


To scroll left/right through a sequence, click and drag the step numbers at the top of the window.

To scroll up/down to reach higher or lower notes, use your mouse scroll wheel or click and drag the grey bar at the far right of the window.

5.3.2.1. Setting sequence length

When you click any of the **1/2/3/4Bar** buttons, the display and sequence length are both set accordingly. However, you can set the sequence length to any number of steps by clicking and dragging on the orange vertical line that indicates the last step in the sequence. The cursor becomes a left/right arrow, and the display beyond the line will be darkened to show it's not in play:



This sequence has been set to a length of 14 steps.

5.3.2.2. Adding or deleting notes

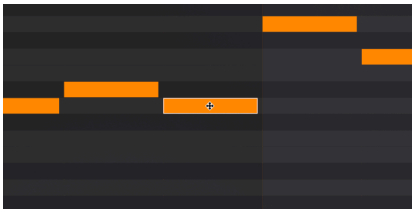
Click on the appropriate pitch in the appropriate step to create a note.

> The Sequencer is *polyphonic*: In any given sequence step, up to six notes (new or sustaining) can be playing at one time.

Click on an existing note to highlight it for editing; right-click to delete it.

5.3.2.3. Editing note position

Hover over the middle of a note and the cursor becomes a 4-way arrow. Click and drag to move the note where you wish.



This cursor means you can drag a note to move it.

5.3.2.4. Editing note length

Hover over the start of a note to lengthen it by moving its start point earlier in the piano roll. Hover over the end of a note to lengthen it by moving its end point later in the piano roll. This lets you quickly create longer notes (ties).

The cursor takes on a special "drag from here" shape in these cases:

Lengthening a note by (a) stretching its end and (b) stretching its start.

Note lengths can be adjusted in increments of one half step.

> If a note's length in the Note Window is set to one full step or longer, the Gate control will no longer affect it. To set a note to respond to the Gate control, shorten it to appear like it's "half a step" long.

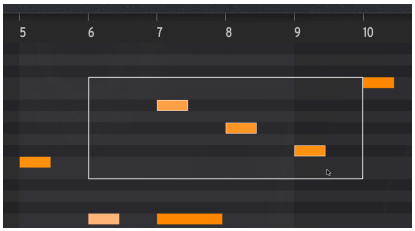
5.3.2.5. Editing note velocities

Hover over the upper edge of a note and the cursor becomes an up-down arrow. Drag up and down to adjust note velocity. The note will take on a lighter shade at lower velocities and a darker one at higher velocities.

This cursor lets you change a note's velocity.

5.3.2.6. Editing multiple notes

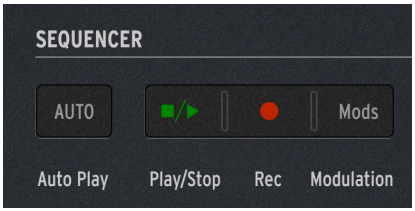
Drag the cursor over a range of notes to highlight them all. Then you can move or lengthen them by the same amount:



Selecting multiple notes for editing

5.3.2.7. Real-Time recording

Real-time recording is a handy alternative to drawing notes with the cursor. To do this, simply select **Rec** to arm recording, and then hit **Play/Stop** to start the sequence looping:



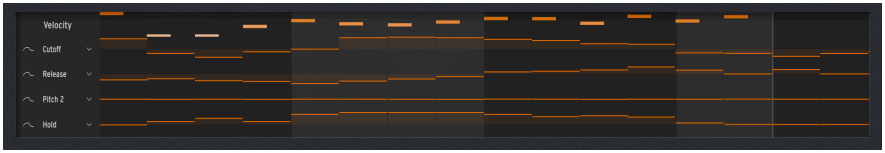
Real-time recording controls

Then you can simply play in your notes and chords to be captured by the Sequencer, overdubbing new notes with each cycle. After you're done, you can hit the Play/Stop button and edit any wrong notes to taste.

> If you're having trouble getting notes in place precisely, try recording at a very slow tempo.

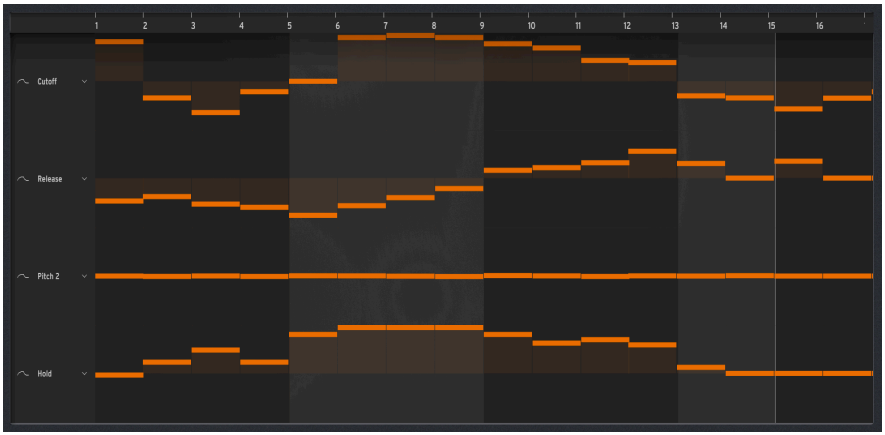
5.3.3. Modulation sequencing

The **Modulation Window** allows you to automate four parameters of your choice, as well as directly edit note velocities. It is always visible in a narrow window at the bottom of the Sequencer Panel:



The Modulation Window at the bottom of the Sequencer Panel

However, if you click the **Modulation** button in the Sequencer Controls [p.108], a larger and easier-to-edit Modulation Window replaces the Note Window [p.108]:



The Modulation Window taking over the center of the Sequencer Panel

Up to four parameters can be automated in *modulation lanes*, each one setting a particular parameter value for each step in the sequence. You can automate filter sweeps, change envelope stage values, add subtle (or drastic) pitch shifts, change FX [p.52] parameters, and much more.

5.3.3.1. Choosing a modulation destination

Each modulation lane is represented as a set of vertical sliders, one per step. To the left is the name of the modulation destination for that lane.

To assign a modulation destination to a lane, you can click or right-click on the destination name.

Clicking the name takes you to the Home Panel [p.19], with available destinations highlighted in orange and the currently selected one (if any) in red. Click the desired destination to set it.

Select a Mod lane destination here (Cutoff is currently selected)

Right-clicking the name pops up a complete list of available modulation destinations (including None):

Modulation destination pop-up menu

Since more than one lane can't be assigned to a single destination, already-used options are greyed out in the pop-up.

5.3.3.2. Setting and smoothing modulation values

To set the value for each step, simply click the slider and move it up or down to the appropriate value. Double clicking a slider returns it to zero.

Right-click and drag the slider for finer control of the value; in the case of Pitch modulation, values under 1 semitone can be set to within 1 cent.

Clicking and dragging the cursor horizontally sets the values of several sliders in a row – sort of a rough drawing of an automation curve.

Setting a modulation lane value with the cursor. Note curve smoothing icons at left.

To the left of the lane destination name is a small icon that looks like a waveform curve. Click this icon (the curve will light up, as shown in the top lane in the image above) to smooth the transitions between stepped modulation values; click again to turn smoothing off – the curve will turn dark, as shown in the bottom lane in the image above.

5.3.3.3. Velocity editing

When shown at the bottom of the Sequencer Panel, the Modulation Window has five modulation lanes, the top one being Velocity editing. Setting note velocities is done the same way as with the four Modulation lanes described above.

If there are multiple notes in one step, you will find it easier to adjust their velocities one at a time directly in the Note Window [p.110] by click-dragging each note's top edge with the up/down arrow cursor tool.

6. THE TOOLBARS

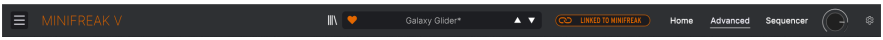
This chapter (and the next [p.124]) cover the user interface elements of MiniFreak V that surround the Home Panel. They contain general controls that will be familiar if you use other Arturia software, and others unique to MiniFreak V.

They include:

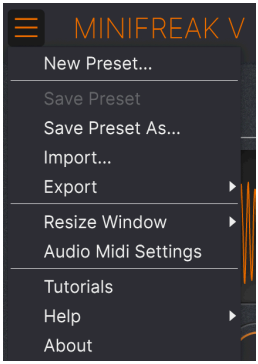
- The Upper Toolbar, including
  - the Main Menu [p.115] and
  - the Preset Browser [p.138];
- The Side Panel [p.124]; and
- The Lower Toolbar [p.121].

6.1. Upper Toolbar

Let's start with the Upper Toolbar, covering its functions from left to right.



6.1.1. The Main Menu



Clicking the "hamburger" icon (three horizontal lines) in the top left corner of the upper toolbar opens the Main Menu, a drop-down menu that lets you access a number of useful functions related to Preset management and more.

6.1.1.1. New Preset

Creates a new Default Preset with initialized settings for all parameters.

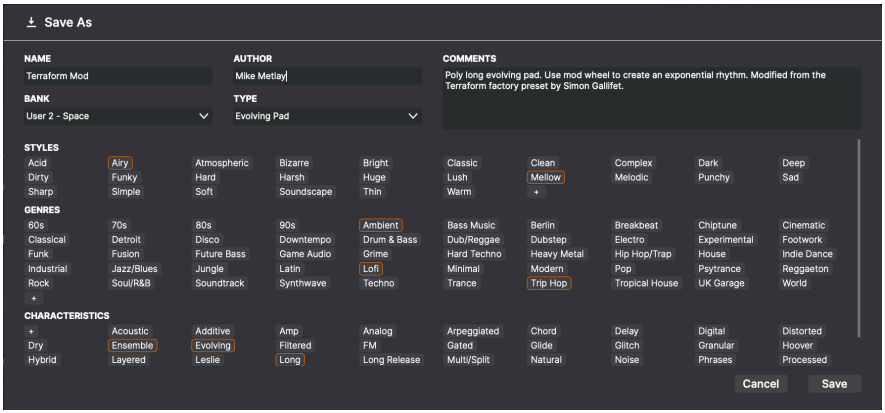
> NOTE: You can also load a new Default Preset by selecting it in the Preset Browser [p.138]. You'll find it in the Templates Type pop-up.

6.1.1.2. Save Preset

Overwrites the current Preset with any changes you have made. This applies only to user presets, so this option is greyed out for factory presets. For example, you don't have to worry about messing up the Default preset.

6.1.1.3. Save Preset As...

Saves the current settings of MiniFreak V under a new Preset name. Clicking this option reveals a window where you can name your Preset and enter more detailed information about it, including detailed Comments about it.



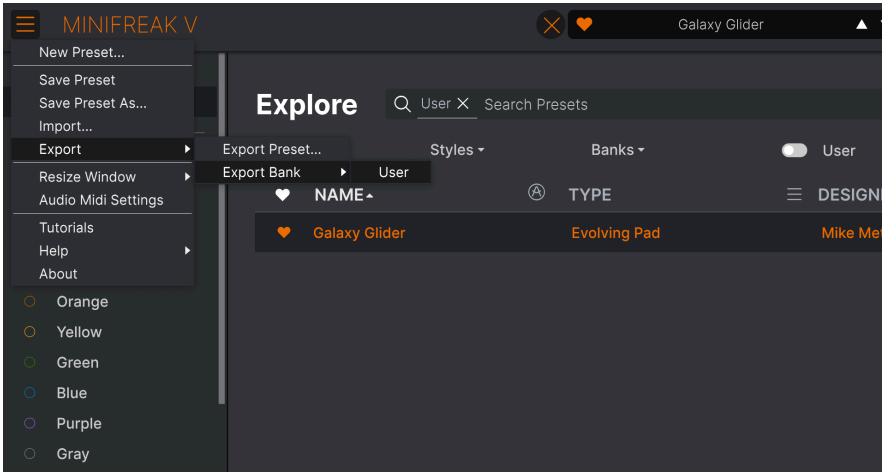
> NOTE: The Bank, Author, and Type fields are all useful when searching for Presets in the Preset Browser [p.138]. In addition, the Style and Characteristic tags are read and filtered by the Preset Browser during searches. When in doubt, add more tags; having too few might mean your Preset isn't selected during a relevant search.

