MASTERING
Part II: Tracking and Mixing

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The introduction to this series on Mastering focused on the history of mastering and what mastering is as a practice and how it has evolved for today's world of music distribution. Here we'll focus on what happens before a mix gets mastered, from tracking to mixing.

You probably have already come across general articles and tutorials on mixing, but the goal here is to focus on hip hop projects, taking into consideration many of the common scenarios people mixing their own projects deal with today. We're going to first touch on tracking your beats, instruments and vocals – because that's where it all begins – and not only give you some suggestions as to what to do, but also what not to do, to hopefully help you accomplish the best possible mixes for mastering. Then, we'll go into the concept of mixing *for* mastering, and how to best use the effects you might have at your disposal.

In today's world of do-it-all digital effects, perhaps the best approach is to use them in moderation; that whole "less is more" mentality definitely applies and it's something you might want to keep in the back of your mind while reading this article.

This article also focuses primarily on the digital format, which is the most popular recording and mixing format these days. We will also touch on tape, since some rap projects are still being recorded to it (and for real good reason too). For those of you who have never worked with tape, it might be interesting to see how some of the things you can do in digital platforms compares.

Before we get into the details of this part of the series, I want to start off by telling you something that can't be said enough: **A great mix is the key to having the best sounding master.**

It's a common misconception these days to believe that mastering will fix the mistakes you made in tracking and mixing. It's real important that you learn as much as possible how things work at the tracking stage, then the mixing stage to later understand where mastering fits into the equation. The best case scenario is to have really well-planned and executed mixes so that in mastering, the mastering engineer will make those good mixes translate well to all listening environments and bring out the best qualities of those mixes, as opposed to having to deal with problems in them. Unfortunately, dealing with mixdown problems is something that Mastering Engineers deal with on the daily, and this article hopes to change that, so let's give it a crack…

Get the Balance Right

There's a common phrase out there: "Fix it in the mix". Sure, you can fix many things at the mixdown stage, but there are some things you can't do much about, such as recording a signal too hot, or putting too much noise on tape by not optimizing your signal chain. The first rule of thumb for getting a good mix is to start with tracking good signals; <u>your goal should be to mix creatively, rather than mix to correct problems</u>.

Clean Signal Path

Getting the best possible signal for recording is the first thing you need to worry about. Here are a few tips that should help you get an optimal signal for tracking:

- Get the best cables you can afford and purchase cable lengths based on your needs, not extra long cables that may be on sale at the store. Spending a few hundred dollars on some high quality cables is not uncommon in pro setups.
- Keep your gear clean, free of dust, especially if you're recording on analog media. Dust bunnies can carry static electricity, which may cause problems with your magnetic media, such as dropouts on your tapes.
- If you have ground loops, unplug everything in your signal chain, piece by piece and cable by cable until you identify the source of the ground loop. In a lot of cases, this happens when you mix balanced and unbalanced cables, or make improper connections to balanced/unbalanced sources. Check your gear manuals for making the proper connections, since they can vary by manufacturer.
- Invest in high-quality power conditioners. These serve two purposes; they protect your gear by acting as surge protectors (in case of a lightning storm, for example) as well as having filters to block noise coming through the electrical current of your home, such as RF (Radio Frequency) signals and noise that can be generated from Fluorescent Lighting.

Garbage in...

In addition to taking care of the connections in your signal path, you also want the highest quality equipment you can afford to record your music.

This article assumes you already know this, as well as proper mic placement and you probably even have the room where you record treated for sound (hopefully you did a good job at this, and not just purchased a foam kit and slapped it over your room where the pieces "look cool" – hey, I'm not assuming that's you, but I have been around plenty of setups where they did just that!) Use acoustic foam and other acoustic control accessories where you most need them (corners, directly behind your monitors if your monitors are against the wall, for example).

