

BV-X

Multimode Vocoder

Operation Manual

Reason Studios

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BV-X

Multimode Vocoder



Introduction



BV-X Multimode Vocoder is a very advanced vocoder with 1024-point FFT vocoding mode (equivalent of 512-band vocoding) for very precise and high quality vocoded speech. BV-X also has a Vintage mode with a variable number of filter bands. BV-X can produce anything from vocoded speech, singing or drums to really cool and weird special effects. BV-X also features a flexible and great sounding built-in synth so you won't have to connect an external synth if you don't want to.

Even if you have worked with a vocoder before, please read the following section. Knowing the basic terms and processes will make it much easier to get started with the BV-X!

Don't forget to check out the BV-X introduction video [here!](#)

How does a vocoder work?

Carrier and modulator

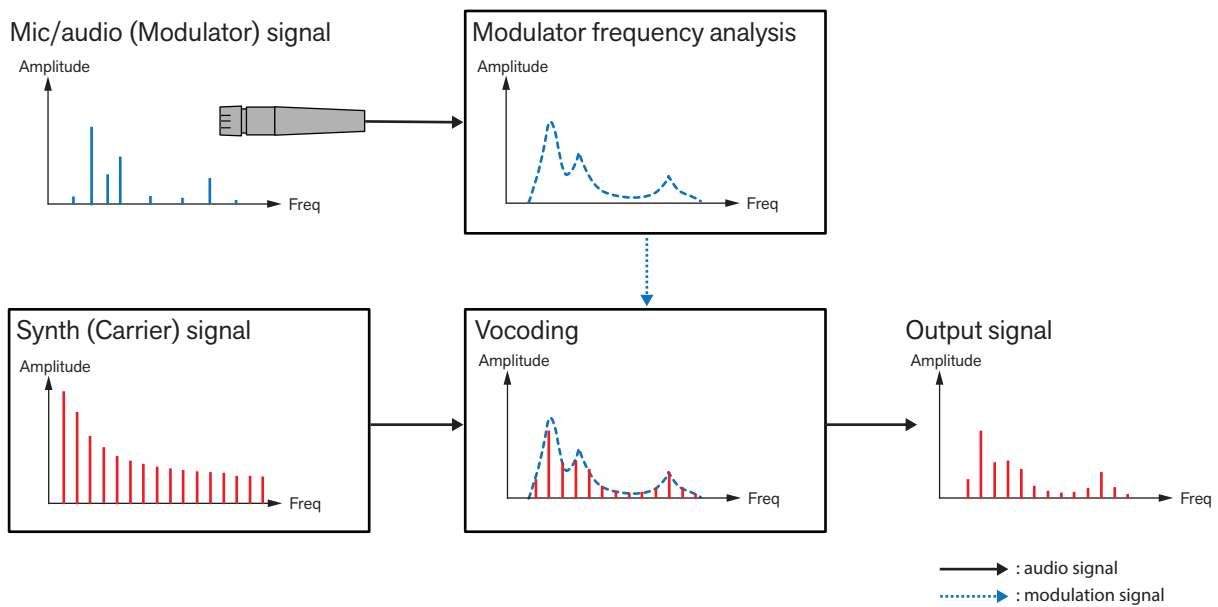
A vocoder uses two different input signals, a "carrier" and a "modulator". It analyzes the modulator signal, applies its frequency characteristics to the carrier signal and outputs the resulting modulated carrier signal - the "vocoded sound".

In the most typical case, the carrier signal is a synth string or pad sound and the modulator signal is speech or vocals - the result will be a talking or singing synth sound. The modulator could also be drums or percussion (for rhythmically modulated sounds and effects) or any sound with changing frequency content.

BV-X uses two modulation signal analysis techniques: Modern and Vintage:



Modern (FFT vocoding)



Vocoder principle using FFT for modulator signal analysis

When set to Modern the BV-X uses FFT (Fast Fourier Transform), in which the vocoding process is based on FFT analysis of the modulator signal (instead of on bandpass filters as in a vintage vocoder described below). The FFT analysis in BV-X equals 512 “conventional” frequency bands (in Hi mode) and results in a very precise and detailed vocoder sound. Also, the FFT vocoding is phase linear, as opposed to filter band vocoding. Note:

- **The Modern (FFT) mode is best suited for vocoding speech or vocals, giving crystal clear and highly intelligible results.**

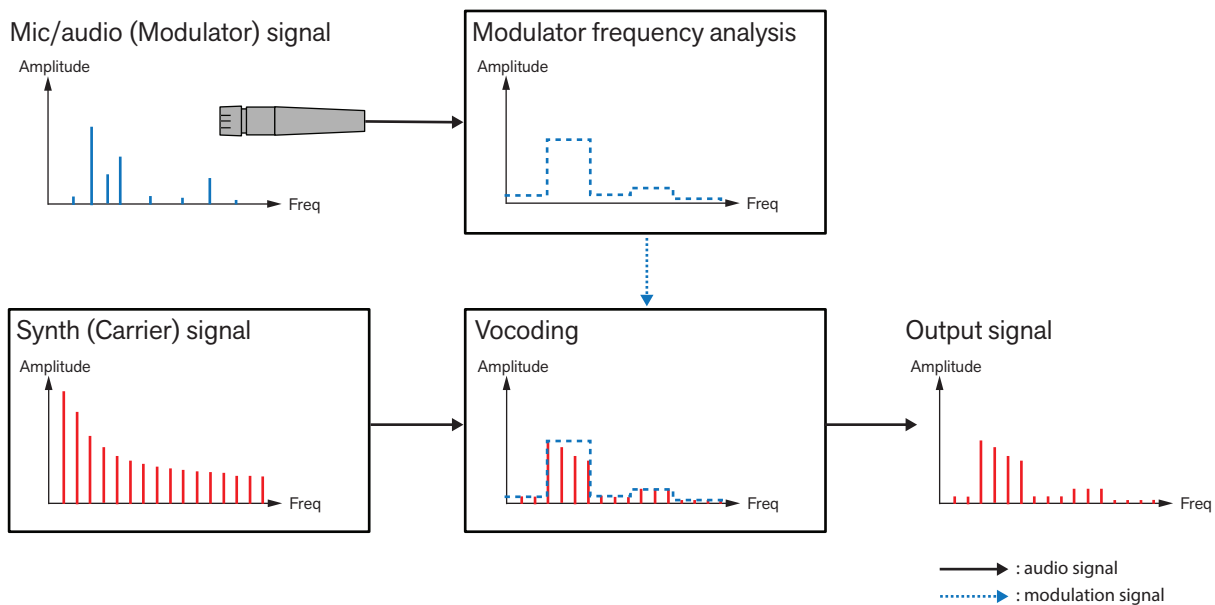
It is not so well suited for vocoding drums and percussion, since the FFT process is inherently “slower” than the regular filtering and doesn't respond as quickly to transients, and also there will be a slight delay added to the signal.

- **Where the conventional filter bands are distributed logarithmically (i.e. the same number of filter bands per octave), the 512 bands in the FFT mode are distributed linearly.**

This means a lot of the bands will be in the high frequency range - this is one of the reasons for the clear sound but it is also something to keep in mind when making settings for the vocoder in Modern (FFT) mode.



