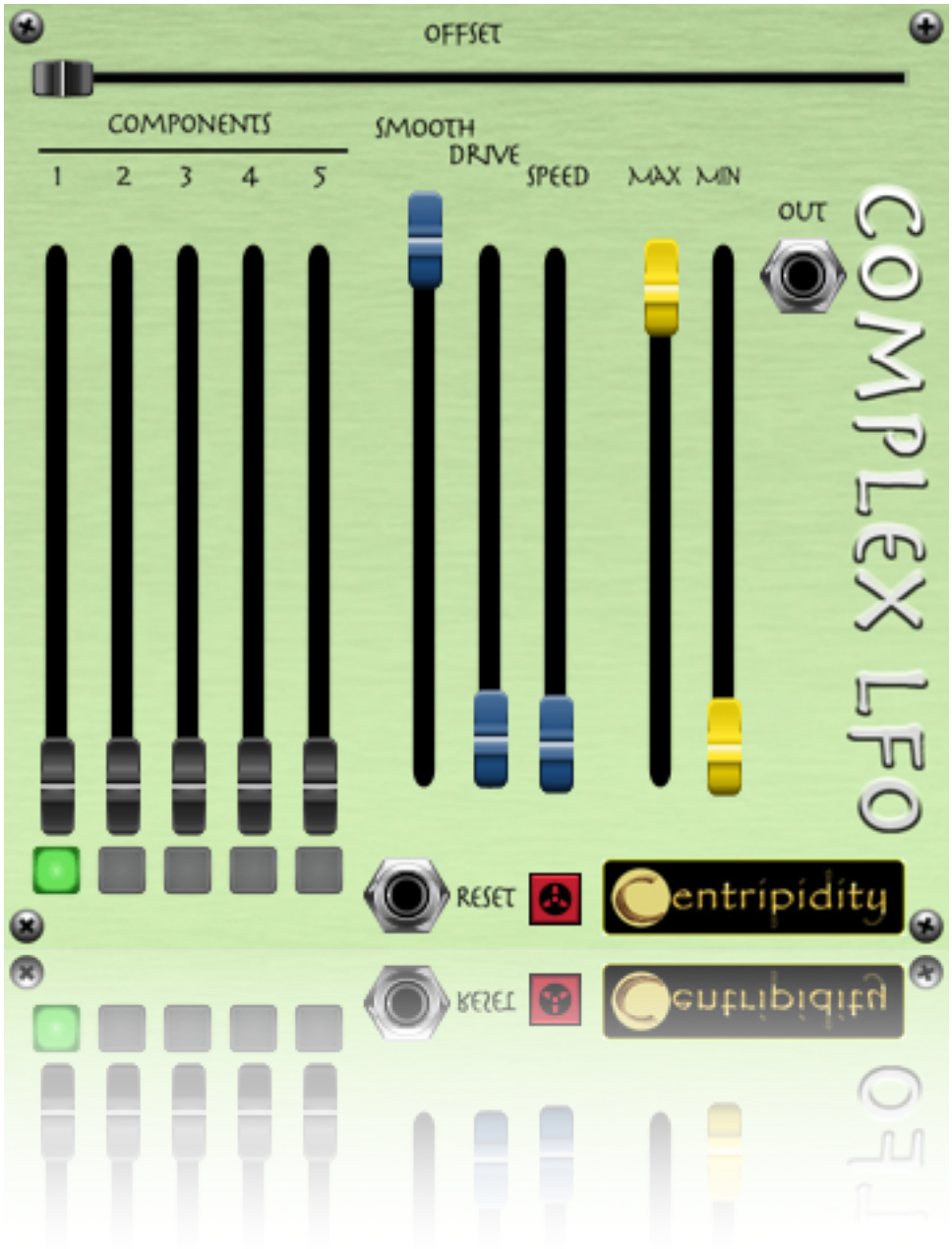
