access
MUSIC ELECTRONICS

VIRUS addendum

New Features Operating System 2.0

Content

▶ The Virus Vocoder

Yes, it is possible. The Virus now contains a real vocoder. All you need to use it is the Virus's internal sound engine or you can use the Virus to process external signals. The Virus vocoder features 32 bands, the ability to shift the spectrums of the modulator and carrier against each other, adjustable Q-factor for the filters, LFO modulation, and much more.

Even though vocoders seem to be back en vogue after a long absence from the music mainstream, many people don't know exactly what a vocoder is, what it does and - most important of all - just what it sounds like.

Basically a vocoder is a device that merges the frequencies of two different signals together to give one signal (called the carrier) the texture of the other (called the modulator). This is achieved by filtering both signals through a bank of bandpass filters, measuring the amplitude of the individual filterbands of the modulator and applying those amplitude values to the carrier signal. An example:

A microphone and a synthesizer pad are fed into the vocoder. To make the pad talk (one of the classic tasks of a vocoder), you need to analyse the frequencies of the voice singing into the microphone and apply the resulting frequencies to the pad. This process could be described as the
voice modulating the synthpad, and this is how the terms "modulator" and "carrier" were coined.

Remember that any signal can be used as a modulator or as a carrier as you will see below. Using the Virus you can either use the internal sound engine for one or both, use external signals (even filter them before you put them through the vocoder using the AUX path) or a combination of both.

The vocoder replaces the entire filter section of the Virus in one single patch. All vocoder parameters are controlled by the filter section's knobs. Set up a MULTI to process other Virus sounds with the vocoder (see below for detailed instructions).

The vocoder consists of three sections:

1. The Modulator Bank

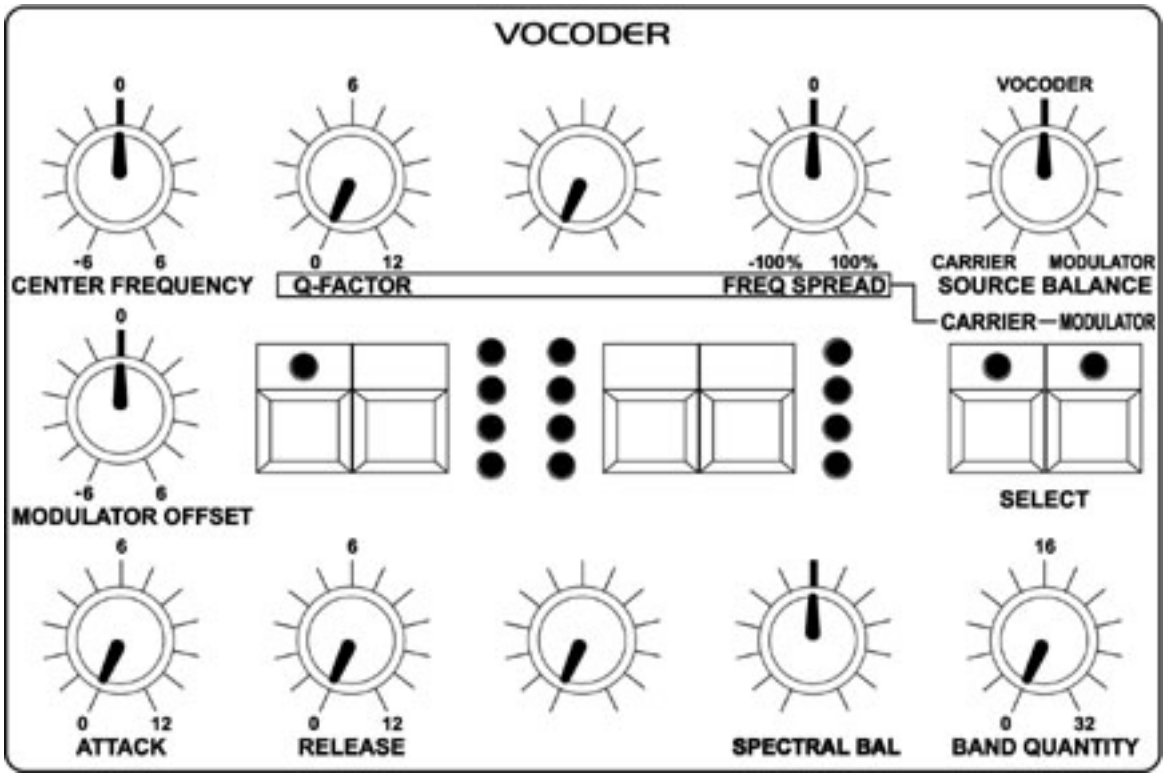
In the modulator bank, a number of bandpass filters splits the modulator signal's sprectrum (for example voice) into different bands just like a studio-analyzer does.

