Full Bucket's Frequency Shifter

Version 1.1

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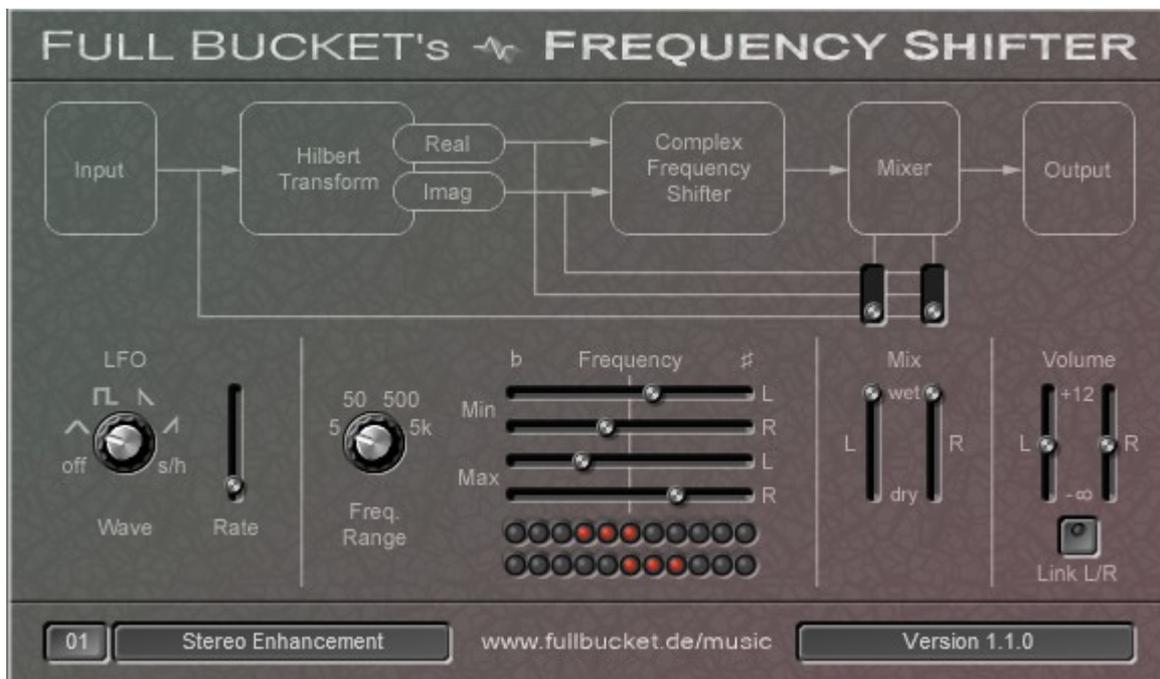
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Introduction

The *Frequency Shifter* is a software effect plug-in for Microsoft Windows (VST) and Apple macOS (VST/AU) 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 supports Windows and macOS (32 bit and 64 bit)

The *Frequency Shifter* shifts the spectrum of the input signal up or down along the frequency axis. This effect is also know 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 am 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
Frequency Range	the range of the frequency shifting (±5Hz, ±50Hz, ±500Hz, or ±5000Hz)
Min. Frequency L	controls the minimum shift frequency for left channel; will be inactive when LFO is off
Min. Frequency R	controls the minimum shift frequency for right channel; will be inactive when LFO is off
Max. Frequency L	controls the maximum shift frequency for left channel
Max. Frequency R	controls the maximum shift frequency for right channel
Mix L	mix balance for left channel
Mix R	mix balance for right channel
Mix Mode L	selects the signal (*Input*, *Real* or *Imaginary*) to be mixed with the effect signal (left channel)
Mix Mode R	selects the signal (*Input*, *Real* or *Imaginary*) to be mixed with the effect signal (right channel)
Volume L	output volume for left channel
Volume R	output volume for right channel
Link	optionally links both left and right channel controls
LFO Wave	selects the waveform of the LFO (*triangle*, *rectangle*, *ramp down/up*, *sample & hold*) or deactivates the LFO
LFO Rate	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 *(Mac VST/AU universal 32/64 bit)?*

Locate the downloaded PKG package file `freqshifter_1_1_0_mac.pkg` in Finder (!) and do a right- or control-click on it. In the context menu, click on "Open". You will be asked if you really want to install the package because it comes from an "unidentified developer" (me ☺). Click "OK" and follow the installation instructions.

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.