

attack PERCUSSION SYNTHESIZER

User Manual



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Worth Knowing

Thank you for purchasing the Waldorf Attack 3 Drum Synthesizer. Attack 3 offers nearly all components to generate analog drum and percussion sounds.

Attack 3 offers a straightforward sound structure that faithfully emulates a wide range of percussion sounds, from those of well-known classic drum or rhythm generators to new, unique drum sounds such as bass drums and snare drums over shakers as well as heavily modulating synth effects.

About this Manual

A problem with any manual is to find a way to cover both the needs of an absolute expert and a beginner alike. There are people who read a manual cover to cover while others don't even touch it. The latter is the worst choice, especially when the manual describes a Waldorf instrument.

Anyone reading the following manual is in for a lot of fun while learning about and working with the Waldorf Attack 3.

We promise you a lot of fun while playing, working and composing with the Attack 3.

Your Waldorf Team

Hint

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❗ Please visit our website for further support and downloads for your Attack 3 synthesizer:
waldorfmusic.com/product/attack

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Overview



1) Head-up section

3) Crack, Mixer, Filter & Amp

5) Sound Effect section

2) Oscillator section

4) Modulator section

6) Mixer section


About this Manual


This manual was written to help you to become familiar with your Attack 3 drum synthesizer. It will also aid experienced users with routine tasks.


To avoid confusion, the terminology in this manual is based on the Attack 3 parameter names. You will find a glossary at the end of this manual; it explains some terms used.


We also used a uniform set of symbols to show you topics of particular interest or significance. Important terms are highlighted in bold letters.

Symbols

 **Caution** – The comments that follow this symbol will help you avoid errors and malfunctions.

 **Info** – Additional information on a given topic.

 **Instruction** – Follow these guidelines to execute a desired function.

 **Example** – Real-world examples to try out.

Highlighted Control Features and Parameters

All of Attack 3 buttons, controls and parameters are highlighted in **bold** letters throughout the manual.

Examples:

- Turn the **Pitch** knob.
- Click the **Bus** button.

Attack 3 different modes and parameter pages are illustrated in a depiction of the display.

The value range of a continuous parameter is indicated from low to high with both values shown in italic letters, separated by three dots.

Example:

FM1 *-100.00%...100.00%*

Installation & Activation

System Requirements for Windows

In order to be able to use the Attack 3 instrument plug-in, you will need at least:

- PC with an Intel or AMD processor.
- Windows 10 or newer.
- VST 2.4 or VST3 compatible host application. This must be correctly installed on your computer.
- AAX compatible host application. This must be correctly installed on your computer.

❗ Please also observe the system requirements of your host application!

❗ The Attack 3 plug-in runs only within 64 bit host applications.

Installation under Windows

1. Refer to the folder where the downloaded Attack 3 plug-in zip archive is located.

2. Double click on the archive file to extract it.

3. Double click on the Attack plug-in Installer icon. This launches a special installation program.

4. Follow the on-screen instructions.

❗ After installing Attack 3 plug-in you will have to activate it on your computer. Please refer to the chapter "Activation of the Attack 3 plug-in".

System Requirements for macOS

In order to be able to use the Attack 3 instrument plug-in, you will need at least:

- Mac with Intel processor
or
Mac with Apple Silicon processor.
- macOS 10.14 or newer.
- VST 2.4 compatible host application or a VST3 compatible host application. This must be correctly installed on your computer.
or

-
- An AudioUnit 2.0 compatible host application. This must be correctly installed on your computer.
or
 - An AAX compatible host application. This must be correctly installed on your computer.

- ❗ Please also observe the system requirements of your host application!
- ❗ The Attack 3 instrument plug-in runs only within 64 bit host applications.
- ❗ The VST2 version will not run on a Mac with Apple Silicon.

Installation under macOS

Proceed as follows to install Attack 3 plug-in:

1. Refer to the folder where the downloaded Attack 3 plug-in zip archive is located.
2. Double click on the archive file to extract it.
3. Double click on the Attack 3 plug-in Installer DMG icon. This launches a special installation program.
4. Follow the on-screen instructions.

- ❗ After installing Attack 3 plug-in you will have to activate it on your computer. Please refer to the next chapter "Activation of the Attack 3 plug-in"

Activation of the Attack 3 Plug-In

Attack 3 uses a copy protection system based on the users email address as well as a personalized serial number.

Proceed as follows to activate Attack 3:

1. Start your host application.
2. Load the Attack 3 plug-in on an instrument track in your DAW.
3. An input field occurs. In the upper field, please enter the email address that was used for purchasing Attack 3 plug-in. In the lower field, please enter the 20 digit serial number which you have received with your purchase.
4. Click on the OK button to confirm your data. From now on, Attack 3 is authorized for this computer.

- ❗ If you want to use Attack 3 on other computers, please proceed in the same way as described above.

Basic Operations

Percussive and Melodic Sounds

The play functions of Attack 3 are identical in its most aspects to the functions of most common synthesizers. Attack 3 can be played over the key range from C1 to G9, if required. The 24 sounds can be played through MIDI notes C1 to B2, thus affording 1 sound per key. This is a common layout for a drum and percussion synthesizer, making it possible to play the sounds on the keyboard next to each other.

Additionally, the upper 12 sounds of Attack 3 can be played melodically and polyphonically on the keyboard on MIDI Channels 1 through 12. This is because Attack 3 is capable of producing other sounds such as basses or leads based on its synthesis functions. These sounds call for playing over a greater key range than 1 key. For these 12 sounds, the key range from C3 to G9 is available for melodic playing.

❗ Summary: Playing sounds chromatically is only possible for the upper 12 sounds on MIDI channels 1 to 12.

General Operation

Attack 3 can be optimized for different screen resolutions. You can click-drag the resize handle at the lower right corner of the plug-in window to scale the Attack 3 plug-in window to your desired size or select a zoom factor from the **Menu**.

Attack 3 has various on-screen controls. The knobs and faders can be moved with greater accuracy by holding down the SHIFT key on your computer keyboard while moving your mouse. Double-clicking the corresponding fader or knob resets the parameter to the default value. Mouse scroll wheel is supported for all continuous controls. Both envelopes can be edited with your mouse.

ALT/OPTION click on any value field opens a text edit field for entering values via your computer keyboard.

In any menu, the arrow up and down keys can be used to move through the entries. Press return to load/select the desired entry, e.g. a sample, a sound or a menu entry.

⚠ Rhythm is both the song's manacle and its demonic charge. It is the original breath, it is the whisper of unrelenting demand. (*Ian McShane*)

Control Elements

Using the Attack 3 controls is simple. There are some different types of control elements:

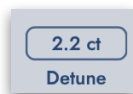
Knobs

To set a value, click on the knob, hold down the mouse button and move the mouse up and down. Pressing SHIFT while holding the mouse button allows finer adjustments. If you hover over a knob using the mouse, the current parameter value appears below the dial.



Value Fields

Click and hold your mouse on the value field and drag up or down to change the parameter value.



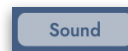
Drop-down Menus

Click on the corresponding parameter/button to open a drop-down menu where you can choose the desired value or selection.



Buttons

If a function/parameter is active, it is highlighted. To activate a function, just click on its parameter name.



Fader

To set a value, click on the fader, hold down the mouse button and move it up and down. Pressing SHIFT while holding the mouse button allows finer adjustments.



Envelope Displays

Click into the graphical representation and drag the mouse to continuously and smoothly change the corresponding envelope parameters. More on the different graphic display types can be found in the corresponding manual sections.



The Attack 3 Pages

Attack 3 consists of numerous sound-shaping components and additional controls. The following manual pages describe all parameters in detail.

! Regardless of the selected page, the Attack mixer is always displayed at the bottom of the user interface.

The Head-Up Section

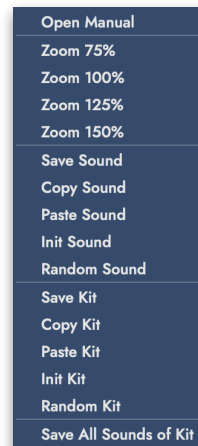


The Head-up section provides the global overview and includes the following options from left to right:

1. A click on the Attack logo opens a window with Attack 3 software version and additional information. To close the information window, click anywhere.
2. A click on the **Sound** button switches the user interface to the standard programming window. Here, you will most likely spend your time playing and programming Attack 3.
3. A click on the **Bus** button switches to the bus and effects overview. Here, you can setup your effect busses and edit the selected effects.

4. Hidden behind the **Browser** button is the loading screen drop-down window for loading preset and user kits or sounds.
5. A click on the **Sound name** allows you to quickly rename the currently loaded preset kit.
6. The **Save** button opens a window to save the current Attack 3 kit. Here, you can select a desired location on your computer hard disk.
7. The **Menu** button opens a pop-up menu including the following options:

- **Open Manual** opens your favorite web browser and directly navigates to the location of this PDF manual (if your computer is connected to the internet).
- **Window Zoom** sets the plug-in window size to the corresponding fix size. There are four options available (75%, 100%, 125%, and 150%).



-
- **Save Sound** saves the currently selected sound to a desired location on your computer hard disk.
 - **Copy Sound** copies the currently selected sound into the buffer.
 - **Paste Sound** puts the copied sound into any desired place. This is useful when creating variations of one particular sound.
 - **Init Sound** restores the selected sound to its basic settings.
 - **Random Sound** creates a random sound. With this parameter you easily can create new and possibly interesting sounds.
 - **Save Kit** saves the currently selected kit to a desired location on your computer hard disk. This option is similar to the **Save** button.
 - **Copy Kit** copies the currently loaded kit into the buffer.
 - **Paste Kit** inserts the copied kit into any other Attack 3 plug-in. This is useful when exchanging kits between different Attack 3 units.
 - **Init Kit** restores the drum kit to its basic settings.
 - **Random Kit** creates a random drum kit. With this parameter you easily can create new and interesting kits.
 - **Save All Sounds of Kit** does exactly that. It saves all 24 sounds of the current kit to a desired data path, within a folder that is created automatically.

ⓘ Attack 3 expects a number of directories to load presets from or to save your own creations. Read more on this in the Appendix of this manual.