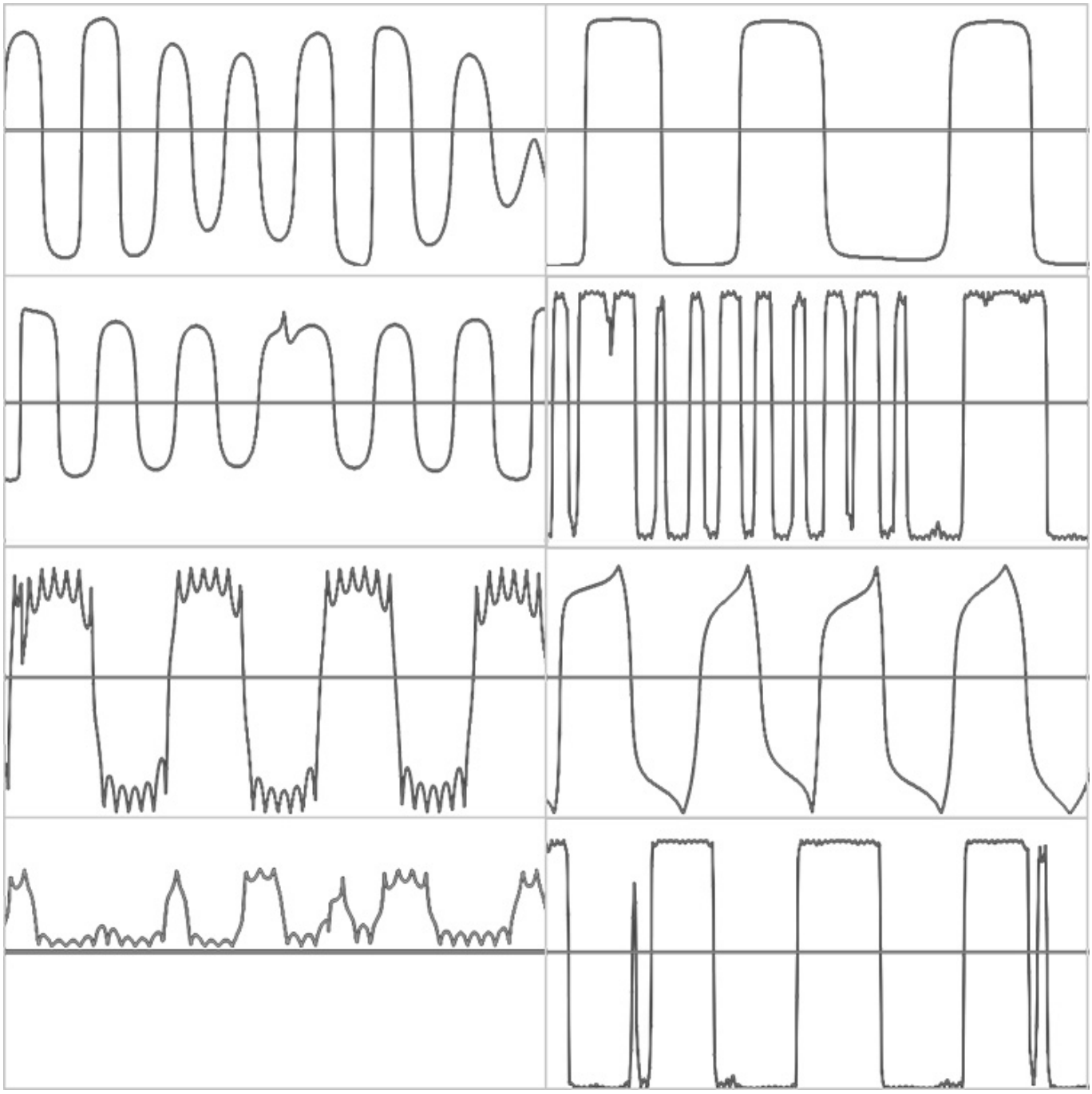
Centripidity

