



VINYL MASTERING NOTES

LOW FREQUENCIES / PHASE

It is important when preparing your masters to ensure that all low end sonics (300hz and below) are in phase. ie: monoing all low end. When low end frequencies are out of phase, they do not translate well and produce 'hourglass' shaped grooves, where at the shallowest point the needle will not be able to track, and thus jump out of the groove; causing a skip in the record.

Optimising the low end:

Frequencies below 20Hz and also low-sub information around 30Hz can cause the needle to jump out of the groove and also use extra space unnecessary. Typically, a low cut filter is used to control and maintain the bass frequency information of the audio.

HIGH FREQUENCIES / SIBILANCE DISTORTION

One of the most common issues during vinyl pressing is distortion. This is because the vinyl medium does not handle a lot of high-frequency information well. Because of the physical constraints of the format, excessive high-frequencies tend to distort during the vinyl cutting and playback process if not adequately addressed.

Audible distortion happens when the cutting head or playback cartridge can't physically keep up with the extremely fast, complex grooves produced by exaggerated high-frequency content. Since the stylus cannot track the groove accurately, the result is a distorted sound anytime the stylus plays over severely sibilant parts of the record.

Instruments such as hi-hats, cymbals and tambourines, and vocals containing a lot of "ess" often cause this type of distortion if not appropriately addressed during the mixing and mastering stage, particularly on modern records and styles such as EDM and hip hop with an exaggerated top end.

Moreover, the physical shape of the vinyl disc has an impact on the high-frequency and sibilant distortion on a vinyl record. When cutting vinyl and also during playback, the outside of the record has and allows for a greater surface area to be cut. As the surface area decreases towards the centre of the record, the ability to cut and playback high-frequencies is significantly reduced, making it prone to distortion.



Yet another reason for sibilance distortion during playback can be caused by a worn stylus or cartridge misalignment, among other things.

Overall, if excessive sibilance and harsh, loud high-frequencies in the music are not properly addressed before the cutting of your vinyl master, we can expect the vinyl record to distort.

Optimising the high end:

Frequencies above 20kHz translate into noise and distortion on vinyl due to the overheating of the cutting head. To avoid this issue, using a low-pass filter to cut 18kHz and above can help.

To avoid distortion due to excessive sibilance, a de-esser can be applied to reduce these harsh frequencies.

Ideally, frequencies above 18khz should basically be non existent as they do not translate well to vinyl and also run the catastrophic risk of blowing up the cutter head. masters with excessive high end frequencies will not be cut and immediately sent back to the customer.

VINYL OUTER VERSUS INNERMOST DIAMETER [AKA INNER GROOVE DISTORTION]

Another limitation of this medium, due to the vinyl's physical nature, is that the frequency response of the disc is different in the outer grooves and in the inner grooves.

Basically, on a vinyl disc, the innermost usable area has a circumference that is less than half of that found at the beginning of a disc, resulting in a degradation in high-frequency response as the needle moves toward the middle of a disc.

This is due to the fact that as the radius of the disc decreases, the speed at which the groove is moving past the needle decreases as well. This slow groove speed leaves a lot less area in which to cut a high-frequency groove that swings back and forth a lot faster. By the inside of the disc, the cutting stylus has to fit a lot of audio information in a much shorter and smaller amount of groove space, causing more complex and rapid groove modulations.

As a result, it can cause high-frequency loss, with the overall sound becoming less pronounced on the high frequencies compared to other parts of the disc. Also, it can produce higher tracking distortion during playback because the stylus struggles to accurately trace these grooves, compromising the fidelity of your top end. A subtle loss of top-end is expected as you approach the middle, but higher frequencies can also become distorted as the playback stylus struggles to track the sharp twists and turns.



These shortcomings are known as diameter loss, and the further in you are in the vinyl, the more pronounced these issues become. It is a good idea to leave a large blank area around the vinyl centre label because the very inner grooves have serious sonic problems.

AVOID VINYL INNERMOST DIAMETER ISSUES

Album Sequencing:

The vinyl sound quality can be greatly influenced by the duration and order of songs. As we have seen, longer music content takes up more groove space, bringing you further inside the disc where sound quality starts to deteriorate. And as we now know, intense music with a lot of high-frequency energy (e.g. fast upbeat songs, loud rock tracks, etc.) are prone to present issues when cut in the vinyl innermost diameter.