ⓘ Please note that some host applications as Steinberg Cubase use an additional sound data management. It offers you an alternative way to load and save sounds on your system. Please refer to the corresponding manual chapter of your host application.

The Browser

Click on the **Browser** button to open the browser panel. Here you find two columns for selection and loading of Drum Kit presets and Drum Sounds presets.

❗ A **Kit** is a collection of up to 24 single drum **Sounds**.



Double-click on the desired kit name in the left column to load the entire kit. If the **Single-Click Load** option is active, a single click on a kit name loads the kit directly.

❗ Keep in mind that loading a kit will overwrite the current kit.

Double-click on the desired sound name in the right column to load the corresponding sound into the currently selected sound slot. If the **Single-Click Load** option is active, a single click on a sound name loads the sound directly.

The factory sounds are organized in subfolders with typical drum sound category names.

❗ Keep in mind that loading a sound will overwrite the currently selected sound.

If you have saved own kits and/or sounds, you can find them in the corresponding User Kit or User Sound section.

❗ Attack 3 expects a number of directories to load User presets. Read more on this in the Appendix of this manual.

To close the loading window, simply click on the **X** button in the top left corner.

The Sound Page

The user interface of the Attack 3 is split into useful sections for easy access to the different parameters. Though the Attack 3 is primarily designed for creating drum and percussion sounds, the setup is reminiscent of a synthesizer offering subtractive synthesis. eating classic synthesizer sounds.



❗ Is this your first drum synthesizer? Are you curious about drum sound synthesis? If so, we recommend to read the corresponding chapters in the Appendix section of this manual.

In the Mixer below, you find 24 Sound Select buttons (with the drum sound name), divided in two sections (1-12 and 13-24). With these buttons you can select the sounds of a drum kit. Here, parameter groups for both Oscillators, the Mixer, the Filter, the Amplifier, the Effects section, the Crack Modulator and settings for both Envelopes and LFOs are available.

Due to its flexible synthesis structure, the Attack is capable of creating classic synthesizer sounds, especially basses and leads.

🔧 **Basic Sound Edit** - fast and easy:

- 1) Click on the corresponding sound slot (or directly into the mixer channel) above the mixer channels to select the desired sound slot. If you want to select sound 13-24, click on the **13-24** button right beside the mixer.
- 2) Edit the selected sound to your needs by using all available parameters on the Sound page.
- 3) Click on the **Bus** button above the sound mixer channel to route the sound to a desired bus channel.

The Oscillator 1 and 2 Section

Attack 3 is equipped with two oscillators that have almost identical functionality. Oscillator 1 additionally contains an integrated FM (frequency modulation) section. The following explanations are valid for both oscillators.



Shape Menu

Sets the type of waveform to be generated by the oscillator. The parameter is called Shape instead of "waveform", because it doesn't necessarily set only classic synthesizer waveforms, but it also generates noise, sample&hold and audio samples. However, the term "waveform" is used interchangeably throughout this manual. The following shapes are currently available:

- **Triangle:** Selects the triangular waveform. The triangle mainly consists of odd harmonics with very low magnitudes. It is perfect for nearly all drum and percussion sounds.
- **Sine:** Selects the sine waveform. It consists of the fundamental frequency only. It has no harmonics at all. With a sine wave you can create clean bass drums and snares. The sine wave is also perfect for FM.
- **Pulse:** Selects the pulse waveform. This waveform produces a hollow / metallic sound and is perfect for bass drums and snare drums.
- **Saw:** Selects the sawtooth waveform. A sawtooth wave has all the harmonics of the fundamental frequency in descending magnitude. his waveform is pleasing to the ear. You can use it for bass and lead sounds.

❗ The square, sine, triangle and sawtooth waveforms always start at full amplitude to create a necessary start click when **Phase** is 0°. This is characteristic for drum and percussion sounds. To avoid this click, either set **Phase** to 90° or 270° for triangle and sine waveforms or raise the Attack value for Envelope 2 to around 1 ms or higher for any waveform or sample.

- **Sample & Hold (S&H)**: S&H samples a random value and holds it. Pitch selects the time of this process. S&H is perfect for industrial-type FX sounds and as an FM source.
- **Noise** is a fundamental source for any kind of analog-type percussion, especially hi-hats and snare drums. Also, wind and other sound effects can be created by using noise. If noise is selected, you can “color” it with the **Pitch** knob. Negative values create pink noise (fewer high frequencies), positive values a blue noise (fewer low frequencies).
- **Sample** does not select an oscillator waveform; instead, you can choose up to 4 samples from a list for further programming. Click on the **Browse** button (only available, when *Sample* as oscillator shape is selected) to open a pop-up window.

The Sample Selection Window

Here you can select up to 4 factory or user samples and different playback options for the corresponding sample oscillator.



The Sample selection window in Velocity mode

Depending on the selected playback option, the functionality of the Sample selection window can change.

To close the Sample selection window, simply click on the **X** button in the top left corner.

Playback Option

Here you can select between 4 options for sample playback:

- *Sample 1* is a standard playback mode for one sample. In this mode, only Sample 1 can be used. For this reason, the other 3 sample slots are greyed out.
- *Velocity* allows you to load up to 4 samples into the 4 sample slots and set a **Hi Velocity** value. So the 4 samples can be triggered based on the incoming MIDI velocity.
- *Round* stands for Round Robin. In this mode, each incoming note triggers the next sample in ascending order repeatedly. 1st note = Sample 1, 2nd note = Sample 2, 3rd note = Sample 3, 4th note = Sample 4, 5th note = Sample 1 again, and so on.
- *Random* - same as Round, but in random order.

Sample Slot

Based on the selected **Playback** option, you can make different settings for a loaded sample. Click on the corresponding **Sample 1...4** button to select the desired sample slot. If a Sample slot is filled with a sample, its name is displayed. Click on the **X** button to remove the sample from a corresponding slot.

- *Start* sets the sample start point in percent. 0.0% means, that a sample starts from its original start point. Higher values move the start point forward, so that the sample is triggered slightly later.
- *Hi Vel* (only for Velocity mode) sets the maximum velocity that is necessary to trigger the corresponding sample. To set up a sound with 4 velocity layers, you can set Sample 1 to 20, Sample 2 to 50, Sample 3 to 90 and Sample 4 to 127.

Loading Section

In the right column of the window, you will find the Preset/User sample selection and a results list.

If **Preset** is active, you can load any of the shown factory samples. Double-click on the desired sample name to load the corresponding sample into the currently selected sample slot. If the **Single-Click Load** option is active, a single click on a sample name loads the sample directly.

If **User** is active, you can load any sample, that is located in your User folder. To fill the user folder, you need to copy the desired sample(s) first into that folder. Right-click in the results list and select *Reveal* to locate the User sample folder. Feel free to move/copy any sample from your hard disk into that folder. After that, the sample(s) will be shown in the

result list. Double-click on the desired sample name to load the corresponding user sample into the currently selected sample slot. If the **Single-Click Load** option is active, a single click on a sample name loads the sample directly.

You can also drag & Drop a sample from your computer hard disk onto a desired sample slot. In this case, the sample is automatically copied into the User folder.

Click on the **Audition** button to activate the automatic audition function, when a sample from the result list is selected.

❗ Attack 3 expects a special data path of directories to load user samples. Read more on this in the Appendix of this manual.

Pitch

This knob determines the pitch of the corresponding oscillator over a very wide range. This is necessary to reproduce drum and percussion sounds. Pitch also has influence on the **Semitone** and **Detune** settings.

Semitone

This value field works with **Pitch**, setting the pitch of the oscillator in semitone steps. This is useful for melodic

sounds. Lead and Solo sounds sound interesting when you set one oscillator to e.g. a fourth (+5 semitones).

Detune

This value field also works with Pitch and fine-tunes the corresponding oscillator in cents. The audible result of detuned oscillators is a chorus or flanger effect. Use a positive setting for one oscillator and an equivalent negative setting for another.

Phase

Determines the start-phase of the corresponding oscillator. *Free* results in free-running oscillators as in analog synthesizers, $0..360^\circ$ determines the phase in degree the oscillator waveform starts with.

Pitch Mod 1 and Pitch Mod 2

Sets the amount of pitch modulation from a selectable modulation source. This is selected from the drop-down menu below the respective Pitch Mod control.

❗ A list of all available modulation sources can be found in the Appendix of this manual.



Modulation Examples:

1) Select *Env1* as modulation source and turn the Mod knob to set the amount of pitch modulation from Envelope 1. Positive amounts will raise the pitch when envelope modulation is applied. Negative amounts will lower the pitch. Use this modulation to create time-dependent pitch changes.

2) Select *Env1xVel* as modulation source and turn the Mod knob to set the amount of pitch modulation from Envelope 1 and Velocity. This determines the amount of influence Envelope 1 has on the pitch, based on key velocity. This option works similarly to the first example, with the difference that its intensity is velocity based. Use this feature to give a more expressive character to the sound. When you hit the keys smoothly, only minimal modulation is applied. When you hit harder, the modulation amount also gets stronger.

FM (only available for OSC 1)

Sets the amount of frequency modulation that is applied to Oscillator 1 by Oscillator 2. The sound will get more metallic and sometimes even drift out of tune. Triangle waves, sine waves and noise are especially suited for FM. To change the frequency modulation dynamically, use an envelope or

velocity. The FM range of Attack 3 is very wide, so that you can generate nearly chaotic FM out of periodic waveforms like sine waves. This is necessary to create hi-hats.

If you use noise as FM source, the sound will become more tonal when you use higher FM settings. To create a vibrato, set Oscillator 2 to a deep pitched triangle waveform and use very low FM settings. Playing this sound at low octaves creates a wobble effect.

ⓘ FM background hints: The frequency modulation of Attack 3 modulates the phase of Oscillator 1 with the amplitude of Oscillator 2. This effect can be very strong, such that there can be phase overflows by a factor of 8. This creates noisy waveforms – perfect for drum sounds. Lower FM settings generate many different spectra of a metallic character. A FM envelope can change the metallic character to chaotic FM, also necessary for drum sounds. Another point to observe is that FM into Attack 3 is scaled linearly.

FM Mod 1 and FM Mod 2

Sets the amount of FM from a selectable modulation source. This is selected from the drop-down menu below the respective FM Mod control.

