VECTOR

User Manual

CONTENTS

1   INTRODUCTION

Welcome to Vector, a digital hardware synthesizer combining elements of several synthesis methods into a very special expressive blend.

The user manual is organized as follows:

- **Quick start guide** shows how to go from zero to sound in a short time while showing the major features.
- **Overview** contains detailed description of all Vector's features and main concepts (such as the Orbiter or Corners) as well as the principles of the sound synthesis method.
- **Configuration** shows available settings and presets.
- **Specifications** documents MIDI implementation or available connections.

Note:

Vector is still evolving which means this manual is being updated accordingly. Please check docs.vectorsynth.com for newer versions.

2   QUICK START GUIDE

The quick start guide will lead you from zero to sound and show some of the most important features of Vector. For a comprehensive description of the machine and its sound synthesis engine, see the Overview section.

1. First, make sure the hardware is set up properly:

   - Connect a MIDI controller to the USB or MIDI IN jack.

   - Connect headphones to the Phones jack.

   - Connect the provided power supply and turn on Vector.

2. After Vector starts up, it shows the **Orbiter screen** ☽ – it is called after the blue orb which moves along a certain trajectory. Make sure the **Control** switch is in the Auto position.

3. Hit the **Focus** button twice. The blue orb moves to the first (top left) Corner.

4. Play a note and experiment with the five knobs just below the display which control the Corner parameters (**Overtone Gen 1 and 2**, **Overtone Blend**, **Filter Cutoff** and **Filter Resonance**).

5. Hit Focus again to move to the next Corner and create a different sound by playing a note. Each Corner has its own set of parameters.

6. Hold the Focus button to exit the focus mode. Notice the blue orb is moving along the trajectory again. Now, when you play a note, all four Corners are playing simultaneously and their mix is determined by the position of the green orb. Explore the periodic modulation.

7. The trajectory can be moved on the touchscreen or warped on the **Warp Pad**. Try the different shapes and speeds.

8. Next, try the **Arpeggiator**. Make sure the **Active** switch in the Arpeggiator section is turned on and that the **Feed Direction** switch is set to **Arp** or **Both** and slowly blinking. If it isn't, enable the **Feed button**.

9. Play a chord to trigger the arpeggiator. You can transpose octaves of the individual steps in the top part of the **Effects screen** ⦙⦙. You can also use the **Octave Walk** ⌨ to enable octave randomization.

10. Try the **Delay**. Set the **Feed Direction** switch to **Delay** or **Both** and the **Delay** knob in the Mixer section to approximately 50%. Play with the **Delay Time** and **Delay Feedback** on the **Effects screen** ⦙⦙.

11. Play with **Chorus** and **Reverb** in a similar fashion (except the Feed Direction has no effect here).

12. Move to the **Presets screen** 💾 and try another preset from the **Factory presets** collection to explore more sound possibilities!

3   OVERVIEW

Vector is a digital desktop synthesizer based around the Orbiter. Four separate sound generators (Corners), each with a separate blend and filter stages, are mixed together based on the Orbiter position in a 2D space and the final mix is then processed by various effects. The Corners are triggered either by notes sent from an external MIDI controller or from an internal Arpeggiator.

Vector's control elements consist of a touchscreen display, 25 encoders, 7 toggle switches, and 4 buttons with status LEDs, all grouped into various sections on the Front panel.

Furthermore, the display is divided into a few screens:

- ☽ **Orbiter Screen**, the main screen with Orbiter,
- ♯♯♯ **Effects Screen**, a "secondary" screen with effects controls,
- ▤ **Presets Screen**, which allows factory and user Presets to be loaded and stored, and
- ⚙ **Settings Screen** with Global settings (MIDI etc.).

Orbiter screen is the main screen which appears on power-up and allows access to the "secondary" Effects screen. The Presets and Settings screens are accessible from the Effects screen.

3.1 Orbiter

Orbiter is at the heart of Vector. Each **Corner** (6) of the universe, or rather, the two-dimensional space (1), is formed by two Overtone Generators, Overtone Blend, and a filter.

The space also contains two orbs, blue (4) and green (5). The blue orb follows a given trajectory within the two-dimensional space, which is determined by Warp. The green orb orbits around the blue orb in a circular motion. This motion is referred to as Suborbit and its speed can be synchronized to the master Tempo. **Suborbit Size** and **Suborbit Speed** can be controlled by dedicated knobs. The whole mechanism is called the Orbiter.

