

A hand with a halftone texture is holding a vinyl record. The record is dark and shows concentric grooves. The center has a yellow label with the text "THE MUSICIAN'S GUIDE TO" written in a hand-drawn, black, sans-serif font. The background is a teal color with a pattern of small white dots.

THE
MUSICIAN'S
GUIDE
TO

A hand with a halftone texture is pointing towards the word "WHY". The word is rendered in large, yellow, block letters with a black outline and a pattern of vertical black lines inside. The background is a dark red color.

WHY

EVERYTHING YOU NEED TO KNOW ABOUT HOW TO MAKE A RECORD

The logo for Disc Makers, featuring a stylized red disc icon to the left of the text "DISC MAKERS" in a bold, red, sans-serif font.

DISC MAKERS[®]



Of course, they never really went away, but the resurgence of vinyl means that manufacturing, releasing, and distributing an album on 12” and 7” vinyl is – once again – a viable option for your independent release. We’re thrilled to be part of the return of this medium; vinyl harkens to the origins of Disc Makers, after all. And renewing the debate over analog vs. digital recording in an age obsessed with technology and expedience is what we audiophiles live for.

Whatever your reasons for releasing an album or single on vinyl, there are realities to come to terms with, particularly the fact that the “art and science” of mastering and manufacturing has a lot more to do with art when it comes to vinyl records.

Producing quality records on vinyl requires experience, skill, and know-how, and ultimately means more compromises when it comes to reproducing your source material. It’s also important to understand that vinyl manufacturing relies on unique production facilities, which currently translates to much longer production schedules when manufacturing vinyl records, compared to CDs.

We’ll discuss many of the nuances and detail the intricacies of the manufacturing process, from recording to production to graphic design. But first, let’s take a quick look at how vinyl works.



HOW VINYL WORKS

Sound is the vibration of particles across a medium – air and water, for instance – in the form of waves. In 1877, Thomas Edison first developed a way to imprint this information onto tinfoil by etching the electrical signal of a sound wave with a needle. Then, with another needle connected to an amplifier and speaker, he was able to read that recorded information and create sound waves.

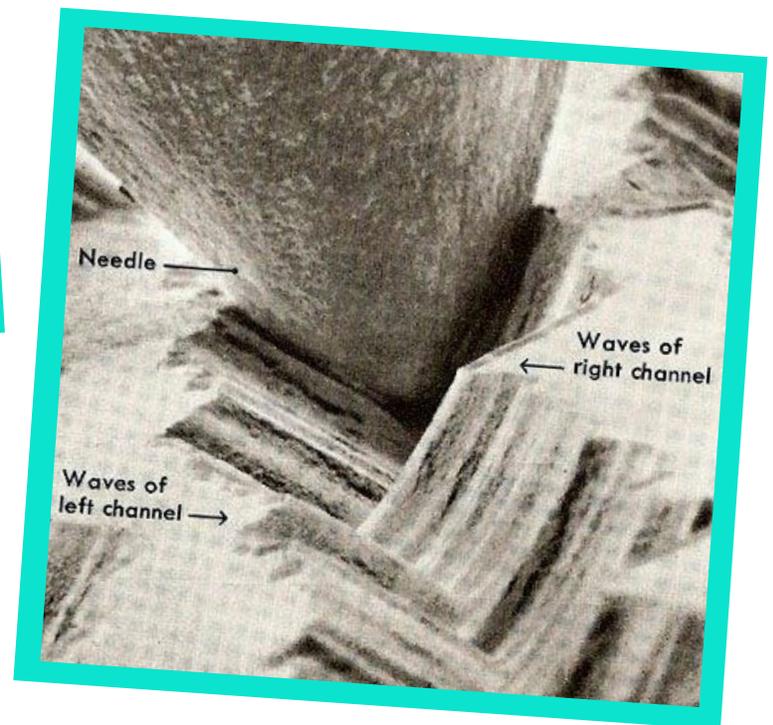
A decade later, Emile Berliner used the same principles, recording to a rubber disc, and then shellac – the predecessor of the vinyl used for modern-day release.

A stylus, or record needle, is one component in a transducer – a device that converts electrical energy into mechanical energy (or vice versa). In the case of a record player, this transducer is a cartridge – composed of a stylus, cantilever, magnets, coils, and body – which converts the mechanical energy of the recorded vibrations into sound waves, which are amplified and broadcast through speakers.