The Crack Modulator

The Crack modulator was designed especially for creating hand clap sounds. Technically it is an amplitude modulation using a sawtooth waveform. The speed and the number of waveforms can be chosen. After transmitting its intended modulation, the Crack modulator resumes emission of a constant signal.

Keep in mind, that the Crack modulator superimposes its effect on all other Mixer signals (Osc 1 and Osc 2, Ring Modulator).



Speed

Determines the frequency of the Crack modulator.

Length

Determines the number of modulations the Crack modulator creates (from 1 Cycles to ∞ Cycles).

The Mixer Section

In the Mixer, you control the volumes of the two oscillators. Ring modulation and Crack modulation can be applied optionally to extend the Attack's tonal range. Also, two modulation options can be found here.



Osc 1

Volume of oscillator 1.

Osc 2

Volume of oscillator 2.

Osc Volume Mod 1 and Mod 2

Sets the amount of volume modulation from a selectable modulation source. This is selected from the drop-down menu below the respective Mod control. Positive amounts will raise the volume when e.g. an envelope modulation (Env 1) is applied. Negative amounts will lower it.

① A list of all available modulation sources can be found in the Appendix of this manual.

RMod (Ring Modulation)

Volume of the ring modulation between Oscillators 1 and 2. From a technical point of view, ring modulation is the multiplication of two oscillators' signals. The result of this operation is a waveform that contains the sums and the differences of the source frequency components. Since ring modulation generates disharmonic components, it can be used to add metallic distorted sound characteristics. This is useful when generating crashes or cowbells. Please note that in a complex waveform all harmonic components behave like interacting sine waves, resulting in a wide spectral range of the ring modulated sound.

Ring Mod can result in unwanted low frequencies when the pitches of Oscillators 1 and 2 don't differ very much. This is logical because, for example, when you use one oscillator set to 100 Hz and the second set to 101 Hz, the resulting ring modulation is 201 Hz and 1 Hz, and 1 Hz is very low.

Crack

Fades in the Crack modulator. Read more about the Crack modulator on the previous page.

ⓘ If the sum of all mixer signals (Osc 1, Osc 2 and Ring Modulator) is higher than 100%, filter saturation will be attained. At this point Resonance does not make any volume difference, as it does in the normal filtering process. Use this phenomenon for additional sound manipulation.

The Filter Section

Once the audio signal leaves the mixer, it is sent to the filters. The Attack offers a multimode filter with different filter types.

In a subtractive synthesizer, a filter is a component that has significant influence on sound characteristics. But Attack 3 was designed to make drum and percussion sounds, for which the filter is used merely for fine tuning the sound. Yet, you can also create bass and lead sounds which definitely require a filter.



Filter Type Menu

❗ Most filter types offer a variant with a 12dB and 24dB slope per octave.

The following filter types are available:

- **Low Pass 12/24:** Use this type if you want to create sounds with a typical audible filtered character; for example, bass or lead sounds. With a low pass filter you can shape bass drums or snare drums.
- **Band Pass 12/24:** This type removes frequencies both below and above the cutoff point. As a result, the sound character gets thinner. Use these filter types when programming effect and percussion-like sounds.
- **Shelf 12/24:** Unlike a normal synthesizer filter, this filter type works like an equalizer. When the resonance parameter is set below 50%, the filter works as Hi Shelf, raising high frequencies up to 12 or 24 db. Values over 50% cause the filter to work as Lo Shelf. Now, deep frequencies can be raised up to 12/24 dB. The Cutoff knob sets the center frequency of the Shelf EQ.
- **High Pass Filter 12/24:** This type is useful to thin out a sound's bass frequencies. This may also give interesting results in conjunction with cutoff frequency modulation. By doing this you can "fly-in" a sound, starting with its high harmonics and then coming up to its full frequency range. You can cut the bass and mid range of high frequency drum sounds like hi-hats or crashes.

- **Notch 12/24:** This type is the opposite of the band pass type. It dampens frequencies around the cutoff point. Frequencies below or above the cutoff point are passed through. Use this filter type for programming effect sounds. Resonance has no great influence because it raises the frequencies that the notch filter dampens. You can hear a little effect of phase changes, but not to any great degree.
- **Bell 12/24:** Like Shelf, this filter type has an equalizer function. The Resonance knob serves as gain, raising or lowering the frequency set with the Cutoff knob up to 12/24 dB.
- **Comb Plus/Minus** differs from the other filter types greatly, because it doesn't actually damp any part of the signal, but instead add a delayed version of the input signal to the output.
- **Redux** also differs from the other filter types. It is a decimator stage that reduces the sample rate of the incoming signal and optionally creates a high-pass filter effect when **Resonance** is turned up.

❗ **What is a Comb filter?** A Comb filter is basically a very short delay that can be controlled in length and feedback. The delay time is so short that you can't hear its individual taps but a colorization of the original signal created by peaks or holes in the frequency spectrum. The frequency of the colorization is set by the delay length, which is controlled in Attack 3 through Cutoff, while the amount of colorization is set by the Comb filter feedback, which is controlled in Attack 3 through Resonance.

Cutoff

Controls the cutoff frequency for the low pass and high pass filter types and the center frequency for the band pass and notch filter types. It has a special function for the Comb and Redux types.

- When the low pass type is selected, all frequencies above the cutoff frequency are dampened.
- When the high pass type is selected, all frequencies below the cutoff frequency are dampened.
- When the band pass type is selected, only frequencies near the cutoff setting will be passed through.

-
- When the notch type is selected, the frequencies near the cutoff frequency are dampened.
 - When the Comb type is selected, all frequencies near the cutoff setting will be boosted.
 - When the Redux type is selected, the sample rate will be changed.

Resonance

Controls the emphasis of the frequencies around the cutoff point (except for the Comb and Redux types). Use lower values to add more brilliance to the sound. At higher values, the sound acquires a typical filter character with a strong boost around the cutoff frequency. When the setting is raised to maximum, the filter starts to self-oscillate, generating a pure sine wave. This can be used to create typical solo sounds.

Drive

Determines the amount of saturation that is added to the signal. If set to 0.0%, no saturation will be added - the signal will remain clean. Lower values will add some harmonics to the signal, resulting in a warm character. Increasing the value will bring in more and more distortion, suitable for harder drum sounds and effects.

- **Clip** results in a hard clipping of the signal.
- **Transistor** generates a distortion based on a bipolar transistor.
- **Diode** generates a typical diode distortion.
- **Tube** simulates the asymmetric distortion of a tube circuit.
- **Crunch** is a sinusoidal wave-shaper. It generates FM-like sounds that can be extremely distorted.
- **PickUp** simulates the sound of a guitar or electric piano pickup.
- **Overdrive** generates a light, warm saturation.

Filter Mod 1, 2, 3

Sets the amount of cutoff frequency modulation from a list of modulation sources. This list is selected from the drop-down menu below the respective Mod control.

❗ A list of all available modulation sources can be found in the Appendix of this manual.

The Amp Section

This section is found near the end of the Attack 3's signal routing. Its main purpose is to set the volume of the sound. Additionally, the Amplifier section offers effect routing, panning and XOR groups.

Groups Menu

Assigns the currently selected instrument to one of the eight XOR groups. When several instruments of the same XOR group receive trigger notes, the sounding instrument will be muted by the succeeding one. Use this function to program realistic hi-hats, especially if only the open or closed hi-hat should be heard. This parameter can also be used to create monophonic synth sounds by selecting *Single* from the list. The default setting is *Poly*, which means, that a sound can be played polyphonic.



Bus Routing

Here, you can select a desired audio bus, where the currently selected sound is routed to. Read more about the bus option in the corresponding chapter.

Volume

Sets the output volume of the currently selected sound. This parameter is identical to the volume fader in the mixer below.

Effect Send

Determines the effect mix for the currently selected sound. The send effects are located on the corresponding Bus page. This parameter only has an influence on the sound if one or more effects are loaded and activated on the bus page. Read more about the effects on the bus page in the corresponding chapter.

Velocity

Specifies, how much volume will be affected by keyboard velocity. Use this feature to give more expression to the sound. With a setting of 0.0%, velocity will have no effect on volume. For positive settings, the volume rises with higher velocities. This is the most commonly used setting. With ne-

gative settings, the volume decreases at higher velocities. This creates a different character suitable for effect sounds. The maximum volume is always set with the **Volume** parameter.

Pan (Panning)

Determines the position in the stereo panorama. When the setting is to the left, the sound is panned left; when the setting is to the right, it is panned right. If you want to situate the sound in the middle of the stereo panorama, use the center setting. This parameter is identical to the pan knob in the mixer below.

The Envelopes

The envelopes create a control signal that varies with time. They are used, for example, to modulate the filter settings or the level of a sound within a given period of time. Both envelopes are structured identically, and offer the classic Attack, Decay, Shape and Release parameters. In *Modern* mode, the envelope phases are extended. If you press a key, the envelope is started. Most envelope parameters can be modulated. This can be done in **Mod** mode.



Classic Mode

Click on the drop-down menu above the graphic representation to select the *Classic* option. Here, the following parameters are available:

- **Attack** defines the period of time for the envelope to rise to its maximum.
- **Decay** defines the time for the envelope to fall to 0.

- **Shape** controls the shape of the Decay and Release phases. You can shape from exponential to linear to inverse exponential, or to a combination of exponential and inverse exponential (cosine like).
- After you let go of a trigger, **Release** defines the period of time it takes for the envelope to sink back to zero. Keep in mind, that the release phase only starts, when **Decay** is set to maximum. If you turn **Release** fully left, this parameter is set to *One Shot*. This is the most useful setting for drum sounds. When **Release** is set to a value greater 0 and Decay is set to maximum, you get an organ-like envelope that stays at its maximum for as long as you hold the note.

Modern Mode

Click on the drop-down menu above the graphic representation to select the *Modern* option. Here, the following parameters are available:

- **Attack** defines the period of time for the envelope to rise to its maximum.
- **Decay 1** defines the time for the envelope to fall to the level set by **Break**.