When a note is triggered, all four Corners play simultaneously and the final mix point of their outputs is determined by the green orb's position.
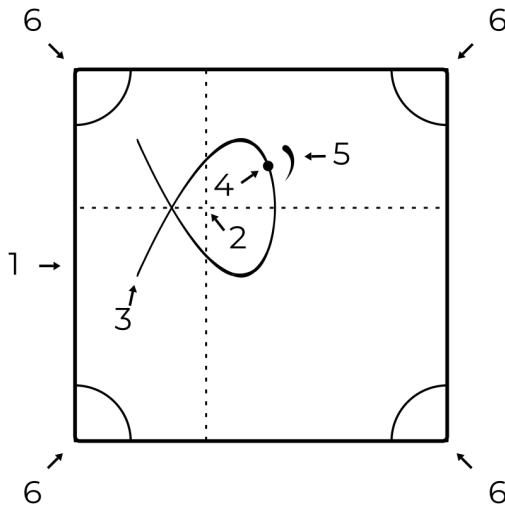
The centre point (2) as well as the rotation and size of the Orbiter trajectory can be set from the touchscreen interface. When **Retrigger** •→ is enabled, the Orbiter motion always starts from the beginning of the shape – its zero phase (3) – on note input or after each cycle of the Arpeggiator sequence. Note that the zero phase can be changed by Warp.

Hints

- To control the movement of the Orbiter manually, press the Focus button once to stop the Orbiter movement along the warped trajectory.
- The centre point of the Orbiter can be also controlled by MIDI Control Change (CC) messages.
- If your MIDI controller supports aftertouch, try routing it to the Suborbit Speed CC.

3.1.1 Corners

Corners are the origin of sound synthesis in Vector.

Each of the four Corners consists of two **Overtone Generators** with six specific overtone patterns. The two generators are combined by the **Blend** block – additive in the first half (G1+G2), phase-modulated in the second (G1×G2). In addition, each of the Corners has an associated filter which can be placed after Generator, Blend or Mix in the Corner Matrix.

All four Corners play at the same time and the resulting **Mix** is modulated by the position of the Orbiter.
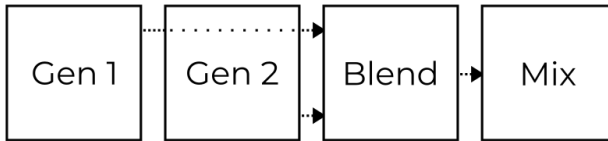
Each Corner is controlled by five parameters (**Overtone Gen 1 and 2**, **Overtone Blend**, **Filter Cutoff** and **Filter Resonance**) which are assigned to the five knobs just below the display. These knobs increase or decrease values of the selected Corners' parameters.

The individual filters' resonances are limited by the **Master Resonance** knob.

 Hint:

The Corners under editing can be changed in the Corner Matrix accessible by the **Corner Select** button.

3.1.2 Overtone Generators

The **Overtone Generators** produce overtones (harmonics) in six specific patterns as described in the table below. For a familiar mental model, It might be useful to think of the overtone patterns in a similar way as you would think of accordion or organ registers.

Overtone number

Overtone pattern	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	…	
A	+	-								-						…	Even-ish
B	+	-				-				-				-		…	
C	+	+		+		+		+		+		+		+		…	
D	+		+		+		+		+		+		+		+	…	Odd-ish
E	+	-				-				-				-		…	
F	+		-								-					…	

Patterns A–C include even-*ish* overtones while patterns D–F are more odd-*ish* (note that the 1st overtone, the fundamental, is always present). Some overtones are present with positive and other with negative amplitudes, making it possible to subtract overtones when blending two patterns together.

The amplitudes of the overtones decrease such that the amplitude of the n-th overtone is either $1/n$ or $-1/n$, depending on the sign in the table.

 Hint:

The blend of overtone patterns C and D produces a sawtooth waveform.

3.1.3 Overtone Blend

The Overtone Generators 1 and 2 can be blended together using the **Overtone Blend** knob. When the knob is in the centre position, the resulting set of overtones equals to Generator 1 (while Generator 2 is ignored).

Outside of the centre position, Blend operates in two different modes:

- When moving the knob to the left from the centre, the two generators are blended **additively** and the Overtone Blend knob determines the amount of Generator 2 overtones added to or subtracted from the overtones produced by Generator 1 (depending on the +/- signs in the Overtone Generators table), with the leftmost position corresponding to G1+G2.

- When turning the knob to the right from the centre, the two generators are **phase-modulated** (marked as G1×G2). In this mode, Generator 1 is a carrier and Generator 2 is a modulator while the Overtone Blend knob determines the amount of the modulation.