Complex LFO



Introduction

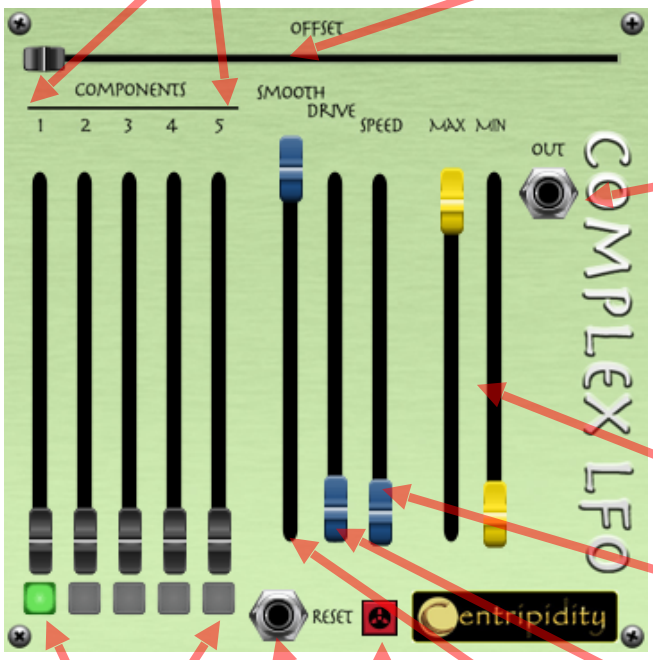
This module is essentially designed to serve as an LFO but, rather than producing the traditional, perfectly repeated waveform it can be used to create waveforms that, without drifting from the basic form, evolve with various pseudorandom elements. It can, for example, produce waveforms such as these:



The Interface

Component Level Controls
The waveform is built up from a combination of up to five separate component waveforms. These sliders determine the periodicity of each component. Higher values will produce faster changes in the resulting waveform.

Offset Control
This determines where in the waveform the output starts when the module is loaded or when it is reset. It is, in this regard, like a phase control but, because of the pseudo-cyclic nature of this LFO, it allows phase offsets of considerably longer than one cycle.
Range: 0 - 60 sec.



Output Jack
The LFO signal is passed out of this jack.

Min.& Max. Slider Controls
These control the amplitude of the LFO signal by ensuring it stays within the limits set here. However, there is no guarantee that the signal will actually reach these levels, particularly if the Drive setting is too low.

Min. can be set at higher level than Max., in which case the signal will be inverted.
Range: ±6V

Speed Control
This is similar to the frequency control of a conventional LFO, although the nature of the waveform produced does not make it possible to calibrate it in any conventional frequency measurement. Increasing the Speed will, however simply speed up the waveform without changing its shape.

Component Switches
These five switches allow each of the five component waves to be switched in and out of the output waveform.

Reset
If this button is pressed, or a voltage greater than 3.5V appears on this jack, the LFO will reset and begin producing the same waveform from the beginning.

Smoothness Control
As the name suggests, this controls how smooth the resulting waveform will be. At high values, close to 1, the waveform will be very smooth. As the value is reduced the waveform will develop spikes in its peaks, their period decreasing as the smoothness comes down. At very low smoothness levels these spikes become fast enough to be audible.

Drive Control
Similar to an audio drive circuit this will increase the amplitude of the signal then apply soft-clipping to keep it within the specified Min. and Max. voltage limits.

Examples

Effect of the Component Sliders.

