GAIN STAGING

WHAT IS GAIN STAGING?

Gain staging is the process we use to solve a common problem, 'going into the red' or digital clipping.

Digital clipping is a cardinal sin within the world of DAWs and software. A computer is not able to accurately produce parts of a sound wave that exceed 0dBFS (full scale).

Back when we used big analog mixing desks, we would measure the level in dBu. 0dBu, being a solid reference level (0.775v), +4dBu is the level used to give the best signal to noise ratio attainable. (1.228 volts) Pushing past this level can cause distortion. Sometimes these driven & distorted signals are pleasing to the ear, this however is not the case. Software signal flow should never exceed 0dBFS.

0dBFS is effectively the maximum limit of loudness attainable from the software. There's nowhere to go beyond this point, so it's important that we stay well below it in level throughout our entire track. The amount by which we stay below this 0dbfs level is known as 'headroom'.

We can think of headroom, as building up cumulatively throughout a track. So we could start with a drum that peaks at -15dB. Once we mix in the rest of the drum group, this may now be at -7dB. Then once we add in the rest of the instruments, they will sum together and the next thing we know we are completely out of headroom and the master is clipping at +5dBs. To prevent this, we need to employ gain staging, which is where we monitor and control the gain at all phases throughout the signal flow and mix-down process.

The reason we need headroom is to stop volume fluctuations in the mix causing the signal to go above 0dBFs. The better balanced our mix is, the less fluctuations we will have. Having fewer fluctuations, means we can push our headroom closer to 0dBFs without clipping, which in turn means we can achieve a louder mix.

Many mastering engineers will expect a mix to have between -6 & -3dBs of headroom for them to be able to work with. Applying a DIY limiter to the mix process is fine, but don't leave this on, as this will use up headroom, as well as ruin remaining dynamic range that the mastering engineer has to work with.