- **Break** defines a level that is reached by **Decay 1**, immediately followed by going into the **Decay 2** phase. The higher the break level the longer it takes, until the envelope goes into the second decay phase.
- **Decay 2** determines the decay rate or amount of time it takes for a signal to reach the **Sustain** level.
- **Sustain** determines the sustain level which is held until a note ends.
- Once the note has ended, the **Release** phase begins. During this phase, the envelope fades to zero at the rate determined by the release value.
- The shapes of the phases can be edited by using the circular handle. You can shape from exponential to linear to inverse exponential.

ⓘ Both envelopes can be edited quickly and easily with the mouse. Make sure, that the **Graphic** button is active. Editing is simplified by the graphic changes you see in the corresponding function. To edit, click on the respective handle and drag in the desired direction. The changes and their values are visible in the envelope display.

Envelopes Modulation

Almost every envelope parameter can be individually modulated. This is done in Mod mode, which you can access by clicking the **Mod** button.

Here, the envelope parameters for classic and modern mode are also available, but the graphic representation gives way to modulation assignments and amount controls.

The basic principle here is the same as setting up a modulation as with the other mod parameters in Attack:

Select the desired modulation source from the drop-down list and then adjust the corresponding **Mod Amount** control. You can set both a negative and a positive modulation intensity.



The Envelope modulations in Classic mode



The Envelope modulations in Modern mode

❗ A list of all available modulation sources can be found in the Appendix of this manual.

The LFOs

In addition to the main oscillators, Attack 3 is equipped with two low frequency oscillators (LFO) that can be used for modulation purposes. Each LFO generates a periodic waveform with adjustable frequency and shape.

Shape Menu

Sets the type of waveform. The following waveforms are available:

- **Triangle** is perfect for smooth pitch, filter or volume modulations.
- **Sine** is best suited for oscillator FM or filter modulations.
- **Square** can be interesting for hard modulations or special effects.
- **Saw Up** can generate interesting filter or volume changes. It creates a rising sawtooth wave.
- **Saw Down** can generate interesting filter or volume changes. It creates a falling sawtooth wave.



- **Exp Saw Down** can generate interesting filter or volume changes. It creates a falling sawtooth wave with an exponential shape.
- **Sample & Hold** samples a random value and holds it until the next value is generated.
- **Noise** creates a chaotic signal for experimental modulations.

Speed

Determines the frequency of the corresponding LFO. At low values, it might take several minutes for the LFO to perform a complete cycle while higher values are in the audible range. This parameter is not available, if **Sync** is set to any other value than *Off*.

Sync Menu

In the **Sync** drop-down menu, the LFO can be synchronized to the host's song tempo and then oscillates based on the selected musical value (between 8 bars and 1/64th note). Note that if any Sync option is selected, the **Speed** control is unavailable.

Polarity

Normally, an LFO waveform oscillates in both directions, also known as bipolar behaviour. Clicking the **Unipolar** button forces the LFO to oscillate in only one direction and not cross the zero crossing.

Phase

Controls the initial phase of the LFO when a new note is started. Click in the Phase value field and drag it to change the start phase of the LFO. *Free* means that the LFO is not restarted on a new note but runs freely while other values set the LFO phase to the respective offset in degrees.

Delay

This parameter works in different ways depending on the setting of the **Fade** parameter:

- When **Fade** is set to *0.00 ms...-0.00 < ms*, the LFO signal output is zero for the time set with the **Delay** parameter. After this time, the LFO is faded in and then runs with full magnitude.
- When **Fade** is set to *0.00...-0.00 < ms*, the LFO runs with full magnitude for the time set with the **Delay** parameter. After this time, the LFO is faded out to zero.

Fade

Controls the speed with which the LFO is faded in or out. With this parameter you can create slowly rising or falling modulations that might create interest when routed to pitch or volume.

The Sound Effects Section

Attack 3 offers an extensive effect section. Each sound slot contains an independent EQ, a compressor and a free selectable effect (Delay, Drive, Phaser, Flanger, Chorus, or Reverb). These are insert effects with a fixed serial order.

Additionally, there are six audio bus channels to which a sound can be routed. Each of these bus channels also offers an EQ, a compressor, and three effect slots with different selectable effect types (such as delay, drive, and reverb).

In total, a sound therefore can contain up to 8 different effects, which should be more than sufficient for most use cases.



ⓘ Since the effects available here are identical to those on the Bus section, they will be explained in the next chapter.

The Bus Page

Click the **Bus** button in the head-up section to switch to the bus view.



Here you can set up and adjust the effects for all six buses of Attack 3.

All six buses are identical and offer, in addition to a compressor (COMP) and an equalizer (EQ), three individually selectable and flexible send effects.

⚠ You can only use each send effect type once. It is therefore not possible to load a delay twice, for example.

These five effects are arranged in series, starting with the compressor, the three individual effects and the equalizer in the end of this effect chain.

Bus Buttons

At the top of the Bus view you will find 6 bus buttons, which select the desired bus for editing.

Global Bus Power Switch

This button left to the bus effects name sets activates/deactivates all bus effects, if necessary.

Mixer Send

In the Mixer, directly above the channel fader, you will find the bus routing menu and a Send control. Both parameters are identical to the corresponding parameters in the Amp section on the Sound page.



How to setup effects for a Sound:

- 1) First, select the desired sound.
- 2) Route the Sound to any desired Bus, e.g. Bus 3.
- 3) Go to the Bus page and open Bus 3.
- 4) Activate EQ and/or Comp, when you want to use it for your sound. Make your desired settings.
- 5) Turn up the Effect Send knob for your sound to hear the bus sound effect.
- 6) If desired, use up to three additional effects by loading them into the corresponding slot.

The Effects in Detail

Attack 3 offers 8 different effects including an equalizer and a compressor.

⚠ Keep in mind that you need to activate an effect with the Power switch next to the effect name.

Equalizer

An equalizer is used to adjust the sound frequencies. The equalizer contains three bands with the following parameters:

- **Low/Mid/Hi Gain** (for all three bands) raises or lowers the volume of the selected frequency.
- **Frequency (Low /Mid/Hi Freq** for all three bands) sets the frequency in Hz (Hertz) respective kHz (Kilohertz) at which the tones will be affected.
- **Mid Q** (only for mid band) widens or shortens the frequency range.



Compressor

A compressor reduces signals which exceed a certain Threshold level in volume by an adjustable Ratio. The speed of this level reduction is controlled by Attack, when the signal starts to exceed the threshold, and Release, when it drops below the threshold again.



Ratio

Sets the amount of gain reduction (compression) applied to signals above the set threshold. A ratio of 4:1 means that for every 4 dB the input level increases, the output level increases by 1 dB.

Gain

Determines the input gain of the incoming audio signal.

Threshold

Determines to which signal level the compressor will be working. Only signal levels above threshold are processed.

Make-Up

Compensates for output gain loss caused by compression.

Attack

Determines how fast the compressor responds to audio signals above the set **Threshold**. If the attack time is high, more of the transient parts of the signal passes through unprocessed.

Release

Sets the time after which the gain returns to its original level when the signal drops below the threshold.

Soft Knee

If set to 0, signals above the threshold are limited instantly according to the set level. Higher settings produce a less drastic result.

Delay

A delay creates repetitions of the input signal. The delay time can be set either in milliseconds or in musical note values if Sync is selected. The maximum delay time is 2 seconds (2000 ms). Additionally, the delay can be modulated.



Time

Sets the length of the delay tap in milliseconds. If **Sync** is set to any other value than *Off*, the Time knob is not available.

Sync

Synchronizes the delay time to the tempo of the host application. When you click on **Sync**, a pop-up menu will appear to select the different musical settings.

Mix

Controls the volume ratio between the original signal and the delay effect output. If set to 0.0 %, the dry signal is sent to the outputs only, so that no delay effect can be heard. Higher values will increase the effect signal. At the maximum setting, 100.0 %, the pure effected signal will be heard.

Feedback

Controls the amount of signal that is routed back into the delay line. Lower feedback values will by definition produce fewer echoes than higher values. Very short delay time settings can be colored by feedback settings.

Lo Cut

Dampens the lower frequencies of the signal generated by the delay effect. The filter is inserted before the feedback

loop, thus dampening each successive step. Lower values suppress deeper frequencies from the feedback.

Hi Cut

Dampens the higher frequencies of the signal generated by the delay effect. The filter is inserted before the feedback loop, thus dampening each successive step. This creates the typical dulled effect familiar from natural delays. Lower values suppress deeper frequencies from the feedback. In conjunction with **Lo Cut**, the delay effect can thus be narrowed to a certain frequency range

Speed

The delay effect can be modulated in its delay time with the integrated low frequency oscillator (LFO). This parameter determines the frequency of the LFO.

Mod

Controls the modulation depth when delay time is changed by means of the LFO.

Spread

Spreads the left and right delay output to half of the delay time maximum. Settings from **-50%** or **50.0%** create a typical ping pong delay.

Drive

Drive distorts the signal by using one of the seven selectable drive curves.

Drive Curves

In this drop-down menu you can select between 7 different drive curves:

- **Clip** results in a hard clipping of the signal.
- **Transistor** generates a distortion based on a bipolar transistor.
- **Diode** generates a typical diode distortion.
- **Tube** simulates the asymmetric distortion of a tube circuit.
- **Crunch** is a sinusoidal wave-shaper. It generates FM-like sounds that can be extremely distorted.
- **PickUp** simulates the sound of a guitar or electric piano pickup.
- **Overdrive** generates a light, warm saturation.



Mix

Controls the volume ratio between the original signal and the drive effect output. If set to *0.0%*, the dry signal is sent to the outputs only, so that no overdrive effect can be heard. Higher values will increase the effect signal. At the maximum setting, *100.0%*, the pure effected signal will be heard.

Gain

Determines the output volume of the Drive effect. Use **Gain** to adjust the overall volume for higher distortions.

Drive

Determines the amount of saturation that is added to the signal. If set to 0, no saturation will be added or, in other words, the signal will remain clean. Lower values will add some harmonics to the signal, resulting in a warm character. Increasing the value will bring in more and more distortion, suitable for harder drum sounds and effects.

Phaser / Flanger / Chorus

These 3 effects are using nearly the same parameter set, but the effect sound generation works different.

A chorus effect is generated by using comb filters that generate slightly detuned copies of the input signal and mix it into the output signal. The result sounds like an ensemble of se-

veral simultaneous sounds, like a choir as opposed to a single voice; hence the name chorus. The detuning is generated by an internal LFO that can be controlled in speed and depth.

