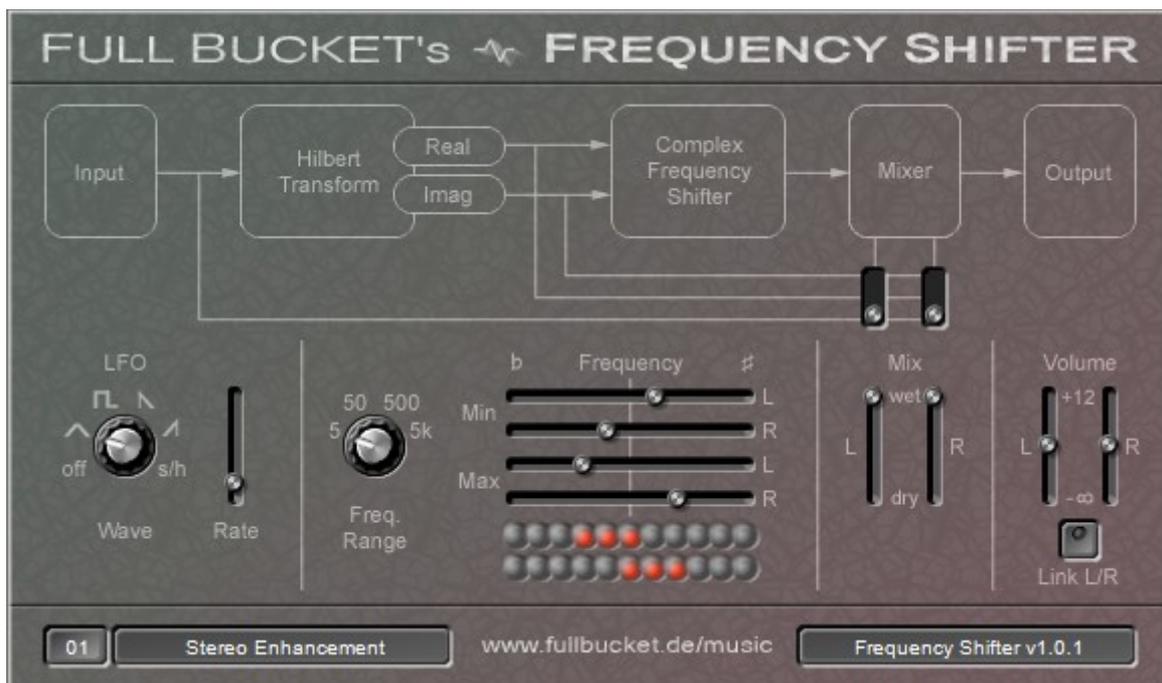


Full Bucket's Frequency Shifter

VST™ 2.4 Effect

Version 1.0

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<http://www.fullbucket.de/music>



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Introduction

The *Frequency Shifter* is a VST™2.4 software effect for Microsoft® Windows® written in native C++ code. The main features are:

- Frequency shifting up to ± 5000 Hz
- Optional LFO with five waveforms
- Four frequency ranges, three mix modes
- Linked or individual control for both stereo channels
- Double precision audio processing
- Plug-in comes in 32 bit and 64 bit versions
- Fully compatible with SM Pro Audio's V-Machine™

The *Frequency Shifter* shifts the spectrum of the input signal up or down along the frequency axis. This effect is also known as "Bode Frequency Shifting" or "Single Sideband Modulation" – imho one of the most underrated and ignored effects ever.

Do not confuse the *Frequency Shifter* with a *pitch* shifter! A pitch shifter multiplies all frequencies of the input signal by a constant factor while a frequency shifter *adds* (or subtracts) a constant amount of Hertz to (or from) those frequencies. Thus, the harmonic structure of the input signal will not be preserved in the modulated signal, resulting in a raw, inharmonic, metallic, you-name-it sound the more you apply the effect. Even more, if you mix a slightly shifted signal with the original input signal you will get some uncommon phasing sound.