Vintage (Filter bands)



Vocoder principle using 5 bandpass filters for modulator signal analysis

The BV-X can also be set to Vintage mode. A traditional vintage vocoder works as follows: The modulator signal is divided into a number of frequency bands by means of bandpass filters (called the “modulator filters” or “analyzing filters”). The signal in each of these bands is sent to a separate envelope follower (which continuously analyzes the level of the signal). The carrier signal is sent through the same number of bandpass filters (the “carrier filters”), with the same frequency ranges as the filters for the modulator signal. The gain of each bandpass filter is controlled by the level from the corresponding envelope follower, and the filtered signals are combined and sent to the vocoder outputs.

In this way, the carrier is filtered to have roughly the same frequency characteristics as the modulator. If the modulator signal has a lot of energy in one of the frequency bands, the gain of the corresponding filter band for the carrier signal will be high as well, emphasizing those frequencies in the output signal. If there is no signal at all within a frequency band in the modulator signal, the corresponding band in the output signal will be silent (as the gain will be zero for that filter).

Another effect of filter band vocoding is that the high frequencies will appear first in the vocoded signal, resulting in that characteristic “vocoder sweep” effect.

There are several factors determining the quality of the vocoder sound, but the most important is the number of filter bands. The larger the number of filter bands, the closer will the output signal follow the modulator’s frequency characteristics. In Vintage mode the BV-X offers 5, 9, 13, 17, 21, 25 or 29-band vocoding.

In BV-X the lowest filter band is actually a lowpass filter instead of the usual bandpass filter. This assures that low frequencies in the carrier signal are let through also if the modulator signal should mostly contain higher frequencies.

- **Even if a high number of bands will make the sound more precise and intelligible, this isn’t always what’s desired! Vocoding with a lower number of bands can give results that sound different, fit better in a musical context, etc.**



Panel overview

The BV-X front panel contains the following sections:



- 1. Patch Selector (for browsing, loading and saving patches) (see **“Loading and saving patches”**)
- 2. Master Volume control
- 3. Modulator section (see **“The Modulator section”**)
- 4. Auto Play section (see **“The Auto Play section”**)
- 5. Vocoder section (see **“The Vocoder section”**)
- 6. Synth/External Carrier section (see **“The Synth Carrier section”** and **“The External Carrier section”**)
- 7. Global controls and Modulation Matrix section (see **“Global controls and Modulation Matrix”**)
- 8. Output Mixer section (see **“Output Mix section”**)
- 9. Limiter (see **“Limiter”**)
- 10. Unison section (see **“Unison section”**)
- 11. Effect section (see **“Effect section”**)
- 12. Reverb section (see **“Reverb section”**)



Playing and using BV-X

Creating a BV-X

Since BV-X is an Effect device (although with a built-in synth) the best way in most situations is to use the BV-X as an Insert Effect.

Set up BV-X as follows:

Setting up BV-X in Reason standalone

1. Start with the Modulator.

This could be a vocal recording on an audio track or a Dr Octo REX playing a loop.

2. Find the BV-X vocoder among the effect devices and add it as an insert effect in the Modulator Audio Track/ Mix Channel device:



! If you're running Reason 12.2.5 or later, the BV-X will automatically get an Instrument track in the sequencer, even if it's created in an insert effect in a Mix Channel or Audio Track device. If you're running an earlier Reason version, you need to select the BV-X and manually create a sequencer track for it.



3. Start playback of the Modulator audio and play MIDI notes on the BV-X track to hear the vocoded sound.



Setting up BV-X in Reason Rack Plugin in most host DAWs

In almost all DAWs you add the vocoder as an effect and send MIDI to it from another track:

1. Start with a Modulator.

This could be a vocal recording on an audio track, for example.

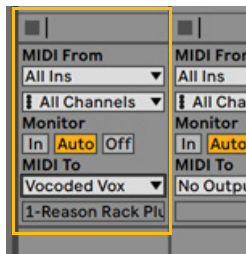
2. Add an instance of Reason Rack Plugin Effect as an effect for that track.

3. In the rack, add the BV-X from the Effects palette in the browser.

4. Add a MIDI track.

This is where the MIDI notes for the Carrier will live.

5. Route the MIDI output of the MIDI track to the Reason Rack Plugin on the Modulator track:



Example of MIDI routing in Ableton Live.

6. Start playback of the Modulator audio and play MIDI notes on the Carrier track to hear the BV-X.

Setting up BV-X in Reason Rack Plugin in Logic Pro

In Logic, you cannot send MIDI to an effect. Instead you play the BV-X as an instrument and send audio to it from another track, using the Side Chain audio input:

1. Start with a Modulator.

This could be a vocal recording on an audio track, for example.

2. Add a Software Instrument Track with Reason Rack Plugin.

This is where the MIDI notes for the Carrier will live.

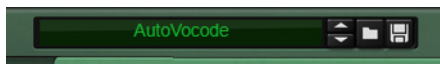
3. In the rack, add the BV-X from the Effect Device palette.

4. In the plugin window, select the Modulator audio track from step 1 as Side Chain Audio Input.

5. Mute the Modulator audio track or lower its level (otherwise you'll hear the unprocessed vocals too).

6. Start playback of the Modulator audio and play MIDI notes on the Reason Rack Plugin track to hear the BV-X.

Loading and saving patches



Loading and saving patches is done in the same way as with any other Reason device that supports patches. See the "Sounds and Patches" chapter in the Reason/Reason Rack Plugin Operation Manual pdf for details.

As with all Rack Extensions, you can find the included patches by clicking "Rack Extensions" in the Reason browser, navigating to the BV-X Multimode Vocoder folder and opening it.

The BV-X patches are sorted in two folders, "Vocoder Patches" where you need to play MIDI notes to hear anything and "Voice Processing Patches" where the BV-X will work as an effect with no MIDI note input required.



Panel reference

The Modulator section



Here is where you control the Modulator audio signal (patched to the Modulator Inputs on the rear panel, (see “[Modulator In](#)”), i.e. the signal used for modulating the vocoder.

Gain

- **Adjust the gain of the modulator input signal.**

Range: -12 to +12 dB.

- ! **The Gain parameter setting isn't stored in patches.**

Adjust this according to your modulator signal level (typically so that the top segment on the level meter lights up at strong peaks, but not all the time). Then you can browse patches freely without having to redo this setting.

Note On LED

This lights up whenever BV-X receives a MIDI Note On (e.g. from the main sequencer or from a MIDI keyboard).

Stereo Input

- **Click the Stereo Input button if you have a stereo modulator input signal and want separate analysis of the Left and Right channels.**

This will mainly be audible if there is distinct stereo panning in the modulator signal. Also, settings like Spectral Spread (see “[Spectral Spread](#)”), Voice Pan (see “[Voice Pan](#)”) and Unison (see “[Unison section](#)”) can create stereo effects which might mask the original stereo information. In those cases it's better to turn Stereo Input off to conserve processing power.

The Auto Play section



Here you can choose if you want BV-X to track the pitch of the Modulator signal and generate the output signal pitched accordingly, without the need for any MIDI notes.

Auto Play

- **Click the Auto Play button to activate the automatic Modulation signal pitch detection.**

The built-in Synth Carrier will now automatically track the pitch of the Modulator signal.

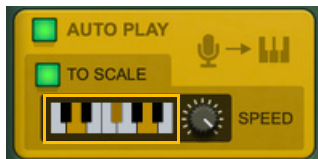
In Auto Play mode, the built-in Synth Carrier will always play a C3 + the pitch will be modulated by the Modulator signal. If you add MIDI notes to this, they will relate to C3. For example, if you hold an E3, you will add a part playing a major third up (and also modulated by Modulator pitch). If you add a G2 too, you will get a part a fourth down.