The flanger effect is very similar to the chorus effect, but features feedback circuitry to feed the generated signal back into the comb filter. This generates a deeper detuning and colorizes the signal. With extreme settings you can hear a whistling sound which is very characteristic of a flanger effect.

A Phaser effect is generated by adding a second signal with a different phase. This generates an effect with equally spaced frequency peaks or troughs. The phase changing is controlled by a LFO.



Mix

Controls the volume ratio between the original signal and the effect output. If set to *0.0%*, the dry signal is sent to the outputs only, so that no effect can be heard. Higher values will increase the effect signal. At the maximum setting, *100.0%*, the pure effected signal will be heard.

Speed

Sets the LFO speed of the Phaser/Flanger/Chorus effect.

Feedback (for Phaser & Flanger)

Controls the feedback amount of the flanger/phaser signal.

Depth (for Chorus)

Sets the modulation depth for the Chorus effect.

Reverb

The Reverb effect is probably the most widely used effect in music production. Attack's reverb effect is an addition to the sound to make it more immersive and expressive.

Mix

Controls the volume ratio between the original signal and the reverb effect output. If set to *0.0%*, the dry signal is sent to the outputs only, so that no reverb effect can be heard. Higher values will increase the effect signal. At the maximum setting, *100.0%*, the pure effected signal will be heard.



Predelay

Determines the delay between the direct sound and the reverb effect output. Lower settings connect the reverb more to the original signal while higher settings separate the effect signal to produce a more spatial sound.

Time

Determines the reverb time. Lower settings simulate a normal room while higher settings simulate a big hall or church.

Color

Determines the spectral colorization of the reverb sound. Negative values dampen the higher frequencies while positive settings dampen the deeper frequencies.

The Mixer and Global Section

In the lower section of the Attack plug-in window, you will find a mixer with a total of 24 channels, representing the 24 sounds of a drum kit.



Here, you can select the sound slot you want to edit and adjust its level, pan, effect send, and routing.

To the right of the sound channels you can make global settings for Attack 3.

❗ Regardless of whether you are in the **Sound** or **Bus** view, the mixer and the global section are always visible and active.

The Mixer

All 24 mixer channels are completely identical in design and, in addition to the **Volume** fader, the **Pan** control, the **Send** knob, and the **Bus** routing menu (which are identical to the Volume and Pan parameters in the Amp section), offer the following options:

- **Name label:** Click on the sound slot name to select the corresponding sound slot. A second click on the sound name allows to rename it.
- **Mute (M) button:** Click on this button to mute the currently selected channel.
- **Solo (S) button:** Click on this button to solo the corresponding channel. This mutes all other channels. You can set more than one channel into Solo mode.
- **Play Pad:** Below the mixer channel you will find a play button for each channel to trigger the corresponding sound slot with a mouse click.

❗ To display the Mixer channels 13 to 24, use the **13-24** switch in the upper right corner of the mixer area. You can also switch back to the view of channels **1-12** from here.

The Keyboard

The Attack offers a 5 octave keyboard. It allows you to play the selected sound melodically with your mouse or via a connected MIDI keyboard controller.



! The **Pad/Keyboard** buttons to switch between keyboard and pad representation are only available, when sound slots **13-24** are selected and shown.

To the left of the keyboard are the modulation wheel and a pitch bend wheel. Both wheels can be moved with the mouse and only affect the sound when they have been set up for one of the modulations.

Click on a key to play the corresponding note. The vertical position of the initial click of the key determines the velocity.

Global Parameters

Here you can configure global settings that apply to the entire instrument.

Master Volume Fader

Controls the overall volume of the Attack 3 audio output(s).

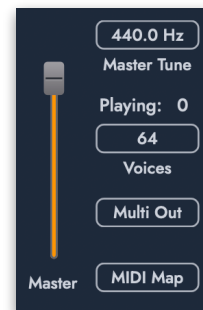
Master Tune

Controls the Attack's overall pitch in Hertz. The value specified here is the reference pitch for MIDI note A3. The default setting is *440 Hz*, which is commonly used by most electronic instruments.

! You should only change this setting if you really know what you're doing. You will have to adjust all your other instruments, too. Don't forget to set it back again!

Voices

Attack 3 offers up to 64 voices. The number of available voices depends on available processor power. Here, the number of voices can easily be set. All you have to do is use the



mouse button to increase or decrease the value in the Voices display.

Keep in mind that each additional voice demands additional calculating power from your computer. Try to set the number of voices to a sensible value, especially if you simultaneously use other plug-ins and if you also play back other instrument tracks in your host application.

The Playing option above the Voices value field displays the used voices in realtime.

Multi Out

Attack 3 offers 6 stereo audio outputs. Each of the 6 buses can have its own physical stereo output.

When **Multi Out** is active, the Bus channels are automatically routed to its corresponding output (Bus 1 to Out 1, Bus 2 to Out 2, and so on). You can use the multi outputs to set up separate effects within your DAW.

⚠ Depending on the used DAW, setting up multiple instrument outputs may vary. Please refer to the corresponding documentation.

MIDI Parameter Mapping

Attack 3 allows you to map most of its parameters to incoming MIDI control change data, e.g. from an external MIDI controller.

To use a MIDI hardware controller, you need to assign it first.

How to map MIDI CC data

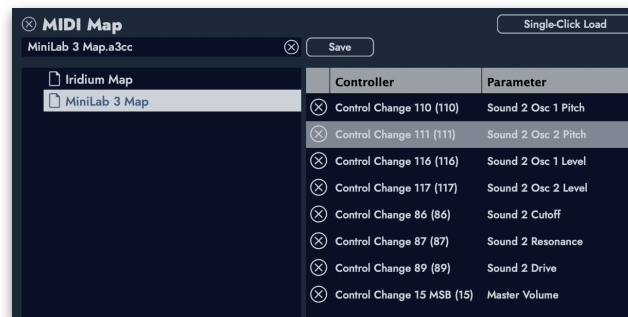
- Right-click on the desired Attack 3 parameter to open the MIDI mapping pop-up menu.
- Select *Learn MIDI* to set the corresponding parameter in learn mode. With *Stop Learning* you can end the learn mode at any time.
- Turn the corresponding knob/fader on your hardware external MIDI controller.
- You can also define a minimum and maximum value for the parameter range. Set the corresponding knob/fader in the minimum setting and select *Set MIDI CC Minimum value*. Do it in the same way for the maximum value.
- Click anywhere to close the pop-up menu.

How to check and delete your mapped MIDI data?

- Right-click on the desired Attack 3 parameter to open the MIDI mapping pop-up menu.
- If an assignment was made, the corresponding MIDI CC number is shown below the parameter name. If no MIDI CC mapping was made, *Unassigned* is displayed.
- Select *Forget MIDI* to delete the assignment.
- Click anywhere to close the pop-up menu.



- Click on the **Save** button to save the current map. We recommend to enter a meaningful name.
- To load a map, double-click on its name in the left section. If **Single-Click Load** is active, a single mouse click loads a map directly.
- In the right column, you can click on the **X** button left to the Control Change number to remove an assignment.



The MIDI Mapping Window

Click on the MIDI Map button to open the MIDI Mapping window.

Here you can save and manage your created MIDI maps. In the left column, you can see your saved maps. In the right column, you see all assignments of the currently loaded map.

Appendix

Worth Knowing about Library Directories

Attack 3 expects a number of directories to load presets from or to save your own creations. Those are divided into two general categories, the "Preset" and the "User" library and are located in different directories on your disk.

Upon startup, Attack 3 locates and scans these directories for any content of the respective type, such as kits, sounds, samples or MIDI mappings, the latter only in the user library.

The "Preset" library contains all kits, sounds and samples placed into them by the installer while the "User" library directories are filled by you. Attack tries to create these "User" directories for you so you can place your creations into them. If this process fails, the browser shows an error message that the respective directory couldn't be found.

This most likely happens due to insufficient permissions to create the directories at the locations described in the error message. So, please check the directory permissions of all the parent directories of the path shown in the error message and set them to appropriate values, i.e. that directories and

files can be written in these directories without requiring administrator rights.

A less likely reason might be that the host or the operating system is "sandboxed". This means that the host and therefore also the plugin doesn't have direct access to the hard disk but only to a limited set of directories or even only shadow-copies of those directories. If that is the case, please inform our Product support team including the operating system and version and the host and version you use so that we can check it and try to find a solution.

The current paths for the library directories are written in the Readme that you can view during installation, but will also be listed below:

macOS

Presets: /Library/Audio/Presets/Waldorf/Attack 3/

User Presets: /User/<Your User Name>/Library/Audio/Presets/Waldorf/Attack 3/

Windows

Presets: \ProgramData\Waldorf\Attack 3\

User Presets: \Users\[username]\AppData\Roaming\Waldorf\Attack 3\

Basics: Oscillators Introduction

The oscillator is the first building block of a synthesizer. It delivers the signal that is transformed by all other components of the synthesizer. In the early days of electronic synthesis, engineers found that most real acoustic instrument waveforms can be reproduced by using abstracted electronic versions of these waveforms. They weren't the first who came to that conclusion, but they were the first in recreating them electronically and building them into a machine that could be used commercially. What they implemented into their synthesizers were the waveforms sawtooth, square and triangle. For sure, this is only a minimal selection of the endless variety of waveforms, but Attack 3 gives you these waveforms plus others at hand.

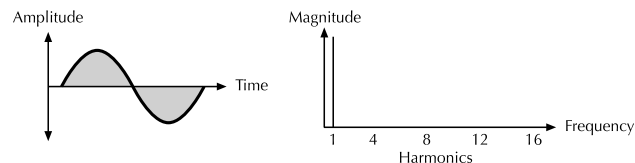
Now, you probably know how these waveforms look and sound, but the following chapter gives you a short introduction into the deeper structure of these waveforms.

Let's start with the most basic one.

The Sine Wave

The Sine Wave is the purest tone that can be generated. It consists only of one harmonic, the fundamental, and has no

overtones. The following picture shows the sine wave and its frequency representation:



The Sine Wave

There is no acoustic music instrument that generates a pure sine wave; the only instrument that comes close to it is the pitch fork. Therefore, the sine wave sounds a little artificial to the ear. However, the sine wave can be an interesting oscillator waveform to emphasize a certain harmonic while other oscillators are playing more complex waveforms, or as FM source for frequency modulation.