3.1.4 Corner Matrix

The **Corner Matrix** is accessible on the **Orbiter screen** ☾ through the **Corner Select** button and allows for

1. selection of the Corners under editing (with **Single** or **Multi** selection possible), and

2. versatile configuration of four independent filters (each filter can be placed to any point in the synthesis engine pipeline or **Bypassed**).
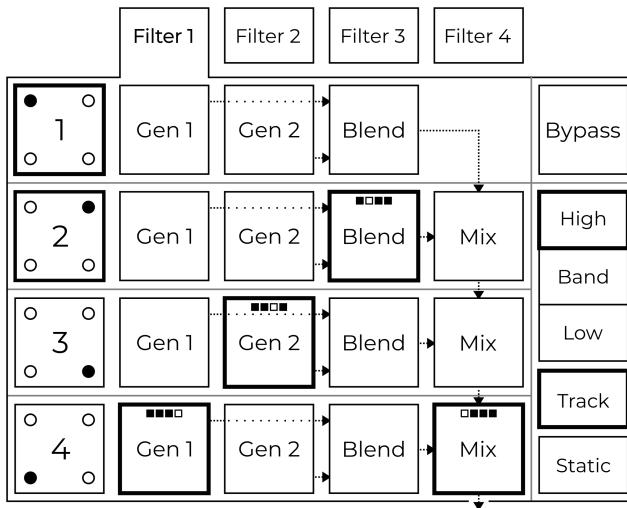
The picture above shows the Corner Matrix interface with four tabs representing each filter and four rows corresponding to each Corner.

To select Corners for editing, tap one or more of the buttons (labeled 1 to 4) in the first column. The selected Corners can then be controlled by the five Corner parameters knobs just below the display.

To slot a filter, select one of the four filters on the tabs (labeled Filter 1 to Filter 4) and then tap one of the elements in the Corner Matrix. The filter is then placed between the selected element's output and the next element's input.

In this particular example, Filter 1 is currently under editing and it is configured as a high-pass filter tracking the fundamental frequency of played notes. Filter 2 is placed after Blend of Corner 2, Filter 3 is placed after Generator 2 of Corner 3 and Filter 4 is placed after Generator 1 of Corner 4 – the number of the filter is always indicated by one of the four squares for convenience. Two Corners 1 and 2 are selected, which means their values are changed by the five knobs just below the display.

Three different 12dB per octave filter types are available:

- **High-pass** filter passes frequencies above **Filter Cutoff** (and attenuates frequencies below the cut-off frequency).

- **Low-pass** filter passes frequencies below Filter Cutoff.

- **Band-pass** filter passes frequencies inside a band with its centre (resonant) frequency defined by Filter Cutoff.

A filter can be configured to either **Track** the played notes (so the cut-off frequency is relative to the fundamental frequency of the note) or interpret the cut-off frequency as an absolute value.

If a filter is **Static**, it is assigned to one specific Corner of the Orbiter (Filter 1 to Corner 1 etc.), which means its properties are always controlled by the specific Corner's parameter no matter where in the Corner Matrix the it is placed. Otherwise the parameters **Filter Cutoff** and **Filter Resonance** are modulated by the current Orbiter's position.

 Hint:

The **Toggle** or **Hold** options determine whether the Corner Matrix stays visible after the Corner Select is released or not.

3.1.5 Warp

The Orbiter trajectory is defined by a warped shape.

Three **Lissajous shapes** ⊂ ⊆ ∞ with increasing complexity or an **ADSR shape** ⌒ can be selected on the **Orbiter screen** ☽. These shapes can then be distorted by dragging the rectangular **Warp Pad** (just below the shape selector) horizontally and vertically.

The Lissajous shapes are always perodic and their sped can be set relatively (1× to 8×) to the master Tempo using one of the speed selectors below the Warp Pad. Moreover, the resulting trajectory can be resized, moved or rotated by dragging it on the Orbiter screen.

When the ADSR shape is selected, the Orbiter follows a figure in which each stage of the envelope covers a different segment of the 2D space. The segments can be warped individually based on the segment selectors below the Warp Pad (A-D, D-S, S-R), while their endpoints can be moved on the Orbiter screen to form the desired trajectory.

The initial orbiter shape and position can be restored using the **Warp Reset** ⑧ button.

The picture below shows examples of warped Lissajous and ADSR shapes.
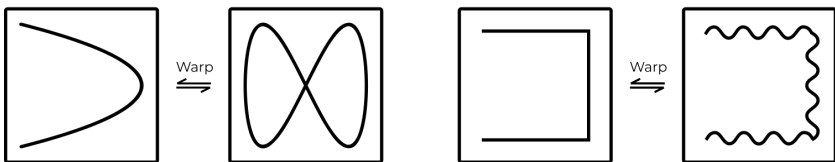
3.1.6 Randomizer

The Randomizer is available on the **Orbiter screen** ☽ and allows for randomization of the four Corners' parameters and the Corner Matrix.