The result will be a three parallel voices, a major chord moving along with the Modulator pitch. This won't sound very natural, but if you add the To Scale function to this (see below), all voices will be restricted to a scale for a much more musical result.

To Scale

- Click the **To Scale** button to correct the detected Modulator signal pitch to the closest note in the 12-tone scale.
- Click the **desired notes on the keyboard display to select specific notes to pitch-correct to**. Selected notes are displayed in yellow:
Selected notes are displayed in yellow:



- Click **selected note(s) to reset**.

Speed

- Turn the **Speed knob to set the pitch correction speed when the To Scale function (see above) is on**.

The Vocoder section



The Vocoder section is where you define how the modulator signal should modulate the carrier signal. The Vocoder section has two different modes:

- **Modern**
The Modern mode uses FFT to measure the frequency content of the modulator signal. This gives a higher precision and a better quality of the sound. Due to the time it takes to perform the FFT analysis there might also be a short delay (latency). BV-X will report its latency to Reason or a DAW host so that Plugin Delay Compensation can be applied.
 - **Vintage**
The Vintage mode uses bandpass filters with envelope followers to detect a desired number of frequency bands in the modulator signal. This is the method that was originally used in the vocoders back in the days and gives that true vintage vocoder sound.
- **Click the Vintage or Modern tabs to select the desired Vocoder mode.**



The Vocoder Display

Depending on which Vocoder mode (Vintage or Modern) you have selected the Vocoder Display looks a little different. In Modern mode the display shows the Modulator frequency response curve as a curved green line. This is because the FFT analysis is very detailed and the frequency “bands” become quite small:



The Vocoder Display in Modern mode (FFT)

In Vintage mode the display shows the frequency bands in a rectangular fashion, where the number of bands is defined with by the Filter Band knob (see “[Filter Bands \(Vintage\)](#)”):



The Vocoder Display in Vintage mode (set to 13 bands)

Resolution (Modern)

Here you choose what resolution (number of “frequency bands”) you want for the FFT analysis:

- **Lo**
LO resolution gives the equivalent of 128 frequency bands (with no latency).
 - **Mid**
MID resolution gives the equivalent of 256 frequency bands (with a medium latency).
 - **Hi**
HI resolution gives the equivalent of 512 frequency bands (with a little longer latency).
- ! **Note that more bands don’t always give better results. For example, if the modulator signal is high pitched it might be better to use the “Mid” setting.**

Transfer Curve (Modern)

The Transfer Curve function lets you distort the Modulator signal by adding and removing overtones in various ways. This effect will be similar to cross-connecting band levels on the old BV-512 vocoder in Reason:



Using the Transfer Curve function in BV-X is similar to cross-connecting band levels in the BV512 Digital Vocoder.



The different Transfer Curves change the transfer function between incoming (analyzed) frequencies and outgoing (processing) frequencies of the Modulator signal. For example, loud signals at frequency X in the Modulator may instead cause loud signals at frequency Y in the vocoded result and so on, changing the timbre of the sound subtly or drastically.

→ **Select the Transfer Curve type with the TYPE knob (or drag horizontally in the display).**

There are 8 different Transfer Curve types to choose between.

→ **Select the Transfer Curve amount with the AMT knob (or drag vertically in the display).**

The amount range is bipolar, with 0 at the 12 o'clock position.

Filter Bands (Vintage)

→ **Select the desired number of bandpass filter bands.**

The following number of bands can be selected: 5, 9, 13, 17, 21, 25 or 29.

! **Note that the lowest band is a lowpass filter instead of a bandpass filter. This is be able to vocode low carrier notes even though the modulator doesn't go down to those low frequencies.**

Low Freq (Vintage)

→ **Set the cutoff frequency of the lowpass filter of the lowest band.**

Higher values let the lowpass filter "catch" more modulator signals and gives a bassier, deeper sound when you play low notes on the carrier synth.

Range: 80-500 Hz.

! **Changing the Low Freq parameter will also affect the passband center frequencies and bandwidths.**

You can see these changes in the Vocoder Display.

Band Resonance (Vintage)

→ **Set the resonance amounts of all the filter bands.**

Each filter band has its own resonance peak. Higher resonance settings often gives a more "hollow" and "pronounced" vocoder effect.

Noise Gate

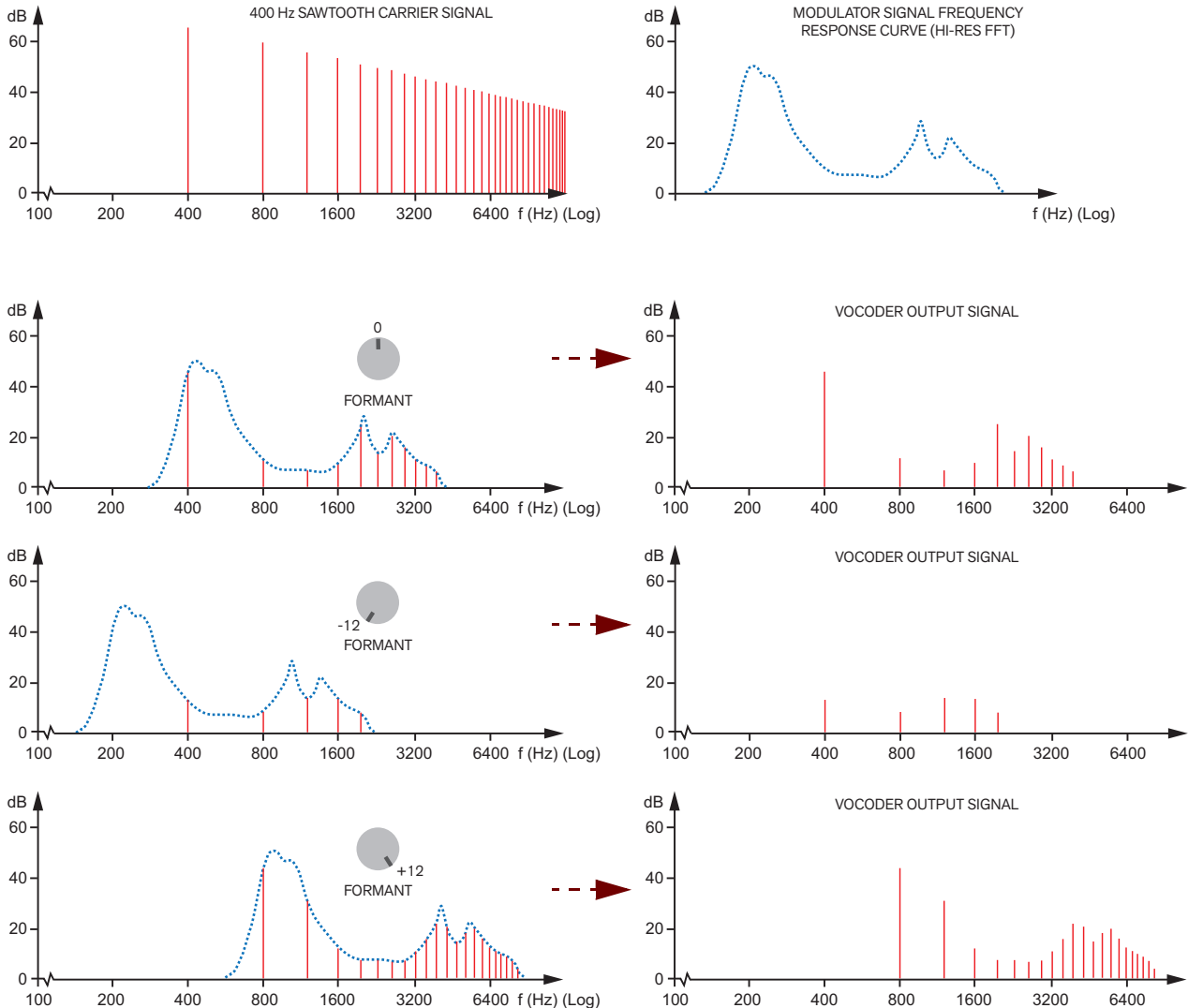
The purpose of this is to filter out low level noise of the modulator input signal. Each FFT/Filter band has its own Noise Gate.

