THE BAS SPEAKER
THE PUBLICATION OF THE BOSTON AUDIO SOCIETY

This is the first issue of volume 23.

TIME TO RENEW!

(for most of you, anyway; please check your mailing label)

And please pass along the membership form,
on the inside back cover,
to interested music-loving friends.

ABOUT THE BOSTON AUDIO SOCIETY

PO 211 Boston, Mass. 02126 USA
(603) 899-5121; fax (603) 899-6415
Email: **dbsystems@attglobal.net**
Web site: **www.bostonaudiosociety.org**

The Boston Audio Society (BAS) is an independent member-supported organization promoting the highest quality of music reproduction in the home and high standards in recording and transmission.

More than a local society, the BAS speaks to the worldwide community of audiophiles. Founded in 1972 and now in its 28th year, the BAS meets monthly to hear and discuss developments in audio. Guest speakers over the decades have included prominent engineers, designers, researchers, editors and reviewers, musicians and critics, and broadcasters and recording producers. On occasion we hold joint meetings with the Boston chapters of the AES (Audio Engineering Society), SMPTE (the Society of Motion Picture and Television Engineers), and the ASA (Acoustical Society of America). Our non-commercial newsletter, the *BAS Speaker* (*BASS*), includes comprehensive and lively coverage of these meetings, as well as reviews, news columns, features, letters and other articles on a variety of audio and such related topics as home theater and video.

Membership ranges from the novice enthusiast to the technically sophisticated. Consumers and producers of audio equipment are both represented. Members include freelance journalists, reviewers, and editors at the major audio magazines, as well as design engineers, consultants, and researchers who influence product development and thereby the course of the industry. Some members work for manufacturers (as technician, engineer, or marketing manager), others for dealers. All are devotees — audiophiles in the best sense of the term — and tend to be technically and technologically aware, informed about the marketplace, and keenly interested in scientific method in a field dominated by myth and hyperbole.

For these reasons, the BAS and the *Speaker* are a vital forum. As someone involved in audio, you likely will find the group an interesting, helpful resource. Our meetings and newsletter may help shape the future of consumer and pro audio even while clarifying its past. If you are a manufacturer, for example, you can use the BAS to keep up with trends and developments, or to learn informed audiophile reactions to products and events. At the least, we attempt to be a clearinghouse for ideas, helping various parts of the industry keep in touch with one another.

To join, or to obtain more information, please use the form in the back.

THE BAS SPEAKER

THE PUBLICATION OF THE BOSTON AUDIO SOCIETY
VOL. 23 NO. 1

Publisher: David B. Hadaway
Editor: David J. Weinberg
Assistant editor: David R. Moran

Contents

The *BAS Speaker* (USN 0195-0908) is published by the Boston Audio Society. A subscription is included with membership. Dues in the US are $35 a year; see the application form for rates outside the US. $33 of the US dues are for one volume of the *BASS*. For further information, please visit **http://bostonaudio.home.att.net** or write the BAS, PO 211, Boston, MA 02126 USA. Editorial matter should be sent to editor David J. Weinberg, *BASS*, 10705 E. Nolcrest Drive, Silver Spring, MD 20903-1006 USA; or email **WeinbergDA@CS.com**.

Opinions in this newsletter are those of their authors; the Boston Audio Society itself does not endorse or criticize products. Copyright 2000 by the Boston Audio Society except as noted; all rights reserved. ***No part of this publication may be reprinted or otherwise reproduced without the written permission of the publisher.***

From the editor

The two meeting summaries in this issue are from within the last six months, making this one of the most current issues in some time.

The migration to DTV is not going as smoothly or quickly as the FCC and consumers would like. In addition, it is substantially more complex than anyone wants. See my *Commentary and News* column to find out where you can learn the details.

The impact of DTV has even gotten audio stalwart and BAS co-founder Alvin Foster involved. Although video is certainly taking a substantial position with audio in the Society's interests, we are not neglecting audio, as shown in the other major articles in this issue. Let us know whether you approve (or don't approve).

As an adjunct to David Hadaway's comments below, we welcome suggestions and any assistance you can offer to help the BAS continue to succeed and hopefully grow. Contact us; let us know how we can do a better job for you.

From the president

We have accomplished much since our general meeting in October 1998:

- Thanks to contributions from many of you, we have paid off much of our debt and are meeting expenses.
- The *BASS* is approaching regular publication under the leadership of David Weinberg, and most of the available meeting summaries have been printed (about 20 tapes are lost).
- You may receive your latest issue as safe email attachment, too, either a Word doc or a pdf file (thanks to David Moran and Stephen Owades); send your request to **drmoran@aol.com**, also specifying whether you still want the printed newsletter in addition.
  Other recent issues are available as pdf files as well.
- Meeting notices are now emailed (with a monthly message), so the society has a regular presence independent of the *Speaker*.
- We have a free website with the easily remembered address **http://bostonaudio.home.att.net**, thanks to John S. Allen and Bernard Kingsley.
- The list of past meetings (back to 1993) and their summaries is posted on the website.
- Some summaries of the contents of back issues are also posted; more will join them.
- The BAS CD and the conversion of further back issues to electronic format are pending.
- During this latest vol 22 time period, our membership has stayed at about 150. That is enough members to survive, although it is disappointing that we haven't seen more from our efforts.
- These efforts continue: we have mailed BAS information to a subset of the *Audio Critic* mailing list (with the help of Alvin Foster), resulting in some new members.

BAS Email Directory

If you wish to be in the BAS email directory (and receive a text copy of it), send email to **dbsystems@attglobal.net** and put "BAS email" in the *Subject* field.

Are You Executive Material?

Would you like a prestigious job with no pay or responsibilities? Consider joining the BAS Executive Committee. Members receive occasional emailings on matters of BAS policy and plans for BAS projects and anything else of interest. They are welcome to contribute their own ideas on such matters, or they may remain silent. If interested, send your email address to **dbsystem@attglobal.net**.

Miscellany

- Yale University blocked access to Napster (a popular website for sharing-music software) after a lawsuit from the heavy metal band Metallica [*Providence Journal* 21 April 2000]. "On May 3, with showmanship worthy of a stadium concert, hard-rock band Metallica dumped a truckload of legal documents on software company Napster's doorstep today, identifying more than 335,000 screen names for people the band says may have been illegally pirating its songs. The band's attorneys say they fingered the individuals sharing Metallica songs online while doing a scan of the software service last weekend, and they want those people stopped. The band isn't threatening to sue the software users, but today it demanded that Napster block them from its MP3-swapping service." [CNET News.com] (The band's initial popularity grew in part from a cassette demo tape, "No Life Til Leather," which the band sent out free and encouraged fans to bootleg; it is said to be among the most traded cassette demo tapes in rock). [*NYT*, 3 May 2000])
- The price of video is plummeting. The recent network television fantasy miniseries *The 10th Kingdom* has appeared on DVD, all 8 hours of it, for $30 list. *Tannhäuser* was $70 on laser, just released on DVD for $30.
- The 18 April 2000 *NYTimes* has an informative feature on the two new critically acclaimed concert halls in Tokyo designed from acoustical principles. Leo Beranek was the principal acoustic consultant on the project. "If you make a copy of the old great halls, you'll have a great hall." But the Tokyo halls, he said, "are different in appearance and they have the sound of the great halls." This is seen as vindication of the science and principles of architectural acoustics.

To the editor

from Michael Fremer

Senior contributing editor,* Stereophile *magazine

While David Hadaway is correct in assessing *NYTimes* audio coverage as "low-level," the characterization (*BASS* v22n5-6) of reporter Roy Furchgott's cable piece as "reasonably objective" is positively hilarious!

There are only two reasons for concluding as you did:

1) you are blinded because the piece concurs with your opinions (or your "measurements") and
2) you are not a journalist and do not know what constitutes "objective" reporting.

That piece was journalistic garbage and here's why: It features a highly editorialized photo of Lewis Lipnick shot from the ground up to make him look even more pompous and effete than he already is. It uses Lipnick as a straw-man cable advocate by captioning the photo with his preference for absurdly expensive $13,000 cables. It then does not give Lipnick any space within the article, proving the photo was a cheap-shot setup. It doesn't quote *anyone* of substance who believes cables can have a sonic effect, and quotes only those who are debunkers. Even the one quote from a manufacturer of expensive cable (Bruce Brisson) is about "cable charlatans" and clearly is taken out of context. And to mirror your picayune factual criticisms of the made-for-the-general-public *History of Audio* TV special, Lewis Lipnick is not a "well-known *Stereophile* ultra-tweak" — he hasn't written for *Stereophile* in years.

There was not one quote from anyone who believes cables can make a difference in a system's final sound except the demonized Lipnick. There are dozens of individuals with credentials equal to that of 16-gauge-zipcord advocate Alan P. Kefauver who could have provided quotes to the contrary, including recording and mastering engineers, musicians, archivists and others (never mind "unqualified" audio writers).

I think that behind the scientific front of the BAS is an agenda as hopelessly biased as that of any "ultra-tweak." That is why, despite the excruciatingly dry, almost a-musical content of BAS, I find it so entertaining.

Assistant editor David Moran replies:

It was I who IDed Lewis Lipnick for readers, and I apologize for keeping him on your staff. However, Lipnick's Kennedy Center bio still says "he currently holds the position of Musician-in-Residence at Stereophile*," and a Web search (using Google) for him minus* Stereophile *produced five live hits, whereas a search for his name with* Stereophile *produced 19 hits.*

As for the tired claims about cable sonics, which have been blown out of the water so many times, I can only cite the medical world's position on alternative therapies: People who believe their own claims will make every effort to do controlled studies. *Responding to the* Times *article, Barry Willis wrote in* Stereophile*, "Almost all journalists in high-end audio agree that any well-designed comparison will reveal differences." "Will"!?! What's the holdup? Bring it on! Do the study and get it published in a refereed journal.*

Charging that David Hadaway is "not a journalist and [does] not know what constitutes 'objective' reporting" is surprising coming from someone with a famously varied background of his own. In the opinion of some of us who have been working journalists, Hadaway is becoming rather an accomplished one. Of course, any experienced, skeptical reader (like him, like you, like me) can figure out what is objective, and subjective, reporting.

Open Forum

Biological Inspiration

by Ken Rudnick (Massachusetts)

In the 10 November 1999 *Boston Globe* was an article by Lee Dye about "biologically inspired electronics," discussing a concept derived from an idea proposed by Bob Adams, the digital designer and manager of audio development at Analog Devices. The idea is that the brain uses noise shaping to help pick out relatively low-level signals in a sea of noise, and that a similar concept could be applied to the design of hifi electronics. Scientists at Boston University have followed up on Adams's idea and published the results of their research in the 31 August 1999 *Proceedings of the National Academy of Sciences*.

Internet Music Database

by Ira Leonard (Massachusetts)

At **www.cddb.com** is a huge free music database, particularly useful to users of portable downloadable personal players, but also of benefit to anyone researching songs on CD. It appears oriented toward popular music, as a search for Arturo Toscanini and Ricardo Muti yielded no results.

Allison Speaker NetList

by Howard Ferstler (Florida)

A friend of mine is starting up an Internet mailing list for devotees of Allison speakers; to subscribe, send email to **Allison-subscribe@topica.com** (subject field and text body may be left blank).

Commentary and News

by David J. Weinberg (Maryland)

CES2000

Technical and marketing consultant in professional and consumer electronics Michael Heiss gives his perspective on CES2000 in the February 2000 *Systems Contractor News*. HDTV, DLP projectors, personal video recorders (like TiVo and ReplayTV), and FireWire all receive his attention.

Measuring Sound

In the March 2000 *Systems Contractor News* are three articles on acoustic measurement systems. "The Evolution

Toward Measurement and Optimization Tools" by Sam Berkow presents his support of software-based systems, such as the SIA-SmaartPro, which his company wrote and sells. In "The Case for a Hardware Solution" John Meyer supports hardware-based systems such as the SIM system from his company, Meyer Sound Laboratories. In "21st Century Audio Analysis: Who Needs Hardware? You Do", Don Eger and Greg Miller, of Gold Line/TEF, say that all systems need both; only the emphasis differs.

"Piano Playing as Science"

In the April 2000 *Johns Hopkins* magazine Dale Keiger synopsized the work of Otto Ortmann, known as the "physiologist of the keyboard". He was a 1917 graduate, then a faculty member, and finally the director of the Peabody Conservatory, in Baltimore, Maryland. He was a "scientist of piano playing" who studied and measured "every aspect of making music at the keyboard." He published *Physiological Mechanics of Piano Technique* (1929). "In the 1963 edition (375 pages; now out of print), musicologist Arnold Schultz noted that Ortmann [described] how [the piano] must be played given the laws of mechanics and the realities of physiology." Schultz also mentioned that Vladimir Horowitz "conformed to Ortmann's scientifically researched ideal."