Architecture

The input signal is fed into a *Hilbert Transform*, an all-pass network that outputs two signals (the "real" and the "imaginary" signal) which are mutually phase shifted by 90° . This pair of signals represents kind of a "complex" version of the input signal (without *negative* frequencies).

The signal pair is then modulated by a complex sinusoid (a cosine and a sine, i.e. again a signal pair mutually phase shifted by 90°) resulting in a frequency shifted version of the input. The amount of shifting may be controlled by an optional LFO.

Finally, the effect signal can be mixed with the original input or one of the outputs of the *Hilbert Transform* (the "real" or the "imaginary" signal).

Note that shifting the signal spectrum "below" zero Hertz will result in *negative* frequencies that are clearly audible, meaning that at some point frequencies you're shifting "down" will reappear as frequencies that are rising "up"! This is not a bug of the *Frequency Shifter* but a fact of Digital Signal Processing mathematics. For more information see for example "*The Scientist and Engineer's Guide to Digital Signal Processing*" by Steven W. Smith, Ph.D. (a free PDF version of this great book is available at www.dspguide.com).

Parameters

parameter	description
<i>Frequency Range</i>	the range of the frequency shifting ($\pm 5\text{Hz}$, $\pm 50\text{Hz}$, $\pm 500\text{Hz}$, or $\pm 5000\text{Hz}$)
<i>Min. Frequency L</i>	controls the minimum shift frequency for left channel; will be inactive when LFO is off
<i>Min. Frequency R</i>	controls the minimum shift frequency for right channel; will be inactive when LFO is off
<i>Max. Frequency L</i>	controls the maximum shift frequency for left channel
<i>Max. Frequency R</i>	controls the maximum shift frequency for right channel
<i>Mix L</i>	mix balance for left channel
<i>Mix R</i>	mix balance for right channel
<i>Mix Mode L</i>	selects the signal (<i>Input</i> , <i>Real</i> or <i>Imaginary</i>) to be mixed with the effect signal (left channel)
<i>Mix Mode R</i>	selects the signal (<i>Input</i> , <i>Real</i> or <i>Imaginary</i>) to be mixed with the effect signal (right channel)
<i>Volume L</i>	output volume for left channel
<i>Volume R</i>	output volume for right channel
<i>Link</i>	optionally links both left and right channel controls
<i>LFO Wave</i>	selects the waveform of the LFO (<i>triangle</i> , <i>rectangle</i> , <i>ramp down/up</i> , <i>sample & hold</i>) or deactivates the LFO
<i>LFO Rate</i>	controls the rate of the LFO (0–20Hz)

Frequently Asked Questions

How do I install the Frequency Shifter (32 bit version)?

Just copy the file `freqshifter.dll` from the ZIP archive you have downloaded to your system's or favorite DAW's VST plug-in folder. Your DAW should automatically register the plug-in the next time you start it.

How do I install the Frequency Shifter (64 bit version)?

Just copy the file `freqshifter64.dll` from the ZIP archive you have downloaded to your system's or favorite DAW's VST plug-in folder. Your DAW should automatically register the plug-in the next time you start it.

Note: You may have to remove any existing (32 bit) `freqshifter.dll` from your VST plug-in folder or else your DAW may screw the versions up...

How do I install the Frequency Shifter on the V-Machine?

First of all: Make sure that you have installed the latest V-Machine firmware and VFX software (available from www.smproaudio.com). The *Frequency Shifter* is known to work with version 2.0.20101204. :-)

Second: I will not take any responsibility if the following install procedure does not work for you, corrupts or damages your V-Machine, or bores you! :-P

Now to the point: Export the contents of the ZIP archive to a temporary folder on your PC/Mac, run the VFX software, and import the `freqshifter.dll` 32 bit plug-in from this folder; make sure to choose the "Don't use a Wizard file" option. The VFX software will tell you that "there is no guarantee that it will run on a V-MACHINE without a wizard's help". That's OK, no magic here. ;-)

Finally, create a preset for your V-Machine that uses the *Frequency Shifter*.

What is the VST plug-in ID of the deputy?

The ID is **F B F S** .

What the heck is happening when I shift my signal down???

Weird stuff. Please re-read the last note in the Architecture section.