→ **Set the level where you want to the modulator signal to pass through to the vocoder.**



Formant

With the Formant knob you can transpose the Modulator frequency spectrum up/down one octave across the Synth/ External carrier signal. If you are using vocals as Modulator signal the result of turning the Formant knob down will be a deeper “bassier” voice. Turning the Formant knob up will result in more of a “chipmunk” voice. This is what it would look like in a frequency spectrum:



Formant transpositions in Modern mode (FFT)

- **If you use the built-in Synth Carrier (see “The Synth Carrier section”) in Modern mode the Formant setting affects each voice independently.**
Modulating the “Formant” parameter from the “Key” source in the Modulation Matrix can be really useful.
- **In Vintage mode the Formant transposition works similarly, but with a much lower resolution of the modulator signal frequency response curve. Also, the Formant setting is global for all voices.**



HF Gain

This boosts the high frequencies in the carrier signal. This is sometimes desired to get a clearer and more detailed vocoded sound. The reason is that a carrier signal should theoretically contain roughly equal energies in all frequency ranges for best results - in a typical synth sound the high frequencies are often weaker than the low frequencies. Raising the HF Gain control will rectify this.

- **Turn up the HF Gain knob to amplify the higher frequencies of the Synth Carrier/External signal.**
This is useful to get a clearer and more articulated vocoder sound.

Attack

This is a global attack time control, affecting all envelope followers for the filter bands. Normally you probably want this set to zero, to make the vocoder react as quick as possible. Raising the Attack time can be useful for “smearing” sounds, creating pads, etc.

- **Set the overall attack times for the Modulator frequency bands.**

Decay

This controls the decay time for all filter band envelope followers, i.e. how quick the filter band levels drop. Adjust this according to taste and context.

- **Set the overall decay times for the Modulator frequency bands.**

Spectral Spread

The Spectral Spread function lets you control the stereo spread of the FFT “bands” or bandpass filter bands. The bands are then panned out individually in the stereo panorama, which gives a very nice stereo effect.

- **Set the panning amount for the frequency bands with the Spectral Spread slider.**

Gain Curve

The Gain Curve function lets you freely draw your own gain curve in the Vocoder display, to affect the various bands in the modulator frequency spectrum.

1. **Click the Gain Curve button.**
2. **Draw your gain curve in the Vocoder display:**



- **Hold down [Ctrl](Win)/[Cmd](Mac) and draw to create a straight line at 0dB.**
- ! **Note that the HF Gain control (see “HF Gain”) remains active even though the Gain Curve function is on.**

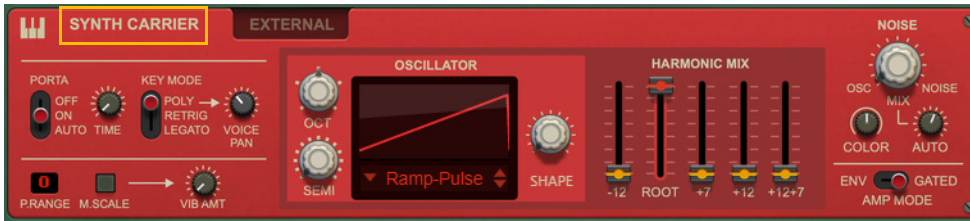
Hold

- **Click this button to “freeze” the current filter band settings.**
While the button is lit, the modulator signal doesn’t affect the sound - the carrier signal is filtered with the settings as they were the moment you activated Hold. Hold also freezes the current pitch of the modulator signal (if any).



- Click the Hold button again to turn off Hold.
- The Hold function can be modulated from the Global controls and Modulation Matrix - for sample and hold-like effects, for example.
See "Global controls and Modulation Matrix".

The Synth Carrier section



The Synth Carrier/External section lets you choose if you want to use the built-in synth - or use an external carrier signal patched to the rear panel of BV-X. We will begin by describing the built-in Synth Carrier section. The External section is described in "The External Carrier section" further down in this manual.

BV-X features a very versatile and great sounding built-in synth, specially designed for generating rich vocoder carrier signals. It features a number of shapeable waveforms as well as a Harmonic Mix section and a flexible Noise generator.

- Click the Synth Carrier tab to select the built-in synth.

Porta

Portamento makes note pitches glide from previous notes to new ones, at the time set with the Time knob. Portamento can be used in all Key modes (see above).

- **When On in Poly Key Mode (see below), the pitches will glide from any of the available voices.**
The results will be unpredictable since there is no way of controlling from which note(s) the glide(s) will commence. The effect is very nice, though.
- **When On in Retrig or Legato Key Mode (see below), the pitch will glide between consecutive notes.**
- **In Auto mode, the pitch will glide between consecutive monophonic notes only when you play legato. If you have selected Poly Key Mode (see below), Auto will have no effect at all.**
If you release the previous key before hitting the new key, there will be no portamento effect.

Key Mode

Here you choose how BV-X should respond to MIDI Note data:

- **Poly**
Select this if you want to play BV-X polyphonically.
- **Voice Pan**
If Poly is selected (see above) you can set the width of the voice panning with this knob. Each voice will then be individually and randomly panned in the stereo panorama.
- **Retrig**
Select this if you want to play BV-X in monophonic mode and always retrigger the envelopes as soon as you play a new note.
- **Legato**
The Mono Legato mode is also monophonic. However, if you play a new note without having released the previous one, the envelopes won't start over.



P.Range

- **Set the desired Pitch Bend range for the “Pitch” wheel with the up/down buttons, or by click-holding on the display and dragging up/down.**

Range: +/-24 semitones (+/-2 octaves) in steps of +/-1 semitone.

Mod Wheel Scale and Vibrato Amount



- **Set the desired vibrato amount with the Vib Amt knob.**
The vibrato affects the pitch of the Synth Carrier signal.
- **Set the vibrato rate with the Rate knob in the Vibrato section (see “Vibrato”).**
- **Click the M.Scale button if you want to scale the Vibrato effect with the Mod Wheel (see “Mod Wheel”).**
With this turned on, you need to raise the Mod Wheel fully to get the set Vibrato amount.

Oct

- **Set the pitch in octave steps.**

Range: +/-2 (5) octaves.

Semi

- **Set the pitch in semitone steps.**

Range: 12 semitones (one octave).

Oscillator waveform display



The Synth Carrier oscillator in BV-X features a number of shapeable waveforms, ideal for using as carrier signals in vocoder applications. The waveforms are a unique combination of analog/wavetable/spectral/physical modeling/FM synthesis techniques. The Oscillator waveform display shows the currently selected waveform, with its current Shape setting.

Waveform selector

- **Click the Waveform name box to bring up a menu of the available waveforms.**

The wave shapes are shown in the display above and are updated in real-time according to the current settings and modulations. A great way to understand how the signal actually “looks”.