Since most rap projects don't incorporate the use of live drums, you don't have to worry about purchasing a few high-end mics and channel strips for your drums, or build an

isolation booth for your drum kit. With live drums, everything counts, from the room itself to how you place the mics on each of the drums and cymbals, as well as the type of mics you use. Hip Hop artists generally are sample-based, so luckily, all you really have to worry about is sampling or getting good drum samples for your drum tracks. If you sample your own drums, you should know how to make best use of your sampling engine, as well as make sure you aren't capturing things like noise and/or hum from your setup in your samples. If you sample 10 different hits and you have a noise or hum issue in your setup, you will multiply and make the noise worse when you put together your sequence.

If you use live guitars and keys, the amp outs generally go straight to the board. You don't have to worry about your room's reflections when tracking these instruments, not even so much if you also are mic'ing up the amps, but vocals is another matter.

In my experience with bad mixes, one of the most problematic elements is poorly tracked vocals. The majority of the problems I've seen are from reflections from the untreated (or semi-treated) rooms leaking back into the microphone and poor-quality microphones and mic pres. Even with software that models high-end microphones and pres, they never sound as good as tracking with better microphones and it's very

A small bathroom can be treated to cancel reflections back to the microphone with foam, blankets and other sound-absorbing materials.

hard (sometimes impossible) to overcome the reflections of the room that get printed with the recordings (if you've ever recorded anything and you play it back somewhere else outside your studio and your vocals sound like they were recorded in a bathroom or small closet, you know what I'm talking about). Invest in a good quality vocal mic and pre, even with top-notch mixing gear, you usually can't make a cheap vocal track sound as good as a nice mic/pre combo in a well-treated room.

I got one mix where the producer asked if I could do anything with a vocal track that sounded "too distant". I listened to the vocal track and sure enough, it sounded as if the MC was standing at least 2 feet away from the mic. I asked about the mic setup and the producer said *"Well, the mic was behind my keyboard and a crate of records and the MC had to stand in front of the keyboard, but we turned up the gain on the Mic and figured you could make it sound better on the mix."* So, two things: First, know what can and can't be done in a mix. The key with recording vocal tracks is to make them sound

as "dry" as possible while recording them so that you can add "room" effects later. The key to investing in a good microphone and preamp is to get the best possible tone from your vocals, not your surroundings. Second, the distance between the vocalist and the microphone in most cases is around 6 inches (you can play around with the distance a bit, all mics can give you different tones but definitely less than a foot. The only thing in between the vocalist and the microphone should be a pop screen).

Mono or Stereo

I'm talking to my digital recording heads on this one specifically. People who record with analog tape know how valuable tape tracks are; "bouncing" to them has a different meaning than it does to those who have only worked with digital tracks. I get Pro Tools sessions sometimes from people that have tracked everything in stereo and in most cases, this is not necessary. This may not be an issue for people who are running DAWs that allow an unlimited track count, but what you have to keep in mind is that processing a stereo track takes exactly double the system processing effort than processing a mono track, and this can slow your system down as you start to stack tracks and add native effects plugins, so it makes sense to consider when to record in mono and stereo in the digital environment, for reasons other than what people tracking to tape have to deal with.

Instruments can be tracked in mono and stereo; it depends on the source. If for example, you are tracking a guitar, with a line out from the amp to a channel on your console, you can then place a mic right on the cabinet, and send that to another track. If you are recording a Triton patch that has a stereo effect, it would be a good idea to track it in stereo. If you're sampling a stereo source, the same thing applies. In tracking samples, a common technique if you have a stereo sample with all the drums on the left channel and the bass on the right would be to track them in dual mono (using two independent mono channels as opposed to one stereo in a DAW). Then, you can play around with pans on the two tracks and get creative.

Drum sounds don't need to be stereo. Kicks, Snares, Hats, Cymbals can all be tracked in mono. Percussion sounds, if sampled in stereo and have a dynamic L/R image from the source can be stereo, but single hits should be mono in your multitrack session.

Basses should always be tracked in mono. Having a stereo bass track can phase out the bass line (relevant when cutting wax), and you could also phase out some of the middle frequencies of your mix in the process.