The Answer Is No

In the February 2000 *Systems Contractor News* (v7n2), Michael Karagosian (a consultant to the theme entertainment — theme parks — and cinema industries and chairman of the AES SC-10 Subcommittee for Sound System Control) declares, in "Answering the Questions: Is Film Really Dead?", that while even SMPTE is working on standards for digital cinema, film is most assuredly a long way from dead. He makes the point that conversion of theaters to digital cinema projectors is too expensive a proposition to be economical at this time.

The DVD Piracy Case

Tord Jansson, BladeEnc (a free MP3 encoder) project "maintainer," published "The Truth About the DVD Case" on the BladeEnc website (**http://BladeEnc.mp3.no**). He claims that the charges brought against those who are alleged to have 'broken' the DVD CSS1 encryption scheme and distributed their 'solution' on the Internet are "completely incorrect and that [the MPAA and the DVD Control Association] have a hidden agenda." He goes into a fair amount of detail and makes a credible case to those of us who do not have all the facts. His premise is that these individuals charged have reverse-engineered the technology to enable DVDs to play on their Linux systems, and that doing so is not at all illegal.

DVD-Audio — Hopefully Coming Soon

In the March/April *Widescreen Review* (issue 37, v9n2) is my article "High(er)-Resolution Multichannel Recordings Will (Finally!) Be Heard," which includes excerpts from the Surround 2000 conference session titled "Record Companies View Surround Sound" with leading A&R and production executives. (The conference was sponsored by *Widescreen Review* and *Surround Professional*.)

Easy Connections

Centerpin Technology (850-916-9100; **www.centerpin.com**) has a wide assortment of connectors that are exceptionally easy to install properly, and are even marine-use-approved. Styles include F connectors for RG-6, -8, -58, 59; RCA; ¼" phone, BNC; UHF; etc. Prices range around $3.50-$5.50 each.

Audio Q&A Website

In the May 2000 *Pro Audio Review* Editor Kevin Becka reports that "Shure has a dedicated department called the Applications Engineering Group that accepts questions free of charge on virtually any audio topic, whether general or Shure-specific. Simply send an email to **productapps@shure.com** and a member of the group will send you a timely answer."

Secure Access

In the June 2000 *Sound & Vision* Brian Fenton reports that the name Secure Digital Music Initiative (SDMI) has been changed to Digital Music Access Technology (DMAT, which will now be used in the logo). The RIAA claims DMAT is more representative of "what SDMI is delivering to consumers." (For background, see the April 2000 *Pro Sound News*, p.6.)

Surround Professional *(December 1999)*

"Judging a Disc by Its Cover"

David Frangioni attempts to clarify the various DVD soundtrack formats, including why a DVD with a mono soundtrack still gets labeled "Dolby Digital" ("What you see on DVD packaging isn't always what you get").

Where To Sit

The "Relevant Research" column points to investigations into the preferred soundstage for recordings, which is even more important now that many are being made in surround. The overall preference is for "best seat in the house" [by definition, one would think — DRM] with "in the middle of the band" a distant second.

"The 5-Percent Solution"

Murray Allen discusses the need for ever increasing audio (that is, dynamic range) compression ratios for video games, and describes the CD-ROM resource allocation generally used for games.

"Eye of the Storm"

Dan Daley describes at length the philosophy, procedures and technology used by Ion Storm (Dallas game creators) in creating surround sound for their latest video games.

Classical Music Surround Recording

Rich Tozzoli interviewed noted engineer Michael Bishop about how he approaches recording classical music for the 5.1-channel format.

How Many Channels Is Enough?

This subject is further explored by Tom Holman in "The Number of Audio Channels part 2".

Beach Boy Surrounded

"California Surround" describes Brian Wilson's philosophy and implementation of surround for the album *Imagination*.

Holophonic Recording

Bobby Owsinski tested the Holophone, a 7-microphone system housed in a single, almost-football-shaped and -sized package that picks up a complete surround soundfield from a single location.

History of Surround

Surround sound is hardly new, but did you know it dates back half a century? Richard Zvonar elaborates on the chronology of surround and multichannel music.

Widescreen Review *(Jan/Feb 2000)*

"Purchasing a DTV Set"

Joe Kane explains why most sets being sold as ready for HDTV reception don't measure up .

"DVD Meets the Web"

Jim Taylor (author of the excellent book "DVD Demystified") describes how several currently available DVDs integrate with Worldwide Web services to create a more interactive experience.

"Purchasing a DTV Set"

Joe Kane describes the state of DTV sets available, and the need to have any DTV set properly calibrated in your home to realize picture quality that even approaches true HDTV capability.

"DVD Meets the Web"

Jim Taylor discusses the efficient interactive capabilities that result from including web links on DVDs.

Surround Professional *(February 2000)*

In his editorial "Setting the Standard," Tom Holman clears up some public misconceptions regarding the role of the ITU [International Telecommunications Union] in setting surround standards. This editorial also corrects some errors in the previous issue's "Who Is Driving 5.1?"

Under "Relevant Research," Chris Kyriakakis (Immersive Audio Lab, Integrated Media Systems Center, USC) describes their work on virtual miking, wherein they can start with a given recording, even monophonic, and create a signal that simulates placement of a microphone in any specific location in any hall for which they have an appropriate set of characteristics. Examples can be found at **http://audiolab.usc.edu**. This technique not only can be used to "remix" old recordings but can enable streaming multichannel audio over the Internet, or any other digital transmission medium, without any more bandwidth than needed for a two-channel recording.

In his description of the Lexicon 960L multichannel digital effects system (successor to the famous 480L), Jan Weismuller of Lexicon discusses the human hearing characteristic of separating a sound stream into individual phones (very short segments) and how the 960L creates several types of reverberation based on how we fuse some sounds and separate others over different time frames.

Steve Harvey wrote a short piece on the famous Todd-AO studio's long involvement in multichannel sound for films, dating back to the Oscar for Best Sound it won for *Oklahoma*.

Tom Holman continues his series in "On The Level: Part 2," in which he discusses various types of meters and why they lead many people to end up with levels they didn't expect. There is one error: Holman writes that for sinewaves "$V_{avg} = 0.637V_{rms}$," which should be "$V_{avg} = 0.637V_{peak}$." He does reiterate that there is no such thing as watts rms, that volts rms x amps rms produces average watts.

This issue includes an extensive multichannel resource directory of products, "The *Surround Professional*'s Shopping List."

Surround Professional *(March 2000)*

Tomlinson Holman editorializes on technical illiteracy in the press and the alleged threat to your hearing of going to the movies. Read this to put the latter in perspective. The "Relevant Research" column discusses papers on hearing loss and noise exposure.

Rich Tozzoli interviewed Washington DC-based recording engineer Curt Wittig, who received a Grammy nomination (jointly with Dave Moulton) for Best-Engineered Classical Album for the groundbreaking [surround] recording *[George] Crumb: Ancient Voices of Children*.

James Guthrie discusses his work in making the DVD *Pink Floyd: The Wall*.

Holman continues his educational series with "Bit Transparency in Digital Audio — How Do You Know for Sure That What You Are Putting in Is What You Are Getting Out?"

John Townley describes the surround-sound systems at the newly redesigned Hayden Planetarium in NYC.

Ed Outwater interviews Bernie Grundman, noted mastering engineer who has worked on Michael Jackson's *Thriller*, Steely Dan's *Aja*, and Carol King's *Tapestry*. Titled "Putting It All Together," the discussion centers on the authoring process for today's high-resolution audio.

Pro Sound News *(April 2000)*

The National Association of Broadcasters (NAB) has sued to block the Recording Industry Association of America (RIAA) from charging royalties to over-the-air radio stations that also broadcast over the Internet.

Universal Music Group is about to start selling music direct-to-consumer over the Internet.

Under phase 1 of the Secure Digital Music Initiative (SDMI), a "broad multi-industry group of companies" has licensed the Verance audio watermarking system. This is considered key to the growth of secure digital music distribution on DVD-Audio discs and over the Internet. These licensees are music labels (including all five majors), Internet distribution companies and consumer electronics firms.

Toshiba and Liquid Audio have joined to include Liquid Audio's Internet music delivery system in a mobile digital-audio player that Toshiba already markets in Japan. This player, which uses an SD memory card, supports both AAC (advanced audio coding) and MP3 formats.

Oak Technology has announced a two-chip set that supports all major DVD player functions, including DD, DTS, HDCD, MP3, and QSound virtual-surround technology. One chip supports the DVD-drive functions, the other includes the DVD-decoder, TV encoder and a 250-MIPS system CPU. The software included also supports VCD and S-VCD. There is no mention of DVD-Audio.

Musicmaker.com, known for offering customized music downloads, released *Jimmy Page and the Black Crows Live at the Greek* from the group's tour in October 1999. This compilation is being released on the Internet only.

Systems Contractor News *(April 2000)*

It was announced that audio is an increasing part of the INFOCOMM International show, this year 15-17 June at the Anaheim Convention Center. A special breakfast meeting is scheduled to allow the audio exhibitors to preview their wares to invited consultants, contractors and the press.

The former DVD Video Group is now known as the DVD Entertainment Group, with a new web address, **www.dvdinformation.com**, and email for information, **getinfo@dvdinformation.com**, plus a database of about 5600 DVD-Video titles.

"DTV and Digital Cable Are Compatible"

"The Consumer Electronics Association (CEA) and the National Cable Television Association (NCTA) have reached voluntary agreements" to allow the two systems to interconnect. "Close, But No Cigar for DTV Over Cable," by Michael Heiss, acknowledges the agreement but points out the fallacy in the implication that all cable and DTV interconnection problems have been resolved. There are still the major problems of must-carry rules (will cable have to carry only the one main DTV channel, or all of them when multicasting occurs? Will HDTV have to be in the same format or can the cable system scale it down, possibly all the way to 480p?); how the connections are labeled (for example, how to inform the user that the connection offers one-way or two-way data transfer, important for many of the advanced functions projected for DTV over cable); and there is still no agreement on copy protection (sound familiar?). "It is important that you view any pronouncements about DTV very carefully so that you can filter out the hype."

This matter is not even close to the point where customers can hope to see solutions soon.

"Taking a New Approach at NSCA Expo" by Barry McKinnon describes how the computer industry business model of ever more rapidly changing models has quickly migrated into the systems contractor (including home theater) world. "Somehow the computer world has managed to convince us (the collective worldwide bunch of technology users) that this is a perfectly reasonable and acceptable business model. Neverending change, improvement and obsolescence, proceeding at a rate much higher than the tax man will allow you to write off the product you [the systems contractor] just bought. And they have added the newest twist to this nutty world view, pay-per-use tech support."

Sound & Vision *(May 2000)*

An excerpt from an interview with Ian Anderson (Jethro Tull) on surround sound; the full transcript is at **www.soundandvisionmag.com**.

Ranada reviews the Apex AD-600A, which plays DVDs and MP3.

Tom Nousaine gives his helpful tips in "Subwoofer Setup Made EZ."

Jonathan Takiff deals with "Judgment Day — It's Hollywood vs. the Hackers in the Battle for Digital Domination" on the legal war over the breaking of CSS1, the video encryption scheme used on DVDs.

Michael Riggs goes "Inside Recordable DVD — How Each of the Four Competing Formats Works."

Michael Antonoff tells us "It's Raining MP3" about the "deluge of Internet music players, some in forms you wouldn't expect."

Widescreen Review *(May 2000)*

Editor Gary Reber reports all sides of the DTV battles: "FCC Seeks Digital Review" (reviewing the state of progress in migrating to DTV), "Broadcasters Offer Excuses in Effort To Delay DTV Transition, Says CEA," "Digital Cable Agreement Criticized by Broadcasters." No one is happy.

William Kallay describes Sony's use of digital video in movies, DVDs and HDTV in "Adventures Through the Digital Looking Glass."

Joe Kane ("Bringing DTV Home: From the Antenna to the Display") helps us find out which stations are broadcasting HDTV and where to find out how best to receive these signals. Although aimed at custom installers, it is useful for the rest of us.

Perry Sun completes his two-part series on the three digital film soundtrack systems in "Packing in the Bits: Data Compression Makes Multichannel Sound a Reality."

Ripping Off Recordings: Digital Audio Extraction Dos, Don'ts, and Doers

by Robert A. Starrett (Colorado)
(http://www.cdpage.com; bobs@cdpage.com)
[Robert A. Starrett is a contributing editor for EMedia Professional*, from whose July 1999 issue this article is taken; co-columnist for the CD Writer; and an independent consultant based in Denver, Colorado. He is also co-author of the* CD-ROM Professional's CD-Recordable Handbook. *Reprinted with permission, this article addresses some of the problems encountered in trying to create compilation CDs on the PC, and is available also at* ***http://emedialive.com*****.** Copyright Online Inc. — *DJW.]*

We all know that the Red Book — the original CD standard — defines CD-Audio, and that the compact disc was created for one purpose: to store and play music in digital format. Designed initially to be nothing more or less than a universal delivery medium for music digitized at 44,100 samples per second (44.1kHz) with a range of 65,536 possible values (16 bits), Red Book, or Compact Disc-Digital Audio (CD-DA), was defined by Philips NV and Sony in 1980. It was an overwhelming — if not quite instant — success, and today, with inexpensive tools and recorders, the average consumer can do much more with audio CDs than play them back on a stereo system. Technology available today — though internally complex — renders quite simple, accessible, and relatively inexpensive the enticing prospect of extracting and rerecording the original Red Book data to make custom compilation CDs of any music enthusiast's favorite tunes.