The sine wave is the most basic building block of each waveform. Any waveform can be broken down to several or many sine waves that are arranged with different frequencies and magnitudes. These sine waves are called partials. In most waveforms, the partial with the lowest frequency is dominant, meaning that this partial is used by the ear to determine the pitch of the tone. This partial is called fundamental. All

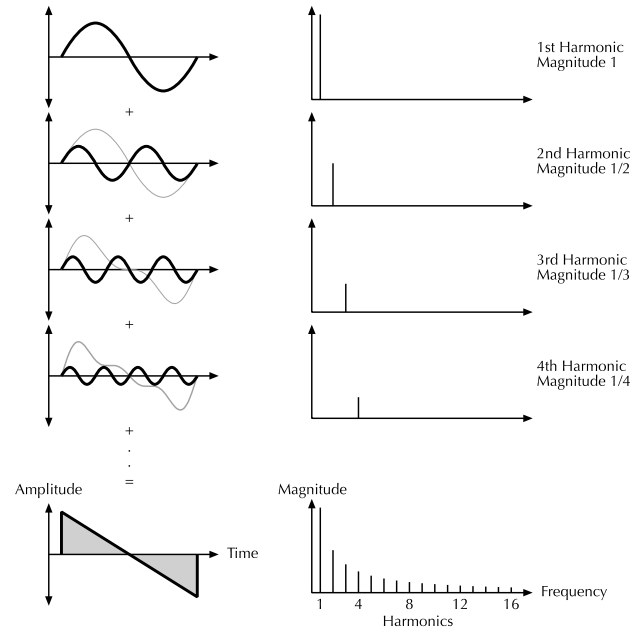
other partials are called overtones. So, the second partial is the first overtone.

Cyclic waveforms such as the waveforms in the Largo only feature sine waves in integer frequency ratios to the fundamental like double frequency, triple frequency and so on. Those partials are called harmonics because their frequency is a harmonic multiple of the fundamental.

Confusing? Let's generalize it to cyclic waveforms: a cyclic waveform like sawtooth, square etc. only consists of harmonic partials. The harmonic with the lowest frequency is dominant and therefore called fundamental. All other harmonics are called overtones.

The Sawtooth Wave

The Sawtooth wave is the most popular synthesizer waveform. It consists of all harmonics in which the magnitude of each harmonic descends by the factor of its position. This means that the first harmonic (the fundamental) has full magnitude, the second harmonic has half magnitude, the third harmonic has a third magnitude and so on. The following picture shows how the individual harmonics build up the sawtooth wave:

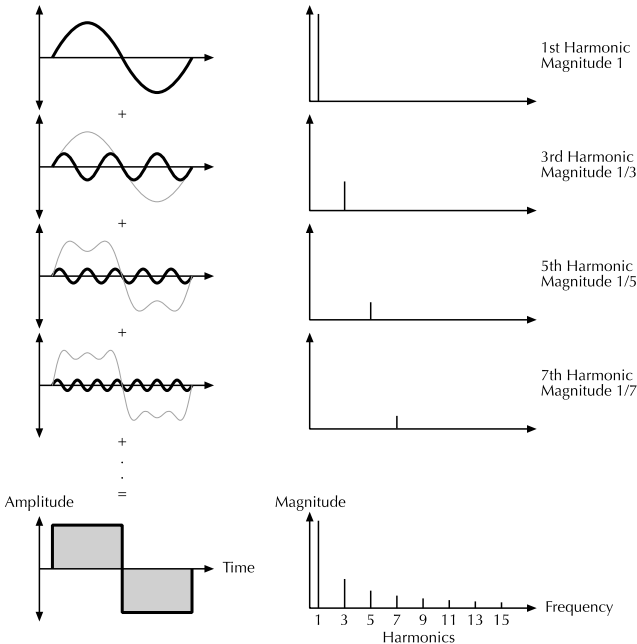


Additive components of the Sawtooth wave

The sawtooth wave was thought as an abstraction of the timbre of string and brass instruments. You can easily understand that when you think of a violin. Imagine a bow pulling the string slightly into one direction. At one point, the string abruptly comes off the bow and swings back to its original position. The bow is still moved and so it catches the string again and the procedure is repeated. The result is a waveform that looks like a sawtooth. The same is true for a brass instrument. The string in this case are the lips while the bow is the air. The lips are moved by the air to a certain extent and abruptly move back to their original position.

The Square Wave

The Square Wave is a pulse waveform with 50% pulse width. This means that the positive part of the waveform has the same length as the negative part. The pulse waveform can have other pulse widths as you will read later. For now, we'll talk about the square wave as a unique waveform. The square wave consists of all odd harmonics in which the magnitude of each harmonic descends by the factor of its position. This means that the first harmonic has full magnitude, the third harmonic has a third magnitude, the fifth harmonic has a fifth magnitude and so on. The following picture shows how the individual harmonics build up the pulse wave:



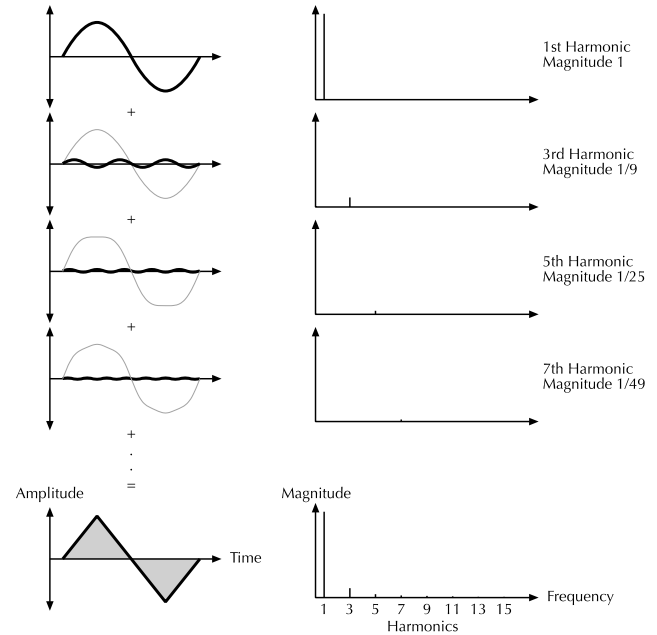
Additive components of the square wave with 50% pulse width

The Triangle Wave

The Triangle Wave is very similar to the square wave. It is composed of the same harmonics as the square wave, but with different magnitude ratios. The magnitude of each harmonic is divided by the power of its number. This means that the third harmonic's magnitude is a ninth, the fifth harmonic is a twenty-fifth and so on. The following illustration shows the harmonic content:

The reason why the triangle wave is so popular in classic synthesizers: It could act as a sub-oscillator wave, to emphasize certain frequencies or to frequency modulate other oscillators.

The triangle wave sounds like a woodwind instrument, i.e. a clarinet. It can also be used for mallet instruments like vibraphone, xylophone etc.



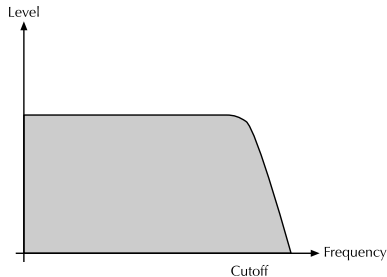
Additive components of the Triangle wave

Basics: Filter Introduction

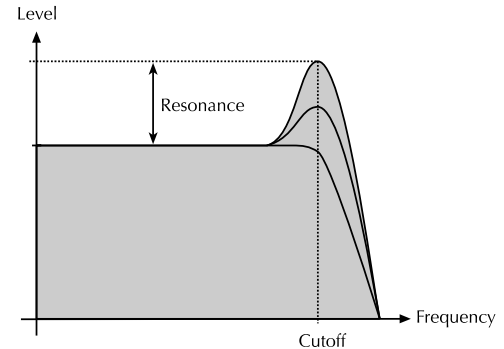
Once the audio signal leaves the oscillator, it is sent to the filter. The filter is a component that has significant influence on Attack 3's sound characteristics.

We will explain the basic function of a filter discussing the type used most commonly in synthesizers: the low pass filter.

The low pass filter type dampens frequencies above a specified cutoff frequency. Frequencies below this threshold are hardly affected. The frequency below the cutoff point is called the pass band range, the frequencies above are called the stop band range. Attack 3's filter dampens frequencies in the stop band with a certain slope. The following picture shows the basic principle of a low pass filter:



Attack 3's filter also features a resonance parameter. Resonance in the context of a low, band or high pass filter means that a narrow frequency band around the cutoff point is emphasized. The following picture shows the effect of the resonance parameter on the filter's frequency curve:



If the resonance is raised to a great extent, then the filter will begin to self-oscillate, i.e. the filter generates an audible sine wave even when it does not receive an incoming signal.

Programming Drum Sounds

To understand how to create drum sounds, you should know a little about how the classic drum machines worked. The following sections give some insights how particular sounds were built and information how to achieve similar results on the Waldorf Attack 3.

Roland TR-808 Bass Drum

On the Roland TR-808, this sound was made by one filter with a high resonance setting, triggered by a short impulse. Two controls were provided to adjust the bass drum: "Tone" was used to set the pitch by changing the filter's cutoff frequency, and "Decay" was used to set its resonance, which in turn controlled the decay rate.

On the Attack 3, you could use the filter's self-oscillation by triggering it with a short noise impulse made by the second oscillator, whose volume you can control by an envelope.

But a better way is to use Oscillator 1 playing a sine wave, and by changing the initial click impulse by means of the filter.

Roland TR-909 Bass Drum

The Roland TR-909 used an oscillator and a noisy click, controlled by three envelopes, to create a bass drum sound. The oscillator played a sine wave whose pitch was controlled by an envelope and the "Tune" control. The rate of the envelope's decay was not adjustable.

This oscillator signal was routed to an amplifier with an envelope whose "Decay" parameter adjusted the decay rate of the envelope. The second part of the bass drum sound was made with a short impulse and a low pass filtered noise generator, both summed and routed into another envelope that controlled their output volume. The attack parameter controlled the overall pulse/noise level, and the decay rate of the envelope was not adjustable.