A stylus is cone-shaped and typically made from diamond or other gemstone or hard metal. The stylus fits into the grooves of the record, picking up and sending the etched vibrations through cartridge,



While Edison originally envisioned the phonograph being used as a recording device for dictation and teaching, Berliner's gramophone introduced the era of the recorded musical album, providing a way to mass produce recordings for people to play on systems in their homes. The process is similar to how records are enjoyed today.



which converts the information into an electrical signal, sent to an amplifier that boosts the signal's power, and then to the speakers, which broadcast the sound.

The stylus' job is to read all the information in the grooves, which were originally created using another needle as part of a transducer – in this case, converting the electrical energy of the sound waves into vibrations etched into the record grooves. In a stereo record groove, the right channel is recorded on the right wall, and the left channel is recorded on the left.

While in the process of mastering, engineers who are preparing the recording to be transferred to vinyl will adjust the groove pitch to account for dynamics in the program (i.e., louder and softer sections of your music), as there are maximum and minimum depths permitted. Too much low

frequency information combined with a lot of information spread across the stereo field can result in the stylus jumping out of the groove and skipping. Too shallow and narrow a groove, and the recorded sound can lose its stereo image and suffer from low volume.

Furthermore, a record only has so much space to contain the grooves. The length of your program – as well as the levels and frequencies contained in your recording – will affect the depth and width of the grooves, and ultimately the quality of the playback. This is one reason why mastering a recording for vinyl release is an important step in creating a high-quality end product.



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RECORDING & MIXING



Despite its inherent limitations in regard to reproducing frequencies and volume, listeners will experience a difference in the dynamics of your recording when played back on vinyl vs. any digital format. One of the selling points of vinyl, and one of the reasons devotees praise it as a superior recording medium, is that you can exploit that “analog sound.”

The style of the music recorded will factor into the amount of post-production work, compression, and limiting your program will need. With acoustic-oriented projects, the general rule of thumb is the less limiting you use, the better. You can mix and master at levels that allow the music to sound natural and dynamic.

Heavier music with more bass will require more compromises in the transfer to vinyl. As a general rule (for recording for vinyl or any medium),

working to get tones and levels right in the recording and mixing stages is the best way to go. While the overall volume of your master can be addressed in the post-production stage, as can a certain amount of compression and frequency control, heavy limiting and compression in the mastering stage can result in some distortion issues for your final product.

High Frequencies and Sibilance Issues

High frequency and sibilant sounds, particularly with vocals and cymbals, can turn into distortion on a vinyl record if not mixed properly. Vinyl can't reproduce high frequencies as accurately as digital media. In fact, higher frequencies can sound fine on playbacks from WAV files, but when transferred to vinyl, some of those bright, sibilant frequencies can turn into a crispy buzz. This can result from various



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factors, but specific frequencies, mixed improperly or lacking proper compression, can ultimately be too prominent and distort on playback.

In most of these cases, it isn't an issue of the sound not being pressed onto the vinyl accurately, it's that the stylus is unable to track the sounds correctly. The same recording can sound fine on a 24 bit WAV file, and might replicate perfectly on a CD or other digital product.

One way to avoid sibilance issues is to simply choose the correct microphone and employ an effective pop filter in the recording process. Knowing from the outset that vinyl will be your ultimate end product can affect choices you make all the way back to the pre-production and arranging stages.

The use of a de-esser in these situations can also be a key and is highly recommended when mixing and

mastering for vinyl release. A de-esser acts like a very narrow-band compressor that is set at specific frequencies where you typically get "esses" and "tees" and other sibilant consonant sounds. It compresses those frequencies to keep them from jumping out and becoming a problem in playback.

Center the Bass Frequencies

With lower frequencies, and especially in music that requires a lot of bass and low frequency content, the recommendation is to center your bass frequencies when preparing a mix for release on vinyl. In essence, make the low frequency information mono. It's also recommended that you avoid hard panning of the toms when recording drums.

