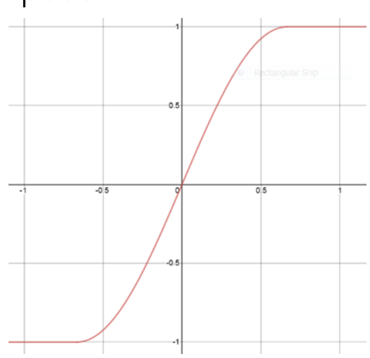
SOURCE AUDIO ULTRAWAVE

APPENDIX A: THE DISTORTION TYPE LEXICON

The list of 40+ distortion types in the Ultrawave's Neuro Sound Editor looks daunting indeed. What to choose? Where to begin? That's why we've created this appendix, so you can discover what all the terms in this list mean, and how to apply them to your sound exploration, preset creation & distortion know-how.

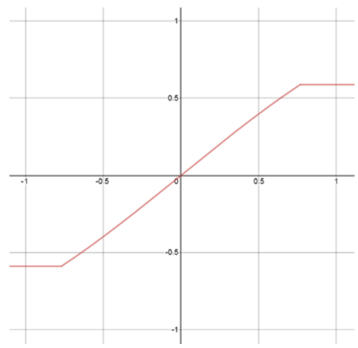
Almost all of the 44 selectable distortion types use a combination of the same few terms. In this encyclopedic glossary, we will be defining those terms so you can have a better idea for what each distortion voice should generally sound like. Keep in mind that many of these elements can be combined for more interesting sounds, which is why you'll see distortion types more than one of these terms in the title. We've included comments from Sound Scientist Bob Chidlaw, creator of the Ultrawave, if you're interested in further reading and scientific explanation.

"Basic" / Tube Distortion – This voice best encapsulates the sound of tubes saturating. At lower levels, the gain is nearly linear, then it begins to sag, and finally distort. Basic / Tube Distortion started its life as the "Normal Distortion" mode on the original Multiwave Distortion pedal.

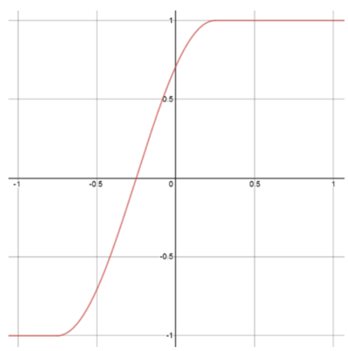


Bob's Notes: *"I think the soft corners are more characteristic of tubes than transistors or op-amps. It's missing the asymmetry between high and low clipping, and it doesn't attempt to match the 3/2 power law characteristic of tubes. But for only one word [for a description], best I can think of."*

Hard Clip – This voice introduces a harder clipping method for a more aggressive distortion, such as a hard-clipping op-amp stage in a pedal. In Hard Clip, the signal begins to clip earlier, resulting in more distortion relative to the input signal, and the transition from clean to distorted is more abrupt.

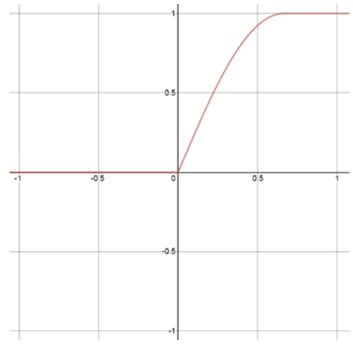


Offset – Similar to asymmetrical diode clipping found in analog overdrive/distortion pedals.



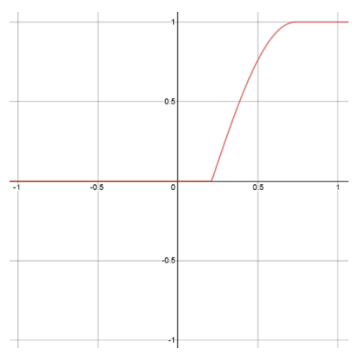
Bob's Notes: *"Offset means that a constant is added to the signal, so instead of moving above and below zero, instead it moves around the constant value. This produces more even harmonics, although with very large drives it becomes pretty subtle. It forces asymmetry into the response. Otherwise, all the pieces that make up the distortion mapping are either pure symmetric, like x^2, or pure antisymmetric, like simply x. Vacuum tubes have a clearly asymmetric response curve; signals of one sign clip more readily than signals of the other sign. Analog pedals may do this sort of thing by, say, having two diodes to ground for one polarity, and only a single diode to ground for the other polarity, so clipping takes place either one or two diode drops (about .6 volts) from ground."*

Diode – Otherwise known as Half-Wave Rectifier, this voice acts similarly to diode clipping in a distortion pedal. In code, all positive signals pass, and negative values are sent to 0.

