

# USER MANUAL

CZ V

**ARTURIA**<sup>®</sup>  
YOUR EXPERIENCE • YOUR SOUND

# Special Thanks

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## MANUAL

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# Thank you for purchasing CZ V!

This manual covers the features and operation of Arturia's CZ V, the latest in a long line of powerful virtual instruments.

**Be sure to register your software as soon as possible!** When you purchased CZ V you were sent a serial number and an unlock code by e-mail. These are required during the online registration process.

## Special Messages

### Specifications Subject to Change:

The information contained in this manual is believed to be correct at the time of printing. However, Arturia reserves the right to change or modify any of the specifications without notice or obligation to update the hardware that has been purchased.

### IMPORTANT:

The software, when used in combination with an amplifier, headphones or speakers, may be able to produce sound levels that could cause permanent hearing loss. DO NOT operate for long periods of time at a high level or at a level that is uncomfortable. If you encounter any hearing loss or ringing in the ears, you should consult an audiologist.

# Introduction

## **Congratulations on your purchase of Arturia's CZ V!**

We'd like to thank you for purchasing CZ V, a virtual instrument recreation of the classic Casio Phase Distortion synths from the 1980s.

Arturia has a passion for excellence, and CZ V is no exception. Listen to the preset sounds, tweak a few controls, skim through the features, or dive as deep as you like; it is easy to understand and use. We are confident that the CZ V will be a valuable addition to your instrument collection, and that you'll have a lot of fun with it.

Be sure to visit the [www.arturia.com](http://www.arturia.com) website for information about all of our other great hardware and software instruments. They have become indispensable, inspiring tools for musicians around the world.

Musically yours,

**The Arturia team**

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# 1. WELCOME TO CZ V!

## 1.1. Emulating Casio's Phase Distortion Synthesis

The CZ V is Arturia's faithful re-creation, in virtual instrument form, of the Casio CZ series of synthesizers which were introduced in the mid-1980s. Eight different models of the CZ series were built, ranging from the budget-priced CZ 101 up to the full-scale CZ 1. In a sense, the CZ synths were a bridge between the traditional subtractive synthesis method used by Moog, Arp, Oberheim, and Sequential Circuits, and the FM synthesis method used by Yamaha in their DX7 series. Famous artists who used CZ synths include Cirrus, Moby, Jimi Tenor, Vince Clarke, Jimmy Edgar, The Orb, Jean-Michel Jarre, and They Might Be Giants.

The unique sound character of CZ synthesizers stems from their use of a synthesis technique called *phase distortion* (PD). Instead of starting with a single, static waveform from an oscillator with a fixed set of harmonic overtones (such as a square wave, sawtooth wave etc.), which is then dynamically filtered to change the tone, PD synthesis starts with a dynamic waveform that changes its overtones over time, yielding classic synth sounds at a lower cost.

For example, a PD waveform may begin its attack as a sine wave, morph into a square wave, and decay back into a sine wave, under the control of an envelope. Casio called this a Digital Control Wave, or DCW. This allows the CZ to emulate the filter sweep effect of a traditional analog synthesizer without the expense of multipole filters (VCFs). To further emulate this effect, three of the stock waveforms are resonant versions of triangle, trapezoidal, and sawtooth waves.

In PD synthesis, it is possible to create a compound waveform with two different halves: for example, the first cycle can be a sawtooth wave, and the second cycle can be a pulse wave. It's like getting two oscillators for the price of one. In the original hardware, you had a choice of eight different waveforms; the CZ V gives you those, plus the ability to draw your own waveform. In the original keyboards, you couldn't combine two resonant waveforms; our modern software instrument doesn't have that limitation.

There are two Lines available to generate sound in the CZ, and each Line has its own waveforms, Pitch, DCW, and Amplitude envelopes, as well as Level and Pan controls. When both Lines are enabled, one line can be detuned from the other across a six-octave range. The two lines can be ring modulated to create entirely different sum and difference frequencies, a classic synthesizer technique. A noise generator and noise modulation complete the sonic possibilities.

One of the good things about the CZ line is that they were much easier to program than a DX7 (for example) due to their simpler architecture. Each button allowed the musician to access a restricted control set fitting in the small display screen. The only difficulty was editing envelopes because no real-time graphic display of a current state was available (like every synth at that time).

With the Arturia CZ V, you get the classic Casio sounds in a virtual instrument, with a modern graphic user display that is intuitive to use and offers more creative control. We have added several other features to bring CZ synthesis into the 21st century, without changing its classic capabilities: internal digital signal processing (reverb, chorus, compression, overdrive, etc.), a 16-by-16 modulation matrix (so you can map almost any modulation source to any destination), a multisegment envelope option featuring up to 16 segments with adjustable slopes, the ability to stack up to 8 voices in unison, and more.

Most importantly, while the Casio CZ-101 and CZ-1000 had only eight DCOs (Digitally Controlled Oscillators), limiting the polyphony to 8 voices, (only 4 voices if two Lines were used simultaneously), the CZ V has up to 32-voice polyphony even when two Lines are in use.

## 1.2. Features of CZ V

- Runs as a standalone application in Windows or Mac, or as an instrument plugin for DAWs in Audio Units, AAX, VST 2.4 or VST 3 formats
- Two independent sound generators, each with simple or compound waveforms, stereo panning, and their own pitch, DCW (waveform) and amplitude envelopes
- Choose from eight of the original CZ waveforms (saw, square, pulse, double sine, saw pulse, resonant sawtooth, resonant triangle, resonant trapezoid), or draw your own custom waveform
- With compound waveforms, sound up to four waveforms per note without affecting polyphony
- Stack up to eight layers of a patch with adjustable detuning between layers for classic analog depth and character
- Ring and noise modulation
- Noise generator with adjustable color
- Three different envelope types, independently selectable:
  - Original Casio CZ eight-stage
  - Classic DADSR (delay-attack-decay-sustain-release)
  - Arturia's versatile Multisegment syncable 16-stage envelope with adjustable slopes for each stage and looping capability
- A versatile set of modulation sources and destinations:
  - 16-by-16 Modulation matrix makes it easy to patch any of the 24 modulation sources to any of the 51 modulation destinations
  - Three Combine mod sources, each of which acts as a mathematical combination of two other mod sources
  - Four definable, assignable Macro sources for complex, simultaneous modulations
  - Two syncable LFO sources with 6 waveshapes, up to 20 seconds of delay, and key retriggering
  - Preassigned Vibrato LFO with simple, easy-to-access top panel controls
  - Two independent MOD envelopes, with selectable CZ/DADSR/MSEG formats

CZ V also offers these popular features:

- Onscreen virtual keyboard with 4-octave range, pitch bend and modulation wheels
- Powerful arpeggiator
- An arsenal of studio-quality digital effects:
  - Four simultaneous effects which can be used in series, or in 2 chains of 2 effects for each Line
  - Chorus/flange/phaser, reverb, delay, multimode filter, overdrive, compression, bitcrusher
- MIDI-assignable parameter control
- Hundreds of factory presets in easy-to-browse banks
- Preset search browser can filter by Type, Style, Name, etc.
- Arrange factory and user presets into Playlists for live use

We've listed a lot of features here but the proof is in the playing. We enjoyed developing this so much, we had to keep reminding ourselves that this was work! CZ V is at once a playground, a factory, and a world of its own.

And now ... Arturia's CZ V.

## 2. ACTIVATION & FIRST START

### 2.1. System requirements

Your first step before installing CZ V is to make sure that your computer hardware and software meets these minimum specifications:

 Win 7+ (64bit)  10.10+

- 4 GB RAM; 2.5 GHz CPU
- 1GB free hard disk space
- OpenGL 2.0 compatible GPU

You can use the stand-alone version of CZ V or use it as an instrument plug-in within a 64-bit digital audio workstation as an Audio Units, AAX, VST 2.4 or VST 3 instrument.



### 2.2. Install and Activate the CZ V license

Once CZ V has been installed, the next step is to activate your license for the software. This is a simple process that involves a different software program: the Arturia Software Center that is included in the installation package, but appears as a separate app.

#### 2.2.1. The Arturia Software Center (ASC)

If for some reason the ASC wasn't installed with your CZ V package, please go to this web page: [Arturia Updates & Manuals](#)

The Arturia Software Center is at the top of the list. Once you've located it, download the version of the installer that you need for your system (macOS with file extension ".pkg" or Windows with file extension ".exe").

Follow the installation instructions and then:

- Launch the Arturia Software Center (ASC)
- Log into your Arturia account (or create one if you haven't already)
- Scroll down to the My Products section of the ASC
- Click the Activate button.

That's all there is to it!

## 2.3. Initial setup

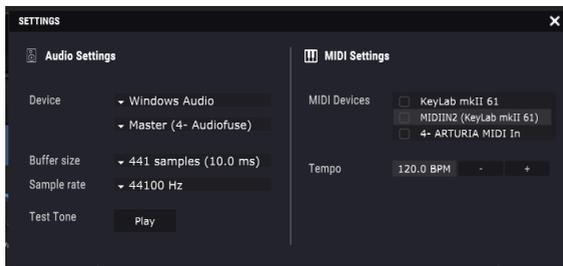
### 2.3.1. Audio and MIDI settings: Windows



At the top left of the CZ V stand-alone application window is a pull-down menu. It contains various setup options. Initially you will need to go to this menu and choose the Audio Settings option to get MIDI flowing in and sound flowing out.

**i**! this applies only to the CZ V standalone application, not when you're running CZ V as an instrument plugin in a digital audio workstation. In that case, audio and MIDI settings are set from within the DAW sequencer or mixer screens.\*

You will then see the Audio MIDI settings window. This works in the same way on both Windows and macOS, although the names of the devices available to you will depend on the hardware you are using.



Starting from the top you have the following options:

- **Device** lets you choose which audio driver you want to use to route sound out of the instrument. This might be your computer's own driver like Windows Audio, or an ASIO driver. The name of your hardware interface may appear in this field.
- **Output Channels** lets you select which of the available outputs will be used to route audio out. If you only have two outputs, only two will appear as options. If you have more than two you can select a specific pair of outputs.

- The **Buffer Size** menu lets you select the size of the audio buffer your computer uses to calculate sound. A smaller buffer means lower latency time between pressing a key and hearing the note. A larger buffer means a lower CPU load as the computer has more time to think, but can result in a small latency (delay). Find the optimum buffer size for your system. A fast, modern computer should easily be able to operate at 256 or 128 sample buffer size without creating pops or clicks in the sound. If you are getting clicks, try raising the buffer a little. The latency time for each sample buffer setting in milliseconds is listed on the right hand side of this menu.
- The **Sample Rate** menu lets you set the sample rate at which audio is sent out of the instrument. The options here will depend on the capability of your audio interface hardware though even most computers' own hardware can operate at up to 48kHz which is perfectly fine. Higher sample rates use more CPU power so unless you have a good reason to go up to 96kHz, then 44.1k or 48k is usually fine.
- The **Show Control Panel** button will jump to the system control panel for whatever audio device is selected.
- **Play Test Tone** helps you to troubleshoot audio issues by confirming whether sound can be heard through the correct device.
- Your connected MIDI devices will appear in the MIDI Devices area. Click the check box to accept MIDI from the device you want to use to trigger the instrument. In "All" mode, CZ V listens for all MIDI channels so there's no need to specify a channel. You can specify more than one MIDI device at once.

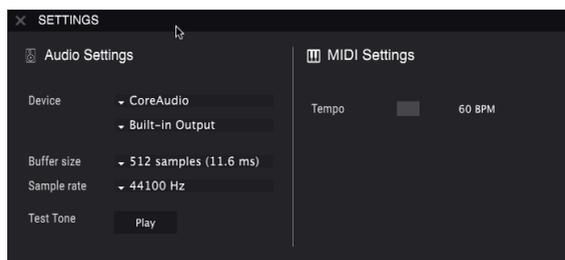
### 2.3.2. Audio and MIDI settings: macOS

The process is very similar to initial setup for Windows and the menu is accessed in the same way. The difference is that macOS uses CoreAudio to handle audio routing and the audio device selection is made in the second dropdown menu. Apart from that, the options work the same way as described in the Windows section.

In the upper left corner, click and scroll down to select Audio Settings.

: this applies to the CZ V standalone application, not when you're running CZ V as an instrument plugin in a digital audio workstation (DAW). In that case, audio and MIDI settings are set from within the DAW sequencer or mixer screens.

This will bring up a pop-up window where you can assign the CZ sound to a valid audio output of your Mac.



In this picture, we're using the Built-in Output of the Mac. Depending on what your audio interface is, you can assign it to any output that is available in the Apple utility **Audio MIDI Setup**, available in the Finder at Applications/Utilities.

### 2.3.2.1. Tempo

When you're operating in standalone mode, this controls the master clock speed of all parameters whose SYNC button is on. For example, when the tempo here is set to 120 BPM (beats per minute), an LFO or the Arpeggiator whose Rate is set to 1/4 (quarter note) will synchronize to play 2 cycles or beats per second; if their Rate is set to 1/8 (eighth note) they will play 4 cycles/beats per second, and so on.

### 2.3.3. CZ V as a plug-in

CZ V comes in VST, VST3, AU and AAX plug-in formats for use in all major DAW software such as Cubase, Logic, Pro Tools, Digital Performer, Garage Band and so on. You can load it as a plug-in instrument and its interface and settings work the same way as in standalone mode, with a few differences:

- The instrument will now synchronize to your DAW's host tempo/bpm rate, when tempo is a factor (e.g., when a parameter is in SYNC mode).
- You can automate numerous parameters using your DAW's automation system.
- You can use multiple instances of CZ V in a DAW project. In standalone mode, only one instance is available.
- Any additional audio effects your DAW has available may be used to process the sound, including delay, chorus, filters, etc.
- You can route CZ V's audio outputs freely inside your DAW using the DAW's own audio routing system.

The first time you boot up your DAW after installing CZ V, the DAW will verify the plugin format, and then it should be available as an option in the menu of an instrument track. Check the manual of your DAW for more information.

## 3. QUICK TOUR OF THE ARTURIA CZ V

Now that all that computer stuff is out of the way, it's time to get familiar with your instrument. This chapter is just a brief overview to get you started; most features are covered in more detail in later chapters.

The layout of the CZ V screen is very intuitive. There are four horizontal areas on the CZ V window: the upper toolbar, the central programming area (which can be hidden when not needed; see [Advanced mode \[p.16\]](#) below), the virtual keyboard area at the bottom of the window, and the lower toolbar. We'll start with the upper toolbar since that's where you can start playing right away.



### 3.1. Upper toolbar: Configuration, Presets, and MIDI

The upper toolbar of the CZ application window is where you'll find controls for saving and recalling presets, a few configuration controls, and the MIDI configuration window.

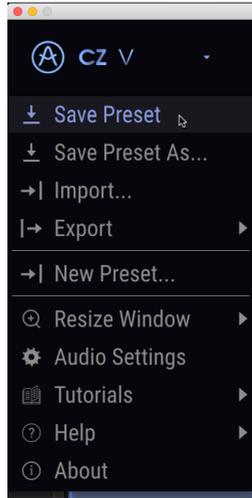
**i**: Note that the "upper toolbar" is NOT the computer system's toolbar at the top of the computer screen which contains the standard application features like About, Preferences and Exit (PC) or Quit (Mac) commands.

#### 3.1.1. CZ V menu (top left corner of app window)

In [Chapter 2 \[p.7\]](#), we already used this dropdown menu to access the Audio Settings for the CZ V. Most of the other commands in this menu involve presets and are already familiar to most users (Save, Save As, Import, Export). These functions are covered in detail in [Chapter 8 \[p.80\]](#) but deserve a quick look here.

### 3.1.1.1. Saving presets from the CZ V Master Menu

The upper-left corner of the CZ window contains a few shortcuts regarding presets:



**Save** saves the current state of the CZ V as a User patch with the current name. If you are editing a factory preset, you must first **Save As...** using a different name. Names can be up to 32 characters long. If you want to start from scratch, select **New Preset...**

### 3.1.1.2. Import

**Import** is the command when you want to add a patch to your CZ library from outside your studio, or from an archive. You can import a single preset, an entire bank of presets, or a playlist. This command will bring up a popup directory window for your computer; simply navigate to a valid file (it **MUST** be in either the .czvx format, or as a MIDI System Exclusive .syx file) and click Open. These features let you share sounds between systems and with other users.

### 3.1.1.3. Export

When you want to share a preset you've made with someone else, or transfer patches to another computer, use the **Export** command and its submenus to export either a single preset or your whole User bank. This generates a .czvx format file that may be uploaded, emailed, saved to a separate backup drive, etc.

### 3.1.1.4. Resize Window

**To resize the CZ V window to fit your screen:** Click on **Resize Window**, which reveals another submenu, and select the size you want, from 50% to 200%. At 70%, the entire CZ app window can be seen on a typical 1440 x 900 laptop screen. On a smaller screen you may want to reduce the interface size so it doesn't dominate the display. On a larger screen or a second monitor you can increase the size to get a better view of the controls and graphics. The controls work the same at any zoom level but the smaller ones can be harder to see at the smaller zoom values.



See [Maximize View \[p.28\]](#) in the lower menubar section for another way to change the window zoom.

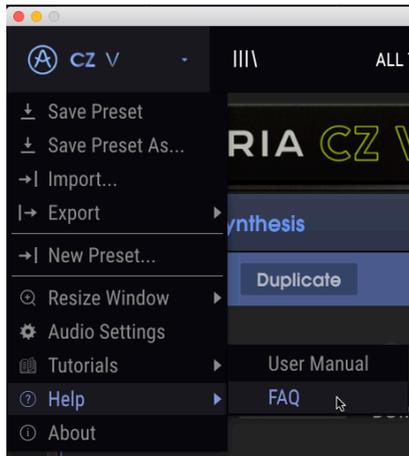
If your computer has a number keypad on the side, you can zoom in and out by holding Control and pressing the "+" and "-" keys on that keypad.