The waveforms are:

- **Ramp-Pulse**
A ramp (sawtooth) wave at Shape=0%, gradually transformed towards a narrow pulse wave at Shape=100%.
- **Pulse Width**
A 50% duty cycle pulse (square) wave at Shape=0 gradually transformed towards an almost 100% duty cycle pulse wave at Shape=100%.
- **Modulate the Shape parameter from the LFO to achieve PWM, see “LFO”.**



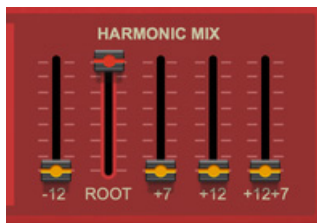
- **LP Sweep**
An almost pure sinewave at Shape=0% gradually transformed into a sawtooth wave at Shape=100%. Sweeping the Shape between 0% and 100% gives the impression of a lowpass filtered sawtooth wave.
- **BP Sweep**
An almost pure sinewave at Shape=0% gradually transformed into a bandpass filtered sawtooth wave at Shape=100%. Sweeping the Shape between 0% and 100% gives the impression of a bandpass filtered sawtooth wave.
- **Reso Sweep**
An almost pure sinewave at Shape=0% gradually transformed into a resonant sawtooth wave at Shape=100%. Sweeping the Shape between 0% and 100% gives the impression of a lowpass filtered resonant sawtooth wave.
- **Ramp-Triangle**
A ramp (sawtooth) wave at Shape=0%, gradually transformed towards a triangle wave at Shape=100%.
- **Detuned Ramp**
A ramp (sawtooth) wave at Shape=0%, gradually transformed towards a detuned/chorus ramp wave at Shape=100%.
- **Ramp Fifth**
A ramp (sawtooth) wave at Shape=0%, with a gradually introduced 5th. At Shape=100% the signal is only the 5th harmonic of the original signal.
- **Game**
A lo-fi “early computer game” type of signal. Turn the Shape knob to change the overtone contents and the octave transposition.
- **FM Ratio (1:1, 1:2, 1:3, 2:1)**
These are frequency modulated sine waves with different frequency ratios between the FM carrier (C:) and FM modulator (:M) signals. Set the frequency modulation amount with the Shape knob.
- **FM Feedback**
A pure sinewave signal at Shape=0% gradually fed back internally at an 1:1 ratio. The feedback signal is filtered before fed back to the FM carrier signal.
- **Transformer, Alien Bell, Complex, Formant Flux, Phase Folder, Robot Ramp**
These are wavetables from the Europa synthesizer that we found particularly suitable for vocoding. The wavetables are built up a number of waveforms that you can sweep through with the Shape knob.

Shape

- **Turn the Shape knob to change the shape of the currently selected waveform.**

The wave shapes are shown in the display above and are updated in real-time according to the current Shape (and modulation) settings.

Harmonic Mix



On the Harmonic Mix panel you can control the level of the original (Root) signal, as well as the levels of any additional harmonics you might want to add.



→ **Set the levels of the Root note and of the desired additional harmonics with the respective sliders.**

- 12 adds an octave below the root note.
- Root controls the level of the original signal.
- +7 adds a 5th (7 semitones) above the root note.
- +12 adds an octave above the root note.
- +12+7 adds a 5th one octave above the root note.

Noise



On the Noise panel you can set a mix between the Synth Carrier oscillator signal and a noise signal. This can be very useful in a lot of situations, to spice up the vocoded sound or just for “special fx” type of sounds.

→ **Set the mix between the Synth Carrier oscillator and noise with the Noise knob.**

→ **Set the noise color with the Color knob.**

The higher the value, the brighter the noise.

→ **Turn up the Auto knob to automatically mix in noise whenever the modulator signal doesn't contain any pitched audio.**

This can be really useful for enhancing consonants or non-pitched syllables in vocal material - or if you are using e.g. percussive sounds in your modulator signal.

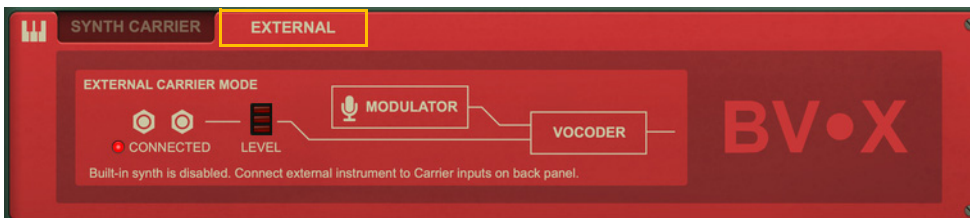
Amp Mode

Here you can choose whether the amplitude (level) of the synth notes should be controlled by the Envelope or "Gated" (immediate attack, full level and no release). In a vocoder, where the Modulator signal affects the level contour of the sound, a Gated carrier synth is often sufficient - that way you can use the Envelope for other modulation purposes.

→ **Select Env to have the Envelope control the carrier signal amplifier, or Gated to gate the carrier signal.**

See “Envelope” for more info about the Envelope.

The External Carrier section



Instead of using the built-in Synth Carrier section you can manually patch in an external carrier signal source to use for vocoding. Typically, the external signal source would be an external synth device that can deliver the type of signals suitable for vocoding.

1. Click the External tab to deactivate the built-in synth.

2. Press [Tab] to flip the Rack around.



- 3. Connect the output(s) of the external synth device to the Ext Carrier In jack(s) of BV-X (see “Ext Carrier In”).**
When the Ext Carrier In jacks are connected, the Connected LED is lit on the front panel and the input level is shown by the Level indicator.
- **If necessary, adjust the output level of the connected synth device.**

Output Mix section



Here you mix the levels of the different signals in BV-X: the Modulator, the Carrier and the Vocoder. There is also a Master Volume control for setting the overall output level.

- **The sliders represent 0 dB in the middle position.**

Limiter



The Limiter affects the output mix signal. It's placed after the Unison and Effect sections but before the Reverb and Master Volume knob in the signal chain.

- **Click the Limiter button to activate the built-in limiter, which prevents any unwanted output signal clipping from BV-X.**

Unison section



BV-X features a delay-based unison effect with modulation. When used with the internal Synth Carrier signal in Modern mode the unison effect is per voice, whereas when you use an External carrier signal - or Vintage mode - the effect is global for the Vocoder Mix signal in the Output Mix section.

The advantage of using unison with the internal Synth Carrier is that you will get a far better result when the Timing parameter is raised, since it affects each voice individually.

- ! If you are using External carrier the unison effect will not affect the carrier signal, only the resulting Vocoder Mix signal in the Output Mix section.**

On/Off

- **Click the On button to activate the Unison section.**

Count

- **Drag up/down in the display to choose the desired number of unison signal duplicates.**



Level

- Set the mix between the original signal and the unison signal duplicates.

Timing

- Set the delay time between the start of each unison signal duplicate.
The result will be better if you use the internal Synth Carrier, since the timing parameter then affects the carrier voices individually.

Detune

- Set the pitch detuning of the unison signal duplicates.

Spread

- Set the stereo spread of the unison signal duplicates.

Effect section



The Effects section features six different effects, where one effect can be used at a time.

On/Off

- Click the On button to activate the Effect section.

Display

- Click the display to bring up a menu where you can choose the desired effect.

The following effects are available:

- Ring Modulation
- Bode Shifter
- Buffering
- Comb
- Dist
- Bit Crush

Ring Mod

This is a ring modulator effect, for generating inharmonic AM/RM effects. When a ring modulator processes audio, two sidebands are generated, one that is shifted upwards and one that is shifted downwards.

