



# FM8

## Operation Manual

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Users Guide written by Thomas Loop

Special thanks to the Beta Test Team, who were invaluable not just in tracking down bugs, but in making this a better product.



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# 1. Welcome to FM8

Congratulations on your purchase of the Native Instruments FM8 software synthesizer. You'll be glad you did.

The FM8 is based on FM synthesis, which made its mass market debut in 1983 with the Yamaha DX7. Boasting aftertouch, velocity sensitivity, a new type of synthesis that was very different from analogue subtractive synthesizers, a new protocol called "MIDI," and a shockingly low list price, the DX7 was an instant hit and went on to become the best-selling synthesizer of its time. It spawned several offspring, including the famous TX81Z (still one of the best synths for MIDI guitar) and the TX802, probably the finest hardware implementation of FM synthesis that Yamaha ever produced.

Native Instruments brought back FM synthesis with the FM7, and it was better than ever. The new incarnation of this successful synthesizer is the FM8.

Designed as a convenient plug-in, the FM8 has 32-bit resolution for superb sound quality, an innovative algorithm programming matrix whose flexibility is light years ahead of older FM synthesizers, extensive modulation, a rack of effects, a filter module/Operator, multiple waveforms and an Arpeggiator.

Although FM synths had a reputation of being difficult to program – and they were! - the FM8 offers a unique "easy" page that makes it simple to customize sounds to perfection, without having to learn programming.

All the great features of FM synthesis are included, such as an "analog" control to add slight amounts of randomness, and a microtuning page for alternate tunings. But it also has modern essentials, such as envelope and delay sync to host tempo, 64-voice polyphony, variable resolution for lo-fi sounds, total MIDI control, and much more to bring FM synthesis into the 21st century.

The FM8 integrates perfectly into the computer-based virtual studio, whether Macintosh or Windows. It can serve as a stand-alone module, turning your computer into a synthesizer. It also works as a sequencer plug-in with various interfaces.

If you were around for the first wave of FM synthesis, you'll be pleasantly surprised at just how good it can sound with up-to-date technology. If you're new to FM synthesis, you're in for a great time. You can coax sounds out of the FM8 that range from angelically clean to hellishly nasty...from sweet to sour...and from traditional to innovative.

## 2. Installation and Setup

Your FM8 ships with a separate manual – the Setup Guide - providing details about all things installation and setup. Please follow the Setup Guide's instructions before you proceed with the information given in this manual.

## 3. Overview and Tutorial

### 3.1. New in This Version

Native Instruments has built upon the years of experience with the FM7 and came up with a host of new and exciting features for the FM8.

All FM 7 functionality is still available in FM8, and FM8 is **100% backwards compatible** with FM7 sounds.

#### 3.1.1. New Features

##### Usability

- The “**Easy page**” is more prominently featured and simplifies quick sound tweaks.
- An **Expert Page** provides access to all Operator details for advanced programming tasks.
- The overall functionality of the various **Edit Pages** has been **improved** for a better sound design experience.
- The new, unified **NI Sound Browser** has been added, streamlining the functionality of all NI synthesis products.

##### Large Amount of Factory Sounds

- The FM8 sports **all FM7 factory Sounds**, as well as the **FM7 Sounds Vol. 1 & Vol. 2** from the NI Sound Line.
- About 200 additional new Sounds come with the FM8, featuring the new capabilities of the software.
- **12 new rack effects** in addition to the FM7 effects.
- All sounds already attributed and ready for **KORE**.

## Arpeggiator

The FM8 features a uniquely flexible, programmable Arpeggiator with a step sequencer-like matrix of up to 32 steps.

You get:

- Different modes for pattern generation
- Keyboard split features (arpeggios triggered by parts of the keyboard only)
- Preset Arpeggio templates

## Sound Morphing

One of the key new features in FM8 is Sound Morphing. It enables you to seamlessly morph between 4 arbitrarily chosen timbres.

There is an X-Y-control with each corner corresponding to one complex timbre. The 4 timbres are easily assigned using drag and drop from the Sound Browser. A graphic handle in the square is used for setting the interpolation (interpolated from the corner's parameter values).

- When running the FM8 as a plug-in in a host that supports automation, the handle's movement can be automated.
- Only timbre parameters can be morphed. This is essentially the FM-Matrix and the Operator settings. Envelopes and modulation settings are not morphed
- Effects are not morphed, but the Effects amount parameter is morphed.

## High Resolution mode

The **High resolution** mode improves the general sound quality by reducing aliasing (in FM modulation, the X-Operator wave shaping, the overdrive effect or the tube amp effect) and achieves a cleaner and more analogue sound. This feature is a global parameter and can't be saved with the sound.

## New Effects

The FM8 brings a number of new **Effects** including a rack concept for constructing effects chains and a preset system for the complete Effects rack. The old FM7 effect is of course still available as the Chorus/Delay effects unit.

Choose from:

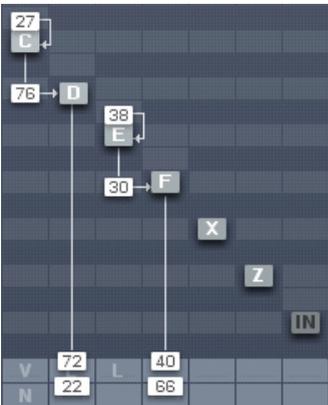
- Overdrive
- Tube Amp
- Cabinet
- Shelving EQ
- Peak EQ
- Talk Wah
- Phaser
- Flanger
- Tremolo
- Reverb
- Psychedelay
- Chorus/Delay

## 3.2. Basic Concepts

### 3.2.1. Frequency Modulation

Subtractive synthesis has its firm place in sound design; there are lots of good synthesizers with a huge basis of presets available. Still, sometimes it can be a bit boring due to its ubiquitous presence.

FM synthesis offers a universe of new and fresh sounding timbres while still providing an extremely large library of classic Sounds from the DX-7 and its derivatives.



Build your own algorithms with the FM Matrix.

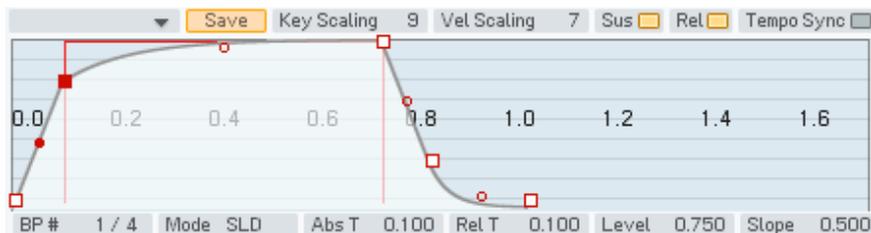
The FM8 is ideal for developing new and very original Sounds due to its very flexible **FM Matrix** with its never ending supply of **Algorithms**.

The FM8 is completely programmable when it comes to the FM engine. Combine the eight Operators arbitrarily in Algorithms to produce sound never heard before.

### 3.2.2. Modulating Parameters

The basic timbre of a sound is only the beginning. The world is full of boring and static synth sounds and of course you want your creations to be animate and articulate.

The old DX-7 was already known for its very **lively** and **expressive** sounds and the FM8 builds on this heritage and extends it with the ability to change the parameters over time either via internal means or by external automation in a sequencing environment.



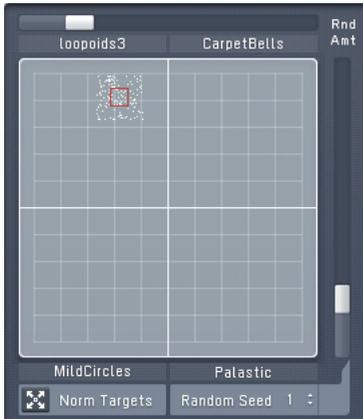
A typical FM8 envelope.

Use the powerful and accurate **multi-stage Envelopes** to get the sound moving and to gain tight control over the **timbral changes**. Examples could be an evolving pad sound that fades several Operators in and out via slow moving envelopes or a dissonant sound that smoothes out in its decay phase.

Another approach for moving sound are the FM8's **LFOs** that can add simple vibrato and tremolo effects but can also be the source for complex changes in harmonic content when you use them on modulators.

### 3.2.3. Morphing Sounds

The FM8 takes vivid sound and evolving textures a step beyond with its **Morph Square**.



The Morph Square in action.

With the **Morphing** function you can melt four different sounds into one interactive sound field.

The basis of the FM sound always is the FM Matrix (see above) and the different matrix settings of different Sounds can be smoothly morphed into each other in real-time. This leads to sound transitions that cannot be accomplished via conventional means like fading in and out.

### 3.2.4. Arpeggiate

So you want those grooving, pumping, sequenced lines that are so important for today's dance music? And of course you want them intuitively playable.



The Arpeggiator – sequence away.

No problem with the FM8 Arpeggiator. Just play a chord and it will be transformed, rhythmically re-triggered and transformed into grooving monophonic synth-lines.

The Arpeggiator is much more flexible than its analogue ancestors as in the FM8 it got injected with a fresh **step-sequencing concept**. It's playing a sequencer like a musical instrument.

### 3.3. Outline of the Interface

The new design of the FM8 Interface improves on the FM7 with a fresh look and a host of usability enhancements.

The Interface is divided into four zones:

- The Application Control bar on top of the window.
- The Navigator to the left is for choosing the different Editor windows.
- The Editing Area to the right displays the currently selected Editor.
- The Keyboard is for playing the sound with your mouse.

The following paragraphs only give a very brief introduction into the scope of the different interface sections. Please read the respective reference chapters for a detailed description of all parameters.

#### 3.3.1. Global Sections: Application Control Bar, Navigator and Keyboard



The **Application Control Bar** is the most basic Interface of your FM8. You can toggle the display of the **Navigator/Edit Area** and the **Keyboard** via two dedicated buttons. You get a mirror of the File menu and a host of status displays dealing with MIDI, polyphony and the like. Please have a look at the Reference section for details.

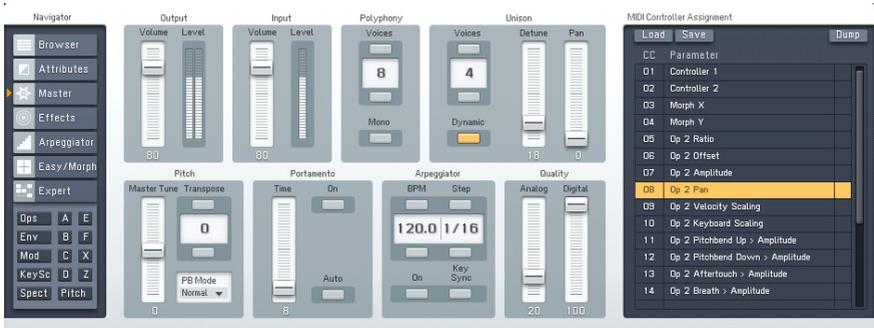
### 3.3.2. Browser & Attributes Page



The Advent of **NI KORE** has brought a **unified Sound format** that is also used in the FM8 – the **KORESound**. This also brings a unified interface for managing Sounds. The Browser is your interface to finding Sounds via a powerful system of Attributes that characterize each and every Sound of all NI Sound products. The complete FM8 Sound library has been fully tagged via an extensive system of **Attributes** and you can quickly **filter** and **search** for any combination of the provided Attributes or keywords.

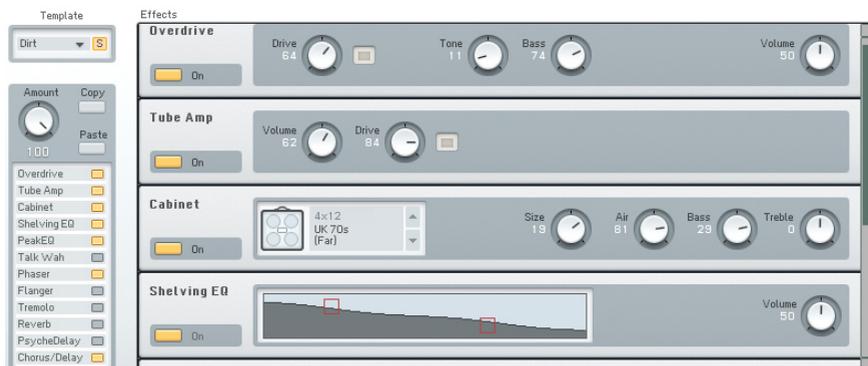
Finding the right Sound has never been easier - they're all in the database.

### 3.3.3. Master Window



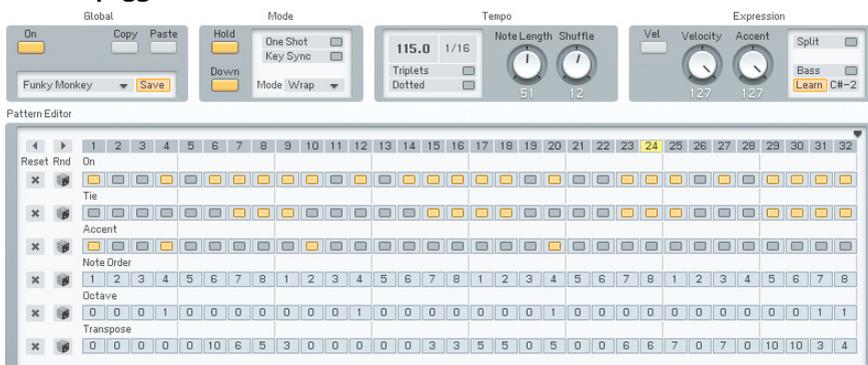
The **Master** Window provides access to the global parameters of the FM8. Here you find things like the main levels, Polyphony settings, global pitch controls and the MIDI controller assignments.

### 3.3.4. Effects Window



The FM8 sports a great sounding selection of **Effects** processors that can be combined to produce a variety of professional sounds. The effects range from classics like chorus and flanger over bread-and-butter tools like equalizers and reverb to a cabinet modelling unit and the crazy Psychedelay.

### 3.3.5. Arpeggiator Window



The FM8 **Arpeggiator** combines the old-school Arpeggiator approach with a flexible **step-sequencer** concept including ties between notes, transposition of steps and rearrangements of note orders. The results range from classic arpeggios to rather complex sequences.

### 3.3.6. Easy/Morph Page



The **Easy** controls provide a convenient set of macro controls that allow for sound manipulations without having to bother about the gory details of FM synthesis. Just grab a knob and change the timbre of your Sound with a single tweak. You can easily route an LFO to the main pitch or to the harmonic content or manipulate the amplitude envelope of all Operators at once and much more.

The **Morph Square** is a new FM8 feature for seamless morphing between the timbral characteristics of four FM8 Sounds. You can freely choose those four Sounds to produce new ones that you would possibly never have gotten when programming the FM8 the normal way. A **randomization** function throws in the possibility for additional variations.

### 3.3.7. Expert Windows

The **Expert Windows** offer detailed control of the FM synthesis engine. Here you can edit and program every tiny detail of the Sound and its movements over time.

The Expert windows can be divided into two groups. The global group deals with parameters that can only be set for the complete Sound (like the FM Matrix and the Pitch window) or showing aspects of all Operators on a single page (like the Envelopes, Keyscaling and Operators window). The second group include the dedicated Operator windows showing the various parameters focussed on the respective Operator.

Depending on the job to be done, both approaches can be the way to go. Sometimes you have to see all parameters of a single Operator, sometimes you want to see a special class of parameters for all Operators at once.

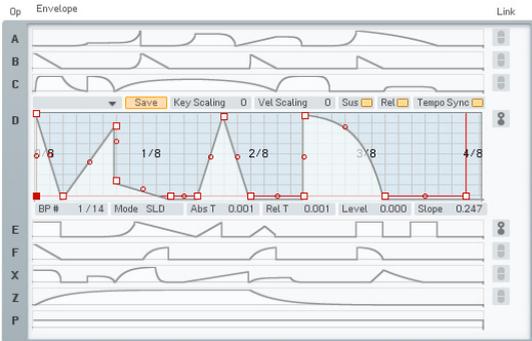
## Global Windows



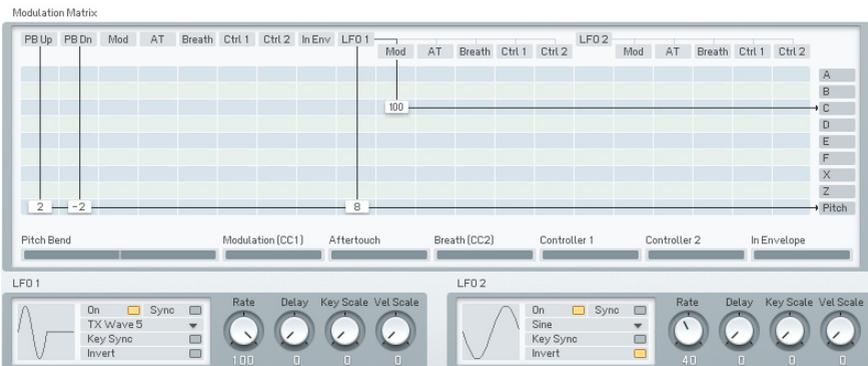
The **FM Matrix** can be found in almost all Expert windows. It is the heart of the FM8 synthesis engine where the modulation relationships between Operators are defined. You can arbitrarily take any Operator's output to modulate the frequency of any other Operator using a concise interface.

Op	Ratio	Offset [Hz]	Waveform	Invert	Key Sync	Pitch Env	Vel
A	0.5000	0.00	Square	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
B	0.5000	0.00	Square	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
C	0.5026	0.00	Square	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
D	0.5020	0.00	TX Wave 5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
E	0.5000	0.00	PWM Ramp Mod	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
F	1.0000	0.00	Square	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
X	Noise Amp	Noise Cutoff	Noise Reso	Sat Gain	Sat Limit	Sat Asym	
Z	Cutoff	Reso 1	Reso 2	Env Amt	Routing	Mix	

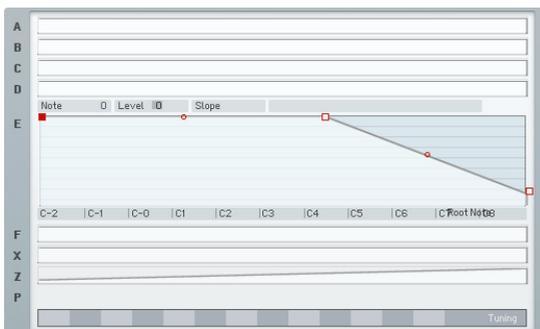
The **Operators** sub page presents all important parameters of all Operators at a single glance. Use it to manipulate the Ratios and frequencies of multiple Operators without getting lost on different pages.



An important aspect of a vivid FM Sound is the Envelopes controlling the amplitude of modulators and carriers. The **Envelope** window gives an overview over all envelopes and still maintains the possibility to edit them. You can also display a single envelope filling out the complete window or even stack multiple envelopes in one single graph.



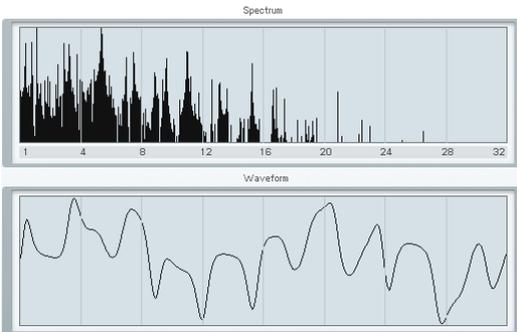
Another way to arrive at lively, interactive Sounds is using modulations via MIDI or the two FM8 **LFOs**. The Modulation window shows all current Modulation assignments of the standard MIDI controllers and the LFO parameters.



Keyscaling can be very important to make a Sound playable over the complete range of MIDI notes. Use the **Keyscaling** window to edit multi-segment keyscaling graphs for each Operator.

Another function to be found here is the **Microtuning** editor for producing alternative tunings.

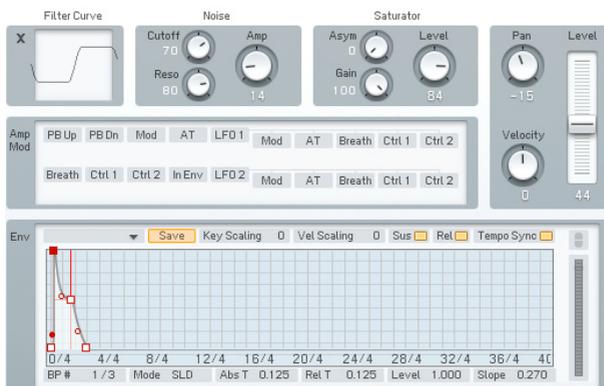
All aspects of pitch are assembled on the **Pitch** window. Dial in the main pitch, Portamento and the Pitch Envelope.



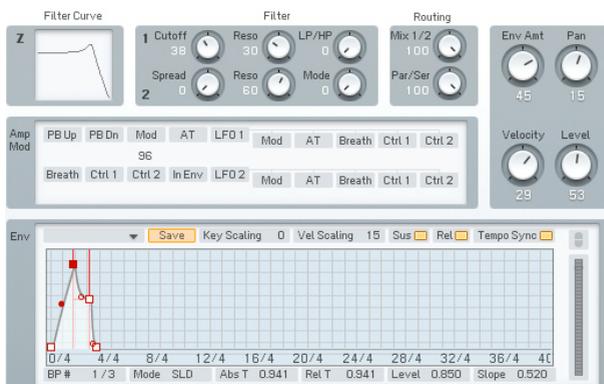
Sometimes it's nice to not only hear sound, but also to be able to actually see its frequency content. The **Scopes** are your trusty companions when it comes to judging changes in timbre due to edits you made somewhere in the FM8 synthesis engine.

## Operator Windows

Each of the **Operators** has a dedicated page containing all its individual parameters.



**Operator X** is a special one, allowing for the addition of **noise** and **wave shaping** to the signal.



The second special Operator is **Operator Z**. It offers a great sounding, analogue-style **multimode filter** including a **filter Envelope**.

### 3.4. Quickstarts

We encourage you to take the time and complete the following short walkthrough sections. They will help you to understand some of the key aspects of your FM8.

### 3.4.1. Loading and Using Sounds

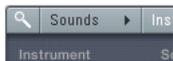
While this is a structured tutorial, if you find something interesting along the way, feel free to investigate anything that interests you.

The FM8 Sound Library is organized in a **Database** providing you with convenient means for searching and retrieving the Sounds you seek.



Hit the Browser button.

Let's start right away and open the **Browser** by clicking on the respective button on the Navigator.



Toggle the Database View button.

With the Browser open, click the **Database View** button to yellow to see the **Database View**.



Mining the Library with the browser.

Now the FM8 **Library** is at your fingertips. On the Browser's left side are five **Category** columns. These contain the **Attributes** used to **tag**, **classify** and **search** all Sounds. These are the same in all NI products using KORESounds.

Let's filter for a classic FM E-Piano. To do this, we combine several Attributes by clicking them in the Attributes list:

- Click on **Piano/Keys** under **Instrument**
- Choose **Electric** and **Synthetic** under **Source**
- In the **Timbre Category**, click on **Bright**.
- Under **Articulation**, we want a **Decaying** sound

As you combine Attributes you put more and more constraints on your search, so the number of **Search Results** displayed on the right side decreases.

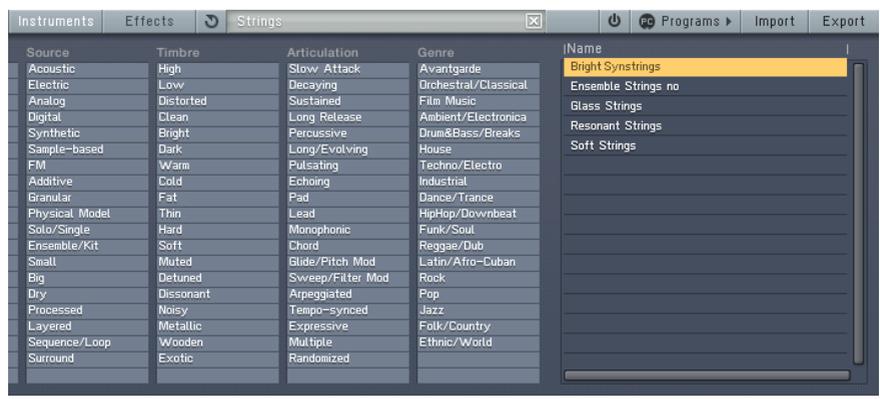
The FM8 Sound *Soft Rhodes* looks promising, so double-click it.



