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INTERVIEW
STEVEN EPSTEIN
PRODUCTIVE PRODUCER
Music in Motion

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Music from Behind the Brain

Dear Editor:

Regarding Edward T. Canby's column in the February 1990 issue, are we taking classical music for granted by treating it as background noise material? So thinks Mr. Canby, who feels Mozart and Beethoven get no respect! I've come to the conclusion that so much of listening, even if it's background listening, is better than none.

Films, art, music, and books have all benefited from, and been hurt by, cheap editions. This enormous distribution of Western cultural artifacts, afforded through modern technology, has made the artifacts disposable. A thrice-in-a-lifetime chance to hear a symphony is no longer the big deal that it was in the 19th century. A Compact Disc contains two symphonies and over 70 minutes of music, always available at our convenience. Therefore, the music becomes less precious. If your attention isn't completely focused, well—there's always next time.

However, I've found that the music really does register in the back brain. The next play, it usually gets my undivided attention. When I'm distracted, a composer will leave little fragments of his music tinkling in my head, and I've discovered that my inattention has actually enhanced my enjoyment of music! Therefore, full attention at full audio volume, über alles, isn't the only way to enjoy recorded music. A little haunting carries a lot of magic.

George Nussbaum
New York, N.Y.

Sunbelt Show

Dear Editor:

This is to announce that the Atlanta Audio Society, Inc. is sponsoring the two-day Sunbelt Audio Show in Atlanta on Saturday and Sunday, August 18th and 19th, 1990. The show will feature public-entry ticket sales and allow exhibitor retail sales.

Space has been reserved at the Radisson Inn and Conference Center in Atlanta. A minimum of 30 guestroom-sized spaces and 10 large-dimension exhibit spaces will be available for both live-demonstration and static displays. High-end audio/video manufacturers, distributors, dealers, recording companies, and audio/video publishers are invited to participate.

As far as we know, ours is the first audio society to sponsor a show of this scale. Please write to the Sunbelt Audio Show, 1160 Cumberland Rd. N.E., Atlanta, Ga. 30306 or call (404) 876-5659 for further information.

Charles G. Bruce, Jr.
President, Atlanta Audio Society
Marietta, Ga.

Direct to What?

Dear Editor:

February 1990's "Spectrum" contained a report on a recent "direct-to-disc" recording session produced by Tam Henderson of Reference Recordings. Mr. Henderson felt that many recording companies complain that their CDs do not sound like the original master. He also suggested that this particular "direct-to-disc" production sounded exactly like the original, since there was, in effect, no original recording to begin with.

Okay so far. However, the reasons why many manufacturers are not pleased with the sound of their Compact Discs are the failure of A/D converters to maintain 16-bit linearity and the imperfections in the analog filters associated with them. Serious audiophiles can certainly attest to this, and have been complaining about it since the first Compact Disc was auditioned. The fact that a "direct-to-disc" session took place in order to bypass an analog master recording process does not, in and of itself, guarantee accuracy. An analog-to-digital (A/D) step was still necessary in order for a Compact Disc to have been made of this performance.

Whether the Compact Disc was ultimately manufactured as a result of an over-the-air transmission or from an accurately archived analog-to-digital recording, I submit that the results would have been identical!

As a publicity stunt, the effort drew attention to the problems associated with the front end of the digital process. As an exercise in solid engineering practices, I would question if the effort was worth it, particularly if there were no corresponding benchmark archival devices available to verify the sound of the original audio feed, as sent by Mr. Johnson to Mr. Harley.

Brad S. Miller
By The Numbers
Incline Village, Nev.
There can be no standard of quality without a Reference.

This is especially true in the audio field where everyone, from studio engineers to manufacturers and reviewers, needs a solid benchmark for accurate sound.

For twenty years, the KEF Reference Series has been a standard by which all other loudspeakers have been judged. The latest benchmark for loudspeakers is the KEF Reference Series Model 105/3. The 105/3's draw upon KEF's groundbreaking research into the interaction of speakers and room acoustics: coupled-cavity bass loading for deep bass from the smallest possible enclosures; conjugate load matching, which uses amplifier power to its full advantage and KUBE, KEF's proprietary bass equalizer, which produces the bass of cabinets eight times as large. The four-way 105/3's are the first Reference Series speakers to use Uni-Q technology.