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AUDIO MASTERING FOR VINYL

Mastering is the final step in the recording process, which takes place after the mixing process (post-production) to optimize and add the final sonic touches to your recordings. When you send your master to a professional mastering studio like [The SoundLab™](#) at Disc Makers, your overall program level is set, as well as the song-to-song (AKA relative) levels. EQ, compression, and other digital processing is also used to make your recorded material sound as good as possible when played in the various listening environments of the customers who buy the end product. When that end product is a vinyl record, certain specific considerations (many already mentioned) need to be accounted for.

Sibilance and Bass

If the music program is sibilant overall, the audio can be cut at a lower amplitude, which can help with the distortion caused by the high frequency information. The result, though, is a vinyl record that's at a lower level, and the surface noise will be more prominent – not to mention, it's not going to be comparable to other vinyl albums. Just like CDs, you'll want to compare your vinyl album to others in your genre. The more compromises you make compressing your program or lowering amplitude to compensate for anomalies in the mix, the more you'll notice a difference when compared to other vinyl releases in your genre.

Sibilance issues with a vocalist can be addressed, to some degree, in mastering, though it poses challenges. By the time a project reaches the mastering stage, the vocals are mixed among various other instruments and sounds, making it difficult (or impossible) to pick out the vocals exclusively. De-essing in the mixing stage can be very important for vocals when pressing for vinyl, particularly with a vocalist who's prone to sibilance. As mentioned, microphone selection and a good pop filter can also go a long way toward avoiding these issues.

Just like with sibilance, proper handling of your bass frequencies is best done in the mix. There are things that can be tackled in the mastering process: one approach is to take everything below 100 Hz and center it. This process and standard of centering bass frequencies can be listed among the major differences between audio mastering for CD and other digital formats versus mastering for vinyl.

Program Order and Inner Groove Distortion

Inner groove distortion refers to how tracks closer to the label and spindle hole on a record can sound audibly different than those on the outer edges. (This is an issue that can be affected by the quality of a turntable and needle on a listener's record player.)

A record is spinning at a fixed speed: it takes the needle the same amount of time to travel from point A back to A in one rotation, whether it's on

an outside groove or the closest groove to the spindle hole. At the beginning of the LP (Long Play), on those outer grooves, the signal is cut across a relatively long section of vinyl. And just as with analog tape, the longer a signal is spread out across the medium, the higher the quality.

When you get to those shorter grooves near the spindle hole, your signal is transferred to a much shorter section – the same amount of audio information is recorded onto that shorter segment.

The audio information, in the form of ridges and valleys, is closer together, and the more dramatic curve of the groove can affect the needle's ability to track and read the information accurately.

To continue the tape speed analogy, consider the outer grooves as equivalent to 30 inches-per-second of analog tape (more or less), and the inner grooves more like 7/12 inches-per-second. To avoid issues stemming from the limitations of those inner tracks, the recommendation for any vinyl project is to keep your louder, bass-heavy tracks at the front end of either side, and your softer, less dynamic tracks for the end of the programs.

This could represent a notable difference in the programs between your CD and vinyl LP release, if you are doing both. With a CD, you can arrange songs purely for continuity and pacing, while with vinyl, factors such as song length and dynamic content may change the order of your songs and which songs appear on one side or the other.



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Program Length

Another major difference between a program running on CD vs. vinyl is how many minutes of music you can include on an album. While a CD can hold over 74 minutes of music, the capacity of a 12" disc is quite a bit less, which means you might be faced with doing a double vinyl set, cutting your program, or rearranging tracks to best fit the format. Here are the program running time recommendations for 12" and 7" vinyl.

12" vinyl – 33 1/3 rpm

Ideal: ≤18 minutes per side

Good: 18-20 minutes per side

Acceptable: 20-22 minutes per side

12" vinyl – 45 rpm

Ideal: ≤12 minutes per side

Good: 12-14 minutes per side

Acceptable: 14-15 minutes per side

Back to the analog tape analogy: at 45 rpm, you're stretching the same signal over a longer section of vinyl compared with 33 1/3, and therefore increasing the quality of the playback. That's why 45 rpm produces a better quality end product, though the running time makes it limited for anything other than maxi-singles and EPs (Extended Play).

7" vinyl – 33 1/3 rpm

Maximum: 6 minutes per side

7" vinyl – 45 rpm

Maximum: 4.5 minutes per side

45 rpm is always the best choice for a 7", if side length permits. 33 1/3 rpm can be more prone to distortion.