The **Randomize** ▦ button generates a new set of parameters for all selected Corners (and the Corner Matrix) while the **Undo** ☏ button reverts back to the previous state.

3.2 Arpeggiator

The Arpeggiator records notes from its input and plays them out sequentially in eight steps, with multi-octave transpositions.

The **Active** switch enables or disables the arpeggiator while the **Note Length** knob adjusts the length of notes played in each step relatively to the arpeggiator tempo (which is derived from the master Tempo and can be set to different time signatures).

The **Effects screen** ⁞⁞ allows for more detailed control over the arpeggiator. The grid (2) represents the arpeggiator sequence with octaves spread vertically. It is possible to select octave transposition for each step or to disable it completely. The velocity of each step in the sequence can be adjusted using the sliders below (3). The adjacent notes can be chained together (1) into one.
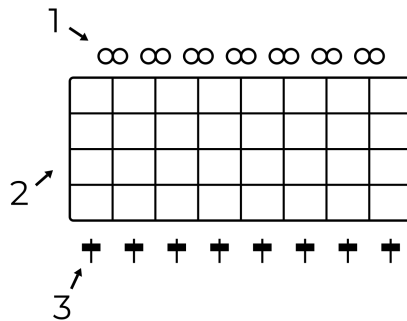
The arpeggiator note memory can be temporary (with arpeggiator playing only the currently pressed notes), **Latched** 🎹 (notes stay in memory even after they are released), or **Step-recorded** ●REC . The order in which the notes are played out can be sorted **Up** ⬆, **Down** ⬇ or **Shuffled** 🔀.

Depending on the Feed configuration, the arpeggiator can play in the background.

To make the pattern produced by the arpeggiator vary over time, some of the parameters can be set to be automatically randomized while the arpeggiator is playing:

- **Octave Walk** ⌨ periodically alters octave transpositions of the individual steps.
- **Time Walk** ⌨ alters the steps' timing.
- **Humanize** alters note lengths.

Hints

- To feed notes into the arpeggiator, the **Feed Direction** switch must be set to **Arp** or **Both** and the **Feed** button has to be active (indicated by flashing LED), as described in section Feed.
- To release notes from the arpeggiator, press the **Latch** ⌨ button twice.
- At least some octaves in the grid have to be enabled in order to make the arpeggiator output notes.
- The arpeggiator can be fed from a separate MIDI channel as described in MIDI configuration. It can be also configured to output notes to a selected MIDI channel.

3.3 Front panel

The control elements on the front panel are grouped into multiple sections: Input (1), Envelope (2), Mixer (3), Feed and Arpeggiator (4), and Sync (5).

This section covers the front panel elements in detail.
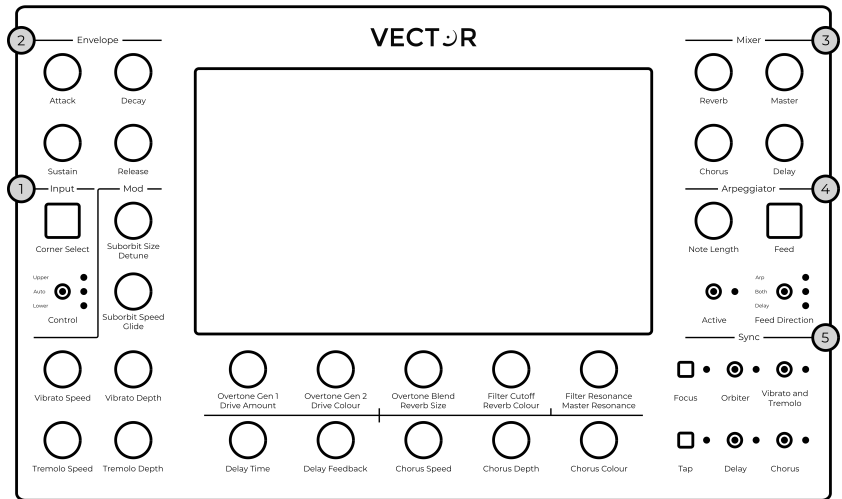
3.3.1 Input

The **Corner Select** button brings up the Corner Matrix, which allows the configuration and routing of filters and selecting which of the four Corners of the Orbiter are currently under editing.