- Set the ring modulation frequency with the **Freq knob**.
- It's possible to "play" the Ring Modulator frequency so that it tracks the vocoder notes. See **"Playing the Ring Mod and Buffering effects"**.
- Set the ring modulator feedback level with the **FM/FB knob**.
- Set the mix between the modulated and dry signals with the **Mix knob**.



Bode Shifter

The Bode Shifter is a Bode frequency shifter effect. A frequency shifter shifts the audio spectrum linearly (instead of logarithmically like a pitch shifter does). E.g. an overtone series of 100, 200, 300 Hz can be shifted by 50 Hz to 150, 250, 350 Hz, making the overtones inharmonic.

When a frequency shifter processes audio, two sidebands are generated, one that is shifted upwards and one that is shifted downwards. In the Bode Shifter one of the sidebands are suppressed (otherwise it would sound like a ring modulator). Mixing a slightly shifted signal with the source signal can create phaser-like “beatings” and applying feedback (with a very short delay time) emphasizes this sound.

→ **Set frequency shift amount with the Shift knob.**

Note that the Shift parameter is bipolar, with no frequency shifting at the 12 o'clock position, positive sideband generated on the + side and negative sideband on the - side.

→ **Set the feedback level with the FB knob.**

→ **Set the mix between the frequency shifted signal and the dry signal with the Mix knob.**

Buffering

This effect samples and loops a small part of the signal into a buffer and plays back the buffer at the desired rate.

→ **Set the buffer sample rate with the Freq knob.**

The higher the Freq setting the higher the pitch of the buffered audio.

→ **It's possible to "play" the Buffer frequency so that it tracks the vocoder notes. See “Playing the Ring Mod and Buffering effects”.**

→ **Set the buffer playback rate with the Rate knob.**

The playback rate is synced to the main sequencer tempo, from 1/8th notes to 1/32th notes. The higher the setting the faster the buffer plays back.

→ **Set the mix between the effect and dry signals with the Mix knob.**

Comb

This is a comb filter effect for generating flanger type of effects.

→ **Set the comb filter cutoff frequency with the Freq knob.**

Modulate the Freq with an LFO to get the typical flanger effect.

→ **Set the comb filter resonance amount with the FB knob.**

→ **Set the mix between the modulated and dry signals with the Mix knob.**

Dist

This is an overdrive type of distortion.

→ **Set the overdrive amount with the Drive knob.**

→ **Set the frequency content with the Tone knob.**

→ **Set the mix between the modulated and dry signals with the Mix knob.**



Bit Crush

This is a bit crusher effect with variable sample rate and bit resolution.

- **Set the desired sample rate with the Rate knob.**
- **Set the desired bit resolution with the Bits knob.**
- **Set the mix between the modulated and dry signals with the Mix knob.**

Reverb section



The reverb section features six stereo reverb types, where one reverb can be used at a time.

On/Off

- **Click the On button to activate the Reverb section.**

Display

- **Click the display to bring up a menu where you can choose the desired reverb type.**

The following reverb types are available:

- Small Room
- Medium Room
- Large Room
- Small Hall
- Medium Hall
- Large Hall

Level

- **Set the mix between the original signal and the reverb signal.**

Early

- **Set the early reflections level with the Early knob.**

Decay

- **Set the reverb decay time with the Decay knob.**

Lo Damp

- **Set the low frequency damping amount with the Lo Damp knob.**

Low frequency damping will remove the low frequencies from the reverb tail, which can help keep vocals clear.



Global controls and Modulation Matrix



Pitch

The Pitch bend wheel can be used for bending note pitches of the Synth Carrier up and down. BV-X also responds to Pitch Bend MIDI data from a connected MIDI master keyboard. You set the desired pitch bend range with the “P.Range” control in the Synth Carrier section. The Pitch bend wheel can also be used as a Source in the Modulation Matrix, for controlling almost any parameter in BV-X, see “The Modulation Matrix” below.

! **Pitch Bend cannot be used if you are using External carrier signal.**

Mod Wheel

The Mod wheel can be used for controlling the Vibrato amount in the Synth Carrier section, see “Mod Wheel Scale and Vibrato Amount”. The Mod Wheel can also be used as a Source in the Modulation Matrix, for controlling almost any parameter in BV-X, see “The Modulation Matrix” below.

Vibrato

The Vibrato works individually per voice and can be used for modulating the internal Synth Carrier oscillator pitch. It can also be used as a Source in the Modulation Matrix, for controlling almost any parameter in BV-X, see “The Modulation Matrix” below.

- **Set the vibrato speed with the Rate knob.**
- **Drag up/down in the display to select the desired modulation waveform.**
Besides the standard waveforms (sine, triangle, pulse, etc.) there are random, slope and stepped waveforms. The shape of the waveforms are shown in the display.
- **Set the time it should take to gradually introduce the vibrato effect after each MIDI Note On with the Delay knob.**

LFO

The LFO is global for all voices and can be used as a Source in the Modulation Matrix, for controlling almost any parameter in BV-X, see “The Modulation Matrix” below.

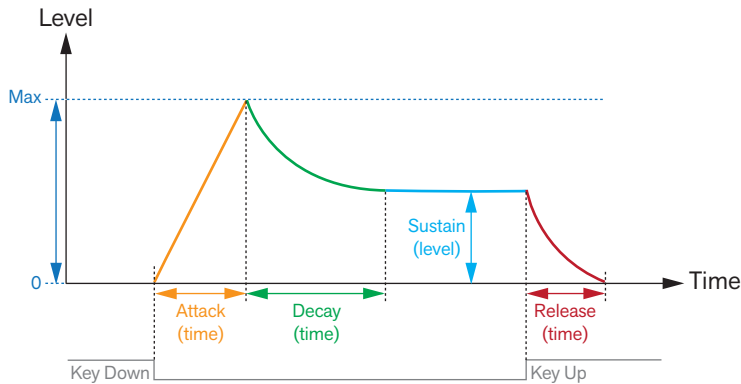
- **Set the LFO speed with the Rate knob.**
- **Drag up/down in the display to select the desired LFO waveform.**
Besides the standard waveforms (sine, triangle, pulse, etc.) there are random, slope and stepped waveforms. The shape of the waveforms are shown in the display.
- **Click the Key Sync button to restart the LFO at every new MIDI Note On.**
- **Click the Beat Sync button to sync the LFO to the main sequencer tempo in Reason/your DAW.**
The Rate parameter now controls the time divisions.



Envelope

The Envelope can be used for modulating the Synth Carrier's amplifier - if the Amp Mode is set to "Env", see "[Amp Mode](#)". It can also be used as a Source in the Modulation Matrix, for controlling almost any parameter in BV-X, see "[The Modulation Matrix](#)" below.

The Envelope is a standard ADSR type of envelope. The picture below shows the various stages of the ADSR envelope:



The ADSR envelope stages.

- **A(ttack)**

When you play a note on your keyboard, the envelope is triggered. This means it starts rising from zero to the maximum value. How long this should take, depends on the Attack setting. If the Attack is set to "0", the maximum level is reached instantly. If the Attack value is raised, it will take longer time before the maximum level is reached.

- **D(ecay)**

After the maximum level has been reached, the level starts to drop. How long this should take is governed by the Decay parameter.

If you want to emulate the volume envelope of a note played on a piano for example, the Attack should be set to "0", the Decay parameter should be set to a medium value and the Sustain level should be set to "0", so that the volume gradually decreases down to silence, even if you keep holding the key down. Should you want the decay to drop to some other value than zero, you raise the Sustain parameter.

