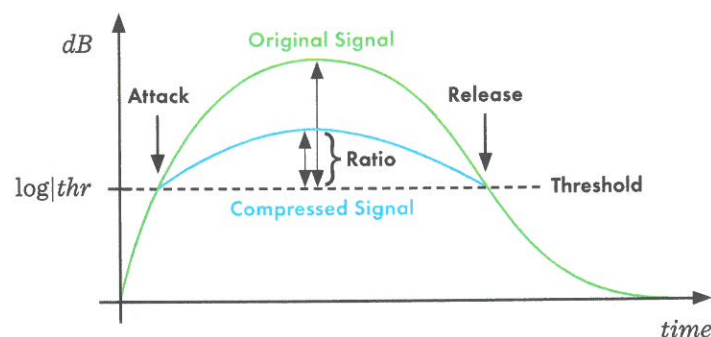


Fig. 6. Effects of compression parameters on an audio signal



react once audio exceeds the threshold.

Release is the time it takes for the compressor to bring the level back to normal once the signal is below the threshold.

Additional optional compressor parameters include make-up gain, knee, sensing algorithm, and stereo linking. More on these later.

Threshold

The threshold is one of the most important settings on a compressor as it determines the audio signal level when the compression process activates. The threshold of a compressor is set in *decibels* (dB) and usually relative to 0 *decibels Full Scale* (dBFS). If a low threshold is set (e.g., -30 dBFS), then a large portion of the signal undergoes compression as compared to a higher threshold (e.g., -10 dBFS).

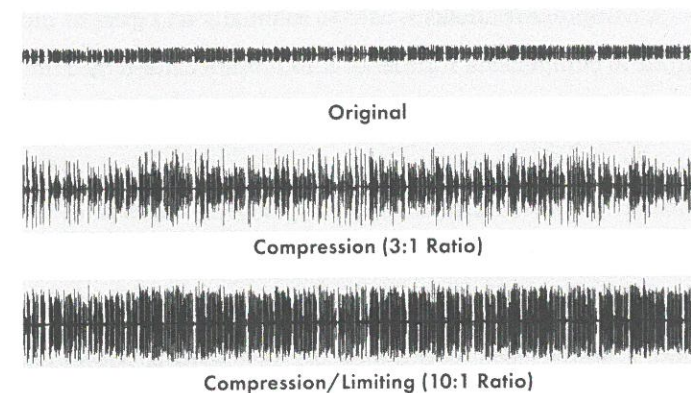
Ratio

The amount of compression applied to an audio signal is expressed as a ratio. For example, if the ratio is set to 4:1, an input of 4 dB above the threshold will result in an output of 1 dB above the threshold. This translates into a 3 dB reduction in volume level.

"Your volume can't be lower than that of the rough mix. But that makes it really hard to create a true high fidelity mix."⁵
Manny Marroquin, mix engineer for Rihanna's ANTI, The Weeknd's Starboy

The act of "dialing" a compressor usually means adjusting the threshold and ratio settings accordingly.

Fig. 7. Effects of compression on audio waveforms



Higher compression ratios such as 10:1 and 20:1 are known as *limiting*. Here the compression amount is noticeably higher, dramatically reducing the audio signal's dynamic range. Limiters are a subset of compressors.

The highest compression ratio possible is infinity:1 (or $\infty:1$), also known as *brickwall limiting*, which attenuates the audio signal to an exact threshold level (see Fig. 7).

Attack and Release

Compression is applied gradually instead of instantaneously, and there are controls for attack and release times—also known as the *time constants* of a compressor. When a compressor is described as "fast" or "slow" it's in reference to the fastest attack times possible.

With most compressors, the attack and release times can be adjusted and are typically set in *milliseconds*. However, in some designs, especially older compressors, the attack and release times are determined automatically. For example, with an optical compressor such as the popular LA-2A, the input signal sets both time constants automatically, making the attack and release *program-dependent*.

Metallica's 2008 release Death Magnetic caused a furor because of the degree of brickwall limiting, resulting in over 13,000 fans signing a petition demanding that the CD be remastered.

A fast attack is best for wrangling sharp transients like those of a snare drum or piano, while a slow attack will maintain the depth of a sound.

A fast release can help create a sense of pressure and rhythmic action to the sound, while a slow release can make the compressor seem less pronounced and more subtle.