

A close-up, high-angle photograph of a speaker driver, likely a tweeter or midrange driver, showing the internal mesh and suspension components. The speaker is mounted in a dark, circular frame with several screws visible around the perimeter. The lighting is dramatic, highlighting the metallic and fabric textures.

# The Complete Guide to High-End Audio

Fourth Edition

**Robert Harley**

Editor-in-Chief  
*The Absolute Sound*

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*Fourth Edition*

**Robert Harley**

**Acapella Publishing**

Carlsbad, California

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# Foreword

*By Keith Jarrett*

Music is the sonic motion of intention. With words, sound can be divorced from meaning by taking away the physical quality of speech. But music's meaning is *in* its physical quality: its sound. When a musician plays something a certain way and we can't hear the intent (the reason) behind it, we are hearing wasted motion, and register it as such because we haven't been given enough clues about the intent. We can then grow to think that everything is only gesture, and miss the real thing.

The media through which we hear music (our systems, rooms, etc.) cannot be separated from our ability to experience the music. It isn't the same *music* on a different system because we cannot separate music's rhetoric (its words) from its physical reality (its delivery). This makes the "delivery systems" (our stereos) more important than we might think they are. Can they *tell* us what the musicians on the recording are telling us?

As a musician, I often—too often—had the following experience: I would play a concert, hear the tape afterward, and wonder what was missing. I would remember incredible things in the concert that just weren't on the tape. The notes were there, but notes are not music. Where was the music, the *intention*?

We could think of it this way: On the tape, the rhetoric had no meaning. Had I trusted the tape and not my memory of the actual event, I would have never grown to understand that, even though the sound is on tape, it doesn't mean you've recorded the *music*. If you've heard a certain CD on a certain system, it doesn't necessarily mean that you've heard what's on the CD. We must learn to trust the responses of our own system—our ears—to music systems. Of course, this demands that we be in touch with ourselves—no easy thing.

People to whom music is important need to get close to the intention in a recording, and there's only one way to do this in the home: learn about the world of audio equipment. Use your (and others') ears to help remove whatever hinders you from the musical experience on the recording. Of course, it's not only the reproduction side that needs care—but that's the only side the listener has control over.

For instance, it's demonstrable that by merely flipping a two-pronged AC plug on a CD player, or even a turntable, a record you thought you didn't like can become a favorite—just because the polarity was wrong. Since music cannot be divorced from its emotional content,

the *sound* of a record can determine whether you think you like the *music*. And vice versa, when you can't listen to music you really think you like because of how it was *recorded*.

Obviously, the musical experience is a delicate, complex thing, and we humans are more sensitive than we sometimes think. But we have the option to tune our music systems to better balance the equation. We can get closer to what we want if we *know* what we want.

There are stereo components that approximate the musical experience at many different price levels. We all know what our financial limitations are; but, given the desire to improve our systems, we *can* do it.

It by no means follows that musicians have to be audiophiles. Though I've been recording since 1965, I didn't seriously think about much of this until the last decade. But audiophiles and music lovers push the envelope, and we all benefit. Also, the more serious audiophiles are determined to keep their minds and ears open, keep learning, and try to remain patient during the process. Doing this thing right can take time.

There are a lot of people out there listening to all of these components for us. I recommend *using* this fact, and *carefully* reading others' evaluations, until you can tell whether a reviewer's preferences in sound match your own priorities. You *can* sort of get to know these guys over a period of time.

But, of course, it's *your* ears that count. I think you should pay attention to their needs. After all, we're talking nutrition in an age of diet soft drinks.

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## Preface to the Fourth Edition

This new fourth edition of *The Complete Guide to High-End Audio* represents the most extensive overhaul of the book since its introduction in 1994. The reason is simple: today's music listener is faced with an unprecedented array of new technologies for acquiring, storing, and accessing music. As recently as 2004 (the book's last update), CD was the dominant medium, SACD and DVD-Audio were battling to be the CD's high-resolution successor, downloadable music was severely compromised in sound quality and thus of little interest to the audiophile, and only a few hardy souls dared to use a PC as a music server.