You can now play the Sound via your MIDI keyboard. If you have not set up your MIDI connections, please have a look at the Setup Guide for details on the procedure.

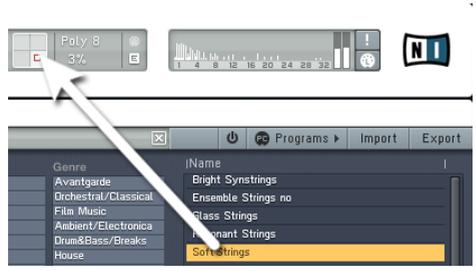
### 3.4.2. Morphing and Easy Editing

Now let's check the Morphing feature. We are going to load four different string Sounds into the Morph Square.



Browsing for Strings.

Open the **Browser** by clicking on the respective **Navigator** button and type *Strings* into the **Search Field**. You see a list of string Sounds in the **Search Results**.



Drag the Sound to the Morph Square.

Now we are going to **drag four** of the **Sounds** into the four **quadrants** of the small Morph Square in the Application Control Bar. The **first Sound** you drag into the square will **establish** all the **parameters** that are not morphed (envelopes, modulations, etc.).

- Glass Strings
- Hirez Bell String
- Soft Strings
- Resonant Strings



The populated Morph Square.

Please switch to the **Easy/Morph** window. You see the four Sounds occupying the four corners of the Morph Square. Play a few chords while moving the **Morph Handle** (the small red square). You can hear the sound being morphed between the four different timbres.

The Sound is a bit on the muffled side, especially with the upper two strings Sounds. We are going to brighten things up.



Add a bit of sparkle.

Click the **Timbre** dial and pull it up to a value of **26**. If you now play you can hear all four Sounds getting brighter. The Easy edit macro controls change

the Sound's parameters after the morphing has taken place, so it affects all four corners.

A bit more movement could also sound nice, so we add an **LFO** to the timbre of the Sounds.



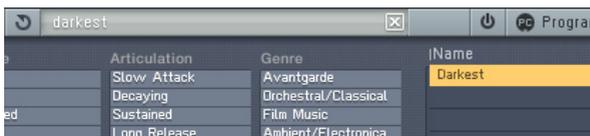
Quick application of the LFO.

Dial in a **Rate** of **-82** and a **Timbre** value of **46**. Now you can hear that the Sounds have become a lot livelier.

The controls of the Easy window are macro controls. Here you can alter the sound completely with a few twists and without having to dive into the innards of FM synthesis.

### 3.4.3. Using the Arpeggiator and Modifying Attributes

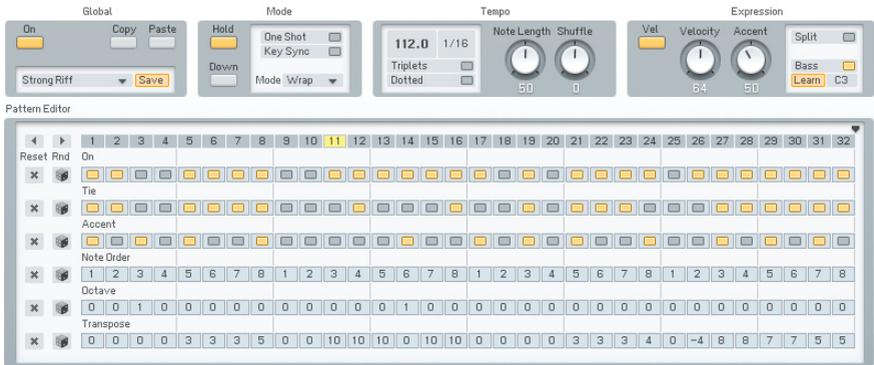
Now to something completely different: the Arpeggiator. As string sounds don't lend themselves very well to Arpeggiators, we first have to find a different Sound. Switch back to the **Browser**.



Loading the bass.

Type "Darkest" into the **Search Field**. This will find a nice, analogue sounding synth bass. Load it with a **double-click** from the Browser's Search Results.

Now switch to the **Arpeggiator**.



Fun with the sequences.

Hit the **On** button and lay down a chord on your keyboard.

Now you can start experimenting a bit with the various Arpeggiator settings. A good start is switching to Autopilot mode (**Hold** button) to get the hands free for tweaks.

As the line you hear at the moment might be a bit boring, choose another one from the **Template** menu. How about *Strong Riff*?



Choose your sequence.

Another fruitful set of parameters can be found in the **Expression** section. Experiment a bit with the **Velocity** and **Accent** settings to get a feeling for what they do. You might want to deactivate the **Velocity** switch to have the Arpeggiator reproduce the velocities you originally played. The **Accent** dial sets the amount of accent applied for every accented step on the sequencing grid.

Next we are going to add a nice effect. Switch over to the **Effects** page.



Adding the Talkwah.

A **Talkwah** is always a nice effect when it comes to adding character to a bass line. Switch it on via the Effects selector on the left side of the window.

Dial in an **Amount** of around **70**, so that the original bass Sound still shines through. Now activate the **Modwheel** option and have some fun with altering the **Mouth** value via your modulation wheel.

Now that we have set up our bass line machine, we want to save the Sound with a new name and with some additional Attributes so that we can find it again in the future. Switch to the **Attributes** window.



New Attributes.

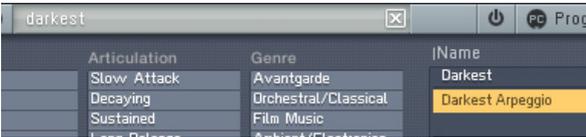
You see the original settings of the Darkest FM8 Sound. Change the name in the **Author** field to your name and add a few matching Attributes to characterize the changes we made. In The screenshot we added:

- Synthetic under Source
- Arpeggiated for Articulation
- Techno/Electro for Genre.



Save your Sound.

Now save your new Sound by choosing **Save Sound** from the **File** menu. A dialog opens asking for a file name. We chose *DarkestArpeggio*.



## The new Sound is in the Database.

Switch back to the Browser and type **Darkest** into the **Search Field**. You can see the new Sound in the **Search Results**.

### 3.4.1. Create your First Sound from Scratch

Now it's time to design your first FM Sound from scratch. Of course we are going to keep it simple and clear.



Initialize the Edit Buffer.

Choose **New Sound** from the File menu of the Application Control Bar. This loads an initial sound stored in NewSound.ksd (to be found in the application folder). If you play a key you will hear a simple and clean sine wave, stemming from Operator F (unless you already have edited the NewSound.ksd).



The lonely Operator.

Click on the Operator page of **Operator F** in the **Expert** Controls. This sounds rather dull, so let's add some harmonics.

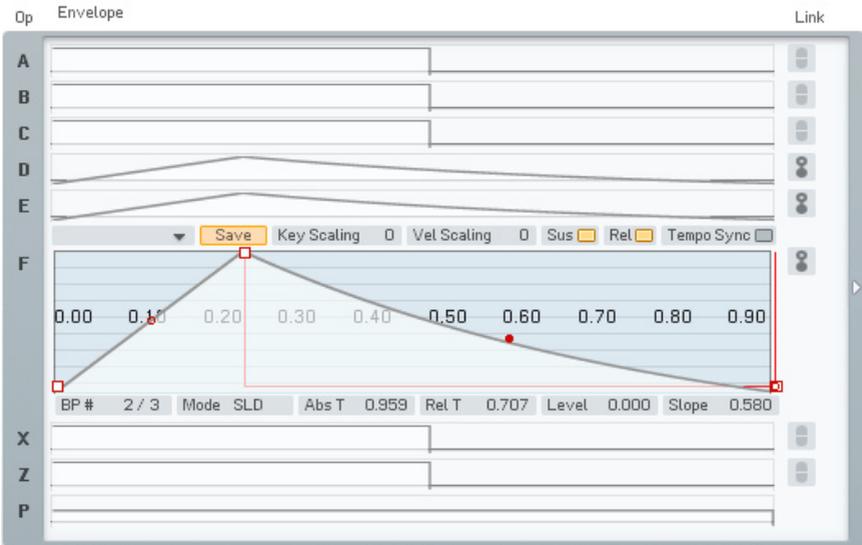


Three Operators and some modulation.

Do this by **right-clicking** Operators **D** and **E** to switch them on (the letters become white). Then click directly to the **left of Operator F** and drag your mouse up until you get a value of about **30**. Now Operator E modulates Operator F. The next step is to have **Operator D** modulate Operator E with an amount of **30**. We have a nice little chain of **modulators** and **carriers**. You see that a modulator (like Op. E) modulating a carrier (Op. F) can be a carrier by himself (like Op. E being modulated by Op. D).

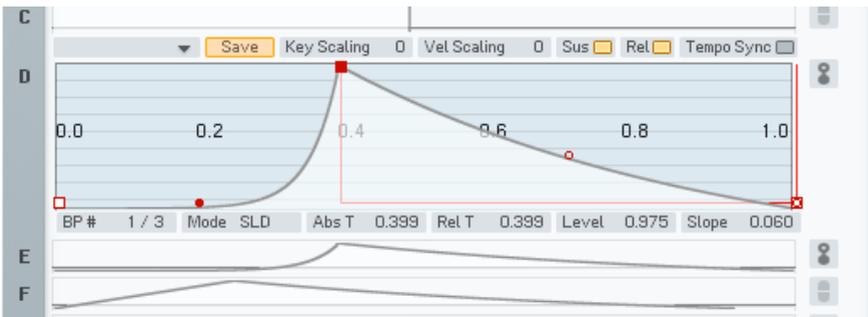
When playing your keyboard you will hear the additional harmonics produced by the frequency modulation.

Let's add some movement to the sound by tweaking the envelopes. Switch to the **Envelopes** page (**Env**).



Now make sure you have **Operator F selected** for edits and **link** Operators **D** and **E** to Operator F by clicking on their Link buttons. Now every **change** you make to Operator F will be **mirrored** in the other two Operators and vice versa.

Dial in a bit of **Attack** and a nice **Release**, as shown in the picture above. Remember that you can **centre in** on the complete Envelope with a double-click on the graph. You see that all three envelopes have the same shape.



In the next step **deactivate the link buttons** and switch to the **Envelope of Operator D**. Grab the **Slope handle** of the **Attack** phase (the red dot) and dial in an **exponential slope**. Play some keys and you will hear that the **harmonics** are being **faded** into the Sound along the Envelope of Operator D, which is a modulator. This makes the Envelope of Operator D similar to a filter Envelope.

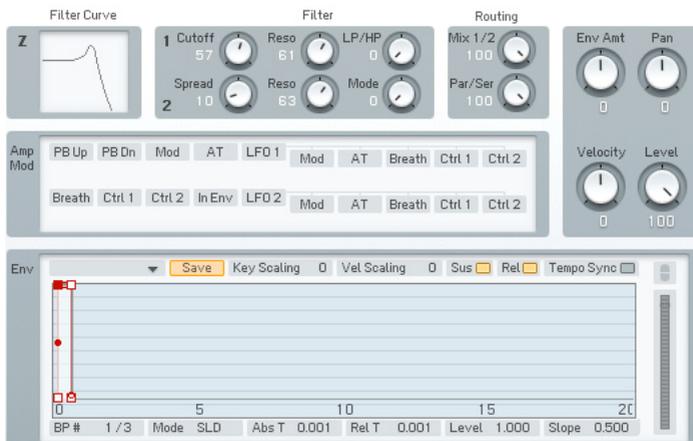
Let's push the Sound a bit more into the woodwind-direction. First of all we want it to be a bit softer. What could be better than a low-pass filter to soften things up?



Operator Z joins the action.

The Operator Z contains a great **multimode filter**, so we just route our signal through it. Have a look at the picture above for pointers how to do it. Don't forget to turn the direct signal from Operator F completely down (a double-click on the value is a shortcut for doing this).

Now switch to the **Operator Z** window.



Dial in the filter.

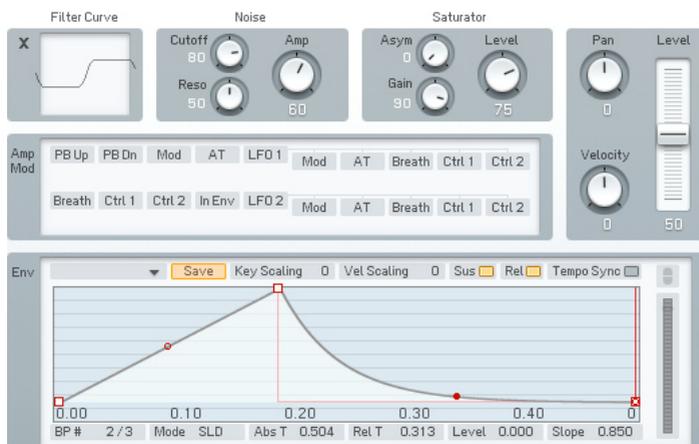
Set the **Cutoff** to about **60** and the **Resonance** of the first filter to about **60**. This setting caps the high mids and highs while adding some character via the resonant peak. Just have a look at the filter curve to see the response.

We still miss something – the breath. Breathly sounds are usually synthesized with **noise** and guess what – the FM8 can produce that too. The noise generator is located in **Operator X**.



Noise Op to the scene.

Activate **Operator X** and route its signal through the filter (**Operator Z**), as shown in the picture above. Now we switch over to the **Operator X** window to tweak the settings.



Noise controls.

Apart from the envelope, the above settings are **default** values.

We have to change the Envelope to a shape with a **small Attack** and an **exponential decay** phase. We just want a short, soft noise burst at the beginning of the sound, so you can deactivate the Sustain and Release buttons. Play some notes to hear the noise being faded in and out at the beginning of the Sound.

It's time to save the new Sound but not before we have added a bunch of **Attributes** to integrate it into the FM8 Database. To do this, open the **Attributes** window.



Adding some Attributes.

Type your **name** into the **Author** field and add the appropriate Attributes describing the new Sound. In the picture above we chose:

- **Reed Instrument** for **Instrument**
- **FM** for **Source**
- **Wooden** for **Timbre**
- **Sustained** for **Articulation**

The last step is choosing **Save Sound** from the File menu, type in a **name** for the Sound and save it to your Sound folder. We'll leave the name to your imagination.

Well, that's it for now. Just go on experimenting with the new Sound. Maybe by adding some effects, or an LFO for more liveliness...

# 4. Reference

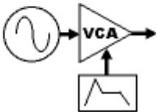
## 4.1. What is Frequency Modulation?

### 4.1.1. The Basics

The principle behind FM synthesis is of remarkable simplicity. The basis of all FM synthesis is a **sine wave** oscillator, represented below as a circle and an output.

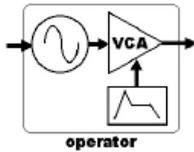


A keyboard or other controller sets the oscillator's pitch. However, we now need a way to gate this oscillator on and off. Analogue synthesizers used a circuit called a VCA (voltage-controlled amplifier) to alter the oscillator level. The level depended on a control signal (called a control voltage) fed into the VCA. Many modern digital synths and programs still use this terminology, even though the level changes are all generated digital, by altering numbers within the program. Some digital synths refer to **VCA** as DCA (for Digitally Controlled Amplifier"), while others just refer to it as amp.



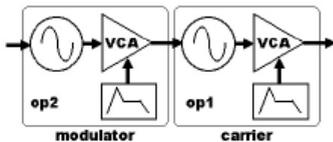
With analogue synths, the control signal that changes the level is generated by a circuit called the **envelope generator** (EG). It causes the level to change over time in a predictable way. For example, to create a plucked sound, the envelope might start at a very high value and then drop over several milliseconds to a much lower value, or even turn off completely. In digital gear, the program generates a data stream that changes level the way an envelope generator would. However, the concept is still usually referred to as envelope generation. This grouping of a sine wave oscillator, VCA/DCA, and EG is called an **Operator**, which is the basic building block of FM synthesis.

As a pure sine wave is pretty boring from a musical standpoint, this leads us to the extremely clever aspect of FM synthesis. Let's add a control input to the Operator to modulate its frequency.



Feed a sine wave into that control input. A low frequency wave produces **vibrato** by slowly changing the frequency over time. But an **audio range** signal produces one of two results. Signals that are not harmonically-related to the main oscillator create “clangorous” sounds. Injecting a harmonically-related signal generates harmonics that sound more “in-tune” (Both types of effects can be useful).

The amount of **harmonics** depends on the level of signal injected into the main oscillator, and the harmonic structure depends on the modulating oscillator’s frequency. As timbre is primarily affected by the injected signal’s amplitude, adding a VCA after the modulating oscillator (along with an envelope generator to control the VCA/DCA) allows predictable control over the signal, hence the overall timbre. Our FM synthesis block diagram now looks like this.

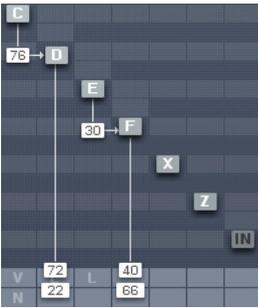


Note how the same Operator structure can provide an audio signal (Operator 1) or modulate that audio signal (Operator 2), so we need to differentiate between the two functions. The Operator we hear is called the **carrier**. An Operator is called a **modulator** if it modulates the carrier.

This two-Operator structure can actually make some very sweet brass timbres. Increasing the output of Op 2 creates a sound somewhat like opening up a lowpass filter; decreasing the output is like closing the filter down.

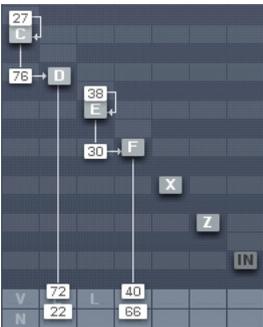
#### 4.1.2. Meet the Algorithm

You can combine Operators in various ways to create a variety of Algorithms. The FM8 has several preset algorithms, accessible from a drop-down menu on the **FM Matrix** window. They use up to six conventional Operators, and you can see how they are combined in the various macro algorithms. For example, the following algorithm has two carriers. Each has its own modulator.



### 4.1.3. Feedback

The next diagram shows the previous algorithm, but with feedback added to the modulators - in effect, **an Operator becomes its own modulator**. Increasing feedback can add bite and grittiness.



Please note that the **Input** is also present on the **FM Matrix**. You can use it as modulator and carrier as if it were a normal Operator. This opens a lot of new possibilities for using the FM8 as an effects processor.

### 4.1.4. The Envelope Generator

The envelopes in vintage synths worked on the rate/level principle, which specified the rate at which the envelope goes from one level to another. Unfortunately this was quite confusing, as going from zero to a high level would take longer than going from zero to a low level, given the same rate. The FM8 solves this problem by letting you set a specific **time** for one **level** to transition to another, and does all the necessary calculations internally to convert this into the correct rate.

The envelope level typically starts at zero. To create an attack, you specify the level to be attained, and the time it takes for the envelope to reach that

level. Other stages of the envelope are set similarly, according to times and levels. Going from a higher level to a lower one produces a decay, going from lower to higher produces an attack.

## 4.2. Interaction with the GUI

### 4.2.1. Mac and Windows Conventions

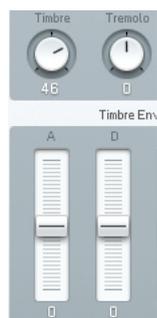
Operating the FM8 on **Mac** or **Windows** machines is identical, with some **slight differences** due to the way the two operation systems handle file systems and keyboards. Key commands are given for Windows. For the Mac, when the text says “right-click,” you may also use Ctrl-click.

### 4.2.2. Buttons and Switches



Click once on a button or switch to activate it, click again to de-select or disable. An active switch will change its colour to orange.

### 4.2.3. Faders and Knobs



To change a slider or knob setting, click with the **mouse** and **drag** it up or down to change the value. For **fine tuning**, press the Shift key prior to moving the element, and keep holding the Shift key while moving the slider. You may also double-click on the value for direct editing.

A double-click on the control **resets** the value to default.

### 4.2.4. Numeric Values



For value tweaking, click on the numeric readout below the slider. Drag the mouse up or down to change the value. When there is both a slider and a numeric value, you get **finer resolution** by dragging the numeric value. Hold the **Shift key** to get an even finer resolution.

For setting up the parameters **Ratio** and **Offset** dragging on the 1s digit of the numeric readout will change the value in 1s. If you drag on the 10s digit, the value will change in 10s.

If the numeric value has buttons above and below, clicking on the **top button** raises the value by one, and clicking on the **bottom button** lowers the value by one. Clicking and holding on these buttons scrolls through the values at a moderate rate.

You can also **double-click** on a value and **type in** a new one via your computer's **keyboard**.

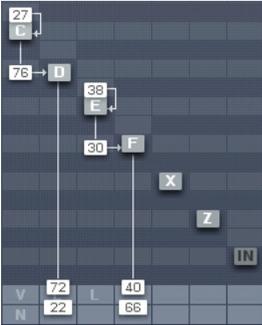
### 4.2.5. Popup Menus

There are two types of popup menus in FM8. The first type is for **preset-type** menus, as with the waveform selection for the Operators. The other one can be found in the **Template** selection sections for envelopes, the Arpeggiator or the Algorithm selector.



For both types, a click on the **triangle** will open up the menu and a click on the desired item will load it.

## 4.2.6. FM Matrix



The following **mouse operations** and **key commands** are available in the Matrix:

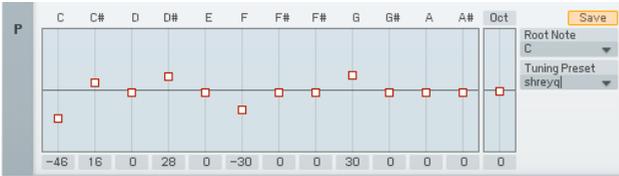
- A click on an **Operator** selects the appropriate Operator page.
- **Right-clicks** (Mac: Ctrl-clicks) on Operators switches them **on** and **off**.
- **Shift+Right Click** (Mac: Shift+Ctrl click) on Operator X and Z switches **Bypass** on and off (if Operator X/Z is active)

**Constructing** your own algorithms is an easy task with the Matrix:

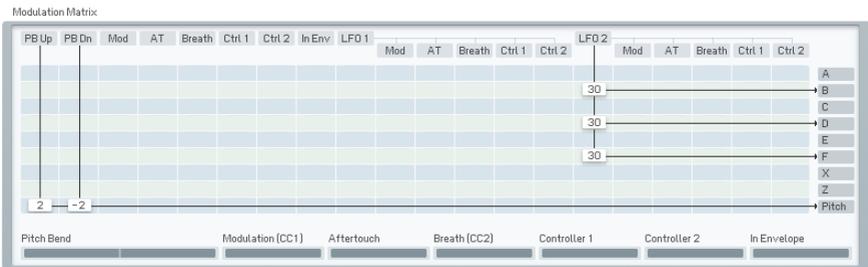
- To send an **Operator output** to another **Operator input**, imagine a line going downward from the first Operator. Imagine a second line going across to the right, to the target Operator.
- Click and hold at the **junction** of these two imaginary lines, as represented by a blue field in the background where you click.
- Drag up. The imaginary lines are now drawn in and a box appears with a numerical value. This controls the level of the modulator feeding the carrier. Drag until the numerical shows the desired level.
- Any Operator can feed back not just to itself, but to any other Operator. To create feedback from one Operator to another, imagine a line going upward from the first Operator and a second line going across to the left, to the target Operator.
- Click and hold at the junction of these two imaginary lines.
- Drag up. The imaginary lines are now drawn in, and a box appears with a **numerical** value that acts like a volume control. Drag until the numerical shows the desired level.
- For removal of a connection, drag its value down to 0 or simply double-click it.

## 4.2.7. Graphical Interfaces

There are some specialty graphical interfaces in FM8.



The **Microtuning Editor** on the Pitch window acts like a bunch of faders. Click on the small squares and drag the mouse up and down to change the note tuning.