6.1.1.4. Import...

This command lets you import a Preset file or entire Bank stored on your computer. It opens a navigation window in your computer's OS to find the proper files.

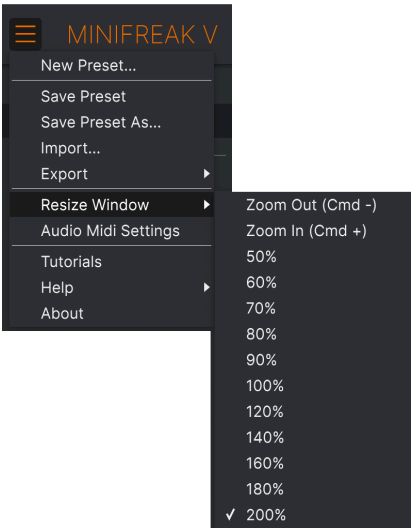
6.1.1.5. Export...

You can export Presets to your computer in two ways – as a single Preset, or as a Bank. In either case, an OS-level navigation window lets you specify where to save the file(s).



- **Export Preset...**: Exporting a single Preset is handy for sharing a preset with someone else. The saved preset can be reloaded using the **Import...** menu option.
- **Export Bank**: This option exports an entire Bank of Presets, which is useful for backing up or sharing many Presets at once. Saved Banks can be reloaded using the **Import...** menu option.

6.1.1.6. Resize Window



MiniFreak V can be resized from 50% to 200% of its default size (100%) without any visual artifacts. On a smaller screen, such as a laptop, you may want to reduce the interface size so it doesn't dominate the display. On a larger screen or a second monitor, you can increase the size to get a better view of the controls and graphics.

This operation can also be performed using keyboard shortcuts: every time you press CTRL- (Windows) or CMD- (macOS), the window will shrink by one size increment, and every time you press CTRL+ (Windows) or CMD+ (macOS), the window will grow by one size increment.

6.1.1.7. Audio Midi Settings [standalone only]

This opens the Audio Midi Settings [p.15] pop-up, where the standalone version of MiniFreak V can have its audio routing, MIDI control, etc., specified.

6.1.1.8. Tutorials

Takes you directly to the Tutorials in the Side Panel [p.124].

6.1.1.9. Help

Get more help by visiting links to this user manual and Frequently Asked Questions pages on Arturia's website. You will need an internet connection to access these pages.

6.1.1.10. About

Here you can view the software version and developer credits. Click again anywhere on the screen (outside the About window but inside the plug-in) to make this pop-up window disappear.

6.1.2. Preset Browser Access and Name Pane

The Preset Pane

The Preset Browser [p.138] offers a variety of ways to browse, sort, and organize Presets in MiniFreak V.

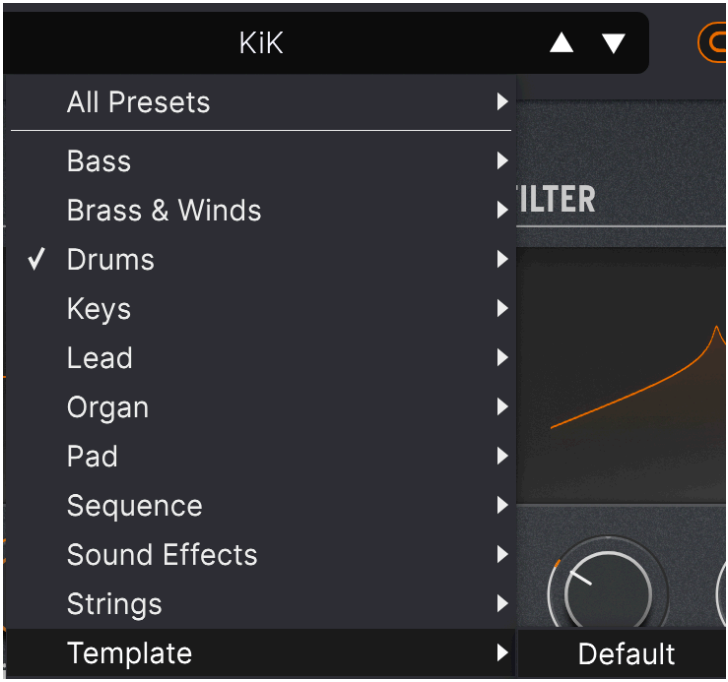
A few of its most commonly needed features are available directly from the Upper Toolbar:

- Clicking the "books on a shelf" button opens the full Preset Browser.

NOTE: You can also toggle between the main panel and the Preset Browser by pressing the Enter or Return key.

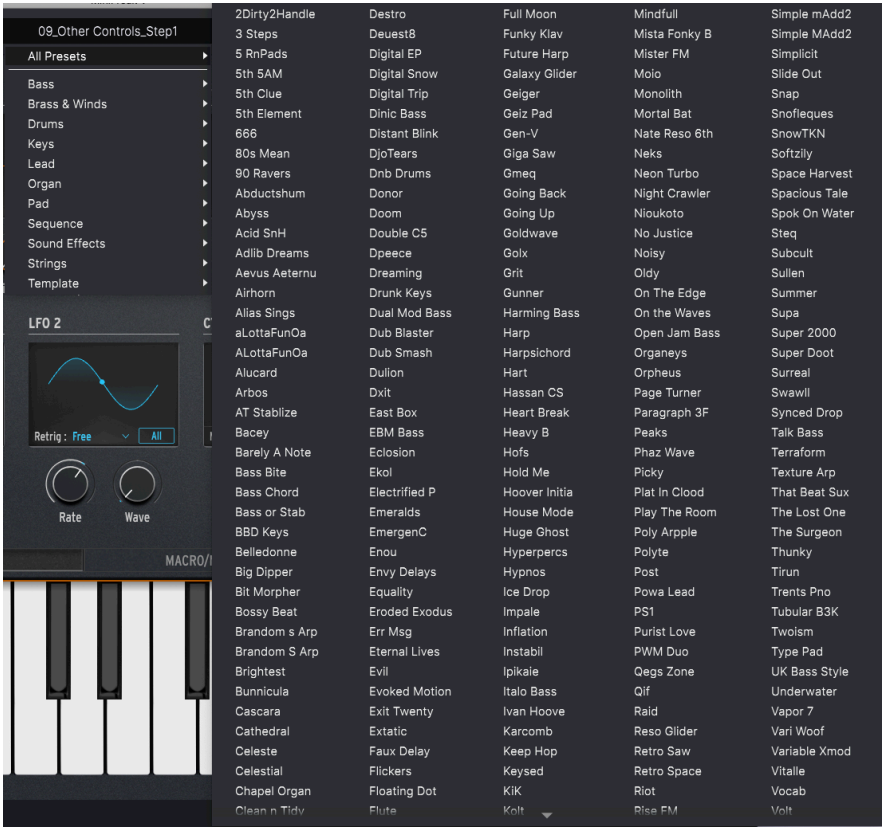
- The **Like** button has a heart icon; just click it to instantly mark the current preset as a Liked Preset for easy access later. (Liked Presets are one of several ways in which you can group and access Presets.)

- The **Preset Name** is listed next in the toolbar. If an asterisk (*) appears next to the Preset Name, it means that the settings of MiniFreak V have been changed so the sound no longer matches the saved Preset. It's a reminder to save the edited version if you like it, overwriting the original (**Save**) or with a new name (**Save As...**).



Selecting Template from the drop-down menu shows the one Template Preset: Default.

Clicking on the Preset name also opens up the **Quick Browser**, a set of drop-down menus for selecting Presets without entering the full Preset Browser. You can select to look at lists of Presets organized by Type, as shown above, or look at All Presets at once, as shown below:



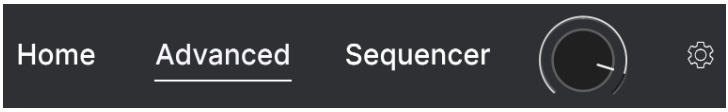
Everything all at once! The window scrolls to show undisplayed presets.

Everything you'll need to know about managing Presets will be covered in detail in the chapter on the Preset Browser [p.138].

- The **Arrow Icons** select the previous or next preset in the filtered list. This is the same as clicking on the Preset Name and selecting the next option in the list, but does it with only one click.

NOTE: The Previous and Next arrows can be MIDI mapped. This means you can use buttons on your MIDI controller to easily step through the available presets without having to use the mouse at all.

6.1.3. Home, Advanced, and Sequencer Buttons

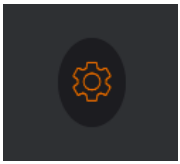


Near the upper right corner of the top toolbar are the **Home**, **Advanced**, and **Sequencer** button. The Home Panel [p.19] shows the basic front panel controls of MiniFreak V. Pressing Advanced widens the Home Panel to display Advanced functions [p.66]. Pressing Sequencer opens the Sequencer Panel [p.103].

6.1.4. Preset Volume

The Preset Volume knob allows you to adjust the overall volume of a completed Preset to align better with the volumes of other Presets, or with the requirements of a particular song or mix, and then store this offset as part of the Preset. It has a range of -12 dB to +6 dB.

6.2. Side Panel Access



Click the gear icon to open the Side Panel

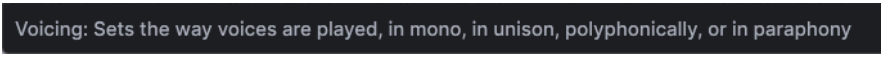
The last control on the Upper Toolbar is a gear icon that opens the Side Panel [p.124], which has three tabs containing detailed setup functions. They get their own chapter elsewhere in this manual.

6.3. The Lower Toolbar

The Lower Toolbar, showing all functions

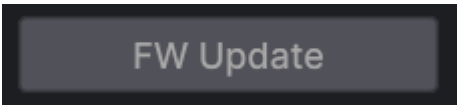
6.3.1. Control Description

On the left side of the Lower Toolbar, Control Descriptions appear and tell you what any knob, button, icon, or other control does, simply by hovering your mouse over it:

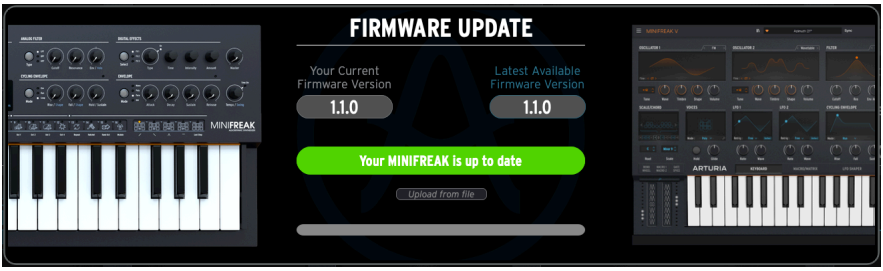


This Control Description pops up when you mouse over the Voices Mode dropdown button in the Advanced Functions

6.3.2. FW Update



The **FW Update** button opens this pop-up window:

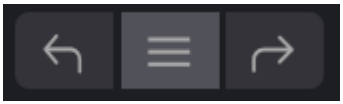


Firmware Update pop-up window

This window shows your MiniFreak's current firmware version, the latest one available from Arturia, and gives you the option to update the firmware directly from Arturia or from a file you've previously downloaded.