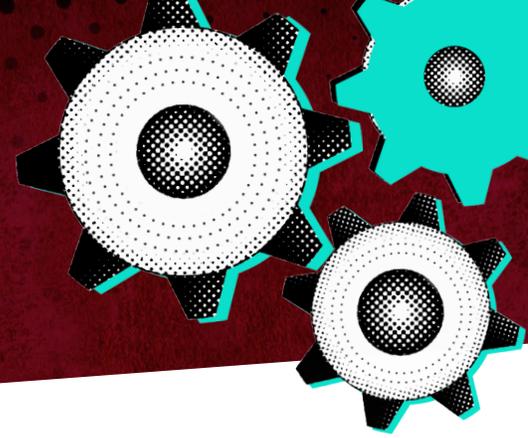


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Audio Master

The general rule is to provide the highest resolution format for your audio master as possible. 24 bit 96 kHz WAV files are recommended, though the majority of audio masters we see are usually 24 or 16 bit at 44.1 or 48 kHz.

Disc Makers can accept your master on any of the following formats: CD-R master (16-bit/ 44.1 kHz CDA format only), PMCD master (pre-mastered CD), DDP 2.0, Digital Audio Tape (DAT), 1/2" or 1/4" Analog Tape.

Note: *DAT and analog tape masters will need additional work performed by the SoundLab in order to prepare a replication-ready master.*

For more information regarding preparing your master, [download our free guide](#), Making A Great Master: Essential information for musicians, engineers, and producers (Revised Third Edition).

Vinyl Record Production Process

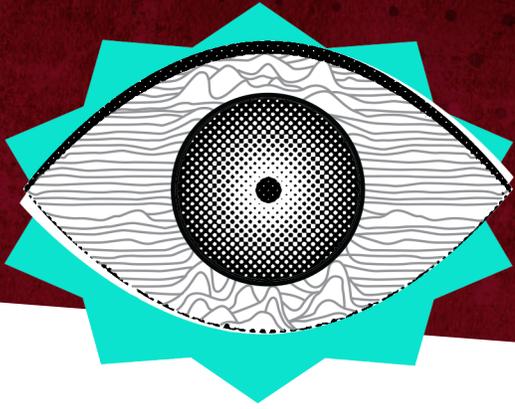
Once your audio master is ready, a lacquer – an aluminum disc coated in acetate (something like nail polish) – is placed on a lathe, or a record-cutting machine. Audio out of a computer is converted to analog, which supplies the audio signal for the lathe to cut. As the lacquer disc rotates, these electric signals from the master recording travel to a cutting head, which holds the stylus. Springs set at converging

45 degree angles control the needle's lateral and vertical movements, which cuts a groove in the lacquer that begins at the outer edge and spirals in one long cut toward the center of the disc.

Once the lacquer is cut, it is coated in a metal (silver and nickel) to produce a metal master. Ultimately, when the metal hardens and is separated from the lacquer, the resulting disc is the inverse of your record, with ridges instead of grooves, which forms the stamper that will be used to make the vinyl records.

The stampers are placed on a stamping press, one stamper (side A) suspended above the other (side B), with a small "biscuit" of vinyl in between. The record's labels sit atop the appropriate side of the biscuit, and as the stampers are pressed together and heated to 380 degrees, the thick biscuit is squeezed flat by the stampers, while a knife trims the excess off the edges.

The finished record cools and solidifies, and the process begins again.



DESIGN MATTERS

Just like you wouldn't let your drummer's girlfriend mix your album (unless she's an awesome engineer and producer), why let someone other than a professional design your enormous LP art? To achieve great album art, we've got some advice born from experience.

Do Your Research

Spend time searching the Internet, and you'll find plenty of examples of vinyl album art done right and wrong. But even with countless album covers available to peruse online, make sure to get your hands on physical vinyl albums as well, whether flipping through your own collection or a bin at a local record store. Pay attention to what inspires you and draws you in, what looks good and is easy to read. Such observations can help you make the right choices when it comes to designing your own album art for vinyl.