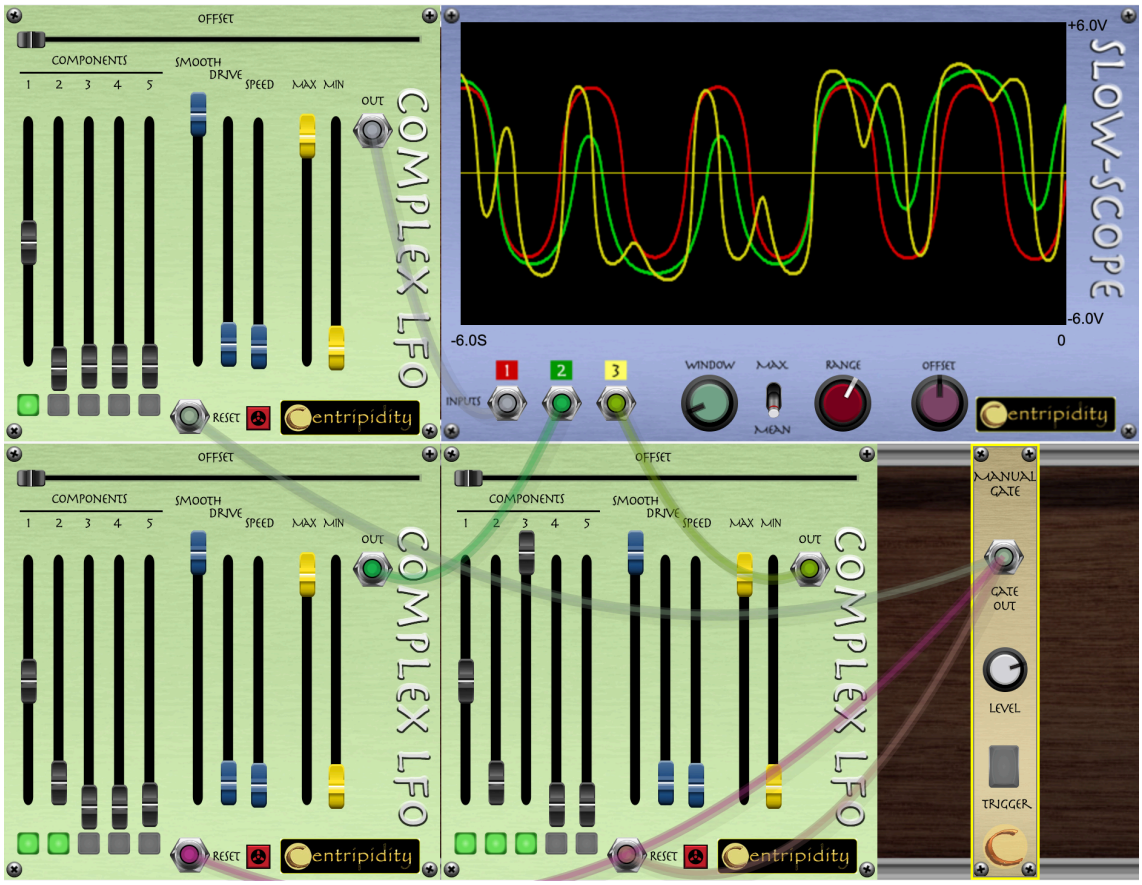
The five component sliders each add new, sine-wave components into the basic wave form of the oscillator with each slider controlling the relative frequencies of the component waveforms.

In the following example, three separate instances of the module are connected to an instance of a Slow-Scope to display their outputs. In each instance, all controls are identical except for those controlling the Components. Smoothness and Drive are both set to 1.0.

All three instances were simultaneously reset to the same phase making for easier comparison between the waveforms.

The component sliders were configured as shown here.

LFO	C1	C2	C3	C4	C5	Smooth	Drive
1	50	-	-	-	-	1.0	1.0
2	50	10	-	-	-	1.0	1.0
3	50	10	100	-	-	1.0	1.0



As can be seen, the first LFO is essentially producing a sine-wave, adding the lower frequency Component 2 adds some longer period variation and the higher frequency Component 3 introduces some more rapid variation.

Effect of the Smoothness Slider.