### 3.1.1.5. Tutorials

This feature guides you through the operation of the CZ V step-by-step. The Welcome tutorial runs automatically when you first start the CZ V; you can run it again from this menu at any time.

### 3.1.1.6. Help

The Help menu is where you have access to this user manual, and a link to a list of FAQs (Frequently Asked Questions) about the CZ V on the Arturia website.



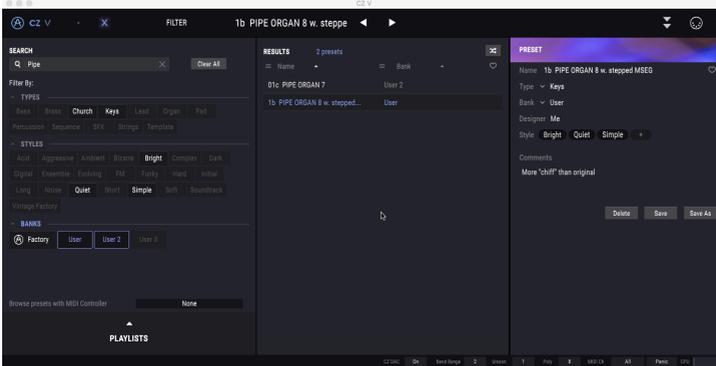
### 3.1.1.7. About

At the bottom of the upper-left CZ menu is About. Click on this to see a list of the extremely talented people who built this software for you, and to see what version of the software you have. Click anywhere on the CZ window to close the popup.

### 3.1.1.8. Preset Library

To the right of the CZ V menu in the upper left corner, is an icon that looks like books on a shelf (III). This is the icon for the Preset library and browser. Clicking on this brings up a SEARCH screen that occupies the whole window (except the upper and lower toolbars). This is a great place to search for exactly the right preset. Its features are explained in detail in [Chapter 8 \[p.80\]](#).

To return to the main screen, press the blue "X" at the same location where the Preset library icon was.



*The Preset Library in SEARCH mode. The search term is "PIPE", not filtered by TYPE or STYLE, but only the User bank is selected for search. The center shows the 2 presets in the User bank that have the word "PIPE" in them, and on the right are the details of the chosen preset.*

### 3.1.2. Preset List

The icons and data fields across the center of the upper tool bar all give you quick access to presets, also known as patches or programs. The TYPE filter, preset number and name, and left / right arrows here give you easy access to the hundreds of presets in memory so you can get up and playing quickly without doing any programming.



## To quickly audition presets:

Move your cursor to the Preset name field and click. A dropdown menu appears with a list of available presets, (filtered by the TYPE field, or ALL TYPES). Click on the one you want to play.



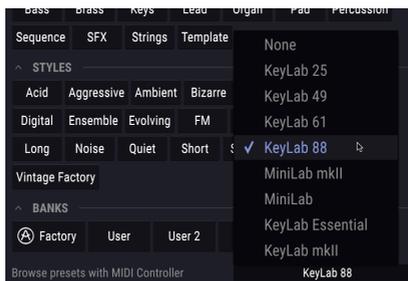
Preset list

Alternatively, you can click on the arrows to the right of the name to move up or down the current preset list one at a time, without having to use the dropdown menu.

If you make changes to a preset, an asterisk (\*) will appear after its name.

### 3.1.2.1. Browse presets with MIDI controller

At the bottom of the Preset browser window on the left side is a field labeled **Browse presets with MIDI Controller**. It will configure the CZ V to work with an Arturia controller so you can browse the preset search results without having to map any controllers to those functions.



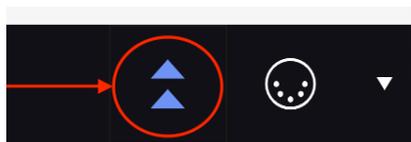
The CZ V will detect which Arturia controller you are using and will be configured automatically to enhance the preset browsing experience. Refer to the documentation for your controller to learn more.

If you want to defeat this feature, click the menu window and select None.

### 3.1.3. Hide/Reveal Advanced features

When you aren't editing presets, just playing them, you can hide the central programming area to reduce the size of the CZ V window. To access Advanced mode and show the central programming screen, click the two downward arrows to the left of the MIDI symbol in the upper menu bar. You can also click the blank area on the right side of the top panel to enter Advanced mode. Either way the central programming area will open, so you can build your own custom presets.

To exit Advanced mode and close the central programming area, click the two upward arrows, which are now blue.



When you're ready to learn more about these features, we suggest starting with the [Synthesis \[p.29\]](#) section.

### 3.1.4. MIDI CC Learn mode

On the right side of the upper toolbar, is the symbol for a MIDI jack. If you click on this, all of the CZ V's parameters that may be addressed via MIDI continuous controller (CC) commands will be highlighted in purple on the screen. Click on any parameter, then send the CC message you want this parameter to be controlled by from your hardware (or DAW sequencer) to the CZ V. The two are automatically linked, and the control image turns red. For more details on this, see [Chapter 9 \[p.88\]](#).

- You won't be able to modify any settings as long as you're in this mode. Click the MIDI icon again to leave this mode.
- On the right of the MIDI icon, the downward arrow opens up the MIDI Controller Configs menu, which lets you save and recall different MIDI CC setups. MIDI Controller configurations are covered in detail in [chapter 9 \[p.91\]](#).

### 3.1.5. Master Tune

Click and drag on this control to adjust the tuning of the CZ V to match other instruments if necessary. At the 12 o'clock position, zero, it is in standard concert pitch (A440). At full clockwise the tuning is +100 cents (hundreds of a semitone) sharp, and at full counterclockwise it is -100 cents flat, a full semitone in either direction.

**Double-click on the control to set it back to zero.**



### 3.1.6. Octave

Click and drag on this control to shift the pitch of the entire instrument by octaves (for example, to make a middle C sound as a low C). Concert pitch is at the 12 o'clock position. Turn it counter-clockwise to shift the instrument down one or two octaves, or clockwise to shift it up one or two octaves.

**Double-click on the control to set the octave to the normal, middle position (O).**

### 3.1.7. Unison Detune

This control works in conjunction with the **Unison** field in the lower toolbar. The CZ V has the capability of stacking additional copies of the sound to make a fatter sound, like voice doubling. When the **Unison** toolbar field is set between 2 and 8, the **Unison Detune** knob detunes these voice copies from each other and pans each voice across the stereo output. See [Unison \[p.25\]](#) for more detail.



### 3.1.8. Waveform and Envelope illustration

To the right of the UNISON DETUNE knob are images of the eight stock waveforms in the original Casio instruments. To the right of those is an illustration of the stages of the original Casio envelope. *These are just images from the CZ-101's top panel, they are not controls.*

## 3.2. Central programming tabs



If the [Advanced view mode](#) is turned on, just under the Arturia CZ V title bar, you'll see four tabs labeled SYNTHESIS, ENVELOPES, MODULATIONS, and FX. You could think of the process of making a new sound in the CZ as moving from left to right.

You start with SYNTHESIS, the most important window in the software. Here you select the basic waveforms that actually produce the sound, and the balance between sound generators. The synthesis window also includes graphic displays of the envelopes, which are shown in greater detail on the next tab. [Chapter 4, Synthesis \[p.29\]](#) covers the synthesis tab in detail.

The waveforms then get processed through ENVELOPES that determine the dynamic character of the sound: how they attack, how their tone changes over time as you hold the key, how loud they are as you hold the key, and how they fade out and/or change tone after you release the key. They contain the sound the way a paper envelope contains a letter. See [Chapter 5 \[p.39\]](#) for more detail about envelopes.

In MODULATIONS, you can change the pitch and timbre of the sound by assigning a modulation source to any of 51 different destinations inside the CZ V. Modulation sources can be hardware controllers such as a pitch bend wheel, modulation wheel, key velocity and aftertouch; or internal sources such as low-frequency oscillators (LFOs) and envelopes. Any of these sources can be routed to affect parameters like vibrato depth, levels, the speed and level of envelope stages, etc. [Chapter 6 \[p.55\]](#) covers the modulations tab.

Finally, in the FX (Effects) tab you have access to four modules of digital signal processing to make the sound richer and create space around the sound. Each module can contain an effect such as a reverb, delay, chorus, or overdrive. Modules can be in a single four-module path or two parallel paths of two modules each. [Chapter 7 \[p.70\]](#) tells you what you need to know about effects.

### 3.3. Virtual keyboard area

The virtual keyboard occupies the lower section of the CZ V window. This is a visual display of a typical hardware controller that allows you to play and modify sounds without the need for an external MIDI device. You can click and drag on controllers to change them, and click on a switch or indicator to turn it on and off.

#### 3.3.1. The virtual keyboard

The virtual keyboard is always available. It makes it easy to audition sounds while you're programming without taking your hands away from the computer. Simply click on a virtual key to hear the currently selected sound. You can also drag the cursor across the keys to hear a glissando.

Clicking near the front edge of the key results in a higher velocity note; clicking near the back of the key produces a soft velocity.

 To use velocity in a program, use it as a Mod Source in the modulation matrix and assign it to a Mod Destination. For example, assigning Velocity to Line 1 Level will make the sound louder the harder you play the keyboard.

When the CZ V is in standalone mode, you can play sounds from your QWERTY keyboard, after clicking in the virtual keyboard window. Natural notes are on the "home" row of the keyboard, sharps and flats are on the row above it, as in this table:

Letter	A	W	S	E	D	F	T	G	Y	H	U	J	K	O	L
Note	C	C#	D	Eb	E	F	F#	G	Ab	A	Bb	B	C	C#	D

- **To shift the QWERTY playing range up an octave:** Press the letter "X"
- **To shift the QWERTY playing range down an octave:** Press the letter "Z."

If you have an AZERTY keyboard, the layout goes like this:

Letter	Q	Z	S	E	D	F	T	G	Y	H	U	J	K	O	L
Note	C	C#	D	Eb	E	F	F#	G	Ab	A	Bb	B	C	C#	D

- **To shift the AZERTY playing range up an octave:** Press the letter "X"
- **To shift the AZERTY playing range down an octave:** Press the letter "W."

### 3.3.2. Master Volume

The fader on the left side of the keyboard is the master volume control for the CZ V. Click and drag the knob to select a value within the range of +24 to -80 decibels (dB). Double-click the knob to reset the value to the default value of 0.00 dB.

This parameter will also respond to incoming MIDI CC #7 (MIDI volume) messages by default.

### 3.3.3. Parameter name display



Just below the master volume control, at the left-hand side of the lower toolbar, notice a readout showing the name of the control that the cursor is currently pointing at or modifying. This is not just for the master volume control, it's for any control on the screen. Just hover the cursor over a control and its name will appear in this lower left-hand corner of the window. The current value of the control will pop up in a text balloon next to your cursor.

### 3.3.4. Pitch Bend

Click on this wheel and drag up to bend the pitch up, or drag down to bend the pitch down. The pitch wheel will return to zero when it is released. This automatically bends the Pitch of both Lines, without requiring any patching in the MODULATIONS tab. The amount of maximum pitch bend is determined by the [Bend Range \[p.24\]](#) parameter, in the lower toolbar.

The pitch bend wheel is also a modulation source which can affect any modulation target that it's assigned to. It will also respond to the appropriate MIDI pitch bend input. See [Modulations \[p.55\]](#) for more information.

### 3.3.5. Modulation Wheel

Like the pitch bend wheel next to it, you can click and drag on the mod wheel to move it. Unlike the pitch wheel, the mod wheel will stay in its current location until it's moved. The mod wheel appears as a mod source in the modulations tab, but doesn't have a default assignment. Its MIDI CC (continuous controller) number is 01.



♪ The CZ V has a [vibrato \[p.20\]](#) section on the top panel that's permanently assigned to pitch. If you want the mod wheel to control vibrato, simply assign ModWheel to Vibrato Depth in the modulation matrix. This assignment is created automatically when importing a System Exclusive file. See [Modulations \[p.55\]](#).

### 3.3.6. Macro faders 1-4

These are general-purpose continuous controllers that can be assigned to any targets in the modulation matrix. They provide a quick way to alter the sound of a preset. The great thing about a Macro control is that it can be assigned to an external MIDI control, which allows that control to alter as many parameters as you want with a single motion.

At the bottom of each Macro fader is a name field. You can enter any name you like for each controller. Names can be different for every preset, and are stored with the preset.

### 3.3.7. Wave scope

Above the center section of the keyboard is a section of the window showing you an image of the two waveforms currently being generated. This is a dynamic display; the waveforms will change as the DCW amount is changed by modulators as you play. There are numeric data fields in this section that allow you to change the DCW amount and the Level of each Line. This is covered in detail in [Chapter 4 \[p.29\]](#).

### 3.3.8. Vibrato

Vibrato constantly varies the frequency of the sound above and below concert pitch. The CZ V has a dedicated low-frequency oscillator (LFO) assigned to vibrato, which retriggers each time you play a key. The controls in the VIBRATO section give you convenient access to these common parameters:

- Clicking on the WAVE window displays a pop-up menu that lets you select the waveform of the low-frequency oscillator that can vary the pitch of the sound: Sine, Triangle, Square, Saw Down, Saw Up, and S&H (Sample and Hold).



- The RATE control sets the speed of the vibrato.
- SYNC synchronizes the rate of the vibrato with the other synchronized parameters in the system, instead of being independent. When SYNC is on, the rate is adjustable from 8:1 to 1/32 of the master clock rate (the tempo set in the **Audio Settings** window of the [CZ V master menu \[p.7\]](#), or the tempo of a DAW).
- DEPTH determines how deep the vibrato will be. When this control is full counter-clockwise (at 0) there will be no vibrato; click and drag up on this control to increase the amount of vibrato.
- DELAY delays the onset of vibrato from 0 milliseconds to about 5 seconds, followed by a linear fade-in proportional to the delay time.

[Vibrato Depth](#) and [Vibrato Rate](#) appear as destinations (targets) in the modulation matrix and may be controlled by envelopes, MIDI continuous controllers etc., but these onscreen controls are not mod sources. For more information see [Chapter 6 \[p.55\]](#).

### 3.3.9. Arpeggiator

An arpeggiator allows you to hold down one or more notes and hear those notes played back, one after the other. When a single note is held it will be repeated; when two or more notes are held the arpeggiator will alternate between the notes. With an Arpeggiator, the pitch values are defined by which keys you hold down. Octave jumps can still be defined and randomized, so the arpeggios can be as crazy as you want them to be.



An arpeggio is basically an outline of a chord; rather than hearing all of the notes at once, they are delivered at different times. Many great pieces of music have arpeggios at their core, from Bach's Prelude 1 in C Major to Eddie Van Halen's hammer-on segment in Eruption.

In some ways an arpeggiator is more improvisational than a step sequencer, because you can decide on the spur of the moment to change which notes the arpeggio will produce by changing which notes you are holding, and how many. The creative possibilities are endless.

**To turn on the Arpeggiator, press the ON button.** As you hold a note or notes on the keyboard, it will arpeggiate according to the current PATTERN.

**Press the HOLD button to keep the pattern going** even after you let go of the keys. The pattern will keep playing until you play another key or chord to start a new pattern.

#### 3.3.10. Rate and Sync

These two controls determine the speed of the arpeggio. When SYNC is off, the rate is adjustable from 0.1 to 50 Hz. When SYNC is on, the rate is adjustable from 1/2 to 1/64th of the current tempo, with 1/4 equaling one beat. The tempo is set in the Audio MIDI Settings, or, when run as an instrument plugin, by the DAW's tempo setting.

### 3.3.11. Pattern

When you click on the PATTERN window of the arpeggiator, a drop-down menu allows you to make a selection from six different response patterns for the arpeggiator, and how many octaves the arpeggiator will cover.



From top to bottom the options are:

Mode	Description
As Played	Held notes will be arpeggiated in the same order they were played.
Up	Notes are played back in ascending order. New notes are inserted into the arpeggio as they are played.
Down	Notes are played back in descending order. New notes are inserted into the arpeggio as they are played.
Up-down 1	Held notes are played back in ascending order and then descending order. The highest and lowest notes are triggered twice and then the direction is reversed.
Up-down 2	Held notes are played back in ascending order and then descending order. The highest and lowest notes are triggered only once and then the direction is reversed.
Random	Held notes are played back in random order.

#### 3.3.11.1. Octave

When 1 is selected, the arpeggiator will play just the notes in the keyboard range you're playing. When 2 is selected, it will play those notes, then repeat them an octave higher before restarting the cycle. Octaves 3 and 4 do the same thing: play the notes of the Mode through a 3 or 4 octave range.

#### 3.3.11.2. Gate

This determines the duration of each note of the arpeggiator. Full counter-clockwise produces short, staccato notes; full clockwise produces long, legato notes.

### 3.3.12. Line Select, Ring and Noise Modulation switches

This upper right-hand corner of the virtual keyboard section of the window is linked to the SYNTHESIS tab above. Briefly, it controls which sound generators are on, and whether the sound generators are modulated by each other (ring modulation) or by the internal noise generator. See [the next chapter \[p.29\]](#) for information about these.



### 3.3.13. Portamento

The PORTAMENTO control sets the amount of time it takes to go from one pitch to another. When it's set to zero, there is no glide time between notes. As you increase the portamento time, it will take longer and longer to go from one note to the next. Portamento effects were often used by musicians such as Keith Emerson and Rick Wakeman.

- When POLY is **off** and PORTAMENTO is set above zero, the pitch will glide from the last note played to the current note, even if you release the key between notes.
- Generally speaking, when POLY is **on**, and you release the keys between notes, there won't be a portamento effect; but if you play legato, there will be. (This depends on the length and type of envelopes, as well.)
- When you are using the Arpeggiator, there will always be a glide between notes if the PORTAMENTO control is above zero, regardless of the POLY setting.