Just six years later, everything is different. Downloadable music is no longer synonymous with horribly compressed MP3 sound quality—it's the serious music lover's path to spectacular-sounding high-resolution digital audio. The format war between SACD and DVD-A was rendered moot by the death of physical media. Although SACD is still a great format with many years of life left, the Internet allows us to transcend physical formats and download high-resolution files, independent of the dictates of the mass market or the need to standardize on a disc format. Linn Products, the company that revolutionized high-performance audio in 1972 with its LP12 turntable, ceased production of CD players in early 2010. Its customers had moved on to accessing music via the Internet. Further evidence of this trend comes from the president of Polygram records, who stated that 90% of all CDs sold are played just once—to be ripped to a computer hard drive. We are in an exciting new age.

But it's not just high-res digital, music servers, downloadable music, and hard-drive storage that have dramatically changed the audiophile landscape. Technology advances have greatly improved the performance of the traditional cone-based dynamic loudspeaker. Switching amplifiers, with their cool operation, compact size, and high output power, are beginning to be taken seriously. That venerable old format, the vinyl record, is seeing a remarkable resurgence in popularity (LP sales doubled in 2009 over 2008). Today's turntables, tonearms, and cartridges extract even more musical information from the LP's grooves. And CD playback has improved immeasurably, largely the result of inventive new digital filters. The establishment of Blu-ray Disc as a mass-market format has wonderful implications for the music lover. The format can contain not only high-definition video, but also up to eight channels of high-resolution digital audio with perfect bit-for-bit accuracy to the source. Concert performances on Blu-ray are nothing short of spectacular. Finally, although the laws of physics haven't been repealed, this fourth edition incorporates new techniques and products for optimizing your listening room and tweaking your system for the best possible sound.

As has been the case with previous editions, each chapter progresses from the most basic information to deeper technical discussions. When you've reached your own comfortable depth, simply skip to the beginning of the next chapter where the material becomes easier. This book is meant to be used as a reference rather than read linearly from start to finish.

Keep in mind that you don't need to understand the technical aspects of audio to enjoy music in your home. I've presented the technical content for those readers interested in knowing how audio works, and to make this book truly *The Complete Guide to High-End Audio*.

Robert Harley  
Carlsbad, California

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## About the Author

Robert Harley is the author of *Home Theater For Everyone*, *Introductory Guide to High-Performance Audio Systems*, and Editor-in-Chief of *The Absolute Sound* magazine. *The Absolute Sound*, founded in 1972, is the world's most respected journal of high-end audio. Robert Harley's more than 1000 published equipment reviews and articles on music and home-theater sound reproduction have helped thousands of enthusiasts improve their home-entertainment systems.

Robert Harley holds a degree in recording engineering and has taught a college degree program in that field. He has worked as a recording engineer and studio owner, compact disc mastering engineer, technical writer, and audio journalist. Before joining *The Absolute Sound* and *The Perfect Vision* in 1999, he was Technical Editor of *Stereophile* magazine for eight years, and also served in that capacity at *Fi: The Magazine of Music and Sound*.

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# 1 What Is High-End Audio?

**H**igh-end audio is about passion—passion for music, and for how well it is reproduced. High-end audio is the quest to re-create in the listener’s home the musical message of the composer or performer with the maximum realism, emotion, and intensity. Because music is important, re-creating it with the highest possible fidelity is important.

High-end audio products constitute a unique subset of music-reproduction components that bear little similarity to the “stereo systems” sold in department stores. A music-reproduction system isn’t a home appliance like a washing machine or toaster; it is a vehicle for expressing the vast emotional and intellectual potential of the music encoded on our records and CDs. The higher the quality of reproduction, the deeper our connection with the music.