On the Attack 3, you can make this sound as follows: Oscillator 1 plays a sine wave, and Envelope 2 is used to modulate its pitch. This means that the pitch of the oscillator becomes higher or lower depending on the setting of the Decay parameter of Envelope 2, but this slight variation doesn't affect the drum sound once it has been set up.

The noise of the impulse can be ignored, because it is low pass filtered anyway. But how do we create an impulse with

the Attack 3? The answer is simply to use a square wave with a very low pitch setting for Oscillator 2, and to control its level with a very short envelope. Now we have an impulse. This impulse is low pass filtered afterwards with a slightly resonating filter, preferably set to around 5000 Hz with a resonance of around 18%.

With the Oscillator 1 Pitch and Pitch Env controls you can adjust the sound of the bass drum, while Envelope 2 Decay controls its length.

Simmons SDS-5 Bass Drum

The Simmons SDS-5 bass drum consists of an oscillator and a noise generator, both routed into a low pass filter and an amplifier. An envelope controls the oscillator pitch, the filter cutoff, and the amplifier volume. The envelope has a decay shape that is in-between exponential and linear.

The oscillator plays a triangle wave whose pitch is controlled by a "Tune" control and a "Bend" parameter that controls the influence of the amp envelope to oscillator pitch.

A "Noise - Tone" parameter controls the mix between the oscillator and the noise generator.

A "Noise" parameter controls the filter cutoff. Very confusing, isn't it?

A "Decay" parameter controls the envelope decay rate.

A "Click - Drum" parameter controls the most important aspect of the Simmons drums: the mix between the original signal from the pad trigger microphone and the triggered drum sound.

On the Attack 3, you can make this sound as follows:

Oscillator 1 plays a triangle or sine wave pitched at around 30 Hz, and Envelope 2 is used to modulate its pitch. Use Velocity to simulate the velocity-dependent pitch bend amount that you would find on the SDS-5. You can simulate the click by setting an FM Envelope to a medium value, with Envelope 1 set to a very short decay. Oscillator 2 generates noise, and the pitch is set to center. The Filter Cutoff can vary between 100 Hz and 5000 Hz, and Velocity should be set at 25% or so. Filter Resonance should be set to 10%. Envelope 2 should be set to an almost linear shape. Use Osc 1 and Osc 2 Level to adjust the mix of tone and noise, and use Osc 1 FM Env to vary the click strength.

Roland TR-808 Snare Drum

On the Roland TR-808, the snare drum was made of two resonating filters and a noise generator with high pass filtering. The "Tone" parameter controlled the output mix from the first and the second filters, while "Snappy" controlled the volume of the noise generator. The noise generator was routed through a separate envelope and a high pass filter.

On the Attack 3, you can make this sound as follows:

Oscillator 1 plays a sine wave at around 150 Hz, and you can use a little FM to disturb the periodic character of the sine wave. This trick makes the oscillator sound thicker, almost as if two oscillators were running at once. Oscillator 2 generates noise, and you should use Pitch to high pass filter it. In the Mixer, turn up Osc 1 to 50% and Osc 2 Env to 50%, set to Envelope 1. Set Envelope 1 to a shorter decay phase than Envelope 2. Use the filter with a low pass setting and add a little resonance to emphasize the high frequency range.

Roland TR-909 Snare Drum

The TR-909 Snare Drum was made with two oscillators and two filters for noise. The two oscillators started in phase but were slightly detuned, and one of the oscillators was modula-

ted a bit by a pitch envelope. The "Tune" parameter controlled the basic pitch of the two oscillators. The noise was split in two parts: there is always some low pass filtered noise during the whole snare drum sound, while a high pass filtered sound is routed through another envelope whose level can be controlled by the "Snappy" parameter.

One Attack 3 sound doesn't feature as many different modules as the TR-909 snare drum had. One solution can be to use two sounds, one emulating the first oscillator and the low pass filtered noise, and the other emulating the second oscillator plus the high pass filtered noise. You will have to play the two simultaneously in your track, but this shouldn't be a problem because the Attack 3 has sample-exact timing.

However, you can re-create the TR-909 snare drum with just one Attack 3 sound instead, by doing the following:

Set up Oscillator 1 to play a sine wave, modulate its pitch slightly with Envelope 2, and add a little FM to it - around 0.1 to 0.5%. When you set the second oscillator to produce noise, you will hear that the sine wave gets smeared, which means that you are not hearing an exact tone any more. This already sounds very close to two slightly detuned oscillators and a low pass filtered noise. Now you only need the "Snappy" part, which is added simply by using Envelope 1 to modulate Oscil-

lator 2's mix level. You can high pass filter the noise with the Pitch control, but in fact the result is already quite similar without doing so. If you want a little more punch, use the Drive control carefully until you can hear a slight distortion at the beginning of the sound.

Another variation can be heard in the sound library that comes with the Attack 3. This one uses a very low noise signal level that is boosted greatly behind the high pass filter. The reason for this is that Oscillator 2 plays the tone of the snare drum while the high pass filter dampens this tone heavily. To raise it back up to a good volume, Drive boosts it to a normal level.

Simmons SDS-5 Snare Drum

The Simmons SDS-5 Snare Drum module was laid out identically to the Bass Drum module. However, a number of parameters were set in a different way internally to create snare drum sounds.

When you want to create Simmons snare drum sounds on the Attack 3, just keep in mind that you should use a very short envelope to frequency modulate the first oscillator; set the envelopes to almost linear shapes, and use Velocity to control all envelope modulations.

TR-808 Side Stick

The TR-808 Side Stick (called RS on the 808, which stands for Rim Shot) sound is very tricky: although it consists of only two oscillators running through an amplifier and a high pass filter, the sound is very complex. This comes from the fact that one oscillator seems to "cut" the other oscillator and that the VCA is used to add high harmonics. How Roland did it is something only they and maybe a handful of people know. If you happen to be one of these people, let us know!

If you want a sound of this type from the Attack 3, use the representative sound from the library instead of trying to simulate it on your own. Look at the parameters and try to find out why it sounds quite close. A couple of hints: Crack is used with a very high frequency setting doing amplitude modulation on the oscillators' summed signal, and Drive is used to add further harmonics by distorting the signal.

TR-909 Side Stick

The TR-909 Side Stick is made of 3 resonating band pass filters that are triggered by a short impulse. Behind the band pass filter cluster there is a distortion unit, followed by a VCA with an envelope and a high pass filter.

Its specific sound comes from the cutoff frequencies, the resonance, and the volumes of the trigger impulses of the three band passes. These settings are:

- 500 Hz, 20ms decay, full volume
- 222 Hz, 45ms decay, half volume
- 1000 Hz, 5ms decay, full volume

Now, the Attack 3 doesn't have three band passes plus a high pass filter, but there's a way to simulate the architecture with the Attack 3.

What produces a resonating band pass filter? Nothing more than a sine wave. So, why not just use two oscillators producing two sine waves, plus a high pass filter that uses the lowest frequency setting as the third sine wave generator. Thus the filter will include both oscillator signals and add its own resonance to the sum.

The high pass filter is therefore set to 222 Hz, with a resonance of 100%. Oscillator 1 produces the 500 Hz sine wave, while Oscillator 2 is set to a 1000 Hz sine wave, but is controlled by a very short Envelope 1 set to around 75% to produce the 5 ms signal. The fact that oscillator 1 plays longer than 20 ms can be ignored, because it's not that noticeable. Do not add it with full volume, however; set it only to a level

of around 25%. This comes into play because there is an additional high pass filter on the original TR-909 Side Stick that dampens lower frequencies.

Finally, add a good amount of Drive (around 30dB) to the signal, set Envelope 2 Decay to 45 ms, and you will have the sharp Attack 3 of the original sound.

TR-909 Hand Claps

TR-909 hand claps are made using the same signal routing as in the original TR-808. However, due to the differing parts and internal parameter settings that were used in the TR-909, the TR-909's hand clap sounded different. Essentially, the "Crack" (or as Roland called it "Sawtooth Envelope") was clearer, and the reverb effect was longer.

Hi-Hats

For Hi-hats, we don't use references to classic drum machines, although there is a quite good emulation in the TR-808 set included in the sound library. Hi-hats can be made in various ways:

The simplest method is to use the built-in samples of the Attack 3. However, those are provided just in case you don't have time to "synthesize" a good-sounding hi-hat.

If you like a really "vintage" sound, use a high pass filtered noise. This gives the very archaic hi-hat sound that was used by many drum machine companies for years. One of the last examples of this sound was the good old Roland CR-78.

If you want more sophisticated results, use FM. Don't use noise as FM source, but instead use a sine or triangle waveform with a very high pitch. The modulated oscillator can be set either to square or sine. The FM of the Attack 3 has a maximum amount of around 8 waveform cycles, which results in heavy but tonal noise. When you don't use a static FM but change the amount by an envelope, the sound gets really exciting. The noisy FM effect changes over time, resulting in a very lively hi-hat sound. You will probably have to experiment with the settings of Oscillator 2 Pitch and FM Env, but the results are very much worth the work.

A good rule of thumb is to start with the Open Hi-hat sound, and copy that sound to the location for the Closed Hi-hat. Making a hi-hat sound shorter almost always succeeds, but making a short hi-hat longer may result in an unwanted characteristics. Also, don't forget to set the sounds to the same XOR Group so that they cut off one another.

Cymbals

With cymbals, the situation is similar to hi-hats. A sample is provided for an authentic crash cymbal, though you can achieve more interesting and unique results using filtered noise or FM.

Ride cymbals are more difficult to create, and their sound is so special that you might wish to use a good sampler or sample player to generate those sounds. If you want to create your own ride cymbal sounds anyway, you might come up with interesting results using FM and ring modulation.

Toms

Tonal percussion instruments can be created easily. Just set one oscillator to produce a sine or a triangle wave, modulate its pitch by an envelope, and set up the second oscillator to create either the Attack 3 noise or the resonance skin. When you want to do the latter, just copy the settings of the first oscillator and change the pitch or the envelope depth a little.

Also, it might be interesting to remove a little of the "tone" from Oscillator 1 by applying FM from the second oscillator producing noise. Note that a short envelope used for FM creates astounding drum stick hit sounds. Furthermore, you can

high pass filter the result to get more punch and less tone into the sound.