### 3.3.14. Poly

The CZ V has up to 32-note polyphony when the POLY switch is on. Most original analog synthesizers were monophonic: they could play only one note at a time. Turn POLY off when you want to play single-note solos that recreate the classic synthesizer solo sounds. When POLY is off, envelopes will **not** retrigger when you play legato; if you play multiple notes, it will sound only the last note played.

**i** : To play in mono mode (where only one note plays at a time, but the envelopes retrigger for each note played), leave POLY **on** but set the Polyphony in the lower toolbar to 1.

### 3.3.15. Lower toolbar

At the very bottom of the CZ V window, underneath the virtual keyboard, is the lower toolbar covering various MIDI features, great features we want to make sure you don't miss. In [section 3.3.3 \[p.19\]](#) we already covered the parameter name display on the far left of the toolbar, but now let's explore the parameters towards the right side of the lower toolbar:



**i**!: If you can't see the lower toolbar, you may need to scroll down to the bottom of the window, or use the [Resize Window \[p.12\]](#) menu to reduce the window size.

#### 3.3.15.1. CZ DAC

DAC stands for Digital to Analog Converter. At the time the original Casio instruments were built, DACs weren't as advanced or as quiet as they are today. But, they were part of the sound of the instrument, so we modeled the sonic performance of the old CZ series DAC as an option on the output of the CZ V. Click on the **On** logo to turn it off and bypass this DAC modeling for a cleaner sound.

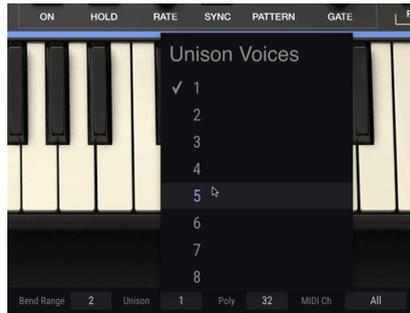
#### 3.3.15.2. Bend Range

This is where you set how many semitones up or down the PITCH BEND wheel will shift the frequency when it is set to its maximum or minimum. For example, a setting of 2 will shift the pitch up a whole tone when the wheel is at its maximum, and a setting of 12 will shift it up an octave.



### 3.3.15.3. Unison

When you want to get a fatter sound from the CZ V by stacking several copies of the sound on top of each other, click on this field and select a number from 2 to 8. At these settings, the UNISON DETUNE knob in the upper toolbar becomes active, and you can increase the pitch difference between the unison voices to emulate the slightly-out-of-tune character of early analog oscillators. As you increase the setting of DETUNE, each unison voice is panned to a slightly different place in the stereo output.



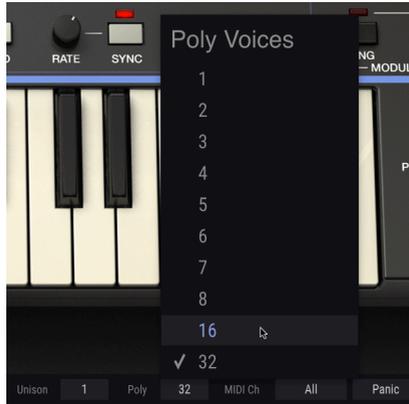
Increased values of Unison use up polyphony, of course: when Unison is set to 1, the polyphony value (displayed just to the right in the toolbar) can be a maximum of 32 voices; when Unison is set to 2, it goes down to a maximum polyphony of 16 voices, and when set to 8, only 4 voices. See [Unison Detune \[p.17\]](#) for more information.

### 3.3.15.4. Poly (Polyphony control)

CZ V allows a maximum polyphony (notes that can be playing at the same time) of 32 voices. A higher voice count is also more CPU-intensive, so this menu gives you the option to limit the number of voices to ease the workload on your computer. This setting is stored independently with each preset, so you can limit one preset to 4 voices and another to 16, depending on the needs of the preset.

Depending on the number of voices being used in unison mode (explained in the paragraph above) you can set the polyphony from 1 to 32 voices. A check mark indicates the currently selected Poly setting.

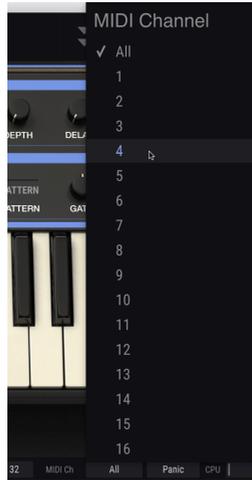
Of course, this has no effect if the POLY switch on the right hand side is off and the CZ V is in legato mode. In that case, this field is greyed out.



**i**!: If you experiment with multiple unisons, but later decide to use fewer unisons, check the Poly control to reset it to a higher value. It won't automatically increase polyphony back to what it was.

### 3.3.15.5. MIDI Ch

This data field determines which MIDI channel(s) the CZ V will "listen" to. The default is All (e.g., Omni mode). In this mode, any MIDI messages on any MIDI channel will play the sounds of the CZ V. To set the CZ V to respond to its own individual channel, choose a value from 1 to 16.



### 3.3.15.6. Panic

Click on the panic button if you run into a situation with stuck notes, or other problems that don't respond to any top panel controls. This essentially sends an "all notes off" message to the CZ V.

### 3.3.15.7. CPU gauge

The final item on the right side of the lower toolbar is a gauge of how hard your computer's processor is working at the moment. If you're running many different instrument plug-ins at the same time, or doing complicated tasks with other programs, the central processing unit (CPU) of your computer may reach the limits of its power. To lower the load on your computer, you can reduce the CZ V's polyphony, or disable some effects.

However, the CZ V isn't a likely source of processor overload by itself.

### 3.3.15.8. Maximize View

If you set the CZ V to a higher magnification value and some of its parameters are pushed outside the viewable range of your display, you might see a couple of blue arrows show up on the far right side of the lower tool bar.



This is the Maximize View button. What it does is provide a quick way to enlarge the window without having to use the pull-down Resize Window menu in the upper left corner. When you click this button, CZ V will make the most of the available screen space by re-centering the CZ V window and expanding it downward toward the bottom of your display.

But if you still can't see everything at the same time then you may want to select a smaller magnification value using the [Resize Window \[p.12\]](#) feature in the CZ V menu. Naturally there's a balance to be struck: Resizing the CZ V window can prevent the need to scroll the window up and down, but it also makes it more difficult to read some of the smaller text.

## 4. SYNTHESIS SECTION / TAB

The Synthesis page is the heart of the instrument, where the basic sound is generated. Here, you select from eight different waveforms (or draw your own wave), and design how those waves will change over time as you play the keyboard.

Click on the Synthesis tab (just under the ARTURIA CZ V logo) to open this window. (If you don't see the tabs, click the double-downward arrows left of the MIDI symbol in the upper toolbar.)

### 4.1. Lines 1 and 2

The Synthesis display page is split into left and right sides. Each side represents a sound generator. You can play either one of the generators, or both, using the LINE SELECT button and indicators on the upper right side of the onscreen keyboard. The options are Line 1, Line 2, 1+2', or 1+1'.



- Alternatively, you can turn each Line on or off by clicking on the power button icon in the upper left hand corner of each line.
- To enter 1+1' mode, you can click on the DUPLICATE icon at the top of the LINE 1 section.

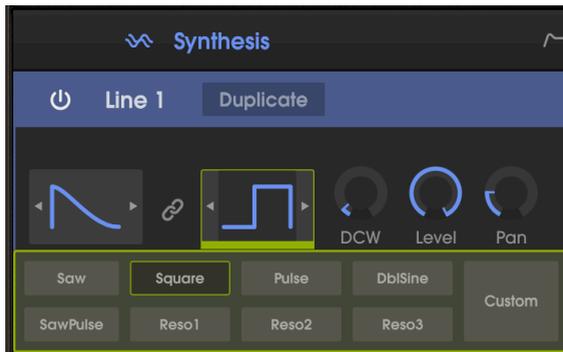
In 1+2' mode, Line 2 can be detuned from the frequency of Line 1 using the DETUNE settings in the center of the screen (OCT(ave), NOTE (semitone), and FINE (+/- 60 cents)). In 1+1' mode, the CZ creates a duplicate of Line 1 that can be detuned, but shares the same waveform and envelopes.

Each side is called a "Line", instead of an "oscillator" (DCO or VCO), for several reasons. First of all, notice that each Line has two waveform windows, so it's as if each Line has two oscillators. Second, each Line has its own set of pitch, DCW, and amplitude envelopes which are completely independent of each other.

## 4.2. Selecting and controlling waveforms

### 4.2.1. Waveform options

Each Line has two waveform selection boxes. Click on either box to reveal the pop-up window, then click on one of the following waveforms:



- Sawtooth
- Square
- Pulse
- DblSine (double sine)
- SawPulse
- Reso1 (sawtooth wave with a resonant filter effect)
- Reso2 (triangle wave with a resonant filter effect)
- Reso3 (trapezoid wave with a resonant filter effect)
- Custom (clicking this opens a pop-up window allowing you to draw your own waveform)

...then click in the waveform selection box again to confirm your choice. For reference, a picture of each of the eight standard waveforms is displayed at the top right side of the CZ V window.

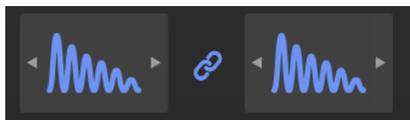
You can also select waveforms without the popup menu by clicking on the arrows on either side of the waveform selection box.

### 4.2.2. DCW, Level, and Pan

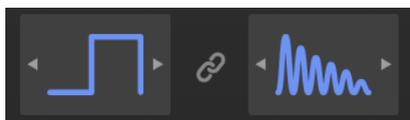
To the right of the waveform selection boxes, each Line has its own DCW, Level, and Pan controls. Click and drag on these controls to change them.

### 4.2.3. Simple and Compound waves

If the Link icon between the two waveform boxes is highlighted, or if you select the same type of wave for both boxes, you will get a simple wave (the first and second halves of the wave will be the same).



But PD synthesis allows you to make a compound wave, a wave that alternates between two different waveforms each cycle. When the waveform link icon is shaded (off), you can select a different wave for the first half and second half of each cycle; for example, a Square and a Reso1. When you're combining two different waveforms, it doesn't matter which is first (in the left box) and which is second (the right box); the sound will be the same. Saw + Square sounds no different from Square + Saw.



In compound mode, since each waveform occurs half as often, the frequency of each wave is cut in half, shifting the tone down by an octave from what it would've been in simple waveform (link) mode. You can compensate for this if needed by turning the OCTAVE control near the top center of the CZ V window.

### 4.2.4. Digitally Controlled Wave: DCW's impact on the resulting waveform

It's important to understand, however, that in phase distortion synthesis the waveform you've selected is more of a destination than a starting point. The basic carrier wave (for non-resonant waveforms) in PD synthesis is a sine wave with no overtones at all, like a single drawbar tone on a Hammond organ. Only after that carrier is modulated—either by turning up the DCW control, or by modulating the carrier with a DCW envelope or something else—will you actually hear a complex wave like a square wave, sawtooth, etc. Without some kind of DCW modulation input, the tone will remain a sine wave with no overtones in the signal.

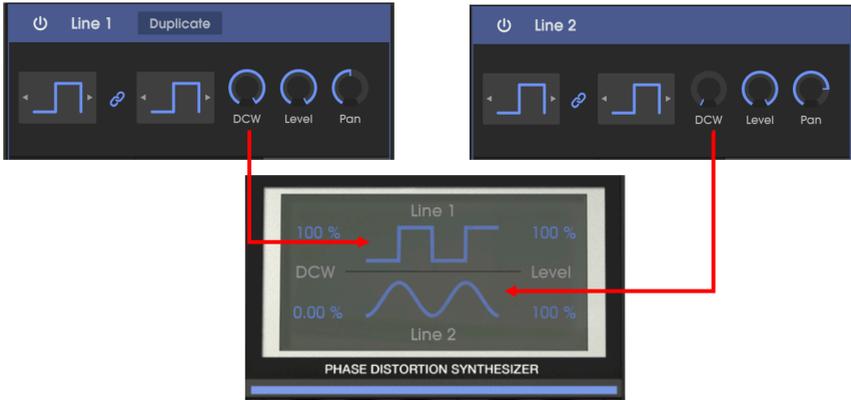
**i** **🎵** If you want to program a sine wave, choose a nonresonant waveform, make sure the DCW control is off (full counter-clockwise) and that the DCW envelope is flat. Note that the DblSine wave carrier frequency is an octave higher than the others.

The output waveform scope (just above the piano keyboard) is similar to an oscilloscope. If you start from scratch to make your own sound by clicking on the Default setting in the preset library, and select a linked Square wave in the Line 1 waveform box, notice that the output scope shows a sine wave, not a square wave. That's because in the default patch, the DCW is set to zero. (If a Line is off, its waveform display will be faded instead of highlighted in blue.)

Just to the right of the waveform selection boxes in Line 1, notice the DCW control. Click on the dark circle and drag upwards.

- Alternatively, you can change the DCW percentages in the output waveform display by clicking and dragging in each data field; it has the same effect as turning the rotary controls.
- Double-click either the DCW rotary control or the DCW data field to set it to zero.

As you increase the DCW, you'll see the output waveform scope morph from a sine wave into a square wave. When the DCW control is at maximum, you'll see the edges of the square wave are very sharp, and if you play the keyboard, you'll hear lots of high-frequency overtones. As you turn the DCW control back down, those high-frequency overtones will gradually fade. Your waveform can vary from a sine wave to a square wave and anywhere in between.



That's why the DCW static level is similar in effect to the filter cutoff knob on a traditional analog synthesizer. It modulates the waveform's shape by a constant, fixed amount. You turn it up to make it sound more and more like the waveforms you chose in the waveform selection boxes; the higher the DCW level, the more overtones in the sound.

When your cursor is over the DCW control, a text balloon next to the cursor shows the current numeric level of the control, for example "60.0%". The current DCW level is also displayed in the Wave Scope.

#### 4.2.5. DCW Envelope

Click on the DCW box underneath the waveform boxes, between Pitch and AMP, to display the DCW envelope in the Synthesis window.

The DCW envelope lets you change the sound of the waveform dynamically over time. When it's flat (all points at the bottom of the envelope window), the timbre of the sound will be static and organ-like, with the tone determined by the setting of the rotary DCW control. When you draw or import an envelope, the sound will change dynamically as you hit a key, hold, and even after you release it. For example, the sound can start as a sine wave, brighten up into a square wave during the attack phase, then fade back as if a filter were closing.

The DCW envelope works in combination with the rotary DCW control above it. If the rotary control is at zero, only the envelope can alter the waveform. On the other hand, if the rotary DCW control is at maximum, the DCW envelope has no effect—it can't go higher than maximum (unless the DCW envelope's Depth is set to a negative number... more on that [later \[p.42\]](#)).

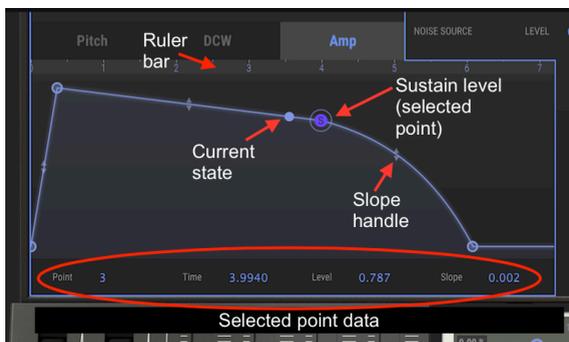
You can create and edit envelopes simply by clicking and dragging. We'll go into more detail about envelopes in the next section, but you can learn a lot simply by experimenting, and by seeing how the preset patches use DCW envelopes.

## 4.2.6. How to edit envelopes in the Synthesis window

**i**  Envelopes in the Synthesis window offer a quick way to affect the sound while you're programming, but for complete access to all envelope parameters, go to the [Envelopes tab \[p.39\]](#).

Generally, click and hold any point on the envelope. Moving the point upwards will increase the level of modulation, moving it downwards decreases modulation. Moving a point to the left makes that stage of the envelope happen sooner; to the right, later. When you trigger the envelope by pressing a key on the onscreen keyboard or your external controller, you'll see a light blue dot (shown below as "Current state") move along the envelope display over time, giving you a clear illustration of how each segment of time works.

**i** ! Keep in mind that later time segments of the DCW envelope won't have an audible effect if they happen after the AMP envelope has already closed.



Beneath the graphic envelope display are numeric values for each parameter. You can edit these numbers by clicking and dragging on the number you want to change; the graphic display will reflect your changes.

### 4.2.6.1. Envelope ruler bar

You can zoom in and out, and forwards and backwards in time, on an envelope window by clicking and dragging on the ruler bar. The ruler bar is the medium-gray bar above the envelope image and below the Pitch, DCW, and AMP tabs.

- Dragging horizontally moves the display backwards and forwards in time.
- Dragging vertically zooms in and out.
- Double-click on the ruler bar to see the entire envelope.

 If you're making a very complicated envelope, you should click on the ENVELOPES tab where the entire window width represents a single envelope (for example, "LINE 1 DCW") and you can edit in more detail.

The CZ V features three different types of envelopes (CZ, DADSR, and MSEG), but you can't select the envelope type from the Synthesis tab, only from the ENVELOPES tab. See [Chapter 5 \[p.39\]](#).

### 4.2.6.2. Copy envelopes

Between the Line 1 and Line 2 envelope graphics on the Synthesis window is a **Copy** function. Click on the upper arrow to copy the currently-displayed Line 1 envelope to currently-displayed envelope to the right (Line 2 or Line 1). Click on the lower arrow to copy in the other direction.