Vocals should almost always be tracked to mono as well, unless you want to capture a stereo performance, but we're talking hip hop here, MCs in a booth with one mic, there's no point in tracking stereo vocals from a mono signal.

Keep in mind that placing tracks in the stereo field is done at the mix level, with the use of panning and effects processing, such as reverbs, delays, modulation effects, etc. If you do

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want your vocal tracks to sound like they are two feet away from the mic, record them dry and create that effect later with processing; you can even make your vocals sound like you're twenty feet away if you want, the point is to start out with a dry track that will allow you to shape it in different ways.

How High?

How high you push your levels when tracking is different when recording to analog media than when tracking to digital.

How hard you hit the tape will have an effect on your mixes, because of the inherited quality of tape, which depends on many factors. Analog processors color the sound in different ways and everything in an analog chain will add its own "color" or character, up through the console. Tape media will have different characteristics that affect the sound as well. In the world of analog recording, how much you drive the processors and hit the tape will give you a varying quality of sound. With A-to-D converters, it's important to optimize your signal chain to get as close to the 0db ceiling and best utilize the analog front end of the converter for your recordings. You can saturate tape for a tape compression effect, since with tape, you can hear an audible (and many times, desired) effect when running out of headroom before completely distorting your recordings, whereas with digital, going past the 0dbfs ceiling will give you a distortion that is nowhere as pleasing as anything you may get from tape. Key thing to keep in mind is: the bigger the tape, the bigger the sonic "real estate".

How hard you hit your digital converters depends on the bit depth you are recording to as well as the analog front end quality of the converter; you can push your levels higher recording at 24-bit than 16-bit for example, this is because the added wordlength (more 0s and 1s) in 24 bit allows more digital headroom while minimizing the noise floor giving you a bigger dynamic range, but one thing is certain with any bit depth, going over 0dbfs will distort the recordings.

A "safety" I've seen (and heard) people do is using a limiter on the master bus. Some people tend to think "Hey, if it's bad to hit 0db on my digital mixes, I'll just put a limiter on the master track, set it to limit at -0.1db and bam! No digital clipping!!"

Well, that will work for the purpose of keeping your levels from hitting 0db and causing "overs". However, what you are also doing is eating up the headroom of the mix, and that won't leave the mastering engineer any room to play with at the mastering stage, or even for yourself, if you plan on mastering your own tracks. A common effect that is heard by doing this is the lack of definition between instruments, lack of punch and a harshness that doesn't sound as pleasing as it does when pushing up levels when tracking to tape.

The Meters

As you know by now, Digital has an absolute decibel limit before audio starts to distort, 0dbfs. Because of this, it's easy to state that anything above 0dbfs in a digital meter will clip. A digital meter takes its signal directly from the data path, unlike an analog VU (Voltage Units) meter, which measures the levels based on voltage from within consoles, recording machines and other analog processors, which can vary.

Because of voltage differences among many consoles and recording machines, the decibel limit before audio starts to distort varies in an analog setup; somewhere between +18db and +24db. For example, one particular console and tape machine might start to saturate the recordings at +14db, while another console and tape machine might start recording a similar saturation effect at +18db. For this purpose, VU Meters on many consoles and tape machines are adjustable. Whatever an Analog VU Meter shows as "0db" is an approximate value, and many engineers adjust the meters on their consoles and tape machines according to what they feel is right for their setup.

This doesn't mean that all digital meters are 100% accurate. Most digital meters follow a -20dbfs calibration, but because of design, they may not accurately represent what is truly 0dbfs (decibel full-scale). For those who really want the most accurate digital meter, there are high-quality meters out there available, capable of truly reading the data stream and translating that to an accurate representation in decibels, but for most, the ears are what matter most, and use meters (analog and digital) for an approximate reading of the signals only.