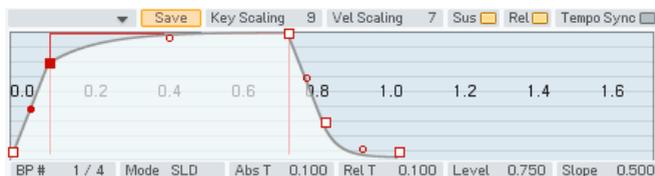


Another graphical interface can be found on the **Modulation** window. It works along the lines of the FM Matrix:

- To send a modulation source's **output** to a target **input**, imagine a line going downward from the source. Imagine a second line going across to the right, to the target.
- Click and hold at the **junction** of these two imaginary lines, as represented by a field in the background where you click.
- Drag up. The imaginary lines are now drawn in, and a box appears with a **numerical value**. This controls the **amount** of the **modulation** applied to the target. Drag until the numerical shows the desired level.

Modulation amounts can be **positive** and **negative**.

## 4.2.8. Envelopes



Some parameters, such as envelopes, are shown graphically as curves and lines with nodes.

- To **change** an envelope's shape, click on a **node** with the mouse, and **drag the breakpoint** into the new position.
- To create a new **node**, right-click where you want the node to appear.
- Drag the **Slope handles** up or down to change the Envelope's slope between breakpoints.
- To **delete a node**, right-click on the node.
- The **ruler** behind the envelope is calibrated in seconds. If the envelope extends past the envelope's visible range, click on the blue background and drag to the left or right to see a different range of the ruler.
- Clicking the **background** and dragging the mouse up or down **zooms** in and out.

Double-click on the background to have the envelope fit exactly within the visible part of the ruler.

## 4.2.9. Pages and Tabs

Most **windows** you find in the FM8 are Editors that are switched via the Navigator and fill out the Editing Area. On some of them (like on the Browser) you also find special buttons, called **Tabs**. Clicking them switches the window into a different mode, displaying a different page of controls.

## 4.3. Standalone menus

### 4.3.1. File Menu

The File menu of the standalone application is mirrored from the Plugin File menu to be found in the Application Control Bar. For a detailed documentation please have a look at chapter 0.

## 4.3.2. Help Menu

### Launch Service Center

This command does exactly what it says: It launches the NI Service Center for managing your NI software licenses. Please have a look at the separate **Setup Guide** manual for details.

### Visit FM8 on the web

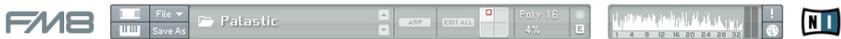
This menu entry opens an external browser window connecting you to the FM8 pages of the NI website. Use it to stay up to speed with the latest information and development of your FM8.

### About FM8

A click on the **FM8 or NI logos** opens the **About FM8** window where you find the FM8's program version number and other information.

The About window can be closed with a click on the close button in the upper right corner.

## 4.4. Application Control Bar

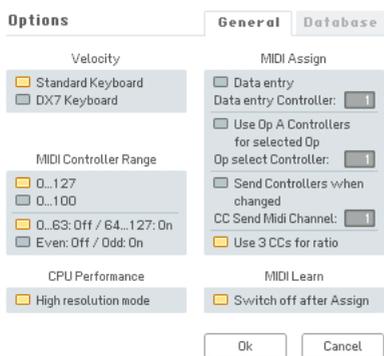


The upper portion of the FM8 remains constant as you switch among the various Editors. It is also the bare minimum interface of the FM8, as you can hide the **Navigator**, the **Editing Area** and the **Keyboard**.

### 4.4.1. Options

The Options window has two tabs.

The **General Options** tab provides access to some parameters concerning the behaviour of your FM8.



## Velocity

The **Velocity** option toggles between two different modes for the reception of **MIDI velocity**. The original DX7 has a note velocity range from 0 to 100, while all other keyboards and sequencers generate notes with velocities between 0 and 127. If you control the FM8 from a DX7, you can use the DX7 Keyboard option to adapt the velocity range. With a standard keyboard connected in this mode, velocities higher than 100 let the presets sound brighter than they have been programmed. In the Standard Keyboard mode a DX7 would not use the full dynamic range, so the sounds would be softer than intended.

## MIDI Controller Range

Many FM8 parameters have a range from **0 to 100**. If you remote control the FM8 by MIDI control changes it can be advantageous to read the identical values between 0 and 100 from the remote device. This can be attained with the **0...100** option; values higher than 100 will be clipped to 100.

---

**Note:** this does not apply to parameters that can be negative (like Pan). In the standard setting, 0...127, the values are mapped to the full range of an FM8 parameter.

---

The second pair of switches let you decide how the buttons react to MIDI controllers. The standard mode is **0...63: Off / 64..127: On**, where values smaller than 64 set the button to the off position, and values greater than 63 set it on. Some MIDI instruments, especially those with multi-step selector switches, send a value with each change with the sequence being 0, 1, 2, 3, ... Here the **Even: Off / Odd: On** option can be used so that the FM8 switches toggle on/off with each action of the remote control switches.

## CPU Performance

The **High resolution mode** enhances the fidelity of the sound by doubling the resolution of the internal computations. As a result, aliasing is reduced (in FM modulation, the X-Operator waves shaping, the overdrive effect or the tube amp effect) leading to a cleaner and more analogue sound. It also eats up a bit more CPU cycles. This feature is a global parameter and can't be saved with the sound.

## MIDI Assign

When **Data Entry** is activated, selected parameters are outlined and can be controlled by external hardware via MIDI control changes. **Data Entry Controller** sets the number of the MIDI controller to be used for this. Just click on any knob and then send the MIDI-CC selected in options to change the value. The Data Entry knob on a DX7 is CC6.

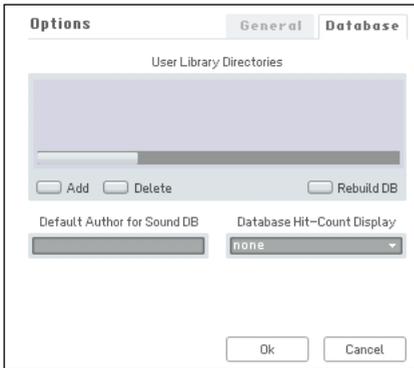
The **Use Op A Controllers for Selected Op** function allows a page oriented assignment of MIDI controllers. The controllers assigned to Operator A's parameters will control the parameters of another Operator, when you switch to its page. The switching between Operators is assigned to a MIDI controller with the number set by **Op Select Controller**.

Some MIDI hardware allows for incremental control and sometimes the display of the current state of the values. This has the advantage that knob movements do not cause any jumps. If you use such a device, enable **Send Controllers When Changed** in order to provide the hardware with the latest values set in the software. **CC Send MIDI Channel** allows for choosing a separate channel for these controller events.

The **Use 3 CCs for Ratio** options provides the possibility to use three different MIDI controllers to adjust the Operator Ratio.

## MIDI Learn

Remember to disable MIDI Learn as soon as a MIDI controller has been assigned to an FM8 control; this ensures that the assignment will not be overwritten by later events. But you may want to keep MIDI Learn enabled should you want to assign several controls in a row. In this case, **disable Switch Off After Assignment** to have Learn mode only finished by a click on the Learn button.



The **Database Tab** provides the commands for adding libraries and maintaining the database.

The User Library Directories are the paths to the folders holding your personal collections of **FM8 Sounds**.

- **Add** chooses a new library to be added via a file dialog.
- **Delete** removes the currently selected library from your FM8 setup.
- **Rebuild DB** should be invoked when you make changes to the library – like adding or removing a new library, or copying new FM8 Sounds into your folders. Rebuilding the Database can take some time. It's best to start a rebuild just before you take a break.
- The name entered under **Default Author for Sound DB** is used automatically in the Author field of the Meta Information if you create a new Sound or save it.
- **Database Hit Count** provides a menu that determines the behaviour of the Browser's Attributes display. When you filter for Sounds by clicking various Attributes in the Browser, you put more and more constraints on the Search Results. For some combination of Attributes, it's possible no Sound will fit into the current roster of Attributes. With **indicate empty categories** chosen, empty categories will be displayed in grey. The **show count as number** option additionally displays the number of Sounds with the current set of Attributes in the various categories. Both options may degrade the Browser's performance, so if you experience a slowdown, switch this menu to **none**.

## 4.4.2. Menu Functions and Status Displays



The two switches to the left toggle the **Editor** and the **Keyboard** on and off, respectively. Use them when screen estate is at a premium while working with various applications and plugins at the same time.



The next bunch of buttons deal with file operations and editing.



The **File menu** is mirrored from the main application window menus.

You find the following commands:

**New Sound** loads an initial FM8 Sound (NewSound.ksd) for you to develop new content. This file is located in the application folder.

If the currently active FM8 Sound has never been saved before, the **Save Sound** opens a File Save dialog. Navigate to the desired folder in your file system, provide a name and click OK to save the current Sound.

If the Sound has been saved before, the Save Sound command will overwrite the old version.

**Save Sound As...** will again provide a File Save dialog, enabling you to save an existing Sound with a different name.

The **Save Sound As...** command is also present separately below the menus.

**Options** opens the Options window. Please have a look at the separate section about the Options for more information.

**Audio and Midi settings** opens the settings window explained in detail in the **FM8 Setup Guide**.

**Exit** closes the FM8 application.



The **Sound Readout** displays the name of the current Sound. Use the two arrows to the left to step through the list of Sounds. Depending on where the Sound was loaded from, this will either be the current **Search Results** in the Browser, the Program change list or the respective **folder** on your hard disk. You can also click on the Sound's name to get a dropdown menu for immediately switching the Sound.

The **ARP** switch toggles the Arpeggiator on and off. Have a look at chapter 4.9 for details about the Arpeggiator.

With **Edit All** inactive, any parameter edits you do are only affecting the timbre residing in the currently **active corner** of the morph square. The Morph Square does not hold complete Sounds but only their timbres (see chapter 4.10.6 for more). The respective quadrant is selected by moving the morph handle into its boundaries. With **active Edit All** option, the **parameter edits are affecting all four Sounds at the same time** (for details check chapter 4.10.6).

---

**Note:** Please be careful with the Edit All option. It's very easy to forget that it is on and therefore to accidentally change timbres.

---

This Edit All option is **deactivated** automatically when a new Sound is loaded.

The **Morph Square** is the place to set up your morphed Sounds. Drag the **Sounds** from the **Browser** to the desired **quadrant** of the square to set up the morph targets. The square is fully functional. Grab the **handle** to morph between the four Sounds.

Next on the Application Control Bar is the **MIDI Data Display**. This display lights up whenever incoming MIDI data is detected.

The **Edit Display** always shows you if the current Sound has been altered. If you have changed something, it will light up.



The **Spectrum Display** of the Application Control Bar is a mirror from the **Spectrum** page. It is for reference purposes and displays the overtone spectrum of the Sound. The numbers represent the harmonics. This can be very useful for analysing frequency content relative to parameter changes while editing a sound.

**Poly** sets the available polyphony, i.e. the maximum number of voices that FM8 is allowed to generate at any one time. Click on the value and drag up or down to change it. The maximum value for this parameter is 64. Only voices that are being played consume CPU cycles, so this parameter acts as a governor to set a limit on the number of voices and thus on the maximum CPU load. The Polyphony setting is not stored or recalled as part of a Sound. It should be set to a value appropriate for the clock speed of the CPU.

The current **CPU Load** as a percentage of the full load is shown under the Polyphony display. This is of course non-interactive.

To the right of the Poly and CPU display you find the **Output Level** meters depicting the current level of the main FM8 signal.

The exclamation mark is the **Panic button**. Should you experience MIDI glitches resulting in hanging notes, hit this button to kill all sound instantly (including any reverb and delay responses).

The **MIDI Learn** button provides an easy means to assign MIDI controllers to the various FM8 parameters. When the button is active, just move the parameter you want to assign and directly afterwards move the hardware element on your controller. The assignment is stored automatically.

## 4.5. Navigator



The **Navigator** is your main tool in switching around the FM8 interface. Use the Navigator buttons to switch to the respective **Editors**. They are displayed to the right of the Navigator on the **Edit Area**.

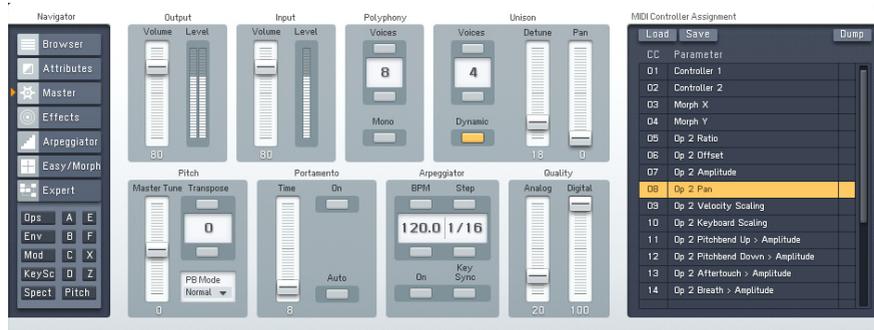
## 4.6. Keyboard



The virtual **Keyboard** of the FM8 is for testing out sounds when there's no hardware keyboard available. Use your mouse to play. The Pitch Bend and Modulation wheels are also active.

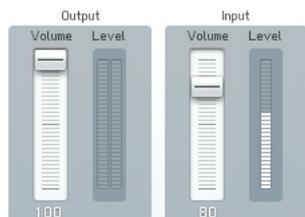
Your **computer keyboard** also generates **MIDI notes**. Type on the letters (QWERT...) to play the FM8.

## 4.7. Master Window



The **Master** Window provides access to the global parameters of the FM8. Here you find things like the main levels, Polyphony settings, global pitch controls and the MIDI controller assignments.

### 4.7.1. Level Controls



**Output Volume** changes the level of the entire instrument. Try to keep this as high as possible, consistent with not overloading the device (e.g., mixer or soundcard) being fed by the FM8 (as indicated by the associated meter hitting

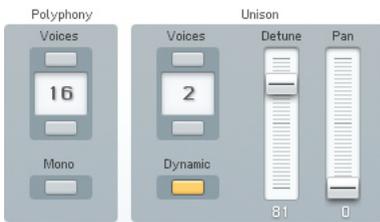
0 dB). This parameter is not stored or recalled as part of a Sound.

**Input Volume** controls the level of signals being fed into the FM8 when using it as a processor. As with output, keep the control as high as possible without causing the associated level meter to hit 0 dB. This parameter is not stored or recalled as part of a Sound.

Please note that the Input is also present on the **FM Matrix**. You can use it as modulator and carrier as if it were a normal Operator. Of course you will have to connect the IN Operator's output to something to hear it.

If you want to **process** the input without any FM action and pass it through the **effects** simply connect it to the **OUT** of the FM matrix.

#### 4.7.2. Voices and Polyphony



**Polyphony** sets the available number of voices. Only voices that are being played consume CPU power, so this parameter acts as a governor to set a limit. This parameter is mirrored by the Poly parameter in the main (top) panel display. It is not stored or recalled as part of a sound.

**Mono** limits playback to one note at a time, as in the old monophonic, analogue synthesizers. Like in the DX7 this also switches to single trigger envelopes (legato playing). However, you can still stack multiple voices on this one note using Unison (see next).

**Unison Voices** determines how many voices are stacked on a single key in unison mode. With **Dynamic activated** and many keys being pressed without enough available voices, the FM8 assigns **fewer voices** to each key, so individual notes “thin out” rather than disappear.

The **Dynamic** switch controls what happens when unison voices are selected, Mono is turned off and several notes are played at the same time.

- With Unison Dynamic switched **off**, each new note uses the number of unison voices specified, if necessary voices are stolen from other notes already playing.
- When Unison Dynamic is **on** the voices are shared equally between the notes. In this case the unison effect thins out gradually as more notes

are being played. Example: Unison Dynamic on, 8 Voices, 3 Unison voices, 4 Notes are played: each note gets 2 unison voices.

Unison **Detune** detunes the unison voices for a fatter, chorus-like effect. Higher values give increased detuning.

Use the **Pan** Parameter to distribute the stacked voices over the stereo panorama. This can produce nice three-dimensional effects.

### 4.7.3. Pitch and Portamento



**Master Tune** offsets the pitch from -99 to +100 cents for precise pitch matching to other instruments. This parameter is not stored or recalled as part of a Sound.

**Transpose** can transpose pitch up or down two octaves, in semitone increments.

**Portamento On** enables or disables the portamento function.

**Portamento Time** sets how long it takes for the pitch to glide from one note to another. 0 = shortest time, 100 = longest time.

**Portamento Auto** allows portamento to occur only when playing legato, i.e. when there is no gap between played notes. If you release a key before playing the next one, there will be no portamento. The auto portamento mode is especially useful in combination with the **Arpeggiator Tie** parameter. Tied notes are played legato and therefore get portamento. This is fun when programming **303-style** lines.

## 4.7.4. Arpeggiator and Quality



The Arpeggiator controls are mirrored from the Arpeggiator window. Please have a look at chapter 4.9 for details.

**Analog** introduces random variations between voices. This used to happen with analogue gear – e.g. component values would change as temperatures drifted, and so on. Higher values increase the degree of randomness, and are very effective in Unison mode.

**Digital** changes the bit resolution, and therefore the sound quality. The original DX7 was a 12 Bit device, whereas later models used 16 bits. This control lets you simulate the “vintage” sound and the resolution can even go lower than 12 Bit.

## 4.7.5. MIDI Controls

The image shows a window titled 'MIDI Controls' with buttons for 'Load', 'Save', and 'Dump'. Below the buttons is a table with two columns: 'CC' and 'Parameter'. The table lists 14 MIDI controllers and their assigned parameters. The row for CC 08 is highlighted in yellow.

CC	Parameter
01	Controller 1
02	Controller 2
03	Morph X
04	Morph Y
05	Op 2 Ratio
06	Op 2 Offset
07	Op 2 Amplitude
08	Op 2 Pan
09	Op 2 Velocity Scaling
10	Op 2 Keyboard Scaling
11	Op 2 Pitchbend Up > Amplitude
12	Op 2 Pitchbend Down > Amplitude
13	Op 2 Aftertouch > Amplitude
14	Op 2 Breath > Amplitude

The **MIDI controls** display a list of currently assigned MIDI controllers. The left column shows the **controller number** and the right column displays the assigned **FM8 parameter**.

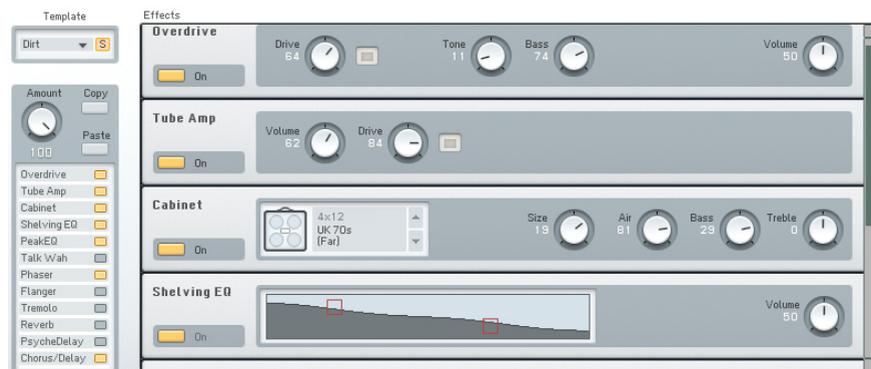
Click an assignment with the mouse to select it and hit the delete key on your keyboard to **delete** the assignment from the list

Double-click on a controller number and you can change the value.

The **Load** and **Save** commands are used to load and save a complete set of assignments from and to the hard disk. The file ending for assignments lists is f8c.

You can **assign** the parameters via the **MIDI Learn** function on the Application Control Bar. Please refer to chapter 4.4.2 for details.

## 4.8. Effects Window



The FM8 provides a complete set of high-quality effects to be used in your sound designs. The Effects units are displayed in a **rack** of virtual devices and the **signal flows** serially from top to bottom.

On the upper left of the Effects window you find the **Effects Template** system. Click on the small **triangle** to see the current **list** of Templates. If you want to save your own creation to the list, you have to name it first. A click on the **name** creates a cursor and you can type in the desired name via your computer keyboard. Clicking on **Save** opens the Templates list for choosing the **slot** you want to save the Template in.

The **Amount** dial controls the overall effects volume of the complete rack including all effects units. It acts like a **crossfade** between wet and dry signal. The wet signal is the signal after it has been processed by the effects and the dry one is without processing.

The following section provides a reference for all Effects units. You can individually switch them on and off with the respective **On switches** on the Effects unit itself or on the **Effects Navigator**. The Navigator is also mirrored on the **Easy** page.

### 4.8.1. Overdrive



This overdrive effect produces a warm and smooth distorted sound.

#### Parameters

- **Drive** determines the “crunch factor.” Turn clockwise for more distortion.
- Turning **Tone** clockwise provides a bright and screaming sound. Counter-clockwise turns lead to a mellower, darker sound.
- **Bass** provides control over the lower frequency tone.
- **Volume** sets the Effect’s output level. It acts like a master volume control.

### 4.8.2. Tube Amp

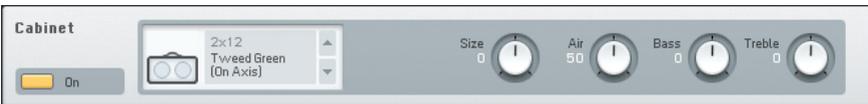


The Tube Amp simulates a tube guitar amplifier.

#### Parameters

- **Volume** sets the output level sent from the amplifier model. This determines the overall volume of the sound and it is strictly a volume adjustment without effect on the tone of the amp.
- **Drive** determines the preamp level sent to the main tube amp model. At high levels, this will force the tube amp into overdrive distortion.

### 4.8.3. Cabinet



The Cabinet Effects simulates a guitar cabinet. Combined with a Tube Amp you can simulate a complete guitar amp.

## Parameters



The **Cabinets menu** is for choosing the different cabinet models. Click on the small arrows to switch through the following models:

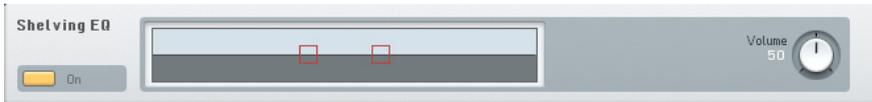
- **Tweed Green** 2x12 (On Axis)
- **Brit 60** 2x12 (on Axis)
- **Chief V-30** 2X12 (On Axis)
- **Chief V-30** 2X12 (Back)
- **Tweed Alnico** 4x12 (On Axis)
- **Tweed Alnico** 4x12 (Far)
- **UK 70s** 4x12 (On Axis)
- **UK 70s** 4x12 (Far)
- **Bass-WR** 4x10 (On Axis)
- **Bass-WR** 4x10 (Horn)

The comment in brackets states the placement of the virtual **microphone** and the numbers behind the name (4x10, etc.) depicts the speaker configuration of the cabinet.

- **Size** does the equivalent of “growing” or “shrinking” the cabinet and speakers. For example, with a 1x12 cabinet, set Size to -20% and it becomes a 1x10. Increasing Size to +25% turns it into a 1x15, and +43% creates a 1x17 speaker/cabinet.

- **Air** controls the level of early reflections in the room response adding a sense of space to the sound.
- **Bass** boosts or cuts the level of the lower frequencies.
- **Treble** boosts or cuts the level of the higher frequencies.

#### 4.8.4. Shelving EQ



A shelving equalizer is a type of tone control that boosts or cuts starting at a specific frequency. Upon attaining the specified amount of boost or cut, the response turns into a “shelf” and provides a constant amount of boost or cut past from that point.

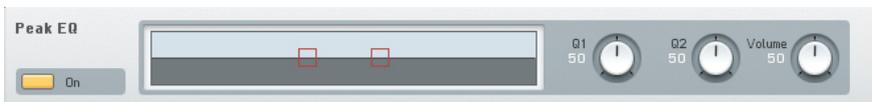
This type of EQ provides general tone shaping to correct broad issues, like lack of high frequency “sparkle” or excessive “boominess” in the bass end. The graph in EQ Shelving illustrates the response created by the controls.

