Compact Disc Manufacturing Process

CD Manufacturing Process Guide

Introduction

CD manufacturing is the process of turning a finalized audio master into physical compact discs for commercial release. For audio projects, the goal is to deliver a manufacturing-ready master that preserves the intended sequence, spacing, fades, and overall sound quality through every stage of production.

For most audio CD projects, the replication plant uses a DDP image or another approved master format as the source for glass mastering. DDP is widely used because it carries the audio data and disc structure information needed for manufacturing, including track spacing and other CD parameters.

What Happens First

Before replication begins, the master is checked to make sure it is properly prepared and meets the plant's technical requirements. This review helps prevent errors later in the process and ensures the disc will be manufactured exactly as intended.

For audio CDs, the source is typically prepared to Red Book specifications, which define the standard format for compact disc digital audio. That standard uses two-channel PCM audio at 44.1 kHz and 16-bit resolution.

Step 1: Master Preparation

The mastering stage is where the final audio is assembled into the exact sequence and spacing that will appear on the finished disc. This includes checking transitions, track gaps, fades, and overall continuity so the final master sounds correct from start to finish.

At this stage, the final delivery file is usually a DDP image, because it is designed specifically for CD manufacturing. A DDP package can preserve track boundaries and manufacturing details more reliably than a simple audio file export.

Step 2: Glass Mastering

Once the plant approves the master, the data is transferred onto a glass substrate coated with a photosensitive layer. A laser writes the disc information into that layer, creating the image that will be used to produce the metal mold.

This glass master is the first physical reference point in replication. It is created in a controlled environment to reduce errors and preserve the accuracy of the source master.

Step 3: Electroforming

After glass mastering, the glass master is metalized through electroforming, usually by building up a nickel layer. That nickel layer is separated from the glass to form a negative copy of the disc pattern, called the stamper.

The stamper is the tool used to press the data into new discs. In practice, this is what allows thousands of identical copies to be made from one approved master.

Step 4: Replication

During replication, molten polycarbonate is injected into the stamper mold and cooled into the shape of a compact disc. This process creates the physical disc substrate that holds the encoded data pattern.

Replication is different from simple burning or duplication on consumer equipment because it manufactures the disc from a mold rather than writing data one disc at a time. That is why replicated discs are used for large commercial runs and professional retail releases.

Step 5: Metallization

Once the clear disc is formed, a thin reflective layer, usually aluminum, is applied to the disc surface. This reflective layer allows CD players to read the encoded information by bouncing a laser beam back through the disc structure.

Without this reflective coating, the data could not be read properly by standard CD players. The metallization step is therefore essential to the functionality of the finished disc.

Step 6: Varnishing

After metallization, the disc is coated with a protective lacquer or varnish layer. This helps protect the reflective surface from scratches, oxidation, and general handling damage.

This protective layer also seals the disc so it can withstand normal shipping, storage, and retail handling. For customers, this step is part of what gives replicated CDs their durable, professional finish.

Step 7: Printing

The disc label is then printed directly onto the finished surface using methods such as silkscreen or offset printing. This is where the title, artwork, logos, and other graphic elements appear on the disc.

Printed discs are part of the final presentation of the product, so the artwork must be prepared correctly before production begins. In most manufacturing workflows, the plant will review the print files separately from the audio master.

Step 8: Packaging

After printing, the discs are assembled into their final packaging and prepared for shipment. Packaging may include jewel cases, digipaks, sleeves, or other presentation formats depending on the project order.

At this stage, the plant typically performs a final quality check before the order is boxed and shipped. This is the last step before the finished product reaches the customer or retailer.

What Clients Should Provide

Clients should provide a final, approved audio master with the tracks in the correct order and the desired spacing between songs. It is also important to review the full master from beginning to end before submission, because the finished disc will reflect exactly what is supplied.

For best results, clients should also provide:

- Final track list with exact song titles.
- Correct track order and spacing.
- Approved album artwork and print files.
- Any notes about crossfades, hidden tracks, or seamless transitions.
- Contact information for production questions.

Common Mastering Standards

Most audio CD manufacturing follows the Red Book format for CD-DA, which is the long-standing standard for audio compact discs. The core technical format is 16-bit, 44.1 kHz stereo PCM audio.

If a project is being prepared for manufacturing, a DDP master is often preferred because it is designed for exact replication and can include the track markers and spacing details needed by the plant. This reduces the risk of sequencing or indexing mistakes.