2. The Envelope-Followers

The Envelope-Followers measure the output level of each of the bandpass filters. The resulting signals - which are no longer audio signals but rather modulation-values or envelopes, can be shaped using the filter section's Attack and Decay knobs.

3. The Carrier Bank

The carrier signal is also split into different bands just like the modulation signal is. Each band corresponds to a band from the modulator section. Normally the matched bands use the same center frequency as well. The resulting signals of the modulator signal are now used to control the output of the carrier filters just like envelopes do. All resulting signals of the individual frequency bands are then mixed back together again into the actual vocoder signal.



VOCODER Mode (in the INPUT pages of the Edit menu)
This switches the vocoder on and selects an input source to be used as a carrier signal.

Osc
This selects the entire regular oscillator section of the Virus (including the noise generator) as the carrier signal. The oscillators can be played polyphonically and the amplifier envelope is active as normal. The signal does not pass the filter section though, since those knobs are being used for the vocoder. The Virus' voice polyphony is reduced depending on the number of bands used for the vocoder. (see Filter Envelope RELEASE).

To use a sound that has passed the Virus's filter section, switch the Virus into multi-mode and select one of the AUX paths as the output for this single. This AUX path can then be used as an input signal for the vocoder's carrier section using the VOCODER Mode page. (see below)

OscHold
Same as Osc, but Hold-Mode is active, which works the same as on the COMMON KeyMode page.

Noise
Noise will be used as a carrier signal, the oscillator section is inactive.

In L / In L+R / In R / Aux L ...
The selected analog input or AUX path will be used as the input source for the carrier section. If you select a stereo source, the left and right signals will be mixed into a mono signal.

OSC VOL (default: 0 (center position))
OSC VOL controls the vocoder's overall ouput level independent from the source selected in VOCODER Mode.

INPUT Select (in the EDIT menu)
Normally selects the source for the input mode. In the vocoder this parameter is used to select the input source for the modulator bank of the vocoder. If you select a stereo source, the left and right signals will be mixed into a mono signal.

Band Quantity (Filter Envelope RELEASE)
This selects the number of bands used for the vocoder (range: 1-32)

The number of filter bands determines the complexity and quality of the vocoder. Fewer bands produce the typical vocoder sound, a higher number produces a higher quality signal and clearer reproduction of signals, for example vocals. 32 vocoder bands use up to 4 voices of the Virus's polyphony.

CUTOFF (default: 64 (center position))
Center frequency for the bandpass filters in the modulator- and carrier-banks. When the filter band spread (KEYFOLLOW) is set to a low value, CUTOFF changes the center frequency of the analysed spectrum.

KEYFOLLOW (default: +63 (right))
Frequency spread of the bandpassfilters in the modulator and carrier banks. Depending on the setting of the Filter-select buttons, this parameter is applied to the carrier, the modulator or both signals, where FILT 1 is the carrier and FILT 2 is the modulator.
If KEYFOLLOW is set to maximum (+63), the filters range across the entire spectrum. If you reduce the KEYFOLLOW amount the filter's spread becomes narrower and only a smaller part of the audio spectrum is used. The center frequency of the spectrum that is used can be determined by using CUTOFF (for the carrier) or CUTOFF 2 (offset for the modulator).
If both banks are selected (FILT 1 and FILT 2 SELECT are lit), the frequencies of both banks are identical. If you then reduce the spread of FILT 1 (carrier signal), the analysed spectrum of the modulator will be applied to a narrower part of the carrier signal, resulting in an audibly compressed spectrum. If on the other hand, the spread of the modulator is reduced, only a part of the modulator signal will be analysed by the envelope followers, but the resulting values are nontheless applied to the entire spectrum of the carrier signal. The spectrum will sound expanded.
Turning one of the KEYFOLLOW parameters into the negative range will cause the modulator's spectrum to be inverted before it is applied to the carrier.