 It doesn't matter what type or function of envelope is on either side; it will copy the shape and type from DCW to Amp, for example.

### 4.2.7. AMP envelope

The amplitude envelope is the final gatekeeper of the Synthesis section. It determines how loud the signal is at any particular stage of time. A sound can fade in, attack and decay, sustain at a different level, and either stop immediately or fade away slowly when the key is released.

In the original analog synthesizers, this would be called a VCA (voltage controlled amplifier), and in digital synthesizers, a DCA, with a permanently-assigned envelope input. But unlike some of those instruments, in the CZ there is no way for the sound to bypass the AMP envelope. If the levels of all points on your Amp envelope somehow get set to zero, you won't hear anything from that Line. The default Amp envelope has a very fast attack time with a sustain level set to maximum (1.00) and a fast release, so usually this isn't a problem.

Remember, however, that if you are designing something in the Pitch or DCW envelopes after the sustain point, that is, a sound change after the key is released, you need to add segments to the Amp envelope after the sustain point, or make a long release time, so you can hear the effect of those other envelopes.

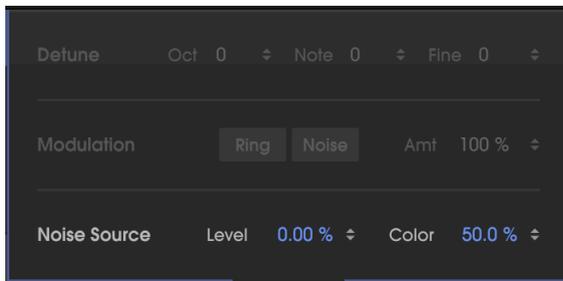
## 4.2.8. Pitch envelope

The pitch envelope modulates the frequency of the waveform over time. If there is no pitch envelope (that is, if all the Pitch envelope points are at the bottom of the display, or if the Envelope Depth parameter is set to zero) each key will play its normal pitch. If the Pitch envelope goes positive for a time period, the frequency will go sharp; as the envelope level falls, the pitch will return to its normal frequency.

 To make the frequency go flat from the normal pitch when you strike a key, go to the ENVELOPES tab, select a Pitch envelope, and set the Line's pitch envelope Depth to a negative number.

## 4.3. Detune, Modulation, and Noise Source

Between Line 1 and Line 2, in the center of the Synthesis screen, are controls that have to do with the interaction between Lines, and other modulation and sound sources.



### 4.3.1. Detune (Oct, Note, and Fine)

The Detune controls are active only if both Lines are turned on: in 1+2' or 1+1' modes as set by the LINE SELECT section on the upper right side of the on-screen keyboard. Changing the pitch of one of the sound generators relative to the other can lead to quite dramatic sound effects. The Detune parameters apply only to the right-side sound generator. Edit these parameters by clicking and dragging up or down on the number you want to change:

- The OCT (Octave) parameter ranges from +3 to -3 octaves. For example, if OCT is set to +1, when Line 1 is playing middle C the right generator (Line 1' or 2') will play high C.
- The NOTE parameter changes the pitch of the right Line by semitones, 11 up or -11 down. For example, if NOTE is set to 7, when Line 1 is playing middle C the right generator (Line 1' or 2') will play middle G.
- The FINE parameter changes the pitch of the oscillator in cents, or hundredths of a semitone, in a range from +60 to -60. Detuning the right Line from the left a few cents gives a natural depth to the sound, similar to a chorus effect.

### 4.3.2. Modulation: Ring and Noise

The second row in the middle of the Synthesis screen row lets you turn on either Ring or Noise modulation and control its amount (Amt). Dedicated switches for Ring and Noise are also located on the upper right corner of the onscreen keyboard, right below the LINE SELECT switch. This location was chosen on purpose: you can't have ring or noise modulation unless two sound generators are on (1+2' or 1+1' indicator lit). If only one Line is on, the Ring and Noise switches have no effect on the sound.

#### 4.3.2.1. Ring modulation

Click on the Ring icon in the modulation row, or on the Ring button down by the keyboard, to turn on ring modulation. Ring modulation adds overtones to the sound by ring modulating the right generator (Line 2' or 1') by Line 1. Technically, it generates sum and difference frequencies between the left and right generators, so the more different the Detune settings are, the more overtones will occur. (This is why the MODULATION controls are located just below the Detune data fields). The amount of ring modulation is controlled from 0% to 100% by clicking on the Amount (Amt) parameter and dragging up or down.

**i**: With ring modulation active and an amount of 0%, Line 2 (or 1) will remain silent. Note also that hearing Line 2 depends on the Line 1 Amp envelope. For example, if you're in 1+2 mode with RING on, with a long attack on the Amp envelope of Line 1, and a short attack and decay on Line 2, the ring modulation doesn't take place.

The effect of Ring modulation is subtle if the Detune settings are all at zero, because the sum and difference frequencies of the two generators are in the same harmonic series. Changing the OCTave setting increases the impact of ring modulation, but the ring frequencies stay in harmony.

The classic signature sound of ring modulation occurs when the Detune settings for Note and Fine are changed from zero. For example, if the Amt is 100%, and Note is set to 1, the result is that the sum and difference frequencies overwhelm the fundamental of the oscillator. The result is more noiselike than tonal.

When Note is set to 5 (a fourth interval) or 7 (a fifth interval), ring modulation produces harmonics that are related to the fundamental frequency, so the resulting sound is a little more musical. Low single-digit settings of the Fine control result in tremolo/vibrato effects; higher settings produce nonharmonic tones.

During ring modulation, the Level control for Line 1 (on the left) increases or decreases the level of the basic tone in the mix. The Level control on the right (1' or 2') increases or decreases the level of the ring-modulated sum and difference frequencies in the mix.

**i**: In 1+2' mode only, ring modulation can change dynamically according to the settings of the Pitch and AMP envelopes of Line 2. In 1+1' mode, the envelopes are identical; the envelope displays of Line 1' on the right side are inactive.

### 4.3.2.2. Noise modulation

Click on the Noise icon in the modulation row, or on the NOISE button on the upper right side of the virtual keyboard, to turn on noise modulation. This causes the right Line (2' or 1') to be modulated with noise. Increase or decrease the Amt to change the modulation level. Changing the Level control of the right Line will reduce the amount of the modulated signal in the output mix.

If the LINE SELECT mode is set to 1+2' and noise modulation is on, the noise follows the Pitch and Amp envelope curves of Line 2'. In 1+1' mode, only the Line 1 curves are active.

Noise modulation is completely separate from the Noise Source described below. They can be used simultaneously.

### 4.3.3. Noise Source

The bottom line of the center section features a noise generator that can be added to the sound. This source is independent of noise modulation, and is mixed with the sound of any Line that is active (left, right, or both). Its level follows the Amp envelopes, but is unaffected by Pitch or DCW envelopes. Unlike noise modulation, its tone is constant, not affected by the notes being played (unless you specifically assign a modulation source to the Color control).

If the noise source Level is increased from 0%, you will hear the noise as you play the keyboard.

The Color control affects the tone of this noise. Low settings of Color (0.00%) emphasize low frequency noise. Mid settings (to 50%) have broadband noise (pink noise). Higher settings accentuate upper frequencies and cut lower ones, creating what most people perceive as hiss.

## 4.4. Unison and UNISON DETUNE

This feature creates up to eight copies of the current patch which are stacked to make a larger sound. On the lower toolbar of the CZ V screen, below the keyboard, is a data field labeled Unison. Clicking on this data field displays a pop-up menu that lets you choose how many instruments you want to stack up, from one to eight.



The default setting for Unison is 1 (no voice stacking). Near the top center of the CZ V screen is the image of a rotary knob labeled UNISON DETUNE. At the default setting, the UNISON DETUNE knob has no effect, and the maximum polyphony (shown at the bottom of the screen in the Poly data field to the right of Unison) is 32. If you click on the Unison data field and increase it to 2, the maximum polyphony goes down to 16 automatically, because every time you play a key you're actually playing two sets of sound generators at once.

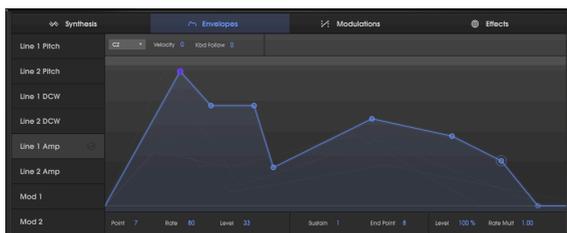
Now, when you click and drag on the UNISON DETUNE and play a note, you'll hear the characteristic sound of two slightly out-of-tune notes beating against each other. Low settings sound a bit like flanging, higher settings like fast chorusing...In fact, this detuning is the effect that a digital chorus effect emulates. Higher settings of DETUNE also widen the stereo effect.

The original Casio instruments had a maximum unison setting of two. In our updated version you can have as many as eight copies stacked on top of each other, in which case the maximum polyphony is four notes at a time.

## 5. ENVELOPES

Envelopes control the level of pitch, tone, amplitude, and modulation from the moment you hit a key, as you hold a key, until you release a key, and afterwards. They shape the sound over time. A parameter can attack suddenly and decay immediately, like a plucked and damped string (“pizzicato”), or fade up slowly and take a very long time to fade away after you release the key—essentially, anything you want to hear. The Arturia CZ V’s graphic display of each envelope makes them easy to see, understand, and edit. You can make almost any time contour imaginable.

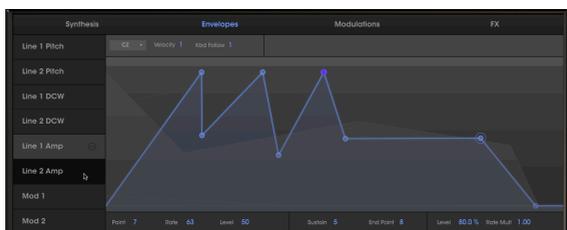
The CZ V has eight separate envelope generators. We’ve already covered the basics of six of those in the [Synthesis section \[p.33\]](#), where each Line has access to its own three envelopes: Pitch, DCW, and Amp. The ENVELOPES tab accesses these same six envelopes in greater detail, plus two MOD envelope generators. The entire center section of the display shows a single envelope, so there is more detail as you edit, and there are several controls not available in the SYNTHESIS window.



### 5.1. Navigating the ENVELOPES window

**To select the envelope you’d like to see or edit:** Click on the envelope name in the left-hand column of the window. The envelope and its points will be highlighted in light blue, and the area under the curve will be shaded.

**To identify envelopes in the background of the current envelope:** Move your cursor over the left-hand column of envelope names, but do not click. As the cursor highlights the envelope name, its shape will appear in light gray in the envelope window.



*Line 1 Amp is the current envelope in blue; the cursor is over the Line 2 Amp name, showing its curve in light grey in the background*

**i**!: Only envelopes that are the same type or mode of the current envelope will be visible in the background. This isn’t an issue if you select the same envelope mode for all eight envelopes in a preset.

## 5.2. Editing Envelopes

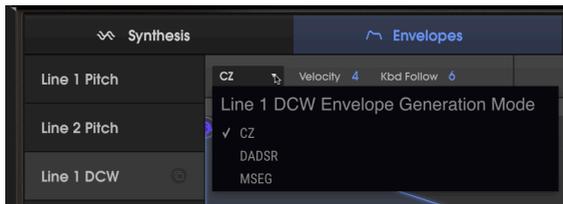
It's easy to design or edit envelopes in the CZ V simply by clicking and dragging on edit points in the envelope screen. But there are some differences between displays depending on the Envelope Mode and the envelope being edited.

### 5.2.1. Selecting an Envelope Mode

In the upper left hand corner of the envelope display window is a small gray pulldown menu that lets you select from three different envelope modes:

- **CZ** is an up-to-8-step envelope used in the original Casio CZ series
- **DADSR** is a conventional synthesizer envelope (Delay-Attack-Decay-Sustain-Release)
- **MSEG** is Arturia's multiple-segment envelope with up to 16 points, adjustable slope curves, and sync capability.

**i**!: You can select a different mode for each envelope. However, if you use the same mode for all envelopes in a patch, you'll be able to see them in the background.



### 5.2.2. Top-Line Envelope Parameters

Different data fields will appear on the top line, just above the Ruler Bar, depending on the envelope being displayed.

#### 5.2.2.1. Velocity

(All except MOD 1, MOD 2)

Velocity settings greater than 0 make the envelope velocity sensitive. The range is 0 to 15. The higher the setting, the greater the dynamic range. It lessens the effect of the envelope when you play softer, increasing it the harder you play.

**Double-click the field to reset Velocity to 0.**

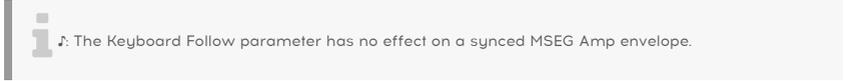
### 5.2.2.2. Keyboard Follow (Kbd Follow)

(DCW and AMP envelopes only)

This parameter, located to the right of the Envelope mode menu, affects the overall duration of the envelope depending on where you're playing on the keyboard:

#### For Amp Envelopes:

When the value is above zero, the envelope duration will shorten as upper notes are played, just as the upper notes of a piano decay more quickly than low notes.



#### For DCW Envelopes:

When the value is above zero, the envelope amount will be less as upper notes are played, so that the lower octaves will have more overtones, and higher octaves will have fewer overtones.

In both cases, the higher the **Kbd Follow** number, the greater the difference will be between the lower and upper notes of the scale.

The maximum value is 9, with a value of 0 having no effect. **Double-click the field to reset it to 0.**

### 5.2.2.3. Zoom and Drag

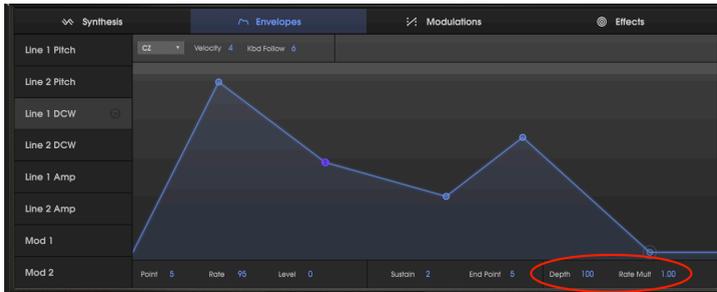
**To zoom in and out on the envelope display:** Click and hold on the [gray area at the top of the envelope display \[p.34\]](#) (the "ruler area") and drag vertically: drag down to zoom in (show a smaller time period) or drag up to zoom out (show a longer time period).

**To automatically zoom to show the entire envelope:** Double-click on the ruler area.

**To move the time display earlier or later:** Click and hold on the ruler and drag horizontally, left or right.



## 5.2.3. Bottom-Line Envelope Parameters



### 5.2.3.1. Rate Multiplier

The Rate Multiplier (located on the bottom right of the ENVELOPES screen) can be used to speed up or slow down the entire envelope, for those situations where the shape of the envelope is correct but the timing needs to be changed.

- A value of 1.000 means the rates of the envelope are normal.
- Values lower than 1.000 slow down the envelope.
- Values higher than 1.000 will speed up the envelope.

The minimum value is 0.100, or 1/10th the normal speed. The maximum value is 10.0, or ten times faster.

**Double-click the field to reset the value to 1.000.**

 Different values are available for the Rate Multiplier parameter when an MSEG envelope is in SYNC mode. They are multiples and fractions of the clock ranging from 1/32 to 8/1.

### 5.2.3.2. Depth

(Pitch, DCW, and Mod envelopes only)

Underneath the graphic envelope display, towards the right side, is a parameter labeled **Depth**. The Depth control allows you to lessen or invert the effect of the envelope. It acts as a multiplier of all the Levels of the envelope.

- At a Depth of 100 (the default level), the envelope has full positive effect, for example opening up the DCW or raising the pitch. Click and drag down on the number to decrease how much the envelope will modulate the target. Lowering the Depth lowers the effect of the envelope on its target. **Double-click the depth field to set it to 100.**
- At a Depth of 0, the envelope has no effect on the sound.
- At a Depth of -100, the envelope's effect is inverted: if it's a pitch envelope, the sound will go flat instead of sharp, if it's a DCW envelope, it will decrease the level of the partials of the waveform.

The Depth parameter comes in handy if you've drawn an envelope that you like the shape of, but you want it to have less effect. It is like lowering the Level settings of each envelope segment simultaneously.

### 5.2.3.3. Amp Level

In place of the Depth control, the amplitude envelopes feature a Level control at that location, adjustable from the default value of 100% down to zero. This is the same as the Level control in the Synthesis panel and on the Wave Scope screen. Lower values here result in a softer output, or even no output.

**Double-click the Level field to set it to 100%.**

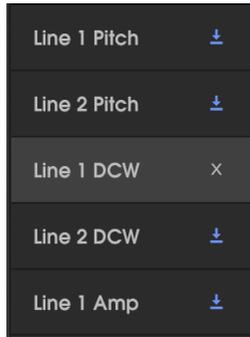
### 5.2.4. Copying and Pasting Envelopes

For some sounds, you may need to copy an envelope, for example, from one Line to the other Line, or from a DCW to a Mod. This function is available on the left side of the Envelopes window.