Monitors/Room/Ears The tools you use to listen to your mixes on are also very important. Nearfield monitors (referred to also as Studio Monitors) were designed to take the room out of the equation while listening to your mixes, since when you listen to music through typical loudspeakers, you're not only listening to the sound the speakers are reproducing, but also the sound reflections in that room. Nearfields work best when the distance between them and your ears are 2-3 times shorter than the nearest wall, to minimize sound reflections coming back to your ears and hyping the sound you hear. Even if you have your monitors placed at an optimal setting in your room, with nothing directly behind them, you may still have to worry about the sound reflections in your room. Too close to a corner? Bass traps can help there, but in short, monitor placement and your room itself work hand-in-hand with your monitors, so remember this the next time someone tells you "Aw man, you gotta get the _____ monitors, those are the *best* monitors!" In some ways, it's like someone telling you to buy the x-brand shoe because it will make you run faster. Sure, not all Nearfields are of equal quality, but don't choose them based on other peoples' experiences with them.

Most home setups won't allow monitor placement in the middle of a room, typically you'll have your monitors placed very close to a wall or corner, so in addition to adding some strategically-placed sound treatment, the best thing you can do is learn your monitors as they are reacting to their placement in your room.
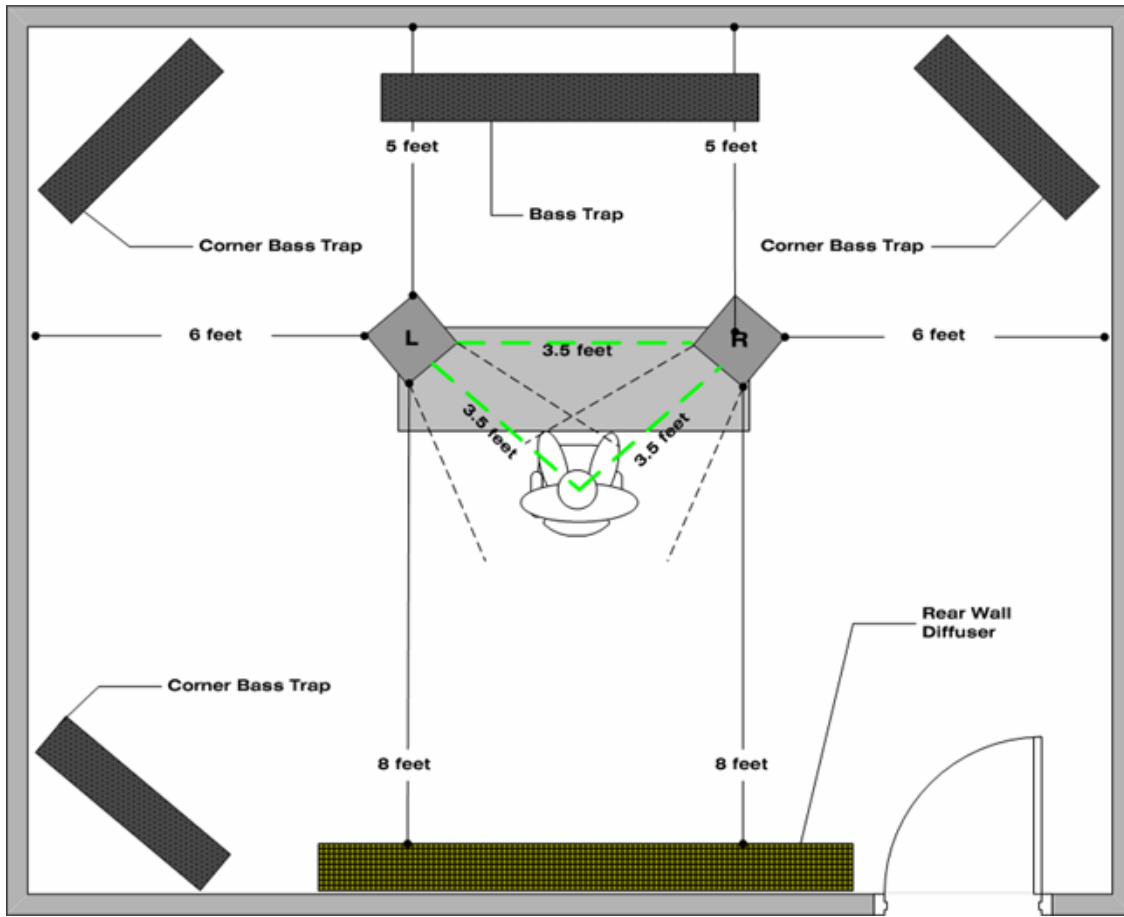
This is an optimal Nearfield Monitoring environment, keeping the distance from the monitors and the walls longer than the distance to your ears.
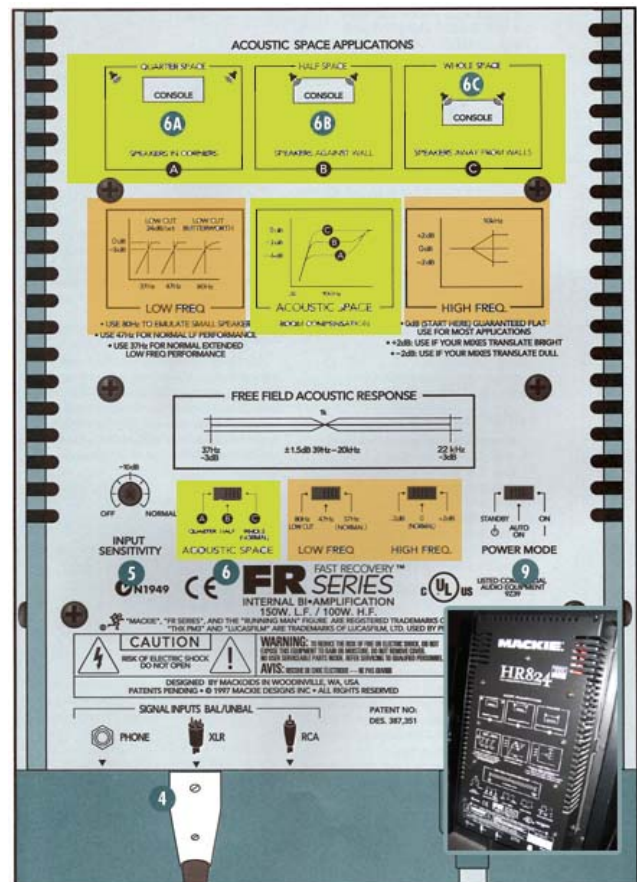
A common suggestion is to play CDs you're familiar with through your monitors, so you can hear how one of your favorite CDs sounds like through your monitors (and room) and try to make your mixes sound like that. In my opinion, that's not really a good idea, since you are basically trying to nail your mixes to sound like something that's already been mixed AND mastered through your set of nearfield monitors. The key thing to keep in mind is that the sound you hear through nearfield monitors doesn't represent what a master is going to sound like in most systems, since nearfields aren't designed to use the entire room when reproducing sound. This is why mastering engineers like to use hi-fi "full-range" loudspeakers, since there's really no way to master a mix through nearfields and get the kind of low-end response that you can feel hitting your chest, for example. Don't forget about headphones; you may have heard that it's not a good idea to mix with headphones, that's not true, a good pair of cans are a great tool for reference checking mixes with (in addition to good nearfields). You don't want to solely rely on headphones

because you don't get a very good imaging representation (think of the "feel" of panned instruments as opposed to "hearing" where they are panned in headphones).