> NOTE: This button won't do anything if a hardware MiniFreak isn't physically connected to the computer running MiniFreak V and turned on. It does *not* require that the Link button in the Upper Toolbar be active.

6.3.3. Undo, History, and Redo



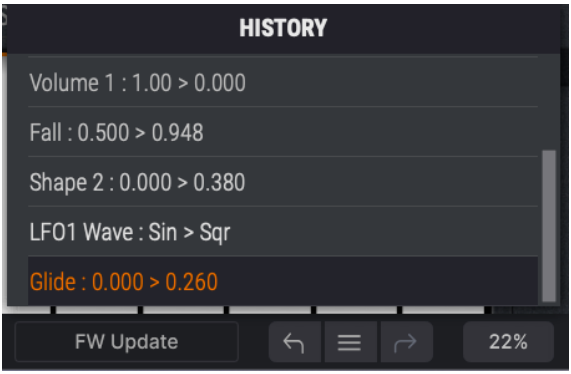
When editing a plug-in, it's all too easy to overshoot a sweet spot and then wonder how to get back to where you were. Like all Arturia plug-ins, MiniFreak V offers comprehensive Undo, Redo, and History so that you always have a trail of "bread crumbs."

Use the arrows to go back and forward one control movement or other action at a time.

Click the left **Undo** arrow to revert to the state before the most recent edit you made. You may click repeatedly to undo several edits in reverse order.

Click the right **Redo** arrow to redo the most recent edit you undid. If you have undone several, you may click repeatedly to redo them in forward order.

Click the "hamburger" (three lines) center button to open the **History** window, as shown here:



This provides a step-by-step list of every edit you have made in MiniFreak V. Clicking on an item in the list not only re-executes that edit – it returns the plug-in to the overall state it was in when you first made that edit.

6.3.4. CPU Meter and Panic button

At far right is the **CPU Meter**, which displays the overall load MiniFreak V is placing in your computer CPU as a percentage. Since it deals only with this plug-in, it is not a substitute for the overall CPU metering tools in your DAW.

Mousing over the CPU Meter accesses the PANIC function

Mouse over the CPU Meter, and it will display the word PANIC. Click to send an all-sounds-off command, just in case your Preset gets away from you and tries to blow your speakers (or just gets stuck droning one note).

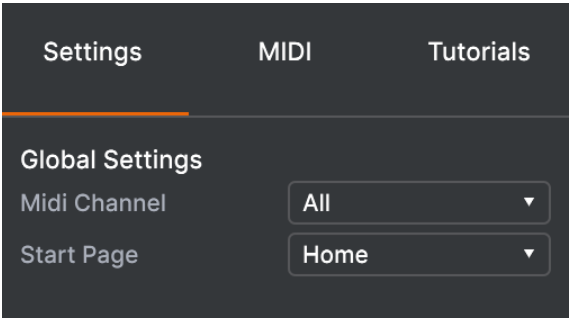
6.3.5. Maximize View Button

If you resize the MiniFreak V window larger and some of its parameters are pushed outside the viewable range of your computer display, you may see this icon in the far lower right corner of the window, just to the right of the CPU Meter:

Click it, and the window will resize and re-center to optimize your available screen space.

7. THE SIDE PANEL

Clicking the gear icon at the far right of the Upper Toolbar [p.115] opens the **Side Panel**, which contains a variety of global settings for MiniFreak V.



By and large, these aren't things you'll need to play with every time; generally, when you get them set up properly for your particular DAW and controllers, you won't need to change them until your configuration changes.

There are three tabs in the Side Panel:

- **Settings**: General system settings for how MiniFreak V works with the outside world
- **MIDI**: Controls for how MiniFreak V responds to MIDI input, including MIDI Learn
- **Tutorials**: walkthroughs of many MiniFreak V functions to help get you started and give you hints

Click on the name of the tab you want to access. When you're done, click the Upper Toolbar gear icon again to close the Side Panel.

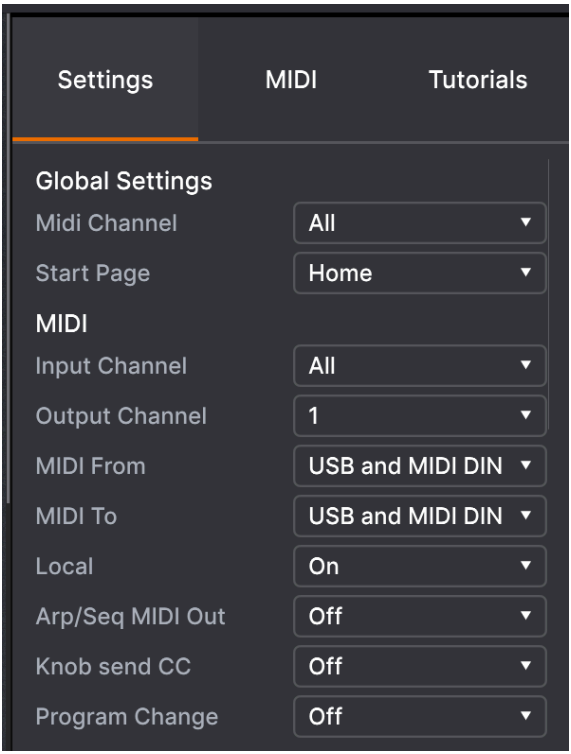
7.1. Settings

There are a lot of settings here, and you'll have to scroll the tab display up and down to see them all. They're organized by section, and each one has a drop-down menu when you click on it.

We'll go through these one by one, section by section, and explain their options as we go.

> NOTE: Aside from the Global Settings, all of these sections are relevant *only* to a MiniFreak hardware synthesizer connected to MiniFreak V. They give you an easy way to change the synth's deeper settings without having to use the **Sound Edit** or **Utility** menus.

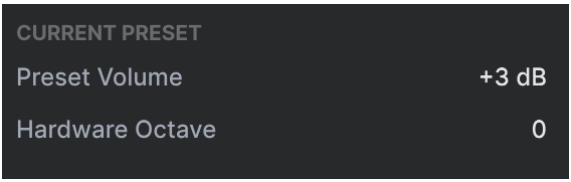
7.1.1. Global Settings



Side Panel Settings: Global Settings and MIDI

- **MIDI Channel:** selects the Global MIDI channel(s) on which the standalone version of MiniFreak V will receive MIDI input. You can select a particular MIDI channel from 1-16, or choose "All" for Omni Mode.
- **Start Page**: selects which page view will appear when you open MiniFreak V. You can choose **Home** or **Advanced**.

7.1.2. Current Preset

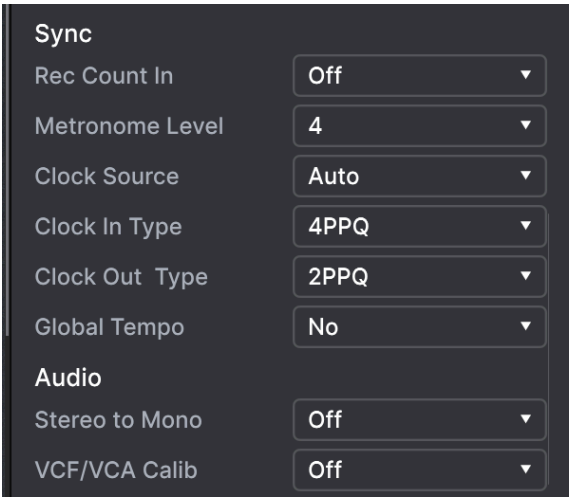


- **Preset Volume**: sets the volume for the preset.
- **Hardware Transposition**: allows you to set the preset transposition to be recalled on the hardware unit.

7.1.3. MIDI

- **Input Channel**: selects the MIDI channel(s) on which the MiniFreak keyboard will receive MIDI input. You can select a particular MIDI channel from 1-16, or choose "All" for Omni Mode.
- **Output Channel**: selects the MIDI channel from 1-16 on which the MiniFreak keyboard will send MIDI data.
- **MIDI From** and **MIDI To**: designate which MIDI connections on the MiniFreak keyboard will be used for its MIDI output and input. The choices are: None, USB Only, MIDI DIN Only, or USB and MIDI DIN.
- **Local**: turns Local Control on/off. When Local Control is on, the MiniFreak's keyboard controls its sound engine; when Local Control is off, the MiniFreak's keyboard only sends messages out via MIDI and the engine can only be controlled by external MIDI. This turns the MiniFreak into a keyboard MIDI controller and a MIDI sound module that are not internally connected.
- **Arp/Seq MIDI Out**: when turned on, MIDI notes and other data from the MiniFreak's arpeggiator and sequencer will be sent to other plug-ins or hardware synths connected to it.
- **Knob Send CC**: when turned on, moving knobs or other controls on a MiniFreak keyboard will send MIDI Control Change messages.
- **Program Change**: when turned on, changing a Preset on a MiniFreak keyboard will send a MIDI Program Change message, and MIDI Program Change messages received by MiniFreak will change the current Preset.

7.1.4. Sync



Side Panel Settings: Sync and Audio

- **Rec Count In**: lets you set a 1 Bar count in for the MiniFreak sequencer's Record function.
- **Metronome Level**: sets the volume of the Metronome sound at one of four possible volumes.
- **Clock Source**: chooses the MiniFreak's clock source for sync: Internal, USB, MIDI, the MiniFreak's Clock In Jack, or Auto (which finds and sets the source depending on what is being input to your DAW).
- **Clock In Type** and **Clock Out Type**: sets the number of Pulses Per Quarter note (PPQ) sent out by the MiniFreak's Clock Out jack. Options include 4PPQ, 2PPQ, 24PPQ, and 48PPQ.

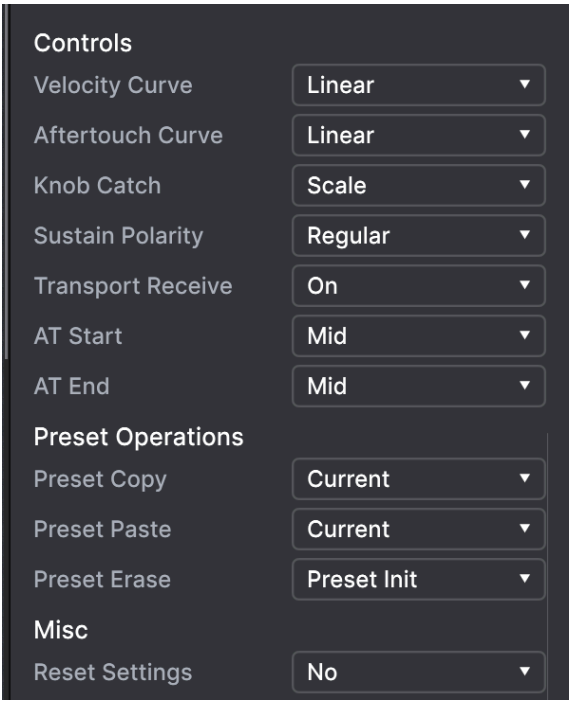
> If you're new to working with analog clock signals, there are online resources that can help you along. There's a whole history of how these signals were developed and for what applications!

- **Global Tempo**: determines whether a globally-set Tempo will be in effect for all Presets. The options are: Yes, No, and When Paused, so there's a steady tempo source when the hardware's sequencer isn't running.

7.1.5. Audio

- **Stereo to Mono**: converts the synth's output to mono.
- **VCF/VCA Calib**: runs a variety of calibration routines on the analog hardware in a connected MiniFreak. These include: Calibrate Analog (all analog elements), Resonance minimum and maximum, Calibrate Cutoff, VCA minimum and maximum, VCA offset, and VCA offset reset.