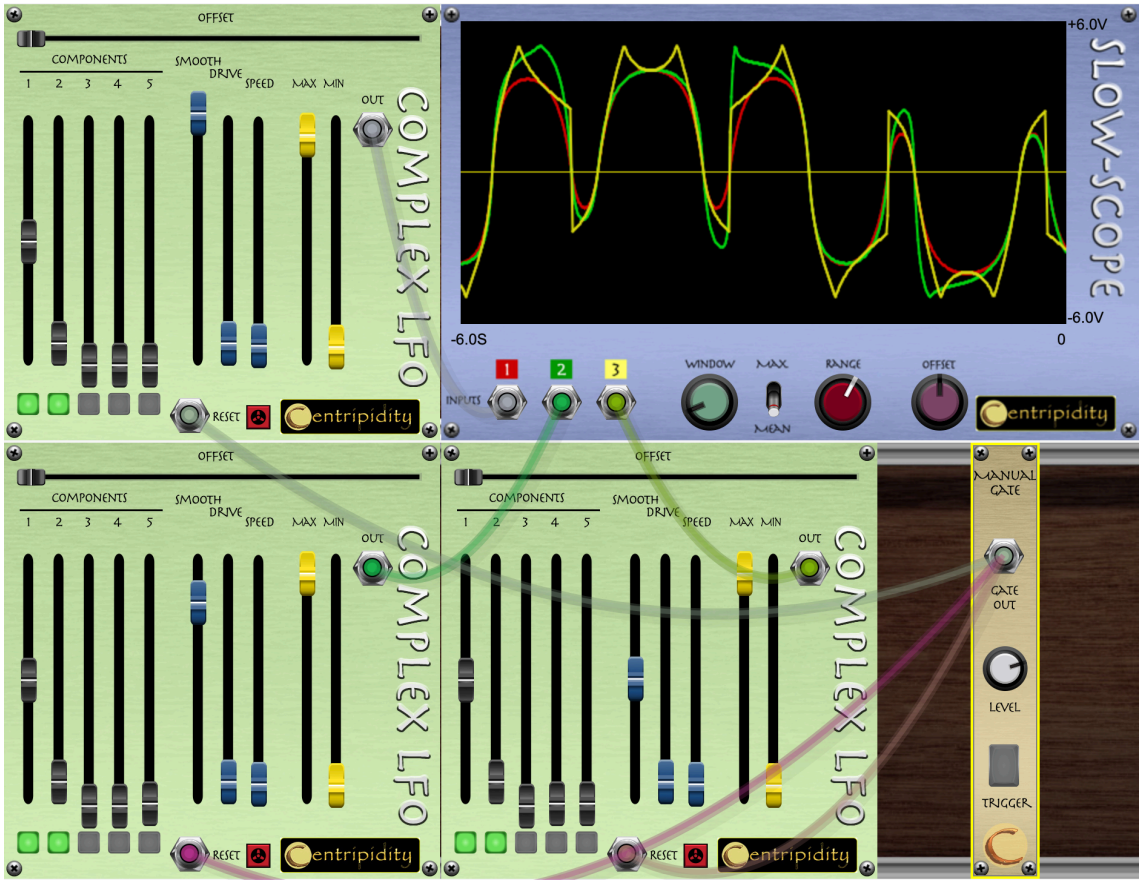
The smoothness slider introduces another component into the waveform which, while essentially a sinusoid, has a more complex relationship with the other components and tends to manifest itself as shorter period variations with sudden changes in direction producing spikes in the otherwise smooth change of output voltage.

In the following example, LFO 2 from above is repeated but with three different Smoothness values. In each instance, all controls are identical except for those controlling the Smoothness. Drive remained set to 1.0.

All three instances were simultaneously reset to the same phase making for easier comparison between the waveforms.

The LFOs were configured as shown here.

