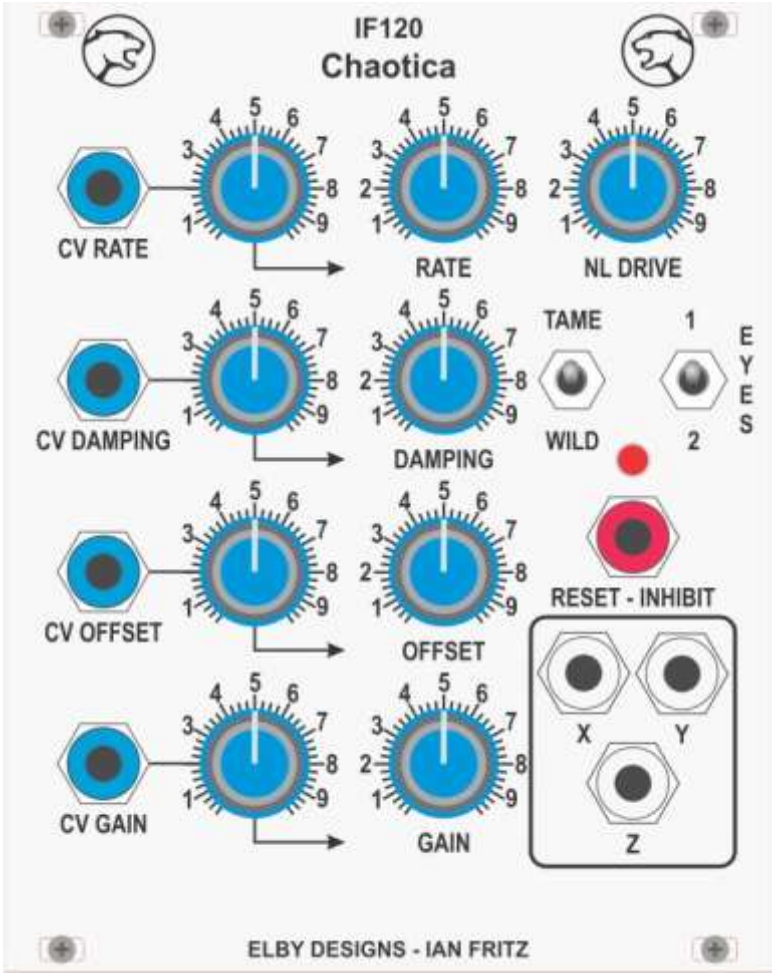

Chaotica: A Voltage-Controlled Chaos Generator

This module is a multi-featured, autonomous, third-order chaos-generating circuit. Its features include

(1) A third order response (ie, three outputs) with a total of four non-linear elements in the circuit path,
(2) switch selectable non-linear elements,
(3) voltage control of rate, loop damping, gain and offset, and
(4) a reset/inhibit input which allows the system to be set to zero voltage at all three integration stages.

Controls
The controls on a chaos generator are different from those on other synth modules. The best way to learn their functions is to experiment with them. Here are brief descriptions of the functions.

RATE: This is the speed at which the signal traces out its patterns. It is similar to the frequency control of a VCO or VCF. It has an initial setting (to the right) and a standard modulation input (input jack and depth control, to the left). Rates range from slow, creeping LFO-like sweeps, well up into audio frequencies.

DAMPING: Damping is a linear negative feedback around one stage within the circuit. Too little damping will cause the signals to run away to the rails. Large amounts of damping can cause the signal to die out altogether. Damping is similar to resonance in a VCF, with less damping analagous to more resonance. As with the rate control, there is a control for the initial amount along with a standard CV input.

OFFSET: It turns out that a DC offset voltage within the main circuit loop is an important parameter in this circuits. Its main effect is to change the overall signal amplitudes, ie the size of the chaotic attractor. Again, this parameter is under voltage control in Chaotica.

GAIN: This is the overall (global) gain in the main circuit loop. It's just a little internal VCA! The amount of gain affects the overall size of the attractor, as well as the the amount of damping. The damping and gain controls work together in determining the chaotic pattern generated. Also voltage controllable.

NL DRIVE: Non-linear drive amount. Chaotic behaviour in an electronic circuit comes from internal feedback loops containing non-linear circuit elements. The NL Drive control varies the amount of feedback of one of these loops. This is one of the controls determining the strength of the chaotic pattern.

TAME/WILD: This switch sets the strength of the second non-linear feedback loop of the circuit. Wild and Tame refer to the wiggliness of the signals.

1/2 EYES: "Eyes" refers to the overall shape of the attractor pattern. This can have a single centre (1 eye) or two separate ones (2 eyes).

RESET-INHIBIT: This input jack is intended to receive rectangular pulses. When the pulses are high, the oscillations are halted and the system returns to a state with all voltages at zero. A narrow pulse will simply reset the system, whereas a wide pulse or gate will hold the system off. Putting in narrow pulses and varying their frequency will illustrate the evolution of the attractor. Can also be used to produce periodic signals with many interesting vocal characteristics.

X, Y, Z: The three output signal. These signals are highly correlated, and are typically used to vary the CV inputs of various modules in a patch.

Setup

There is a wide variety of chaotic patterns available in this system, but not all control settings will give useful results. To test the circuit initially, hook up the X and Y outputs to the inputs of an oscilloscope operating in x-y mode, or alternately to CV inputs of two modules in a patch. Next set the panel controls to one of the following two sets of clock-hand positions:

Rate: 1:00, 1:00
Gain: 1:00, 9:00
Damp: 3:00, 9:00
Offset: 1:00, 9:00
NL drive: 1:00, 5:00

Oscillations should be observed/heard for all four combinations of the TAME/WILD and EYES 1/2 switches, for each of these setups. Next, experiment with varying the different controls one at a time, and finally explore the range of settings available for all the controls.
Frequency range: Check that the circuit operates from LFO rates up into the low audio range. (Note, the range depends on the pattern.)

The Reset-Inhibit input provides some novel, interesting effects. Set up a chaotic pattern then hit this input with an oscillator swept from high frequency to low. At high frequencies the chaotic pattern doesn't have a chance to develop, and all you see is a fixed dot at the centre of the scope. As the frequency becomes lower and lower more of the chaotic attractor is traced out between cycles of the driving oscillator, allowing you to see the time evolution of the attractor. Some complex waveforms can be obtained at certain drive frequencies, many with interesting vocal qualities.

Please note that the Chaotica can be operated without any external controls, in this mode only the controls in the 2 right-hand columns have any affect.

The pots immediately to the right of each CV input is an attenuator for that CV with the resultant attenuated circuit being fed in to the relevant section of the module as indicated by the arrow under the pot.