7.1.6. Controls



Side Panel Settings: Controls, Preset Operations, Misc

- **Velocity Curve**: sets the curve for how the MiniFreak responds to velocity on its own keyboard and to MIDI Velocity messages. There are three settings:
    - **Linear**: an even response from minimum to maximum velocity.
    - **Logarithmic**: more sensitivity at lower velocities, with a smoother and slower change between higher velocities.
    - **Exponential**: relatively little sensitivity at lower velocities, with more dynamic variation at higher velocities.
- **Aftertouch Curve**: sets the curve for how the MiniFreak responds to aftertouch on its own keyboard and to MIDI Aftertouch (Channel Pressure) messages. The options are Linear, Log, and Expo, as explained above.
- **Knob Catch**: determines how a parameter setting on a knob will react when the physical knob on the MiniFreak isn't set to the same value as what's currently set in the sound engine. There are three possible behaviors:
    - **Jump**: the moment MiniFreak sees the control move, the software knob value jumps instantly to where the physical knob is.
    - **Hook**: MiniFreak's parameter value won't change until the physical knob passes that value and "hooks" it to follow along.
    - **Scale**: MiniFreak calculates the difference between the physical and software knob settings, and as the physical knob is turned, it gradually scales the software knob value until the two match up.

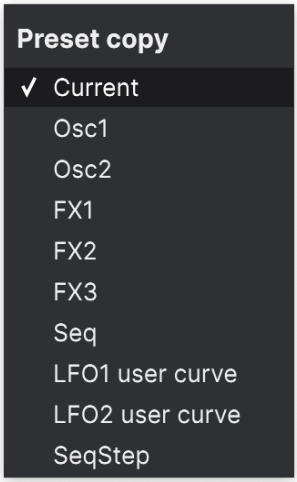
- **Sustain Polarity**: sets whether a connected MiniFreak's sustain pedal is a normally open or normally closed switch. Change the setting if notes you play sustain when you're not holding down the pedal, and don't when you are.

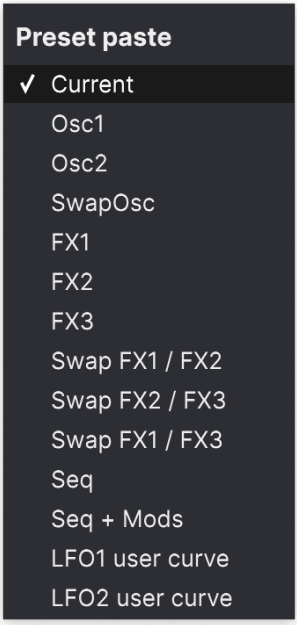
- **Transport Receive**: sets whether or not the MiniFreak's arpeggiator and sequencer respond to MIDI Transport commands (Start, Stop, Pause, etc.) from outside the synth.

- **AT Start** and **AT End**: sets the sensitivity for when pressure on a key starts to send aftertouch data, and for how much pressure is needed to max out the MIDI value being sent. This lets you control how heavily you can play without activating aftertouch, and how much pressure beyond that will send the maximum value, with the sensitivity in between controlled by the Aftertouch Curve setting. Options are Low, Mid, and High.

7.1.7. Preset Operations

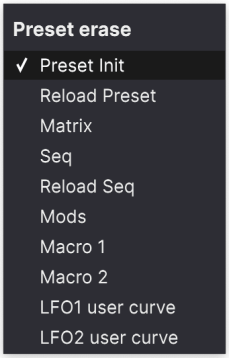
- **Preset Copy** and **Preset Paste**: Allow you to copy, paste, and swap subsections of the current MiniFreak Preset to a different Preset, or between two parts of the same Preset (for example, to move an LFO Shaper Wave from LFO 1 to LFO 2). The pop-up menus of available options looks like this:





These functions are great timesavers when programming the MiniFreak, and like other settings on this menu, using MiniFreak V to perform them makes the process even faster.

- **Preset Erase**: allows you to initialize an entire Preset back to the Init Preset, or erase certain sections of the current Preset, such as Macros, LFO Shaper Waves, the Modulation Matrix, etc. The pop-up menu of available options looks like this:



Preset Erase options

7.1.8. Misc

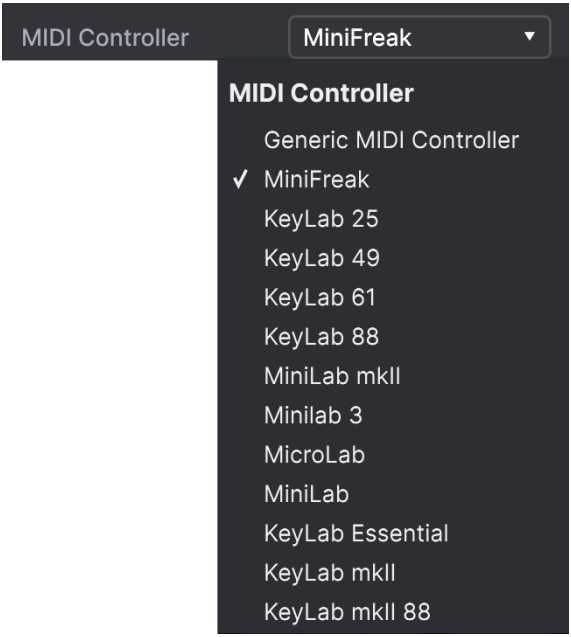
- **Reset Settings**: remotely triggers a hard reset of a connected MiniFreak synthesizer.

7.2. MIDI

The MIDI tab configures how MiniFreak V works with MIDI messages from and to a connected MIDI synthesizer or controller.

Side Panel MIDI tab

MIDI Controller: selects the controller you're using with MiniFreak V from this drop-down menu:



MIDI Controller options

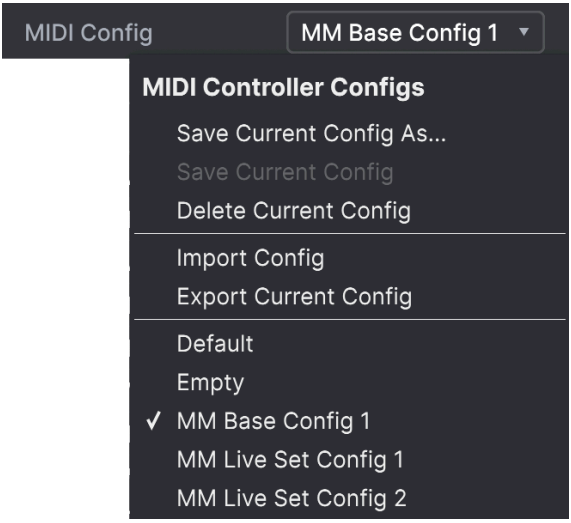
You can select a particular Arturia controller that MiniFreak V will immediately recognize, or a Generic MIDI controller that you can configure by hand.

> Naturally the MiniFreak will give the tightest control integration, as MiniFreak V is designed to perfectly mirror its functions.

MIDI Config: a drop-down menu for working with the MIDI Configurations created with the MIDI Learn function (see below).

This is a quick way to set up different hardware MIDI keyboards or controllers with MiniFreak V, without having to build all the assignments from scratch each time you swap hardware.

For example, if you have multiple hardware controllers (small live keyboard, large studio keyboard, pad controller, etc.), you can create a MIDI Configuration for each of them, save them, and then quickly load them here. This saves you from having to redo the MIDI mapping assignments from scratch each time you swap hardware.



MIDI Controller options

Options include:

- **Save Current Config As...**: saves the current MIDI Configuration with a name you set.
- **Save Current Config**: saves the current MIDI Configuration, overwriting what was saved before.
- **Delete Current Config**: deletes the current MIDI Configuration.
- **Import Config**: opens an OS-level browser to import a saved or shared .mnfxmidi file into MiniFreak V.
- **Export Current Config**: opens an OS-level browser to export the current MIDI Configuration to your computer as a .mnfxmidi file to archive or share.
- **Default**: loads a default MIDI Configuration as shown in the MIDI Tab [p.126] image.
- **Empty**: clears the current MIDI Configuration to give you a blank slate.

At the bottom of the drop-down, there's a list of your saved MIDI Configurations, which you can recall for immediate use.

7.2.1. MIDI Learn

In MIDI Learn mode, all MIDI-assignable parameters on the main panel are highlighted and you can map physical controls on your MIDI controller to them. A typical example might be to map a real expression pedal to the Master Volume control, or a physical knob on the MIDI controller to the Frequency knob of the Filter section.

Click the **Learn** button to activate (or deactivate) MIDI Learn mode. Controls on MiniFreak V's front panel will immediately be highlighted.

Controls available for assignment are purple. Controls that are already assigned are red, but can be reassigned if desired.

The screenshot below shows the assigned and unassigned controls for MiniFreak V's Default configuration:

When MIDI Learn is active, available parameters are purple and already-assigned parameters are red.

Click any purple control and its name will appear in the list. Now, move a control or operate a switch on your MIDI controller. The corresponding control onscreen will turn red and the assigned MIDI CC number will appear in the list to the left of the parameter name.

To unassign a control onscreen, control-click or right-click it. Alternative methods of assignment are described below.

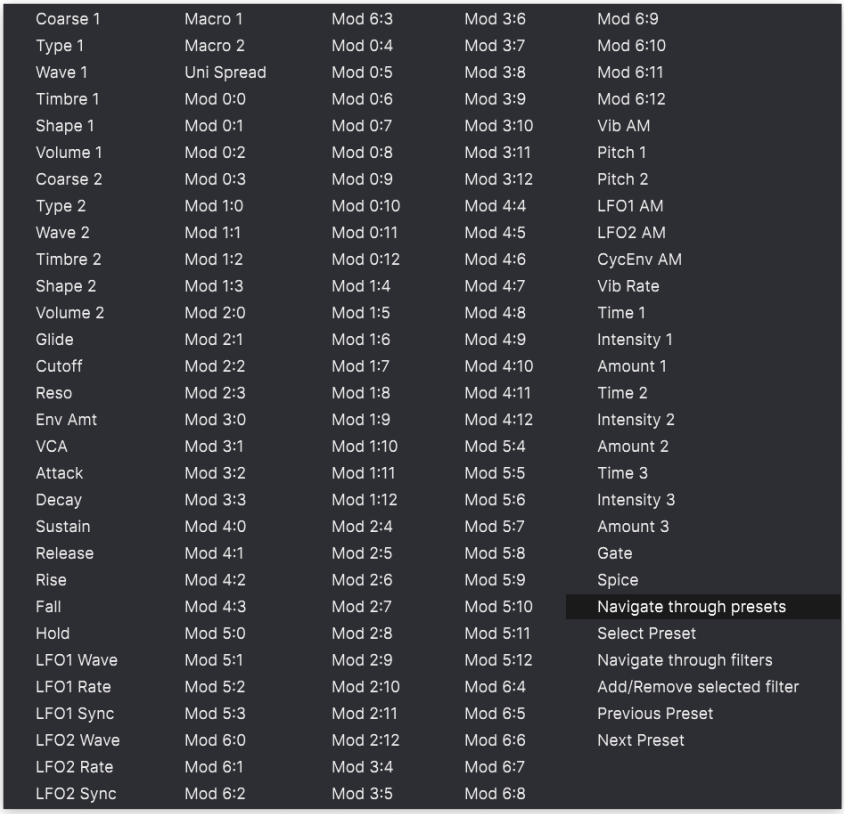
7.2.2. MIDI Configuration options

The **Min** and **Max** value columns for each Control in the list let you scale the amount by which a parameter in MiniFreak V changes in response to a physical control movement. For example, you may wish to limit the range of a filter sweep, even though you're probably going to turn the knob all the way during a live performance.

