PART I

The Mechanics of Mastering

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The Essence of Mastering

The term "mastering" is either completely misunderstood or shrouded in mystery, but the process is really pretty simple. Technically speaking, mastering is the intermediate step between mixing the audio and preparing it to be replicated or distributed. Up until recently, we would define it as follows:

> Mastering is the process of turning a collection of songs into an album by making them sound like they belong together in tone, volume, and timing (spacing between songs).

That was the old way to explain mastering when the album was king. Since we live in a singles world today, the definition has to be tweaked for our current production flow. Let's use this definition instead.

> Mastering is the process fine-tuning the level, frequency balance, and metadata of a track in preparation for distribution.

That first definition isn't obsolete, though, since albums are still around (and probably always will be), but the fact of the matter is that individual songs are always played in a collection. The collection can be an album or, more usually, played before or after someone else's track on the radio, on an online distribution service, or on someone's playback device. Of course, you want all your songs to sound at least as good as the others that you listen to or the ones they're played around.

> *I think that mastering is a way of maximizing music to make it more effective for the listener as well as maybe maximizing it in a competitive way for the industry. It's the final creative step and the last chance to do any modifications that might take the song to the next level.*
>
> *—Bernie Grundman*

So loosely speaking, that's what mastering is. Here's what mastering is not—it's not a tool or a plugin that automatically masters a song with little or no effort from the operator. All too often people have the misconception that mastering is only about EQing the track to make it sound bigger, but it's really more of an art form that relies on an individual's skill, experience with various genres of music, and good taste. In fact, it's been said that 95 percent of all mastering is in the ears, and not the tools.

> *I think that mastering is, and always has been, the real bridge between the pro audio industry and the hi-fi industry. We're the ones that have to take this stuff that sounds hopefully good or great on a big professional monitor system and make sure it also translates well to the home systems. We're the last link to get it right or the last chance to really screw it up and make it bad, and I think we're all guilty at times of doing both.*
>
> *—Glenn Meadows*

While the tools for audio mastering do require more precision than in other audio operations, the bottom line is that this is an area of audio where experience really does matter.

Why Master Anyway?

Mastering should be considered the final step in the creative process, since this is the last chance to polish and fix a project. Not all projects need mastering, especially if they're not destined to be heard by the public, but here are a few instances when mastering can help:

- ▷ If you have a song that sounds pretty good by itself but plays at a lower volume when played after another song.
- ▷ If you have a song that sounds pretty good by itself but sounds too bright or dull next to another song.
- ▷ If you have a song that sounds pretty good by itself but sounds too bottom heavy or bottom light against another song.

A project that has been mastered simply sounds better *if done well*. (That's the key phrase, of course.) It sounds complete, polished, and finished. The project that might have sounded like a demo before now sounds like a "record" because:

- ▷ Judicious amounts of EQ and compression were added to make the project sound bigger, fatter, richer, and louder.
- ▷ The levels for each song of the album (if there is one) are adjusted so they all have the same apparent level or have the same level as other professionally mastered songs in the same genre.
- ▷ The fades have been fixed so that they're smooth, if needed.
- ▷ The distorted parts or glitches have been edited out.
- ▷ All the songs of an album blend together into a cohesive unit.
- ▷ In the case of mastering for CD or vinyl, the spreads (the time between each song) have been inserted so the songs flow seamlessly together.
- ▷ The songs destined for a CD or vinyl are sequenced so they fall in the correct order.
- ▷ ISRC codes and the proper metadata have been inserted into each track.
- ▷ A backup clone is created and stored in case anything should happen to the master.
- ▷ Any shipping or uploading to the desired replication facility is taken care of.

As you can see, there's a lot more to mastering than it seems when you really get into it. To begin to understand mastering, let's see how it has evolved over the years.

From Vinyl, to CDs, to MP3s, and Beyond

Until 1948, there was no distinction between different types of audio engineers, because everything was recorded directly onto 10-inch vinyl records that played at 78 rpm. In 1948, however, the age of the mastering engineer began when Ampex introduced its first commercial magnetic tape recorder. Since most recording of the time began using magnetic tape, a transfer had to be made to a vinyl master for delivery to the pressing plant to make records; hence the first incarnation of the "mastering engineer" was born, although he was called "transfer engineer" at the time (see Figure 1.1).

Figure 1.1 A disc-cutting lathe.

There was a high degree of difficulty in this transfer process because the level applied to the master vinyl lacquer when cutting the grooves was so crucial; too low a level and you get a noisy disc. Hit it too hard and you destroy the disc and maybe the expensive ($15,000 in ’50s and ’60s dollars) cutting stylus of the lathe, too (see Figure 1.2).

