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Dynamic Range

In 2001, mastering engineer, Bob Speer, wrote this article about the abuses of compression in modern recordings. The article (with updates) is more relevant today than it was then.

What Happened To Dynamic Range?

By
Mastering Engineer, Bob Speer

What happened to dynamic range? That's a question that should be asked of record labels, producers, artists, and last but not least, recording and mastering engineers. The question needs to be asked because we're the ones responsible for what's happened to our music. Much of the music we listen to today is nothing more than distortion with a beat (see the sine wave reference in the chart below). It's not because the music is inferior. Great music is suffering because it lacks dynamic range. When music lacks dynamic range, it lacks punch, emotion, and clarity. The record labels blame digital downloads, MP3s, CD burners, and others for the lack of CD sales. While there is some truth to their constant whining, they only have themselves to blame for the steady decline in CD sales. The record labels need to reevaluate what they consider to be good music.

Much of the music being produced today isn't music at all. It's best described as anti-music. It's anti-music because the life is being squashed out of it through over compression during the tracking, mixing, and mastering stages. It's simply, non musical. It's no wonder that consumers don't want to pay for the CDs being produced today. They're over priced and they sound bad. In 2005, CD music sales in the U.S. slid to their lowest level since 1996, ending all hopes that the music industry's downward sales trend may have bottomed out. This is according to sales data released by [Nielsen SoundScan](#), a tracking firm that measures point of sale purchases across the U.S. Although there was a slight upturn in sales in 2004, total CD sales fell 7.2 percent from 2004 to 618.9 million units in 2005, the lowest since 1996, when they were 616.6 million. It's time for all of us in the music industry to wake up! Our musical heritage is being threatened by this wave of anti-music.

What is dynamic range anyway? Dynamic range is the difference between the softest and loudest sounds we can hear. Or, to put it another way, the difference between the softest and loudest sounds in a recording. Dynamic range is measured in decibels (dB). For comparison, the typical dynamic range for a cassette recording is around 60 dB, while CDs can reach a dynamic range of 96dB.

For years we've tried to recreate the excitement of a live performance by trying to maintain as wide a dynamic range as possible. This has always been difficult with analog recording. We had to keep the softest signals above the noise floor while keeping the loudest signals below the level of distortion. To keep the soft signals from being buried in tape hiss, we had to record with as high a level as possible. To keep our loud signals from distorting, we had to compress the signal which resulted in a restricted dynamic range. As the years went by, many improvements were made in recorder and tape technology. This, along with various types of tape noise reduction systems, helped to improve the dynamic range of our recordings, but it was still limiting.

Then one day we awoke to a new technology, "digital recording." Wow, now with a dynamic range of over 90 dB, our recordings could almost rival a live performance. Well, in theory, yes. However, the music industry had other ideas.

Rather than use this new technology to take advantage of it's wide dynamic range, the music industry went in the opposite direction. They decided that louder is better. Suddenly, we found ourselves in a race to see whose CD was the loudest. The only way to make CDs louder was to keep compressing the signal more and more. That's where we are today. Everyone's trying to make their CD sound louder than everyone else's. The term that is used for this process is called, hot. Yes, most of today's music is recorded hot. The net result, distortion with a beat.

In December, 2001, several prominent individuals in the recording industry served on a panel to judge the best engineered CD for the Grammy's. After listening to over 200 CDs, they couldn't find a single CD worthy of a Grammy based on the criteria they were given. Everything they listened to was squashed to death with heavy amounts compression. What they wound up doing was selecting the CD that had the least amount of engineering. In reality, the winner didn't win because of great engineering, he won simply because he had messed with the signal the least. On second thought, maybe that was great engineering. For the record, the winner that year was Norah Jones' CD, "Come Away With Me."

Here's a quote from [Roger Nichols](#), one of the participants on that panel. "Last month, I listened to all the CDs submitted to NARAS for consideration in the 'Best Engineered Non-Classical' Grammy category. We listened to about 3 to 4 cuts from the 267 albums that were submitted. Every single CD was squashed to death with no dynamic range. The Finalizers and plug-ins were cranked to 'eleven' so that their CD would be the loudest. Not one attempted to take advantage of the dynamic range or cleanliness of digital recording." - Roger Nichols Grammy winning engineer for Steely Dan, Beach Boys and more. [EQ Magazine](#) January, 2002, issue.