Drag up or down on a value to change it. Parameter values are expressed as numbers from 0.00 to 100. Setting the maximum lower than the minimum reverses the polarity of the physical controller; i.e. turning it *up* will turn the assigned parameter *down*.

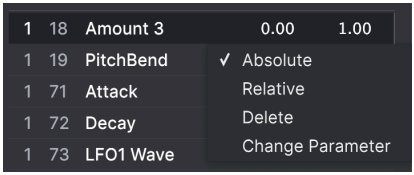
Switches that only have two positions (On/Off, etc.) would normally be assigned to buttons on your controller, but it's possible to toggle those with a fader or another control if you like.

The **Add Control** button at the bottom of the MIDI Tab lets you create a new Control by hand. Clicking on it opens a large pop-up menu with every possible parameter that can be controlled via MIDI, including some useful ones not found on the front panel (e.g. Navigate Through Presets).



All parameters available for MIDI Learn are shown in the Add Control pop-up.

Control-clicking or right-clicking on any item in the list of assigned Controls pops up a menu with the following options, which can be different for each Control.



Right-clicking a Control gives you these options.

- **Absolute:** The assigned parameter in MiniFreak V tracks the literal value your physical controller is sending out.
- **Relative:** The assigned parameter in MiniFreak V will go up or down from its current value in response to physical controller movements. This is often useful when using endless 360-degree encoders that don't have physical motion limits.
- **Delete:** Removes the assignment and turns the corresponding onscreen control purple again.
- **Change Parameter:** Pops up a menu of every assignable parameter in MiniFreak V. This lets you change the assignment of the current CC/physical control manually, and is useful when you know exactly the destination you're looking for.

> This pop-up is identical to the one seen when using **Add Control**.

7.2.3. Macro Controls

Additionally to the 2 originally available Macros, the MiniFreak V 2.0 introduces the standard 4 Macro controls found on all our software instruments. These can be assigned from the side panel, in the Macro section.

By default the last two Macros are assigned to the original ones from the main panel, the other two are dedicated to Brightness and Timbre.

You can edit their assignations from this section, as well as remove the default routings from any given preset.

To assign a Macro, click on the one of 4.

Enter the learn mode.

Select the parameter from the Main panel of the MiniFreak and click on it.

Once paired you can edit the range of the Macro over the destination from the lower section of this menu.

To delete a routing simply right click on it from the listing and use the delete function.

The Macros are preset specific so ensure that you save your preset before moving on.

7.3. Tutorials Tab

This MiniFreak V tutorial introduces you to the virtual keyboard and Touch Strips.

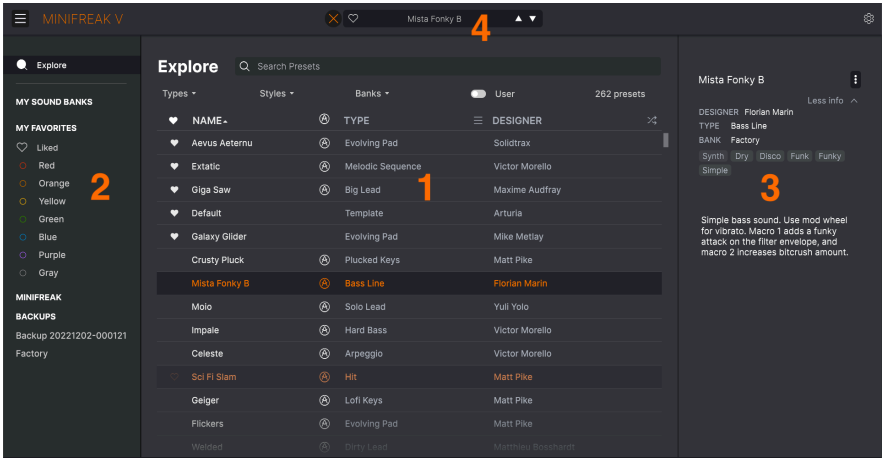
MiniFreak V comes with interactive tutorials that walk you through different features of the plug-in. Selecting this tab shows you a list of tutorials, detailing the plug-in's various sections. Select one to access step-by-step descriptions that highlight the relevant controls and walk you through the process. You'll also find short "101" sections explaining some basic principles.

If you're editing a Preset, make sure to save it before opening the Tutorials, because doing so will load a dedicated Tutorial Preset and overwrite your changes. The Tutorials also take over the Side Panel space when in use.

8. THE PRESET BROWSER

MiniFreak V lets you browse, search, and select Presets from a browser-like interface inside the plug-in. You can also create and save your own Presets in the User Bank. Of course, the state of any instance of the plug-in – including the current Preset – is automatically saved when you save your DAW project, so you can always pick up where you left off.

The Preset Browser has three main areas, as well as a section that is always visible in the Upper Toolbar [p.115]:



The full Preset Browser window

Number	Area	Description
1.	Explore [p.138]	Search Presets with text strings, and/or by tags for Type and Style.
2.	Sidebar [p.144]	Manage Banks, Backups, and MiniFreak hardware synth Presets.
3.	Preset Info [p.146]	Summary of Bank and Tags, Designer name, and descriptive info for the current Preset.
4.	Preset Name Pane [p.148]	Always-accessible quick selection of Presets filtered by Type.

To open the Preset Browser, click the Upper Toolbar icon that looks a bit like books on a shelf. It will be replaced by a large X (as shown in the image above), which you can click to close the Preset Browser when you're done.

8.1. Explore

Click on the Search field at the top and enter any search term. The browser will filter your search in two ways:

- It will look for text strings that match what you have typed, whether in the Preset Name, Type, or even the comments in the Preset Info [p.146].
- If the text you've typed suggests a particular **tag**, it will pop up as an option that you can click to select it.

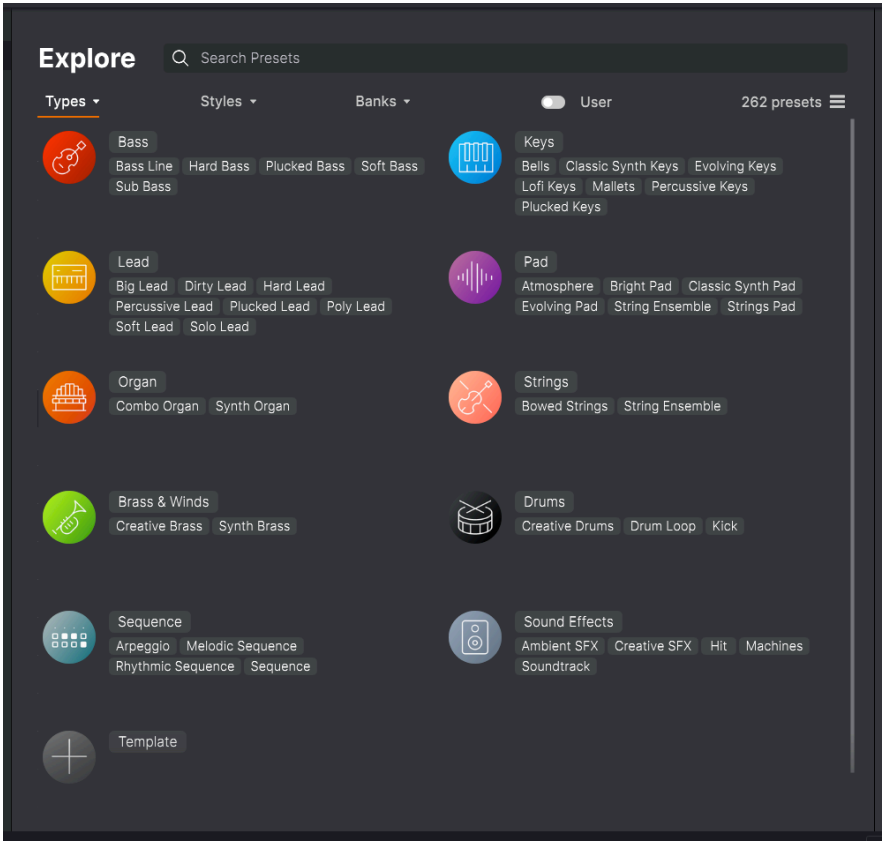
NOTE: The *more* criteria you add, the *narrower* your search becomes, because the Browser is trying to match *all* criteria.

8.1.1. Tags

Tags are labels that you can attach to the Presets you create, and which are already attached to Factory Presets. They allow you to quickly search for Presets based on certain qualities you may be looking for.

8.1.1.1. Type

Types are categories of instruments and musical roles: bass, leads, strings, pads, organs, and more. With a clear search bar, click the **Types** button to bring up a list of types. Notice that each type also has several subtypes:



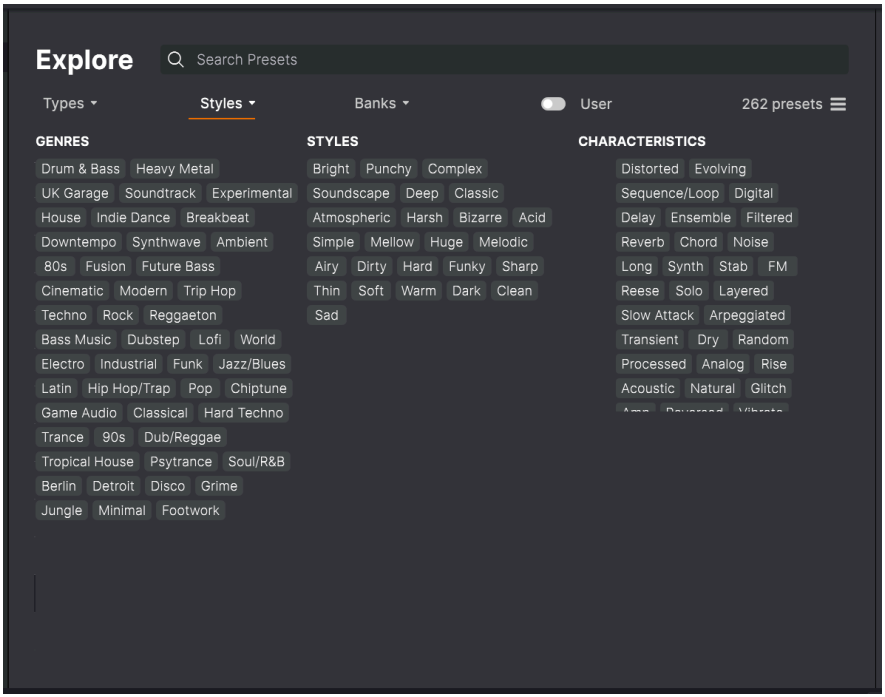
Click any one of them, and the results will show only Presets that match that tag. You can also select multiple Types using Cmd-click (macOS) or Ctrl-click (Windows). For example, if you aren't sure whether the Preset you're looking for was tagged with Keys or Pad, select both to broaden the search.

Note that adding Types in this way is the only way to make a search wider rather than narrower.

8.1.1.2. Style

Styles refine your search according to further musical attributes. Accessed by the **Styles** button, this area has three further subdivisions:

- *Genres*: Identifiable musical genres such as Latin, Trance, Techno, Synthwave, Disco, etc.
- *Styles*: General "vibe" such as Atmospheric, Dirty, Clean, Complex, Mellow, etc.
- *Characteristics*: Sonic attributes such as Analog, Evolving, Distorted, Dry, Rise, etc.