I. Click on the name of the envelope you want to copy on the left side of the Envelopes window. When it is highlighted, the copy/paste icon will appear on the right side of the name, as shown below:



II. Click on the copy/paste icon. Down-arrow icons will appear on the right side of all the other envelopes, and the source envelope will turn to an "X":



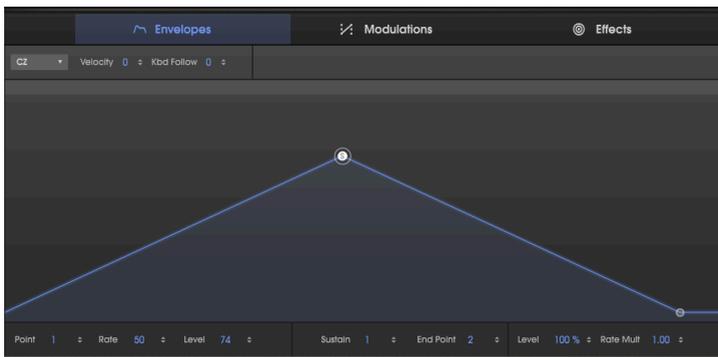
III. Click on the down-arrow icon of any of the seven other envelopes, and the source envelope will be pasted to that envelope.

- **To copy to multiple envelopes**, hold the Control key (PC) or Command key (Mac) and click on the envelope names; each name box will turn blue. Click on any of the down-arrow icons, and the source will be copied to all of the other envelopes; or
- If you decide you don't want to paste it anywhere, click on the "X" icon of the source envelope to leave copy/paste mode.

### 5.3. CZ Envelopes

This is the style of envelope used in the original Casio phase distortion synthesizers. Unique for its time, CZ envelopes had up to eight definable points. Any point can be defined as a sustain point, and each point has its own rate and level.

The minimum CZ envelope has two points: a starting point (which can be either a sustain or attack point) and an endpoint.



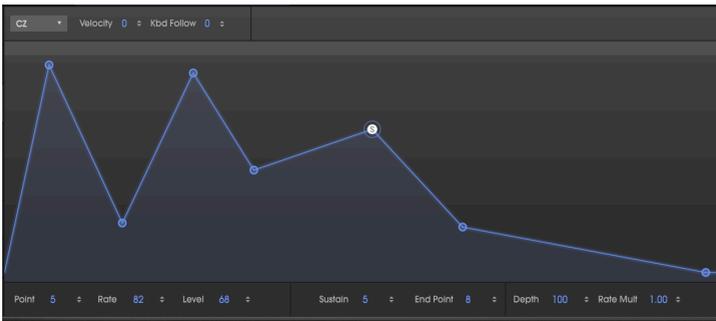
In the illustration above, the selected point (with a halo around it) is Point 1, the Sustain point, as indicated by the letter "S". When a point is selected, its number, Rate, and Level are shown on the bottom line of the display, along with what point is the Sustain point and which is the End Point. The speed it takes to reach the Sustain point after a key is pressed is the Rate, in this case a value of 50. The level of the Sustain point is 74.

### 5.3.1. About Rate

Rate is the rate of change from one level to another. The duration of an envelope stage depends on the combination of rate and level. If the change in level is small, it will happen faster than if the change in level is large, even if the rate is the same. For example, in the illustration above, if the Sustain point Level was cut in half to 37, but the Rate was still set to 50, it would take half as much time to get to the Sustain level. The horizontal position of a point in a CZ envelope does not indicate a fixed time position. (That's why there are no time markings in the ruler bar of a CZ envelope.)

### 5.3.2. Editing a CZ envelope

A CZ envelope can have as many as eight points, and any point except the End Point may be defined as the Sustain point. When you release a key, the envelope will jump to the last stage. If nothing is defined as a sustain point, the envelope will progress through all its stages as you hold the key.



In the illustration above, notice the halo around Point 5 indicating that it is the currently selected Point for the Point, Rate, and Level data fields. In the center of the bottom data field it shows that the Sustain Point is number 7, and the end point is number 8, the maximum number.

**To change a point's Rate and Level:** Parameter values may be changed in one of two ways:

- Click a point and drag it to the desired value, or
- Click a value field and drag it up/down to the desired value, or type in the value.

**i**!: When dragging in any value field, holding the Control key or right-clicking as you drag will act as a 'fine tuning' control.

**To move a point, and all following points backwards or forwards in time:**

- Hold the SHIFT key while clicking and dragging on the point.

**To add a point:** Simply click where you want the point to be.

**To delete a point:** Right-click on the point.



Macintosh users: If you don't have a mouse with a right-click switch, use System Preferences to set up a two-finger tap on a trackpad as a "secondary click" function, then click-drag the point .

**To select a point for editing:**

- Click on the point, or
- Click on the Point data field at the bottom of the window and drag up or down.

**To make a point the Sustain point:**

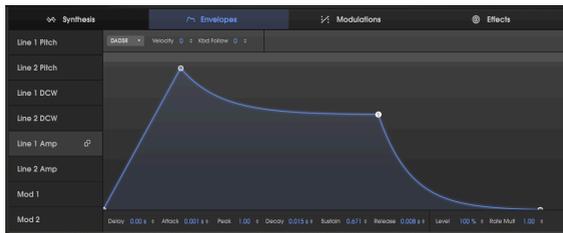
- Double-click on the point, or
- Click on the Sustain data field at the bottom of the window and drag up or down.

**To make an envelope without a Sustain point:**

- Double-click on the current Sustain point, or
- Click on the Sustain data field at the bottom of the window and drag it down to the Off position.

## 5.4. DADSR Envelopes

The DADSR envelope type emulates the envelopes common on analog synthesizers. One of the nice features of DADSR is that each point has a fixed definition. When you slide one point in time forward or backwards, the other points automatically slide with it. The values of each point are simultaneously visible on the bottom line of the ENVELOPE window.



Here's what each component of the DADSR envelope does, as listed along the bottom of the ENVELOPES window:

- **Delay** delays the attack stage of the envelope for up to 30 seconds from the moment the note is triggered. (In the picture above, the delay is set to zero seconds.)
- **\*Attack** \* time. This is the amount of time it takes for the envelope to reach the Peak level. It can range from 0 to 30 seconds. Its slope is a straight line.
- **Peak** level is the level of the attack phase. Hundreds of values between 0 (no attack level) and 1.000 (maximum attack level) are available.
- **Decay** time is the amount of time it takes for the envelope to reach the Sustain level, after the Attack phase is completed.
- **Sustain** level is the level of the envelope as you hold down the key, in a range between 0 and 1.000. Note that the Sustain level can be higher than the Peak level.
- **Release** time is how long it will take for the envelope level to decay to 0 after the note is released.

**i**: When you release a key before the attack time or decay time is completed, the envelope will immediately jump to the release stage of the envelope, from the last level it reached.

### To change the envelope times or levels:

As with the CZ envelope, parameter values may be changed in one of two ways:

- Click a point and drag it to the desired value.

**i**: To graphically edit the points of a default envelope, you may need to click at the bottom of the graphic display on the release point and drag it to the right to uncover the Sustain point.

- Click a value field and drag it up/down to the desired value.

**Double-click on the Peak or Sustain fields to restore each to its default value** (Peak to 1.00, Sustain to 0.00).

## 5.5. MSEG envelopes

The MSEG (Multi-segment) envelopes are the most flexible envelopes of all. They can contain up to 16 points, with independent time, level, and slope values for each stage. At the top of an MSEG envelope window you can select from a predefined set of envelope presets (11 different ones for an unsynced envelope, and 9 different synced envelope presets). They also can be looped and synchronized to a master clock.

When you click on a point, a halo appears around it and the data about that point is shown at the bottom of the envelope window: the number of the point, its time, its level, and its slope.



*A 16-point MSEG envelope*

### 5.5.1. Editing an MSEG envelope

Editing an MSEG envelope is similar to editing a CZ envelope. The round circles are called "points". They may be clicked and dragged to make changes. For more precise edits, click and drag the appropriate value field underneath the graphic; hold the Control key or right-click as you drag for fine tuning.

### 5.5.2. Points

Click a point to select it, or click the Point number field and drag it up and down to select the point to be edited. To add another point, click anywhere in the envelope field. Up to 16 points are possible.

Right-click a point to remove it. If you double-click a point, it will become the Sustain point.

To zoom in and out, drag the ruler in the upper part of the window up and down. Drag the ruler left and right to access points outside the viewing area; or double-click the ruler to zoom to the size of the envelope.

### 5.5.3. Adjust the Time

This sets the length of time it will take to reach this point from the previous point in the envelope. Changing this value will also affect the length of time it will take to reach the next point in the envelope from the current point.

**i**: Unlike the other envelope types, MSEG times are absolute: the time it takes to get from one stage to another isn't affected by the Level of the points.



A synced envelope features a grid resolution that points will "stick" to, depending on how close you drag a point to the grid. See [Sync \[p.52\]](#) below.

### 5.5.4. Time-shifting multiple points

When moving an MSEG point, or changing the value in the Time field, you can't move it earlier than the previous point, or later than the next point.

However, if you hold the SHIFT button on your computer keyboard and click the desired point in the editing window, you will be able to offset the position of all the points that are located to the right of the point being modified.



The shift + click adjustment technique works only in the graphic window. It is not allowed in the Time data field.

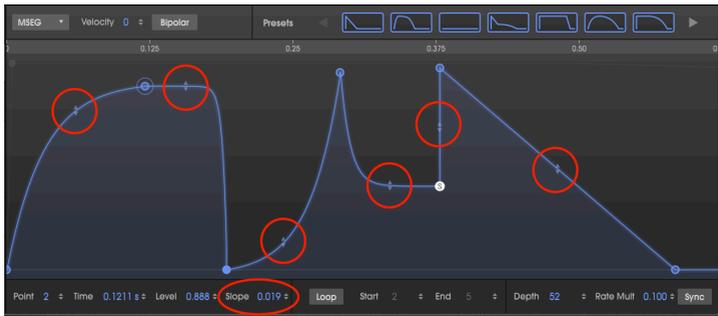
### 5.5.5. Levels

The relative strength of the selected point is set using this parameter. The graphic will change as the level is moved.

### 5.5.6. Slopes

Each point has an adjustable slope that governs the shape or curve of the transition into the next point. Positive values are exponential; negative values are logarithmic.

Click and drag the small arrows inbetween points up or down to change the slope:

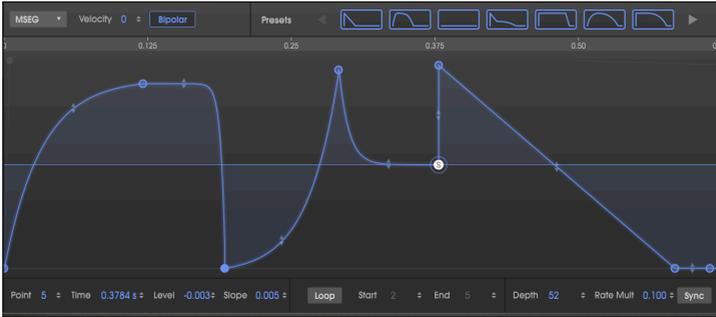


Double-click the numeric Slope field to reset a curve to a linear slope.

## 5.5.7. Bipolar (Pitch and Mod envelopes only)

The Bipolar button sets a center point for an envelope. Values above that point are positive, and values below that point are negative. The level of each point in a non-bipolar envelope will always be a value between 0.00 and 1.00.

In contrast with the previous illustration, here is the same Pitch envelope with the Bipolar button pressed:



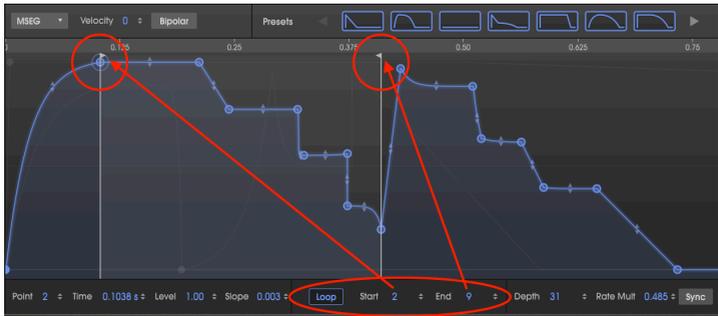
Now the same Pitch envelope has points that are both above and below the center point. Values can be anywhere from -1.00 to +1.00.

## 5.5.8. Looping envelopes



♪: Looping envelopes are available only for MSEG envelopes.

An MSEG envelope can be looped between any two points except the end point. As long as you hold the key, the envelope will keep repeating the stages from Start to End until you release the key.



♪: Points after the loop will not be reached until after the note is released.

Click the Loop button, press a key, and then watch the progress indicator. The envelope will start from the beginning, progress to the end point of the loop, return to the start point of the loop, and repeat that cycle until the key is lifted. After this the envelope will jump to the loop end point and continue through the release stage.

In the above picture the envelope will start at point 1, progress to point 10 (the End flag), return to point 2 (the Start flag), and then loop between points 2 and 10 until the key is released.

When the Loop button at the bottom of the ENVELOPES window is first pressed, the Sustain point of the envelope automatically becomes the end point of the loop. If the End point of the loop is moved, it will become the new Sustain point after Loop is disabled.

### To change the loop points:

- Click on the top of the flag (by the ruler bar) and drag it horizontally to the point you want; or
- Clicking on the Start or End value field and drag it up or down.



♪: It is not possible to use the same point for both the start and end points of a looping envelope. It is also not possible to place the start point beyond the end point.

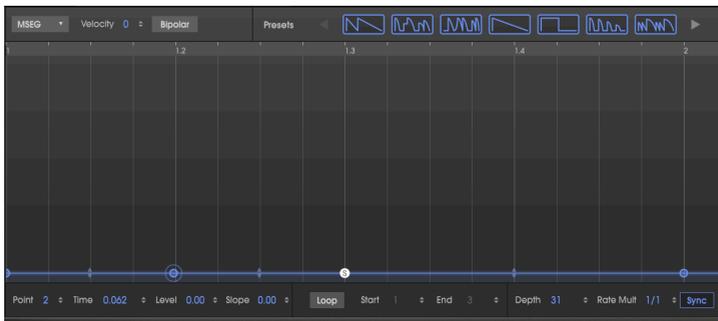
## 5.5.9. Sync

 The Sync button is available only for MSEG envelopes.

When the Sync button (in the lower right corner of the ENVELOPES window) is clicked, several changes happen to the editing window:

- The time ruler shows tempo divisions instead of durations.
- A grid appears in the envelope editing area.
- A different envelope will appear. The unsynced envelope parameters are preserved, but hidden.
- A different set of preset envelopes are available at the top of the window.

This is what you will see the first time the Sync button is pressed:



The default envelope will become very interesting when more points are added! The same procedures are used to add points and adjust their times, levels, and slopes [as in a non-synced MSEG envelope \[p.48\]](#).

However, a synced envelope is different in one way: the placement of new points is affected by a grid. The spacing of the grid becomes finer as you zoom in, and wider as you zoom out.

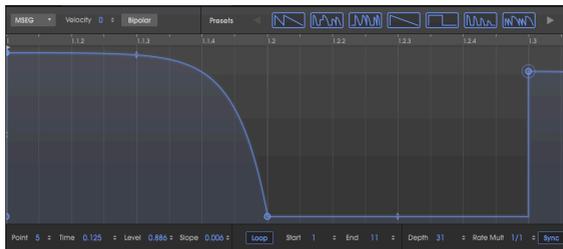
## 5.5.10. Grid and zoom

The easiest way to see how the sync grid display interacts with the zoom is to grab the time ruler and zoom out until an entire measure of 4/4 time is visible, like so:



What you're seeing here is a grid that is spaced at sixteenth notes (4 grid lines per beat), with the first four stages hitting on the eighth notes. At beat #3, it slides down until at beat #4, it jumps to the sustain point.

Now, let's zoom in on that first stage of the envelope at beat #1:



Here, the grid is much finer, with sixteen grid lines from beat #1 to beat 1.3 (the eighth note). Points placed on the grid would be a 64th-note apart.

When you add a new point to the envelope or drag an existing one to a new location, when you get close to a grid line it will tend to snap to the grid, keeping the envelope in relation to tempo. However, you're not restricted to placing them on the grid; you can drag them anywhere you want.

Each stage of a synced envelope corresponds to a rhythmic value. If you are using CZ V as a plug-in, these values are derived from the master tempo of your DAW. What the zoom setting of the envelope window does is determine the resolution of the grid that points will snap to.

Once a point has been added it can be dragged to any one of the 32 locations within a quarter note. The zoom setting merely makes it easier to add a note exactly where you want it within the rhythm.



Changing the resolution does not affect the timing of the current envelope. It only affects where new points can be added. Remember to try the synced envelope templates we have provided! When selected the Loop button is enabled automatically, so you will hear some cool rhythmic effects immediately.

### 5.5.10.1. Preset Envelopes (MSEG Envelopes only)

A quick way to learn about the power of the MSEG envelope type is to experiment with the preset MSEG templates included with the CZ V. These presets are also great starting points for creating your own presets.

The Preset envelopes are displayed above the graphic at the top of the Envelopes window. Two sets of templates are available: one for unsynced envelopes, and a different set that appears when the Sync button in the lower right corner is on. (Synced envelopes are explained [here \[p.52\]](#).)

#### Unsynced MSEG Preset templates

There are ten templates available when the MSEG envelopes are not synced:



Click on a blue arrow to display more presets. These provide basic envelope shapes as well as some other useful shapes that would take longer to create.

#### Synced MSEG Preset templates

There are nine templates available when the MSEG envelopes are synced. Click the Sync button to reveal the preset options:



Click on a blue arrow to display more presets. These envelopes could be used as part of a rhythm track. They also are great starting points for your own rhythmic explorations.

The synced MSEG templates are fully adjustable.