Unfortunately, because of the nature of the format, we can never completely eliminate this deterioration. We can, however, lessen its impact by following some of the below recommendations.

Keep the running time per side at an optimal length, and avoid cutting too much in the innermost diameter. When possible, keeping the running length of each side up to 20 minutes or less usually provides great results.

Another strategy to prevent the noticeable deterioration of the innermost diameter is by making sure that the last tracks on each side are less intense with a more mellow high-frequency range (e.g. a laid-back instrumental track, acoustic song, etc.). When you know the record will be released on vinyl it is important to take this into consideration for the album sequencing. Try placing demanding, powerful and exposed tracks at the beginning of the required side and not towards the end of the record. While not required, sequencing your music this way can result in a more pleasurable listening experience.

Also, when working on the sequencing and the order of a record intended for vinyl pressing, it's important to keep both sides running times relatively balanced so both sides can be cut with similar sonics and loudness.

VINYL PLAYING TIMES & LOUDNESS

As a physical medium, vinyl records have limitations on side lengths, on how much music they can fit on each side, which varies according to the recording technique used. It's important to be aware that the playing time per side is affected by the amount of sub and low-end frequencies, the loudness (RMS) level, and the stereo width in low to low-mid frequencies.



The program length primarily determines the loudness of a vinyl disc. Basically, the longer the playing time, the lower the volume and bass levels will need to be cut to get the grooves to physically fit on an album side. Simply put, the louder the signal, the bigger the mono and stereo low-end information, the bigger the groove, the more space is used, and hence less total time can fit per side.

The longer the side of a record, the more sacrifices must be made to fit all the music on it. The general rule is—the shorter the side, the better quality of sound.

Using a universal scale to tell you how many decibels your music will be boosted or lowered depending on how long your sides are is fundamentally inaccurate, as every piece of music has its own sonic characteristics and thus impossible to know exactly how loud your music can be cut until it is properly inspected by the cutting engineer. ie. a 1 minute side with excessive low end may not fit on a 7" record. However a 6 minute side with only spoken word and minimal low end may fit on the same format.

7" records cut at 45 rpm should be no longer than 4 minutes for an ideal cut. 3 and a half minutes is definitely the sweet spot on our lathe.

7" records cut at 33 rpm should only be reserved for music longer than 5 minutes but no more than 7 minutes and sometimes 8 depending on the nature of the audio. Please note that a 7" record cut at 33rpm will sound terrible in comparison. Typically punk EP's are cut at 33rpm in order to fit more music on the disc, as well as the added sonic characteristic of groove distortion.

12" records cut at 33rpm should not be longer than 20 minutes per side, however the sweet spot with our equipment has proven to be 18 minutes and under. Please note that all 12" records cut at 33rpm will have inner groove distortion. This is a characteristic of the medium. Although it is impossible to completely rid it from your record we can do all we can to minimise the severity by using proper track order, attenuating problem frequencies and allowing for a longer run out groove to avoid the problem area.

12" records cut at 45 rpm should not be longer than 14 minutes. Again, depending on the nature of the audio, sometimes we can fit an extra minute or so, but typically for a great cut at 45 rpm we don't want the sides to be longer than 14 minutes.



*Please note that each job is different and we should never compare two records to each other, as each job presents its own unique set of challenges embedded deep within the sonic characteristics of each piece of music. With that, sometimes we will be able to squeeze a slightly longer side onto a lacquer and sometimes we won't. This all has to do with the amount of low end, the amount of top end and sometimes even the amount of tracks on a side. When working with the vinyl medium it is imperative to keep in mind that this is an extremely physical format. There are many characteristics which all have their own rules we must abide by in order to produce a high quality result. With that, as long as your side lengths adhere to the above mentioned recommendations, this helps us produce a better result for you.

ALL MASTERS SHOULD BE PRESENTED UNIFORMLY

If masters are sent as individual tracks, they must all be labelled correctly by side and track number.

If presented as 2 continuous files ie. side A and side B, please label them as such.

Most importantly every track / side must have matching sample and bit rates. Accepted configurations are as follows:

44.1khz - 16 BIT
44.1khz - 24BIT
48khz - 16 BIT
48khz - 24BIT
88.2khz - 24 BIT
96khz - 24 BIT

In addition, to correctly supplying masters, it is crucial that an accurate cue sheet is also provided.

Cue sheets must list where each track starts and finishes, NOT just the length of each track.