The downside of it all is that the careless, the pirate, and the criminal take great advantage of these inexpensive tools and recorders for the illegal distribution of compilations of copyrighted songs or complete album copies. This musical contraband can be stored and distributed on CD-R, by pressed disc, or in MP3 format, and sold at discounts, leaving the artist, the recording company, and the songwriter without royalties — in essence, without payment for their work. But audio extraction also supports not-for-profit private pleasures, of course, and plays a key role in the back-end infrastructure of today's increasingly popular Web-driven custom audio CD services. While using the same enabling technology as the pirates and bootleggers, such Web-based businesses as **customdisc.com** and **supersonicboom.com** are upstanding, royalty-paying enterprises who offer alternate music distribution (and technology) models fully approved and accredited by the music industry powers-that-be.

Whatever your purpose, accurately extracting a Red Book track from a CD has always been more challenging than copying a file from a CD-ROM to a hard drive. Red Book tracks are not files *per se.* They are made up of a bunch of data that are meant to stream, and within the stream there is more than music. The stream itself is not a straight stream, it is interleaved, that is, portions that naturally follow each other in a song do not follow each other on the disc itself. You can easily record an analog version of a song from your computer through your sound card to hard disk, or record from your CD player to a tape deck, but getting a digital copy of the music that is on the disc, and getting a good one — let alone a perfect one — is another story altogether.

Why Extraction?

There are many reasons to move audio from CD to hard disk. Some would argue that the most common is for piracy purposes, although that debate is better left for another forum. Here we are just going to examine the process of Digital Audio Extraction, also known generally, and unfortunately, by the word "ripping."

Digital audio extraction (DAE) is the process of moving a Red Book track on a CD, usually music, to a hard drive or other storage medium by creating a file in any number of formats, although the most popular one is WAV. There are many possible purposes for which one might want to move the track into a file: to edit the sound, to rerecord it to another disc for a compilation, to manipulate the file further by compressing it into an MP3 file or a Yamaha VQ file, or to convert it to a lower-quality WAV file to use as a system sound, to name just a few.

Many CD recording software packages contain a digital audio extraction function. This functionality has been around as long as recording software. But only recently has it become so popular a feature that there are now many specialized programs that do nothing but extract audio. Recent years have seen many recording software manufacturers releasing new versions of their programs with enhanced audio features or producing separate or companion programs for audio extraction, manipulation, and recording.

Like Pulling Teeth?

Why is it so hard to get good extraction? The difficulties are inherent in the way audio discs are written. Data on an audio disc are organized into frames to ensure a constant read rate. Each frame consists of 24 bytes of user data, plus synchronization, error correction, control and display bits. One of the first things crucial to understand about CDs is that its data are not arranged in distinct physical units. Instead, the data in one frame are interleaved with the data in many other frames, so that a scratch or defect in the disc will not destroy a single frame beyond correction. Rather, a scratch will destroy a small portion of many frames, all of which can probably be recovered.

A Red Book disc is divided into three areas: Lead In, Program, and Lead Out. Each track's location, or address, is recorded in the disc's table of contents (ToC), which is stored in the Lead In area of every disc. Because pressed CDs are read-only, the number and location of the audio tracks to be recorded are known in advance, and the final ToC is created on the glass master in advance of the actual

audio data. An audio disc can contain up to 99 tracks, which are stored in the Program area. Following the Program area is the Lead Out area, which is simply 90 seconds of silence, or blank sectors. Encoding a Lead Out area on an audio disc lets CD-Audio players know that the music stream has ended.

So an audio disc's ToC, much like a book's, is a good resource for knowing what's where, but can't always lead the reader to the right spot. If "How To Make an Audio CD" is a chapter in a book that begins on page 43, that doesn't necessarily tell you where the part about actually recording the CD is as opposed to the other steps in the process (unless it's, say, a subindexed science textbook). Likewise, the table of contents on an audio CD tells the CD reader about where the song starts, but, unlike a CD-ROM with data on it, it does not tell it exactly where it starts.

Audio discs were designed to be read sequentially, in real time, with the digital data converted to an analog signal that would be played through a stereo's speakers. There was no need to have data on the disc to pinpoint the exact location of the beginning of a song. It is good enough just to get close. Those extra data containing an exact starting address for each song take up space that could otherwise be used for musical data. Since CD-Audio data are stored on the disc in a different form from computer data, accurate extraction can be a difficult task. The 2048 bytes of user data in each 2352-byte CD-ROM sector can be accessed exactly because the header information in each sector contains the precise address of the data block.

An audio block, on the other hand, contains 2352 bytes in each physical block, and all of these bytes are used for audio data. No header exists; there is no information in the block that allows for the exact positioning of a read head over a specific block. To address an audio block, a drive must use the Q subcode. The Q subcode provides audio positioning only to within ±1 second of the actual block address. When addressing an audio block, a CD-ROM drive moves the read head to a position close to the requested block, then compares the Q subcode with the block address being sought. The Q subcode references the minute, second, and frames relative to the start of the track and also the absolute time, that is, the time in minutes, seconds, and frames relative to the whole of the disc.

When requested to seek an audio sector, the drive starts reading, then compares the Q subcode information with the block address being sought. The drive begins transferring data when a Q subcode address that is close to the desired block address is located. CD-ROM drives many times seek an audio address that is only within ±4 Q subcode addresses of it (±4/75th of a second in playback time). In that case, a read request could return any one of nine blocks. This is why extraction is not an exact science. Clicks and pops in the extracted files are many times caused by this inexact positioning.

The Role of Readers

Anyone who has done any significant amount of digital audio extraction is well aware that some CD-ROM drives and recorders perform the task well, while others do poorly or will not extract at all. Traditionally, SCSI drives have been better at extraction than ATAPI drives. Some lower-cost drives are less likely to perform the task well, while higher-end, name-brand drives usually perform adequately.

Today's best-selling drives run the gamut of DAE capabilities. Plextor leads the way with its 40x UltraPlex drives and its DAE-optimized driver software. There is no intention here to list which drives perform well and which do not; there are simply too many variables to consider that go well beyond a drive's innate capabilities. Many factors affect a drive's DAE performance, including system settings, software used, disc condition, and drive condition. CD-ROM drives passed into the commodity product domain years ago, and with myriad manufacturers continuing to improve the speed and audio extraction capabilities of their drives, frequently, if irregularly, any listing presented here would be obsolete by the time you read it.

Digital Audio Extraction Definitions

There is a great deal of software available, mostly as online shareware or freeware, that is specifically designed for digital audio extraction. The differences among the various tools are deep in the details, and those details are peculiar to the digital audio extraction technology niche. So when using specialized extraction software, it is helpful to know and understand several terms that will pop up now and then as functions in these programs:

Synchronization, Overlapped Reads, Jitter Correction

These terms are many times used interchangeably to describe a method of reading data from an audio disc that is meant to make the extraction as accurate as possible. When reading audio, the program will reread sectors to make sure that the program is extracting audio accurately. An extreme example is presented by Andre Wiethoff in his notes about his Exact Audio Copy program: "In secure mode, this program reads every audio sector at least twice. That is one of the reasons why the program is [so] slow. But by using this technique, it could detect any non-identical sectors. If an error occurs (read or synch error), the program keeps on reading this sector, until eight, or a selectable number, of 16 retries are identical. So, in [the] worst case, bad sectors are read up to 82 times! But this will help the program find the best result by comparing all of the retries. If it is not sure that the stream is correct (at least approximately 99.5 percent sure), the program will tell the user where the (possible) read error occurred."

Overlapped and synchronized reading refers to a process of reading a certain amount of data, then going back and rereading a portion of those data and comparing it with the first read. If there is a mismatch, the data are read again from a different offset, then compared again until there is a match.

This ensures that the proper data are being read even if the head positioning is not exact.

Normalization

Different CDs are recorded at different volumes. When you make a compilation disc, there might be differences in the volume of the different songs, which can be very annoying. Normalization fixes this and sets all tracks to the same volume level.

Track Offset

The track offset is the position of the read head in relation to what the correct position should be. Usually the head will be a fixed offset before or after the correct read position. Once the offset is determined and adjusted for in the program, it should then position correctly on all CDs.

Big-endian, and little-endian or Reverse Byte Order

Some audio extraction tools extract and store the files they extract in "big-endian" order, placing the "big end" at the lowest storage address used. Others store automatically in "little-endian" order, storing the "little end" byte at the lowest storage address. When tracks are extracted and stored in little-endian byte order, the files they create will sound like a bunch of static. Big-endian order stores the "big end" or most significant byte first at the lowest storage address. This approach must be reversed to be able to extract a track correctly.

Swap Channels

Some drives swap the left and right channels when extracting audio. Some software allows you to correct this.

CDDB

CDDB is the Compact Disc Database. Using CDDB, you can retrieve disc title and track names from the CDDB database on the Internet. There are several servers throughout the world that host the CDDB. CDDB can be accessed by direct TCP/IP or the HTTP protocol. Many extraction programs link to the CDDB to retrieve the artist, title and song names on a disc.

MP3, RA, VQ Encoding

Some extraction programs offer the option of encoding an extracted WAV file to MP3 or other format after the extraction is done.

Beyond the Mendoza Line: Extraction Speeds

Extraction can be slow and unreliable or fast and reliable. It can also be fast and unreliable or slow and reliable. Let me explain. A drive that does poorly on extraction will likely run at a speed much less than its rated maximum. Other drives, accurate at extraction, can reliably rip files at almost their full rated speed. Still other drives purr along at full rated speed but produce an unacceptable output file. And, finally, when exact extraction is required, even drives like Plextor's mighty UltraPlex will get their speed bumped down to 1x or 2x to deal with a serious synchronized read, even though that is not necessary with the latest accurate streaming technology.

Speed and reliability are dependent on the hardware and software used for the extraction task. Accurate extraction can be done at 16x and more. While there is generally no way to tell for sure whether an extraction was accurate or acceptable other than to listen to the resulting file all the way through, some programs, like Exact Audio Copy (EAC), track the extraction and report the status of the task. If EAC reports that the file was extracted correctly, it probably was. The tradeoff for knowing that the file is good is the slow speed necessary to ensure accuracy and report on the status of the extraction.

Who's Zoomin' Who? The Search for Sound Extraction

The best approach to ensuring reliable, high-quality audio extraction is to rely on the experience of others, via newsgroups and the like, who know which drives do it well and which ones don't. Fortunately for those with drive concerns, the price differentials among drives offering comparable read speeds are negligible (and don't even vary that much versus read speeds), so the issue is less likely to be the user's bankroll size than simply careful selection.

The news is even better on the software side. If you're not satisfied with the extraction capabilities offered in the premastering software bundled with your drive (Adaptec and CeQuadrat, for example, offer solid, reliable tools that might lack some more sophisticated features available elsewhere), fear not. Many of the best tools available are Web-distributed shareware, and a representative sampling of those is corralled here. So choose wisely and rip away.

MMC and SFF8020: Error-Free Ripping?

The ATAPI (SFF8020) specification for PC peripheral connections now includes the new MMC command set used by drive manufacturers in current CD-ROM drives. The advantage of using MMC is that many of the commands that previously needed to be performed in software can now be performed by a CD-ROM drive's controller chip. These functions include real-time error correction of Layer 3 Reed-Solomon Product-like Code (RSPC), error detection, real-time ECC correction of one byte per P-word and Q-word, and repeated ECC passes to increase the reliability of data being read. Controllers from Oak Technology and Winbond have these functions built in. CD-ROM drives and CD-Recorders using these new chips can extract data more efficiently, since less-complicated algorithms are required in the ripping software. Since the controller works to position the head more accurately, existing synchronized-read algorithms also work faster. "Compares" will now match sooner, allowing them to move on to the next data more quickly. This feature is called "Accurate Streaming" and drives using it can many times extract audio correctly in a fast or burst mode, which greatly increases extraction speed.

Driving Miss DAEsy: Plextor Leads by Example

One drive manufacturer that has demonstrably taken the lead in optimizing its drives plus the accompanying driver and management software for Digital Audio Extraction is Plextor. Those serious about fast, clean, reliable extraction swear by Plextor drives, and with good reason. For years, Plextor has built drives that push the speed and reliability envelope not only on data retrieval, but on digital audio extraction as well. Plextor's latest offering, the UltraPlex Wide, is a 40x max, 17x minimum CAV drive that averages 24x in digital audio extraction with complete accuracy. Using an UltraWide SCSI connection, the drive has an 85ms average access speed, a 512KB data buffer, and data transfer rates of up to 40MB/sec in burst transfer mode. The drive has front panel controls for playing audio CDs, and the firmware can be flashed as BIOS improvements become available. The drive uses SCAM (SCSI Configured Auto Magically) technology to set SCSI IDs and termination automatically.