#### Parameters

To adjust parameters click on the graphic display’s **dots** and **drag** (up to **increase gain**, down to **decrease gain**, sideways to change **frequency**).

The **Volume** dial controls the output level of the Effect.

#### 4.8.5. Peak EQ



A **peak** or **parametric equalizer** is a highly sophisticated form of tone control. Unlike the graphic equalizer which can boost/cut only at specific fixed frequencies, a parametric EQ can boost or cut over a continuously variable range of frequencies. In addition, the bandwidth (the range of frequencies affected by the boosting or cutting) is variable from broad to narrow. The graph illustrates the response created by the controls.

The Peak EQ includes two complete parametric EQ stages, i.e. the first stage could boost the bass frequencies around 100 Hz, while the second stage adds a midrange notch.

## Parameters

To adjust parameters click on the graphic display's **dots** and **drag** (up to **increase gain**, down to **decrease gain**, sideways to change **frequency**).

**Q1** and **Q2** edit the width of the frequency band for the boost or cut. Narrow bandwidth settings (turning clockwise from the centre position) affect a very small part of the audio spectrum, while broad bandwidth settings (turning counter-clockwise from the centre position) affect a broader range.

The **Volume** dial controls the output level of the Effect.

### 4.8.6. Talk Wah



This is similar to a Wahwah, but uses a different filter type that emulates the filtering that your mouth creates when enunciating vowels.

## Parameters

Mouth controls the Talk Wah frequency. Turning counter-clockwise gives an “oooo” sound; moving it toward center morphs into more of an “aah” sound, while going further to the right morphs into more of an “eee” sound.

Size adjusts the size of the “virtual mouth.” When counterclockwise, the mouth

is small, like that of a midget. When clockwise, it’s like a giant’s mouth.

Bright is a switch that makes the overall sound more trebly.

### 4.8.7. Phaser



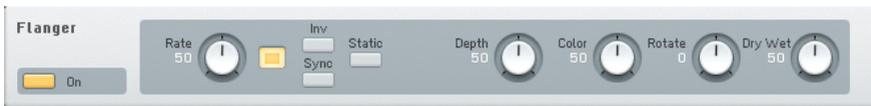
The Phaser adds a swirling, animated effect to the sound.

## Parameters

- **Rate** controls the speed of the phaser effect.
- **Invert** changes the phase of the shifted signal, producing a different timbre.

- **Sync** synchronizes the phaser rate to the host tempo so that it follows the song's rhythm. In standalone mode, the phaser rate syncs to the internal clock.
- **Notches** determines the number of stages in the phase shifter. Click on the associated numerical and drag to select from 1 to 5 notches.
- **Color** creates a timbral change that's a variation on the standard phaser sound.
- **Sweep Min** sets the sweep's lower frequency limit.
- **Sweep Max** sets the sweep's upper frequency limit.
- **Rotate** alters the phase difference between the LFOs feeding the left and right channels for a stereo effect.
- **Dry Wet** adjusts the mix of the dry and processed (phase shifted) sound.

#### 4.8.8. Flanger



This versatile flanger is roughly derived from a legendary analogue effects box.

#### Parameters

- **Rate** controls the LFO frequency. In other words it controls the speed of modulation.
- An active **Inv** button leads to a phase-shift of the modulated signal, thereby changing the timbre.
- **Sync** enabled synchronization of the LFO to the current MIDI tempo.
- **Static** toggles modulation of the effect on and off. If switched off, the flanging effect becomes static.
- **Depth** sets the amount of modulation applied to the effect.
- **Color** dials in the amount of feedback.
- **Rotate** produces a spatial effect by shifting the phases of the LFOs for the two channels against each other. This leads to the impression of “rotating” the effect in the stereo space.
- **Dry Wet** controls the balance between effect and dry signal.

## 4.8.9. Tremolo

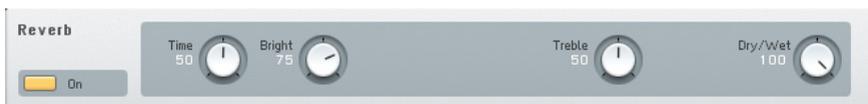


The Tremolo provides a periodic amplitude change leading to a pulsating sound. A modulation source controls the rate of these amplitude changes.

### Parameters

- **Rate** sets the modulation frequency. Faster settings add a type of “shimmering” effect to the sound.
- **Sync** synchronizes the tremolo rate to the host tempo so that it follows the song’s rhythm. In standalone mode, the tremolo rate syncs to the FM8 internal clock.
- **Intensity** controls the tremolo effect depth by adding in some dry signal to the processed signal.
- **Stereo** switches between a mono and stereo Tremolo effect. This interacts with the Width setting (see above).
- **Width** sets the ratio between the time spent at high or at low volume when stereo is off, or to the right / left side of the stereo field when stereo is on.
- The **Attack** dial controls the time the Tremolo spends rising up.
- The **Decay** dial controls the time the Tremolo spends decaying.
- Turning both Attack and Decay to minimum creates more of a hard gate effect.

## 4.8.10. Reverb



The Reverb provides a natural-sounding emulation of halls and rooms.

### Parameters

- **Time** determines the decay time of the reverb tail. Turn clockwise for a large concert hall, counter-clockwise for a small auditorium or room.
- **Bright** controls the decay time for the high frequencies.

- **Treble** boosts or cuts the level of the higher frequencies.
- **Dry Wet** adjusts the mix of the dry and processed (reverberating) sound.

#### 4.8.11. PsycheDelay



This true stereo delay (both ins and outs are stereo) creates sounds that range from standard echo/ambient sounds, to reverse-based effects that recall the “backwards tape” sounds of the 1960s.

#### Parameters

- **Time** adjust the initial delay time, from 10 ms to 2000 ms. This parameter interacts with the Stereo dial. Note that very short delay times give complex, ring modulation-type tones.
- **Tap** sets the delay rhythm as you click on the Tap Time button. This function measures the time between clicks, and uses this value to derive the tempo. It will also average the time between multiple “taps.”
- **Sync** synchronizes the delay time to the host tempo so that it follows the song’s rhythm. In standalone mode, the delay time syncs to the FM8 internal clock.
- **Feedback** determines how much of the output feeds back into the input. Minimum feedback gives a single echo. Increasing this parameter produces repeating echoes. As noted above under “Detune,” Feedback interacts with the Detune parameter.
- **Reverse** causes these additional delays to play back in reverse, like the main delays when the main reverse button is enabled.
- **Stereo**, when turned clockwise, creates stereo echo effects. At 1.00, the delay time is set solely by the main Time parameter. Settings of less than 1.00 place echoes in the stereo field, with the number indicating division (e.g., a setting of 0.50 means that the extra echoes will happen at half the time of the main delay setting).
- **Detune** detunes echoes up to  $\pm 50$  cents. Combining this with feedback causes successive echoes to have ever-increasing amounts of detuning.

- **Pitch** adds a more extreme amount of detuning by transposing the echo in semitones, from  $-12$  to  $+12$ . It interacts with the feedback control in the same way as Detune (i.e., each successive echo will be transposed an additional amount upward or downward, as set by the Pitch value).
- **Dry Wet** sets the balance of straight and delay sounds. Completely turned to the left means dry sound only. Turning the dial clockwise adds more delay effect.

#### 4.8.12. Chorus / Delay



#### Parameters

This actually is a 4-tap stereo delay line with four independent modulation LFOs and the output can be filtered - a luxury Chorus. You can also use it for nice delay effects.

- 
- **Time** sets the time between repeats.
- **Invert** alters the phase of the repeats. Inversion gives a somewhat more diffused sound with echoes and with flanging, changes the effect's tonality.
- **Sync** synchronizes the delay time to the host tempo. If Sync is activated, the modulation LFO is also synchronized to the tempo. In standalone mode, the delay time syncs to the FM8 internal clock.
- **Sync Delay's** phase locks the modulation LFOs and diffused echoes.
- **Diffusion** spreads the 4 echo taps in time. Higher values give more diffusion. With Time = 55, Feedback = 70, Diffusion = 100, Dry/Wet = 85, Low Cut = 100, Hi Cut = 40 and Modulation Depth = 20, you'll hear a reverb-like effect.
- **Low Cut** determines the delayed signal's low end frequency response. 0 gives full low frequency response. A setting of 100 cuts out the low frequencies.
- **Hi Cut** edits the delayed signal's high end frequency response. 0 gives minimum high frequency response. A setting of 100 gives maximum high frequency response.

- **Feedback** causes the delay output to feedback to the input, thus creating multiple echoes. The Delay Time control sets the spacing between echoes.
- The two **modulation parameters** add a periodic, cyclic shift to the delayed signal time. At low delay times, adding modulation by turning up the Depth control creates flanging effects. At slightly longer delay times, it's possible to obtain chorusing. At high values, you can get some really warped sounds by turning up the Depth.
- **Mod Rate** sets the period of the LFO modulating the delay time. 0 = slowest rate, 100 = fastest rate.
- **Mod Depth** determines how much the modulation varies the delay causing pitch modulation. 0 = no modulation, 100 = maximum modulation.
- **Dry Wet** determines the mix of straight and processed sounds. 0 gives dry sound only, 100 gives effect sound only. 50 is generally the optimum for chorusing and flanging effects.

## 4.9. Arpeggiator Window



**Arpeggiators** are an integral part of the synthesizer world since the 80s. The FM8 extends on this system of **semi-automatic pattern production** by adding a step matrix that is derived from step-sequencers. This adds a lot of flexibility and blurs the line between sequencing and arpeggios.

The pattern driven FM8 Arpeggiator is a bit more complex than your average Arpeggiator to be found in many other synthesizers. Nevertheless, it is still your note input from the keyboard (or from another sequencer) that is the basis on which the resulting pattern of notes is constructed.

The notes you play on the keyboard are “projected” on the pattern you construct with the **Pattern Editor**. The Editor works like a step sequencer where you can

set several parameters for every step of the pattern. The Pattern as defined in the Editor always runs from step one to the Repeat marker and then starts over from position one.

You can define for every step if it triggers a note or not, which of the input notes is triggered, if the following note gets tied to the current one, if the step is accented, transposed, etc.

Most of the time there are more steps in the pattern than notes played on the keyboard. The notes played are used according to the Mode setting leading to a great variety of sequences. They can be used as an upwards, sequence, randomly, extended over several octaves, etc.

### 4.9.1. Arpeggiator Controls



The **On** button activates the Arpeggiator. The step position is driven by the clock (internal or host). When you press a note it plays at whatever step it happens to be now.

Use the **Copy** and **Paste** buttons to transfer complete sets of Arpeggiator settings from one Sound to the other.

The **Template** system provides access to a variety of preset patterns and is also the way to go if you want to save your own creations. Find the factory templates and your own, previously stored patterns by clicking on the small **triangle** of the menu. There can be up to 64 stored Templates. For saving the new Arpeggio, use the **Save** command. A click on this button opens the **list** of Templates. Click on the desired slot and the new pattern is stored. Please be aware, that the Template already residing in the chosen slot will be overwritten.

Use the **Hold** function to let the Arpeggio run even if you lift your fingers from the keys. You can keep adding notes by holding them down at the same time. When you let go, they all keep playing. When you then press a first note, the old held notes stop and the new note starts playing.

The **Down** switch selects whether the pressed notes are counted up from the lowest (default), or down from the highest.

- When off, 1 = lowest note, 2 is second lowest.
- When on, 1 = highest note, 2 is second highest.

With the **One Shot** Option active, the pattern will run only once and then stop. This is useful for triggering single phrases. This is most useful with active Key Sync (see below).

If you have developed a nice new Arpeggio, you can give it a new name with a single-click into the **name field** and subsequent keyboard entry.

**Key Sync** determines whether the Arpeggio will restart from position one when a key is pressed or if it will just continue at the position it is currently at (the Arpeggiator has its own clock that is always running).

**Tempo Sync** is only functional when the FM8 is running as a plugin in a sequencer or other host environment. If Tempo Sync is switched on, the Arpeggiator will synchronize to the current song tempo of the host application. If you switch it off the Arpeggiator will run with its own clock and the tempo can be independent from the host tempo.

In standalone mode the Arpeggiator always runs with its own clock and cannot be synchronized to external software.

The **Repeat Mode** menu sets the way the Arpeggiator distributes the input notes on the chosen step grid (see below). As the length is determined by the pattern, there are many ways how the notes can be used by the Arpeggiator to build the sequence. Example: the Note pattern goes 1 2 3 4 5 6 7 8, but only 3 notes are pressed: C, D and E. There are nine Repeat Modes available:

- **Ping:** C D E D C D E D
- **Pong:** C D E E D C C D
- **Wrap:** C D E C D E C D
- **Wrap+:** C D E C+ D+ E+ C++ D++ (+ = 1 octave up, ++ = 2 octaves up)
- **Wrap-:** C D E C- D- E- C—D-- (- = 1 octave down, -- = 2 octaves down)
- **Last:** C D E E E E E E
- **First:** C D E C C C C C
- **Random:** This chooses randomly from the played notes.
- **Pause:** C D E - - - - -



The next controls all deal with the tempo grid and note lengths.

Use the **BPM Display** to dial in the desired tempo of your Pattern. Click with your mouse and drag it up or down to change the value. Be aware that an active Tempo Sync will override this setting when running the FM8 in a host environment.

The **Time Resolution** menu provides five options for choosing the duration of the steps. Depending on this setting the Pattern will run faster or slower.

The Time Resolution parameter interacts with the **Triplets** and **Dotted** switches, which are mutually exclusive. Use them to produce triplet or dotted steps with the step length set by the Time Resolution menu.

The length of the produced notes is controlled by the **Note Length** dial. The value displayed means **percentage** of the current **step length**, with a default value of 50%.

With **Shuffle** dialled in, every second step is shifted forward or backward in timing. At Shuffle = 0 (default) these off-steps are exactly in the middle and the result is the usual mechanically precise timing. With Shuffle = 33 you get a triplet timing 2/3 to 1/3, i.e. the on-the-beat-step is twice as long as the off-step.



The last group of controls circle around velocity and keyboard split.

The **Vel** switch activates fixed velocity mode. When on, all notes are played at constant velocity (determined by the Velocity dial), otherwise at the velocity with which they were pressed.

The **Velocity** dial determines the Velocity of produced notes when the Vel switch is on and the Arpeggiator produces only fixed velocities.

Control the amount of velocity boost given to accented steps via the **Accent** dial.

With active **Split**, one part of the keyboard is arpeggiated, the rest plays normally. Set the split point in the **Note** field below the Split button or press the **Learn** button and hit a MIDI key. An active **Bass** button causes the notes below the split point to be arpeggiated. With inactive Bass option the notes above the split point are arpeggiated).

## 4.9.2. Pattern Editor



The **Pattern Editor** is the place where you actually develop your sequences. It consists of a grid with the columns representing the individual steps and each row controlling one of the six parameters. The steps and the binary parameters can be activated / deactivated by single mouse-clicks. The parameters offering more than one state present a menu with the possible values.

The position on the timeline is shown by a **running highlight** on the **Position Row** on top of the grid. Set the **Pattern length** by clicking between the numbers on the Position Row to set the **Repeat Marker** or drag it directly.

To the left of the Position Row there are two **Position Shift** buttons that rotate the contents of the matrix. They move all steps up to the repeat marker to the left or right by one position. What was the last step before the repeat marker now becomes the first step. Everything to the right of the Repeat Marker stays unchanged.

The **On** row determines which steps trigger a note.

With an activated **Tie** on a step, the last note is played legato to tie it to the one with the Tie. This has two important side-effects:

- When the tied step plays the same note as the step before, no new Note On message is generated. The old note just continues to sound.
- The Auto-Portamento mode in FM8 is triggered by legato playing. This means that tied steps will generate a pitch-slide like in the TB303.

With the **Accent** row you can boost the velocity of individual steps. The amount of Accent is controlled by the Accent dial (see above).

The Note Order row allows for very complex sequences to be derived from your note input. The ID number for each step specifies which of the pressed notes will be played. The default order is 1 2 3 4 5 6, etc., with the notes being counted either from lowest to highest or the other way around (depending on the Down switch). It can be set to the following values:

- **All:** All input notes are triggered at once, so if you play a chord, you will hear this chord for all steps activated set to All; otherwise the Arpeggiator always plays monophonic lines.
- **Random:** One of the pressed notes is picked out at random.
- **1-32:** Means that this input note (counted from lowest or highest) is triggered.

The **Octave** row allows for transposition of the steps octave-wise up or down, whereas the **Transpose** parameter is for transposition in semi-tone steps.



You can reset the individual rows to their default values by clicking on the **Reset** buttons and a click on the **Randomize** button fills the respective row with random values.

## 4.10. Easy / Morph Window



FM synthesizers were never easy instruments to program. Familiar synth parameters were suddenly replaced by a confusing array of Operators, modulators, rate/level envelopes, and other terms that had no counterpart in analogue synthesis. No wonder so many people bought third-party sounds!

In designing FM8, Native Instruments has added various helping hands to make FM synthesis a breeze to program.

For most sounds, the **Easy Edit** page will be sufficient to customize a sound for your needs. Just call up a Sound and experiment with the settings to hear how each one affects the sound.

All the Easy Edit sliders go **positive** and **negative**, to let you increase or decrease the relevant properties of the sound. When the sliders are centred (zero), you hear the original sound.

The various Easy Edit parameters are “meta-parameters” and manipulate a more or less complex set of FM8 parameters when you use them.

### 4.10.1. Timbre Controls



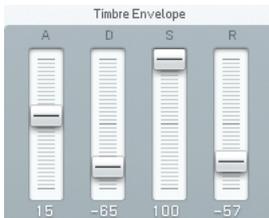
**Harmonic** changes the harmonic content (by adjusting the Operator Ratios). Depending on the patch, the changed harmonics may be somewhat atonal.

**Detune** changes the pitch slightly of different oscillators in a multi-oscillator preset, which creates a fatter sound.

**Brightness** increases the sound's high frequency content by increasing the connection amounts in the FM-Matrix.

**Envelope Amount** sets how much the timbre envelope influences the sound.

**Velocity** Sensitivity determines the extent to which changes in timbre correlate to the dynamics of your playing.



The FM8 multi-stage envelopes allow for extremely precise control, but are time-consuming to set up. The Timbre Envelope brings all these parameters together into the familiar ADSR (Attack Decay Sustain Release) envelope format. Changing any **Timbre Envelope** parameter causes multiple changes in the individual Operator envelopes to accomplish the desired effect.

- **Attack** Positive values increase the existing attack time, negative values decrease the attack time.

- **Decay** Positive values increase the existing decay time, negative values decrease the decay time.
- **Sustain** Positive values increase the existing sustain level, negative values decrease the sustain level.
- **Release** Positive values increase the existing release time, negative values decrease the release time.

### 4.10.2. Output Controls



**Stereo Width** affects the spread of Operators in the stereo field. Positive values increase the width to create a wider stereo spread, negative values collapse the spread to centre (mono).

- **Velocity** sets how the velocity affects the overall output level. Positive values increase velocity response, while negative values decrease the response to velocity.
- **Volume** changes the overall Sound level. Positive values raise the volume, negative values decrease it.

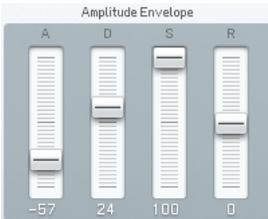
### 4.10.3. LFO and Amplitude Envelopes



As with the envelopes, the LFO parameters tie in with multiple parameters. Here's what each control does.

- **Rate** changes the LFO speed. Positive values increase the speed, negative values decrease it.

- **Vibrato** alters how much the LFO modulates pitch. Positive values increase the amount of pitch modulation, negative values reduce it.
- **Timbre** determines how much the LFO modulates the frequency response. In an analogue synth, this is equivalent to altering the amount of filter modulation from an LFO. Positive values increase the amount of timbre modulation, negative values reduce it.
- **Tremolo** sets the extent to which the LFO modulates amplitude. Positive values increase the amount of amplitude modulation, negative values decrease it.



This allows tweaking amplitude (level) characteristics in a manner similar to using the Timbre Envelope to tweak timbral characteristics. Changing any Amplitude Envelope parameter causes multiple changes in the individual Operator envelopes to accomplish the desired effect.

- **Attack** Positive values increase the existing attack time, negative values decrease the attack time.
- **Decay** Positive values increase the existing decay time, negative values decrease the decay time.
- **Sustain** Positive values increase the existing sustain level, negative values decrease the sustain level.
- **Release** Positive values increase the existing release time, negative values decrease the release time.

#### 4.10.4. Apply and Reset



If you like the edits you've made to the sound, click on **Apply** to store the edited sound in the Edit buffer. This means that the Easy Page settings revert to zero, but the relevant sound settings on the other pages are changed so that you get the same sound. You can go on changing your sound with the Easy Page from there.

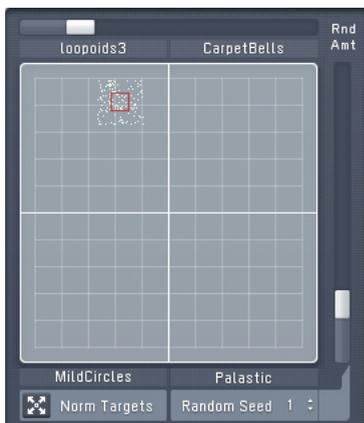
Use **Reset** to return to the original, pre-edited sound.

## 4.10.5. Effect Controls



The Effects controls provide a convenient way to change the Effects setup without leaving the Easy Page. Just activate or deactivate the various Effects units by clicking on the respective buttons. The Effects settings will be default or as saved with the current Sound.

## 4.10.6. Morph Controls



The **Morph Square** is your interface to sonically move between four different FM8 Timbres.

The Morph corners are set up via **dragging** the Sounds from the Browser to a quadrant of the **small Morph Square** you find in the **Application Control Bar**.

Once the corner slots are filled with Sounds, you can grab the **red square** handle and move it around in the square. The timbre will be morphed to intermediate versions of the four timbres. Old FM7 sounds have no morphing information, meaning all corners are the same, and morphing has no effect.

New FM8 sounds have morphing built in so you can load the sound and start morphing between its corners right away.

You can also morph a **single Sound**. Load a sound and **normalize** it (see below). Select the lower-left corner of the morph square (let's name it "master corner"). In this state all four corners have the same timbre settings. Now click on another corner (let's name it "timbre corner") and change some parameters which can be morphed, e.g. FX Amount. Now you can morph with the handle between the two parameter settings in the master and timbre corner.

Each corner represents a set of parameters consisting of:

- Operator frequencies
- Operator waveforms (not morphed, but switched)
- Operator X and Z settings
- The Analog & Digital parameters
- FM matrix amounts
- FX Amount

These morphable parameters are marked in the user interface. The following parameters are **not morphed**. They exist only once:

- Envelopes
- Keyscalings
- Mono, unison, portamento
- Modulations (LFO, modulation assignments)
- Arpeggiator
- Single FX parameters

You can **edit the names** of the four morph corners by single-clicking them and typing in a new one. This can be very useful, as not all parameters are morphed (see above) leading to a disconnection from the original.

At the right edge and at the upper edge of the square are two sliders labelled **Random Amount**. When they are non-zero, a cloud of dots appears around the handle to indicate the range in which parameters are randomized (each dot represents one parameter). The two sliders control the height and the width of the cloud.

Each value of the **Random Seed** parameter sets a different but reproducible random distribution (throwing the dice).

The **Normalize Timbres** button takes the current Morph state and copies it to all four Slots of the Morph Square leading to four identical Morph corners.

## 4.11. Expert Controls

### 4.11.1. FM Matrix

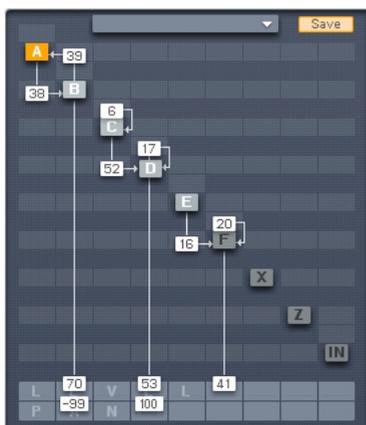
#### Concepts

Although the FM8 comes with numerous Sounds and can load in presets from FM synths, learning how to program the FM8 will reward you with unique sounds that have your own sonic signature. The depth and range of FM synthesis astonishes, from complex, acoustic-like timbres to wild sound effects.