Some rotary encoders have more than one function – in such a case the two functions are written below the encoder. The **Upper** function corresponds to elements on the **Orbiter screen** ☽ and the **Lower** function controls elements on the **Effects screen** ⚙.

The **Control** switch sets which function is used. In **Auto** mode, the function follows the active screen on the display for convenience.
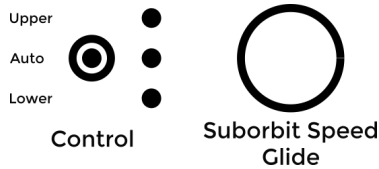
In the case illustrated above, the **Control** switch is in the **Auto** mode which means the encoder either functions as **Suborbit Speed** or **Glide**, depending on the active screen.

3.3.2 Envelope

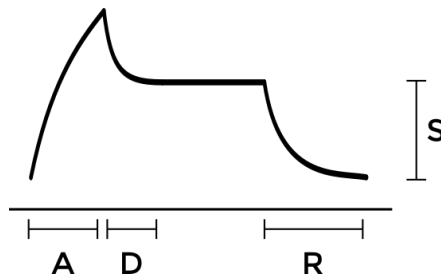The **Envelope** section controls the the length of the **Attack**, **Decay** and **Release** phases and the level of the **Sustain** phase which define the shape of the amplitude envelope of produced sounds. The envelope is triggered on a per-voice basis when a note is played.

Hints

- The final amplitude of the played note is affected by its MIDI velocity (subject to MIDI configuration).
- The lengths of the **Attack**, **Decay** and **Release** phases also control the movement of the ADSR orbiter shape.

3.3.3 Mixer

The **Mixer** section controls the amount of the individual effects (Reverb, Chorus, Delay) mixed with the dry signal and also the **Master Volume** of the final stage of the audio chain.

The level of the output signal is indicated on a bar graph meter on the **Orbiter screen** ☽. If clipping occurs, its color turns red.

3.3.4 Feed

The **Feed Direction** switch enables the routing of notes to **Arpeggiator** and of audio input to **Delay**.

The **Feed** button cuts the connections altogether, while both Arpeggiator and Delay continue processing normally. When Feed is active, the respective LED next to the **Feed Direction** switch is flashing.
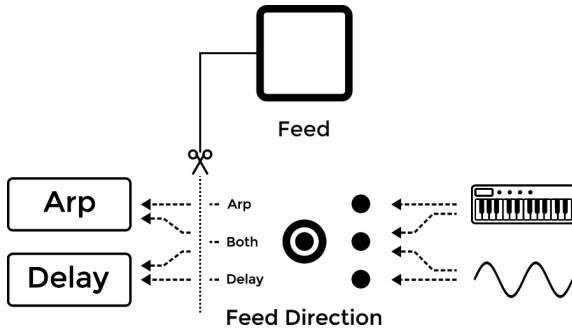
Using the two control elements, it is possible to have the following routing:

· Notes to Arpeggiator,

· Audio to Delay,

· Both, or

· None of the above.

The status of **Feed Direction** is also indicated in the **Delay** section on the **Effects screen** ⦙⦙⦙.

3.3.5 Sync

The **Sync** section allows the synchronization of the Orbiter's suborbit movement, Vibrato and Tremolo, Delay and Chorus to the main tempo or to let them run on their own. When an element is synchronized, it snaps to the closest time signature.

The LED next to the **Tap** button indicates the current tempo and the tempo can be changed by tapping the button several times. See the Tempo section for more details.

The **Focus** button temporarily disables the Orbiter movement and cycles through each the four Corners, making it easy to tweak the Corners' synthesis parameters. The focus mode is indicated by the associated LED and can be exited by holding the **Focus** button longer.

When the Corner Matrix is displayed, the focus mode cycles through the four Corners. When the Orbiter is displayed, the focus mode has an additional step in which the Orbiter is collapsed and placed in the middle of the screen. The additional step is useful to temporarily bypass the Orbiter and perform the movement manually.

3.4 Sound engine

3.4.1 Tempo

Vector works with a master tempo which is used to synchronize the movement of the suborbit, sequencing of the Arpeggiator or timing of effects. The synchronization of the individual parts can be enabled or disabled by the switches in the Sync section.

When Vector is **playing** ▶, the tempo is indicated by an LED next to the **Tap** button in the Sync section. The tempo can be either tapped into the button or adjusted by pressing and dragging the BPM indicator on the **Effects screen** ⅲ!. When Vector is **stopped** ■, no tempo is being generated and Orbiter and Arpeggiator are also stopped.