The UltraPlex Wide ships with Plextor Manager software, currently in version 1.73. This utility pops up with four tabs: Drive Control, Disc Info, Audio Control, and A/V Player. The Drive Control lists the host adapter number, the SCSI ID, the firmware revision, and the buffer size of the selected drive. It allows you to change the drive speed, set the spindown time, enable/disable Plextor's AudioFS conversion tool, plus lock and unlock the drive tray. Disc Info shows you the type of disc, number of tracks, number of sessions, and the disc label. From there, you can call DiscDupe, the Plextor disc copy utility (assuming that you have a Plextor recorder). Audio Control lets you set the volume and balance for audio discs, switch the channels, and reset the drive. The A/V Player will play audio, WAV, AVI, and MPEG files.

Two other features of the Plextor Manager are notable. The Audio Capture feature is simple and fast. The Audio capture screen lets you choose the track number to extract, the sampling rate, and the channel setup. Capture lets you choose the destination directory and begin the extraction. This program is simple and easy to use, but the best thing about it is the speed. Extracting a 4:30 track took 13 seconds! That is a 24x extraction, as advertised, and the file was perfectly clean. You can see why people swear by Plextor drives for digital audio extraction.

The other feature is AudioFS, which makes .cda (compact disc audio) tracks on a CD look like WAV files. This feature is especially useful if you are compressing to MP3. Instead of having to extract WAVs to the hard drive — using 40 to 50MB of disk space per file —- you can use the simulated WAV on the CD audio disc as a source and compress it directly to MP3. And since the files look like WAVs to Windows, you can play them through the SCSI bus, without a physical cable connection to your sound card. This is a very handy feature for external SCSI drives. (For those of you who don't have a Plextor drive and thus no access to this conversion tool, try the alternate CDFS.VXD mentioned in the endpiece "Breaking the WAVs." It does not work with all drives, but if it works with yours, you can have this handy feature, too.)

For companies using audio extraction as an integral part of a custom audio disc production system, Plextor has combined these elements and more in a turnkey solution. Incorporating automated extraction and recording software in an integrated network, the key selling point of the system remains the extraction-optimized Plextor drives found in the MegaPlex towers from which the stored audio tracks are drawn after the customer selects them. The system provides a sound model for how digital audio extraction can play a key role in aggressive new technology-based business models.

Breaking the WAVs: CDFS.VXD

If your plans are to create MP3 files or other compressed audio formats, creating a WAV file on hard disk first and then compressing it into the secondary format are a waste of time and disk space. There is a handy solution that bypasses the creation of a WAV altogether. CDFS.VXD is a freeware device driver that replaces the Microsoft CDFS.VXD (compact disc file system) in the subdirectory **c:\windows\system\iosubsys**.

Once the driver is installed, compact disc audio files (.cda) appear as WAVs and can be opened directly from the CD in a WAV editor and otherwise treated as WAV files. Opening the file in a WAV editor and then saving it to hard disk gives you the same result as extracting the track from the disc. You can also use any WAV-to-MP3 converter to convert the .cda file directly from the audio CD to MP3 (or other compressed format) without first having to extract it to hard disk. This driver will work with some drives but not others.

When you open a CD after this replacement driver is installed, you will see two subdirectories on the disc in addition to the audio tracks. These subdirectories are Mono and Stereo. Under each subdirectory, you will see three additional subdirectories: 11.025kHz, 22.050kHz, and 44.100kHz. Opening these directories reveals the WAV files with the usual Windows WAV icons. Right-click one of the WAVs and choose **Properties**. If the box shows the **Preview** tab, then the drive is supported by this driver. If only the general tab is showing, then the drive is not capable of working with the new driver.

You can get the driver from **http://www.maz-sound.com/cd-rippers.html**. To install it, go to the **windows\system\iosubsys** directory and rename CDFS.VXD to something else. Then unzip the downloaded file and copy its new CDFS.VXD into the directory.

Further Information

Plextor Corporation
4255 Burton Drive, Santa Clara, CA 95054;
800-886-3935, 408-980-1838; fax 408-986-1010;
http://www.plextor.com

Audio Catalyst, http://www.xingtech.com

Audio Grabber, http://www.audiograbber.com-us.net/

CD Copy
http://members.aol.com/mbarth2193/titel.htm

CDFS.VXD
http://www.maz-sound.com/cd-rippers.html

Easy CDDA Extractor
http://www.poikosoft.com/cdda/main.html

Exact Audio Copy
http://studserver.uni-dortmund. de/~su0165/eac.html

WinDAC 32
http://www.windac.de/English/StartUp.html

TV Station Signal Levels: HDTV, UHF and VHF

by Alvin M. Foster (Massachusetts)

With digital terrestrial broadcasting quickly becoming a reality across America, it recently seemed an opportune time to investigate the signal strength in my area and see how well I might receive DTV signals.

BAS member John Emerson recently bought the Sencore DSL757 Director Digital Signal-Level Meter (srp $1200) to measure RF signal levels. It measures the signal strength in cable TV systems as well from DTV, UHF and VHF stations. The Sencore is battery-operated and portable (about the size of a book), having been designed to be handheld. Although the manufacturer sells an optional test antenna, Emerson opted to use a simple RCA rabbit-ears dipole.

Using the Sencore to determine signal levels at your site will assist you to make an intelligent antenna-buying decision based on these questions:

- Where are the stations — are they in all directions from my location (requiring either an omnidirectional antenna or a rotor) or are they all in basically one direction (permitting a directional antenna without rotor)?
- Is the multipath at my location a sufficient problem to indicate that a directional antenna might be best?
- Based on the signal strengths at my location of the channels I wish to view, will an indoor antenna suffice?
- If I need a signal amplifier, which broadcast stations have levels that might overdrive it?
- What antenna height and location represent the best compromise among costs, signal levels and my property boundaries?

I live in the Mattapan section of Boston, about 120 feet above sea level, higher than most of Boston. As a result, my reception has always been free from multipath problems ('ghosts'). Regardless, signal strengths are higher (by about 6dB) on my second floor.

Emerson and I first measured the reception in my basement to get an idea of what signal levels were necessary to obtain a good, viewable picture. The handheld dipole antenna was rotated to get the highest signal level. The arms were extended to maximum on the VHF tests and reduced to minimum on the UHF and digital tests (closer to optimum for the higher frequencies — shorter wavelengths — of these signals). However, no attempt was made to adjust arm length to coincide with a specific station's broadcast frequency.

Our results would apply only to measurements made under similar conditions, because we did not use a calibrated antenna. What we found is that UHF and VHF signal levels in my home are viewable if higher than -25dBmV (dB re 1.0mVrms). Snow was present in these signals, but if the show was interesting enough it could be ignored. Signal levels at 0dBmV and above are considered ideal.

I do not have a DTV receiver, but tests completed at a home in the suburb of Lexington using the RCA DTC100 Digital Tuner suggest that the signal level for digital reception should be better than -20dBmV. Weaker signals yield more freezeups (picture with no motion). Generally, with DTV, the picture is received either perfectly or not at all. There is no snow. But you must have low multipath, too; it won't generate ghosts, but it can easily cause freezeup and other annoyances.

For adequate reception, some of the signals at my home require an RF amplifier. The Sencore can power a typical LNB amplifier. We used a Radio Shack amplifier (20dB gain) on some of the tests to determine if my poor reception could be fixed with boost. We concluded that it couldn't be used on all signals, at least not easily, because my strong channels would likely overdrive the RF amplifier.

Tables 1 and 2 show the channels I could receive and whether an outdoor antenna and/or booster was required.

Analog stations are measured by using the video carrier-level synch signal peak to peak. The digital channels are measured using some kind of RF-level sensing at 500kHz intervals across the 6MHz band and then summing them. This seemed to work well even though the meter is designed for cable QAM systems instead of 8VSB.

The results for my basement were too meager to report; I could receive only channel 7 at an adequate, snow-free level. Even after adding the 20dB booster the VHF and UHF signals remained essentially unwatchable. Remember, unless you are within sight of the broadcast tower, your signal level results are unpredictable. Long distances, hills, rain, lakes, snow, trees, height, buildings, large structures, etc. can introduce huge variations.

According to the Boston TV Dial web site, the effective radiated power levels, as listed on their FCC applications, are as posted in Table 3. Antenna height is aboveground, not above sea level. The radiation pattern for channels 20 and 30 is not on the web site.

As of March 2000 we were not sure which Boston DTV stations are broadcasting at full power. Channel 4 is currently on low power; their plans were to go to full power this sum-

mer. However, unless all levels increase significantly, people living in Mattapan and surrounding communities will have a difficult time viewing DTV without an outdoor antenna.

Clearly, antenna height does matter.

Table 1: First floor

Channel	dBmV	20dB booster
2	1	
4	-4	
5	-3.5	
7	8	
9	no data taken	
10	-21	
11	-34.5	
12	-26.5	
25	7	
38	-2	
44	-26.4	-3.7
56	-9	
68	-1.1	
DTV		
20 (5)	-22	-6.6
30 (4)	no signal	No signal
31 (25)	off air (temp)	
42 (7)	-18.8	3.5
59 (9)	no signal	-32

Table 2: Second floor

Channel	dBmV	20dB booster
2	6.6	
4	9.7	
5	13.7	
7	14.8	
9	-30	
10	-18	
11	-29	
12	-8.7	
25	15	
38	11	
44	-22.3	
56	5.2	
68	7.7	
DTV		
20 (5)	-16	
31 (25)	off air (temp)	
30 (4)	no signal	-20
42 (7)	-9.5	
59 (9)	no signal	no signal

Table 3: Radiated power

Channel	Power (kW)	Antenna height (ft)	Radiation pattern
20	200	626	
30	600	1279	
31	74.7	1085	circular
42	948	944	circular

Digital Images and Imaginings

[Although this article's title implies visual images, digital audio processing permits similar transformations. Reprinted with permission; copyright 2000 Jeff Talman; from the author's "eMuse" column in the e-zine Music & Vision: The world's first daily Internet music magazine (**www.mvdaily.com**) *— DJW.]*

by Jeff Talman (New York)

When you describe art, you are also describing how meaning is produced and subjectivity formed. In other words, you are describing reality — Joseph Kosuth.

"Let's wipe the slate clean." Language describes image: the slate being wiped. Hearing that statement, few actually think of the slate being cleaned; the other meaning is implicit. As with language so with image itself. A subtext, a *lingua franca* of idea follows image as inexorably as the mind creates connections between any A and B. A woman eating an ice-cream cone, trash blowing across a vacant lot on a gray day, a solitary man confronting a tank: advertisers, artists, the media recognize the power of the image as a prime tool of communication, one that goes beyond the literal. At least since Magritte we have known that 'this is not a pipe.'

Technology has increased the ability to manipulate, distribute and access the image. Scanners, imaging software, color printing and photocopying, CD-ROM, DVD and especially the Internet have escalated the bombardment of images that every day try to command our attention. Images of all imaginable sorts are the common currency of the Internet-connected business place. They run as workplace-related topics, good and bad jokes, sex, politics, advertising — whatever the tastes of the creator/procurers and their circles might be. These images appear on a daily basis, make their rounds, have a very short life and virtually disappear, perhaps to reappear only briefly when another group latches on and recirculates them.

The image proliferates partly because of the desktop capability of comical or grotesque manipulation. But the subtlety also available in manipulation should not be discounted. In everyday images, what we see is not necessarily what truly was. The image is cleaned up, lighting changed, color 'corrected,' file size compressed. Any number of other manipulations occur, all in the name of producing a professional product. To be sure, there is a difference between artwork and journalism, but still, on this new frontier each must create his or her own ethics about what is process-oriented for display purposes vs what is 'truth in advertising' and accurate reportage. In an era when the image might be manipulated seamlessly, what constitutes the actuality — the image in the editor's imagination or the image actually captured?

Sound is now capable of similar manipulation, mass reproduction and dissemination. The sound is an 'image' nearing that of the performers' and/or producer's intent. As such, it easily becomes part of the daily mass of image in/image out. Manipulation of sound information today typi-

cally occurs in both studio and distribution. Unknown to most, this manipulation is taking on a subtle intrusiveness of chilling intensity which will undoubtedly have unexpected long-term effects.

