

propellerhead

PULSAR DUAL LFO

OPERATION MANUAL

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Pulsar Dual LFO

Introduction



The Pulsar Rack Extension device from Propellerhead is a very flexible and versatile dual LFO module. LFOs (Low Frequency Oscillator) are used for generating cyclic modulation signals. A typical example is to have an LFO modulate the pitch of an oscillator to generate vibrato, but there are countless of other applications for LFOs.

Pulsar features two separate LFOs that can be used for modulating parameters in other rack devices. The two LFOs can also modulate each other to generate complex modulation signals. The LFOs in Pulsar can reach way up in the audible frequency range, which opens up for really interesting applications. As an additional feature the LFO rates can also be tracked from a MIDI keyboard!

Panel parameters

LFO 1&2 common parameters

Rate



This controls the LFO rate. The Rate range in Pulsar is very wide and can reach way up in the audio frequency range. The rate is indicated by the lamp to the left above the Rate knob. The rate can also be synced to the sequencer tempo by clicking the Tempo Sync button below the Rate knob (see “Tempo Sync” below). In sync mode, the Rate knob controls the sync resolution.

The LFO 1 Rate can be modulated and/or synced by LFO 2, see “Rate (LFO 2 to LFO 1 Rate)” and “Sync”. The Rates can also be modulated from the Envelope, see “Envelope”. As a special feature, the Rates can also be controlled from a MIDI keyboard, see “KBD Follow”.

Range: 0.06Hz-1.05kHz (synced: 32/4 to 1/64th)

! **When the Rate is modulated, it can reach far beyond the default frequency range.**

Waveform selectors



Here you can select one of nine different LFO waveforms. 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.

! **Note that all waveforms are bipolar, i.e., they generate both positive and negative levels.**

→ **Select waveform for each LFO by clicking the up/down arrow buttons or by clicking and holding in the waveform display and dragging up/down.**

Level

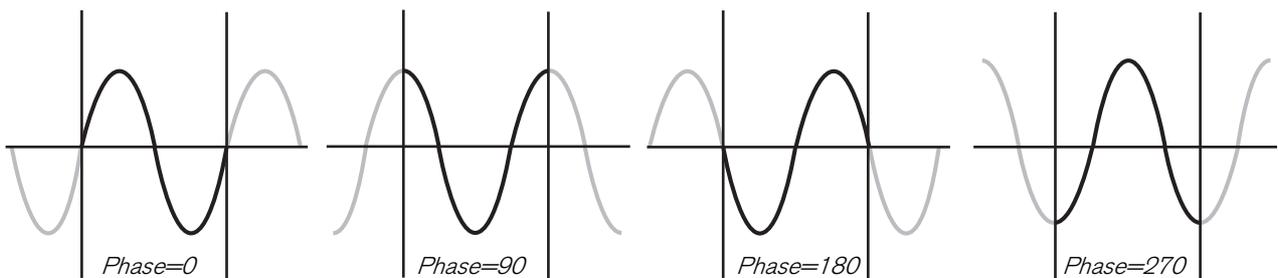


Here you set the output level of the LFO signal. The LFO 1 Level can be modulated by LFO 2, see “[Level \(LFO 2 to LFO 1 Level\)](#)”. The Levels can also be modulated by the Envelope, see “[Envelope](#)”.

Phase



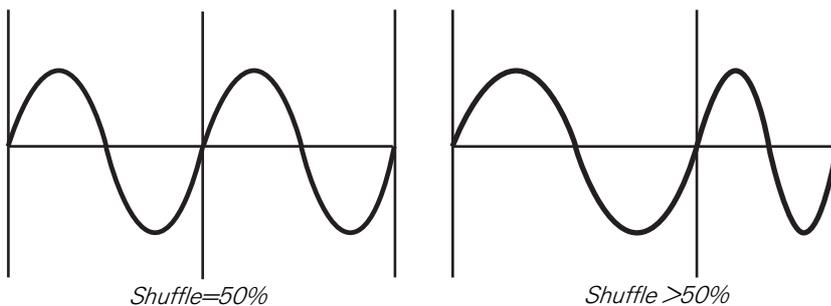
The Phase control lets you offset the phase of the LFO cycle, i.e. decide where in the cycle the waveform should start. The range of the Phase control is 0-360 degrees:



Shuffle



The Shuffle function affects two adjacent LFO cycles, in pairs. Increasing the Shuffle value lengthens the first cycle and shortens the second one:



Note that the total length of the cycle pair is always 2 regular cycles, which means that shuffling will work great also in Tempo Sync mode, see “[Tempo Sync](#)”.

Range: 50% (no shuffle) to 75%

Lag



The Lag control acts like a lowpass filter on the LFO signal, making the signal smoother. This is especially noticeable on waveforms with sharp edges or transients like the square, sawtooth and stepped waves. On the sinewave you will barely notice any effect since it's already smooth by nature.

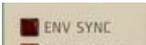
Tempo Sync



Click the Tempo Sync button to sync the LFO Rate to the sequencer tempo. This is great for creating animated effects in sync with the song's tempo. In Tempo Sync mode, the Rate knob controls the sync resolution, see "Rate".

LFO 1 specific parameters

ENV Sync



With ENV Sync active, whatever triggers the Envelope will also restart LFO 1, see "Envelope".

If Tempo Sync is also active (see "Tempo Sync") the LFO will continue to sync to the sequencer tempo. However, *when* you actually press a key or hit the Trig button will affect the LFO cycle start. In some situations this could be perceived as the LFO is losing sync but it's not; it's merely the LFO cycle start that is changing.

LFO 2 specific parameters

On/Off



Click this to activate LFO 2.

LFO 2 to LFO 1 modulation parameters



Rate (LFO 2 to LFO 1 Rate)

This controls the modulation amount from the LFO 2 signal level to LFO 1's Rate. The result is frequency modulation (FM) of LFO 1.

Level (LFO 2 to LFO 1 Level)

This controls the modulation amount from the LFO 2 signal level to LFO 1's Level. The result is amplitude modulation (AM) of LFO 1.

Sync

With the Sync button on, every new LFO 2 cycle automatically restarts LFO 1.

Envelope



This is an AR (Attack-Release) envelope. The Envelope can be triggered from any of these four sources:

- **The Trig button, see “Trig”.**
- **LFO 2, see “LFO 2 Trig”.**
- **Envelope Gate In modulation input on the rear panel, see “Envelope Gate In”.**
- **MIDI Note On from a connected MIDI keyboard.**

The Envelope can modulate the Levels and Rates of LFO 1 and/or LFO 2.

! If the envelope is retriggered before all envelope stages are completed, the envelope will simply restart at the current level (similar to how a monophonic synthesizer works).

LFO 2 Trig

With the LFO 2 Trig button on, the Envelope is automatically synced by the LFO 2 signal. This means that every time LFO 2 begins a new cycle, the envelope is triggered.

Trig

This is a non-latching gate button which gates/triggers the envelope.