- **S(ustain)**

The Sustain parameter determines the level the envelope should rest at, after the Decay stage. If you set Sustain to full level, the Decay setting is of no importance since the volume of the sound is never lowered.

If you want to emulate the volume envelope of an organ, you theoretically only really need to use the Sustain parameter set to full level, as a basic organ volume envelope instantly goes to the maximum level (Attack "0") and stays there (Decay "0"), until the key is released and the sound instantly stops (Release "0").

But often a combination of Decay and Sustain is used to generate envelopes that rise up to the maximum level, then gradually decreases to finally land to rest on a level somewhere in-between zero and the maximum level.

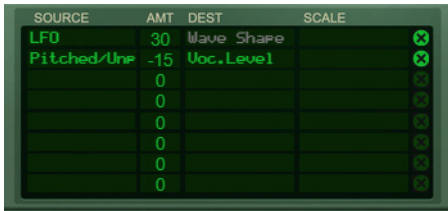
Note that Sustain represents a level, whereas the other envelope parameters represent times.

- **R(elease)**

The Release parameter works just like the Decay parameter, except it determines the time it takes for the volume to drop back to zero after you release the key.



The Modulation Matrix



The Modulation Matrix section is used for routing a modulation Source to one Destination each. This creates a very flexible routing system that complements the “pre-wired” routing in BV-X.

The Modulation Matrix section in BV-X is derived from the one in other Reason instrument devices, so if you are familiar with Reason you will quickly find your way around in BV-X’s Modulation Matrix.

There are eight “Source → Destination → Scale” busses.

A Source parameter can modulate one Destination parameter per bus. Each bus also has a Scale parameter that affects the relative modulation Amount for the Destination.

- **Note that it is possible to assign the same source parameter as Source in several busses. This allows you to control more than one Destination parameter from the same Source.**

1. Select the desired Source parameter by clicking in the corresponding Source box and selecting from the list.

The following parameters can be used as modulation Sources:

Parameter	Description
Velocity	This applies modulation according to the Keyboard Velocity values (how hard or soft you strike the MIDI keyboard keys).
Envelope	This allows you to modulate parameters from the Envelope.
LFO	This allows you to modulate parameters from the LFO.
Vibrato	This allows you to modulate parameters from the Vibrato.
Random	This sends out a random value each time a new note is played.
Key	This is keyboard tracking. If a positive Amount value is used and the destination is Noise Color, for example, the Noise Color will track the keyboard, i.e. increase with higher note numbers.
Modulator Level	This allows you to modulate parameters from the Modulator level.
Modulator Silence	This sends a high signal when the Modulator level approaches silence.
Pitch Detect	This lets you modulate a parameter based on the Modulator input pitch. A pitch detected as note C3 represents a modulation level of 0.
Pitched/Unpitched	This lets you modulate a parameter based on if the Modulator input contains a pitched or unpitched signal. If the signal is pitched the value is 0 and if the signal is unpitched the value is max.
Modulation Wheel	This allows you to modulate parameters from the Mod Wheel.
Pitch Wheel	This allows you to modulate parameters from the Pitch Bend control.
Breath Controller	This allows you to modulate parameters from the Breath performance controller.
Expression	This allows you to modulate parameters from the Expression performance controller.
Aftertouch	This allows you to modulate parameters from Keyboard Aftertouch (channel aftertouch).
CV1/2	This takes the current value on the CV 1 and CV 2 inputs on the rear panel and sends to the desired destination.

Modulation Matrix Source parameters

2. Set the Amount for the Destination by clicking and dragging vertically in the corresponding AMT box.

- ! **Note that the Amount range is +/-100. This means that the Amount value can exceed the modulated parameter’s range. When this happens, the modulated parameter simply stays at its extreme value until the Amount value gets within the parameter’s range again.**



3. Click the desired Destination box and select the Destination parameter from the list.

The following parameters can be used as modulation Destinations:

Parameter	Description
Synth: Pitch	This affects the (full range) pitch of the Synth Carrier Oscillator.
Synth: Amp	This affects the Synth Carrier level.
Synth: Wave Shape	This affects the Synth Carrier Oscillator wave shape.
Synth: Noise Mix	This affects the Synth Carrier Noise Mix amount.
Synth: Noise Color	This affects the Synth Carrier Noise Color parameter.
Synth: Sub Level	This affects the Synth Carrier "-12" level on the Harmonic Mix panel.
Synth: Root Level	This affects the Synth Carrier "Root" level on the Harmonic Mix panel.
Synth: Fifth Level	This affects the Synth Carrier "+7" level on the Harmonic Mix panel.
Synth: Oct Level	This affects the Synth Carrier "+12" level on the Harmonic Mix panel.
Synth: Oct+Fifth Level	This affects the Synth Carrier "+12+7" level on the Harmonic Mix panel.
Vocoder: Formant	This affects the Vocoder Formant parameter.
Vocoder: HF Gain	This affects the Vocoder HF Gain parameter.
Vocoder: Spectral Spread	This affects the Vocoder Spectral Spread parameter.
Vocoder: Attack	This affects the Vocoder Attack parameter.
Vocoder: Decay	This affects the Vocoder Decay parameter.
Vocoder: Noise Gate	This affects the Vocoder Noise Gate parameter.
Vocoder: Low Freq	This affects the Vocoder Low Freq parameter (in Vintage mode).
Vocoder: Band Reso	This affects the Vocoder Band Resonance parameter (in Vintage mode).
Vocoder: Curve Amt	This affects the Vocoder Transfer Curve Amount parameter (in Modern mode).
Vocoder: Hold	This affects the Vocoder Hold parameter.
Modulation: Vibrato Rate	This affects the Vibrato Rate parameter.
Modulation: LFO Rate	This affects the LFO Rate parameter.
Modulation: Env Attack	This affects the Envelope Attack parameter.
Modulation: Env Decay	This affects the Envelope Decay parameter.
Modulation: Env Sustain	This affects the Envelope Sustain parameter.
Modulation: Env Release	This affects the Envelope Release parameter.
FX: Unison Blend	This affects the Blend parameter in the Unison section.
FX: Unison Detune	This affects the Detune parameter in the Unison section.
FX: Unison Spread	This affects the Spread parameter in the Unison section.
FX: Unison Timing	This affects the Timing parameter in the Unison section.
FX: Effect P1	This affects the first knob in the Effects section.
FX: Effect P2	This affects the second knob in the Effects section.
FX: Effect Mix	This affects the Mix parameter in the Effects section.
FX: Reverb Level	This affects the Level parameter in the Reverb section.
FX: Unison Decay	This affects the Decay parameter in the Reverb section.
Output: Carrier Level	This affects the Carrier Mix parameter in the Output Mix section.
Output: Modulator Level	This affects the Modulator Mix parameter in the Output Mix section.
Output: Vocoder Level	This affects the Vocoder Mix parameter in the Output Mix section.
Output: CV1/2 Out	This sends out the source modulation value(s) on the CV1/2 Output on the rear panel.

Modulation Matrix Destination parameters



4. If desired, click the Scale box and select a Scale parameter.

The available Scale parameters are the same as the Source parameters, see “[Modulation Matrix Source parameters](#)”.

Selecting a source here means the modulation is scaled by that source.