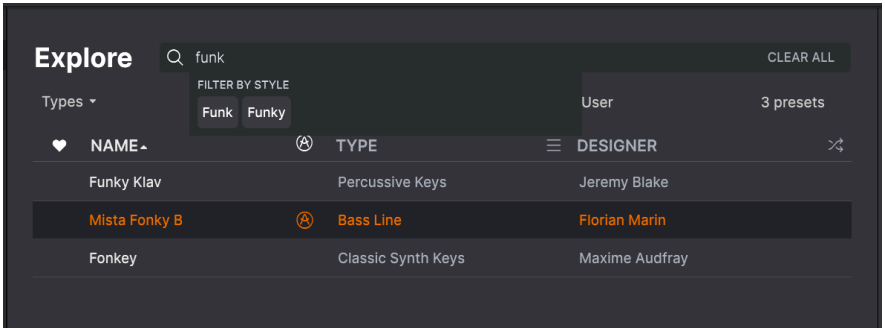


Click on any tag to select it. Click again (or right-click) on any selected tag to de-select it. Notice that when you select a tag, several other tags usually disappear. This is because the browser is narrowing your search by a process of elimination. De-select any tag to remove that criterion and widen the search without having to start all over again.

Click **CLEAR ALL** in the Search field to clear all of your tags and text to start over.

8.1.1.3. Example search: combining tags and text

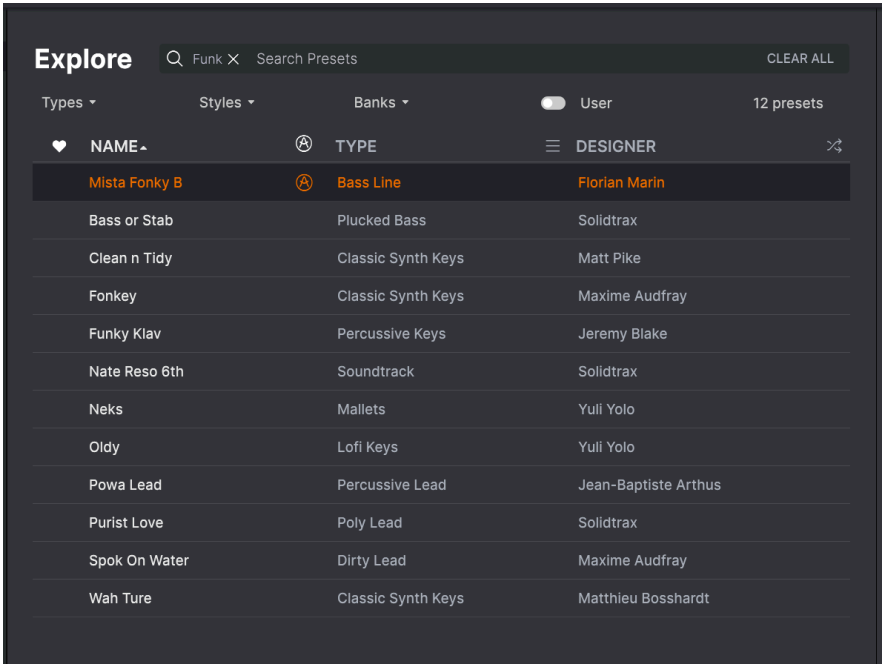
Here's an example of narrowing down a search. If you type "funk", the Browser does two things: it suggests patches that contain the letters *f-u-n-k*, but it also offers you the choice of clicking on a Tag of either **Funk** or **Funky**.



Search on the word funk

Notice that there are only three Presets that match the word "funk", because the text string itself appears in the Preset Name, Type, or Preset Info, perhaps as "funk", or as part of the word "funky" or "funkier".

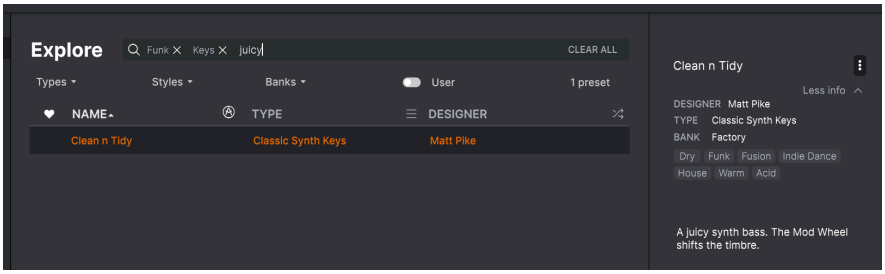
In this next example, instead of searching on the *word* "Funk", we click the **Funk** tag:



Search on the Funk tag

There are a lot more results this time, because many Presets have the **Funk** tag without having the word "funk" in their names or descriptions.

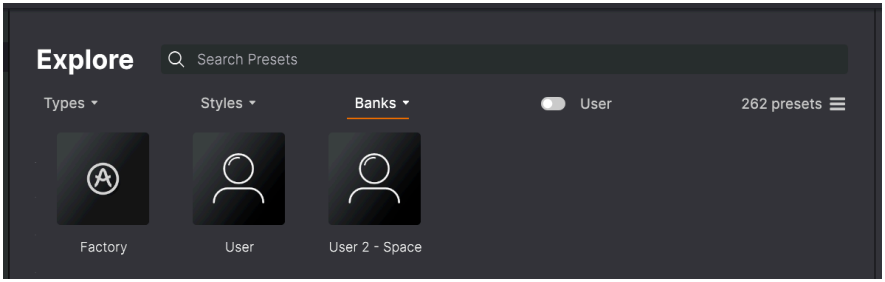
You can search on any number of Tags; each one has an X beside it that you can click to remove it. In this next example, you are looking for a funky keyboard sound and you think you remember the designer describing it as "juicy"... so you select the tags **Funk** and **Keys** and then add the word "juicy", and there's the Preset you wanted!



Search on the tags Funk AND Keys AND the word juicy

8.1.2. Banks

Next to the **Types** and **Styles** buttons is the **Banks** button, which lets you do your search (using all the methods above) within the factory bank or user banks. Just click on the Bank you want to search to add them to your list of search criteria.

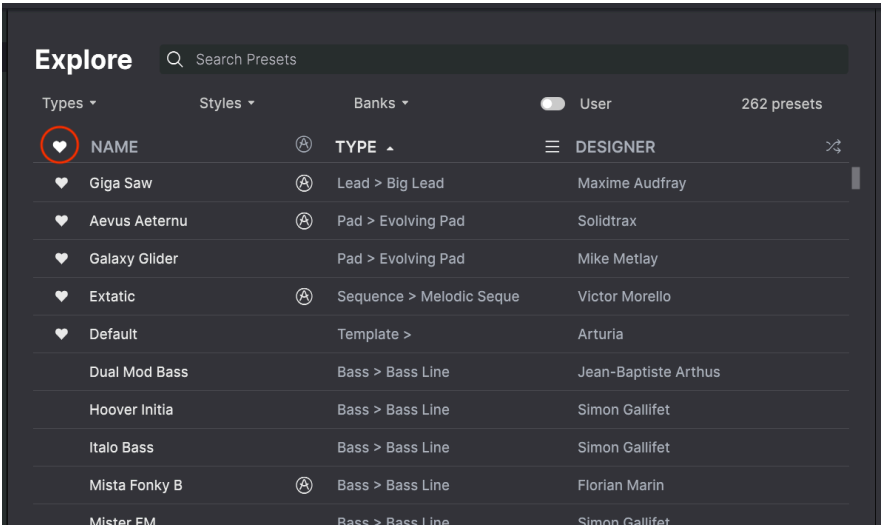


The **User** switch allows you to quickly look at only User Presets. To the right of that is the number of presets currently available with whatever search criteria you've set.

8.1.3. Liking Presets

As you explore and create Presets, you can mark them as Liked by clicking the **Like** (heart) icon next to their names, either in the Preset Browser or the Upper Toolbar's Preset Name Pane [p.148].

In the Explore panel, you can click on the heart icon (shown circled in red) to put all of your Liked Presets at the top of the Results list:



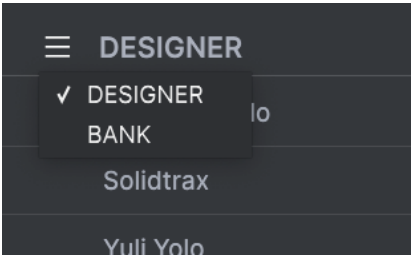
8.1.4. Sorting the Preset Order

Click the **NAME** header in first column of the Results list to sort Presets in ascending or descending alphabetical order.

Click the **TYPE** header in the second column to do the same thing by Type > Subtype.

Click the **Arturia logo** to the left of **TYPE** to bring factory-featured Presets to the top of the list. These will appear just under any Presets you have Liked [p.142].

The third column has two header options: **DESIGNER** and **BANK**. Click the icon with three lines to choose between the two. Then click either header name as with the other two columns to reverse the alphabetical order.



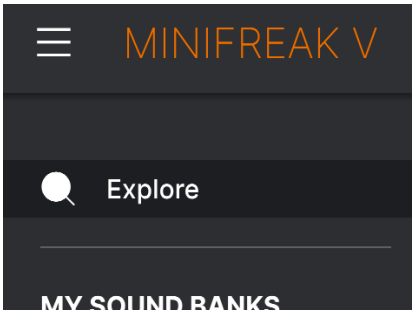
Last but not least, there's a **Shuffle** button to randomly rearrange the order of the Presets in the List.

Once you master the Search and list sorting features, you'll be able to find the Presets you want with ease.

8.2. Sidebar

The leftmost section of the Preset Browser determines what is displayed in the Explore section.

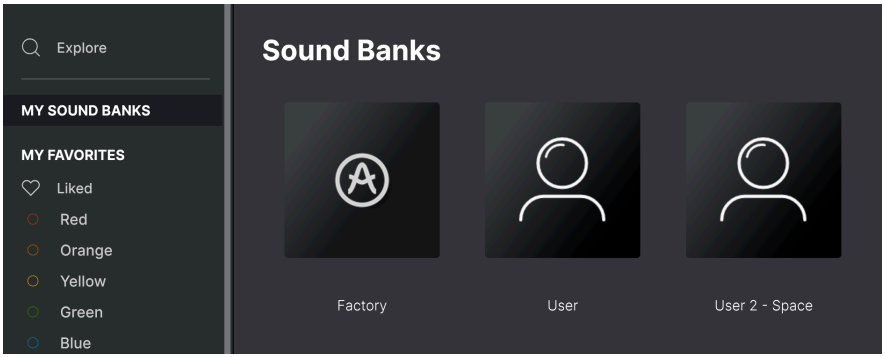
The topmost option is:



The **Explore** section is the default, letting you search the current bank of Presets loaded into MiniFreak V.

8.2.1. My Sound Banks

Clicking **MY SOUND BANKS** brings up a window with all of the currently available Sound Banks, starting with the Factory bank. User banks appear next to it, and can be deleted, renamed, or exported by right-clicking them.

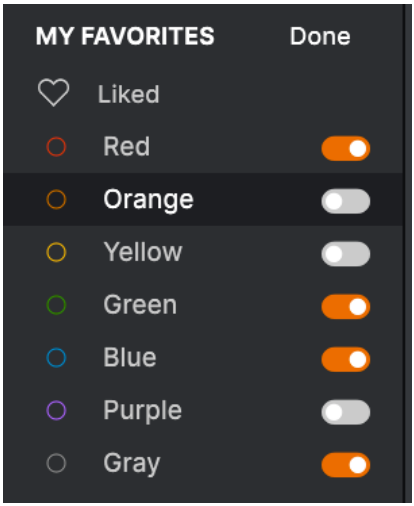


You can also export User Banks directly from the **SOUND BANKS** section, to do so, right click on a Bank you would like to export and use the Export as Bank feature.