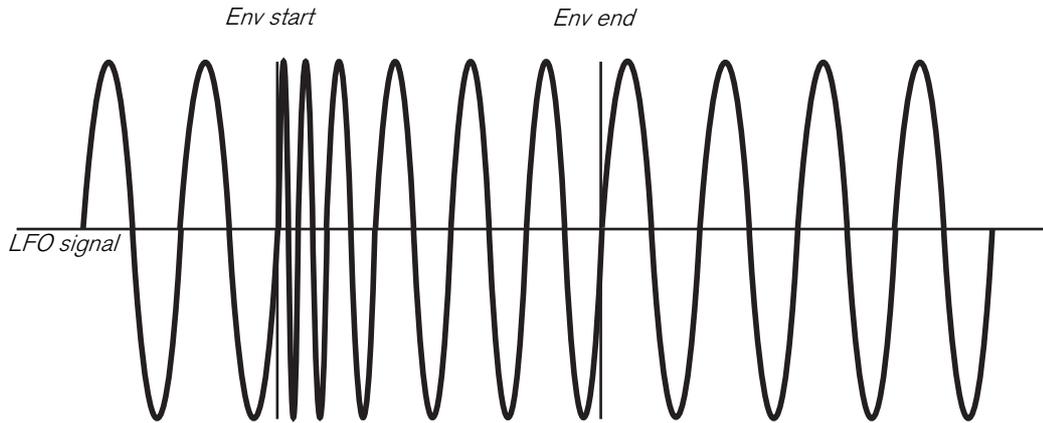
Attack and Release

The attack and release times of the envelope when the gate opens/closes are set with these knobs. For a gated effect set both controls to zero and control the gate time with the Trig button, CV Gate In modulation input or MIDI Notes. You can also let LFO 2 trig/gate the envelope as described above.

Range: 0.1ms-3.00s (Attack) and 0.0ms-10.00s (Release)

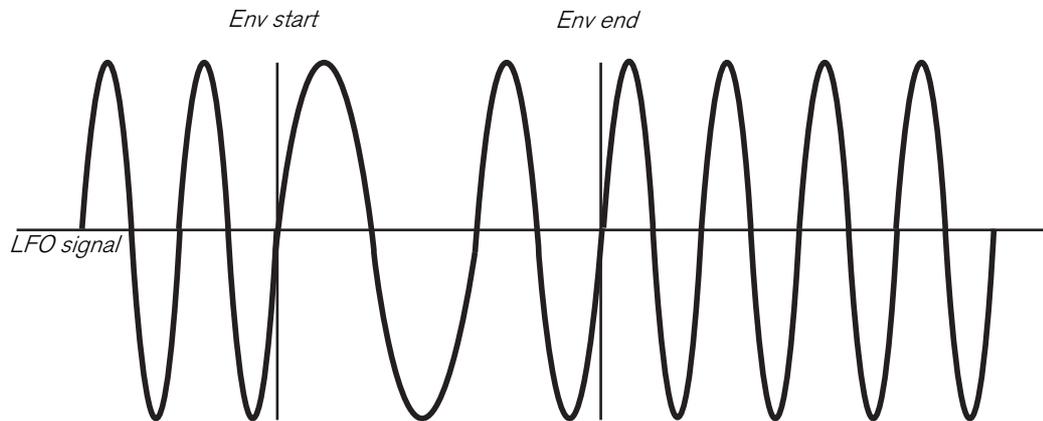
Rate (LFO 1 and 2 Envelope modulation)

The Rate knobs control the modulation amount of the Rate parameters of LFO 1 and 2 respectively. With these you can force the LFO rates to vary according to the envelope's Attack and Release times:



Env Attack = 0, Env Release > 0, Rate modulation = +50%

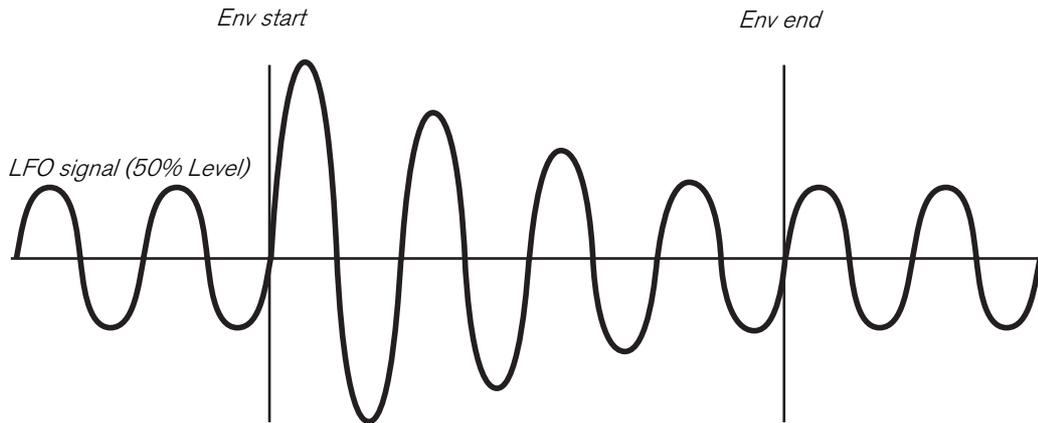
The Rate modulation controls are bipolar, with no modulation at 12 the o'clock position, negative modulation to the left and positive to the right. Negative modulation means that the LFO Rate gets slower during the envelope stage and then goes back to the set Rate:



Env Attack = 0, Env Release > 0, Rate modulation = -50%

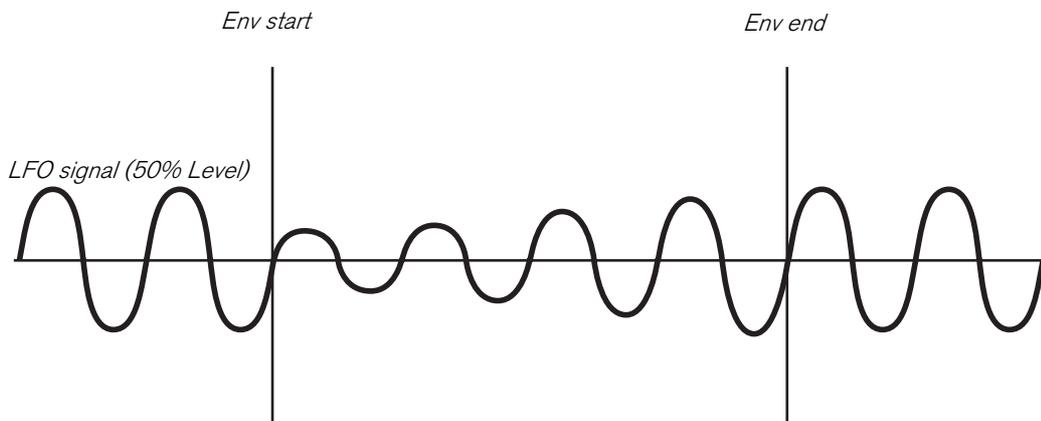
Level (LFO 1 and 2 Envelope modulation)

The Level knobs control the modulation amount of the Level parameters of LFO 1 and 2 respectively:



Env Attack = 0, Env Release > 0, Level modulation = +50%

The Level modulation controls are bipolar, with no envelope modulation at 12 the o'clock position, negative modulation to the left and positive to the right. Negative modulation means that the LFO signal decreases in level during the envelope stages and then goes back to set Level:



Env Attack = 0, Env Release > 0, Level modulation = -50%

KBD Follow



It's possible to control the LFO Rates in Pulsar from a connected MIDI keyboard:

- **Create a sequencer track for Pulsar by selecting "Create Track for Pulsar n" from the context menu (right-click the device in the rack).**

A sequencer track is created and is automatically selected.

With the KBD Follow knob you can define how the LFO Rates should be modulated by incoming MIDI Note data. The KBD Follow parameter is bipolar:

- **At zero (12 o'clock position), the Rates are not modulated at all.**
- **At 100 the LFO Rates track the incoming MIDI Notes 1:1, which means you can “play” the LFOs chromatically from a connected MIDI keyboard.**
- **At -100 the LFO Rates tracks the incoming MIDI Notes “backwards” chromatically, which means the LFOs run slower the higher up on the keyboard you play, and vice versa.**

The center MIDI note, i.e. where the LFO Rates “intersect” with the MIDI Note, is C3.