CUTOFF 2 (default: 0 (center))
Linear shift of the modulatorbank's frequencies to the frequencies of the carrier bank. This shifting of the spectrums of the two banks will create pitch shifter type effects.

RESONANCE
RESONANCE controls the Q-factor of the bandpassfilters. Depending on the setting of the FILT SELECT buttons, this parameter controls the carrier, the modulator or both signals. Again FILT 1 controls the carrier and FILT 2 controls the modulator.

At a low Q-factor for the carrier bands (FILT 1), the carrier signal will sound more natural, a higher Q setting will emphasize the artificial character of the vocoder.

This parameter works slightly different in the modulator bank. Here the Q-setting determines the selectivity of the modulator's filter bands. Depending on the type of signal used as a modulator, this setting can be almost inaudible or drastic.

FILTER ATTACK (default: 0 (left))
The Envelope follower's attack time.

FILTER DECAY (default: 0 (left))
The Envelope follower's release time.

FILTER BALANCE (default: 0 (center position))
Filter balance lets you mix between the vocoder signal and the inputs (modulator or carrier). If you turn FILTER BALANCE to the left, the carrier signal is added to the vocoder signal. If you turn FILTER BALANCE to the right, the modulator signal is added to the vocoder signal. Hard left or hard right settings let you monitor the respective input signals for the vocoder.

You can modulate several of the vocoder parameter using LFO 1 and LFO 2:

LFO 1 RESO 1+2
Modulates the bandpassfilter's Q-factor of the modulator- and carrier banks.

LFO 2 FILT 1
Modulates the bandpassfilter's frequencies of the carrier bank.

LFO 2 FILT 2
Modulates the bandpassfilter's frequencies of the modulator bank.

When the Virus is set to multimode, any of its 16 parts can use the vocoder. If the vocoder is the active patch for more than one part in a MULTI, the part with the lowest partnumber will be the active vocoder.

The vocoder requires quite a bit of DSP power, thus using the vocoder reduces polyphony in the Virus depending on the number of vocoder frequency bands used. To produce a vocoder sound with 32 bands, the Virus uses up to four of its voices.

Since the vocoder uses the entire filter section of a single, features like SATURATION or FILTER ROUTING (functions that are not used in the vocoder) are not available.

To use the Virus as a stand-alone vocoder, select one of the inputs as the modulator signal and the other for the carrier signal. To do this, go to the VOCODER Mode page and select "In L" to select the left input as the carrier, use the INPUT Select page and select "In R" to use the right input as the modulator signal. Alternatively you could use another part in a MULTI as an input for either of the two vocoder inputs. Route the parts signal to one of the two AUX paths (using OUTSel in the EDIT menu) and select that AUX path as an input for either one of the two vocoder inputs. The AUX paths may be the output for more than one multipart, thus it is possible to create an entire drumtrack using several programs, route them all into one of the AUX paths and use this as an input for the vocoder modulator. You can then adjust the amount of the original input signal that is mixed to the vocoder signal using the FILTER BALANCE knob.

Keep in mind that when using the vocoder, the settings of a of a single(or multipart), for chorus, delay and output select are available as usual.

▶ New Features in OS 2.0

New MULTI-Mode Features

A new timeout window avoids unwanted switching and so erasing of an edited multi program

New parameter "Priority" in Multi mode in CTRL menu
(parameter C 77, bit 5, value range 0:low, 1:high).
By this parameter you can control the behavior of voice stealing of the Virus. The default value is "Low", the voices of all parts have equal rights, when a voice must be switched off for the benefit of a new voice. When the "Priority" of one part is switched to "High", the voice stealing on voices of this part will be avoided. An economical use of this parameter is recommended, do not switch all parts to "high", the parameter would lose its effect, because all voices would have equal rights again.

Multi-Program-Change
It is now possible to switch entire Multi-Programs via MIDI. To use this function you must first enable it in the CTRL menu: set "MultiPrgChg = Ena" (enable). The Virus will then react to Multi Program changes sent to its "GlobalChan", program changes on all other channels will switch around the single programs. Multi-Program-Changes only work when "MultiPrgChg = Ena", but is not influenced by the "ProgChange" setting which only applies to single programs. Multi-Program-Change does not work in Multi-Single mode, since it would be impossible to represent on the display.
(CTRL: MIDI MultiPrgChg Dis/Ena)

Multi-Part Store
When in Multimode, pressing STORE, MULTI and SINGLE simultaneously, now saves all 16 single programs included in the 16 multiparts.