Master tempo operates in multiple modes:

- 📷 **Stand-alone Mode** (the default configuration), in which the tempo is generated by Vector and used only internally.

- 📷 **Send Mode**, in which the tempo is generated by Vector and transmitted over MIDI to other devices.

- 📷 **Receive Mode**, in which the tempo is received from an external device (such as a MIDI drum machine or a sequencer).

Hint:

The MIDI tempo can be additionally slowed down by a fixed divider. See the Master slowdown parameter in MIDI configuration.

3.4.2 Polyphony

Vector supports three different polyphony modes.

In the **Poly Mode**, each new note is played by a separate voice, resulting in a 16-voice polyphony.

In the **Dual Mode**, each note is played by a separate voice which is complemented by a second voice with an altered pitch and amplitude. This mode thus effectively reduces the maximum number of concurrently playing voices to eight. The pitch of the complemented voice can be adjusted by the **Detune** knob while the amplitude is controlled by the **Co-Volume** slider on the **Effects screen** .

In the **Mono Mode**, all voices are dedicated to playing one note, each of them slightly detuned by an amount derived from the **Detune** knob. The number of available voices can be reduced using the **Voices** slider on the **Effects screen** , which when reduced to a single voice makes Vector act as a monophonic synthesizer. The **Glide** knob controls the portamento time (i.e. the amount of time it takes to change the oscillator pitch between two overlapping notes).

Table 1: Parameters available in different modes

Mode	Detune	Co-Volume	Glide	Voices
Mono	Yes	Yes	Yes	Yes (1 to 16)
Dual	Yes	Yes	No	No (8 or 16)
Poly	No	No	No	No (16)

The **Glide** function in the Mono mode can be used to play a legato effect by pressing a note followed by another note without releasing the first one. Legato can be also played by the Arpeggiator if two adjacent steps are **chained** ⊂⊃ together.

3.5 Effects

Vector has multiple effects connected to the output stage of the main mix of all Corners. Unlike Corners, the effects are independent on the Orbiter position.

The Effects' parameters are accessible on the two bottom-most rows of encoders (depending on the Control switch configuration for some of them) with additional options available on the **Effects screen** ⸬.

 Hint:

 To hear the output of Reverb, Chorus or Delay, the respective knob in the Mixer section has to be turned up.

3.5.1 Vibrato and Tremolo

Vibrato and tremolo are effects which periodically modulate the pitch and amplitude of the played notes. They are characterized by two parameters, depth and speed.

Vibrato Depth controls the amount of the pitch variation and **Tremolo Depth** controls the amplitude variation, while **Vibrato Speed** and **Tremolo Speed** control the frequency of each variation.

The speed can be synchronized with the master Tempo using one of the switches in the Sync section.

 Hint:

 To disable Vibrato or Tremolo, turn the respective Depth knob to zero.

3.5.2 Reverb

Reverb simulates the reverberation of sound in a physical environment caused by reflections from the boundaries (walls of a concert hall for example).

Reverb Size increases the persistence of the processed sound (in the same way as larger rooms produce longer reverberation), while **Reverb Colour** controls the cutoff frequency of a band-pass filter at the effect's output.

The effect operates in stereo mode so its output is different for the left and right channels.

3.5.3 Chorus

Chorus mixes together sounds played back at different pitches, resembling the effect of a choir or an orchestra section. It consists of several variable delay lines and an optional band-pass filter which are characterized by three parameters:

- **Chorus Depth** controls the amount of detuning.
- **Chorus Speed** determines the speeds of the variable delay lines (this can be synchronized with the master Tempo using one of the switches in the Sync section and additionally **slowed down** 🐢 by a factor of two).
- **Chorus Colour** controls the band-pass filter's cutoff frequency if the filter is **enabled** ⌂.

The effect can operate in mono or stereo. If the **Stereo Mode** 🎧 is enabled, the effect's output is different for the left and right channels.

3.5.4 Delay

The Delay effect adds a delayed version of the audio signal to the final mix.

Delay Time controls how much is the signal delayed and **Delay Feedback** controls the amount of output signal being fed back into the delay. The feedback signal is also affected by an optional **Band-pass Filter** ⊿.

If the Delay Feedback is set to a maximum (and the band-pass filter is disabled), the Delay effect behaves as a looper. If the feedback is set to zero, the internal audio buffer is fully cleared after one Delay Time period. If needed, the buffer can be **cleared manually** 🗑.

Delay can operate in mono or stereo. In the **Stereo Mode** 🎧, the effect's output is different for the left and right channels ("ping-pong").