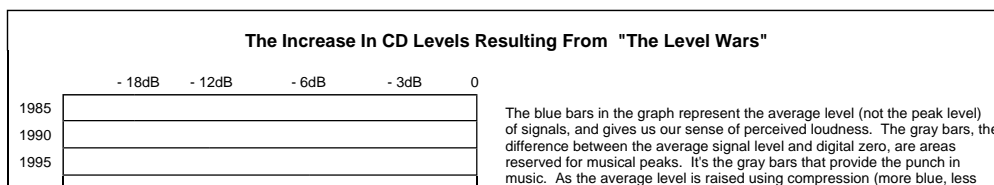
The Myth Of Radio-Ready CDs. (mastering specifically for radio)

Radio ready is an ambiguous term created by marketing professionals whose goal is to sell a product or service. It's in your best interest to be an informed artist or producer. Radio is the great leveler. It takes songs that are soft and dynamic, and brings them up in level to compete with the so called loud songs. In doing so, the dynamics of these songs are greatly reduced. But that's not all. Radio compressors are designed to drive peaks down. They will view a loud song as one huge peak and will reduce it's overall level. This can make a loud song lower in level than a properly mastered recording. Loud songs don't sound louder on the radio. They sound softer and distorted. The exact opposite of what was intended. So, why do many still believe their CD needs to be mastered loud to sound good on the radio? It's because of misinformation. Recordings need no special processing to sound good on the radio. Radio limits peaks and raises the level on its own. Mastering music specifically for radio (making it loud) only serves to make it sound worse. Also see: [What Happens To My Song When It's Played On The Radio?](#)

There's no excitement in today's music. There's no texture, and certainly no reason to buy it. Many people today accept this hot sound because that's all they know. They weren't brought up on music that sounds "musical." I can't believe what we've done to our music. We've somehow allowed radio, with it's limited dynamic range and frequency response, to become the standard for what sounds good. We want the CDs we buy to sound like they do on the radio. What happened to recreating the excitement of a live performance? Does any of this make sense? Is it possible that we've moved forward with our technology, but backward in our thinking? The loudness wars have been with us for a long time. With analog, there was a "loudness" limit. With digital technology, however, there is no limit. The music industry now has the ability to destroy it's own product

Don't Fall For The Loud CD Trap

Below is a chart that traces the increase in CD levels. It clearly shows how the average level of CDs has changed over the years due to the "Level Wars" engaged in by the music industry. CDs produced in 1985 had an average (RMS) level of -18dB. This left plenty of room for musical peaks, or to put it another way, punch. It's the average level, not the peak level, that gives music it's perceived loudness. As we move into the 90's we can see the slow change taking place as the music industry enters into the "Level Wars" and begins to destroy our music. The average level of CDs in 1990 was -12dB. Then, as our chart shows, the level was raised to -6dB in 1995. In 2000, CDs reached an average level of -3dB. Since 2000, many CDs have been produced at an average level that's between digital zero and -3db. As the average level of CDs was raised, dynamic range was reduced. By 2002, this raise in average level was so severe, it caused a big loss in clarity and reduced the overall quality of commercial CDs. By 2005, it became even worse.



2000		gray) the signal gets louder, but dynamic range is reduced. This produces a flat, boring sound, without punch, impact, or emotion. It also results in reduced clarity. Digital clipping can be heard in many commercial CDs produced since 2002. For an animated display of the loud CD trend, click Here .
2002		
2005		
2007		

= Average Signal level - Not Peak Level

= Available Headroom For Punch / Musical Peaks

The above is a study calculating the average level of popular CDs from each of the time periods indicated.

The average level of a sine wave is 3dB below its peak level. When listening to recorded music with a peak to average ratio of less than 3dB (2002 - 2007) you're listening to harmonic distortion (with a beat).

There needs to be a compromise in what the average level of CDs should be. I believe we should go back to the level of 1990 (actually -14dB would be a good compromise). This compromise would give us a healthy level as well as enough headroom to generate the musical peaks that would reestablish what's missing in today's music! For the record, I personally prefer -18db.

There's one question that artists, producers, and record labels should ask themselves before they even hit the record button. Is it better to produce music that listeners will want to turn up, or produce music that listeners will want to turn down?

Hopefully, one day we'll wake up from this nightmare. Then we can record, mix, and master music the way it was meant to be. It's high time we took advantage of what digital technology has given us. The ability to make recordings without noise or distortion, while at the same time preserving the natural dynamics of our music!

Say it with me, very loud. **"BRING BACK DYNAMIC RANGE!"**

Additional Resources Regarding CDs, Music, & Dynamic Range.

- [The Death Of Dynamic Range](#)
 [Rock Music Is Too Loud](#)
 [A Short Video About Loud CDs](#)
 [The Art Of Noise](#)
 [Turn Me Up!](#)
[Brick Wall Limiting](#)
 [Distortion To The people](#)
 [Radio Ready: The Truth](#)
 [Over The Limit](#)
 [Digital Distortion In CDs & DVDs](#)

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