New Arpeggiator Features

Arpeggiator Hold (CTRL Menu: ARPEGGIATOR)

Arpeggiator To Midi (CTRL Menü: MIDI, global parameter)

New arpeggiator modes: Random and Chord
Random plays the notes in random order while chord plays the entire chord with the value defined in the ARPEGGIATOR CLOCK. (EDIT: ARPEGGIATOR Mode)

New FX Features

Output Select for the global Delay

The global delay is now accessible from all parts in Multi mode and MULTI SINGLE mode (former only part 1)

Parameter CHORUS Feedback now bipolar

(Parameter A 109, value range -64..63).
For creating a flanger effect, the additional negative value range of the feedback makes possible new, even softer flanger characteristics.

Delay Time even smoother

By adding a new smoothing function to the DELAY TIME parameter, manual changes to delay times (and the resulting change in pitch) sound much smoother now.

New Synchronisation Features

real LFO Sync to MIDI Clock with selectable Note Resolution (1/64 to 4 bars)

Midi Clock Synchronisation

The LFO's and the arpeggiator are resynchronised on the beginning of the next bar, when the song is started in the middle of a bar.

LFO Keytrigger now works when LFO is synced to masterclock

A synced LFO used to run synced to the beginning of a measure, thus monophonic and it ignored the Keytrigger setting. Now even synced LFOs can be triggered through note on events, LFO rate is still set by the Master-Clock or the MIDI-Clock.
Additional New Features

Panic Function (by pressing both Transpose buttons at a time)

This function e.g. stops the Virus playing notes, where the note-off is missing.

Global Program-Change Enable, Global MIDI-Volume Enable (CTRL Menu: MIDI)

Parameter LED-Mode (in SYSTEM menu) with a new setting: "Auto"

When the setting "Auto" is active, then the LFO Rate LEDs automatically switch to input level indicators, when a Single or a Part is selected, where the Input mode is active.

Keytrigger and Keytrigger-Phase for LFO1, Keyfollow for LFO2

These functions correspond with the parameters on the respective other LFO (as described in the manual) but are only available through the display pages.
(EDIT: LFO1 TrigPhase, LFO2 Keyfollow).

Adaptive Control Smoothing

Since version 1.55 the Virus can differentiate between continuous parameter changes (such as fader and button moves) and jumps in parameters as step sequencers might send them. This means that a step sequencer sending large value changes for parameters like cutoff will no longer cause a "whop" sound in the attack phase of the next note. The Virus detects the difference between continuous changes and jumps and automatically switches off the Adaptive Control Smoothing function for the latter. (see below for further information on Adaptive Control Smoothing).

Comments about Adaptive Control Smoothing:
Analog step sequencer let you send a new cutoff value with every new note. Even though modern digital sequencers can do this too by drawing controller values into the arrangement, there is a drawback. To keep the timing tight, a digital sequencer will send note events before controller events, causing a new cutoff value to reach the Virus after the note has started to play back. This will cause unwanted artefacts. A workaround would be to put all controllers on a separate track from the note events (on the same MIDI channel of course) and to give this track a negative delay. This way, the cutoff is sent to the Virus prior to the note event. This is true for all MIDI synthesizers, not just the Virus.
To have the sequencer sent continuous controller moves to the Virus (for example using the ruler in Cubase), quantization (if active) should be set to at least 1/32 notes. Otherwise the Virus will think that these jumps in controller values are intentional and switch off Adaptive Control Smoothing.

The Hold mode is a new polyphonic mode,

where the notes are held, even when the keys are released. Only when all keys are released, and a new key is played, those notes that were held till now, are internally released. So this mode works similar to the Arpeggiator Hold, but directly affects the individual notes. (CTRL: COMMON: Keymode)

Arrangement Dump

Arrangement Dump sends the current Multi and all enabled Single Programs via MIDI, enabling a quick way to store the arrangement on a sequencer. To reduce the size of this dump, only the Single Programs of the enabled parts are sent.
(CTRL: MIDI DUMP TX Arrangement)

Global Dump

Global Dump sends all global data (all parameters that are not saved in a Single or Multi Program: for example SoftThru on/off) via MIDI to save it on a sequencer.
(CTRL: MIDI DUMP TX Global)

Total Dump
Total Dump sends all the data from the Virus to a sequencer via MIDI.