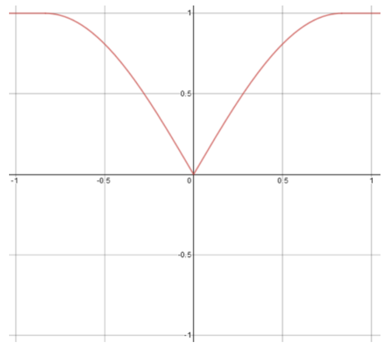


Bob's notes: *"If the output went directly out of the pedal at this point, there would be a large DC offset, but the following high-pass filter will center things around zero again. . . I think there are some analog distortion pedals that only have a single diode to ground at some point, which will pretty much stomp on any (say) negative going signal. More generally, a pair of different kinds of diodes (small signal diodes, or various colors of LED's (which we recall stands for Light Emitting Diode)), oriented in opposite directions, can cause an asymmetry between positive and negative going signals. Resistors and capacitors around the diodes can be used to tailor the response. The asymmetry introduces more even order harmonic distortion."*

Gate – Unless a signal is large enough, the output remains at 0. This kind of gate tends to be "sputtery" as the input signal decays. This is very similar to the type of gate in a "gated" fuzz, or like turning the bias down on a fuzz or dirt pedal with that control. It acts like a voltage-starve.

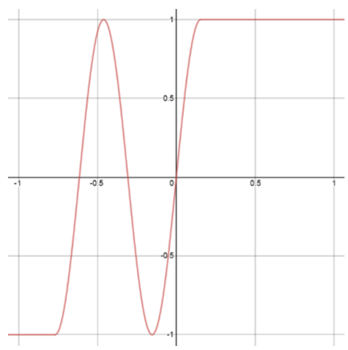


Absolute Value – Also known as Full-Wave Rectifier, Absolute Value is the "code equivalent" of two germanium transistors combined in a Superfuzz circuit to create that analog octave-up effect alongside the cutting fuzz. I made sure Bob was okay with this definition.



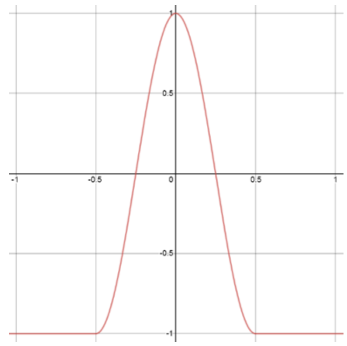
Bob's notes: *"If one puts a sine wave through a full wave rectifier, the output frequency is twice the input frequency. This is how we get an octave up. The full-wave rectifier (FWR) is used in all analog octavers."*

Foldback – Foldback Distortion is a synth-like sound, actually derived from a sound created by modular synths. It is very rich in harmonics and overtones, and can be best described as "setting a note on fire and listening to it burn". Who better to explain Foldback than Bob himself?



Bob's notes: "*The shape of the distortion mapping curve is different from standard distortions. Normally, as the input signal voltage rises, the output voltage also rises, but begins to level off and finally pins (or clips) at a maximum value. With a foldback curve, for large enough values of the input, the output will begin to decrease. With more extreme amounts of foldback, after decreasing for a while, the output can begin to increase again. Maximum foldback has many regions where the output alternates between increasing and decreasing. These kinds of curves add a lot of high frequency content to the output. It also can provide a lot of control over the sound, based on the level of the input signal. With foldback, chords containing only octaves and fifths tend to sound best. Other intervals can cause some strange, although not necessarily undesirable sounds.*"

Octave – Despite Absolute Value/Full-Wave Rectifier also being capable of creating an octave effect, the voices labeled "Octave" actually use a different technique to create an octave-up sound, more suited for combining with other elements.



Bob's notes: *"If you consider the input/output mapping curve for Abs, you see that there is quite the kink as the input signal moves across 0. Sharp breaks in the mapping curve generate a lot of high frequencies in the output. One might visualize this by imagining that it takes a lot of high frequencies (sort of concentrated at one point) to make such a sharp change in direction.*
The Octave curves are much smoother, and thus don't create such a lot of high frequency junk. Mathematically speaking, the Octave goes as x^2, while Abs Value goes as |x|. This also means that the dynamic range of small signals is doubled. If a signal x is 20 dB below full scale, x^2 is 40 dB below full scale."