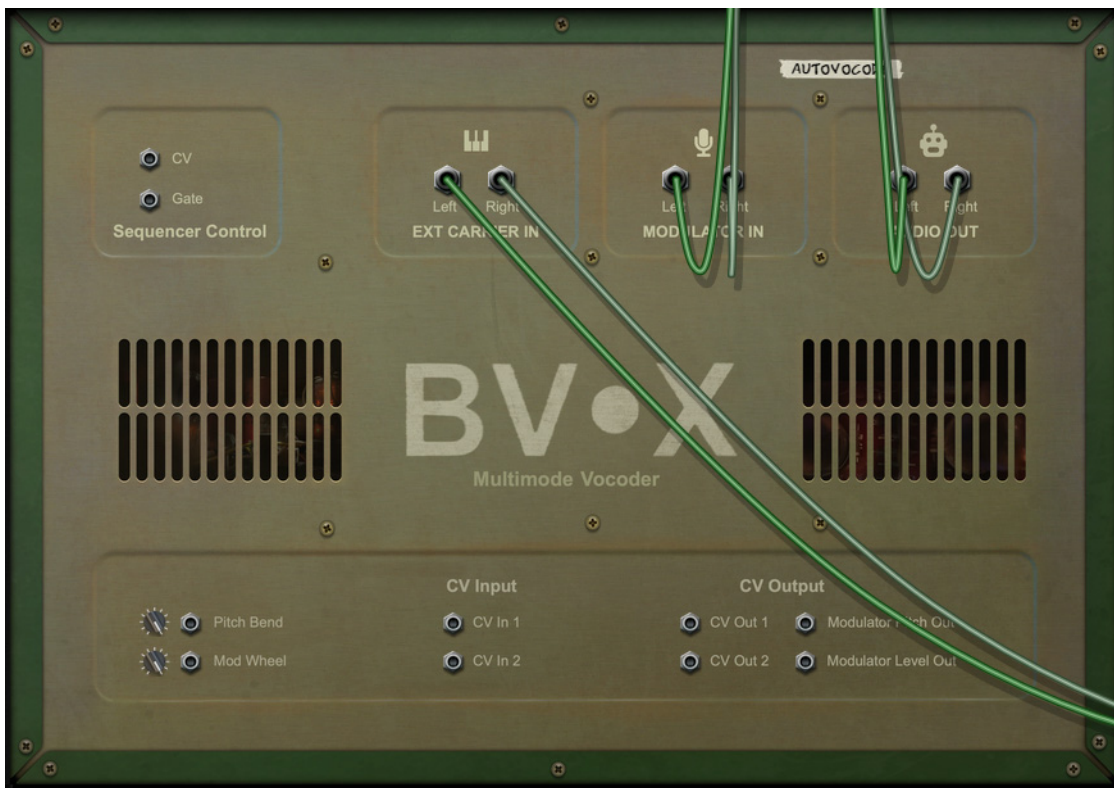
For example, if you set up a modulation as follows:

Source	Amount	Destination	Scale
LFO	50	Vocoder: Formant	Mod Wheel

then the LFO will modulate the Formant parameter, but the modulation will be scaled by the Mod Wheel. When the Mod Wheel is at zero, there will be no modulation at all. Raising the Mod Wheel will gradually increase the modulation up to the set Amount (50).

- To clear an assigned Source, Destination or Scale parameter, hold down [Ctrl](Win) or [Cmd](Mac) and click the Source/Destination/Scale box. Alternatively, click the Source/Destination/Scale box and select “Off” from the list.
- To reset an Amount value to 0, hold down [Ctrl](Win) or [Cmd](Mac) and click the desired Amount box.
- To clear an entire modulation assignment (a whole row), click the circular X button to the right of the corresponding Scale box.

Rear panel connections



! Remember that CV connections are NOT stored in the BV-X patches! If you want to store CV connections between devices, put them in a Combinator device and save the Combi patch.



Sequencer Control inputs

The Sequencer Control CV and Gate inputs allow you to play BV-X from another CV/Gate device (typically a Matrix or an RPG-8). The signal to the CV input controls the note pitch, while the signal to the Gate input delivers note on/off along with velocity.

Ext Carrier In

Here is where you connect the outputs of an external synth/instrument device if you want to use an external carrier signal instead of the built-in Synth Carrier, see [“The External Carrier section”](#).

Modulator In

Here is where the Modulator input signal is routed. When BV-X is used as an insert effect in an Audio Track/Mix Channels device this is where the Insert Effect “To Devices” connectors should be routed.

Audio Out

These are the main audio outputs.

CV Input

These control voltage (CV) inputs can be used for modulation source signal modulation via the Modulation Matrix (see [“The Modulation Matrix”](#)). There are also CV inputs with attenuation knobs for modulating the Pitch Bend and Mod Wheel parameters.

CV Output

These control voltage (CV) outputs can be used for modulating external device parameters. The CV1/2 outputs can be assigned as Destinations in the Modulation Matrix (see [“The Modulation Matrix”](#)).

- **The Modulator Pitch output sends out a bipolar pitch CV value according to the detected pitch of the modulator signal, where the value 0 represents note C3.**
Use this signal to control e.g. filter cutoff in an external synth device.
- **The Modulator Level output sends out a positive unipolar signal according to the detected level of the modulator signal.**



Tips & Tricks

Using Rex loops as Modulator signal in BV-X

An alternative to using vocal audio as Modulator signal in BV-X could be to use percussive Rex loops. This could generate really cool “vocoded” beats. Here is how you can set up a Dr Octo Rex with BV-X:

1. Create a Dr Octo Rex device.
2. On the Dr Octo Rex Mix Channel device click the Insert FX button to open the Insert Effect container.
3. Drag a BV-X device from the Effects palette in the browser and drop in the Insert FX container.
If you are running an earlier Reason version than 12.2.5, manually create a sequencer track for BV-X.



4. Play back the Rex loop and play notes on the BV-X sequencer track to generate rhythmic vocoded chords.



Using Players with BV-X

Since BV-X is an Effect device (and not an Instrument device) you can't add a Player straight to it as you can with instruments. Instead you will have to create a Combinator device and put BV-X in the Combinator - then add the Player to the Combinator device:



← Insert Effects section of an Audio Track device

A PolyStep Sequencer Player attached to a Combinator featuring a BV-X for controlling the Synth Carrier notes.

! It's important that you attach the Player to the Combinator device and not to the BV-X inside it.



Playing the Ring Mod and Buffering effects

It's possible to "play" the frequency of the Ring Mod and Buffering effects so that the frequency tracks the vocoder notes. Here's an example with the Ring Mod effect but you can use the same principle also for the Buffering effect:

1. Select Ring Mod in the Effect section and set the Freq parameter to 50%:



2. In the Modulation Matrix, add the Source "Key", routed to the Destination "FX > Effect P1" with the Amount "100":

SOURCE	AMT	DEST	SCALE
Key	100	Effect P1	⊗
	0		⊗
	0		⊗
	0		⊗
	0		⊗
	0		⊗
	0		⊗

3. Set the Effect Mix parameter to taste:



4. Now, when you play the BV-X vocoder the effect pitch will track the last key you play (monophonically). For intervals, try changing the Freq parameter.

- If you are using the BV-X in Auto Play mode (see "Auto Play"), replace the "Key" Source with "Pitch Detect" in the Modulation Matrix. This way the Modulator pitch will control the frequency of the Ring Modulator or Buffering effect.

Credits

BV-X Multimode Vocoder was designed and developed by Reason Studios.

Patch design by:

Harald Karla

J Chris Griffin

Joey Luck

Navi Retlav

Seán Murray

Simon Sherbourne

Reason Studios