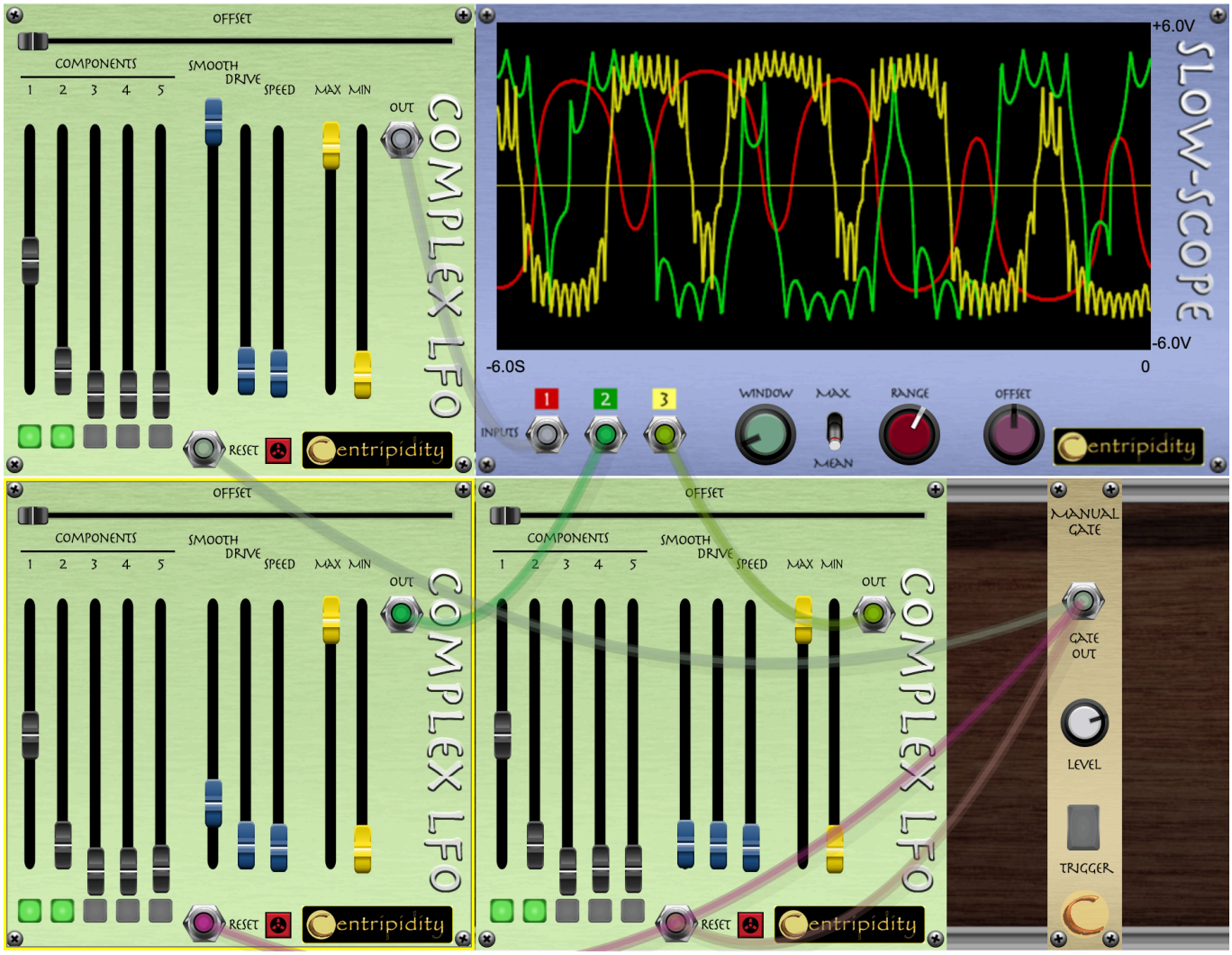
LFO	C1	C2	C3	C4	C5	Smooth	Drive
1	50	10	-	-	-	1.0	1.0
2	50	10	-	-	-	0.8	1.0
3	50	10	-	-	-	0.5	1.0



Further decreasing the smoothness decreases the period of these spike variations which can, at low values of Smoothness, become audible.

This can be seen in the following example where Smoothness is lowered even further. In this case the phase of each LFO has been shifted slightly to make the differences more visible.

LFO	C1	C2	C3	C4	C5	Smooth	Drive
1	50	10	-	-	-	1.0	1.0
2	50	10	-	-	-	0.25	1.0
3	50	10	-	-	-	0.1	1.0



Effect of the Drive Slider.

As with a traditional audio drive pedal, the Drive control amplifies the signal but limits its peaks by clipping the waves extrema. In this case, soft-clipping is employed.

In this example the same basic waveform used above is repeated with three different Drive values. In each the Smoothness is set to 0.4 to show the effect Drive has on the spikes introduced by low Smoothness settings.

Once again, all three instances were simultaneously reset to the same phase for easier comparison between the waveforms.

The LFOs were configured as shown here.

LFO	C1	C2	C3	C4	C5	Smooth	Drive
1	50	10	-	-	-	0.4	1.0
2	50	10	-	-	-	0.4	0.1
3	50	10	-	-	-	0.4	10.0