

Distribution

{tab=CD Production Timeline}

Below is a timeline indicating what to expect and plan for in a typical independent CD production. The time-variances in the different stages of the production process are seasonal. Typically, midsummer through December is the busiest and therefore production times are usually longer.

{tab=The Replication Process}

Replication is a bit more complicated and involved than most people would think, not unlike the manufacturing of vinyl records. It is because of this that a better understanding of the entire replication process will help you in determining who you will send your master to for replication and will arm you with the information to make informed inquiries from your chosen replication facility.

Not all replicators are alike. What differentiates the good replicators from the others is a commitment to quality. This relies upon several factors such as; what methodologies they use, how stringent their in-house standards are, how good their quality control is, and how sensitive they are to any special needs of their clients and brokers. There are many steps between the point at which your master arrives at the plant and when you receive your manufactured CD's. The following paragraphs set out to describe the complete CD production process.

The Glass Master

First, the production master has to be transferred to a glass master or direct stamper (We will focus on the more traditional 'glass' method of manufacturing in this article -- see side bar below about direct stamper manufacturing.) Many replicators now have set plant standards as to what master format all of their glass will be made from. That is, if your project arrives at the plant in a format different than the plant standard, it will be transferred to the in-house standard (usually CDR or Exabyte) prior to the making of the glass master. This is definitely something that you want to avoid, and, a big reason why you should decide which plant that you will be using prior to the making of your production master. The transference to the glass master can happen in either real-time (best) or higher speeds (up to 4x.) Formats such as Sony 1630 can only be transferred in real-time, and because of this, is one way of guaranteeing a single speed glass transfer. You may also request a single-speed transfer with other formats. Some plants charge a premium for this (up to \$200) and some do not. The reason that single speed transfers are preferred is that the initial transfer to glass is the first step where all of the 'ones and zeros' on your digital master get transformed into pits and lands (flat areas) which are subsequently molded into your finished CD's. At higher speeds, the probability of transfer errors increases.

The glass master is a piece of glass approximately 5" (240 cm diameter by 6 mm thick to be precise) in diameter. Your data is physically etched into this piece of glass. It is subsequently metallized and then used to make 'stampers' which are then used to mold the CD's. The way it works is that the glass is coated with a very fine layer of a chemical solution called 'photoresist'. The glass must be coated very precisely to an even thickness of 140-150 microns (depending upon the plants molding times.) The coated glass is then baked at 176 F for approximately 30 minutes to harden the photoresist solution and thereby readying it for the transference of your data. The data transfer from your master tape to the coated glass master is facilitated by a high powered laser beam recorder or LBR. The laser is modulated to expose the photoresist on the surface of the disk in accordance with the data on your master. The process is much like what happens when you take a picture with a film based camera where the light exposes a portion of the film. After the transference of data to the photoresist coated glass master, the glass is then 'developed' in a solution that etches the exposed areas (removing the photoresist coating) on the surface of the disk, ideally leaving tiny elliptically shaped pits that reach down to the surface of the glass. This stage is extremely important because the developing of the coated glass has to be timed precisely to maintain proper geometry. Further development is stopped by immersing the glass into a solution that halts the etching process.

Metallizing

The next step is to 'metallize' the glass by placing it into a bath of electrically charged water with nickel alloy particles or to sputter silver over the etched side of the disc. Generally speaking, nickel alloy is preferred over silver sputtering because during the next phase, (electroforming,) the 'father' disc is made with a nickel alloy and the nickel alloy coated pits on the glass master merge and are transferred to the 'father' (as bumps) thus maintaining the original pit geometry. With silver sputtering, the father is typically grown on top of the silver layer which compromises the pit geometry somewhat. Nickel alloy metallizing takes place over the period of a few hours as the metal particles are attracted to the negatively charged glass and literally 'grow' on the surface of the disc. Once the proper amount of particles has been 'grown' on the glass, the now metallized disk is removed and polished. Once this phase is over, the glass master is considered completed, and, as mentioned above, the process of electroforming or making the 'father' disk takes place.

Electroforming

In electroforming, the finished glass master is used to create the 'father' disk which, instead of pits, has bumps on the surface of the disk. When the 'father' is completed, the side containing the bumps is oxidized to allow for the electroforming of the 'mother' from the father (oxidization allows for the two similarly metallized discs to be separated from each other.) The resulting 'mother' (pits again) is then subsequently used to make 'stampers' (bumps again) which is what is used to mold your production CD's. And if you were wondering, yes, the 'father' disk can be used as a stamper once the 'mother' is electroformed from it. The reason that 'mothers' and 'stampers' are made is because stampers have a limited stamping life, and, in large production runs, multiple stampers are required to produce the large number of CD's. In addition, multiple production lines can be simultaneously stamping out the same project and therefore expedite the completion of such large projects. However, before stampers can be used in the production line, they must be polished, punched to the correct diameter, have a center hole punched out, and be analyzed for pit geometry, balance and uniformity. Once all of the stampers have passed these tests they are ready for molding.