The best way to learn your monitors (and room) is to spend some time mixing your song, then burn a CD, take your CD and a pen with a notepad to as many different systems as you can get out to, and make notes as you listen at each spot. Don't compare what your mix sounds like in comparison to another CD you own that's already been mastered (I already said that, I know); rather, listen to what sticks out in your mixes. I had someone ask me a real good question, which was: *"How then, am I supposed to know when a mix is good, like good for mastering, if all I have to compare my mixes to is a bunch of stuff I have that is already mastered from other artists?"*

The answer (according to my opinion) is what I consider the key to having the best mixes for mastering, and that is – you want to eventually have mixes that sound "even" everywhere you play them. The bass should not sound muffled, it should sound defined, the vocals should be clear, the drums should sound punchy and dynamic, the highs should sound crisp, not brittle and you should be able to hear all of the

Some Nearfields, like the Mackie 824 have frequency cut filters that help when placing monitors in the middle of the room is not an option. Other monitors have similar compensation features that help when placing monitors against a wall or near corners.

instruments, with nothing sticking out more than it should. Mastering will take care of amplifying (and attenuating if need be) the frequencies and taking that great mix and tweaking it (hopefully not much) so that it translates well into most systems.

A key thing to know is, if for example the bass on your mix sounds good on your monitors, but when you take it somewhere else, the bass is muffled, understand your setup is not giving you an accurate bass response and you are adding too much low end, the same goes with the rest of the frequency ranges, so the more you learn how your mixes translate to other systems, the less you'll have to leave your studio and with time, you will know how to best use your mixing environment and come up with good mixes based on what you hear in your studio, not because you bought the "_____" set of monitors. If the bass problem is too serious, you may consider a sub for your monitors and we can write volumes of articles on monitors and sound treatment, but for the sake of this series, let's just say that spending the time in getting used to your environment will be more valuable

to you down the line. Try not to fall for the "Buy the most expensive monitors you can afford" advice, since not everyone's setups are the same, let alone their ears (and if I've learned anything with regards to nearfields, it's definitely that price does NOT dictate quality in many cases). You can use manufacturers' frequency charts as a guideline, but keep in mind that there is no standard measuring guideline for measuring a monitor's frequency ranges; each manufacturer uses their own.
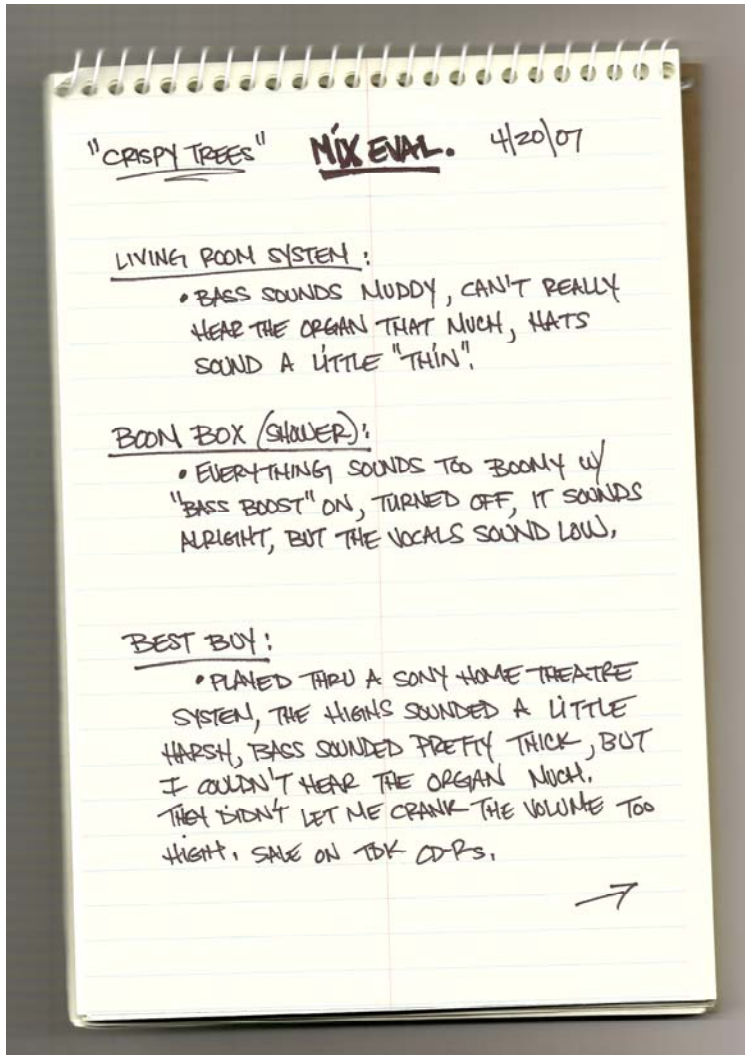
Mixing and (*later*) Mastering