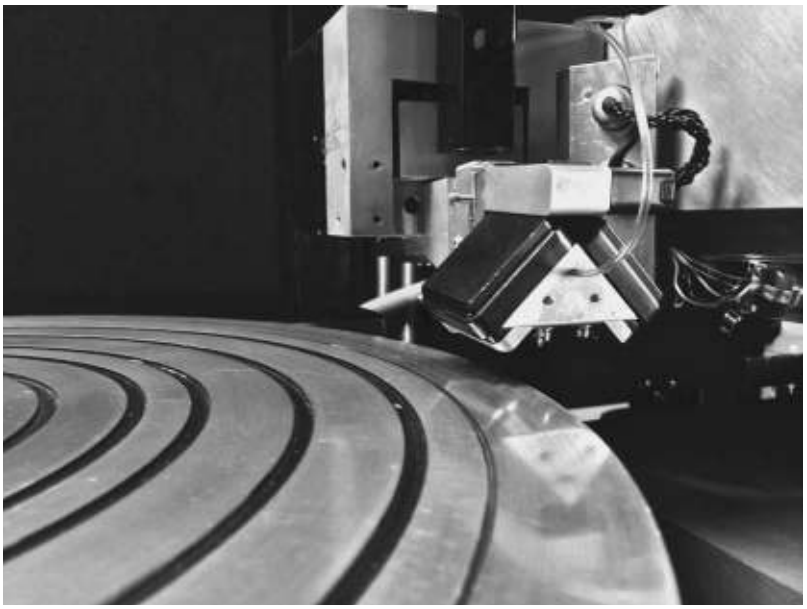

Figure 1.2 A disc-cutting stylus.

In 1955, Ampex released Selective Synchronous Recording, or Sel Sync, which gave the multitrack recorder the ability to overdub and changed the recording industry forever. At this point there became a real distinction between the recording and mastering engineer, since the jobs now differed so greatly, although many were trained at both. (The EMI training program at Abbey Road made mastering the last job before you became a full engineer.)

In 1957, the stereo vinyl record became commercially available and really pushed the industry to what many say was the best-sounding audio ever. Mastering engineers, who were now known as "cutters," found ways to make the discs louder, and as a result less noisy, by applying equalization and compression. Producers and artists began to take notice that certain records would actually sound louder on the radio, and if it played louder, then the listeners usually thought it sounded better (although they were speculating instead of using any scientific data), and maybe the disc sold better as a result. Hence, a new breed of mastering engineer was born—this one with some creative control and ability to influence the final sound of a record, rather than just being a transfer jock from medium to medium.

An interesting distinction between American and British mastering engineers developed, though. In the U.S., mastering was and still is considered the final step in the creation of album, while in the UK, they look at it as the first step in manufacturing. As a result, American mastering engineers tend to have much more creative leeway in what they're allowed to do to the audio than British engineers.

With the introduction of the CD in 1982, the cutting engineer, who was now finally known as a "mastering engineer," was forced into the digital age, using a modified video tape recorder called a Sony 1630 (see Figure 1.3) to deliver the digital CD master to the replicator, but still utilizing many of the analog tools from the vinyl past for EQ and compression. The 1989 introduction of the Sonic Solutions digital audio workstation with "pre-mastering software" provided a CD master instead of a bulky 1630 tape cartridge (see Figure 1.4). Now mastering began to evolve into the digital state as we know it today.

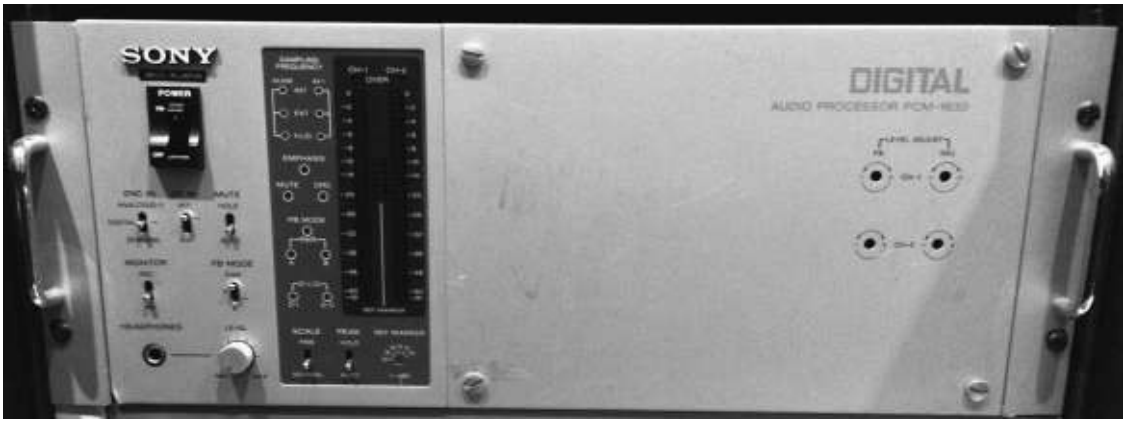

Figure 1.3 A Sony 1630.