Molding

The Molding process is where the actual CD is formed. The stamper (or 'father') is inserted into the molding machine where small poly carbonate beads (held in a hopper) are heated to a liquid state. The liquid poly carbonate is injected into the mold and the stamper 'stamps' an inverted image (pits again) of itself in the poly carbonate. The molding process is also important because the geometry of the pits must be maintained from the stamper in order for the disk to be playable (and require less error-correction upon playback) by CD players. Some factors that can effect the quality of the disk during the molding process are the maintenance of proper molding temperatures, the duration that the stamper remains in contact with the mold (cycle time,) and the quality of the poly carbonate. Indications of improper molding temperatures or too-short cycle times is what is called 'plowing', which, if looking at the reflective side of a CD, is a distortion in the transparency of the disk. It looks like a smearing of the clear polycarbonate that is a little less reflective.

Once the molding of the disks has been completed, the disk is then sputtered with an aluminum alloy so that the laser and optical pickup in your CD player will be able to read the data off of the surface of the disk. Once that the disks have been 'metallized' the disks are then coated with a protective lacquer coating and then silk-screened with the desired artwork. During the lacquering and silk-screening process drying machines speed up the curing of the lacquer and inks.

Packaging

The final stage of the process is packaging, where all of the materials (CD's, booklet, and additional inserts) are inserted into jewel boxes or eco-paks, spine stickers applied, then shrink-wrapped, and boxed for shipping.

When considering a replication facility to manufacture your project, keep in mind that if the representative doesn't know

the formats that they accept, or, if they indicate that they will transfer your project prior to transferring it to glass, look somewhere else. Everyone involved in a recording project from the artists to the engineers pour their hearts and souls into every project. To have your record compromised at the final stage of the process is not worth saving a penny or two per disk. Use the information above to help you consider a facility that is committed to quality, check references, and express to them that you are looking for quality replication. In the end, when your disks are returned from the plant they should sound at least as good, if not better than the CDR reference from your mastering session. If it sounds worse, reject the project. You have the right to demand that the replicator do what it is supposed to, replicate your disk, you'll be happy you did.

{tab=ISRC codes}

An ISRC (International Standard Recording Code) is a unique digital identifying code that assists performing rights organizations in the automatic collection of royalties due for public performance of copyrighted material. These codes are encoded onto your master and duplicated in the sub-code area of your manufactured CD's. Essentially, it is a digital fingerprint.

Recently ISRC codes have become standard (if not required) for digital downloads through vendors such as iTunes. Also, many foreign markets utilize these codes and therefore it is a good idea to obtain one if you will be distributing overseas.

If you are not on a recording label, you can obtain an ISRC code by contacting the IFPI or RIAA.

{tab=Licensing}

If you are mastering music that you did not compose and do not have a mechanical licensing agreement in place, you must secure a licensing agreement prior to the duplication of your CD. All reputable manufacturing plants adhere to the RIAA's strict standards with regard to licensing documentation. If you are signed to a recording label, usually the legal department will take care of this. For all others, you can obtain a licensing agreement from either the current publisher of the music or through a publishing clearing house such as The Harry Fox Agency. Generally speaking, licensing fees run about \$.07 - \$.09 per disk, per song, depending upon several factors such as the total length of the composition. If you are on a tight production deadline, you should have your licensing worked out prior to the mastering session.

For more information on licensing, check out the NMPA (National Music Publishers' Association) website.

{tab=Barcodes}

Bar-codes or UPCs (Uniform Product Codes) are unique identifiers utilized globally by both distributors and retailers to assist in the tracking, inventory, and sales of all types of products. If you are an artist on a recording label, the label will typically issue a variance of their UPC code for the aforementioned purposes. The Bar-code will be encoded on your master and integrated into your artwork.

If you are an independent artist, you should be aware that many distributors require a UPC code in order for your project to be distributed. Some replicators (like K Disc) and some distributors may issue you a variance on their UPC (typically between \$35 & \$65). You can also obtain your own UPC by contacting the UC Council at: www.uc-council.org. Unique parent codes run approximately \$750 for companies and individuals with gross annual sales below \$1,000,000 US.

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The material on this page deals with preparing for distribution whether using typical formats such as CD's to online distribution and web distribution. Click on any of the topics that interest you above.