Software auto-tuning is an invasive technique that is part of typical sound studio preparation. Auto-tuning is a process, used by studios worldwide, that precisely tunes or 'corrects' out-of-tune pitches. Mostly used for vocal correction, the software fixes are applied to music of virtually every equal-tempered genre, including classical. Although the software has been developed by a number of industry corporations, the recognized leader is Auto-Tune by Antares Audio Technologies, (**http://www.antarestech.com/**). Billed as 'really cool stuff for making music,' Antares Auto-Tune will nudge false pitches to the correct frequency almost effortlessly. Globally, a string of notes might be relatively tuned, so that they center on their correct frequencies while maintaining something like the dips, swoops and rapid oscillations [vibrato] around a pitch that are typical of normal, expressive singing.

Auto-Tune can also tune with pinpoint precision, such that normal inflections are almost entirely bypassed in favor of dead-on accuracy. This type of processing, where every note is fastidiously tuned, is not atypical. The effect, handled by a seasoned studio pro with sharp ears, can be revelatory, but also disturbing, regarding the very nature of tuning and the human voice. In a very real sense the humanity of the voice is traded for accuracy of image. In the short term, we hear perfectly tuned performances. In tonal music, the pitches take on the nature of their tonal function with a transparency that is unusual and at first enlightening, though this quickly pales as the homogenized mass becomes increasingly apparent. Musicians for centuries have 'leaned' one way or the other to heighten tonal function. These leanings can be paramount to expression, and here they are wiped out.

Otherwise, the long-term results of such tuning corrections are open to speculation. As people become increasingly sensitized to absolutely accurate tuning, perhaps it will actually improve the non-musician's ear to off-key rendering. To young musicians it will ultimately improve the accuracy of their playing, just as recording has helped to improve performance standards in succeeding generations. However, the loss of inflection might also be another instance of the homogenization that recording has brought to performance standards, and a complaint often leveled at the international character that classical music has taken on in favor of local performance color (tunings of indigenous music is a whole other topic of loss). A hopeful third possibility also emerges: with pitch becoming increasingly absolutely defined, composers and musicians will learn to hear pitch differentiation better. This will lead to more extensive exploration of alternate tunings both in traditional work and in new composition.

Unrealized by many listeners, subtle intrusive adjustments are ubiquitous in modern radio production — both in traditional and in Internet broadcasting. One of these methods is the ability to speed the flow of data transmission while only subtly changing the content. In the United States programming remains largely dependent on advertising. Advertising demands airtime. Program material demands airtime. There is a continual conflict about how much programming can/should be delivered vs the advertising or 'traffic' that the radio stations schedule. The industry remedy: software time compression of program material to gain advertising revenue.

Time compression of this sort is done by percentage. In radio scheduling software, produced by a number of industry developers, simply load up a 'Play-List' with program material and set the compression percentage. When the appointed schedule time arrives, the program material airs, but at a faster rate than recorded. The pitches remain the same, only the duration, and subtly the tempo and timbre, of the music are changed. A one percent change over an entire day will yield more than 14 extra minutes of advertising time while allowing the 'same' program material to be run. One percent is actually very conservative. Stations in tight markets have compressed by as much as 10 percent, but generally have backed off to about five or six percent in the face of audience complaints. Archly, a station using this technique might advertise that they play more music per hour (by song count) than other stations, and they will still be able to air a number of ads equal to that of the competition. One chief engineer I spoke with said that he wasn't concerned with the revenue so much as the sound, he liked to 'bump everything up by one percent because it makes the material have more pizzazz!'

Another method of gaining advertising time in radio is to use a hardware unit that trims silence from material, even live feeds. The hardware, aptly named CASH (**http://primeimageinc.com/**), is now ubiquitous to speech formats and is the killer app of talk radio. The unit works by delay time. A live program is fed in, but broadcast is delayed by the unit the amount of time that the broadcaster wants to reclaim across a specific time period. The unit then works through the vocal data during the delay. It shortens durations of silence and durations of certain phonetic sounds such as vowels and the longer consonants 'm,' 'n' and others. The unit works seamlessly so that as much as four minutes can be reclaimed every hour (more is possible, but Prime Image, the makers of CASH, recommend four as the maximum). The unit is sold for $12,000, a bargain at less than $33 a day over one year. This would easily be repaid in virtually all markets with less than one extra commercial a day.

Surely a radio station somewhere in the world is running CASH and trimming the recommended four minutes (6-2/3 percent), and then time-compressing that same material by another few percent. If they aren't now, they will be soon, unless otherwise treating the material with an even newer technology that allows for absolute maximum perceivable, corrected content. Speeded-up, silence-cut, phonetic-trimmed, compressed, auto-tuned, our sonic environment

reflects our oddly sanitized, frantic era. The tools of artistic inflection have never been so available to the engineer and producer who today will typically redraw every single note of a vocalist's performance. This obsessive attention to standardized detail is rampant as material is crammed into every available second of our lives. Competition for attention is paramount, but only within the established, conservative and slow-moving realm of corporate design. As the superfluous detail of unique existence is extinguished, the artist becomes reduced to no more than a raw content provider whose work must be reconfigured, trimmed and assimilated into the flow of so much more constant, consistent information.

That this is antithetical to the artistic process is not certain: some artists have been able to work within the expected constraints of their epochs and to produce marvelous work. That the process is more frequently taken away from the artist and becomes a collaborative effort is not necessarily problematic; one thinks immediately of film. But the tradeoffs in individuation are readily apparent. Predictable is an overt artistic reaction initiated by individuals. To the extent that artists themselves adopt the engineering tools, their visions will remain intact. As more content is thrown at the public, as more and more data are finely spun to specific standards, look to artwork that breathes deeply, that ignores standards. Look to unique vision that demands afforded real time. Be certain that in the vortex which is ever-protean technology, this is the *lingua franca* that truly matters.

Of Dipoles and 'Nulls'— and a Homebrew Approach to Side Speakers

Most of this review appeared, in somewhat different form, in $ensible Sound *issue 79, and is reprinted with permission.* SS *subscriptions are $29 for six issues (in North America; elsewhere $47); call 800-695-8439.*

by David R. Moran (Massachusetts)

Home-theater beginners quickly learn that their side speakers (often still called "rear" speakers, though the effect is better when they're to the sides of the listening positions) ought not to be too localizable. That's why so-called dipole designs, with two drivers (typically tweeters) set to opposite polarity on adjacent or opposite panels, have become the widespread type for this application. The claim is that their sidewise ear-aimed "nulls" and diffuse radiation elsewhere will do the trick.

But much of the current thinking about dipoles is confused and confusing. (So what else is new in audio?) One goal of this article was to sort through some of the confusion, but more important to propose some BAS-frugal ideas and solutions to readers who have older small speakers lying around idly and are wondering if it's really necessary to spring for fancy new dipoles.

The KEF web site's explanations of dipole issues are a bit worse than the norm, but not atypical. My snide comments are in brackets:

...A dipolar speaker radiates sound from two opposite surfaces and each radiating system is out of phase with the other. This means that where the two soundfields meet, they have the effect of canceling each other out [wait — there's no sound?! Oh, no, we know what they mean].

The dipolar design radiates little energy at the listener. Because most of the energy from the speaker is reflected energy, the soundfield of a dipolar speaker is the most diffuse of the three types discussed. A listener positioned in the "null" is always in the reverberant field of the speakers [no, and this is hardly possible anyway in most home theaters]. *In addition, the tonal balance within the null of a dipolar surround is dominated by the "power response" of the speaker* [well, this is always the case unless the speakers are attached on our shoulders]. *A speaker's power response is the total energy radiated by the speaker in all directions.*

[But uh-oh:] *In fact, all Home THX Surround Speakers are required to have a flat power response. This ensures that the tonality of the speaker will be flat for any listener seated near the "null".* [Huh? What about that "little energy radiated at the listener" stuff?] *This provides a very large "sweet spot"* [not quite what they mean, but again we can guess what they're driving at] *where flat, accurate, and spacious surround sound is available.*

Even though dipoles create the most diffuse surround soundfields, they also provide good directional cues as well. [Uh…no.] *In any soundfield, it is the first sounds that reach you which furnish the directional cues. These first sounds can come from the surround speaker itself or the surface nearest the enclosure.* [This poor copywriter's wheels are coming off.] *These early arrivals contribute location cues while the reflections from the remaining room surfaces provide the necessary diffuseness.*

Whew. All right, it's not fair to pick on KEF like this. Let's look stateside. For this review, for example, I was delivered a pair of Polk dipole surrounds, the FX500 (srp $550/pr), and their website explanation of surround and dipole matters is reasonable and understated (which just happens to be the complete opposite of Polk's deceitful ad history). But before getting to the FX500's good performance, let me discuss the basics of what goes with conventional side dipoles.

Localization results from first-arrival sound, usually direct, and timbral/tonal/spectral perception and judgment result from total sound output — no matter what you occasionally hear and read to the contrary. It is true that with surround and home theater playback you want to be unable to localize sounds to the sides. The easiest way to do this is roll off the direct treble — *but without dulling the side speakers' sonic balance overall*. Dipoles with inversely mounted and driven tweeters generally do this automatically, hence their popularity. Note that the so-called null is not really much of a null, and the depth and bandwidth of the

direct treble cancellation notch (which is what it really is) are governed by several variables: the size of the drivers, the bandwidth they reproduce (the length of the soundwaves, in other words), the distance between them, the material and angle and shape of the adjacent/opposite baffles, and so on.

Some companies put two midranges back to back or on adjacent panels and drive them inversely, too, which produces a bit of cancellation lower down; but because the wavelengths are longer, the "null" is even less of one, even as the result is still somewhat diffuse.

In all cases the effect is most successful only when you are sitting in the reduced-output valley, which means the side speakers have to be directly out to the side from your ears (and, optimally, somewhat above them too). If the side dipole speakers are on the side walls somewhat in front of or somewhat behind audience heads, it is not much different from a well-dispersed so-called direct-radiating speaker.

Typically, this information is not available in stores.

* * *

Let's look at this Polk FX500, a heavy (nearly 40 lbs!), triangular side-wall speaker finished in black, with a 6" vented woofer, two 1" tweeters on the adjacent panels, and a bipole/dipole switch. The left speaker was placed upright against the left side wall of a very typical listening ("living") room (13' w x 24' l x 8' h), 6' or so up on the wall, but only a foot from a wide entry archway.

First I wanted to get a sense of its total performance regardless of any spatial qualities. I measured it in-room as sited above, taking data all the way around it horizontally and somewhat below it, a few feet away, somewhat closer than the seated listening position. The dbx pro RTA, used with my B&K mike, was set as always to continuous averaging. The bipole/dipole switch was set one way for half the measurements and the other way for the other half, and the total average was quite similar for each setting — which is not an easy result for a speaker company to achieve. The smooth output is shown in Figure 1. Except for the voice-thickening 7dB hump around 160Hz, the response is remarkably flat. Polk tends to use their two drivers everywhere, a 6" midrange and 1" tweeter, and I have found reviewing Polks several times in the past that these drivers perform very well. Note the strong output to 40 Hz.

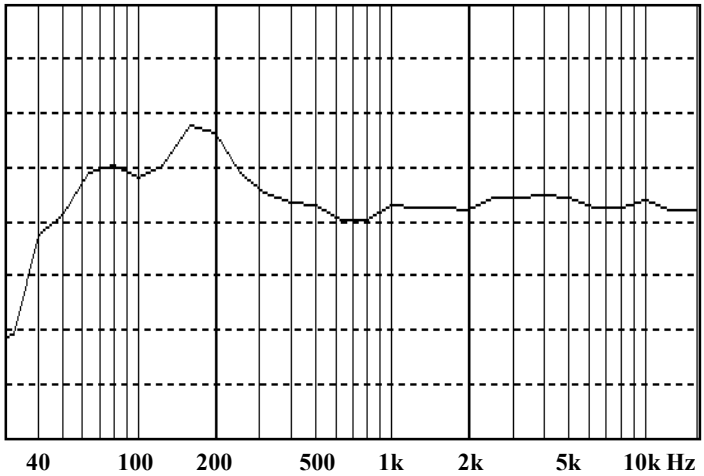


Figure 1: *In-room power response. This is the average of all measurements (i.e., total power of one speaker), both modes; the bipole and dipole mode average power were quite similar, although the bipole by itself showed a small rise broadly centered on 4kHz, like figure 2 top except not as pronounced. All curves plotted 5dB/vertical division.*

In Figure 2 we see the **on-axis** (but in-room) response of the speaker comparing the bipole setting (top) and the dipole setting (bottom). Note that in order for the mike to get the same energy from each tweeter, I did *no* horizontal spatial averaging here. I wanted to stay in the cancellation notch, if there was one. So I put the B&K mike directly in front of the speaker, 4-5' away, and moved it both up and down and to and fro (in and out) just a little bit, to average out unrepresentative "snapshot" or "slice"-related measurement anomalies.