Think Big

With a 12" vinyl record you have about four times more space on each panel than you do on a CD, so use it. Design bigger than what you think you'll need. Don't design for a CD and try to upscale your images to fit the size of a vinyl jacket. If you are working in a design program like Adobe Photoshop with a raster file — a.k.a. psd, tif, jpeg, or other similar formats — increasing the size of the image

can result in pixilation or distortion. The images for each panel should begin at the size of the vinyl jacket proportions at 300 dpi.

Outsource

Just because you can find your way around Photoshop or InDesign doesn't mean you're the best person to design your vinyl packaging. If you are not a designer, find someone who is and can help. If you choose to work with Disc Makers, we have seasoned in-house professional designers in our [Design Studio](#) who can help create a look and package that will blow you away.

Keep it Clean

Given all of the extra design real estate you have to work with, it's easy to go crazy. Don't make the art too busy. While there's a lot more space, leave out any unnecessary text or unimportant small details from the cover.

Print and Proof

Many artists and producers listen to their final masters time and time again to make sure everything is perfect before calling the project done. When it comes to album design, the same level of meticulous attention should be given. Proofread... vinyl is big, and that makes mistakes look even bigger. Find a way to print your design and proof it at actual size.

SET YOUR EXPECTATIONS



Ultimately, you may need to set some expectations for your final product, as it's going to sound different pressed to vinyl than it did in the tests and mixes you've heard. You've spent a lot of time in the studio listening to playback of a digital source recording. Once your program is pressed to vinyl, some high frequency content might come back sounding harsh or edgy, or not being reproduced as crisply and cleanly as the original source. Depending on the volume and program, your tests may come back from the plant with less bass than you expected because the engineers may have had to roll off some low frequencies.

Volume and low frequency content go hand in hand with the length of the side. If you try to pack a long program on one side, those grooves are going to be close together. At some point, you physically run out of space. In these cases, a lot of bass can get lopped off a recording to compensate and make additional room.

It's important to note that comparing your vinyl record to your original digital master and files can throw some of these differences into sharp focus. Your overall volume might need to be modified as it relates to the high and low frequency content, so you might be better off making those comparisons with other vinyl records in a similar genre than you would be comparing them to your digital master.