Programming starts with an algorithm, and then continues with programming the various Operators that make up the algorithm. The final programming step involves adding effects and tweaking.

Unlike FM synthesizers, which had a fixed selection of algorithms, you can create a virtually infinite number of algorithms via the FM8's programming matrix. You find the matrix on all Expert pages, except on the Modulation page.

The matrix lets you route modulators to carriers, and send carriers to the audio output. Any Operator can be a modulator, a carrier, or both simultaneously, and any number of modulators can modulate any number of carriers. Let's analyze the algorithm for the Sound Piano 2 included in the FM8 database.



Operator A modulates Operator B, which is a modulator for Operator C. Operators C, D, and E all modulate Operator F, which serves as a carrier, and feeds the output. Note that Operator D has feedback.

Inactive Operators are „greyed out“. In the X and Y Operators the letters are greyed out if Bypass is activated.

## Changing Parameters

The following **mouse operations** and **key commands** are available in the Matrix:

- Click on Operator selects the appropriate Operator page
- Right click (Mac: Ctrl click) on Operator switches it on and off.
- Shift+Right Click (Mac: Shift+Ctrl click) on Operator X and Z switches Bypass on and off (if Operator X/Z is active)

**Constructing** your own algorithms is an easy task with the Matrix:

- To send an Operator output to another Operator input, imagine a line going downward from the first Operator. Imagine a second line going across to the right, to the target Operator.
- Click and hold at the junction of these two imaginary lines, as represented by the square field in the background where you click.
- Drag up. The imaginary lines are now drawn in, and a box appears with a numerical value. This controls the level of the modulator feeding the carrier. Drag until the numerical shows the desired level.
- Any Operator can feed back not just to itself, but to any other Operator. To create feedback from one Operator to another, imagine a line going upward from the first Operator and a second line going across to the left, to the target Operator.
- Click and hold at the junction of these two imaginary lines.
- Drag up. The imaginary lines are now drawn in, and a box appears with a numerical value that acts like a volume control. Drag until the numerical shows the desired level.
- For removal of a connection, drag its value down to 0 or simply double-click it.

## Panning

The lowest row of the FM Matrix holds the **panning** values for the different Operators. Pan values range from **-99** (left channel only) to **100** (right channel only).

Panning has no effect on modulations. The Operator has to be a carrier and be routed to the output for the pan value to work. Pan will also work for operators routed to the filter operator Z when Z is routed to the output.

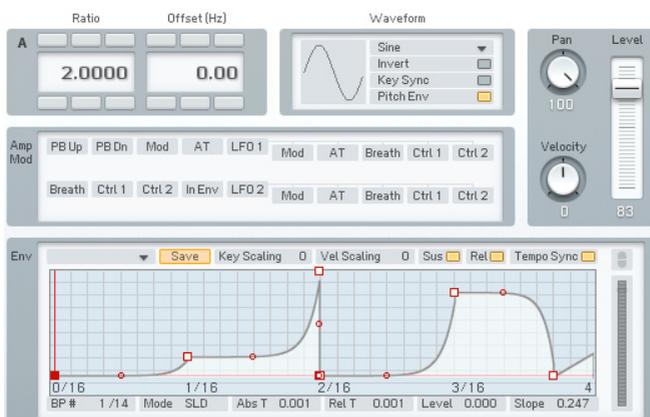
## Templates



There is a handy **Template** system available for storing your fresh Algorithms and for accessing the preset Algorithms that ship with your FM8.

The **Template menu** presents a list of preset algorithms, including all those found in the original DX7. Save lets you store an Algorithm to the list of presets. To **save** an Algorithm you created, enter a **name** in the name field, click the **Save button** and choose the **Slot** you want to save to. The maximum number of stored Templates is 64.

### 4.11.2. Operator A-E Pages



## Global Controls



**Level** serves as a master level control for all values in the matrix column associated with the selected Operator, except for any feedback to itself. Example: If Operator E modulates Operator F and sends its output to the main output, there are two values in the column, one connecting to Operator E

and one to the output. Lowering or raising Level will lower or raise both values. Similarly, raising or lowering the highest-value numerical will raise or lower the slider.

---

**Note:** the Level slider will always assume the value of the column numerical with the highest value. It also works ratiometrically. In other words, if one value is at 50 and another is at 100, reducing the second value from 100 to 50 doesn't reduce the other value to 0, but to half of its value, as 50 is half the value of 100.

---

**Pan** mirrors an Operator's pan control in the algorithm creation matrix, and edits the audio output's placement in the stereo field, from left to right. Changing this control changes the corresponding value in the matrix; changing the numerical similarly changes the slider.

**Velocity** sensitivity sets how the overall envelope amplitude responds to velocity. At lower values, velocity has less effect. At higher values, velocity kicks the envelope up higher. If the Operator is a carrier, higher-amplitude envelopes increase the volume. If the Operator is a modulator, higher-amplitude envelopes change the timbre by increasing the brightness. With negative values a higher keyboard velocity will reduce the Operator level.

## Frequency Controls



**Frequency Ratio** defines the mathematical relationship of the Operator frequency compared to the fundamental frequency of the note being played. 1.0000 means the Operator is the same pitch as the fundamental, 2.000 sets the Operator to the second harmonic (1 octave higher), 3.000 is the third harmonic (octave + fifth), etc. 0.5000 is the sub-harmonic one octave below the fundamental.

These values are edited by clicking on one of the digits and moving it up or down. The arrows above and below each numerical allow incrementing (up arrow) or decrementing (lower arrow) one value at a time.

When the Ratio is not an exact integer (e.g. 1.0030) then the Operator is detuned and will “beat” against other Operators. The beat frequency rises if the note pitch increases, and falls if the note pitch decreases.

**Frequency Offset** applies a constant frequency offset (in Hz) to the Operator to cause detuning and beating against other Operators. This is constant regardless of pitch. Example: a 5 Hz Offset causes beating at exactly 5 Hz between the selected Operator and another Operator with no offset.

When using an FM-Operator as a **static wave shaper (Ratio = 0, Offset = 0)**, the phase of the waveform can be adjusted. This makes a big difference to the modulated sound. A **negative value** for **Offset** controls the phase in percent. So Offset = -10 means the wave is shifted by 10%. Offset = -100 is 100% shift which sounds the same as no shift at all, as the waveform is periodic.

## Waveform Controls



An Operator can have any of 32 different waveforms (the original DX7 had only sine waves). Clicking and dragging up or down on the numerical selects the waveform.

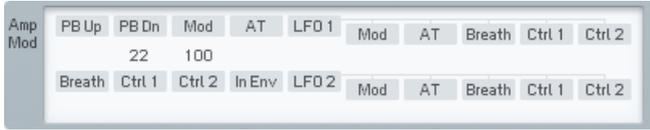
### Key Sync vs. Free Run

Clicking on this box toggles between these two selections. Key Sync mode resets the oscillator phase at the beginning of each note. When any group of Operators needs to have a fixed phase relationship to preserve a particular tone quality, activate Key Sync for all Operators in the group. With Free Run mode, there is no phase reset.

**Pitch Envelope** toggles modulation by the pitch envelope on and off. This allows some nice effects. When one carrier is pitched and another is not, a deactivated Pitch Envelope for one of them gives a fat, time-varying detune effect. When this time-varying detuning is applied between a carrier and its modulator, the result is an inharmonic FM effect.

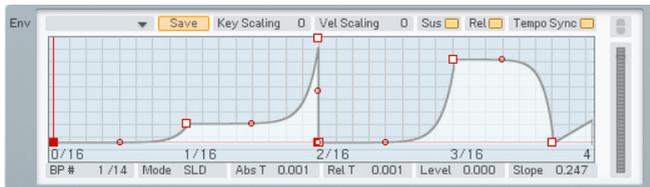
**Invert**Waveform flips the waveform upside down. This can make a subtle difference in FM-Modulation. The effect is especially noticeable when a waveform Operator feeds back on itself.

## Amplitude Modulation Controls



This is a subset of the Modulation Matrix page. Please refer to chapter 4.11.7 for information on assigning controllers; the only difference is that to conserve space, the pitch modulation sources are arranged in two lines stacked above each other, instead of one long line.

## Amplitude Envelope Controls



The lower pane displays the **Amplitude Envelope** varying the Operator amplitude over time.

**Key Scaling** edits how keyboard pitch affects the envelope times. At higher values, playing higher up on the keyboard shortens all time values. This emulates many plucked instruments, whose notes attack and decay more quickly at higher pitches.

**Velocity Scaling** edits how velocity affects the envelope times. At positive values, hitting the keys harder shortens all time values. At negative values the envelope times become longer with higher key velocity.

**Sustain mode:** In FM7, Sustain was always on. When Sustain is turned off, the envelope does not go into a loop or wait at the loop-end marker, it just continues straight into the release phase.

**Release mode:** In FM7, Release was always on. When Release is turned off, Note-Off messages are ignored. So when a key is released, the envelope just keeps doing whatever it's doing: looping, sustaining or (with sustain off) running through to the end. When Release is off and Sustain is on, the Envelope will never reach its end, but sustain indefinitely, until it is retriggered .

**Tempo Sync** superimposes a grid on the envelope display that corresponds to rhythmic values, such as quarter notes, eighth notes, 16th notes, etc. Breakpoints can be snapped to these points.

The quantization value depends on the current zoom factor, as set by right-clicking on the envelope ruler and dragging. (When Tempo Sync is enabled, the ruler markings will be calibrated in rhythmic values instead of seconds.) If the incoming tempo information changes, the envelope times are re-computed to match the current song tempo. Example: If the envelope loop is set to a 1 beat duration, it will remain 1 beat long as the tempo changes.

If an envelope has already been created, enabling Tempo Sync will not change the existing breakpoints. However, you can edit an existing envelope by moving the breakpoints so that they snap to the nearest quantization value.

---

**Note:** Not all VST host software supplies tempo information to plug-in instruments, so this feature may not work with your host software.

---

The **Level meter** displays the current amplitude of the Operator (for the last triggered voice). This is the combined effect of the envelope and any amplitude modulation. The FM-Matrix connections do not affect the meter reading.

The **Envelopes** are of the time/level type. You specify the levels and add the times that it takes to get from one level to the next. Levels are created by **inserting breakpoints** along a line. Then you **move the breakpoints** up or down to change levels, and left or right to change times.

**Right-click** (Mac: ctrl-click) wherever you want to **insert** a breakpoint. The first and the last breakpoints always move up and down together because they are really one and the same. This is because the envelope always has to start from the same level where it ends. In fact, to prevent annoying clicks, the envelope always does this, even when it is retriggered before it has reached the end - it starts the first segment, the attack, from whatever level the envelope happens to be at when it is triggered.

The left-most breakpoint is where the envelope starts. The next breakpoint to the right sets the envelope's maximum level; the first two breakpoints therefore create the envelope's **attack**. The next breakpoint to the right specifies the level to which the envelope will fall after passing through the attack phase (**decay**).

This and the maximum breakpoint fall on two vertical red lines. These indicate the segment where the envelope reaches the **sustain** level, marked by the horizontal red line. On this level the envelope stays as long as the key is held down.

If you insert one or more breakpoints between the red markers the sustain segment becomes a **loop**. This means that this part will be repeated as long as the note is sustained. You can create novel tremolo effects by changing

the positions of these breakpoints and this can even be used to create sequences.

If there are more than 3 breakpoints the sustain or loop segment can be shifted by moving the **vertical red lines** with the mouse. They **snap** to the next breakpoint, except the start and the end point.

Upon releasing the key, the envelope continues with the segment after the second red marker. In our example there is one more breakpoint after the sustain, the final end point.

Dragging the **Slope Handle** (small circle) between breakpoints changes the line's **slope** between the breakpoints from concave over linear to convex.

BP #	1 / 14	Mode	SLD	Abs T	0.001	Rel T	0.001	Level	0.000	Slope	0.247
------	--------	------	-----	-------	-------	-------	-------	-------	-------	-------	-------

Now let's investigate the envelope parameter strip below the envelope. Except as noted, clicking on a numerical value and dragging up or down edits the value; they also update automatically if you move the breakpoint.

- **#** shows two numbers. The first field is the index number of the breakpoint or stage being edited. The second field is the total number of envelope breakpoints. This is for display only and cannot be edited.
- **Mode** has two options, **SLD** and **FIX**. In **SLiDe** mode, if you move a breakpoint left or right, the envelope to the right of the breakpoint moves as well to maintain the same times and levels past the breakpoint being edited.
- In **Fix** mode, the total envelope time doesn't change. Moving a breakpoint to the right not only lengthens its distance compared to the breakpoint to its left, but shortens the distance compared to the breakpoint at its right.
- **Abs Time** shows the amount of time in seconds from the start of the envelope to the breakpoint being edited.
- **Rel Time** shows the time between the current and the previous breakpoint.
- **Delta Time** shows the amount of time in seconds from the breakpoint being edited to the breakpoint at its immediate left.
- **Level** shows the breakpoint level referenced to the centre line.
- **Slope** shows the state of the line between breakpoints. 0.5 indicates a straight line. 0.999 indicates a maximally convex curve. 0.001 indicates a maximally concave curve.

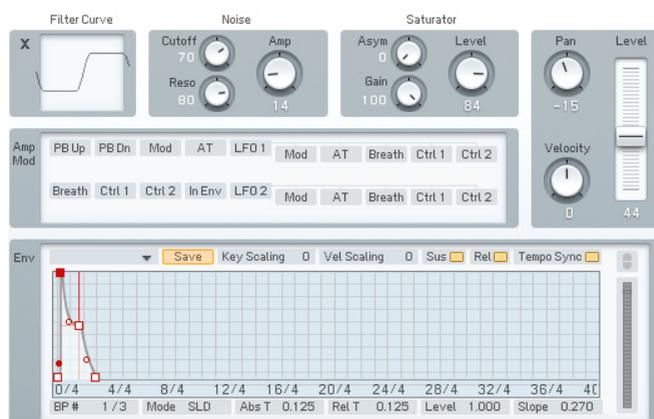
The ruler behind the envelope is calibrated in seconds. If the envelope extends past the envelope's visible range, click on the blue background and **drag** to the left or right to see a different **range** of the ruler.

You can **zoom in or out** by clicking into the background and moving the mouse up or down

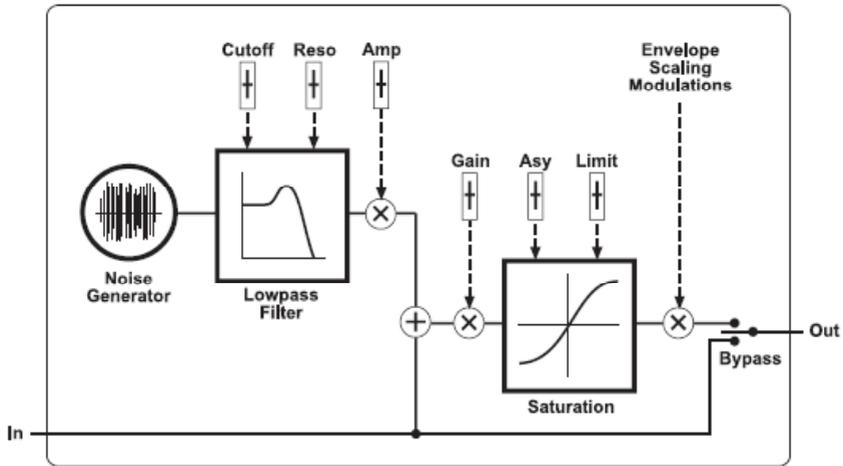
Double-click on the background to have the envelope **fit** exactly within the visible part of the ruler.

To the right of the envelope there is a button indicating the link status of the envelope. Note that it can only be used to unlink the current envelope.

### 4.11.3. Operator X Window

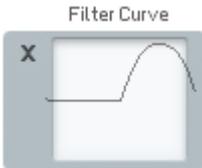


This special-case Operator resembles a conventional Operator in many ways: its amplitude can be envelope-controlled, keyscaled, amplitude modulated, and fed back to other Operators. However, it both generates **noise** and can process an input signal with **wave shaping (distortion)**. The noise is mixed with the input signal, processed by a saturation stage and multiplied with the envelope.



Operator X block diagram

## Filter Curve



This display shows the effects on the waveform of manipulating the various saturation controls. It has no adjustable parameters.

## Noise and Saturator



Noise adds digitally-generated random noise (this is very useful for modulating carriers, but also provides a useful audio output).

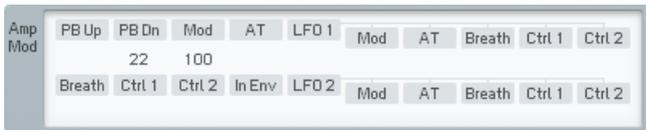
- **Noise Amp** sets the noise level.
- **Noise Cutoff** sets the noise generator's lowpass filter cutoff. With very low cutoff values, the noise source can serve as a low frequency random modulator.

- **Noise Reso** sets the noise generator’s lowpass filter resonance. It adds a sense of pitch to the noise.



- Saturator **Gain** sets the level going through the Saturator. The higher the level, the more pronounced the effects of the Asym and Limit controls.
- **Asym** offsets the symmetry of the saturation. The higher the value, the greater the saturation of negative amplitudes will be.
- **Limit** clips both the positive- and negative-going portions of the waveform. Lower values produce more clipping; a value of 100 introduces no clipping. Note: Extreme clipping will also lower the output level.

## Amplitude Modulation Controls

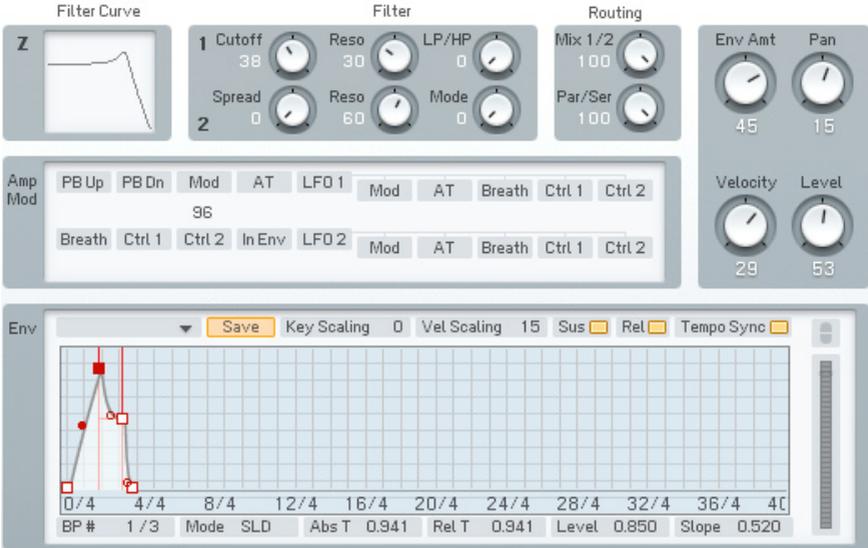


This is a subset of the Modulation Matrix page. Please refer to chapter 4.11.7 for information on assigning controllers; the only difference is that to conserve space, the pitch modulation sources are arranged in two lines stacked above each other, instead of one long line.

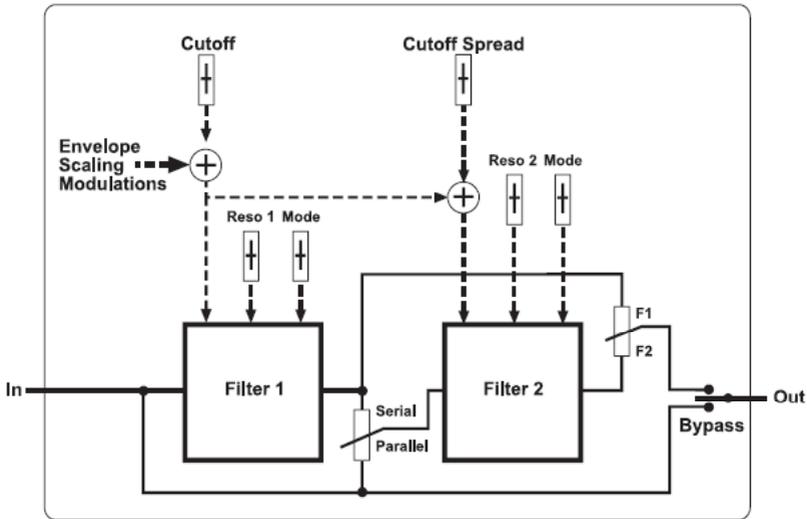
## Envelope

This is identical to the envelope function in the other Operators, as described in this chapter under Operator Amplitude Envelope.

### 4.11.4. Operator Z Window

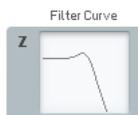


This special-case Operator is a signal processor that contains two separate filters (each a 2-pole 24dB/oct multimode filter), which can be combined in almost any imaginable configuration. Yes, FM synthesis finally has a great-sounding, analogue-style multimode filter.



Operator Z block diagram

## Filter



This display shows the effects on the waveform of manipulating the various saturation controls. It has no adjustable parameters.



- **Cutoff** controls the initial cutoff frequency of both filters.
- **Reso** performs the same function for each filter, and sets the degree of resonance (boost at the cutoff frequency).
- **Mode** performs the same function for each filter. It allows setting the response mode in a continuously variable fashion from lowpass, to bandpass, to highpass.
- Cutoff **Spread** applies to Filter 2 only. It offsets Filter 2's frequency compared to Filter 1. A value of 0 sets identical cutoffs for both filters. Increasing the value increases Filter 2's cutoff compared to Filter 1.



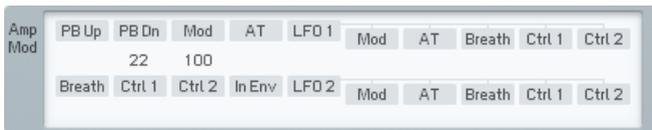
- Filter **Mix** changes the balance of the output of the two filters, from only Filter 1 output, to both outputs, to only Filter 2 output.
- **Par/Ser** adjusts the configuration of the two filters from serial (Filter 2 follows Filter 1) to parallel (the same input signal feeds both filters, and their outputs are mixed together), to anywhere in between.



Note that the display of the filter response is invaluable in figuring out how these parameters affect the filter response.

- **Env Amount** determines how much the envelope affects the cutoff frequency. Positive values kick the cutoff higher, while negative values lower the cutoff.
- The **Pan** dial controls the placement of the Operator's signal in the stereo spectrum. Low values place it to the left, higher values to the right.
- Use the **Velocity** knob to control the filter cutoff with velocity. The modulation amount can be negative and positive.
- The **Level** dial determines the volume of Operator Z in the mix of all Operators.

### Cutoff Modulation Controls



This is a subset of the Modulation Matrix page. Please refer to chapter 4.11.7 for information on assigning controllers; the only difference is that to conserve space, the pitch modulation sources are arranged in two lines stacked above each other, instead of one long line. Also note that unlike the other Operators, this modulation affects the filter cutoff frequency, not an amplitude parameter.

### Envelope

This functions similarly to the envelope function in the other Operators, as described in this chapter under Operator Amplitude Envelope, but affects filter cutoff rather than amplitude.

## Application Notes

A typical use of Operator Z would be to put the filters in series and select low pass mode for both. This provides the typical 24dB/octave low pass filter response as found in traditional analogue synthesizer filters, such as the Minimog. To emulate the Oberheim filter sound, use only one filter, as these filters had a 12 dB/octave response. These configurations are particularly effective when sweeping the filter with the envelope.

Another option is to put the filters in parallel, choose bandpass mode with relatively high resonance, and spread them a bit to simulate formants, such as vocal formants (this usually doesn't require cutoff frequency modulation).

Typically, the signal produced by the waveform Operators feeds through Operator Z to make it softer and warmer (possibly just after passing through the Operator X).

Of course, with the FM Matrix, Operator Z can connect anywhere between the other Operators. When Z is connected to the output, it is actually a stereo filter. This means that operators that play through the filter can be positioned in the stereo panorama and will stay that way as they go through the filter.