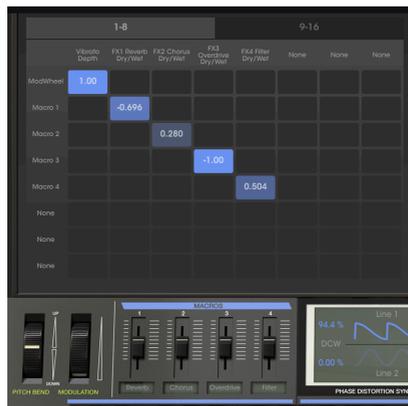
## 6. MODULATIONS

The original Casio CZ-101 did not offer much in the way of controlling parameters dynamically in real time. But the Modulations tab of the Arturia CZ V is loaded with features and concepts that were found only in the most massive modular analog synthesizers of the day. These include a 16-by-16 modulation matrix that can connect any of the 24 mod sources to any of the 51 mod destinations, highly configurable LFOs, and synchronization capabilities. The Modulations tab is the perfect combination of power and possibility, and yet it is very simple to use.



### 6.1. Modulation matrix

The left half of the Modulations page displays the modulation matrix. A modulation matrix is basically a software “patch bay” that allows you to route one or more sources to one or more destinations. The CZ V offers 16 sets of modulation routings on two different tabs labeled “1-8” and “9-16”, with 8 mod routings available per tab. Here’s an example of a simple routing that assigns the modulation wheel to the vibrato depth, and each of the four Macro faders to a separate effect level:



The modulation sources we’ve selected are listed on the left side (row headers) and the modulation destinations we’ve selected are listed along the top (column headers). The blue boxes show the connection and level of modulation from a source to a destination.



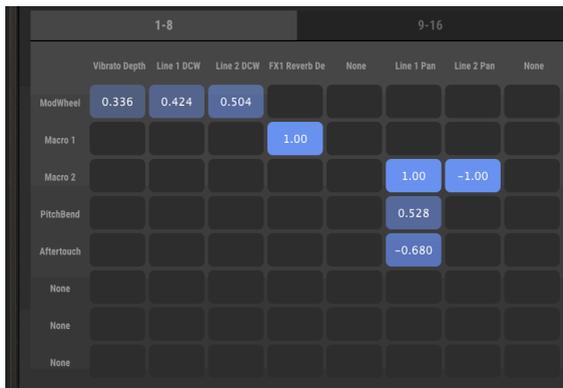
Noticed that we’ve labeled the four MACROS below the matrix with the names of the effects we’re controlling. Simply type in those fields to rename the faders; they don’t get named automatically.

## 6.1.1. How signal flows through the matrix

With so many possible choices in the Mod matrix, it can be confusing at first glance to figure out what is connected to what. It may be helpful to follow the path starting with the source on the left side, trace from left to right until you reach the blue square in the matrix, and then trace upwards to the destination in the top row. Modulations take a path following the red arrows in the illustration below:



The above example maps single sources to single destinations. But you can map one source to multiple destinations, or have one destination modulated by multiple sources, like this:



Each of the 16 mod routings allows up to 8 different sources to be routed to a single destination, or as many as 8 destinations to be modulated by a source.

## 6.1.2. Mod Source to multiple destinations

In the illustration above, raising the ModWheel will simultaneously increase the vibrato depth, and brighten the DCW of both Lines (that is, assuming that the DCWs aren't already maxed out by their DCW envelopes or the DCW level control).

Macro 2 is mapped positively (1.00) to Line 1 Pan, and negatively (-1.00) to Line 2 Pan, so they will cross-pan as you move the Macro 2 control.

### 6.1.3. Mod destination controlled by multiple sources

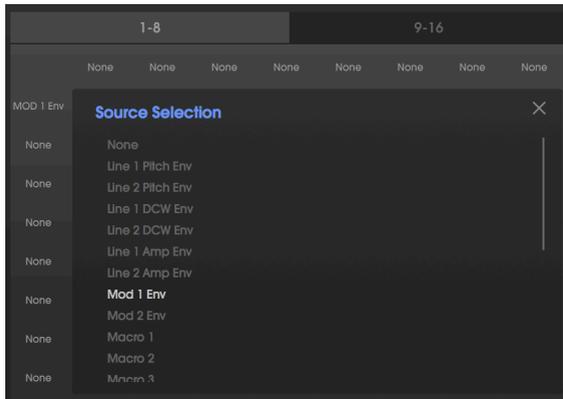
In the illustration above, the Line 1 Pan (in the sixth column) is affected by three sources simultaneously: Macro 2, PitchBend, and Aftertouch, each in different amounts. Bending the pitch wheel will not only cause the pitch of the note to change, it will cause the pan position of Line 1 to shift. Pressing down on a keyboard that has Aftertouch capability will cause the Line 1 Pan to go in the other direction.

! Modulation sources can "fight" each other when mapped to the same destination, or they can add together. But in any case, they can't make a value go greater than the maximum or lower than the minimum. In the above example, if the Macro 2 fader is up full and Line 1 is panned hard right already, moving the pitch bend wheel can't make it go any farther.

### 6.1.4. Connecting Mod Sources to Mod Destinations

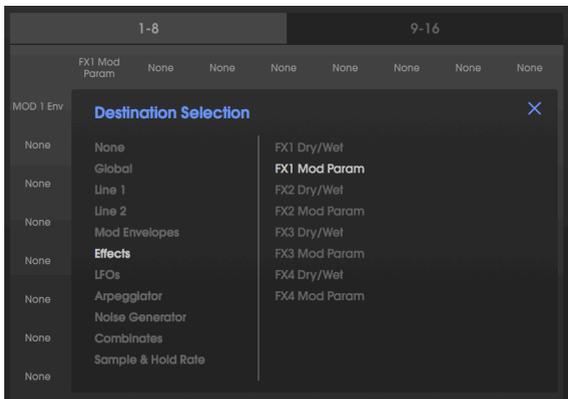
**To select a Mod Source and a Mod Destination:**

I. Click on any of the eight boxes along the left side of the mod matrix to show the Source Selection menu. Scroll down to see the entire list. Click on the one you want:



*If the current selection is OK, click on the X to close the menu.*

II. Click on any of the eight boxes along the top of the mod matrix to show the Destination Selection menu. Click on a category in the left column to show a list of possible destinations for that category, and click on the one you want:



*In the Effects category, FX1 Mod Param is selected.*

III. Click and hold the square in the matrix where the source row and the destination column intersect, and drag up or down to set the level of modulation. As you drag the cursor up and down the amount of modulation will be adjusted. **To fine-tune the setting, hold down the control key as you drag.**



**i**!: Mod matrix levels can be positive or negative. Positive levels do things like increase DCW modulation, pitch, or vibrato level; negative levels decrease them. Notice that the color of the square that represents the connection between source and destination will brighten the higher the level is, in either positive or negative directions.

**To disconnect a source and destination, set the level to zero or double-click on the box.**

### 6.1.5. The 9-16 tab

If you've used up all eight destinations or eight sources on the 1-8 tab, simply click on the 9-16 tab to display an entirely blank set of eight additional sources and destinations.

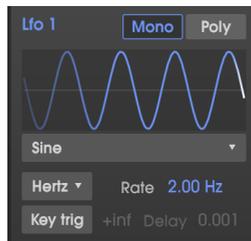


## 6.2. Combos / Lfo / S&H tab

Next to the 9-16 tab for the Mod Matrix is a tab that displays controls of these modulation sources:

- **LFOs** (Low Frequency Oscillators), which generate slow-moving waves that are often used to modulate other parameters like pitch or amplitude, resulting in vibrato or tremolo
- **Sample & Hold**, which takes a momentary "snapshot" of a signal and holds on to that level for a specific period of time, then takes another sample and holds that, and so on.
- **Combine**, which combines two different mod sources mathematically.

### 6.2.1. LFOs



The CZ V has two independent low-frequency oscillators, in addition to the dedicated Vibrato LFO on the top panel. The parameters for LFO 1 and LFO 2 are identical, so the description of each parameter applies equally to both LFOs.

### 6.2.1.1. To select an LFO Waveform:

Click on the name of the wave underneath the LFO wave graphic, and make a selection from the menu:



### 6.2.1.2. S&H LFO Waveform

Most of the other LFO waveform choices are probably familiar to you by now, but the one at the bottom of the menu, **S&H**, needs some explanation. "S&H" stands for Sample and Hold, but it is **not** the Sample and Hold generator to the right of the LFOs. S&H in this case is an independent waveform, sampling and holding a random noise generator to yield a classical random stairstep pattern.



♪: A Sample and Hold filter effect was used by Keith Emerson at the beginning of the song 'Karn Evil #9'. An LFO with a S&H waveform assigned to a closed DCW has a similar effect.

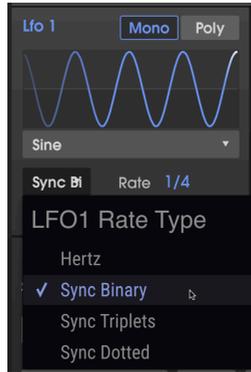
### 6.2.1.3. To change the rate of the LFO:

Click on the Rate data field and drag up or down to increase or decrease the LFO speed.

- The range is from 0.010 to 200 Hz (cycles per second) if the Rate Type is in **Hertz** mode.
- The range is from 1/32 to 8/1 of the master clock if the Rate Type is one of the Sync modes. In this case the LFO speed selections will be musical multiples or fractions of the current tempo of your DAW, or the tempo set in Audio MIDI Settings see [page \[p.9\]](#)).

**Double-click on the Rate field to reset it to the default (2.00 Hz, or 1/2 in a Sync mode)**

#### 6.2.1.4. Rate Type



There are four different ways to set the speed of the LFO:

- **Hertz:** the rate is independently set in a range of 0.01 to 200 cycles.
- **Sync Binary:** the rate is synchronized with tempo, with a setting of 1/4 (quarter note) equalling one cycle per beat.
- **Sync Triplets:** Tempo-synchronized, where 1/4 equals a quarter-note triplet per beat (faster).
- **Sync Dotted:** Tempo-synchronized, where 1/4 equals a dotted quarter-note per beat (slower)

#### 6.2.1.5. LFO Delay

Turn on the Key Trig switch to turn on the Delay. Click and drag the Delay data field to introduce a gradual fade-in of the LFO level. The range is from 0.001 seconds to 20 seconds.

#### 6.2.1.6. Mono/Poly buttons

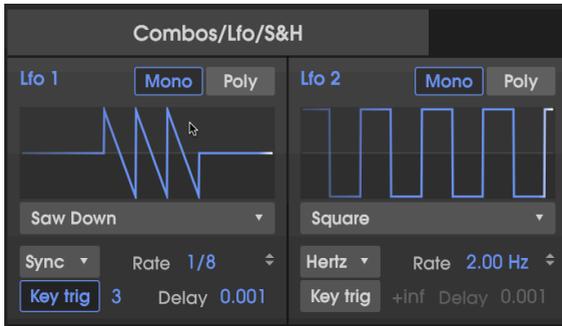
When the Poly (polyphonic) button is lit, the LFO waveform is independent for every note that is played, so that the modulation stage of each note depends on when it was played.

When the Mono button is lit, there is a single LFO waveform for all notes being played, so that the modulation rises and falls in unison.

### 6.2.1.7. Key Trig button and data field

When the **Key Trig** switch is lit, the phase of the LFO will restart from zero each time a new note is played. When **Key Trig** is off, the LFO for each note that is played will rise and fall independently.

The **Key Trig** data field determines how many cycles the LFO will perform when a key is played. The default value of "+inf" (infinity) means that the LFO will not stop as long as the key is held. The other possible values range from 1 (only one LFO cycle when a key is played) to 8 (the LFO will perform 8 cycles, then stop).



In the illustration above, LFO 1's Rate Type is Sync Binary at a Rate of 1/8. **Key trig** is on, with a Key trig setting of 3. When a key is pressed, LFO 1 outputs three Saw Down waves, at the speed of three 1/8th notes. LFO 2 is generating a constant square wave at a Rate of 2.00 Hz because its Rate Type is "Hertz" and its Key trig button is off.

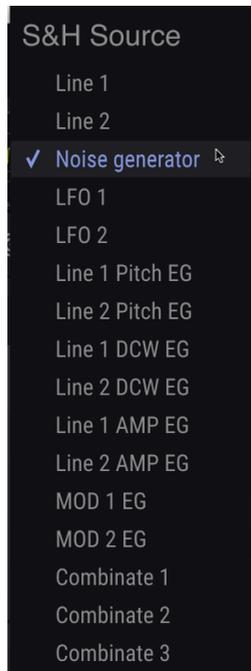
## 6.2.2. Sample and Hold

Sample and Hold is a function generator most commonly recognized by its stairstep appearance. It takes a momentary "snapshot" of a signal and holds on to that level for a specific period of time. Then it takes another sample and holds that, and so on. The resulting signal can then be used as a modulation source in the Mod Matrix (Mod Source = SampleAndHold).



*The Sample & Hold module is sampling random noise into a classic skyline pattern.*

To use the sample and hold generator in the CZ V, the first step is to choose the signal that you want to sample by clicking on the box just underneath the graphic display. Then a pull-down menu appears with the available choices:



### 6.2.2.1. About S&H Sources

- Line 1 and Line 2 are the outputs of the two sound generators in the SYNTHESIS window.
- LFO 1 and 2 are the outputs of the low-frequency oscillators just left of the S&H section. Below is an example of the Sample & Hold output when its source is Lfo 2 and its Rate is a multiple of the Lfo 2 Rate:



- Envelope Generators (EG): Any of the eight envelope generators can be a S&H source, notably the two MOD envelopes that don't control anything until they're used as a modulation source.
- Combine 1, 2, and 3 are mathematical combinations of any two other modulation sources, as explained [below \[p.65\]](#).

### 6.2.2.2. Sample and Hold Rate Type

This functions in the same way as the Sync features elsewhere in the CZ V: when it is in a Sync mode, the Rate is synchronized with tempo. See [Rate Type \[p.61\]](#) above.

### 6.2.2.3. S&H Rate

The Rate control in the Sample and Hold module is similar to the LFO Rate controls, with the exception that when it is in Hertz mode the range is from 0.010 to 40 Hz (instead of 200 Hz maximum).

### 6.2.2.4. S&H Key trig

When Key trig is on, the input source is sampled only once when a key is played; the Rate has no effect. Each time you play a key, a new sample will be taken and held, until the next time you play a key.

### 6.2.2.5. Smooth

This data field smooths out the rough, sharp stairstep edges from sample to sample. Low values keep it sharp, high values smooth them into a more gentle curve at the transitions.

### 6.2.3. Combine

A Combine function is used to generate a modulation source based on the interactions of two other modulation sources. The CZ V provides three of these mathematical marvels for use as modulation sources.

The best way to understand how this works will be to provide a simple example. But first, here's a list of the parameters:

Parameter	Description	Range
SOURCE	The parameter being affected	23 options
MOD	The parameter doing the affecting	23 options
TYPE	Decides the math process that will be applied	5 options
AMT	Controls how much the Mod affects the Source	0.00 - 1.00 in steps of 0.001 (with CNTL key pressed)

#### 6.2.3.1. Combine Source and Mod options

The pulldown menus of sources and mods contain elements you're probably already familiar with: all the envelopes, LFOs, controllers, even the other Combines.

**Keyboard Follow** is unique to this menu, however:

- When used as a **source**, a key must be pressed for the mod to be output. Multiply and Divide have no effect.
- When used as a **mod**, each time a key is played it holds the current value of the source until the key is released.

### 6.2.3.2. An example of Combine

Let's combine two LFOs to illustrate using the combine function :

- Start with the Default preset.
- On the Modulations window, select the **Combos/Lfo/S&H** tab.
- Set LFO 1 to generate a Sine wave, with Rate Type set to Sync Binary , and a Rate of 1/1. Set LFO 2 to generate a Saw Down wave, with Sync on and a Rate of 1/4.
- In Combine 1 (the topmost in the COMBIMATE window), set SOURCE to LFO 1 (Sine), TYPE to Sum (the default), and MOD to LFO 2 (Saw Down).
- Set AMT (Amount) to maximum (1.00).
- Slowly decrease the Amount from 1.00 to 0.00 and watch the waveform. Lower amounts decrease the impact of the Sawtooth wave, as seen in the smaller spikes that eventually disappear into the sine wave.
- Return the Amount to 1.00 and observe the waveform: it leads with a sharp saw edge, then curves down as a sine wave.
- Change the TYPE to Diff (Difference) and observe: now the wave curves up and ends with a sharp drop down. Mathematically the results are at opposite extremes, as are the results here.
- Try changing the TYPE to Multiply, and to Divide. The differences in the math processes are even more extreme, and though the results are too technical to describe, we think you'll agree that the output waveforms are equally complex and useful.



*Combine 1 Type is Sum, Combine 2 type is Diff, Combine 3 type is Multiply, all with LFO 1 as source and LFO 2 as Mod.*

- Select TYPE: Crossfade. This one's easy: with the Amount at 1.00, only the Mod wave passes through, resulting in a Saw Down wave output. In the middle at 0.500, it's a sum of the two waves. At a value of 0.00 only the Source wave passes through, resulting in a Sine wave output.

### 6.2.3.3. Combine formulas

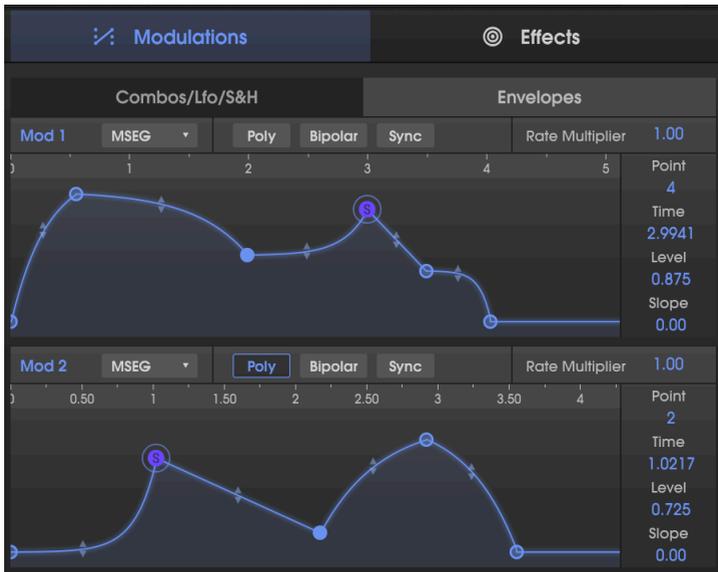
The formulas used to calculate each Type are displayed below in a single chart to see how each formula differs from the others:

Type	Formula
Sum	$\text{Source} + (\text{Mod} * \text{Amount})$
Diff	$\text{Source} - (\text{Mod} * \text{Amount})$
Multiply	$\text{Source} * \text{Mod} * \text{Amount} + \text{Source} * (1 - \text{Amount})$
Divide	$\text{Source} / (\text{Amount} + \text{Mod})$
Crossfade	Amount crossfades Source and Mod



The output of the equations is not allowed to exceed the values of -1.00 and +1.00.