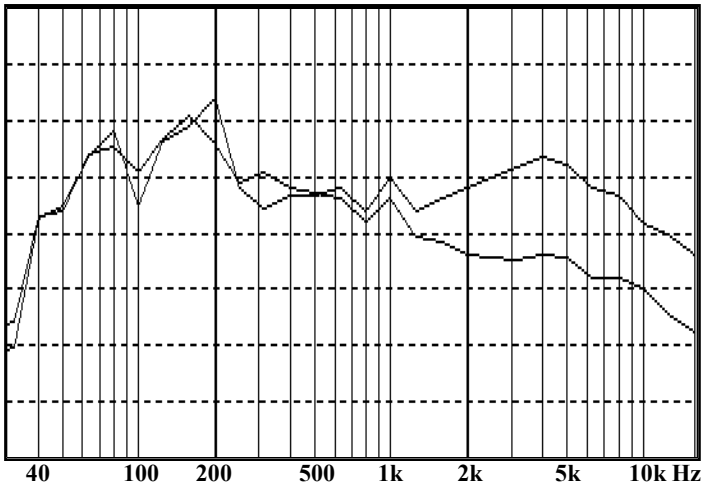
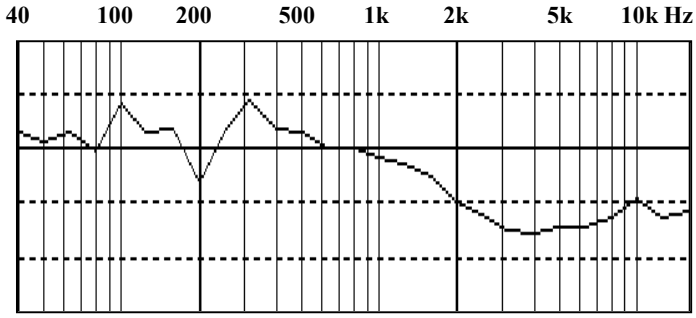


Figure 2: *Bipole vs. dipole, on-axis (but in-room). Note the treble rolloff of the dipole mode in the lower curve.*

Figure 3 (below) *is the same as figure 2 except the Polk bipole axis response has now been normalized — turned into a straight line — in order to show the* difference *between it and the so-called dipole mode. There's your "null," in the bottom trace: 5-7dB deep, across the treble and upper treble:*



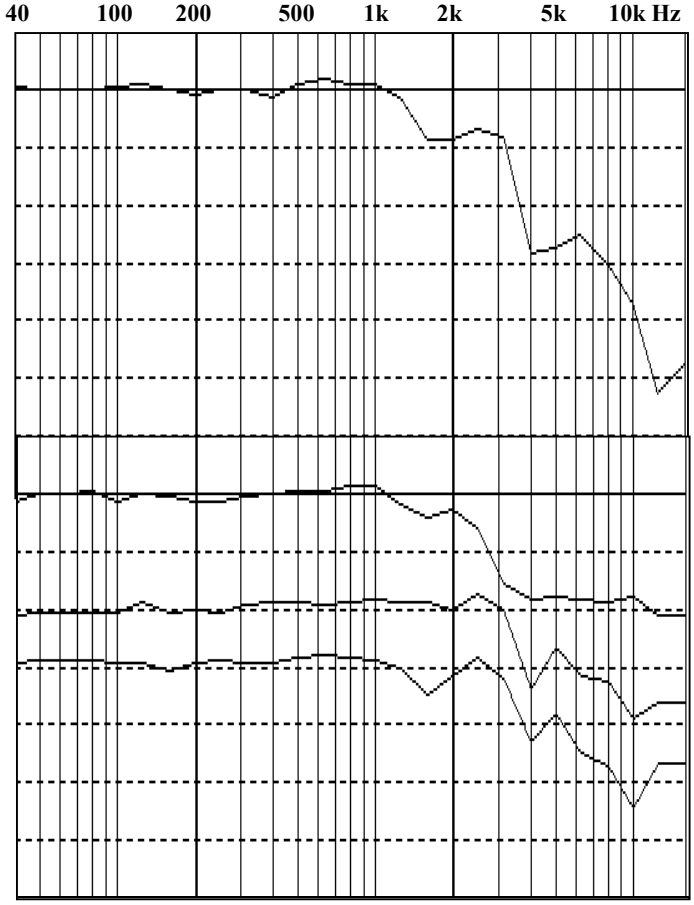
The small kinks in the 100-300Hz octaves in Figure 3 are inconsequential for the purposes of this discussion. The important point is the direct-treble rolloff, starting at 1kHz — regardless of whether we call it an authentic null or merely a small and highly imperfect partial cancellation.

Well, these interesting measurement results got me thinking. Except in the mind of marketing and sales types, and maybe some journalists and HT proselytizers, there's nothing magical about side-speaker "nulls." If the goal for home theater is reduced treble in the direct sound to your ears and diffuse treble otherwise for the sake of sonic balance, why, I asked myself, bother with the expense and implementation complexity of two tweeters and a fancier, more parts-intensive crossover? Why not just stick some absorber or other in front of a wider-dispersion conventional speaker? I know the reason: it's the marketing, stupid.

But for thrifty *BASS* readers, there are some things to think about. In other words, try this at home!

So I grabbed a small 2-way satellite gathering dust in the closet. I bet most members have something similar. This one is an unusually fine design, from the defunct RA Labs, with a very-wide-dispersion, ¾" tweeter. I thought, Let's put something absorptive directly between the tweeter and the seated listener. I tried a few kinds of soft blockers and took some measurements — again, on the listener axis, not horizontally spatially averaged.

Figure 4 shows some quickie results:



At the very top is the *difference* curve of the conventional satellite on its own and with a quilted paper towel roll placed between the tweeter and the mike, which was several feet away, at the listening position. This first jury-rigged solution involved grabbing a half-used Bounty (or Brawny or one of those guys) roll and cutting it way down by three-quarters, until it was about 3" high, the same as its outside diameter. The sheets' quilting pattern made for some extra sonic damping; smooth-finish toilet paper did not work as well or go as low in the frequency "soak-up." For best surround effect, I think, you want to go as low in your lowpassing as you can, within reason. Some treble rolloff here.

The second curve from the top shows the effect of two plies of a thick wool rag sock, a piece about 2.5" wide, right in front of the tweeter, or more precisely between it and the listener.

The third curve from the top is of a somewhat thinner wool sports sock bundled into a cylindrical shape with an outside diameter of about 1.5".

The bottom curve is of the rag sock more tightly bundled, into a cylinder 2" in outside diameter. Odd 5-6kHz tiny peak.

With a little further work on materials, it should be easy, I suggest, to find the optimal shape, size, and material for your spare speakers at home, and indeed for manufacturers. Strips of dense foam, tightly bundled columns of string or yarn, etc.— anything that is thick, roughly surfaced, and non-solid but hard to blow air through — should suffice, ideally reaching down into the upper midrange.

Fastening and fixing this absorber may be a small challenge, but superior solutions should even be possible to incorporate while leaving the grilles on your satellites. And best of all, you can move the absorbers a little to one side or other of the tweeter to soak up and redirect the treble for listener positions when these spare side speakers are not located straight out at right angles from their shoulders and ears.

Listening

I did not do extensive comparative listening to the satellite with the different absorbers, but I did confirm that the blocking of the direct treble seemed to work satisfactorily for music and for movies using Dolby Pro Logic. Localization seemed adequately blunted and diffused, in other words, and whenever the overall surround tonal balance to the side seemed dull, I simply turned up the treble, effectively forcing more highs to be sprayed sideways in all directions down the wall.

I suppose a hard material like a wood or plastic rod could be used as a straightforward block, but I briefly checked this approach and on brief auditioning did not think it sounded as acceptable for a surround.

My comparison against the Polk also was not exhaustive, but it was quite clear that the conventional dipole design is not *automatically* preferable in its treble diffuseness and unlocalizability and also relatively smooth power response. [This technique also addresses the desires of some listeners

to have direct treble radiators for music surround and diffuse ones for movie surround — DJW.]

* * *

After my review was published, the *$ensible Sound* received this sensible letter from a reader:

> After reading … how to delocalize the rear speakers for home theater, I wondered if you thought of pointing your small two-way satellite speakers toward the walls or (even better) into the [back] corners of the room to produce diffuse sound. The only disadvantage might be that it looks less attractive to see the back of the speaker rather than the front, but you would certainly roll off the treble and diffuse it without the need for absorbers.

To which I replied:

Your fine idea accomplishes, more simply, the same thing I was driving at. Maybe better, because with some speakers the positional "shadowing" will go down to a lower frequency. Many listeners would find they need to turn up the treble in their repositioned side speakers overall, because of too much shadowing, which would increase the treble in the reverberant field — never a bad idea, except perhaps at the sides.

The reason I did not mention it is the extra-clunky aesthetics involved; my clunky wool sock / paper towel scenario seemed slightly more elegant!

Nearly 40 years ago, when the KLH 11 suitcase came out, one of the manual's specific and novel suggestions (almost certainly from Henry Kloss) was to take its two very smooth satellites (EQed midranges is what they were) and face them toward the wall. I thought this quite cool and did so, and the sound does become much more spacious thereby. Bose, the most successful speaker company in the world, the one serious audiophiles just love to hate, of course is founded (albeit with a lot of strange and wrongheaded explanations) upon such principles and practices of midrange and lower-treble diffusion. But that's another discussion for another time.

One last thing

The FX500s performed so well sonically as "normal" loudspeakers on their own that when I was asked one Saturday morning last winter to be the *pro bono* audio tech for a lecture/demonstration by a famous visiting organist for a group of Boston church musicians at Old West, I included the Polks with my gear. They sounded nice and flat; the lower-midrange bump was easy to EQ out; they go low for their size; and they were handy. Normally I don't ever use equipment lent for review for personal or ancillary purposes, and furthermore these Polk FX500s obviously are designed for something other than conventional stereo playback. But I figured Polk would not mind the exposure such an august crowd. I configured the speakers for dipole mode and "stereo-located" them such that the in-phase output of each was toward the center (toward the other speaker). Imaging was just fine, and pleasantly spacious — a quasi dbx Soundfield Imaging effect, if you will — and audience coverage was broader than you get with a single 1" dome tweeter. In fact, the overall sound was impressive enough that the guest organist and half the church musicians specifically commented on it to me afterward.

December 1999 meeting

by David B. Hadaway (New Hampshire)

Open Forum

The BAS has placed ads in five local student newspapers publicizing ourselves, giving our website and our Boston phone number (which rings at Alvin Foster's office). Previous ads have yielded little response, but president Hadaway feels this is a valid use of the contributions made to help out the Society. Since all students have Internet access, they can find information about the BAS for free.

Hadaway discussed the idea of drawing on our out-of-town membership for officers and staff. He himself was leery of taking on the presidency because he lives out of state, but with email it has worked very well. A physical presence is hardly needed. Elections could be on the basis of résumés, like the AES. A new office could be Promotions, which would involve a few minutes a month.

Steve Rochlin bought some new servers for his business **www.feelthemusic.com** and has offered free Web space if we decide to become **BostonAudio.com** (that seems to be taken, but **BostonAudio.org** and **BostonAudioSociety.org** are not).

Ira Leonard said that the link to the BAS from the local AES section is now working well (on the national AES site there's a link to the local site).

Alvin Foster recently bought the Mighty Mike 2 (an inexpensive calibrated microphone for measuring loudspeakers) for $250 (srp). The former model's 20" wand has been replaced with a foot-long wand with a curve at the end that is claimed to improve its performance (though Foster finds it less convenient).

Foster talked again about his $500 Behringer equalizer. All digital, it performs an amazing number of functions. The only thing it doesn't have is a manual that you can understand (it is made in China). He had thought it was adding audible distortion, but after a trip to the factory it seems to work okay.

Leonard: It's typically sold through pro channels, so it's discounted more than high-end audio.

Rochlin: Mobile Fidelity Sound Labs, which has brought us many enjoyable vinyl remasterings of older recordings (they even bought their own pressing plant to ensure quality), has gone out of business. They sold the pressing plant 2½ years ago. The final blow came when one of their major distributors went out of business holding a large stock of

their product. Their last issue was an incredible-sounding remastering of a Who album. Also, they issued the world's first dual-layer SACD.

Feature: Clark Johnsen of the Listening Studio, and Jack Butler of Image Acoustics

The American Physical Society has a long-running feature on "hidden" physicists, graduate physicists working in other occupations. David Griesinger (last month's guest) and yours truly are two, Clark Johnsen (an optical physicist) a third.

Johnsen founded the Listening Studio 20 years ago in an industrial warehouse building only a few blocks from downtown Boston (the building had lain vacant for 40 years!). The BAS has met with him twice before, in 1986 (see *BASS* v15n1,2) and in 1991 (see *BASS* v19n3), and he always has an entertaining mix of audio demonstrations, contrary views, and nostalgic mementos from audio history.

He began by stating that he was a "black hat" as opposed to most of the BAS being white hats. This referred to the *Audio Critic*'s judgments of subjective vs objective [to put it as politely as possible — DRM] viewpoints by persons in the audio industry.