One of the services you should expect from a professional Mastering Engineer is the evaluation stage of your mixes. If you give them squashed mixes, with no headroom to maneuver in, the first thing they will ask for will be mixes that aren't as maximized. It's important to not render loudness processing effects to your mixes and always keep the original mixes backed up, in the event that you do have your music professionally mastered one day. Mastering Engineers also have high-quality processors, and for example, a plugin mastering compressor isn't going to sound as good as an outboard high-end compressor that an ME might have in their arsenal. You definitely want to give your mastering engineer plenty of room to have them make the most use of that processor's high-end qualities, which will most likely give your music a better sound and not a "thin" sound that you may generally get with lesser-quality digital effects.

If you are doing your own mastering, you'll definitely want to mix first, master last. Maximizing signals is considered part of the custom mastering process and you definitely want to take care of that part of it at the last step, not during your Mixing process. One of the drawbacks of doing your own mastering is that you are mixing and mastering in the same environment. This may not be a problem if you have a properly "tuned" room and

an audiophile-grade loudspeaker system, but if not, you are definitely doing it all in an environment that may not be giving you an accurate frequency representation of what you are working on, on top of the fact that you are using only your perception of the sound, so keep the following in mind:

If you are sending out your mixes to get mastered professionally, avoid putting a limiter at the master bus, just bring down the master faders so that you are not hitting 0db in your meters (and definitely use your ears in the process). A professional ME will be able to maximize the levels of your tracks and not suck the life out of them in the process (hopefully).

Use a compressor on the master bus only if you feel the mix needs a "gluing" effect, not to bring up the volume on the entire mix. Watch how you use compression in your mixes also. Just because you have the power in your DAW to dial up a compressor for every audio track in your session doesn't mean that you should.

If you are mastering your own material (assuming here you are working with digital processing), work on mixing your songs first, master later, on the bounced stereo track; don't mix AND master at the same time. If you think that your mix sounds too low from bringing down the faders, that's fine, that's what Mastering is for. When you think you've got your mixes where you want them, stop. Take a break from listening to your mixes and come back at a later time with a fresh pair of ears. Take a day or two off from listening to the mix if time allows, this will let you check the mix with a different perspective and things may stick out to you that weren't apparent when you last heard the mix. When you think your mixes have the balance you were looking for, you can then think about mastering them, or send them out to get mastered. One of the benefits in sending them to a ME is that you'll get a second pair of fresh ears in a more neutral environment than yours, and they'll catch things in your mix that you might have missed, not just from the perspective of someone entirely different than you, but also by them listening to your mixes in a more neutral environment than the one you are in.

Panning, EQ, Compression, Reverb, Delay, etc. etc...

Oh, were you looking for the section where I would give you tips on EQing, Compression, Panning, and all that other stuff? Well, here it is:

EXPERIMENT.

There are tons and tons of tutorials out there, starting with the manufacturers of your processors and plugins that are a good starting point, and today with online support for everything, you can find a bunch of documents that attempt to show you how to use a compressor, for example. My thing is – how are you supposed to understand how a 3:1 compressor ratio on a drum loop sounds like, or how a 2db boost at 12.5kHz will sound like by reading about it?

To wrap up, in the grand scheme of it all, getting the best possible mix is the foundation to a great master. The best mixes for mastering require a small amount of EQing and have a good amount of headroom to increase the loudness of the mix. A great masterer would then use skill in combination with high-quality tools to increase the loudness of the mix while also maintaining the dynamic qualities of the mix as much as possible so that the song translates well into most systems.

In part III, we're going to check out some of the tools used in a mastering studio and how they are different than tools used for recording and mixing.