### 6.3. Modulations: Envelopes tab

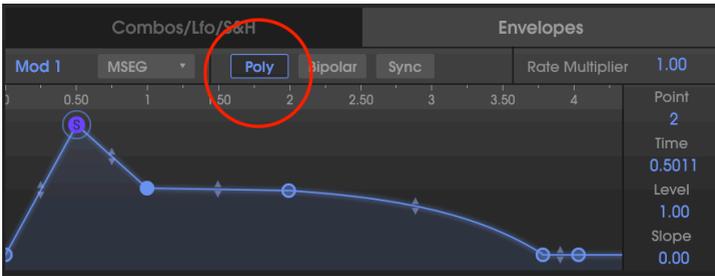


Just as the Synthesis page has shortcuts to the Pitch, DCW, and Amp envelopes, the Modulations page features a shortcut to the two Mod Envelopes. This is for convenience while you are using the Mod matrix. The Modulations/Envelopes tab offers the ability to select the envelope type (CZ, DADSR, or MSEG) without having to open up the Envelopes page.

**i**!: Remember, this is just another way to work with the envelopes for Mod 1 and Mod 2; they are the **same** envelopes shown on the Envelopes page. Changes made here will be reflected there and vice versa.

All of the parameters here have already been explained in the [Envelopes section \[p.39\]](#), except POLY.

### 6.3.1. Mod Envelope Poly



The two modulation envelopes have the capability of being triggered in either single-trigger or poly-trigger mode.

- When Poly is off, each time you play a key, it will retrigger the mod envelope for all notes being played.
- When Poly is lit, each note being played will complete its own envelope without regard to any other notes that are being played.

For example, suppose you assign Mod 1 to Pitch of Line 1 in the Mod Matrix. Mod 1's envelope has a long rise sending the pitch sharp.

- If Poly is off, each time you play and hold a note the Mod 1 envelope will retrigger, sending all notes being played sharp by the same amount, maintaining their harmonic relationship.
- If Poly is on, and you play successive notes of a chord, the notes will independently bend according to the time they were played, and will be out of tune until all envelopes reach their sustain point.

## 7. FX (EFFECTS)

When the original Casio CZ instruments were introduced, “affordable” digital multi-effect units like the Yamaha SPX-90 were first becoming available...at a cost of over \$700. Reverb, chorus, flanging, etc. were too expensive to be built into keyboards at the time.

Times have changed! The Arturia CZ V has digital multi-effects built right in, available under the FX tab on the right side of the central window:



*FX page with a serial chain of four digital effects: a Reverb into a Chorus into an Overdrive into a Multimode Filter. Follow the blue arrows to trace the signal flow. The green controls are available as Mod destinations in the Mod matrix.*

### 7.1. Series and parallel module configuration

The CZ V has a total of four effect modules. Each module can be any one of nine different effects, or left unused. The modules can be arranged in two different ways:

- a chain of four in series, with both Line 1 and Line 2 being processed by all the modules, or
- two parallel chains, with each Line going through its own two modules.



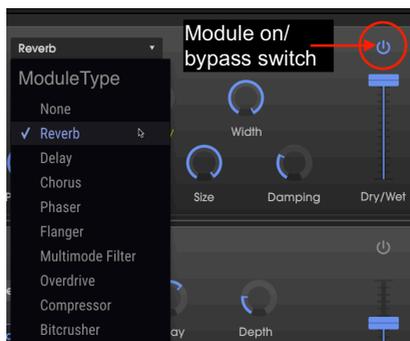
*The same effect modules as in the first illustration, but in parallel mode. Line 1 is going through a Reverb into a Multimode Filter, and Line 2 is going through a Chorus into an Overdrive. Note the addition of the Line 1 and Line 2 volume controls on the right side.*



It may be necessary to adjust the Wet/Dry balance of an effect in order to hear it or the original signal all the way through the FX signal path.

## 7.2. Selecting an effect

To select an effect, click the name field at the top of the effect module. A dropdown menu will appear; click on the effect you want. A check mark indicates the current selection. After an effect is selected the menu will close automatically. To remove an effect from the signal path, either disable it with its on/off button or select None for that FX slot.



## 7.3. Enabling / disabling an effect

To enable or disable an effect, toggle the on/off button to the right of the effect name. This is sometimes referred to as a "bypass" switch.

Audio will still pass through the disabled effect to the next effect or the mix output, but the effect itself will not affect the audio signal.

## 7.4. Editing the effects

Each effect has its own parameters, which will be described in the following sections.

**i** When you hover your cursor over an effect control, the numerical value for the parameter is displayed in a text bubble next to the control, and the name of the control is displayed in the lower tool bar on the left side.

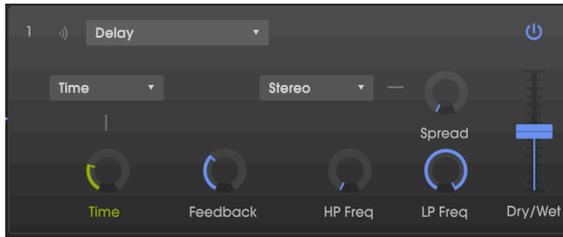
### 7.4.1. Reverb



A Reverb effect creates a large number of echoes that gradually fade or "decay". It simulates how the input would sound in a room or a large space.

Control	Description
Predelay	Sets the amount of time before the input signal is affected by the reverb, from zero to 200 milliseconds.
Decay	Determines the length of time the reverb effect will last. <i>Appears as a Mod Destination in the Mod Matrix.</i>
Width	Adjusts the reverb from mono to an increasingly wide stereo space.
In. Lp filter	Input Low Pass filter: Reduces the high-frequency content before processing. Range 100 Hz to 20 kHz. Default 15 kHz.
In. Hp filter	Input High Pass filter: Filters out low-frequency content below the selected frequency before processing. Range 30 Hz to 10 kHz. Default 200 Hz.
Size	Adjusts the size of the room: counter-clockwise is smaller, clockwise is larger.
Damping	Controls the rate at which the high frequencies decay.
Wet / Dry mix	Controls the balance between the input signal and the effected signal for this effect.

## 7.4.2. Delay



A delay can increase the spaciousness of a sound by providing distinct echoes within the stereo field. It can also be used as a rhythmic counterpoint to accentuate a groove. The Time options let you synchronize the delays with tempo and any other synchronized parameters of the CZ V, and even allow delays in triplet and dotted times.

Control	Description
Time/ Sync	Changes the length of the delay, from 2 ms. to 2 seconds (2000 ms.), or if in a Sync mode, synchronizes the delays according to tempo from 1/32 notes to 8 (every 8 measures), as long as the total delay doesn't exceed 2 seconds. For a description of the Sync binary, Triplets, and Dotted options, see <a href="#">Rate Type [p.61]</a> . <i>Appears as a Mod Destination in the Mod Matrix.</i>
Feedback	Adjusts how many times the delay will repeat.
HP Freq	High pass filter: Higher values reduce low-frequency content with each echo. Range 20 Hz to 10 kHz.
LP Freq	Low pass filter: Higher values reduce high-frequency content with each echo. Range 200 Hz to 20 kHz.
Spread/ Width	Higher values increase the distance between the left and right iterations of the echoes. In Stereo mode, this control is labeled "Spread"; in Ping-Pong mode it is labeled "Width."
Stereo/ Ping- Pong Mode	Toggles between Stereo and Ping-Pong (alternating left/right echoes with exact rhythmic spacing).
Dry/Wet	Controls the balance between the input signal and the effected signal.

### 7.4.3. Chorus



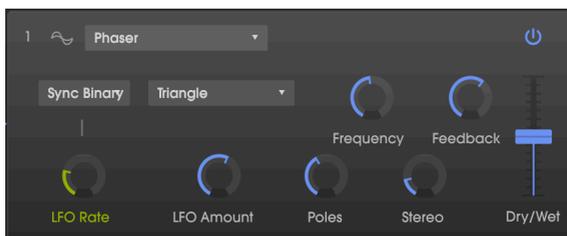
A Chorus delays the signal, then uses a low-frequency oscillator (LFO) to vary the playback speed of the delay, throwing the delayed signal out-of-tune with the input, like vocal doubling. The amount of change in pitch depends both on the depth of the delay range being scanned, and the speed and waveform of the modulating LFO. The effect is similar to a flanger, except that since the delay time of a chorus is longer than that of a flanger, the delayed signal is out-of-tune instead of comb filtering. This results in a more-subtle but still very useful effect.

**i** The Chorus effect is similar in results to the [Unison detune \[p.25\]](#) feature of the CZ V, but it doesn't consume polyphony.

Control	Description
Voices	Selects the number of delay lines the chorus will use (from 1 to 3), with a different starting phase for each voice.
Delay	Sets the amount of delay applied to the input signal, from 0.6 to 20 ms.
Depth	Controls the depth of the chorus (e.g., how far above and below the incoming pitch) by adjusting the range of time that will be scanned.
Shape	Toggles modulation LFO between sine and square waveforms.
Frequency	Adjusts the speed of the chorus (the frequency of the scanning LFO).
Feedback	Controls how much of the output is fed back into the input, creating more harmonics. <i>Appears as a Mod Destination in the Mod Matrix.</i>
Stereo	Switches between mono and stereo output.
Dry/Wet	Controls the balance between the input signal and the effected signal. <b>Note: Chorusing is most effective when there is a mixture of wet and dry signal, so there are beat frequencies between them.</b>

**i** There is a crucial relationship between Depth and Frequency. If Depth is high but Frequency is low, the effect is of a subtle de-tuning. As Frequency is increased, the result is more like a vibrato where the LFO frequency is obvious.

## 7.4.4. Phaser



A phaser uses a steep multipole filter whose frequency can be modulated by an LFO, sweeping across the spectrum of the input, causing that familiar “whooshing” sound. It is similar to flanging, but is filter and phase-based instead of time-based.

Control	Description
Hertz/Sync (Rate Type )	Sets the mode of the LFO Rate control beneath it. See <a href="#">Rate Type [p.61]</a> .
LFO Wave	Selects one of six modulation waveforms: Sine, Triangle, Saw, Ramp, Square, or SampleAndHold (which is an independent random S&H).
Frequency	Sets the harmonic center for the modulation effect.
Feedback	Controls the amount of phaser resonance.
LFO Rate	Controls the speed of the phaser effect, with sync options and without. <i>Appears as a Mod Destination in the Mod Matrix.</i>
LFO Amount	Determines the depth of the modulation effect. If depth is 0, the filter frequency stays in one position.
Poles	Determines the steepness of the filter frequency response from 2 (subtle) to 12 (extreme).
Stereo	Gradually changes the phaser from mono to stereo output.
Dry/Wet	Controls the balance between the input signal and the effected signal.

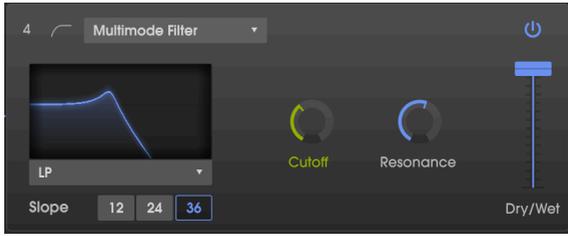
## 7.4.5. Flanger



Flanging works by mixing two nearly-identical signals together, with one signal delayed by a small and gradually changing period. This produces a swept “comb filter” effect as the delayed signal adds and subtracts from the original due to phase cancellation at multiple frequencies simultaneously.

Control	Description
Stereo	Switches the flanger output between mono and stereo.
LP Freq	Low Pass Filter, range 1 kHz to 20 kHz. Use this to reduce the range of high-frequency content that will enter the flanger effect. Double-click to set to the default of 10 kHz.
HP Freq	High Pass Filter, range 30 Hz to 800 Hz. This rolls off low-frequency content that the flanger effect will receive. Double-click to set to the default of 125 Hz.
Shape	Toggles the modulation LFO between sine and triangle waveforms
Polarity	Changes flanger feedback to subtractive (negative) rather than additive
Feedback	Adds feedback for a harsher or “ringing” sound, similar to a resonant filter. Maximum is 99% to avoid runaway feedback.
Delay	Sets the base delay frequency, which changes the spacing and frequency of the resulting comb filter.
Depth	Sets the range of delay time that will be scanned around the base frequency. When Depth is 0, the comb filter stays at a fixed position set by the Drive control.
Frequency	Controls the “sweep speed” of the flange effect. In Hertz mode, the range is from 0.005 to 10 Hz, or if in a Sync mode, speed of flanging is synchronized with tempo. For a description of the Sync binary, Triplets, and Dotted options, see <a href="#">Rate Type [p.61]</a> . <i>Appears as a Mod Destination in the Mod Matrix.</i>
Dry/Wet	Controls the balance between the input signal and the effected signal. <b>Note: flanging characteristics are strongest when there is a mix of dry and wet signals.</b>

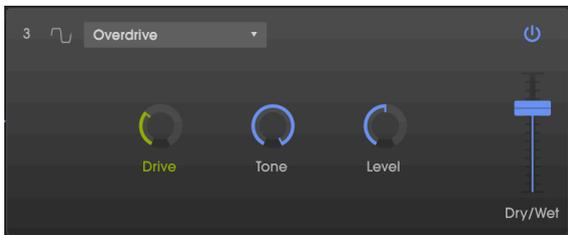
## 7.4.6. Multimode Filter



This analog filter model inserts one of 5 different kinds of filter into the FX chain. It can act in low pass, high pass, band pass, and two comb filter modes. Each pass filter is available in 12-, 24-, and 36 dB per octave slopes.

Parameter	Description
Mode	Select from 5 options, including LP (Low Pass), HP (High Pass), BP (BandPass), Comb FB and Comb FF
Slope	12-, 24-, or 36 dB per octave: sets how steep the rolloffs will be for the pass filters. (Not present for Comb filters.)
Frequency	Sets the frequency of the filter. <i>Addressable in the Mod Matrix.</i>
Resonance	Emphasizes the cutoff frequency.
Wet/Dry Amount	Controls the balance between the input signal and the effected signal. <b>Note: if you want to use this as a pass filter in the FX chain, this effect that should be 100% Wet (fader all the way to the top).</b>

## 7.5. Overdrive



The Overdrive effect will add a certain "fuzziness" to the sound. The tone control will adjust the brightness of the output. This is modeled after a "solid-state" circuit being distorted.

Control	Description
Drive	Sets the overdrive amount.
Tone	Adjusts the high frequencies of the sound, smoothing it or adding a harsher edge.
Level	Use this to compensate for increased output gain caused by the other settings.
Dry/Wet	Controls the balance between the input signal and the effected signal.

## 7.6. Compressor



A compressor is an automatic level control. If a signal rises above a certain level (the threshold), the compressor lowers the signal output to compensate (at low Ratios) or won't let it rise at all (high Ratios, also called "limiting"). It is generally used to help maintain a consistent level of sound, though there are many other ways to use it.

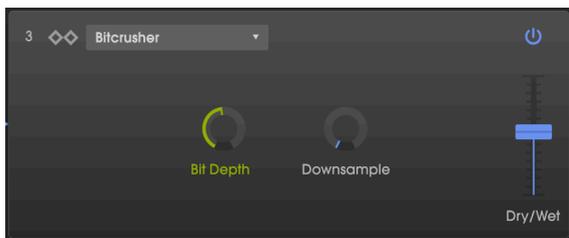
For example, it can keep the attack transients of a sound from overloading the input of the next effect. It can also help a sound which would normally decay quickly to sustain longer.

The graphic in the window shows you the gain curve slope. It also features a gain reduction meter that will show you how much the compressor is reducing the gain, if the input signal is greater than the threshold and the ratio is greater than 1:1.

Control	Description
Attack	Adjusts the speed with which the compression will be applied after the threshold is reached, from 0.01 to 1000 ms.
Release	Sets the release time of the compressor, from 1 to 2000 ms.
Threshold	Sets the level where compression will begin, from -60 dB to +20 dB.
Ratio	Determines the amount of compression to be applied once the threshold is reached. A setting of 4 means 4:1: if the input signal is 4 dB over, output will rise only 1 dB.
Output Gain	Use this to compensate for changes in volume if compression settings lower the volume too much.
Makeup	When on, automatically increases or decreases output level to compensate for Threshold setting.
Dry/Wet	Controls the balance between the input signal and the effected signal.

**Note:** for most applications, a compressor should be in the 100% "Wet" setting. |

## 7.7. Bitcrusher



This bit-reducing effect offers several ways to deconstruct the sound. As the number of bits used to express the sound is reduced, details will gradually disappear.

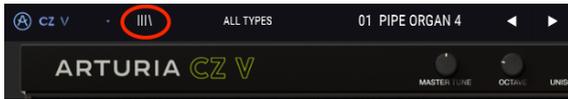
Downsampling is another form of audio entropy that can provide just the right measure of de-evolution to your sound. As the sample rate is reduced, aliasing is introduced in the higher harmonics, which can produce sub-harmonics as well. For a truly lo-fi experience, the sample rate can be reduced to as low as 1/80th of the original.