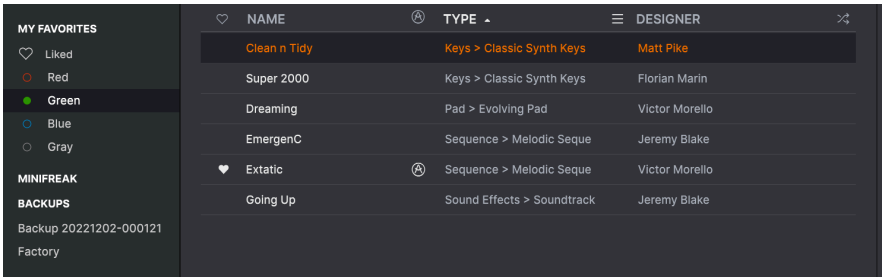
8.2.2. My Favorites

The middle part of the Sidebar has a menu called **MY FAVORITES**, which allows you to color-code certain groups of Presets for easy access. It also includes the **Liked** group, so you can quickly find Presets you've marked with the heart icon.

To decide which colors you'd like to display, hover over **MY FAVORITES** and click **Edit**. Then use the buttons to select which colors you'd like to see or hide, and then click **Done**.



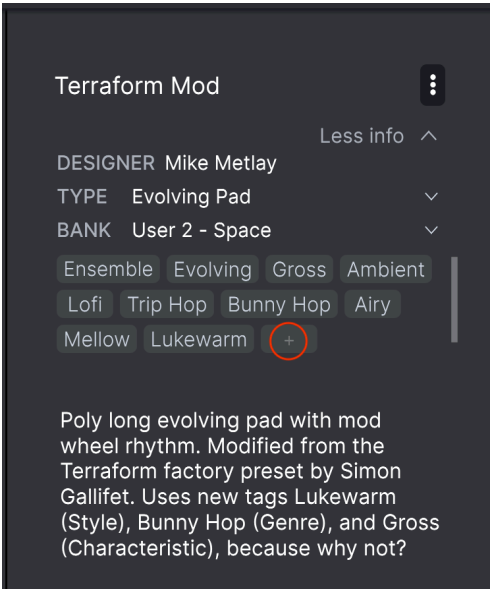
To add Presets to a particular set of Favorites, simply drag and drop them over the appropriate color. Then click on the color itself to display your grouping.



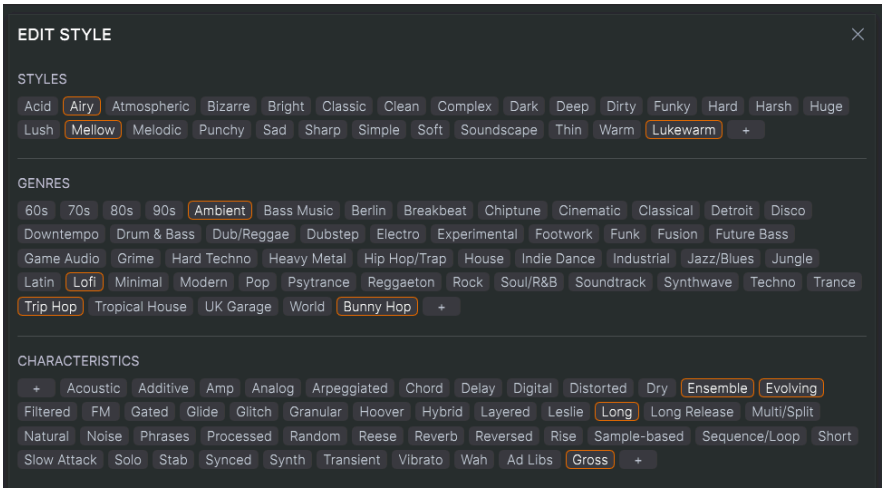
The last two Sidebar options, **MINIFREAK** and **BACKUPS**, are used in conjunction with a MiniFreak hardware synthesizer, and are discussed in the section on MiniFreak Preset Management [p.151] below.

8.3. Preset Info

The right side of the browser window shows specific information about each Preset. The information for User Presets (but not Factory ones) may be changed here: Name, Type, Favorite, etc.

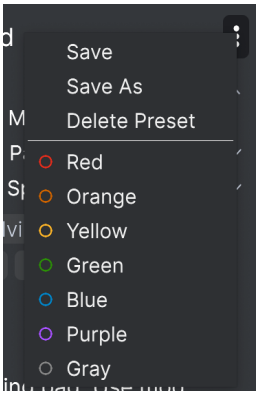


To make the desired changes, you can type in the text fields, use one of the pull-down menus to change the Bank or Type, and click the + sign (circled here in red) to add or delete Styles via the **Edit Style** pop-up:



Type and Style changes you make here are reflected in searches. For example, if you remove the **Funky** Style tag and then save that Preset, it will not show up in future searches for Funky sounds.

Clicking on the three-dots icon at the top right pops up a menu with organizational options for the Preset.



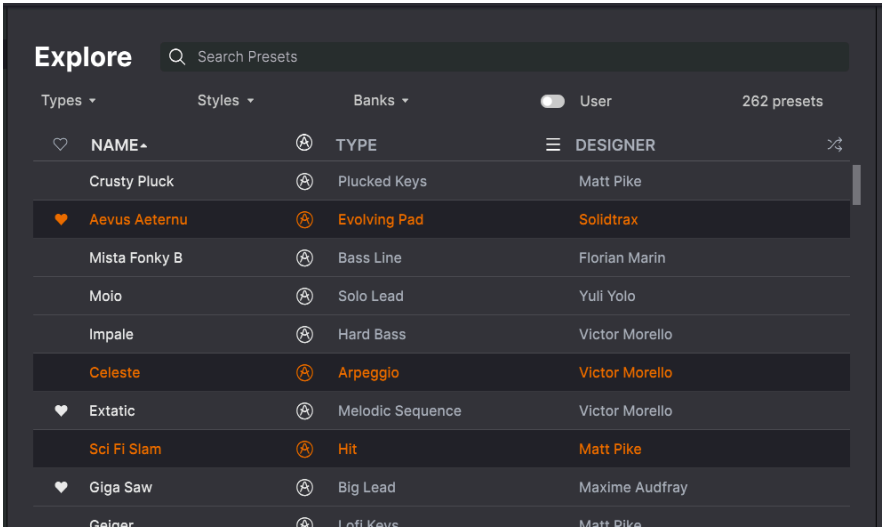
Options include **Save**, **Save As**, and **Delete Preset**. The lines with color icons allow you to add the Preset to a particular group of Favorites [p.145].

NOTE: If you want to alter the information for a Factory Preset you must first use the **Save Preset As...** command to re-save it as a User Preset.

Remember to use the **Save** option after editing the Preset Info. Otherwise you'll lose your edits, even if you haven't edited the Preset itself.

8.3.1. Editing Info for Multiple Presets

If you'd like to move several Presets to a different Bank while preparing for a performance, or enter a single comment for several Presets at the same time, it's easy to do. Simply hold Cmd (macOS) or CTRL (Windows) and click the names of the Presets you want to change in the Results list. Then enter the comments, change the Bank or Type, etc., and save the Presets. In this example, we've selected three Presets to work with:



8.4. Preset Name Pane

The Preset Name Pane in the Upper Toolbar [p.115] is always displayed, whether you're in the main controls view or the Preset Browser. It displays the name of the current Preset, obviously, but also offers further ways to browse and load Presets. Again, a filled-in heart icon indicates a liked Preset.

8.4.1. The Arrows

The up and down arrows to the right of the Preset name step serially through Presets. This is limited by the results of any currently active search, i.e. the arrows will only step through those Presets. Make sure any searches are cleared if you simply want to step through all available Presets until you find something you like.

> Remember that these arrows can be assigned to MIDI control for rapid scrolling without using the mouse. You can also scroll to a patch on the MiniFreak synthesizer and click the **Preset/Edit** encoder to load it onto both the hardware and into MiniFreak V. The patch name is shown in blue to indicate that it's been loaded from the hardware rather than the plug-in's own Preset library. You can save it to MiniFreak V in the usual way.

8.4.2. Store

You can now browse dedicated Sound Banks through the in-App store of the MiniFreak V as well as purchase and install them.

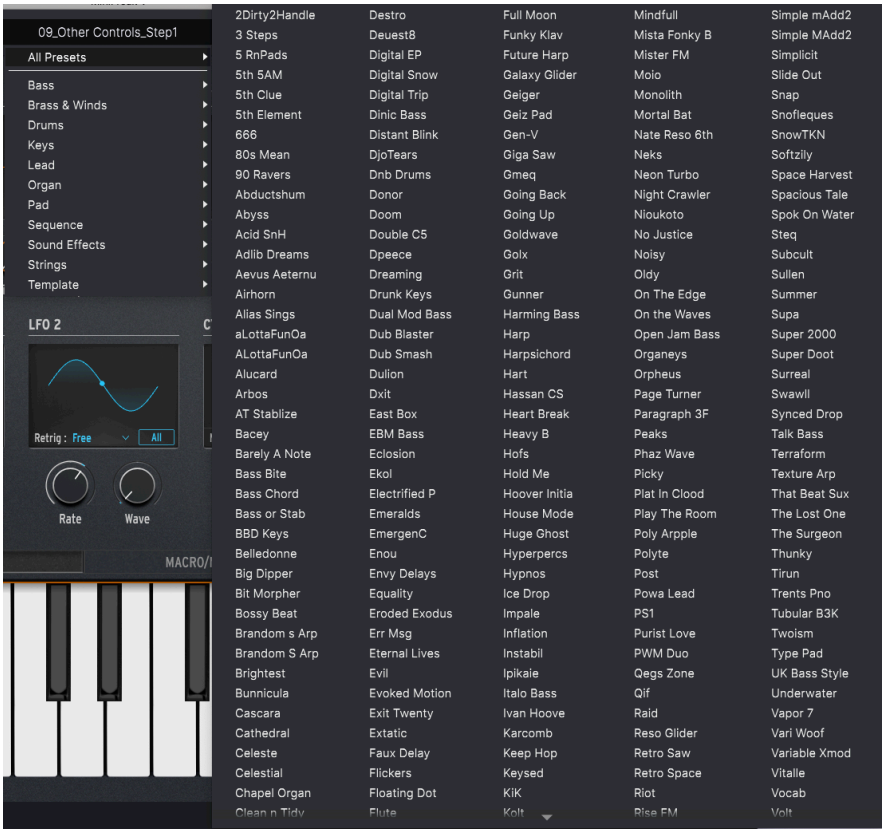
To access the Sound Store, click on the Store Icon on the right side of the preset browser view.

You can sort the Preset Banks by type, style and subtypes under each of the main categories.

Additionally once selected for purchase, the banks will be listed in the Cart section on the top right of the interface, next to the Master Volume Control.

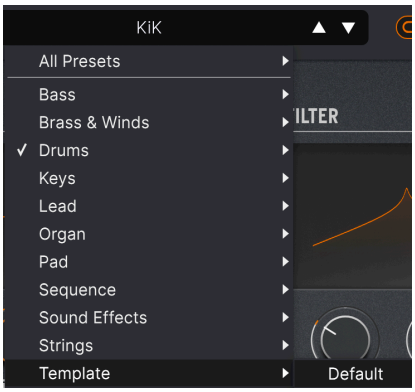
8.4.3. The Quick Browser

As mentioned in the Toolbars [p.115] chapter, you can click on the Preset name in the center of the Upper Toolbar to bring up a drop-down Quick Browser for Presets. The first option in this menu is called All Types, and it brings up a submenu of literally every Preset in the current Bank:



A full list of Presets can be too big for your screen. The down arrow at the bottom moves the display to show the ones that don't fit.