### 4.11.5. Operators Window

The Operators Window displays parameters for six operators (A-F) and two filter operators (X and Z). Each operator has a name, a Ratio field, an Offset (Hz) field, a waveform icon and name, and three checkboxes for Invert, Key Sync, and Pitch Env. Operator Z has a Volume knob. Operator X has knobs for Noise Amp, Noise Cutoff, Noise Reso, Sat Gain, Sat Limit, and Sat Asym. Operator Z has knobs for Cutoff, Reso 1, Reso 2, Env Amt, Routing, and Mix.

Op	Ratio	Offset (Hz)	Waveform	Invert	Key Sync	Pitch Env	Vel
A	2.0000	0.00	Sine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	1.0000	0.00	Sine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	0.5000	0.00	Soft Tristate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	2.0000	0.00	Soft Tristate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	1.0000	0.00	Sawtooth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	1.0000	0.00	Short Tristate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
X	Noise Amp	Noise Cutoff	Noise Reso	Sat Gain	Sat Limit	Sat Asym	<input type="checkbox"/>
Z	Cutoff	Reso 1	Reso 2	Env Amt	Routing	Mix	<input type="checkbox"/>

This page gives you a one-stop overview of the most important Operator parameters in a single window. Use it to conveniently see and manipulate all

frequency relations between Operators. You basically get an excerpt of the controls of the main Operator pages without modulation and envelopes.

## Frequency Controls



**Frequency Ratio** defines the mathematical relationship of the Operator frequency compared to the fundamental frequency of the note being played. 1.0000 means the Operator is the same pitch as the fundamental, 2.000 sets the Operator to the second harmonic (1 octave higher), 3.000 is the third harmonic (octave + fifth), etc. 0.5000 is the subharmonic one octave below the fundamental.

These values are edited by clicking on one of the digits and moving it up or down. The arrows above and below each numerical allow incrementing (up arrow) or decrementing (lower arrow) one value at a time.

When the Ratio is not an exact integer (e.g. 1.0030) then the Operator is detuned and will “beat” against other Operators. The beat frequency rises if the note pitch increases, and falls if the note pitch decreases.

**Frequency Offset** applies a constant frequency offset (in Hz) to the Operator to cause detuning and beating against other Operators. This is constant regardless of pitch. Example: a 5 Hz Offset causes beating at exactly 5 Hz between the selected Operator and another Operator with no offset.

## Waveform Controls



An Operator can have any of 32 different waveforms (the original DX7 had only sine waves). Clicking and dragging up or down on the numerical selects the waveform.

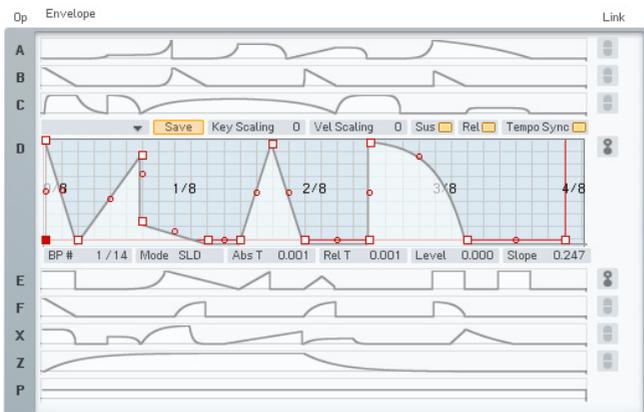
### Key Sync vs. Free Run

Clicking on this box toggles between these two selections. Key Sync mode resets the oscillator phase at the beginning of each note. When any group of Operators needs to have a fixed phase relationship to preserve a particular tone quality, activate Key Sync for all Operators in the group. With Free Run mode, there is no phase reset.

- **Pitch Envelope** toggles modulation by the pitch envelope on and off.
- **Invert** inverts the waveform which can make a difference in sound when used as a modulator.
- **Velocity** sensitivity sets how the overall envelope amplitude responds to velocity. At lower values, velocity has less effect. At higher values, velocity kicks the envelope up higher. If the Operator is a carrier, higher-amplitude envelopes increase the volume. If the Operator is a modulator, higher-amplitude envelopes change the timbre by increasing the brightness.

Please have a look at the chapters about **Operator X** and **Operator Z** for documentation of their parameters.

### 4.11.6. Envelopes Window



Equivalent in approach to the Operators Window, the **Envelope** Window shows all Amplitude envelopes for all Operators on one page in a list of graphs for easy editing.

One of them is displayed in **edit view**. You can choose the envelope you want to edit by clicking on the respective **Operator letter** to the left.

The **FM Matrix** to the right can be **hidden** by clicking on the Expand button, providing more space and better overview for editing operations.

The **Link buttons** to the right of the graphs allow for editing several envelopes at the same time. The envelope you link others to is always the one currently chosen for edits. Click on the Link buttons of other envelopes to build a **Link Group**. If you now edit any of the linked envelopes, the other envelopes of the Link Group will look exactly the same as the one you changed.

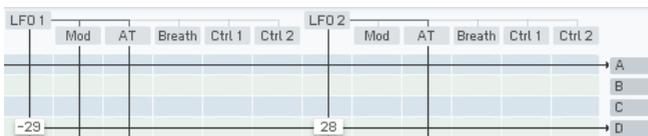
You can even build **several Link Groups** in parallel. If you already have a Link Group active and add an envelope of this old group to a new group, it will lose its connection to the first group and become a member of the new one.

### 4.11.7. Modulations Windows

Although each Operator page shows modulation information for that individual Operator, this page shows the modulation parameters for all Operators in one convenient screen.

#### Modulation Basics

The amplitude of each Operator has a major effect on the overall sound. Therefore, many modulation sources are available to vary the Operator amplitude in real time.



Modulations are set up on a matrix, with columns of modulation sources and rows of modulation targets (destinations). At each junction, you can vary the amount of modulation going to the destination.

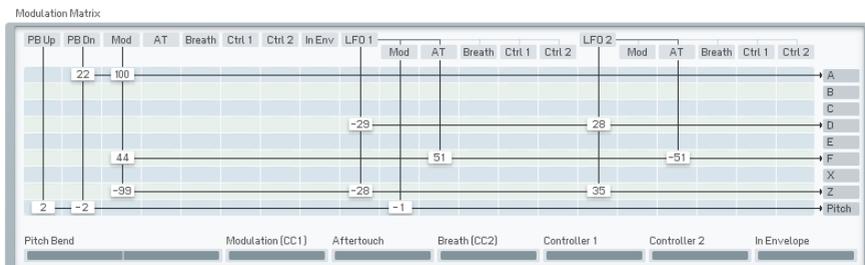
If you want to add a modulation:

- Imagine a line going downward from the modulation source.
- Imagine a second line going across to the modulation target.
- Click and hold at the junction represented by a blue field in the background.
- Drag up. The imaginary lines are now drawn in, and a box appears with a numerical value. Drag until the numerical shows the desired modulation level.

Removing a Modulation Control:

Click on the numerical box, and drag down. Upon reaching 0, the box and lines disappear.

## Modulation Matrix



This shows all modulation sources and targets. Available modulation sources (left to right) are:

- **PB Up** Pitch bend up range
- **PB Dn** Pitch bend down range, applied in negative direction
- **Mod** Modulation wheel (MIDI controller #1)
- **AT** Aftertouch (channel pressure)
- **Breath** Breath controller (MIDI controller #2)
- **Ctrl 1** 1st MIDI controller assigned on Master Page
- **Ctrl 2** 2nd MIDI controller assigned on Master Page
- **In Env** Envelope derived from input signal amplitude

The parameters for LFO1 and LFO2 are identical, so we will list those only for LFO1.

- **LFO 1** Main LFO output
- **LFO 1 Mod** LFO1 output controlled by mod wheel
- **LFO 1 AT** LFO1 output controlled by aftertouch
- **LFO 1 Breath** LFO1 output controlled by breath controller
- **LFO 1 Ctrl 1** LFO1 output controlled by the 1st MIDI controller assigned on the Master page
- **LFO 1 Ctrl 2** LFO1 output controlled by the 2nd MIDI controller assigned on the Master page



The lower strip of controls provides two independent functions: modulation input monitoring, and modulation input control by mouse. These are available for the following modulation sources:

**Pitch Bend, Modulation, Breath, Controller 1** (assigned on Master page), and **Controller 2** (assigned on the Master page). **Input Envelope** has only the meter, and does not include the control function.

- The meters display the incoming control signals.
- The numerical not only works as a display but also allows entering the value by mouse action (click on it and drag up or down to change).
- A double-click on the individual displays restores them to zero.

## LFO 1 and 2 Controls



The two LFOs are identical, so we will describe only LFO1.

**On/Off** enables/disables the LFO.

**Tempo Sync** matches the LFO frequency to the song tempo and syncs the LFO to the beat. When disabled, the LFO ignores the song tempo.

---

**Note:** Not all VST host software supplies tempo information to plug-in instruments, so this feature may not work with your host software.

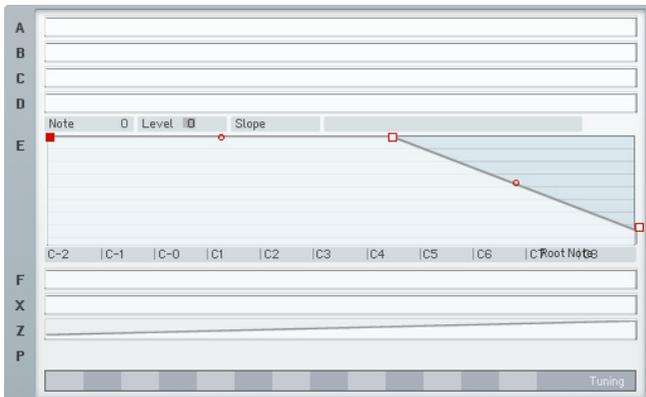
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- **Waveform** chooses among the various modulation waveforms. The waveforms are the same as available for the FM Operators. Click in the numerical and drag up or down to select the desired waveform.
- **Invert** sets the polarity of the waveform. If inactive, the LFO produces positive values, while active Invert produces negative values.
- With inactive **Key Sync**, the LFO waveform runs continuously. When you press a key, the modulation picks up whatever part of the LFO curve is happening at that moment. With active Key Sync, pressing a key resets the LFO to the beginning of the waveform. Example: Suppose Sine is selected as the waveform. With Key Sync, upon pressing a key, the waveform starts at 0 and goes positive. Without KeySync, the waveform could start anywhere: at 0, at the peak, at the lowest value, somewhere in between, etc.
- **Invert** flips the waveform upside down. This is useful in Tempo Sync mode, to make the modulation go down instead of up, on the beat.

- **Rate** sets the LFO's base frequency.
- **Delay** sets the time the LFO's start will be delayed after the note's start.
- **Key Scale** changes the LFO's rate as you play over the keyboard. Higher values cause the rate to speed up as you play progressively higher on the keyboard.
- **Velocity Scale** changes the LFO's rate according to velocity. With higher values, higher velocities increase the LFO rate.

#### 4.11.8. Key Scaling Window

##### Keyscaling Graphs



**Keyscaling** sets how the Operator amplitude changes across the keyboard range. Choose the Operator by clicking on the **Operator letter** to the left of the stack of keyscaling graphs.

Like the envelopes, you can create/delete breakpoints to create a particular curve shape. Dragging the small circle between the breakpoints changes the line's shape from concave, to straight, to convex. A small keyboard graphic below the curve serves as a reference for breakpoints. The white area corresponds to the range of the FM8 keyboard, or a standard 5-octave MIDI keyboard controller.

The default keyscale line is at 0 (maximum level), as indicated by a horizontal line going across the top of the graph. You reduce the level for a particular area of the keyboard by lowering the line over a particular keyboard range. In the screen shot above, amplitude falls off starting at around middle C, and the slope gets progressively steeper the higher you play on the keyboard.

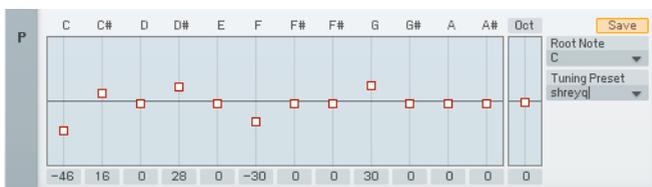
Here's what the various parameters indicate.

**Note** shows the MIDI note number of any breakpoint on which you click, or when you create a breakpoint. Moving the breakpoint updates the MIDI note number.

- **Level** shows the level of any breakpoint on which you click, or when you create a breakpoint. Moving the breakpoint updates the level. Levels are referenced to 0, so the more negative the number, the lower the level.
- **Slope** shows the state of the line between breakpoints. 0.5 indicates a straight line. 1.000 indicates a maximally convex curve. 0.000 indicates a maximally concave curve.

## Microtuning Controls

Even-tempered tuning, which divides an octave into 12 equal intervals, was developed for playing in different key signatures. However there are many other scales, such as just intonation, microtunings, stretch tunings so that pianos sound more in tune, etc. Several of these are available in the FM8 as presets, or you can create your own tunings using the microtuning controls on the Keyscaling page.



Each of the **twelve semitones** that make up an **octave** (C, C#, D, etc.) has an offset control that can change the note's tuning by **-99 cents to +100 cents**. Zero offset gives a standard even-tempered scale. Any offsets are preserved throughout all octaves (example: if D is offset by +3 cents, all D notes will be offset by +3 cents).

The **Octave stretch** parameter leaves middle C unaffected, but positive offset values create progressively sharper note tunings when playing higher up on the keyboard, and progressively flatter note tunings when playing lower on the keyboard. A negative offset value does the reverse - higher notes become progressively flatter, while lower notes become progressively sharper.

An offset of 50 compresses the scale into two semitones per key, or two octaves into one octave. An offset of -50 does the opposite, expanding the normal scale into a quarter tone scale (in other words, there are 24 notes per octave).

Pianos use stretch tuning, which can be simulated in the FM8 by a small positive offset. This is because the harmonics of lower strings are slightly sharp, as the strings cannot be as long as the laws of physics would like, because of a piano's size constraints. Therefore, tuning them slightly flat allows the harmonics to fall into tune with the rest of the piano. A related phenomenon occurs at the high end, where notes have to be tuned slightly sharp to sound in tune with harmonics from lower strings.

With small offset values (near 0), the number is an octave's detuning in cents. Example: a reading of +5 means that each octave is 5 cents sharp.

To select a Microtuning preset click on the arrow in the right edge of the name field and choose a preset from the drop down list. To save a tuning preset you created, enter a name in the name field and click on Store.

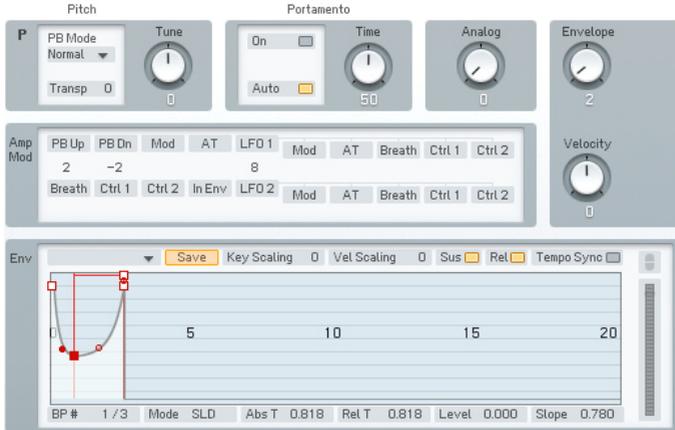
With the Root note control you can set a note to be the root of the displayed scale.

The Microtuning controls also sport a **Template** system. Find the factory templates and your own, previously stored patterns by clicking on the small **triangle** of the menu. There can be up to 64 stored Templates.

If you have developed a nice new tuning, you can give it a new name with a single-click into the **name field** and subsequent keyboard entry.

For saving the new tuning, use the Store command. A click on this button opens the **list** of Templates. Click on the desired slot and the new tuning is stored. Please be aware, that the Template already residing in the chosen slot will be overwritten.

## 4.11.9. Pitch Window



On the Pitch page you find various controls dealing with – well – static and dynamic pitch.

### Basic Pitch

The top row of controls starts with the **Pitch Bend Mode**. You get a choice of five:

- **Normal** affects all notes equally.
- **Highest** affects only the highest note if several notes are held. This is designed to provide guitar-like pitch bending effects.
- **Lowest** affects only the lowest note if several notes are held.
- **Key On** allows pitch bend to work only as long as a key is held down. There is no bend during the sound's release phase.
- **Latest** affects only the note that was played last.

Use the **Transpose** dial to shift the main pitch of the sound up or down for up to 24 semitones.

**Tune** is for fine tuning your sound in cents. You get a range from -99 to +100 cents.

## Portamento and Analog



Portamento **On/Off** enables or disables the portamento function.

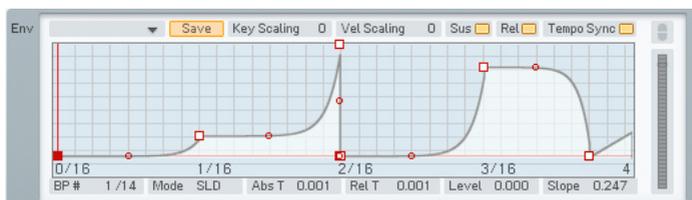
- Portamento **Auto** allows portamento only for legato notes played without gaps in between. If you release a key before playing the next one, there will be no portamento.
- Portamento **Time** controls how long it takes for the pitch to glide from one note to another. 0 = shortest time, 100 = longest time.
- The **Analog** Dial is mirrored from the Master page. It introduces random variations between voices. This used to happen with analogue gear – e.g. component values would change as temperatures drifted, and so on. Higher values increase the degree of randomness, and are very effective in Unison mode.

## Pitch Modulation



This is a subset of the Modulation Matrix page. Please refer to that chapter for information on assigning controllers; the only difference is that to conserve space, the pitch modulation sources are arranged in two lines stacked above each other, instead of one long line.

## Pitch Envelope



The lower pane displays the **Pitch envelope**. The pitch envelope varies the pitch over time. Remember that you can decide for every Operator if it is modulated

by the Pitch Envelope. You find the related control on the Operators window and on the dedicated Pages for the individual Operators.

**Key Scaling** edits how keyboard pitch affects the envelope times. At higher values, playing higher up on the keyboard shortens all time values. This emulates many plucked instruments, whose notes attack and decay more quickly at higher pitches.

**Velocity Scaling** edits how velocity affects the envelope times. At positive values, hitting the keys harder shortens all time values. At negative values the envelope times become longer with higher key velocity.

With **Sustain switched off**, the envelope will always run to the end, no matter whether you hold the key or not. With **Sustain active**, the envelope behaves like your standard synth-envelope by staying on the Sustain level or playing the loop until the key is released.

A **deactivated Release** button leads to an envelope that ignores the Note Off signal. This means it either stays on the Sustain level or plays the loop forever, respectively, when Sustain is on, or it runs one single time to the end (one shot) when Sustain is off. With **active Release** the envelope behaves normally.

**Tempo Sync** superimposes a grid on the envelope display that corresponds to rhythmic values, such as quarter notes, eighth notes, 16th notes, etc. Breakpoints can be snapped to these points.

The quantization value depends on the current zoom factor, as set by right-clicking on the envelope ruler and dragging. (When Tempo Sync is enabled, the ruler markings will be calibrated in rhythmic values instead of seconds.) If the incoming tempo information changes, the envelope times are re-computed to match the current song tempo. Example: If the envelope loop is set to a 1 beat duration, it will remain 1 beat long as the tempo changes.

If an envelope has already been created, enabling Tempo Sync will not change the existing breakpoints. However, you can edit an existing envelope by moving the breakpoints so that they snap to the nearest quantization value.

---

**Note:** Not all VST host software supplies tempo information to plug-in instruments, so this feature may not work with your host software.

---

The **Envelopes** are of the time/level type, where you specify levels and the times that it takes to get from one level to the next. Levels are specified by inserting breakpoints along a line, then moving the breakpoints up or down to change levels, and left or right to change times.

Right-click (Mac: ctrl-click) wherever you want a breakpoint. The first and

last breakpoints move up and down together, because it is assumed you will eventually want the envelope to end up where it started.

The left-most breakpoint is where the envelope starts. The next breakpoint to the right sets the envelope's maximum level; the first two breakpoints therefore create the envelope's attack. The next breakpoint to the right specifies the level to which the envelope will fall after passing through the attack phase (decay).

This and the maximum breakpoint fall on two vertical red lines. These indicate the segment where the envelope reaches the "sustain" level, marked by the horizontal red line. On this level the envelope stays as long as the key is held down.

If you insert one or more breakpoints between the red markers the "sustain" segment becomes a "loop". This means that this part will be repeated as long as the note is sustained. You can create novel tremolo effects by changing the positions of these breakpoints.

If there are more than 3 breakpoints the sustain or loop segment can be shifted by moving the vertical red lines with the mouse. They snap to the next breakpoint, except the start and the end point.

Upon releasing the key, the envelope continues with the segment after the second red marker. In our example there is one more breakpoint after the sustain, the final end point.

Dragging the small circle between breakpoints can change the line's shape between the breakpoints from concave, to straight, to convex.

BP #	1 / 14	Mode	SLD	Abs T	0.001	Rel T	0.001	Level	0.000	Slope	0.247
------	--------	------	-----	-------	-------	-------	-------	-------	-------	-------	-------

Now let's investigate the envelope parameter strip below the envelope. Except as noted, clicking on a numerical value and dragging up or down edits the value; they also update automatically if you move the breakpoint.

- **#** shows two numbers. The first field is the index number of the breakpoint or stage being edited. The second field is the total number of envelope breakpoints. This is for display only and cannot be edited.
- **Mode** has two options, **SLD** and **FIX**. In **SLiDe** mode, if you move a breakpoint left or right, the envelope to the right of the breakpoint moves as well to maintain the same times and levels past the breakpoint being edited.
- In **Fix** mode, the total envelope time doesn't change. Moving a breakpoint to the right not only lengthens its distance compared to the breakpoint to its left, but shortens the distance compared to the breakpoint at its right.

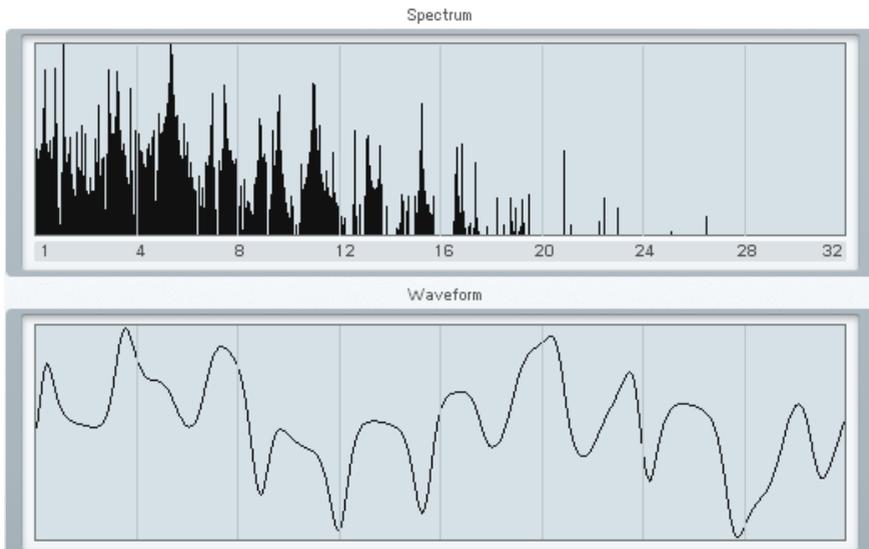
- **Abs Time** shows the amount of time in seconds from the start of the envelope to the breakpoint being edited.
- **Rel Time** shows the time between the current and the previous breakpoint.
- **Delta Time** shows the amount of time in seconds from the breakpoint being edited to the breakpoint at its immediate left.
- **Level** shows the breakpoint level referenced to the centre line.
- **Slope** shows the state of the line between breakpoints. 0.5 indicates a straight line. 0.999 indicates a maximally convex curve. 0.001 indicates a maximally concave curve.