Congas

Congas can be made by using a sine wave oscillator, with a very short envelope controlling the FM amount of Oscillator 2 producing noise. This, together with a medium fast Attack 3 on Envelope 2, creates very authentic conga sounds.

Muted or slapped congas can be made by increasing the basic FM amount a little and using a high pass filter to dampen the "tone".

Shakers und Maracas

Both are made with noise, either unfiltered or used to frequency modulate Oscillator 1 in order to create strong colorization. A high pass filter can be applied to remove some low end.

The difference between shakers and maracas from the synthesist's viewpoint is that a shaker has a longer Attack 3 and decay phase than maracas. Of course the sound depends a great deal on how you play, so don't forget to set up velocity-based changes to the amplifier.

Claves und Woodblock

Claves and woodblock sounds are also very similar. They both consist of very short sine or triangle waveforms. A woodblock is lower in frequency, and you can add the second oscillator to produce a different frequency. Claves should be made with only one sine oscillator and a very short envelope.

TR-808 Cowbell

You are waiting for this one, aren't you? The TR-808 Cowbell is made of two square oscillators, one oscillating at 540 Hz, the other oscillating at 800 Hz. The Attack 3 phase of the envelope is emphasized heavily to create the strong click. Afterwards, the summed signal is sent through a band pass filter and an envelope that stops abruptly.

A funny side note: on the TR-808, the square oscillators were the same that were used for the cymbal and hi-hat sounds. However, those sounds used a cluster of six detuned square oscillators with different band pass and high pass filter settings.



Always keep in mind: We need more cowbell!

List of Modulation Sources

Source	Description
LFO1	LFO 1 Signal
LFO1xMW	LFO 1 Signal shaped by Mod Wheel
LFO2	LFO 2 Signal
LFO2xMW	LFO 2 Signal shaped by Mod Wheel
Env1	Envelope 1 Signal
Env1xVel	Envelope 1 Signal shaped by Mod Wheel
Env2	Envelope 2 Signal
Env2xVel	Envelope 2 Signal shaped by Mod Wheel
Rnd1 Bi	Random 1 bipolar mod signal
Rnd2 Bi	Random 2 bipolar mod signal
Rnd1 Uno	Random 1 unipolar mod signal
Rnd2 Uni	Random 2 unipolar mod signal
Key	MIDI note number
Vel	MIDI Velocity
PB	MIDI pitch bend signal
MW	MIDI modulation wheel (CC #1)
Press	MIDI channel pressure

Glossary

Aftertouch (aka Pressure)

The majority of contemporary keyboards are capable of generating aftertouch messages. On this type of keyboard, when you press harder on a key you are already holding down, a MIDI Aftertouch message is generated. This feature makes sounds even more expressive (e.g. through vibrato).

Aliasing

Aliasing is an audible side effect arising in digital systems as soon as a signal contains harmonics higher than half the sampling frequency.

Amount

The extent to which modulation influences a given parameter.

Amplifier

An amplifier is a component that influences the volume level of a sound via a control signal. This control signal is often generated by an envelope or an LFO.

Attack

An envelope parameter. 'Attack' is a term that describes the ascent rate of an envelope from its starting point to the point where it reaches its highest value. The Attack phase is initiated immediately after a trigger signal is received – i.e. after you play a note on the keyboard.

Band Pass Filter

A band pass filter allows only those frequencies around the cutoff frequency to pass. Frequencies both below and above the cutoff point are damped.

Clipping

Clipping is a sort of distortion that occurs when a signal exceeds its maximum value. The curve of a clipped signal is dependent of the system where the clipping takes place. In the analog domain, clipping effectively limits the signal to its maximum level. In the digital domain clipping is similar to a numerical overflow and so the polarity of the signal's part above the maximum level is negated.

Coffee Filter

A coffee filter is a coffee-brewing utensil, usually made of disposable paper. It is part of an essential toolkit for survival when working with the Waldorf Attack 3.

Control Change (Controllers)

MIDI messages enable you to manipulate the response of a sound generator to a significant degree.

This message essentially consists of two components:

- The Controller number, which defines the element to be influenced. It can be between 0 and 120.
- The Controller value, which determines the extent of the modification.

Controllers can be used for effects such as slowly swelling vibrato, changing the stereo panorama position and influencing filter frequency.

Decay

'Decay' describes the descent rate of an envelope once the Attack envelope phase has reached its zenith and the envelope drops to the level defined for the Sustain value.

Envelope

An envelope is used to modulate a sound-shaping component within a given time frame so that the sound is changed in some manner. For instance, an envelope that modulates the cutoff frequency of a filter opens and closes this filter so that some of the signal's frequencies are filtered out. An envelope is started via a trigger – usually a fixed trigger. Normally the trigger is a MIDI Note. The classic envelope consists of four individually variable phases: Attack, Decay, Sustain, and Release. This is called an ADSR envelope. Attack, Decay, and Release are time or slope values, and Sustain is a variable volume level. Once an incoming trigger is received, the envelope runs through the Attack and Decay phases until it reaches the programmed Sustain level. This level remains constant until the trigger is terminated. The envelope then initiates the Release phase until it reaches the minimum value.

Filter

A filter is a component that allows some of a signal's frequencies to pass through it and dampens other frequencies. The most important aspect of a filter is the filter cutoff frequency. The most common type is the lowpass filter. A low-pass filter dampens all frequencies above the cutoff frequency.

Filter Cutoff Frequency

The filter cutoff frequency is a significant factor for filters. A lowpass filter dampens the portion of the signal that lies above this frequency. Frequencies below this value are allowed to pass through without being processed.

High Pass Filter

A high pass filter dampens all frequencies below its cutoff frequency. Frequencies above the cutoff point are not affected.

LFO

LFO is an acronym for Low-Frequency Oscillator. The LFO generates a periodic oscillation at a low frequency and features variable wave-shapes. Similar to an envelope, an LFO can be used to modulate a sound-shaping component.

Low Pass Filter

Synthesizers are often equipped with a lowpass filter. A lowpass filter dampens all frequencies above its cutoff frequency. Frequencies below the cutoff point are not affected.

MIDI

The acronym MIDI stands for Musical Instrument Digital Interface. It was developed in the early 1980s so that diverse

types of electronic musical instruments by different manufacturers could interact. At the time a communications standard for different devices did not exist, so MIDI was a significant advance. It made it possible to link any MIDI-equipped device with another through simple, uniform connections.

Essentially, this is how MIDI works: One sender is connected to one or several receivers. With a few exceptions, the majority of MIDI hardware devices are equipped with two or three ports for this purpose: MIDI In, MIDI Out and in some cases, MIDI Thru. The sender transfers data to the receiver via the MIDI Out jack. Data is sent via a cable to the receiver's MIDI In jack.

MIDI Thru has a special function. It allows the sender to transmit to several receivers. It routes the incoming signal to the next device without modifying it. Another device is simply connected to this jack, thus creating a chain through which the sender can address a number of receivers. Of course it is desirable for the sender to be able to address each device individually. Consequently, there is a rule that is applied to ensure each device responds accordingly.

MIDI Channel

This is a very important element of most messages. A receiver can only respond to incoming messages if its receive

channel is set to the same channel as the one the sender is using to transmit data. Consequently, the sender can address specific receivers individually. MIDI Channels 1 through 16 are available for this purpose.

MIDI Clock

The MIDI Clock message determines the tempo of a piece of music. It serves to synchronize processes based on time.

Modulation

Modulation influences or changes a sound-shaping component via a modulation source. Modulation sources include envelopes, LFOs, or MIDI messages. The modulation destination is a sound-shaping component such as a filter or an amplifier.

Note On / Note Off

This is the most important MIDI message. It determines the pitch and velocity of every generated note. The time of arrival is simultaneously the start time of the note. Its pitch is derived from the note number, which lies between 0 and 127. The velocity lies between 1 and 127. A value of 0 for velocity is similar to 'Note Off'.

Panning

The process of changing the signal's position within the stereo panorama.

Pitch Bend

Pitch-bend is a MIDI message. Although pitch-bend messages are similar in function to control change messages, they are a distinct type of message. The reason for this distinction is that the resolution of a pitch-bend message is substantially higher than that of a conventional Controller message. The human ear is exceptionally sensitive to deviations in pitch so the higher resolution is used because it relays pitch-bend information more accurately.

Release

An envelope parameter. The term 'Release' describes the descent rate of an envelope to its minimum value after a trigger is terminated. The Release phase begins immediately after the trigger is terminated, regardless of the envelope's current status. For instance, the Release phase may be initiated during the Attack phase.

Resonance

Resonance is an important filter parameter. It emphasizes a narrow bandwidth around the filter cutoff frequency by amplifying these frequencies. This is one of the most popular methods of manipulating sounds. If you substantially increase the resonance, to a level where the filter begins self-oscillation then it will generate a relatively clean sine waveform.

Sustain

An envelope parameter. The term 'Sustain' describes the level of an envelope that remains constant after it has run through the Attack and Decay phases. Sustain lasts until the trigger is terminated.

Trigger

A trigger is a signal that activates events. Trigger signals are very diverse. For instance, a MIDI note or an audio signal can be used as a trigger. The events a trigger can initiate are also very diverse. A common application for a trigger is to start an envelope.

Volume

The term describes a sound's output level.

USB

The Universal Serial Bus (USB) is a serial bus system to connect a computer with an external device. USB equipped devices can be plugged together while active. The recognition is made automatically.

Product Support

Service & Repair

Attack 3 does not contain any user-serviceable parts. If your Attack 3 develops a fault or needs servicing, please refer to a Waldorf authorized service center. For more information, please ask your musicians dealer or your local Waldorf distributor.

Any Questions?

If you have any questions about your Waldorf product, feel free to contact us. We're here to help.

❗ You should definitely read our FAQ, perhaps your question will be answered there.

1) Use the support page at our website. This is the most efficient and fastest way to find our FAQ or to contact us. Your questions will be forwarded immediately to the resident expert and you will quickly receive an answer.

support.waldorfmusic.com

2) Although we are in the new millennium, you can also write us a letter. It will take a bit longer, but it is just as dependable as an email.

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