When Johnsen moved in it was just an open floor, and he realized he could get the ratio of the dimensions of Symphony Hall (but without the statuary) for his listening room [if only wavelengths scaled proportionally — DRM].

For 20 years Clark Johnsen has sold VMPS loudspeakers (many of which now use the Bohlender ribbon from 100Hz to 12kHz). A recent review in the *Absolute Sound* was a rave. They are 5- or 6-way designs with gradual crossovers, usually 6dB/octave. The front baffle is 3" MDF, the sides 2". Weight is 300 lbs. The speaker cables are 1" diameter (Synergistic Research on the bass and Silver Foils on the treble) and suspended by 3" supports "to separate them from the electrostatically charged acrylic carpet."

Johnsen offered a riddle: Of the three groups of people — retailers, reviewers, and designer/manufacturers — which does the best job of setting up a really good audio system? After we had thought about it for a while, he gave the answer: none of the above. The customer's setup is the best, because time spent on the system is worth more than money. He is astonished at how bad reviewers' systems sound, and he's been to some major ones.

He then went on to read excerpts from the history of audio:

An article from the *Phonograph Monthly Review* (from 1926; published in Jamaica Plain, just a short distance from where Johnsen lives) about the extreme variability in "sound boxes" (the diaphragm to which the needle is attached). Johnsen sees this as an early example of high-end tweaking.

An article on users' reactions to the new long-playing records: "Why doesn't RCA Victor do its experimenting in the laboratories and not in its customers' pocketbooks." This was from "*Disques* magazine" (published in Philadelphia in January 1932!) about the first wave of LPs, with wide grooves, lasting 12 minutes instead of 4 minutes (made by dubbing three 78 sides, which caused a loss of quality).

An ad from Columbia in 1948: "When you buy a record, the thing to ask is 'how long does it play?'."

From a novel: "...she wished Jim took a more ardent interest in his wife instead of being preoccupied with his books on mysticism, going out all alone to concerts, or tinkering all day with his gramophone. He had an electric gramophone of his own invention, unusual in construction, and very fine in tone. But it always seemed to go wrong. Then Jim tinkered with it for hours and hours." This was from 1925 (comment: "An early adopter").

Then: "No finer records of orchestral combinations have ever been placed on sale, and the tone of the strings is little short of perfection" (from a 1908 Red Seal ad).

Finally from c.1955: "You can tell it's high fidelity just by looking at it" (Eico).

Johnsen's first involvement with audio was Tinkertoy turntables. A professor Neidegger introduced him to classical music through audio: "If you listen to my system you'll have to listen to my music." So he sat down and listened to symphonies. And it took.

Johnsen went to work in Wolff's HiFi while in high school. In 1959 the *Sioux City Journal* wrote up the local audio scene under the headline "Woofers and Tweeters for Golden Ears." "Some have claimed their systems have come so close to perfection that only 24-carat gold-plated ears can detect a shade of difference."

He passed around ads from his "perfection wall":

"The superb Victrola reaches new perfection."

"This is what we wanted to do but do it perfectly" (Garrard).

"Introducing a slight improvement on perfection" (Technics).

"Perfect sound forever just got better" (Sony).

Johnsen saw the belief of some that early digital recording sucked as a blessing in disguise for the high-end crowd — it drove them to get the most out of the LP. There is more information locked in those grooves than many people ever imagined.

Johnsen was a systems engineer on the Mars lander camera. He worked on anti-aliasing filters in digital imaging in 1968, and never dreamed it would come back to haunt him (The eye is much easier to fool than the ear, he claimed). He received an award from NASA for recognizing a problem with the processing of reds in the camera system. After being laid off, he worked as a consultant, and then this space opened up.

At that time, Goodwin's was charging $10 to listen to a $60,000 hifi. Johnsen helped set it up and it sounded horrible. "I could do a better job for $10,000, no, $5000," he remembers thinking.

He was most impressed by VMPS speakers. Brian Cheney of VMPS showed him a brick that improved the sound (which sparked his interest in tweaks). He picked the name the Listening Studio (there are lots of recording stu-

dios, but only one listening studio: "No competition — we don't record, they don't listen.").

Someone ran over his leg, and the settlement from that was the initial capitalization. When that ran out, he switched to daytime retail. Digital recordings were coming out. Brad Meyer demoed the Telarc *Firebird* and it was okay but not quite right. The drums were so loud, the strings so distant.

Johnsen's college roommate had been Sandy Ruby, a founder of Tech HiFi (who has addressed the BAS; see *BASS* v19n2), which expanded to 78 stores before it went bust. Ruby has remarked, "I now know that it was the beginning of the end when we discovered banks." The video revolution started just as they were getting into financial trouble and their suppliers didn't want to extend their credit further.

Johnsen recalled his first presentation before the BAS (perhaps 80 people present), when he showed multiple copies of Pink Floyd's *Dark Side of the Moon* lined up as a continuous display, a feat he repeated with the help of front-row members.

He asserted that the artists of the '20s, '30s, '40s and perhaps the '50s set a musical performance standard that has not been surpassed today. The fact that they were closer to the composers might be a factor. And a well-recorded 78rpm record (for solo or small group) can in some ways surpass any LP or digital recording. Record companies have never known how to properly play back their recordings. "If they had known how good they were making these recordings, they wouldn't have made them as good."

He admitted he had been a devoted listener to *ShopTalk* (which spawned the BAS). But eventually it moved to WHRB and the focus shifted to digital. He called, then wrote a letter defending LPs, and it was characterized on the air as "hate mail." Then by way of making good on the epithet, he and friends decided to stage a mock protest against digital by throwing digital-origin LPs and CDs into Boston Harbor. Called the Boston D Party, it took place in 1983 on the 210th anniversary and location of the Boston Tea Party. A video of the event was played, evoking great amusement from the audience [I noted that strings were attached to the digital items so they could be retrieved and not further pollute the harbor — DBH].

Johnsen wrote the *Wood Effect*, about the supposedly ready audibility of polarity change, with 4000 copies in print, and then became a regular contributor to *Positive Feedback*.

His building is being razed in early 2000 to make way for a parking garage. Where he will relocate is still up in the air. But he isn't bitter; he had a good run.

He concluded by briefly surveying various tweaks (he prefers the term "necessities," owing to their neglect by designers and manufacturers). One is a machine to grind a precise 39^{o} angle on the edge of a CD to true it so it doesn't wobble. Symposium roller blocks allow equipment to move freely in the horizontal plane for isolation. He showed an ac cable about 3" in diameter, for $3200 (he plans to send it back as impractical). A vibration isolation platform ($900) from Machina Dynamica has a natural resonance of 1Hz in the lateral plane and 1.7Hz in the vertical direction, and holds up to 40 lbs.

Johnsen and the Listening Studio can be reached at 617-423-4590.

* * *

Image Acoustics is a small research, development and consulting firm that specializes in acoustic transducers. Most of their work is for government contracts. "Unfortunately they don't award government contracts for loudspeakers."

Loudspeakers are their "fun" work. Jack Butler was dissatisfied with the performance of dome tweeters — limited power handling if you made it small enough to have a wide radiation pattern, undesirable resonant peaks in the 12kHz range in older models, and the inability to go down to 1kHz without being large [and consequently beamy in the upper treble — DRM]. The ribbon is narrow, for good horizontal dispersion; its height makes it directional vertically, but the assumption is that the listener is seated. It's all metal so it conducts heat away rapidly. And it's very simple — the ribbon is driven all over its surface as described by Lorentz's law (a current in a magnetic field generates an orthogonal force), so you don't excite all the crazy modes of a cone tweeter. But life is not simple, so you have to corrugate it to make sure you don't excite its own crazy modes.

The first ribbons date from patents by Gerlach of Siemens in 1925.

Image Acoustics decided to design one from scratch using basic physics without reference to anyone else's design (which in hindsight might have not been such a good idea). The production model has a sealed back, with fiberglass behind to damp the back wave. A dipole has certain advantages in sound quality, but they wanted to have a more controlled sound, meaning no back wave.

Then they decided to build a complete speaker, which took a couple more years. Little things like diffraction have to be considered — when the acoustic wave reaches the edge of the cabinet it can act as if a new sound source has been created.

The ribbon has a resonance of about 700Hz, so they use a 1kHz 24dB/octave crossover to a 5½" dynamic driver.

It has such a low impedance that you have to use a transformer.

Alvin Foster: How much excursion and spl?

The spacing is 3/16" from the plate so it has tremendous excursion. We've never measured maximum spl; maybe 105dB.

Q. If you stretched out the ribbon, how long would it be?

A: About 20-30% longer. Comment: "The children will find out when they pull the ribbon out."

Foster: One of the problems with ribbons is they might sag with time. Have you had such a problem?

We've been building ribbons for four years and there's been no problem.

Foster: Have you tried neodymium magnets?

We considered it, but a certain size of chamber behind the ribbon is needed to keep the resonance down — regular

ceramic magnets work fine since there's plenty of space of available.

Srp is $3000 a pair. They are looking for any help with marketing and retail outlets. **imageacoustics.com**; Jack Butler is **butler@imageacoustics.com**.

April 2000 meeting

by John S. Allen (Massachusetts)

The meeting was held at HiRez Projections' Framingham location.

Open Forum

The last time we met at HiRez (April 1998; see *BASS* v21n5/6), John Hilliard commented on the problems when renting DVDs. It seems customers don't take particularly good care of rentals and the discs skip or lock up. Hadaway said that he has encountered a few problems in the 30-40 he has rented, but in every case cleaning the disc solved it. Now before playing any disc he holds it under the light, and if there are any smudges on the disc he breathes on it and wipes it radially with a soft cloth. This has eliminated the problem.

Alvin Foster: "Even fingerprints?" Yes. [Isopropyl alcohol, available at drugstores, is highly effective at removing oil-based stains such as fingerprints without the need for dry rubbing, which can produce surface scratches — JSA.]

Back issues of the *Speaker* are stored at Alvin Foster's business on two pallets, 6' high. Hadaway proposed that we gather some volunteers on a BAS Sunday and sort the issues into complete volumes so we can sell them. The oldest issues could be scanned so we can recycle the paper copies. Scanning them as graphic files would go fast, take 30kB of space [per page; that's about 30pp/MB, or about 16,000 pages on a CDR; we could easily publish a complete *Speaker* volume and lots of audio on the same CD — JSA] and be much more practical than using scanning and imperfect OCR translation. As an example, US patents are on the IBM web site as graphic files.

Foster rhetorically asked why line-source speakers sound different from point-source speakers. Distortion is not one of the reasons. He performed a twin-tone test — the ribbon was better than the dynamic speaker, but the dynamic speaker's distortion was still 50dB down (~0.003%). The highest audio level was 83dBsplA. (Don Keele Jr. has shown that distortion does increase rapidly at higher levels.) Therefore the answer must be the differing radiation patterns and frequency responses of the two types of speakers. With the line source you get less reflection from floor and ceiling. As far as ultimate output goes, ribbons can play as loud as or louder than dynamic speakers. From the audience: There was no audible difference between the two types of speakers in an anechoic chamber [where radiation pattern is unheard — DRM].

There's a new movie out, *High Fidelity*, about (in part) a vinyl junkie. Lou Souther said it was terrible.

Foster wondered where the editors and writers from *Audio* will next appear, now that it is defunct. Michael Riggs had an article in the May 2000 *Sound and Vision*. Keele had a double whammy: the company where he worked for his day job moved. It will be a sad day if he doesn't resurface somewhere, Foster felt.

Ira Leonard: The Apex (Chinese-made) DVD player with the hidden menus that disable Macrovision and regional coding has been reconfigured. Someone on the Web has been selling a chip to install in the player (probably a copy of the old system ROM) to retain these features.

E. Brad Meyer went to Circuit City and bought two of the old-type Apex players to make short dubs from movies. To him, the player has the feeling of an unfinished product. If you push the stop button, it says "push play to resume," but if you do you get a little hand on the screen that says "don't do that." There are other such peculiarities. The only way to get it from fast motion into play is to keep pushing the fast-motion button: x2, x4, x6, x8, Play. This player is modified from a Korean computer transport. Its audio noise level is -63dBA referenced to -20dBfs; it should be 10dB lower. This problem does not occur if you use the digital output. It also plays video-CDs.

Early video-CDs looked harsh and contrasty. Now they look reasonable. Ira Leonard says that the image is very soft and fuzzy, though. The film *Titanic* appeared in this format, pirated, before its theater opening, but apparently the copy had been made with a camcorder pointed at the screen.

John S. Allen: Quality aside, that's a nice cheap way to pan and scan a widescreen movie.

There was a long discussion of whether the command in *Titanic* to steer hard to starboard was correct in the movie, as the wheel turned what seemed to be the wrong way. Apparently, some wheels were backward on ships; all tillers were.

Alan Southwick: A recording of *Bolero* and other music with the BSO conducted by Munch on an RCA LSC CD includes some recordings with the orchestra out on the floor.