The ruler behind the envelope is calibrated in seconds. If the envelope extends past the envelope's visible range, click on the blue background and **drag** to the left or right to see a different **range** of the ruler.

You can **zoom in or out** by clicking into the background and moving the mouse up or down

Double-click on the background to have the envelope **fit** exactly within the visible part of the ruler.

#### 4.11.10. Spec Window



The two displays are non-editable and for reference purposes only.

The upper graph is the **Spectrum** of your sound. It displays the frequency distribution. This can be very useful for analysing frequency content relative to parameter changes while editing a sound.

The second graph shows your sound in the time domain, displaying the **waveform**.

## 4.12. Browser and Attributes Window

### 4.12.1. Attribute Concept

FM8 provides a new and musical way to save, browse and load its sounds. The old paradigm of sounds within different sound banks is left behind with all its organizational problems. Instead, each **Sound** is saved into a **single file** that can then easily be **ported** between platforms or projects. Those sound files can also be loaded directly by Native Instruments' KORE. Therefore, each sound within FM8 is called a **KoreSound**. If you are familiar with KORE's powerful approach, the following explanations will be rather easy to understand.

To handle all those single KoreSound files you need a powerful way to browse them. Therefore, each KoreSound file also contains information about the sound in musical terms, called the sound's **Attributes**. The **Attributes Window** of FM8 provides a list of about 170 attributes. By combining them individually each of the synthesizer's sounds can be described due to its **origin** or **source**, its **timbre**, **articulation** or **genre**. If FM8 is used as an effect, the sound can be tagged with a different, dedicated set of attributes. You can also enter additional **Meta Information** like the sound's author or its number of outputs.

All KoreSound files placed in FM8's user and factory library folders – read more about this preference in chapter 4.4.1 - are automatically integrated into a **Database**. The **Browser Window** of FM8 is your interface to this database. Within the Browser you can combine the attributes to find a sound that fits your needs. For instance, you can activate the attributes Bass, Digital, Dark and Fat, Monophonic and Techno/Electro to find exactly that – a digitally cold yet pushing and fat bass line sound. Different bank files at various locations on your disk won't bother you anymore – you'll find the KoreSounds you need for your music fast.

---

Please note that there is a differentiation between SingleSounds and MultiSounds within KORE. All KoreSounds you save with FM8 will be loaded as SingleSounds in KORE, and the FM8 will also only be able to load SingleSounds. Please refer to the KORE manual for detailed information. This difference is of no importance within FM8 itself.

---

The following sections will explain in which way you can use FM8 Attributes to browse your sounds and load them, and how you can save your sound using the attributes. An additional section will cover compatibility questions regarding FM7 bank files. You can find a complete description of all available attributes within Appendix B, and a detailed tutorial on how to search with the browser is available in Appendix A of this manual.

### 4.12.2. Searching and Loading Sounds with the Browser

The *Browser Window* is the place where you search and load your FM8 sounds, and where you organize them into **Programs**.



The Browser Window of FM8 can be used in two alternative view modes that are toggled by clicking the **Database** button or the **File Tree View** button, respectively. Both views share the same structure: At the left you specify which sounds you want to see (i.e. a folder in File Tree View or a set of attributes in Database View), and on the right you load one of the KoreSounds from the **Search Results** by double-clicking it. When activating the **Programs** button in either view a program list is added. All views feature the **Browser Control Bar** at the top, containing the **File Tree View** button, the **Database** button the **Programs** button and further controls.

#### Database View

The Database View is displayed when the **Database** button is active. It consists of the **Sound Type** switch, the **Clear** button and the **Search Term** text field placed within the **Control Bar** as well as of the table of attributes below that.

The list of available attributes changes depending on the Sound type you are searching. In most cases this will be instrument Sounds, as FM8 is a synthesizer. Yet, as described in chapter 4.7.1, you can also route audio signals to FM8 to use the application as an effect unit. Therefore, you can toggle

between searching for Instruments or Effects by clicking the **Instruments** or **Effects** button in the Control Bar.

Either way, the attributes provided are grouped into columns, the **categories**. For instruments there are the categories **Instrument**, **Source**, **Timbre**, **Articulation** and **Genre**. Effects, on the other hand, can be specified using the attribute groups **Type**, **Mode**, **Characteristic** and **Application**:

- **Instrument** specifies the general type of instrument as in Synth, Bass, or Soundscape.
- **Source** loosely describes the sound's origin - acoustic, derived from a sample loop, synthetic, etc.
- **Timbre** describes the sound's tonality – cold, warm, metallic, dissonant, and the like.
- **Articulation** describes the development of sound over time (rhythmic, short, evolving, and the like).
- **Genre** provides a choice of musical styles with which the Sound might be compatible.
- **Type** characterizes the effect in technical terms. Choose between reverb, distortion, delay, and the like.
- **Mode** is about how the effect is applied, as in side-chain, LFO, and multi-band.
- **Characteristic** describes the effect's tonality (warm, intense, metallic, etc.)
- **Application** gives you a choice of “targets” for which an effect might be best suited. These can be different instruments, like Organ or Bass, or application areas, like mastering or surround sound.

Every category contains a large number of Attributes describing different characteristics a KoreSound might have. As stated above, a detailed explanation of all available attributes can be found in **Appendix B**. There are also several examples on how to find a specific sound in **Appendix A**.

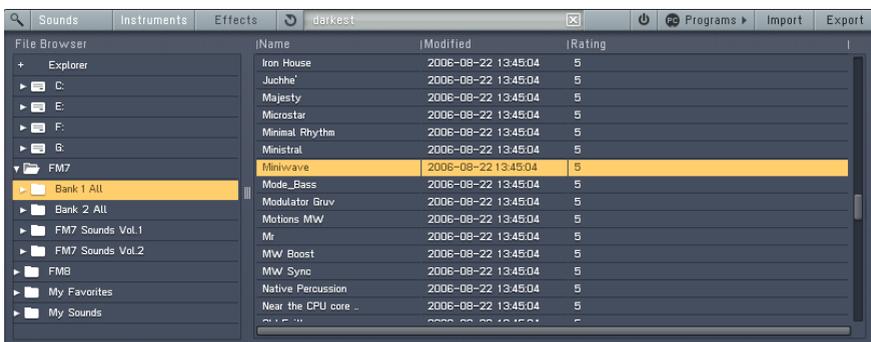
When searching for a sound within the database, you can now simply select or deselect single attributes by clicking them with the mouse. Any number of attributes can be combined to narrow your **search**, except that you can only use one attribute of the **Instrument** (instrument sounds) and **Type** (effect sounds) categories, respectively. The **Clear** button deselects all currently activated attributes. Each selected attribute reduces the number of KoreSounds matching all of them. The remaining KoreSounds are displayed in the **Search Results**. *You can configure the display of attribute columns through the context menu by right-clicking the header. A right click on Sound lets you add it to your favorites, accessible in the file tree view.*

Instead of browsing the database by using the attributes you can also search for sounds by entering a search term into the **Search Term** text field. This term is compared with all KoreSound file names and all text items of the KoreSounds' **Meta Information**. By using this feature you can, for example, search for all sounds created by a particular author; or you can find those sounds containing specific terms in their **Comment** fields. This flexible search by terms is, however, not combined with the attribute search: Entering a search term automatically clears the current attribute selection. It is also independent from any **Sound Type** switch setting.

Please note, that the database represents the contents of the library folders (and their sub-folders) on your hard disk. Those folders are not checked for new KoreSound files each time FM8 is started, as this would significantly slow down the start-up time. Thus, if you manually place KoreSound files within your library folders by using your operating system, FM8 will not integrate these files into the database search until the library folders are re-scanned. Again, you can trigger the **database rebuild** manually within the **Options Dialog**, described in chapter 4.4.2.

## File Tree View

The File Tree View is activated via the **File Tree View button**. It misses additional control elements within the **Control Bar**, and instead of the attributes a common file tree is displayed. As the File Tree View is about organizing files, there is no distinction here between Sounds and Effects, similar to the fact that the Database View doesn't care about sub-folders. You can adjust the layout in File Tree View by dragging the small handle on the frame between the windows to either side.



The view's basic handling is straightforward, as it is similar to the operating system's file handling. You can select a folder by clicking its name; its contained

KoreSound files are immediately displayed within the **Search Results**. If a folder contains sub-folders you can have them displayed by clicking onto the folder icon in front of the folder's name. The list of sub-folders is closed again by clicking the icon once more.

When all folders are closed there are three main nodes:

- Topmost there is the **Explorer** entry. It contains your operating system's folder structure as sub-levels. This is particularly useful if you want to open a KoreSound file that is not placed within your library folders.
- In the middle there is the **My Favorites** entry. It does not itself contain KoreSounds; instead it contains links to the sound files.
- Finally, there is the **My Sounds** entry that is a link to the user content folder on your hard drive. (Read more about this below). It reflects that directory's sub-folder structure; its handling is similar to that of the **Explorer** entry. The **My Sounds** entry contains all your custom made sounds.

Note that you cannot delete, rename, copy or move KoreSounds within the File Tree View as this might provoke inconsistency with the database. However, the **My Favorites** entry is a powerful alternative. As stated above, the **Favorites** are links to the actual KoreSound files, and therefore they can be handled more easily without causing database problems.

The **Favorites** are mainly used to provide easy and fast access to KoreSounds you often use. You can add any KoreSound from the Search-Results by right-clicking it and selecting **Add to My Favorites** from the context menu. Alternatively, you can drag it from the Search Results into the My Favourites folder or one of its sub-folders. Note that you can create sub-folders to the **My Favorites** node to sort your favourite sounds hierarchically: Right-click on the **My Favorites** entry and a menu comes up that let's you create a new folder. Empty folders can also be removed by using this context menu.

You can easily step through any folder's content of KoreSounds by using the Application Control Bar.

## Search Results

Independent of which Browser View you work in, the KoreSounds that match the search criteria - folder selection or attribute combination – are displayed as a table within the search results.



Each row of the **table** holds one KoreSound. Information about the KoreSound is displayed in several columns. You can alter the table's layout by clicking into its line of headers:

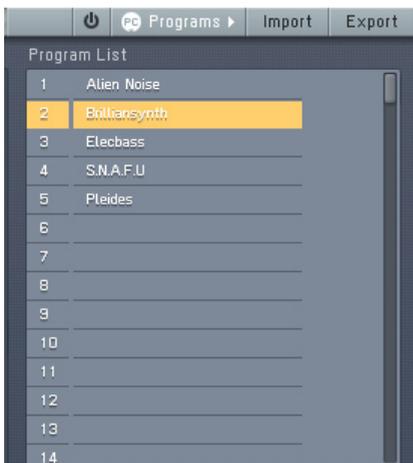
- Clicking onto a column's header **sorts** the Search Results alphabetically, according to that column's entries. Clicking it another time reverses the order. (This can come in handy if you, for instance, want to search all bass KoreSounds with a high rating. Simply select the Bass attribute within the Database View's Instrument column, and then click the Rating column's header - see below to learn how to make it show up - within the Search Results: All KoreSounds with high rating will be sorted to the top of the list.)
- Right-clicking provides a context menu of possible **columns** to be displayed. Clicking a column label that is already displayed (e.g. *Name*) removes it from the display. Vice versa, clicking the label of a column that is currently not displayed inserts the column into the table.

You can now easily **load** an FM8 KoreSound by double-clicking it within the **Search Results**.

Note that you can also load your Search Results one after another by using the **Application Control Bar**.

## Programs

Within the **Browser Control Bar** you find the **Programs** button. Clicking it removes the **Database View** (the **File Tree View** remains, as it is smaller) and brings up a second list beside the current Search Results. You can **drag** any KoreSound to this list from the **Search Results**. You can also change the list's order by dragging the KoreSounds within the list up and down. If you drag a KoreSound to a position in the list that is already occupied, that entry and all subsequent ones are shifted down by one position.



What **purpose** serves this list? Several MIDI keyboards or host programs use program lists to organize sounds. The KoreSound database, however, is more than a simple listing, and cannot be easily reduced to a linear sequence of KoreSounds. Therefore, you can define the list of KoreSounds by yourself in the manner described above. After you press the Activate button (beside the Programs button if this one is activated) the list of KoreSounds is sensitive to MIDI Program Change messages, and to host automation.

Obviously, only one program list can be active at a time. You can, however, **export** the list to a file and create a different one. All exported lists can be imported again for further usage. Note that those program lists link to the actual KoreSounds, similar to the Favorites. If, by any circumstance, one of the referred KoreSounds is lost or renamed, the program list will not be able to recall it.

#### 4.12.3. Defining Attributes and Saving Sounds

Assuming that you are familiar with searching for a sound in the Browser's Database View (as described in the previous chapter) the following explanations are straightforward.



You access the **Attributes Windows** by hitting the **Attributes** button in the Application Control Bar. Its layout is similar to the Browser's Database View, but while you load KoreSounds from the **Browser Window**, within the Attributes Window, you **save** them. Therefore, the Search Results are not needed and are replaced by the Meta Information.

The **Meta Information** provides additional text fields to enter information about the sound to be saved:

- **Author:** States the Author of a KoreSound. Fill in your name for your own KoreSounds.
- **Company:** Shows the commercial vendor of the KoreSounds, if there is one.
- **Bankname:** Names the bank the sound is derived from, e.g. if you imported it from a FM8 3 bank file.
- **Color:** Associates a color with the KoreSound. This is particularly used if the sound is loaded into KORE.
- **Rating:** Allows you to judge the sound.
- **Comment:** Holds any information you want. Normally it is used to describe a KoreSound in terms of usage and also notes any special interactive features, e.g. "MIDI modulation wheel controls master cutoff."
- **CPU Usage:** Displays the amount of CPU power the sound uses. The amount varies depending on the number and type of modules and voices used.
- **Load Time:** Specifies the time it takes to load the Sound.

Note that you can search for all literal entries of the Meta Information with the **Search Term** field of the Browser. For instance, you can enter the name of the project you created your sound for in the first place into the Comment field. By using the database you can access it easily in all future projects;

and if you need all sounds used in a particular project, you can find them by entering the project's name into the Search Term field.

All sounds you save are automatically integrated into the database. While this is very comfortable for browsing – you don't have to care about file locations or similar things –, you should take a moment while saving a KoreSound to set its **Attributes**. If you don't do this, your database will soon become less useful, as you won't find your own sounds correctly with its functionality. Take a look at Appendix A and Appendix B for an explanation of all attributes and some basic examples.

After you entered the Meta Information and set the attributes according to your sound, you can **save** it by clicking the *Save* button within the Application Control Bar. If you saved the sound before, the *Save* button will overwrite the old file; if the KoreSound has not been saved yet, the button will react similar to the **Save As** button: A dialog box will come up asking for the new KoreSound file's name and its location. By default, dialog box will suggest to save the sound into the user content folder or one of its sub-folders. The user content folder is created during installation and can be found in “My Files/Native Instruments/Shared Content/Sounds/FM8” (“[User]/Documents/Native Instruments/Shared Content/Sounds/FM8” with OSX). Note that you can access this folder within the Browser's File Tree View by selecting the **My Sounds** node.

#### 4.12.4. Loading FM7 Sounds

Use the **Lib Convert** command from the File menu to import Sounds from the FM7. You are prompted with a **File Open dialog**. Navigate to the folder containing the FM7 data you want to import. You can import:

- A complete set of Presets and Edit Buffer (.f7a)
- A single Preset (.f7p)
- A complete FM7 bank (.f7b)
- A set of FM7 controller assignments (.f7c)

#### 4.12.5. Importing System Exclusive Data

The FM8 can accept **System Exclusive** Data (preset parameters) from Yamaha's DX7, DX7II and DX200 synthesizers and convert the sound to its own parameter format.

In standalone mode FM8 **automatically receives** any MIDI SysEx data in the recognised formats (do not click on Import SysEx; this process is automatic).

**Single Presets** go into the edit buffer (and need to be stored manually), while **Banks** are converted into .ksd files and saved automatically.

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Note that receiving SysEx data via MIDI is not possible when using FM8 as a plug-in because VST and the other plug-in standards do not currently support SysEx.

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Another way (that always works) is to load the SysEx data **from a file**. Click on the **Import SysEx button** in the File menu and navigate to a compatible SysEx file (it will usually have a .syx suffix under Windows), and open it. You can find lots of DX7 SysEx data files on the internet. You can also capture MIDI SysEx data and save it to disk as a file using programs like Midi-Ox (PC freeware for private use, <http://www.midiox.com>), as well as sequencer programs and even some keyboards

DX7 Operator 1 will map to FM7 Operator F, Operator 2 to Operator E, Operator 3 to Operator D, etc.

# Appendix A – Attributes Explained

This chapter will provide several examples on how to search for sounds and effects with the sound Browser. You'll learn the meaning and the definitions of the supplied Attributes, as well as the logic behind their arrangement. We will discuss how to search for specific sounds or effects effectively, and how to supply Attributes for your own sounds and effects. A detailed explanation of all Attributes can be found in Appendix B.

Note that you can search for both instruments and effects; the approach is the same. The following explanations will focus on instruments only.

First, switch to the Browser Window and activate the Database View by activating the Sounds button. Then click on the **Instruments** tab at the top of the browser.



The Browser is arranged in five columns. Your search should begin with the leftmost column and then filter the results as you move toward the rightmost column. Some columns have internal groupings, so work with a left to right/top to bottom protocol when searching for sounds.

## Instrument Column

The **Instrument** column acts as the starting point for your search and describes a sound's basic instrumental quality:

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Slide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	SwEEP/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

Probably the first thing you did was to click on **Synth** to find a sound, as FM8 is a synthesizer. You'll wonder why we've included so many acoustic instruments as Attributes.

The practice of imitating acoustic instruments has a long history. Synthesizing brass, woodwinds or strings in analog synths has become so familiar to sound designers that sounds like Mellow Strings or Fat Brass have become familiar preset names for synthesized sounds.

On the other hand, there are sounds that are clearly based on acoustic instruments, yet they don't sound anything like the acoustic original. For example, you might have an FM8 KoreSound which uses a sample of an acoustic flute as material for granular synthesis. Clearly, this sound is only possible with digital synthesizers, but the origin of the sound is still an acoustic instrument. So you'd choose *Flute* in this column to look for such a sound.

Of course there are many sounds that have no connection to any acoustic instrument, so you'll probably find these sounds categorized as **Synth**, **Soundscapes**, **Sound Effects** or **Other**. Also, don't worry if you're looking for Pads or Leads, and can't find these Attributes under **Instruments**. You can specify this in the **Articulation** column, letting you distinguish between, for example, String and Synth Pads.

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A sound can have only one instrument as an Attribute. For example, if you're looking for a sound that features a drum loop and bass loop at the same time, choose *Multitrack*. If you're searching for a nice piano sound with some strings layered on top of it, choose *Piano/Keys* and *Layered* (in the *Source* column).

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## Source column

The **Source** column has the following functions:

- It defines the instrument you've chosen in the first column more specifically
- It gives you information about the synthesis technique used in the sound
- It provides information about the sound's origin

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Swweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

As you can see, this column is subdivided into seven smaller groups, each of them serving a specific purpose. We'll start from the top and make our way to the bottom of the list, so let's begin with the first group:

- *Acoustic – Electric – Analog – Digital*: These four Attributes define the instrumental source. Let's assume you've clicked on *Bass* in the *Instrument* column; you can then distinguish among *Acoustic* basses (e.g., an upright bass), *Electric* bass (e.g., a picked rock bass), *Analog* Bass (e.g., a typical subtractive synth bass sound) and *Digital* bass (e.g., an FM bass sound). Of course, depending on your choice in the first column, not every attribute will fit. If you chose *Flute*, you will probably only be using *Acoustic*, *Analog* or *Digital*. Note that every sound should belong to exactly one of the four types; i.e., a sound should not be *Analog* and *Digital*.
- *Synthetic – Sample-based*: This pair of Attributes describes the sound's technical aspects, as it can be important to know if a sound was generated by some form of synthetic synthesis technique or through sampling. If a sound is *Synthetic* you will have the option of accessing many, if not all parameters that constitute the sound. If a sound is *Sample-based* you'll most likely not be able to change the sound's origin, but the sound might not use as much CPU. If you want to add "real" acoustic instrument Sounds to the Database, you'll probably want to select this Attribute. *Synthetic* also refers to patches that use samples, but have such heavy processing that the sample is perceived as an oscillator (FM8's sample and granular mode are good examples of this). Note that a sound is always either *Synthetic* or *Sample-based* (but not both).

- *FM – Additive – Granular – Physical Model*: These four Attributes specify the audible perception and/or synthesis technique of the sound. Note that an Attribute like *FM* does not necessarily mean that the sound uses the actual technique of frequency modulation, but it clearly sounds like FM. Let’s assume you are looking for a typical FM bass sound. This sound could be produced by actual frequency modulation, or by using a sample. If you’re sure you want “true” FM synthesis, you would check *Synthetic*, and then you can be confident that your FM Bass was generated using this technology.

The next six Attributes are grouped in pairs and specify the sound’s source:

- Solo/Single – Ensemble/Kit
- Small – Big
- Dry – Processed

These are clearly opposites (e.g., a sound cannot be **Dry** and **Processed** at the same time). Please refer to Appendix B for a complete set of definitions.

## Timbre Column

The **Timbre** column specifies a KoreSound’s timbre. It is made up mostly of Attribute pairs:

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electroica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/ Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/ Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

As with the pairs in the Source column, these Attributes are opposites. It is important to realize that this column’s Attributes have to be seen in relation to the selected Attributes in the *Instrument* and *Source* columns (that’s why it’s a good idea to always go from left to right).

For example, a bass instrument is obviously low in nature; therefore you don't have to additionally select *Low*. However, you could still do it for bass sounds that clearly exhibit low frequencies like a sub bass. Note that Attributes like *Warm* or *Exotic* are highly subjective. It is important to consider the expressiveness of such Attributes in relation to the instrument.

Please refer to the Appendix B for a complete set of definitions.

## Articulation Column

The **Articulation** column serves two purposes: It describes how the sound progresses over time; and it gives you information regarding how to use the sound

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electronic
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
PerCUSSION	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

In previous versions of FM8, you'd have to work with preset names like "Slow Strings," "Dream Pad (+rls)" or "Monsta Synth (lead)." But a preset name is not really the best place to indicate the sound's intended application. With the *Articulation* column you can define exactly what the Sound is about, and its intended use.

Especially in a live situation, the knowledge of how a sound is meant to be played is quite important: If for example a sound is categorized as *Chord*, you know immediately that hitting one key results in a chord, meaning that if you play a chord on the keyboard the result will be rather messy.

## Genre Column

The **Genre** column describes the musical style with which a sound can be associated:

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	SwEEP/Filter Mod	Rock
SoundscaPES	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

This set of Attributes is the last step in defining your KoreSound, as these are the most subjective definitions and/or interpretations.

Obviously, the definition of “What is techno?” and “What sound can be used for techno?” is always subjective because really, every sound can be used for every genre, like a harpsichord in hip-hop or a sub bass in jazz. But here, we also try to pinpoint the sound’s origin whenever possible. Therefore, a harpsichord sound should be found under *Orchestral/Classical*, as it’s an instrument used in the repertoire of the 17<sup>th</sup> and 18<sup>th</sup> century.

Again, check Appendix B for a complete list of definitions.

## Examples

In this section, we’ll present some examples of typical searches. In each example, we kept the amount of selected Attributes to a minimum, just to give you an idea about the basic principle. You always can refine your search.

- Analog Kick Drum: This search will provide you with a single kick drum sound, as *Solo/Single* is selected (although the pitch of the kick drum might change when you play across the keyboard). Because *Synthetic* is checked, you know that you’ll be able to modify the sound in its entirety. Try the *Genre* column to refine your search.

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- FM Bass: This is a typical search setting for an FM bass sound. You could select *Sample-based* instead of *Synthetic*; then you'll retrieve programs that sound like FM but are based on samples.

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- Rave Lead: Note that no Instrument is specified, so this search will give you all sounds which could be used in the same context.

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Slide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- Soft Electric Piano: In this example, because *Sweep/Filter Mod* is selected the sound will have some sort of filter movement. As a result, the electric piano might have a wah-wah “feel” to it.