Hints

- To feed notes into the delay, the **Feed Direction** switch must be set to **Delay** or **Both** and the **Feed** button has to be active (indicated by flashing LED), as described in Feed.
- Try recording a sample played by the Arpeggiator and then play it over a different sequence.

3.5.5 Drive

Drive is derived from an overdrive effect known from guitar amplifiers where the input signal is saturated so that clipping occurs, adding a number of new harmonics to the signal.

The effect consists of a band-pass filter followed by a saturator, wired in parallel. The filter's cut-off frequency is controlled by the **Drive Colour** knob, while **Drive Amount** controls both the input gain of the saturator and the contribution of the Drive effect to the final mix.
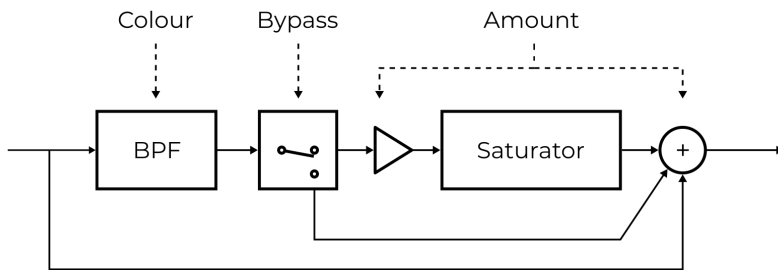
The **Bypass** ⋮ button on the **Effects screen** ⦙⦚ disables the saturator. In this case, the **Drive Amout** only sets the mix level of the effect's band-pass filter.

4   CONFIGURATION

4.1 Presets

The **Presets screen** 🖫 allows access to up to 50 presets. A preset contains all parameters defined on the Orbiter and Effects screens.

The first three rows of the grid contain fifteen **Factory presets** which are read-only. The other presets are **User presets** which can be stored and renamed.

To store a preset, select a slot and press Save. If the slot is not free, it will be overwritten with the new values.

Warning:

Do not power off Vector when saving a preset, wait for the confirmation message first.

Hints

- The **Presets screen** 🖫 also allows for Firmware updates. User presets are preserved during an update.
- It is possible to change the current preset by a MIDI Program Change message (value 1 corresponds to the top-left and value 50 to the bottom-right preset).

4.2 Global settings

The **Settings screen** ⚙ contains global configuration which is common for all presets. It is currently not persistently stored and returns to the default value after Vector is powered off.

4.2.1 MIDI configuration

The following MIDI parameters can be set in the Global settings:

- **MIDI input channel** for receiving Note On/Off, Control Change (CC), Pitch Bend, and Program Change messages,

- Separate **Arp in MIDI channel** for Note On/Off events fed into the Arpeggiator (equals to the **MIDI input channel** by default),

- **MIDI output channel** for sending MIDI messages (Start/Stop, Timing Clock, and also notes received from connected MIDI controllers if **Forward MIDI notes** is enabled),

- Separate **Arp out MIDI channel** for sending notes played by the Arpeggiator if **Output Arp MIDI notes** is enabled,

- The option to ignore velocity of the received notes and use a **Fixed MIDI velocity** to play all notes wit the same amplitude, and

- The option to divide the received MIDI Timing Clock (depending on the Tempo configuration) by a factor defined by the **Master slowdown**.


Hint:

Both **MIDI input channel** and **Arp in MIDI channel** can be set to receive messages on all sixteen channels simultaneously.

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5   SPECIFICATIONS

- 7" touchscreen display
- ARM® Cortex™-A53 with NEON™ DSP instructions
- 32-bit internal processing
- 32-bit DAC, 48kHz, 106dB SNR
- Headphone amplifier
- Runs Linux with a realtime kernel
- MIDI TRS input and output ports
- USB MIDI host and device ports (both capable of input and output)
- Ethernet (LAN) connection
- Up to 16-voice polyphony
- Firmware easily upgradable over the network or with a USB flash drive

5.1 Connectivity
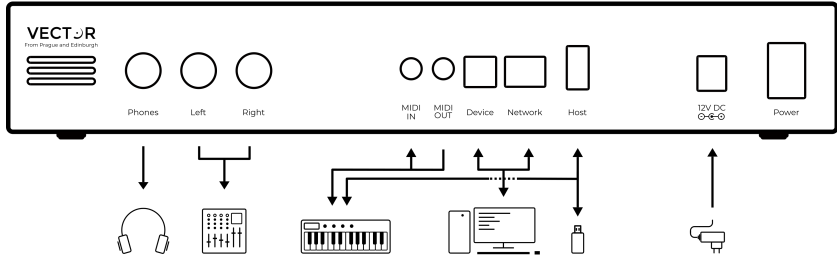
The rear side of Vector offers various connections. From left to right:

- **Phones** is a 6.35mm TRS jack with a stereo output. Connect it to a pair of headphones for monitoring.