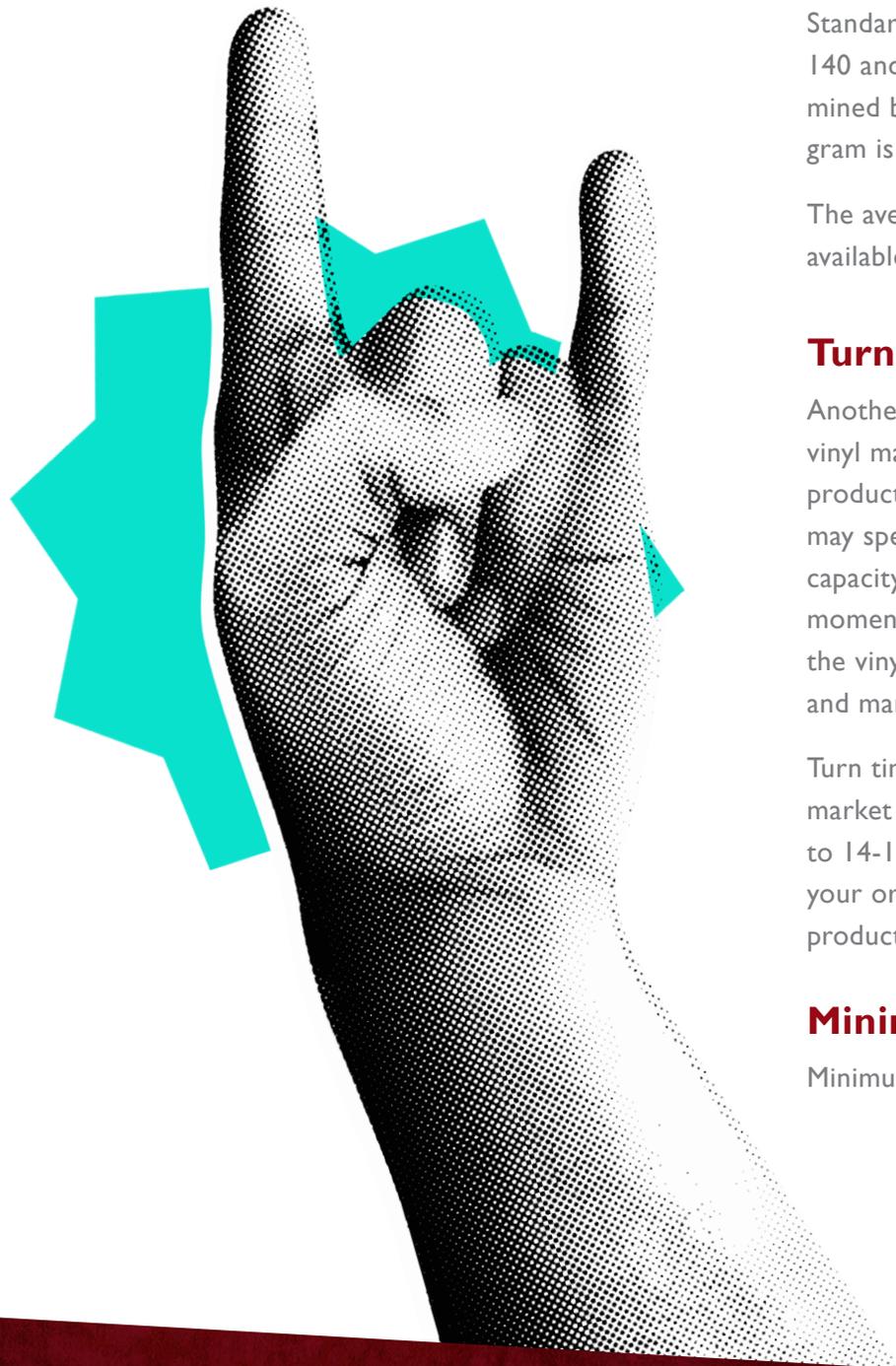
Test Pressings

A test pressing is a vinyl record, made from the stampers that will be used to press your order. All vinyl orders from Disc Makers include four test pressings, outfitted with a generic proof label and packaged in plain white inner sleeves. Test pressings should not be used to gauge the quality of your mix or mastering work – that all needs to take place before the audio master is approved.

If we need to create a new set of test pressings because of an error on the master you provided, you will incur a charge for new mastering, and for creating a new plate and set of test pressings. In addition, if new plates and masters need to be made, it will add weeks to your delivery time. That's why we stress that you need to be 100% satisfied with your mastered recordings before submitting your audio master for vinyl manufacturing.

Vinyl Options and Weight

Disc Makers offers a large selection of custom-colored vinyl LP variations, including mixed and random colors. Color options include black, red transparent or opaque, blue transparent or opaque, orange/gold transparent, green transparent, crystal clear transparent, coke clear transparent, violet opaque, or yellow opaque.



Standard weight for a 12" record averages between 140 and 150 grams, though the final weight is determined by your master content and vinyl color. (180 gram is available for 12" formats in black vinyl only.)

The average weight for a 7" record is 40 grams (also available in colored vinyl).

Turn Times

Another major consideration when heading into vinyl manufacturing is the significant difference in production times compared to CDs. The process may speed up as the demand for vinyl increases and capacity is added in the coming years, but at the moment there is limited production capacity, and the vinyl manufacturing process takes skill, time, and manpower.

Turn times fluctuate seasonally and with major market demand, and can range from 8-10 weeks to 14-16 weeks or more from the time you place your order, approve your proofs, and receive your product. That's potentially 4-5 months!

Minimum Orders

Minimum order for vinyl records is 200.

Go to www.discmakers.com/vinyl
for the latest deals, details, and offers.

Written and edited by Andre Calilhanna. Thanks to Brian Lipski, Michael Gallant, David Hevalow, Tom Barrett, and the sources listed below for information and inspiration.

Images of microscopic view of vinyl grooves courtesy [That Eric Alper](#).

[How Record Players Work](#) (How Stuff Works)
by Meredith Bower

[The Stereo Phonograph Record: How Does It Work?](#)
(Joe Collins, YouTube)

[Mastering for Vinyl](#) (Recording Magazine)
By Scott Dorsey

[Vinyl Mastering](#) (Gotta Groove Records)

[How It's Made](#) - Vinyl Records

[Disc Makers Vinyl Product Page](#)

Want more info on vinyl records and recording?
[Check out the Disc Makers Echoes Blog](#)



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