The high-end ethos—that music and the quality of its reproduction matter deeply—is manifested in high-end audio products. They are designed by dedicated enthusiasts who combine technical skill and musical sensitivity in their crafting of components that take us one step closer to the original musical event. High-end products are designed by ear, built by hand, and exist for one reason: to enhance the experience of music listening.

A common misperception among the hi-fi-consuming public is that high-end audio means high-priced audio. In the mass-market mind, high-end audio is nothing more than elaborate stereo equipment with fancy features and price tags aimed at millionaires. Sure, the performance may be a little better than the hi-fi you find at your local appliance store, but who can afford it? Moreover, high-end audio is seen as being only for trained, discriminating listeners, snobs, or gadget freaks—but not for the average person on the street.

High-end audio is none of these things.

First, the term “high-end” refers to the products’ *performance*, not their price. Many true high-end systems cost no more—and often less—than the all-in-one rack systems sold in department stores. I’ve heard many inexpensive systems that capture the essence of what high-quality music reproduction is all about—systems easily within the budgets of average consumers. Although many high-end components *are* high-priced, this doesn’t mean that you have to take out a second mortgage to have high-quality music reproduction in your home. A great-sounding system can be less expensive than you might think.

Second, high-end audio is about communicating the musical experience, not adding elaborate, difficult-to-operate features. In fact, high-end systems are much easier to use than

mass-market mid-fi systems. This is because the high-end ethic eliminates useless features, instead putting the money into sound quality. High-end audio is for music lovers, not electronics whizzes.

Third, *anyone* who likes music can immediately appreciate the value of high-quality sound reproduction. It doesn't take a "golden ear" to know what sounds good. The differences between good and mediocre music reproduction are instantly obvious. The reaction—usually pleasure and surprise—of someone hearing a true high-end audio system for the first time underscores that high-end audio can be appreciated by everyone. If you enjoy music, you'll enjoy it more through a high-end system. It's that simple.

Finally, the goal of high-end audio is to make the equipment "disappear"; when that happens, we know that we have reached the highest state of communication between musician and listener. High-end audio isn't about equipment; it's about music.

The high-end credo holds that the less the musical signal is processed, the better. Any electronic circuit, wire, tone control, or switch degrades the signal—and thus the musical experience. This is why you won't find graphic equalizers, "spatial enhancers," "sub-harmonic synthesizers," or other such gimmicks in high-end equipment. These devices are not only departures from musical reality, they add unnecessary circuitry to the signal path. By minimizing the amount of electronics between you and the musicians, high-end audio products can maximize the directness of the musical experience. Less is more.

Imagine yourself standing at the edge of the Grand Canyon, feeling overwhelmed by its grandeur. You experience not only the vastness of this massive sculpture carved deep into the earth, but all its smaller features jump out at you as well, vivid and alive. You can discern fine gradations of hue in the rock layers—distinctions between the many shades of red are readily apparent. Fine details of the huge formations are easily resolved simply by your looking at them, thus deepening your appreciation. The contrasts of light and shadow highlight the apparently infinite maze of cracks and crevasses. The longer and closer you look, the more you see. The wealth of sensory input keeps you standing silently at the edge, in awe of nature's unfathomable beauty.