If Tempo Sync is enabled for the LFO(s) you will be able to do cool wobble effects by playing various notes on your MIDI keyboard, see [“Tempo Sync”](#).

Modulation inputs and outputs



LFO 1&2 input sections



Rate

Use this for dynamically modulating the Rate of the corresponding LFO. Attenuate the input signal with the knob.

Phase

Use this for dynamically modulating the Phase of the corresponding LFO. Attenuate the input signal with the knob.

Shuffle

Use this for dynamically modulating the Shuffle amount. Attenuate the input signal with the knob.

Amount

Use this for dynamically modulating the Level of the corresponding LFO. Attenuate the input signal with the knob.

LFO 1&2 output sections



CV

There are two CV signal outputs for each LFO, plus two additional outputs for the CV signal phase inverted.

Audio

There are two Audio signal outputs for each LFO, plus two additional outputs for the Audio signal phase inverted. The difference between the Audio outputs and the CV outputs is that the signals on the Audio outputs have higher quality for use in e.g. audio processing applications.

Output LFO 1+2



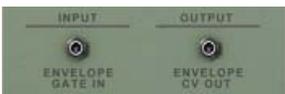
CV

There is one CV signal output for the LFO 1 and 2 signals summed with each other.

Audio

There is one Audio signal output for the LFO 1 and 2 signals summed with each other at audio quality.

Envelope connections



Envelope Gate In

A CV signal with a value > 0 present on this input will gate the Envelope (see [“Envelope”](#)). When the CV input signal decreases to zero or below, the gate is opened (deactivated).

Envelope CV Out

There is one CV signal output for the Envelope signal.

Tips and Tricks

Patch between LFO 1 and LFO 2 on the back for more flexibility

- By connecting one LFO CV output to the Phase CV input of the other LFO you can achieve some very interesting rhythms. Try using a square wave and set the CV Trim rotary to around 25%.
- Try connecting an LFO CV output to the Shuffle CV input of the other LFO. Use the sawtooth waveform, at a slow Rate, in the first LFO to gradually add more shuffle over time.
- With the Envelope CV Out you can control both Shuffle and Phase from the Envelope and with the Envelope CV In you can trigger this effect with any CV signal.

Using Pulsar as a monophonic synth

Because the LFO 1&2 can work in audio rate and can be tracked from a MIDI keyboard, it's possible to use Pulsar as a two oscillator mono synth with a lot of character. Here's how to set this up:

1. **Make sure the level of the LFO(s) you want to use is completely turned down.**
 2. **Connect the Audio output of the LFO(s) you want to use to a Mix Channel device.**
 3. **Create a sequencer track for Pulsar by right-clicking the device in the rack and selecting "Create Track for Pulsar n".**
A sequencer track is created and is automatically selected.
 4. **Turn KBD Follow up to 100%.**
 5. **Turn up the Level knob(s) in the Envelope section for the LFO(s) you want to use.**
This decides how much the level of the LFO(s) will be affected by the envelope when you play.
 6. **You can now play Pulsar from your MIDI keyboard!**
- ! **You have to tune Pulsar manually by adjusting the Rate(s) of the LFO(s) you are using. You can set the Rate knob(s) to max (1.05kHz) to be completely in tune - however, the Pulsar will then be 2 octaves above played MIDI note. Lower octaves can be found at around 524Hz and 263Hz (hold [Shift] to fine tune).**
 - ! **Note that Pulsar is an LFO device and therefore doesn't feature the standard sound improvement features of a synth device (anti-aliasing filters etc.).**
 - **By using LFO 2 to LFO 1 Rate modulation you can modulate the frequency of LFO 1, resulting in frequency modulation (FM).**
 - **By using LFO 2 to LFO 1 Level modulation you can modulate the level of LFO 1, resulting in amplitude modulation (AM).**
 - **By modulating the Shuffle you can achieve a sound similar to pulse width modulation (PWM), great for harsher tones!**