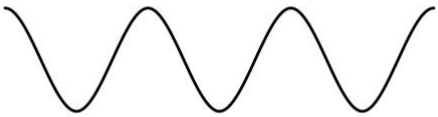
1 WAVEFORM CHARACTERISTICS

1.1 VISUAL REPRESENATTION OF WAVEFORMS

A graphical representation of how the amplitude (intensity or loudness) of a sound wave changes over time. It is a visual representation of how air pressure changes over time.
(image)

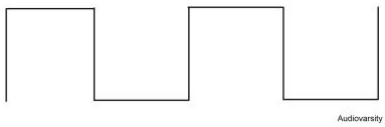
1.2 TYPES: SINE, SQUARE, TRIANGLE, SAWTOOTH

Sine wave.



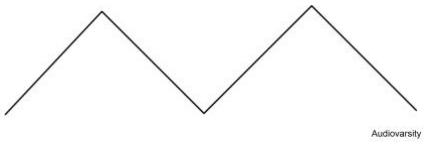
A sine waves is the purest tone. With essentially no harmonics, and only one frequency. It has a clean clear sound like a flute.

Square wave.



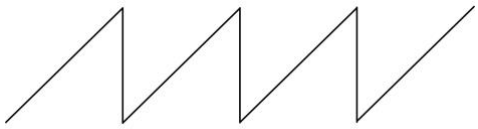
Contains odd harmonics (odd whole number multiples of the fundamental). This means that if the fundamental frequency of a square wave is 200 Hz, it will also generate 600 Hz (3rd harmonic), 1000 Hz (5th harmonic), 1400 Hz (7th harmonic), and so on…

Triangle wave



The triangle is like a square wave containing odd harmonics, except the harmonic content is lower in amplitude than in a square wave. Meaning the harmonics have less influence on the overall shape of the wave

Sawtooth wave

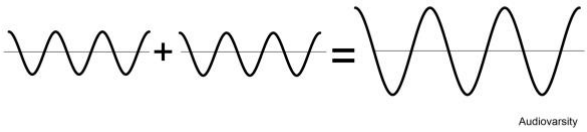


Contains all harmonics. This is the most complex of the four basic synthetic waveforms - but nowhere near as complex as natural sound. In addition, if the fundamental of a sawtooth is 100 Hz, it also contains 200 Hz, 300 Hz, 400 Hz ….etc. Each harmonic is a little lower in amplitude than the previous one.

1.3 PHASE RELATIONSHIPS

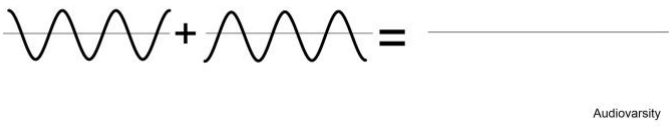
In phase

Combining two waves with the same frequency (speed), loudness and polarity. will lead to a new combined sound wave that is doubled up and twice as strong, but with the same frequency. This is because both sound waves start out in the same direction from the zero-line, and are considered in phase



Out of phase

Combining waves with the same frequency (speed) and loudness that are going in the OPPOSITE directions out from the zero-line (opposite polarities in which one starts going in the positive direction and the other starts going in the negative direction) are considered out of phase and will result in phase cancellation, with the new combined sound wave being silent as the two waves have cancelled each other



out.

1.4 OTHER CHARACTERISTICS OF SOUND WAVES.

- Velocity (speed)
- Harmonics
- Octaves

Velocity

Is the measure of how fast the sound wave travels through air. It is basically the speed of sound and changes as temperature goes up and down.

The velocity (speed) of a sound in normal temperature is about 770 miles per hour. This speed is commonly known as "Mach 1.0" in the field of aerodynamics. For reference, a Boeing 787 travels at Mach 0.85.

Harmonics

Harmonics represent integral multiples of a fundamental frequency. For example, if the fundamental frequency is 220 Hz, A3 note on the Piano, the frequencies of the first three higher harmonics are 440 Hz (2nd harmonic), 660 Hz (3rd harmonic), 880 Hz (4th harmonic).

Octaves

On octave is the interval between two frequencies having a ratio of 2:1.
For example, look at the A3 note. As is 220 Hz. A4 is considered one octave up and has a frequency of 440 Hz. A2 is considered one octave down from A3 and has a frequency of 110 Hz.