The **Richter Wogglebug**, among other things, contains: 1 Voltage-Controlled Clock, 1 Sample & Hold, 2 Lag Processors, 1 Random Gate Burst Generator, and 2 VCO Digital Ring Mods. Most of these are patchable via the instrument's panel, in a system capable of CV and Audio Signal generation and processing.

While the Panel Controls & Input/Output descriptions are found below, please understand that all portions of the Wogglebug interact with each other. For example, changing the Ego/Id Balance will affect the Stepped, Smooth, and Woggle CVs, the Smooth VCO, Ring Mod and Woggle VCO Outs. The Woggle circuit is chasing the Smooth/ Stepped circuit, which is being kicked in the ass by the internal clock. It is very possible to make patches and panel settings which lock up the Wogglebug, and thus the CV outputs will hang at the last voltage level while the VCOs will drone on almost unchanging. When this happens, adjusting just about any panel control will disturb and wake the Wogglebug. Finally, consider that many changes in the system are not immediate, because the Wogglebug is a complex feedback system where several sub-circuits are responding to each other.

SMOOTH VCO OUT: Shark's Fin wave audio rate signal controlled by the External Input, Ego/Id Balance rotary setting, Influence CV In, and Clock Speed rotary. 10Vpp.

EGO/ID BALANCE ROTARY: with nothing inserted at the External Input, this sets the range of probable values. Turning the rotary CCW, random values generated by the system tend to "cluster." With a signal applied to the External In, it allows that external signal to be balanced with the internal signal source, to generate random voltages.

EXTERNAL IN: External input for Sample & Hold. Signals applied here will be injected directly to the uncertain, beating heart of the Wogglebug. Accepts CV or audio rate signals. Expects 10Vpp max.

INFLUENCE IN: CV and/ or Audio Signal input that performs the following duties: modulates frequency of Smooth and Woggle VCOs, inputs to the Ring Mod circuit, and level shifts the Woggle CV signal. Responds 0V to 10V.

WOGGLE ROTARY: Sets how quickly (or slowly) the Woggle circuit is able to catch the Smooth/ Stepped circuit. CW slows the Woggle CV, CCW speeds it up.

SPEED CV ATTENUATOR: Unipolar attenuator for Speed CV IN. Normalled to 8V.

SPEED CV IN: Unipolar CV In for **Speed** parameter. Normalized to +8V so that with nothing patched, the associated Speed CV Attenuator will extend the internal clock generator range up to around 200hz. Range: 0V to +8V.

EXTERNAL CLOCK IN: Any signal may be applied here, allowing for independent control of rate and smoothness.

DISTURB BUTTON: Direct control of the Sample & Hold circuit. Pressing will sample, and holding will hold.

SYSTEM CLOCK LED: Displays rate of Sample & Hold clock. When a signal is applied to the External Clock In, this shows the rate of the incoming clock/rising edge. With nothing patched, this LED will mirror the Internal clock.

RING MOD OUT: Pulse wave audio rate signal, ring modulated product of Smooth VCO, Woggle VCO, and audio rate signal at the Influence In (if present). It gets messy fast. The digital nature of the Ring Mod circuit makes simple waveforms (Pulse, Square, Triangle, Sine, Saw) almost necessary to achieve something remotely musical, but don't let that stop you from pumping Motown samples into this circuit. 10Vpp.

WOGGLE VCO OUT: Square Wave audio rate signal, controlled by Woggle rotary control, External In, Ego/Id Balance rotary, Influence CV In, and Clock Speed rotary. 10Vpp.

STEPPED OUT & LED: At lower Clock rates, the Stepped Random Voltage appears here: new value occurring at every clock pulse indicated by the blue system clock LED. At higher (audio) clock rates, bit reduction effects may be achieved by inserting an audio signal into External In and setting Ego/Id Balance rotary to full CCW. 10Vpp range. The **Stepped Out LED** gives visual indication of Stepped Random Voltage value.

SMOOTH OUT: Smooth CV appears here, the smoothness of which is set by the Clock Speed rotary control. Range: 0V to 10V.

WOGGLE OUT: A of product of the Smooth/ Stepped CV, this voltage quivers, shakes, and always chases after the heart of the system. Smoothed by the Woggle rotary; 0V to10V.

BURST OUT & BURST LED: Square random gate signal, synced to the clock and influenced by the Stepped, Smooth and Woggle rotaries. Range: 0 to +10V. The **Burst Out LED** provides visual represensentation of random gates.

CLOCK OUT & INTERNAL CLOCK LED: Square clock signal from the internal clock generator. Not influenced by signal at External Clock In. Range: 0V to +10V. The **Internal Clock LED** provides visual representation of the rate of the internal clock. It is not affected by the External Clock In.

SPEED ROTARY: Dual purpose control that sets the Rate of the Wogglebug's internal clock generator and lag processor feeding the Smooth CV circuit. Turning CCW slows the system and smoothes its response. Turning CW quickens the system with the Smooth CV response becoming jittery. Internal Clock generator range: 1 minute/cycle up to 40hz (extended range pushes upper limit to around 200hz).

NOTE: The gold lines on the Wogglebug denote the three key areas: 1. Audio at the top (noted here with gold text), 2. CV in the middle (noted here with blue text), and 3. Clock at the bottom (noted here with green text).

Is the Wogglebug my synthesizer's ID Monster? Yes! Should I beware of the Wogglebug? Maybe.

The Wogglebug is a random voltage generator, originally designed by Grant Richter of Wiard Synthesizers. The Wogglebug's purpose is to overtake the CV produced by your keyboard or sequencer during performance and give a voice to your synthesizer's ID. A continuation of the Smooth and Stepped, flucutuating, random voltage sources, pioneered by Don Buchla, the core of the circuit is based on the Buchla Model 265 "Source of Uncertainty" module, which many consider to be the most musical of all random voltage generators. Like the 265, the Wogglebug utilizes a lag processor (low frequency smoothing filter), a VCO, and a Sample & Hold in order to produce Stepped and Smooth (lagged; slewed) CV in the range of 0V to 10V.

Grant Richter's Wogglebug design expands on this system to include the otherworldly Woggle CVs (stepped voltages with decaying sinusoids at the edges), which must be heard in action to be truly appreciated. In a moment of considerable noise, Richter decided to tap into the sound sources at the uncertainly beating heart of the Wogglebug and bring them forth to the instrument's panel. He then figured a clever way to Ring Modulate these sounds and that, too, is on the panel of all Wogglebugs. Thus, the Wogglebug is a complete system. No external modules are required to Woggle; however, all voltage-controlled systems long to be tickled, bitten, plagued, and eventually destroyed, by the Wogglebug.

The Make Noise Wogglebug is not a clone. Instead, it is a tribute to all that Woggles and is an evolution of the original Grant Richter design. The Wogglebug is a single system. It also offers further functionality, such as an Influence In to the Ring Mod circuit, the ability to directly inject a signal to the heart of the Wogglebug via the Ego In, and a random gate Burst function. All of this has never appeared on any other Wogglebug. The Cluster circuit was also redesigned, and thus it has been renamed Ego/Id Balance, to reflect its further purposes, allowing for new functionality.