Below this are options that correspond to the Types. Each of these brings up a submenu of all Presets of its Type:



Selecting Template from the drop-down menu shows the one Template Preset: Default.

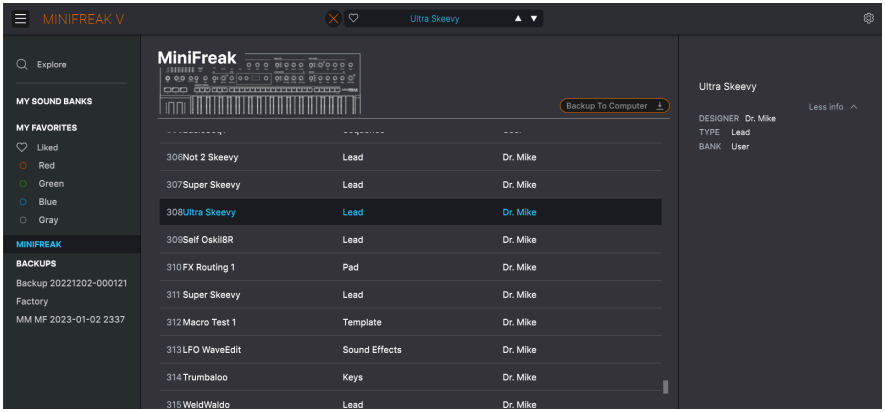
Unlike the up and down arrows, the "All Presets" submenu is independent of search criteria – it simply shows you every Preset available. Likewise for the Type choices below the line, which always include all Presets within that Type.

8.5. MiniFreak hardware Preset management

The last two options in the Sidebar are **MINIFREAK** and **BACKUP**. These are used when MiniFreak V is linked to a MiniFreak synthesizer. With these features, it's easy for you to keep backups of your hardware Presets within MiniFreak V, create new Banks of Presets to download into your hardware, quickly reorganize Presets using the MiniFreak V user interface, and more.

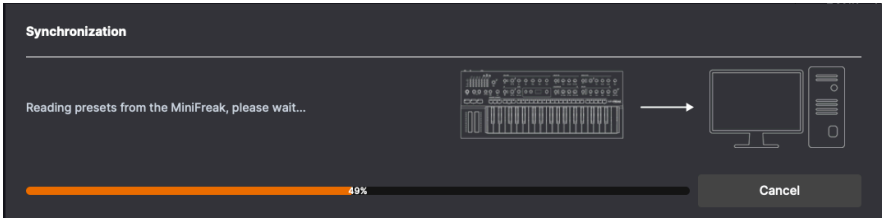
8.5.1. MiniFreak Direct Access

Clicking on the **MINIFREAK** title gives you a direct look into the MiniFreak's own Preset memory:



Notice that the Sidebar item, currently highlighted Preset, and Preset Name Pane are all blue, indicating that they're from the hardware.

Most notably, there's a button labeled **Backup To Computer**. Pressing it pops up this progress bar:

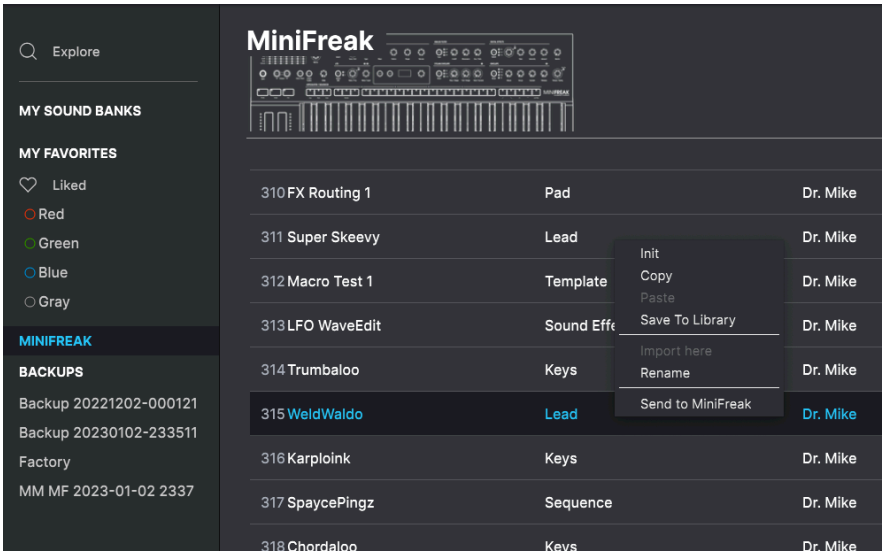


When the program upload is done, the contents of the MiniFreak now appear as a Backup [p.152].

Controls on the hardware and software directly affect one another. In the case of working with Presets, an edited sound can be saved on the MiniFreak itself via the **Save/Panel** button; when this is done, the asterisk by its name will disappear from MiniFreak V, indicating that the Preset once again matches the hardware. However, the Preset will not be saved in MiniFreak V's Library unless you use the **Save Preset As...** option in the Main Menu [p.115].

8.5.1.1. Working with individual MiniFreak Presets

Right-clicking on any Preset reveals the following pop-up option menu:



Options include:

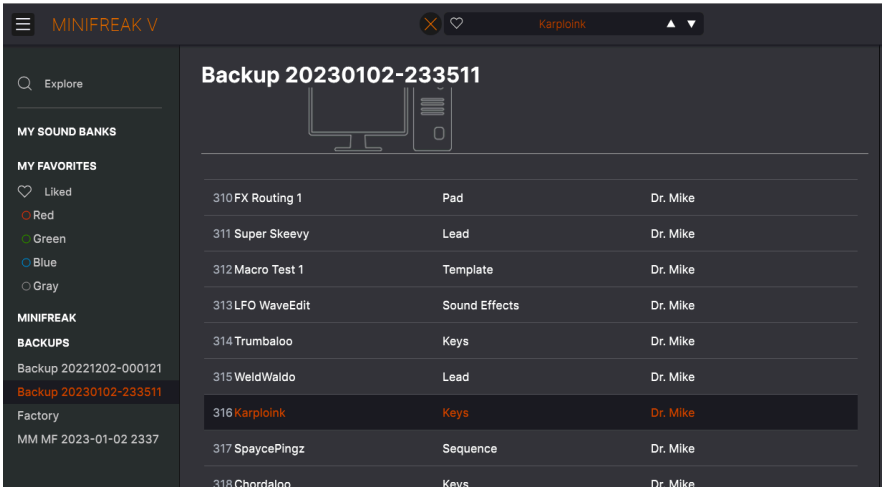
- **Init**: initializes the selected memory slot on the MiniFreak, erasing the Preset that was there.
- **Copy**: copies the Preset into your computer's clipboard memory.
- **Paste**: pastes a previously-copied Preset into the selected memory slot.
- **Save To Library**: saves the selected Preset into the MiniFreak V Library via the usual **Save As** pop-up. You can designate Designer name, destination Bank, add comments, and set tags, just as you would for a Preset created in MiniFreak V.
- **Import here**: opens an OS-level browser to import a Preset file on your computer into the selected slot.
- **Rename**: renames the selected Preset on the MiniFreak.
- **Send to MiniFreak**: sends the Preset in its currently edited form from MiniFreak V to the MiniFreak, saving any edits you've done in the plug-in.

8.5.2. Backup

When MiniFreak V backs up the contents of the MiniFreak to your computer, the backup appears in the **BACKUP** list in the Sidebar.

Backups are named by the precise date and time when they were created: YYYYMMDD-HHMMSS indicating the year, month, day, hour, minute, and second.

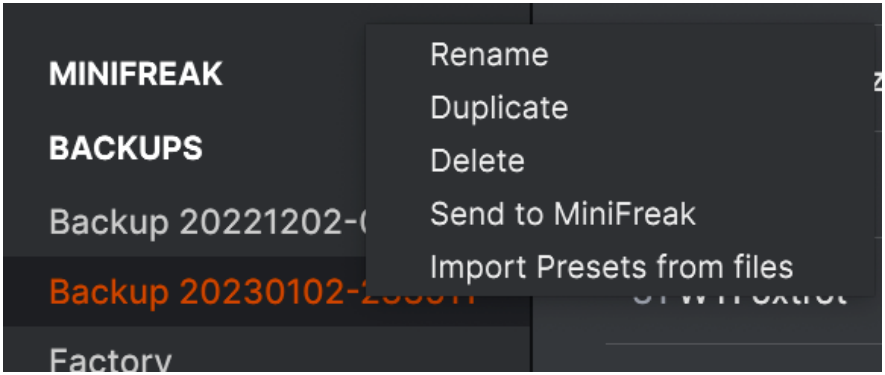
Once a Backup has been made, you can click on it to bring up a browser almost exactly like the one for the **MINIFREAK** access:



Notice that the Sidebar item, currently highlighted Preset, and Preset Name Pane are all red, indicating that they're from the backup.

8.5.2.1. Managing Backups

Right-clicking on a Backup's name pops up this menu of options relating to the Backup as a whole:



These options include:

- **Rename**: renames the Backup to something sexier than a date and time.
- **Duplicate**: creates a copy of the Backup that you can alter without worrying about destroying the original.
- **Delete**: deletes the Backup.
- **Send to MiniFreak**: downloads the Backup into the MiniFreak, erasing its previous contents.
- **Import Presets from files**: opens an OS-level browser window in your computer to import saved Preset files into the Backup.

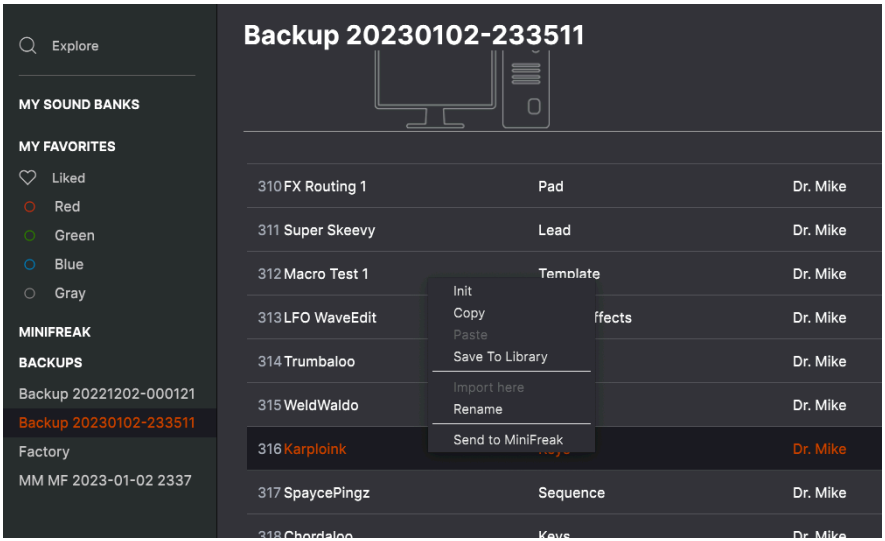
This last option won't usually be carried out on an existing Backup; however, it's a great way to populate an Initialized (empty) Backup!

To create an Init Backup, hover your mouse over **BACKUPS** and click on **+New** when it appears. You'll get this pop-up:

Fill in an appropriate name, and MiniFreak V will create an empty Backup with 512 slots, ready for you to populate however you wish.

8.5.2.2. Working with individual Backup Presets

Right-clicking on the currently selected Preset in a Backup gives you the same options as discussed above with the **MINIFREAK** browser, as shown on the pop-up:



With all of these options, you can quickly build entire Banks of Presets precisely for any application, such as taking your MiniFreak on the road with Presets for a particular music set, collecting experimental Presets for further exploration, organizing Banks to share with friends and colleagues... the Preset Browser's tight integration with the MiniFreak makes it easy.

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