Control	Description
Bit Depth	Reduces the number of bits used to render gradations in amplitude. Range: 1.50 to 16.0 bits.
Downsample	Lowers the sample rate used to represent harmonic content. Range: 1.00x to 80.0x.
Dry/Wet	Controls the balance between the input signal and the effected signal.

## 8. PRESET BROWSER

In chapter 3 we gave you a brief introduction to the [preset library \[p.14\]](#), and how to access sounds through the [preset list \[p.14\]](#). Once you're making your own custom presets, it's likely you'll generate so many different sounds that you need a Search tool to find them when you need them. The preset browser is how you search, load and manage sounds in the CZ V. It has a couple of different views but they all access the same banks of presets.

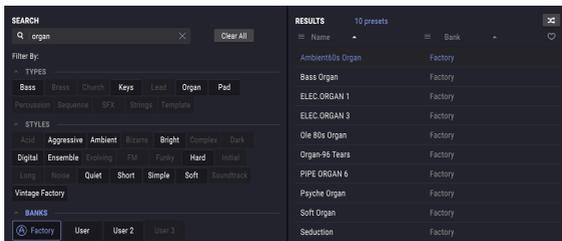
To access the search view, click the browser button towards the left side of the upper toolbar (the icon looks a bit like books on a library shelf).



To exit the Preset Browser, click on the blue "X" in the upper left menu, in the same place where the browser button was.

### 8.1. Searching presets

The Search screen is divided into three sections: Search, Results, and Preset details. Click on the Search field at the top left (next to the magnifying glass), enter a word or term you're searching for, hit return, and the Results column will be updated to show the results of your search.



In the example above, the word "organ" was typed into the Search field. This displayed all presets in the Factory bank that have that word in the preset name, because the other filters beneath it (TYPES, STYLES, and the User banks) were not selected. Search terms can be any letters or numbers, they don't have to be words. Note that several TYPES and STYLES are highlighted; this means that the browser found those types and styles among all the results in the window. Note also that there are presets with the word "organ" in User and User 2, but not in User 3. But whatever those are, they're not showing as a result because those banks aren't highlighted in blue.

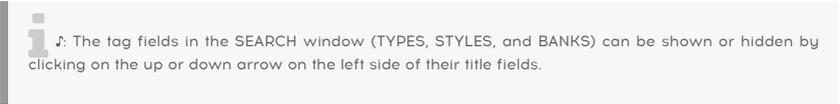
- **Click on any name in the Results field** to recall it.
- **Double-click on the name** to recall it and leave the preset browser page.
- **Click the "X" on the right of the Search field** to clear the name, or
- **Click on Clear All** to clear all filters at once and restore the Results field.
- **Control-click (PC) or Command-click (Mac)** on multiple BANKS to include all of them in the search.

## 8.2. Using tags as a filter

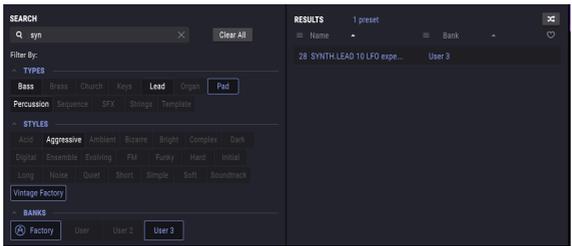
You can also search using different tags. For example, by clicking on the Keys option in the TYPES field you will see presets that have selected that tag.

You can also select more than one Type by holding Cmd (macOS) or Ctrl (Windows) and then clicking the desired Types. For example, if you aren't sure whether the preset you're looking for was tagged with Keys or Pad, select both to broaden the search.

Next to the Name list (which can be shown in reverse alphabetical order by clicking the down arrow at the top of the name list) is a column that can display either the Type, Designer, or Bank of the presets, by clicking on the column heading and selecting one. Click on the down arrow at the right side of this column heading to show these in reverse order.



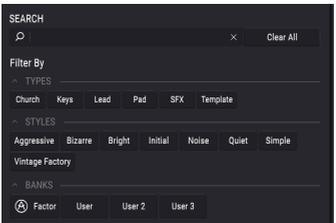
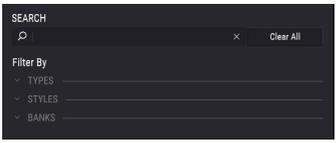
You can use multiple search fields to perform narrower searches. By entering a text search and also specifying the Types, Styles, and Banks options, you will see only the presets that match those exact criteria. Deselect any tag in any area to remove that criteria and widen the search without having to go back and start again.



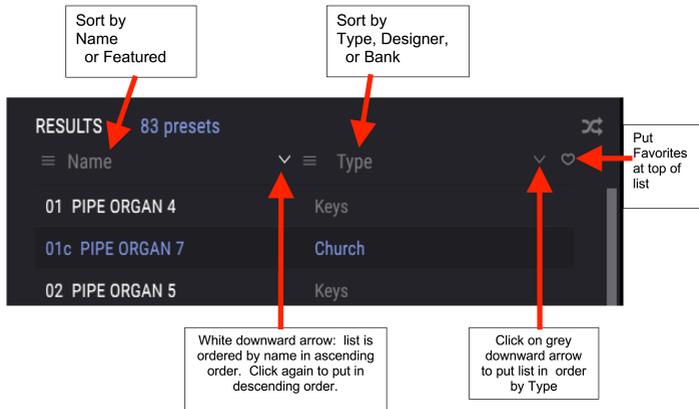
*The search term is Syn, the Type is Pad, and the Style is Vintage Factory. The only preset in the library that meets those three criteria is Synth.lead 10 LFO experiment.*

## 8.3. Tag category windows

The Tag category windows may be collapsed and expanded using the up/down arrows near their names.



## 8.4. Results window



Click the options menu button in the first Results column to specify whether you want to view the presets by Featured or by Name. Click the sort arrow once to sort by that option, click again to reverse the alphabetical order.

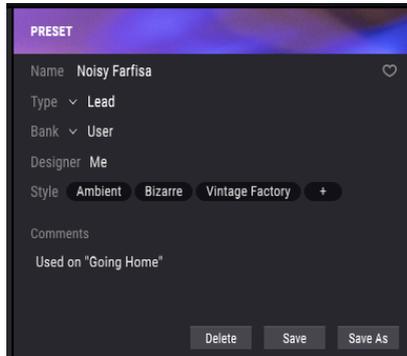
Similarly, click the options menu button in the second Results column to order the display results by Type, Designer, or Bank tags. Click the sort arrow to reverse the alphabetical order.

As you explore and create presets you can mark them as Favorites by clicking the heart next to their names in the Preset Info section. Afterwards, you can click on the heart icon in the Results window to put all of your favorites at the top of the Results list.

Use as many of the sorting and filtering features as you need and you will find the exact sound you want every time.

## 8.5. The Preset Info section

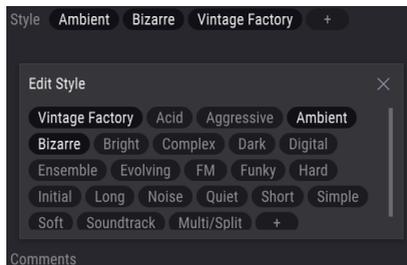
The right side of the browser window shows specific information about each preset. The information for User presets may be changed here: Name, Type, Bank, Designer, Style, Comments, and Favorite.



To make changes to the Name, Designer, and Comments, simply click on the data entry fields.

The downward arrows next to the Type and Bank fields open popup windows that display the current choices. If none of them fit, see [Making new tag categories \[p.84\]](#).

To select Styles, click on the + sign to open a popup window with the current choices. If none of those Styles fits, define a new style by clicking on the + sign inside the popup window.



Comments can be very useful...for example, entering the search term "Home" would result in the patch above being listed in the Results column, since the comment says it was used in the song "Going Home", plus any other presets that have the word "Home" in their data.

**Click Save when you are done.**

### 8.5.1. Making new tag categories

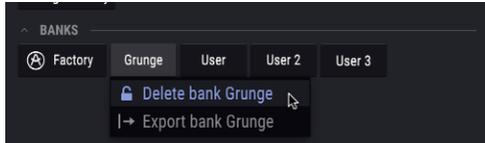
You can define your own styles, types, and banks on the right side of the preset browser, in the preset info section. However, the current preset must be in the user bank. If you want to change the tags of a factory preset, perform a **Save As...** first.

1. In the SEARCH column, select a User bank (or multiple non-factory banks by holding Control (PC) or Command (Mac) while you click).
2. Select a preset from the Results column.
3. In the Preset info section on the right side, click on the existing Type field and enter the new tag name.
4. To start a new bank, enter a new bank name in the Bank field.
5. To add a new Style, click on the "+" on the right side of the list. This will open a popup window with all the existing styles, and any styles the preset is already using highlighted.
6. Click on the "+" inside the STYLES popup menu. Then write in your new style.
7. Click Save at the bottom of the Preset info column.

After you've made a new tag category, it will appear as an option in the search window.

**To delete a tag category from the list**, uncheck it from every preset that has it. You cannot delete tag categories that are used in factory presets.

**To delete an entire bank**, right-click on the bank name, and a pull-down menu will appear with the options to delete, or export the bank.



**i**!: If you click on Delete bank, a window will pop up warning that all the presets in that bank will also be deleted. This operation cannot be undone.

### 8.5.2. Edit information for multiple presets

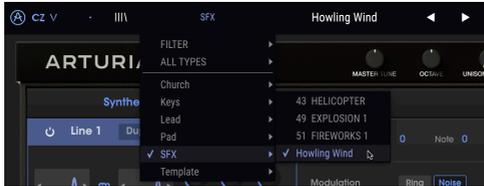
If you'd like to move several presets to a different bank while preparing for a performance, or enter a single comment for several presets at the same time, it's easy to do. Simply hold the Control key (Command key for macOS) and click the names of the presets you want to change in the Results list. Then enter the comments, change the Bank or Type, etc., and click Save.

**i**!: If you want to alter the information for a Factory preset you must first use the Save As command to re-save it as a User preset.

## 8.6. Preset selection: other methods

Various features in the upper toolbar to the right of the Preset Browser icon provide a different way to select presets. The first field is a shortcut to the current Filter, and clicking on it will display the presets that fit the search terms and filters you last used in the Search field. So if you searched for the word "Bass" in the main search area, the results of that search will appear here. Similarly, if you previously selected Type: Keys and Styles: Aggressive in the Search tag fields you would see the results of that search in this area instead.

This field also offers a shortcut to Type category filtering. Below, by clicking on "Howling Wind", the Filter field will show "SFX" and the arrows to the right of the preset name will scroll through the four presets in the SFX category.



Selecting the All Types option in the pull-down Filter menu, and clicking on any preset in the submenu, will clear all the Search criteria and show the entire list of presets each time you click on the Name field of the upper toolbar.

The left and right arrows in the toolbar cycle up and down through the preset list: either the full list when the filter field says "All Types", or the filtered list that resulted from the use of one or more search terms or tags.

## 8.7. Playlists

In the lower left corner of the Preset Browser window is a feature titled Playlists. This is used to collect presets into different groups for different purposes, such as a set list for a particular performance or a batch of presets related to a particular studio project.

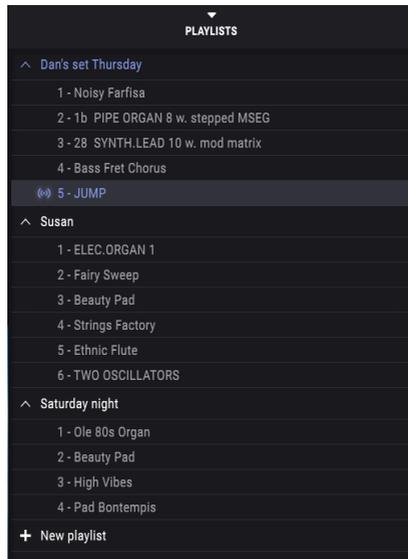
### 8.7.1. Add and name a playlist

To create a playlist, click anywhere inside the Playlists field at the bottom of the SEARCH side of the Preset Browser, and click **+ New playlist**.

Give the playlist a name and it will appear in the Playlists menu. You can rename the playlist at any time; just click the pencil icon at the end of its row.

### 8.7.1.1. Adding presets to a playlist

You can use all of the options in the Search window to locate the presets you want to have in your playlist. Once you have found the right preset, simply click and drag it onto the playlist name.



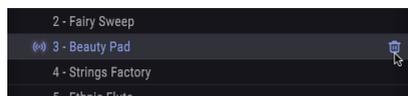
To hide or reveal the contents of a playlist, click on the playlist name.

### 8.7.1.2. Re-order the presets

Presets may be reorganized within a playlist. For example, to move a preset from slot 1 to slot 3, drag and drop the preset to the desired location. This will cause the other presets to be bumped up in the list to accommodate the new location of the preset being moved.

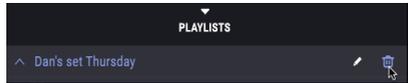
### 8.7.1.3. Remove a preset

To delete a preset from a playlist, move the cursor to the preset and click the Trash icon at the end of the preset row.



## 8.7.2. Delete a playlist

To delete an entire playlist, click the Trash icon on the right side of the playlist name. This will only delete the playlist; it will not delete any of the presets inside the playlist.



## 9. MIDI CONTROLLERS AND CONFIGURATIONS

### 9.1. MIDI Learn controller assignment

The MIDI plug icon at the far right side of the upper toolbar places the instrument into MIDI learn mode. MIDI-assignable parameters will be shown in purple, which means you can map physical controls to those destinations inside the instrument. A typical example might be to map a physical expression pedal to the Master Volume control, or buttons on a controller to the Preset selection arrows so you can change the preset from your hardware keyboard.

**i**: While the CZ V is in MIDI learn mode, you can't edit any parameters. Click on the MIDI icon to leave MIDI learn mode.



In the image above, the Master Volume control is red. That means it has already been assigned to an external MIDI control. It can be [reassigned \[p.89\]](#), though.

There are MIDI-assignable parameters inside all four advanced programming tabs. In the **Envelopes** window, Velocity, Kbd Follow, Depth (or Level), and Rate Mult are usually assignable to MIDI controllers. On the **Modulations** page, LFO wave and Rate parameters are addressable, as well as Rate and Smooth for Sample and Hold.

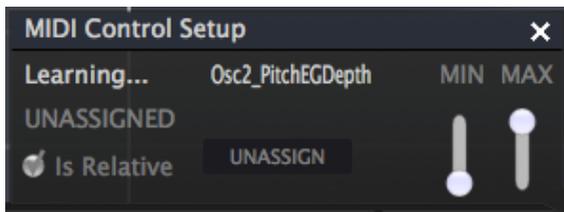
MIDI-addressable parameters in the **FX** window depend on which modules are currently enabled:



### 9.1.1. Assigning / unassigning controls

If you click on a purple area you'll put that control into learning mode. Transmit a MIDI Controller message from your controller (by moving a physical knob, fader, or button) and the target goes red, indicating that a link has been made between the hardware control and the software parameter. There's a popup window that displays which two things are being linked, and an Unassign button that will disconnect the two.

You can also right-click on a control to unassign it.



### 9.1.2. Min / Max value sliders

In the popup window notice the minimum and maximum value sliders ("Min" and "Max") that you can use to restrict the range of the parameter response to something other than 0-100%. For example you might want to limit the master volume slider to a range of 30-90%. If you made this setting (Min set to 0.30 and Max set to 0.90) your physical knob would be unable to alter the volume lower than 30% or higher than 90%, no matter how far you turned it. This is very useful for making sure you can't accidentally make the sound too quiet or too loud when performing.

In the case of switches which only have two positions (On or Off, Linear or Exponential, etc.), those would normally be assigned to buttons on your controller. But it is possible to toggle those with a fader or another control if you like.

### 9.1.3. Relative control option

The final option in this window is a check box labelled "Is Relative". It is intended for use with a specific type of control: one which sends only a few values to indicate the direction and speed at which a knob is turning, as opposed to sending a full range of values in a linear fashion (O-127, for example).

To be specific, a "relative" knob will send values 61-63 when turned in a negative direction and values 65-67 when turned in a positive direction. The turn speed determines the parameter response. Refer to the documentation of your hardware controller to see if it has this capability. If so, be sure to switch this parameter on when setting up its MIDI assignments.

When configured this way, movements of the physical control (usually a knob) will change the software parameter by starting at its current setting, rather than being an "absolute" control and snapping it to some other value as soon as you start to move it. This can be a great feature when controlling things like volume, filter, or effect controls, since you won't usually want them to jump noticeably from their current setting when they are modified.

### 9.1.4. Reserved MIDI CC numbers

Certain MIDI Continuous Controller (MIDI CC) numbers are reserved and cannot be reassigned to other controls. These are:

- Pitch bend
- Modulation wheel (CC #01)
- Expression controller (CC #11)
- Sustain (CC #64)
- All Notes Off (CC #123)
- Aftertouch

All other MIDI CC numbers may be used to control any assignable parameter in the CZ V.

## 9.2. MIDI controller configurations

There's a small arrow at the far right hand side of the toolbar that opens the MIDI controller configurations menu. This allows you to manage the different sets of MIDI maps you may have set up for controlling the instrument's parameters from MIDI hardware. You can copy the current MIDI assignment setup or delete it, import a configuration file, or export the currently active one.

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



There are several options shown in the graphic above:

- **Default** gives you a starting point with predetermined controller assignments
- **Empty** removes the assignments of all controls; the check mark indicates that it is currently active
- **Currently Used** will be selected automatically whenever an assignment is changed

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