Uni-Q: the first coincident-source drivers.

KEF Uni-Q is an engineering breakthrough: the first truly coincident-source driver. Many audiophiles know that an ideal speaker would be a point source; unfortunately, multiple-driver systems often fall far short of this ideal. With Neodymium-Iron-Boron, the most powerful of all magnetic materials, KEF has created a tweeter so small that it can be placed inside the woofer's voice coil. In effect, every Uni-Q driver is a point source.

Moreover, the woofer cone acts as a wave guide for the tweeter and controls its dispersion. The entire frequency range arrives at the listener's ears at exactly the same time, producing seamless sound no matter where the listener sits. Unwanted reflections within the room are actually reduced, and the music you hear is less colored.

If you appreciate music, audition the Reference 105/3's. For any audiophile system, they are "standard" equipment.
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Now that you’ve upgraded your system to include CD technology, your headphones must meet a higher standard.

That’s why you need AKG’s high output parabolic stereo headphones.

The K280 features a computer-positioned pair of matched transducers in each ear cup to provide transparent, interference-free sound at the center of your ear.

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AKG's K280 headphones. The standard of quality for the digital era.

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516-349-9180

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Readers report that both the LP and Prof. Lirpa are dead. But are these reports completely accurate?

On Death and Lying

Dear Editor:

At long last, there is word of Prof. I. Lirpa. I learned from Liam, a close cousin of his, that Lirpa is dead. Liam said Lirpa was involved in a head-on collision with his new Vehicular Compact Disc Reproduction System (VCDRS). Also, he told me that we should not grieve for Lirpa because he was dangerous. He was fiendishly clever, as were the devices which he cooked up and you unwittingly published. Now I ask you, why did no one write to say whether or not these concoctions worked? I'll tell you. They were designed to self-destruct, with a large explosion. That's why no one wrote. The fiend!

Also, he had become boring, which is more reason not to grieve. But I must warn you: Should you receive a communication from someone who claims to be Lirpa but is not dead, don't believe him. On top of everything else, the man was an impostor and a liar.

Have a nice day.

Ahyim Khid'n
Big Bull, Mont.

Editor's Note: False reports of Prof. I. Lirpa's death are as common as multipath in New York City and, likewise, should be tuned out. As for your claims of self-destructing equipment, we have always known that Lirpa wanted audiophiles to get a bang out of his products, but such "explosive" accusations are totally unfounded. In fact, I am right now listening to a CD on Lirpa's outstanding VCDRS (reviewed in the April issue), and I have had absolutely no problems.

R.I.P. LP?

Dear Editor:

With regard to the letter from Lloyd E. Townsend, Jr. about the price of records in stores versus the price from clubs and independents (January), the bottom line is: Who cares about the price of records? LPs are dead.

In most places where I shop, the CDs are less than $10. Trying to pawn off black plastic at any price should be illegal. I have not listened to any of my records in years. Even at $2 apiece, I don't want them.

C. Engebretsen
Hamilton Square, N.J.
How to make an Onkyo receiver as good as its competition.

If we wanted to make an Onkyo receiver as good as our competition, it wouldn’t be too hard.

First, we’d remove our proprietary heavy duty transformer, replacing it with a commonly used smaller version. Unfortunately, this means less current capability, resulting in compromised low impedance performance and compressed musical dynamics. Sonic anemia.

Next, we’d substitute a much lighter, cheaper heat sink. Of course, this greatly increases the chance of thermal overload when the music’s cooking, but since we’d already be using a low capacity transformer, the music would only be half baked anyway.

Room-to-room remote capability would have to be sacrificed. After all, if we’re not concerned with performance, why should we bother with convenience?

As a finishing touch, faceplates & chassis would be plastic instead of metal. True, that wouldn’t give us the same structural integrity. But we’d be cutting so many other corners you’d probably never notice the difference.

Now, we could do all these things to an Onkyo receiver. But then we wouldn’t have a component as extraordinary as our new TX-866, with 185 watts per channel of dynamic power, plus the ultimate in room-to-room musical control.