- **Left** and **Right** are two 6.35mm TS jacks with line outputs (left and right channels). Connect them to a mixer or an audio interface.

- **MIDI IN** and **MIDI OUT** are 3.5mm TRS jacks with MIDI input and output channels. The pin-out is "Type A" as per the official MIDI terminology. Connect them to other MIDI gear with a compatible connector or to a legacy 5-pin DIN cable (adapters are included with Vector).

- **Device** is a USB Type B connector with class-compliant MIDI interface (both input and output). Connect it to a DAW etc.

- **Network** is a RJ-45 network connector used for firmware updates. Connect it to a LAN network with Internet access and DHCP.

- **Host** is a USB Type A connector with a class-compliant MIDI interface (both input and output). Connect it to a USB MIDI keyboard or a USB flash drive for software updates.

· **Power** is a connector for the provided 12V DC 1000mA (center-positive) power supply with a dedicated power switch.

Note:

It is possible to connect more devices to the **Host** connector using a USB hub. Follow the current rating of connected devices; if the total current exceeds 500mA, use a hub with external power adapter. For software updates, the flash drive has to be connected directly without any hubs or cables in between. Do not use hard drives for software updates as they might draw too much current.

5.2 Firmware updates

Vector can be updated either over network or using a USB flash drive. To find if there is an update available, start Vector with a network cable connected and navigate to the **Presets screen** . The bar in the bottom of the screen will indicate available updates and guide you through the update process.

Please note that some major updates are only available over USB and as such do not appear in the **Presets screen**. Check vectorsynth.com/support for announcements and a detailed description of the firmware update procedure.

> **Warning:**
>
> Do not power off Vector when a firmware update is in progress.

5.3 MIDI implementation

Vector responds to and outputs MIDI messages through various interfaces (TRS IN/OUT, USB Host, and USB Device). See the tables below for a complete list of supported messages and Control Change (CC) parameters.

Table 1: MIDI Implementation Chart

Function	Transmitted	Recognized	Notes
Channel	1–16	1–16	*1
Note: Number	1–127	1–127	*2
Note: Velocity	1–127	1–127	*2
Pitch Bend	–	Yes	*3
Program Change	–	1–50	
Control Change	–	1–37	*4
Timing: Clock	Yes	Yes	*5
Timing: Start	Yes	Yes	*5
Timing: Continue	–	–	
Timing: Stop	Yes	Yes	*5

Notes:
1. Separate channel for the Arpeggiator is possible, see MIDI configuration.
2. Transmitted are notes played by the Arpeggiator and/or notes forwarded from the MIDI input if enabled.
3. Range: two semitones up/down.
4. Documented in a separate table.
5. Disabled by default, configurable in the Tempo section.

Table 2: Control Change Parameters

CC	Parameter
1	Suborbit speed
2	Suborbit size
3	Orbiter centre point position X
4	Orbiter centre point position Y
5	Orbiter width
6	Orbiter height
7	Lissajous shape warp X
8	Lissajous shape warp Y
9	Master volume
10	Reverb amount
11	Chorus mix
12	Delay mix
13	Envelope attack
14	Envelope decay
15	Envelope sustain
16	Envelope release
17	Vibrato speed
18	Vibrato depth
19	Tremolo speed
20	Tremolo depth
21	Drive amount
22	Drive colour

Table 2 – continued from previous page

CC	Parameter
23	Reverb size
24	Reverb colour
25	Master resonance
26	Delay time
27	Delay feedback
28	Chorus speed
29	Chorus depth
30	Chorus colour
31	Arpeggiator note length
32	Arpeggiator humanize
33	Mono co-volume
34	Mono detune
35	Mono voices
36	Dual co-volume
37	Dual detune

5.4 What's in the box

- The Vector synthesizer unit (with a serial number on the bottom plate)
- Power supply with a region-matching plug
- Printed manual
- 2× MIDI-TRS adapter cable

5.5 Health and safety

Use common sense when handling Vector. Standard guidelines for handling electronic devices apply, which, among others, are:

- Use only the supplied power supply.
- Do not expose the machine to any liquids or excessive levels of humidity.
- Do not cover the ventilation holes on back and bottom.

5.6 Free and open-source software

Vector is built using many great free and open-source (FOSS) software components.

See vectorsynth.com/licenses for the license agreement and a complete list of the FOSS components used in Vector's firmware.

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