Parameter Scroll
Hold down a Parameter button to automatically scroll through the list of the available parameters in the CTRL or EDIT menus. You can also scroll quickly through the parameter groups by holding down one parameter button then pressing the other. If you keep the second button pressed as well, the Virus will scroll through the parameter groups.

The New MIDI-Parameters

A	73	a	Lfo1 Keytrigger	0..127	0:Off, 1..127:Keytrigger Phase
A	84	a	Lfo2 Keyfollow	0..127	
B	1	b	Arp Mode	0..4	0:Off 1:Up 2:Down 3:Up&Down 4:AsPlayed 5:Random 6:Chord

Arrangement Request
$F0 $00 $20 $33 $01 [DeviceId:$00..$10] $34 $F7

Global Request
$F0 $00 $20 $33 $01 [DeviceId:$00..$10] $35 $F7

Total Request
$F0 $00 $20 $33 $01 [DeviceId:$00..$10] $36 $F7

▶ Updating the System

The Virus operating system update consists of two MIDI files; "first.mid" and "second.mid" (the second.mid- file is not generally included - only if there are changes). The file "first.mid" actually contents the OS, while "second.mid" contents the factory singles and multis.

If you already created and stored your own sound programs, you can dump them into any MIDI sequencer with the MIDI Bulk Dump function, because you have the possibility to import new factory sound with the new operating system. This function can be found in the MIDI menu, accessible through the CTRL button.

Update Procedure:

- Switch the VIRUS off.
- Load the MIDI file "first.mid" into your favourite MIDI sequencer and make sure that the right MIDI output stream is selected.
- Hold down the STORE button while switching the VIRUS on until the display shows "SYSTEM UPDATE Receive".
- Press STORE again to activate the receive status.
- Now you can start the MIDI file

While receiving the file, the VIRUS displays the current block number that was received. If an error occurs, the display shows the message "RECEPTION FAILED". If this message appears, a problem in the MIDI transmission of either your sequencer or your MIDI interface occured. In this case you should repeat the above procedure, maybe with a slower tempo (e.g. 60bpm). Press any key to quit the error message and press STORE to activate reception status again.

After transmission you have to press the STORE button to start the burn procedure that writes the operating system to the Flash ROM.

ATTENTION!
Make sure that the VIRUS is not being switched off during this procedure!

After the burn procedure, you are asked to switch of the virus.
If you have already loaded the file "second.mid" on an earlier system update, it is

not necessary to reload it.
If the version number of your previous OS was 1.12 or lower, you are asked to load file "second.mid"
right after switching on the Virus again. This file contents the factory singles and multis. By loading this file your consisting RAM Singles will NOT be overwritten, because the file is stored in the FLASH ROM.

Load the MIDI file "second.mid" into your MIDI sequencer and make sure that the right MIDI output stream is selected.
Press STORE again to activate the receive status.
Now you can start the MIDI file

When the reception fails on this file, the reception of "second.mid" must be repeated. But it is NOT required to load "first.mid" again. Press any key to quit the error message and press STORE to activate reception status again.

After transmission you have to press the STORE button to start the burn procedure. Make sure again that the VIRUS isn't switched off during this procedure.

After this burn procedure, you can finally decide if you want to copy the included factory singles (bank A and B) and multis to the RAM or not.

ATTENTION: SOUNDS THAT WERE LOCATED ON THESE BANKS ARE LOST!

▶ System Reset

If your VIRUS ever behaves strangely or does unexpected things - try a System Reset!
Hold down the LFO 1 SHAPE and LFO 2 SHAPE buttons while switching the VIRUS on. No RAM Data will be overwritten, though several Global Settings (like MIDI Soft Thru) will be set to their defaults.
In the following menues you can decide if you want to takeover bank A or B (press SINGLE) or not (press any other key).

You can use the System Reset also to restore the factory sounds.
ATTENTION: SOUNDS THAT WERE LOCATED ON THESE BANKS ARE LOST!

enjoy the new Virus features.

Your access development team.
autumn 1998

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