Also, the Prokofiev recordings by Koussevitzky are out on BMG, but there is a problem in the 3rd movement of the *Classical* Symphony — about four seconds of a sound like a squealing brake drum. This is the 1935 version [I seem to remember this as from 1929, and there was a later recording around 1949 — JSA]. If the first movement is from the original master, it is far better than the 78 release, which was a dub because the master started too close to the edge of the disc.

Feature: Joel Cohen of Hi-Rez Projections

Joel Cohen first commented that it was nice to be in his showroom without the TV on for a change. Things have been happening since the previous BAS meeting at Hi-Rez, two years ago. Cohen knew he had turned the corner from reconditioning old video projectors when he started turning them down. He did bring home a high-resolution Electrohome projector made for computer displays, purchased from a company that ran out of money in Kendall Square.

He remembered a BAS meeting 20 years ago at the Advent factory in Cambridge where he saw the Advent projec-

tor. His wife, who was also at that meeting, wondered how he could possibly be interested in it. But he bought one and took the trouble to tweak it, with excellent results. This began his interest in projection TV. Cohen still reconditions Electrohome projectors, though his fingers are crossed because he has to warranty them everywhere. He sells a lot of projectors; most don't break and he comes out all right. But once he had to bring one home from London and replace both power supplies, at a cost of $3000.

Electrohome is owned by a rather old man who is shedding divisions, including one that makes computer monitors. Still, Electrohome is a viable projector maker. Another manufacturer, Vidikron, coughed and stumbled but got back on its feet. Yet another, Madrigal, buys its top three models from Electrohome; Harman's top model, with 9" tubes, is also from Electrohome. The models with 8" CRTs look about as good but project somewhat less light [and have slightly lower resolution — DJW].

The timing for reconditioning projectors for HDTV is good because many CRT-based projectors are available now that the computer market is going over to cheaper DLP and LCD projectors. The CRT models look very good for video. They have a deeper black, which is important for video, though not for computer displays.

The cost of the small CRTs used in projectors is quite high — about $900 each for 7" CRTs. The transition is happening very quickly, driven by the price difference. US Precision Lens, which makes lenses for CRT projectors, has announced that it is stopping production, somewhat to the consternation of projector manufacturers. More than the usual number of CRT projectors is being retired. Hi-Rez has a large stock of them in a warehouse in Ashland.

Aside from more sophisticated projection equipment and a nicer-looking facility, Cohen has a device from DigiVision originally designed for enhancing surveillance images — a detail enhancer. It is not a 'video treble' control, which adds overshoot and ringing. The white doesn't shoot way up, since the DigiVision enhancer is additive rather than multiplicative.

The equipment is very expensive but there is little to see yet. DVD looks wonderful as is, but HD-DVD is not available yet. Video cameras are more sensitive than film, and the lenses are different, so there is not the depth-of-field problem film has. Images can be in focus from foreground to background. Cohen's wife sees the HD video image as flatter than film because it is all in focus. Cohen uses a projection monitor even for computer applications including email, though it is critical to avoid burn-in from computer images, which always have the bright parts at the same place on the screen.

3-D HDTV is possible using alternate-shutter glasses; the bandwidth is sufficient. The real trick is to build a machine to scan at the necessary rate. DLP projectors can easily run for alternate-field 3-D — 120Hz vertical. HDTV rear projectors and most others using CRTs cannot do that.

The available ways to view HDTV include standalone rear-projection sets, such as the Zenith in the display room (a 64", with HDTV tuner), or DLP and LCD projectors such as the Seleco field-sequential DLP on the ceiling. [The better-quality CRT projectors still give the best-quality HD images — DJW.]

It is also possible to view HDTV on computer monitors, many of which have the required resolution if you don't mind watching a small, though very sharp, picture. Cohen has computer-based DVD players, which can be used with projection monitors as well. You buy a PC that includes a DVD-ROM drive and a special graphics card that processes the video. Computer-based machines can convert the video to any scanning rate, and don't have to run at 30 or 60 fields per second. Scanning at 72 fields per second, they can avoid the 2-3 pulldown problem that occurs with film at 60fps. You can now pick up a video card and DVD-ROM player for $300, install them in a 300MHz PC, and the results look better than anything you can buy in a standalone DVD player.

Foster: What are you using to pick up HDTV off the air? Cohen: a regular UHF antenna, and a dual LNB (receivers for two different satellites via the same dish) for DirecTV. The HDTV tuner he uses is the RCA DTC-100, which has RGB out and is so good at such a low price that it is universally popular. It has 3 tuners (DirecTV, terrestrial DTV broadcast, and analog NTSC broadcast or cable). It can configure the output for regular 480i, or convert everything to 1080i or 540P, each configurable for 16/9 or 4/3 aspect ratio, and it costs only $650. The only weakness is that you can't adjust the aspect ratio from the remote.

Changing among aspect ratios can be a problem, because the way they are treated is not consistent. Channel 7 (Boston) runs 4/3 as an inset in the 16/9 image. However, the receiver also handles aspect-ratio formatting, so if you tell the machine it's a 4/3 display, it puts gray bars left and right; it will fill the screen width with a 16/9 image and put gray bars top and bottom. The problem of legacy 4/3 footage having the top and bottom lopped off to display in 16/9 is not a technical problem but rather a poor artistic decision. Gray bars are important in order to avoid uneven burning in the screen, which will cause the sides or top and bottom of the image to appear brighter than the central portion, which is common to both aspect ratios.

The Seleco projector uses a mechanical filter wheel like the early 1950s CBS color television system. It uses a single DLP array for the three primary video colors. Despite the amount of light power lost into the filter wheel [and converted to heat — DJW], this projector is very bright and there is no visible pixelation. [Cohen pointed out a side effect of sequential color is that if you move your eyes rapidly across the screen you see color where there was none! — DBH.] The DLP is more efficient than LCD because it doesn't waste as much area around each pixel. With only one set of DLP mirrors, the color balance is automatically good. There can be a problem of unevenness with DLP or LCD projectors in the dark areas of images, since the black level can vary. This problem does not occur with 3-CRT projec-

tors, because these generate brightness directly rather than by subtraction.

Foster: Will there ever be a true 16/9 LCD? Cohen: Yes, but that is not where the market is yet. Even LCD displays used in theater presentations use LCDs with a 4/3 aspect ratio. Either they do not use the top and bottom of the LCDs, or they use anamorphic projection lenses. The displays seen in theaters that everyone is raving about are 1280 x 1024, anamorphically stretched.

We viewed a number of channels in HDTV. The image quality was variable. None were from true HDTV sources. In some cases the NTSC image transmitted by HDTV looked better, and in some cases worse, than the one coming over the analog TV channel. Channel 5 was broadcasting *The Ten Commandments*, shot in widescreen format, but the HDTV signal was only the panned-and-scanned 4/3 aspect ratio image that was also being shown on the analog VHF channel, stretched to 16/9 width so the actors all looked shorter and fatter. The color was also less vivid than on the analog channel.

Channel 25's HDTV channel was also broadcasting the same image as the analog channel but with better quality, in a 4/3 aspect ratio, displayed with gray bars at the sides that were part of the broadcast. Since the Channel 25 signal was coming directly from a digital feed, color bleed was not as bad as on the analog channel, and there were no artifacts of the color subcarrier even though the show was the animated cartoon *King of the Hill*. Cartoons are some of the most demanding material for display on analog television, due to the sharp edges and abrupt color shifts [they can be hard on digital video, too, especially if manually drawn as the old Disney cartoons were, frame by frame. The lack of stability of all the edges frame-to-frame makes realizing high compression ratios quite difficult — DJW].

The HDTV channels all had an extra logo superimposed on the picture. On Channel 5, there were two different logos superimposed one above the other on the panned and scanned version of DeMille's epic — about as crass a presentation as is possible. John S. Allen: Whatever you may think of DeMille, this film was a work of art, and the artists deserve more respect than to paste a label over the images they created.

Channel 25 had the HDTV logo outside the image and the regular logo inside. Cohen remarked that these were dim, translucent logos; the BBC TV feed uses a bright-white one, which would burn itself into your CRTs if you watch that channel much. John S. Allen: We used to have an FCC in this country that set standards, including the separation of program content from commercials, and prohibiting signals that would damage your receiver. Now we haven't.

When will we see broadcast HDTV? Cohen said that there is very little being broadcast yet, though DirecTV has a demo channel. It repeats a demo loop till midnight and then runs a movie. There is also not much 5.1-channel audio being broadcast. Pro-Logic derived from the stereo sounds better than the 2 or 3 channels the broadcasters are sending out. Though many movies are now available in widescreen format on DVDs, these still have only 480i lines vertical rather than 720p or 1080i.

The meeting moved to the large viewing room, where we saw clips from movies, compared line doublers, and checked out the detail enhancer. One setup derived the RGB signals for the projector from the PC with DVD-ROM player and enhanced video card which Cohen had described. Image quality was generally excellent, though the true HDTV of the DirecTV HTDV loop was noticeably sharper than the other sources.

[One problem that showed up is DVD-unique. Some DVDs, such as *The Fifth Element* (a favorite demo DVD due to its excellent film-to-video transfer and lots of action), defaults to the Dolby Pro-Logic (Dolby Surround) soundtrack. The viewer has to go into the DVD's menu to select the 5.1-channel soundtrack — DJW.]

CLASSIFIEDS

Lexicon DC-1 (DD/DTS; S/W v3.1 with newer-design Lexicon remote control, latest Logic 7 software, but no Surround EX; DTS S/W v1.2; srp $4500).

Two working Apt 1 amplifiers plus two others, each with one working channel, that can be made into a working stereo Apt 1 (srp $748).

Teac AN180 Dolby B Processor (monitors record and playback simultaneously) (srp ~$200).

Allison Electronic Subwoofer (srp $290).

Call or email to discuss items and pricing: David J. Weinberg, 301-593-3230; **WeinbergDa@cs.com**.

Marantz 7 and 8B originals with manuals, bench test tags and warrantee certificates, all serial-numbered. Oscilloscope tuner model 2110 solid state, with manual. All in beautiful condition. Call to discuss offer(s); Jim Lee, 207-787-3225.

Behringer equalizer ($500). All digital, it performs an amazing number of functions. The only thing it doesn't have is a manual that you can understand (made in China).

Call or email: Alvin Foster (617-282-8335; **amfmail@gis.net**.

The Boston Audio Society *Membership Application 2000*

Name *(PLEASE PRINT ALL FIELDS)*_____

Address_____

City, state, zip, country if not USA_____
Optional:
Occupation_____Phone no(s)_____

Email, BAS usage only *(PRINT EXTRA CLEARLY)* _____

Status:
Renewal_____ New Member_____ Address change_____
Current members receive a volume of the *Speaker* and, for zip codes 017__ - 024__, monthly meeting notices, which may be either printed or emailed (or both); please let us know your preference.

Dues

_____ $35	Basic membership (overseas** $55; includes *Speaker* by airmail); Basic dues cover only a portion of publication costs.
_____ $45	Contributing membership
_____ $75 and above	Supporting membership (these members will receive the BAS Compact Disc vol. I when available)
_____ other	(also indicate here if you have already renewed for $35 and wish to make a contribution)

Overseas members only may charge their dues and/or contributions to MC/Visa by sending email to **dbsystems@attglobal.net or writing to: DB Systems
PO 460
Rindge, NH 03461 USA.

All checks must be in $US and made payable to the **Boston Audio Society**; **foreign checks ***must be from banks with US affiliates***.

Samples and back issues
Published issues of the *BAS Speaker* contain a trove of audio information. While there have been 23 volumes since 1972, we suggest that new members consider acquiring vols 17 on. For contents refer to this issue or **http://bostonaudio.home.att.net/archives/**, and write for information about availability and costs.

Directory
We have a membership directory and will provide a copy to members who request it. Tell us if you are willing to be listed, and if so how:
____no listing ____name only ____home phone ____work phone_____email.

To receive a copy of the directory, please send a self-addressed stamped envelope with a note.

Constitution
To receive a copy of the BAS constitution, please send a self-addressed stamped envelope with a note.

Fame
The *BASS* can always use articles on audio matters. Send them to the editor, David J. Weinberg, *BASS*, 10705 E. Nolcrest Drive, Silver Spring, Maryland 20903-1006; 301 593-3230; **WeinbergDA@cs.com**.
Your byline will appear in good company, as a number of our contributors have gone on to eminence as audio writers and editors. Note that for meeting summaries there is compensation.

Send this form to:
The BAS PO 211 Boston, Mass. 02126 USA.

Send all membership correspondence there as well, but not *Speaker* submissions. Thank you.

BAS

THE BOSTON AUDIO SOCIETY
PO 211
BOSTON, MA 02126

Address service requested

BULK RATE
U.S. POSTAGE
PAID
BOSTON, MA
PERMIT 53295