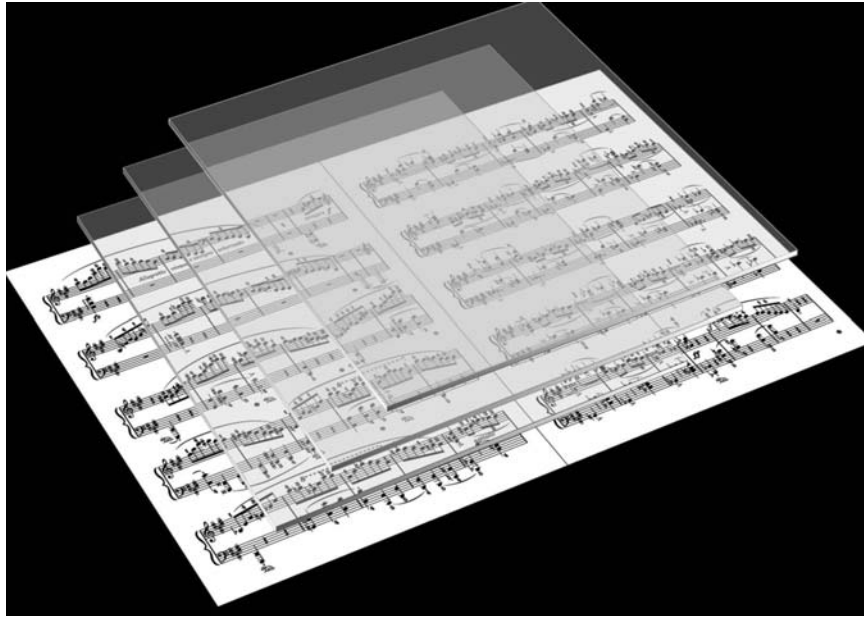
Now imagine yourself looking at the Grand Canyon through a window made of many thicknesses of glass, each one less than perfectly transparent. One pane has a slight grayish opacity that dulls the vivid hues and obliterates the subtle distinctions between similar shades of color. The fine granular structure of the next pane diminishes your ability to resolve features in the rock. Another pane reduces the contrast between light and shadow, turning the Canyon's immense depth and breadth into a flat canvas. Finally, the window-frame itself constricts your view, destroying the Canyon's overall impact. Instead of the direct and immediate reality of standing at the edge of the Grand Canyon, what you see is gray, murky, lifeless, and synthetic. You may as well be watching it on television.

Hearing reproduced music through a mediocre playback system is like looking at the Grand Canyon through those panes of glass. Each component in the playback chain—CD player, turntable, preamplifier, power amplifier, loudspeakers, and the cables that connect them—in some way distorts the signal passing through it. One product may add a coarse, grainy character to instrumental textures. Another may reduce the dynamic contrasts between loud and soft, muting the composer's or performer's expression. Yet another may cast a thick, murky pall over the music, destroying its subtle tonal colors and overlaying all instruments with an undifferentiated timbre. Finally, the windowframe—that is, the electronic and mechanical playback system—diminishes the expanse that is the musicians' artistic intent.

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**Fig. 1-1** Each component in an audio system can be thought of as a piece of glass through which we experience music. (Courtesy AudioQuest)



High-end audio is about removing as many panes of glass as possible, and making those that remain as transparent as they can be. The fewer the panes, and the less effect each has on the information passing through it, the closer we get to the live experience and the deeper our connection with the musical message.

Why are high-end audio products more transparent windows on the musical event than mass-market “stereo systems”? High-end products are designed to *sound* good—that is, like the real thing. They’re not necessarily designed to perform “well” according to some arbitrary technical specification. The true high-end designer *listens* to the product during its development, changing parts and trying different techniques to produce the most realistic sound possible. He combines technical skill with musical sensitivity to create a product that best conveys the musical experience. This dedication often becomes a zealous pursuit, involving many hundreds of listening hours and painstaking attention to every factor that influences the sound. Often, a more expensive part will be included to improve the product’s sound, while the retail price remains the same. The higher cost of this musically superior part comes off the company’s bottom line. Why? Because the high-end designer cares deeply about music and its reproduction.

Conversely, mass-market audio components are often designed to look good “on paper”—on the specification sheet—sometimes at the expense of sound quality. A good example of this is the “THD wars” of the 1970s and ‘80s. THD stands for Total Harmonic Distortion, a specification widely used by uneducated consumers as a measure of amplifier quality. (If you’ve done this, don’t worry; before I learned more about audio, I, too, looked at THD figures.) The lower the THD, the better the amplifier was perceived to be. This led the electronics giants to produce products with vanishingly low THD numbers. It became a contest to see which brand had the most zeros after the decimal point in its THD specification (0.001%, for example). Many buyers bought receivers or amplifiers solely on the basis of this specification.



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