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- Dark Pad

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	SwEEP/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- Chord Stab

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	SwEEP/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

- Thin Bells

Instrument	Source	Timbre	Articulation	Genre
Piano/Keys	Acoustic	High	Slow Attack	Avantgarde
Organ	Electric	Low	Decaying	Orchestral/Classical
Synth	Analog	Distorted	Sustained	Film Music
Guitar	Digital	Clean	Long Release	Ambient/Electonica
Plucked Strings	Synthetic	Bright	Percussive	Drum&Bass/Breaks
Bass	Sample-based	Dark	Long/Evolving	House
Drums	FM	Warm	Pulsating	Techno/Electro
Percussion	Additive	Cold	Echoing	Industrial
Mallet Instruments	Granular	Fat	Pad	Dance/Trance
Flute	Physical Model	Thin	Lead	HipHop/Downbeat
Reed Instruments	Solo/Single	Hard	Monophonic	Funk/Soul
Brass	Ensemble/Kit	Soft	Chord	Reggae/Dub
Bowed Strings	Small	Muted	Glide/Pitch Mod	Latin/Afro-Cuban
Vocal	Big	Detuned	Sweep/Filter Mod	Rock
Soundscapes	Dry	Dissonant	Arpeggiated	Pop
Sound Effects	Processed	Noisy	Tempo-synced	Jazz
Multitrack	Layered	Metallic	Expressive	Folk/Country
Other	Sequence/Loop	Wooden	Multiple	Ethnic/World
	Surround	Exotic	Randomized	

## Appendix B – Attributes Reference

The following pages are a reference of all attributes used in FM8's database. The attributes are identical to those used within KORE. They are ordered in categories: first those used to describe an instrument sound, then those that specify an effect sound.

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Please note that some attributes should be used mutually exclusive, e.g. a sound's source can either be acoustic or electric. Refer to Appendix A for examples.

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### Instrument Categories

#### Instrument

This column specifies a sound's basic instrumental quality. All other columns are additional descriptions of these instruments. Only one instrument can be chosen. The sound can be an emulation of the chosen instrument or a timbre which audibly refers to an instrument without trying to imitate it (e.g., granular processed flute sample).

- Piano/Keys: All acoustic/electric pianos, harpsichord, clavinet etc. In general all sounds that are meant to be played in a piano/keyboard fashion.
- Organ: Acoustic and electric organs. Also harmoniums and organ-like reed instruments, e.g. accordion, melodica, reed organ etc. Generally played on some kind of keyboard.
- Synth: All kinds of typical synth sounds not associated with other instruments in this column. A typical synth brass sound for instance belongs to Brass. Synth instruments which are meant to be played in the lower range are found in Bass.
- Guitar: An instrument that sounds like a guitar, including acoustic, classical, electric and synth guitars.
- Plucked Strings: Instruments that are generally played by plucking a string, like a harp, koto, banjo, etc. This also applies to synth instruments whose main sonic quality is derived from the sound characteristic of a plucked string.

- Bass: A sound which can serve as the bass part in a production. A synth should only be categorized as Bass if the lower range is more convincing than the upper range. (Note that a double bass used in a classical context (i.e., bowed) would be categorized as Bowed Strings. However, if used in a jazz context (i.e. plucked), it would be categorized as Bass.)
- Drums: A single drum sound, a drum kit or a drum loop based on an acoustic or electronic drum kit. Typically this includes kick drum, snare, toms, hi-hat, ride/crash cymbals, claps.
- Percussion: A single percussion sound, a percussion kit or a percussion loop. This includes all idiophones and membranophones of indefinite pitch, such as bongo, timpani, agogo etc. It also includes electronic percussion that is not usually found in an electronic drum kit.
- Mallet Instruments: All instruments with definitive pitch played with mallets, like vibraphones, xylophone, marimba, bells, steel drums etc.
- Flute: Instruments that reproduce or simulate flutes (oscillating air tubes) or which are based on flute samples. This includes acoustic flutes, pan pipes, synthetic flute simulations, breathy sounds, etc.
- Reed Instruments: Instruments that reproduce or simulate reed instruments like oboe, clarinet, bassoon, saxophones etc. Note: reed organs are categorized as Organ.
- Brass: Instruments that reproduce or simulate brass instruments like trumpet, french horn, trombone, tuba. You'll also find a lot of analog brassy synth sounds in this category. Note that Saxophones are not brass, but reed instruments.
- Bowed Strings: All instruments with a playing technique defined by bowing a string, typically violin, viola, cello and double bass. Also, typical analog string pads are found here.
- Vocal: Choirs, vocal samples and all other instruments that sound like vocals. This also includes synth sounds that clearly make use of a formant/vowel filter or a talkbox/vocoder to make the sound speak or sing.
- Soundscapes: A sound providing some sort of acoustic scenery, whether it's based on tonal timbres or noise textures (typically long compared to sound effects).
- Sound Effects: A sound effect (not an effect plug-in) like an explosion, shot or footsteps (typically short compared to Soundscapes).

- **Multitrack:** A combination of several different instruments. If you can imagine using the different instruments independently from each other, it's Multitrack. These are mostly sequenced or used in a key-split (like a combination of drums/bass/keyboard). If the instruments blend into one sonic entity, its Source is categorized as Layered and is not categorized as Multitrack.
- **Other:** Select this Attribute if none of the above instruments apply.

## Source

Describes the source and/or synthesis technique with which the sound can be associated, always in relation to the selected instrument.

- **Acoustic:** Further defines the instrument, e.g. acoustic piano, acoustic guitar, acoustic (i.e., church) organ.
- **Electric:** Further defines the instrument as an electro-acoustic instrument, e.g., electric piano, electric guitar, electric organ.
- **Analog:** Further defines the instrument as a typical subtractive synth sound, e.g., analog bass, analog brass, analog synth.
- **Digital:** Further defines the instrument as a typical digital synth sound (like wavetable, FM), e.g., digital bass, digital piano, digital synth.
- **Synthetic:** This Attribute describes the technical aspect of how the sound was produced. Synthetic refers to all synthesis techniques like subtractive, additive, FM, wavetable, granular etc.
- **Sample-based:** This Attribute describes the technical aspect of how the sound was produced. Sample-based refers to all instruments in the sense of sample playback, i.e., the sounds were obtained from external sources. It should not be used for granular synthesis or sample-based wavetable synthesis. For example FM8 Patches, which use a sample for playback but manipulate it drastically, would be categorized as Synthetic.
- **FM:** A sound which uses FM synthesis. FM can also be used for sample-based instruments that sound like FM.
- **Additive:** A sound that uses additive synthesis (or sounds like it).
- **Granular:** A sound that uses granular sampling (or sounds like it).
- **Physical Model:** A sound that uses physical modeling (or sounds like it).
- **Solo/Single:** Used to differentiate between a single instrument and a group of identical instruments, like a solo violin (as opposed to a violin section) or a single snare drum (as opposed to a drum kit).

- Ensemble/Kit: Used to differentiate between a group of identical instruments and a single instrument, like a string section or a drum kit. Don't mistake Ensemble/Kit with Layered.
- Small: Specifies the physical size of the instrument source to help differentiate among similar instruments. Only select this Attribute to describe real instrument sizes, not the timbre itself. For example, a violin is categorized as Bowed Strings/Small; a hand drum would be found under Percussion/Small.
- Big: Specifies the physical size of the instrument source to help differentiate among similar instruments. Only select this Attribute to describe real instrument sizes, not the timbre itself. (For example a violoncello is categorized as Bowed Strings/Big; a taiko drum would be found under Percussion/Big.)
- Dry: Has no noticeable effects like reverb or delay. Distortion and/or filtering do not affect this Attribute.
- Processed: A sound reinforced with some obviously added and audible effects like delay, reverb or .
- Layered: A sound where two or more sound sources contribute to one instrument. The sounds must combine to form one sonic character, like a typical Piano + String sound.
- Sequence/Loop: Based on a sequence or loop, like a step-sequenced synth or a drum loop. This Attribute is not used for simple repeating or retriggering of notes (see Arpeggiated).
- Surround: A sound using surround-sound technology.

## Timbre

This set of attributes describes the sonic composition of the sound (always considering the selected instrument).

- High: Used for high pitched sounds and to distinguish similar timbres by their range, like a piccolo flute, hi-hat, bells etc.
- Low: Used for low pitched sounds and to distinguish similar timbres by their range, like a bass clarinet, kick drum, sub bass etc.
- Distorted: A sound featuring obvious distortion/overdrive. Saturated and heavily bit reduced sounds are also found here.
- Clean: A sound featuring no distorted sound elements at all. Can be used to further specify instrument groups, e.g. clean electric guitar.
- Bright: A sound with emphasized high frequencies.

- Dark: A sound with de-emphasized high frequencies, perhaps from lowpass filtering.
- Warm: A sound with an organic, pleasing ambience, often associated with analog sounds. Technically speaking, warm sounds tend to have a bit more lower midrange emphasis and not too many highs.
- Cold: Not a natural sound, but a more electronic/digital sound.
- Fat: A “room-filling” sound, e.g., an analog super sawtooth sound, also to be used with typical unison sounds.
- Thin: A small sound or a sound with a narrow frequency band.
- Hard: A general, rather subjective interpretation of a sound. Can be used to differentiate similar instruments (e.g., vibraphone with hard mallets). Also associated with hard-synced oscillators.
- Soft: A general, rather subjective interpretation of a sound. Can be used to differentiate similar instruments (e.g., vibraphone with soft mallets).
- Muted: A sound with a muted or damped quality, like a muted guitar or con sordino strings. Usually found on acoustic instruments (a dark sound is not necessarily muted).
- Detuned: A sound with detuned oscillators to create floating tones, like saw leads used in trance music or honky-tonk piano. This is not used when the oscillators are tuned a fifth apart (see Chord), and it is not used with instruments that use micro intervals and/or non-standard tunings.
- Dissonant: A sound which in general is not playable tonally.
- Noisy: With some noise elements in the sound, but still playable tonally, like very breathy flutes. Slightly bit-reduced (not yet distorted) and lo-fi sounds are also categorized as Noisy.
- Metallic: A sound with a metallic quality. Note that several types of bells and FM often sound metallic.
- Wooden: A sound with a wooden quality, like a bamboo flute or xylophone.
- Exotic: Sounds with an extremely unusual quality fall under this category.

## Articulation

Describes how the sound progresses over time in terms of volume and timbre. Also, this column lists all the Attributes that affect the playing style.

- **Slow Attack:** A sound with a gradual attack or a fade-in.
- **Decaying:** A sound which decays while holding a key, like a piano or a guitar. It does not necessarily fade out completely; see Sustained.
- **Sustained:** A sound with a constant volume level while holding a key, e.g. an organ or sustained strings. The sound doesn't fall under this category if just a small part of the signal is sustained. A sound can be both Decaying and Sustained. A loop, although it continues to play a sound, is usually not categorized as Sustained.
- **Long Release:** A sound with a long fade out after releasing the key, like a bell or a pad. This can also indicate instruments with release samples. Don't confuse Long Release with an echo or long reverb!
- **Percussive:** A sound with a short attack and usually short decay/release, often found in the group of drums or percussion.
- **Long/Evolving:** A sound with a complex, moving or increasing envelope, which persists for more than just a few seconds.
- **Pulsating:** A sound with periodic changes in volume and/or timbre over time, e.g., a step modulator controlling volume/filter. A loop is not necessarily Pulsating - only if it is processed in a similar manner.
- **Echoing:** A sound with significant reverb or delay.
- **Pad:** A sound texture suitable for as a homophonic background. As opposed to a Soundscape, a Pad has a more uniform characteristic and is often played as a chord.
- **Lead:** A sound suitable for the main instrumental melody part.
- **Monophonic:** A sound which can play only one (MIDI) note at a time, with or without key-up action.
- **Chord:** A sound with more than one pitch played simultaneously per key, like fifth leads. This does not include sounds that simply double the octave. A Chord can also be Monophonic, as long as only one (MIDI) note is sounding at a time.
- **Glide/Pitch Mod:** A sound that uses pitch slides between note transitions. It also indicates sounds with pitch modulation, like a dropping kick drum.
- **Sweep/Filter Mod:** A sound with some kind of filter modulation, i.e., an LFO or envelope modulates filter parameters. A simple velocity to filter modulation is not sufficient (see Expressive).

- Arpeggiated: A sound that arpeggiates or repeats held notes. A sound that triggers a sequence is not Arpeggiated, but Sequence/Loop.
- Tempo-synced: A sound which clearly changes when the host tempo changes, i.e., where certain parameters like LFO or delay times are synced to tempo.
- Expressive: A sound with a large and noticeable dynamic and/or tonal range, controlled by either velocity or mod wheel (a subtle velocity to amplitude routing is not sufficient).
- Multiple: Used to denote instruments that feature more than one articulation. Usually applies to key-switched instruments.
- Randomized: A sound with random elements in it, for example a random or free-running LFO modulating filter. Also indicate sequences and/or loops that give the impression of randomness.

## Genre

Describes the typical musical genre to which a sound would be suited. It can also stand for a particular sound's origin.

- Avantgarde: Sounds associated with modern contemporary music, whether acoustic or electronic. This Attribute works well in combination with other genres, e.g. orchestral + avantgarde might include extended playing techniques on acoustic instruments.
- Orchestral/Classical: Sounds used in a traditional symphonic orchestra or chamber group. Such sounds need not necessarily be dry, but the emphasis is placed on natural reproduction. Sample-based acoustic instruments are usually found here.
- Film Music: Sounds associated with film music and/or game audio. In general, sounds belonging to this category have a certain “bombastic” quality, in other words they're ready to use for scoring, like massive orchestral brass, airy atmospheric synth textures and cinematic effects.
- Ambient/Electronica: Sounds that create a certain atmosphere, based on depth and warmth. Also, sounds with a kind of slow motion character or “clicks & bleeps” are often used for ambient or electronica tracks and will be found here, as well as all typical sounds for “intelligent electronic music” (opposite of cheap plastic sounds).
- Drum&Bass/Breaks: Prominent and deep basses combined with dark lead sounds and gloomy atmospheric hover pads. Synthetic sound effects are also a part of this genre, as syncopated drum loops are often based on polyrhythms and samples from 70s jazz and funk records.

- House: Typical warm and often human-sounding elements are used for this four to the floor dance music, e.g. organ chords, warm analog basses etc. Generally more analog sounds with a certain depth will be found here.
- Techno/Electro: Synthetic and electronic sounds and sound effects with a rather dry and dark nature are this genre's trademark. Percussion with hard attack and a very compressed character belong here as well as a wide spectrum of synthetic bass sounds, stabs and leads.
- Industrial: Sounds with a digital and cold/metallic character, often combined with noisy or distorted elements, belong in here.
- Dance/Trance: Sounds with a rather soft and warm character will be found here. Typical sounds are analog and digital synth pads, melodic elements (from soft and small to typical detuned super saw sounds for trance anthems) and commercial dance sounds like bells and arpeggiated elements go here. Sounds which are suited to create a hypnotic mood also fit here.
- HipHop/Downbeat: Sounds with a laid back and chilled character belong in here as well as typical sound effects like vinyl-scratching, struck drum sounds with an acoustic or analog synthetic character, and mellow pads.
- Funk/Soul: These instruments have that vintage funk sound, such as organs from the 60s, synths from the 70s, wah-wah guitars, slap bases, and dry acoustic drums.
- Reggae/Dub: For this genre, typical instruments would be dry acoustic drums and percussion, clean guitars, some acoustic flutes and smaller organs.
- Latin/Afro-Cuban: Sounds to be used in Central and South American music (Salsa, Son, Samba, Bossa Nova). This includes all latin percussion such as congas, maracas and timbales, as well as some acoustics guitars and djembes.
- Rock: Typical sounds for straightforward rock music, like electric guitars and basses, acoustic drums, and dirty synths.
- Pop: A rather broad musical genre that includes sounds of typical "radio-ready" music, ranging from pianos and guitars to electro-pop synths and drums.
- Jazz: All typical jazz instruments like piano, upright bass, saxes, brass and drums are found here. In other words, all sounds used for an acoustic jazz arrangement, ranging from small ensemble to big band. Sounds are rather natural in character with little or no processing.

- Folk/Country: Sounds associated with all kinds of folk and songwriter styles like bluegrass, klezmer, blues. In general, this encompasses acoustic sounds.
- Ethnic/World: Sounds associated with non-western musical cultures like south/north Indian music, gamelan, Arabic/Persian, Asian and African music. These sounds need not necessarily be acoustic in nature; electronic textures can also be categorized here as long as they reflect this kind of atmosphere.

## Effect Categories

### Type

Describes the basic effect characteristics.

- Delay: An echo effect that adds one or more delayed versions of the original signal to the sound.
- : An effect that mixes a very slightly delayed and pitch-shifted version of the input signal with the original input signal.
- Phaser/Flanger: All kinds of effects using a comb filter (delay-line) to generate phase shifting and cancellation thus creating, a phasing or flanging sound.
- Reverb: All effects creating an obvious room ambience.
- Filter/EQ: All types of effects which modify a sound's harmonics.
- Dynamics: Effects that manipulate the input signal's dynamic range such as compressor, limiter or expander.
- Enhancer: All types of effects that enhance the sound through psycho-acoustic means, e.g., to add brilliance and/or depth.
- Vocoder: Effects based on traditional vocoder technology where the signal present at one input modulates the signal present at another input.
- Distortion: All types of effects that distort the incoming signal, from discreet to heavy distortion.
- Resonator: A special effect containing a (comb) filter that rings at a resonant frequency when it is excited by an input signal. A short input pulse creates a significantly longer decaying oscillation at the output.
- Lo-Fi: An effect that creates lo-fi sounds from the incoming signal, like a bit or sample rate reducer.

- Pitch Shift: All effects altering the pitch of a sound without affecting the playback tempo.
- Gate/NR: All types of gate and noise reduction effects.
- Panning: Effects that modulate the incoming signal's stereo/surround placement.
- Re-Sampler: All effects that re-sample the incoming signal for the purpose of altering it via granular synthesis, making sequence changes, etc.
- Amp Simulator: An effect that simulates the sound of an analog amp.
- Speaker Simulator: An effect that simulates the sound of a particular speaker/cabinet combination.
- Restoration: Effects used to restore vintage or otherwise damaged recordings, e.g., click, hiss, or scratch removal.
- Combination: All effects including the character of several different effects of the above list (e.g., a combination of delay, filter and reverb effects).
- Other: Select this Attribute if it's not possible to specify an effect type.

## Mode

Specifies the effect's mode of operation.

- Synced: All effects that can sync to the host sequencer's tempo.
- Side-chain: All effects controlled by an external signal via side-chain.
- Gated: Effects that including "gating" (rapid amplitude changes) as an integral part of their sound.
- Tuned/MIDI: Effects that are tuned or controlled via MIDI.
- Envelope Follower: All effects that follow an amplitude envelope to modulate certain Attributes like filter cutoff, pitch, volume and so on.
- Random: Effects with random parameters.
- LFO: All effects with parameters controlled by low frequency oscillator(s).
- Step: All effects with parameters controlled by a step-modulator.
- Granular: Effects that re-synthesize the signal by using a micro-sound time scale.

- Impulse Response: All effects working with impulse responses, e.g., convolution reverb effects or filters.
- Overdriven: For effects with potentially overdriven inputs or outputs.
- Vintage: An effect that creates a vintage character, mostly associated with warmth and positive sound alteration.
- Multi-band: For effects working with more than one level or band, e.g. a multi-band compressor.
- Selective: All effects that operate on certain selective scopes of the signal, e.g., on selective frequencies like an exciter or de-esser.
- Adaptive: Driven by parameters that are extracted from the sound itself. The goal of this effect's class is to provide a changing control signal to an effect.
- Channelstrip: A combination of effects designed for processing incoming audio, similar to a hardware mixing console.
- Parallel: The signal routing of effects is parallel.
- Chain: The signal routing of effects is serial.
- Stereo: All effects work in stereo mode.
- Mono: All effects work in mono mode.

## **Characteristic**

Describes an effect's special sound characteristics.

- Long: Describes the release time of an effect, e.g., a long reverb or delay.
- Short: Describes the release time of an effect, e.g., a short reverb or delay.
- Fast: For effects that need to treat the incoming signal immediately upon receiving it (e.g., a compressor) or the effect itself sounds or acts fast.
- Slow: An effect that treats the incoming signal slowly, or the effect itself sounds or acts slow (e.g., attack-delay effect).
- Bright: A general, rather subjective interpretation of an effect. Can also be used to differentiate similar effects.
- Dark: A general, rather subjective interpretation of an effect. Can also be used to differentiate similar effects.
- Warm: An effect that adds warmth to the processed sound.

- Cold: An effect that adds coldness to the processed sound.
- Intense: An effect that changes the sound in an intense way, e.g., a heavy distortion effect.
- Discreet: An effect that changes the sound in a discreet way, e.g., a subtle delay.
- Nasty/Evil: An effect that modifies the sound in a nasty or evil way, e.g. a distortion effect with high intermodulation distortion.
- Enhancing: An effect that generally enhances the incoming sound.
- Coloring: An effect that adds color or character to a sound. Often found in vintage compressor or equalizer gear.
- Neutral: A transparent effect that doesn't alter a sound's essential character.
- Alienating: An effect that modifies the sound completely, e.g., vocoder.
- Clean up: An effect that cleans up the incoming signal, e.g., an equalizer that reduces or removes unwanted frequencies like hum or hiss.
- Metallic: An effect that adds metallic elements to the sound, e.g., a ring-modulator or frequency shifter.
- Ambience: An effect that creates an atmospheric mood, e.g., a room reverb.
- Spacious: An effect that creates an evocative mood, e.g. a very long delay.

## Application

Describes the type of instrument, track, or field of application with which the effect is typically used.

- Acoustic Piano: For effects typically used with acoustic pianos, e.g., reverb or compressor.
- Electric Piano: For effects typically used with electric pianos, e.g., phaser or tremolo.
- Organ: For effects typically used with organs, e.g., speaker simulator or distortion.
- Pads/Strings: For effects typically used with pad or string sounds, e.g., or phaser.
- Guitar: For effects typically used with guitar sounds, e.g., amp simulator or distortion.

- Bass: For effects typically used with bass sounds, e.g., equalizer or filter.
- Drums/Percussion: For effects typically used with drum/percussion instruments, e.g., small reverb or compressor.
- Brass/Woodwinds: For effects suitable for brass or woodwind sounds, e.g., reverb or delay.
- Lead: For effects typically used with lead instruments, e.g., or reverb.
- Vocal: For effects typically used with vocal tracks, e.g., vocoder or reverb .
- Sequences: For effects typically used with sequenced lines, e.g., delay or gate.
- Loops: For effects typically used with drum or other loops, e.g., flanger or lo-fi.
- Experimental: For effects that change the signal so extensively it becomes unrecognizable.
- Surround: For effects that could be used for surround applications, e.g., panning etc.
- Mastering: For effects intended for mastering applications, e.g., multiband compressor or FIR equalizer.

# Appendix C – Keyboard Shortcuts

Action	PC	Mac, if different
New Sound	Ctrl+N	Cmd button instead of Ctrl.
Open	Ctrl+O	
Save	Ctrl+S	
Save As	Ctrl+Shift+S	
Exit	Alt + F4	Cmd + Q
Arp on/off toggle	Ctrl-G	
F2 Browser	F2	
F3 Attrib	F3	
F4 Master	F4	
F5 FX	F5	
F6 Arp	F6	
F7 Easy/Morph	F7	
F8 Expert	F8	
Step	cursor up/down ***	
Hide Editor	Ctrl + H	
Hide Keyboard	Ctrl + K	
Midi Learn	Ctrl + L	
Select single OP pages	Ctrl + [Op-first letter] A-Z + Pitch	
Select Ops page	Ctrl + W	
Select Env page	Ctrl + V	
Select Mod page	Ctrl + U	
Select KeySc page	Ctrl + Y	
Select Spect page	Ctrl + T	

\*\*\* cursor up/down has two functions:

- when browser page is visible navigate through lists without changing the Sound.
- when any other page is visible, step through current list of Sounds, like using like using the Previous/Next buttons.

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