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Loss of Phono Output

Q. I have a problem with my turntable. Recently, between records, the sound disappeared. When I turned the volume way up, I could hear very faint sound. Does this suggest what the problem may be? The rest of my system works fine. Could the phone button on my receiver be defective? Thestylus is new, and the cartridge leads look fine and are snugly connected to their terminals. No, I didn’t have the tape monitor button pressed on my receiver.—H. Moski, Branford, Conn.

A. Any number of things could have gone wrong.

If your turntable mutes between records, it is possible that the contacts which short the cartridge output during this time are not reopening. You will have to examine the mechanism to see how the muting is accomplished. A “follower” may have become distorted in some way, preventing it from riding on the cam that normally forces the muting contacts apart during play.

Yes, the phono switch on your receiver could be defective. It’s also possible that its contacts could be dirty, but I think this is not the case when both channels have failed at the same time. If dirt were the problem, one channel would probably still play properly, or you might hear distortion rather than silence from one or both channels. Contact cleaning sprays are available for cleaning dirty or oxidized contacts, however.

Perhaps an IC common to both phonograph channels has failed.

If you can obtain a second receiver/integrated amplifier, connect the turntable to it and see if your records play normally. If they do, you will know that nothing is wrong with the turntable. If you are greeted with silence, the turntable needs repair.

Audio Quality and Wall Plug Polarity

Q. I can’t imagine why or how reversing the polarity of the wall plug will bring about sonice differences. About all I can suggest is that perhaps there is a slight background hum with the plug polarized in a certain direction; when the plug is reversed, the hum disappears. The hum may not have been noticeable, yet with it gone, you might hear a more open sound. Such a small amount of hum probably could mask some of the subtle elements of the music.

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For over a quarter-century Bryston has been committed to designing and producing audio products with musical accuracy, reliability and value as our primary focus. It is widely known that Bryston’s policy on the warranty of our products has always been extremely generous if ever required. To further enhance our long term commitment Bryston is instituting a 20 year warranty program as of January 1st, 1990. This, as far as we know, is a first in our industry and as such will further demonstrate our continuing dedication to our products and customers.

Musical accuracy is reflected throughout all Bryston power amplifiers. This includes the necessity for wide-band transient accuracy, open loop linearity ahead of closed loop specifications, and power supply design as an integral part of the overall sonic and electrical performance of a power amplifier.

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We discovered that some parameters of transistors must be controlled as much as 100 times more closely before their contribution to audible distortion is rendered negligible.

Each of the steps or stages in every Bryston amplifier, from the input section to the output section, without exception, are designed to optimize the musical experience. Bryston takes very seriously the correct functioning and long term reliability of its products.

This new twenty year warranty is also retroactive. It includes all audio products previously manufactured and sold under the Bryston name. This warranty is also fully transferable from first owner to any subsequent owners.

Bryston has always been dedicated to designing and producing audio power amplifiers, crossovers, and pre-amplifiers that deliver uncompromised performance, outstanding reliability and exceptional value. We believe our new 20 year warranty is one more example of our continuing commitment to this ideal.
A Tangential Question

Q. Which would you buy to begin a stereo system: A receiver or a separate tuner, preamp, and power amp? (Price is important.)—Eddie Crawford, Tuscaloosa, Ala.

A. While your question is not directly related to tape recording, it is a pivotal question for audiophiles, and I would like to answer it. I vote for a receiver, particularly if price is important. In fact, I might vote for a receiver even if price were a secondary consideration, because good-quality receivers today can pretty much rival the performance of separate components. Another important advantage, in many cases, is that a receiver saves space. Considering that one may need room for a CD player, turntable, cassette deck, and quite possibly other components—particularly signal processors—it may be quite a boon to combine three components into one chassis.

Open Reel vs. Cassette

Q. I am using an old open-reel deck for recording and playing old radio programs. My format is similar to that of other collectors: I tape four mono tracks onto a single reel. I can really pack a lot of shows—12 half-hour programs—onto an 1,800-foot reel at 3¾ ips, and using white-box tape enables me to get by very cheaply.

The point of all this is: By saving a few dollars on tape right now, am I investing time and money in a dead technology? I could record these shows onto cassette in a similar manner—four separate mono tracks—but I worry about not having enough tape to cover a show and being vulnerable to tape dropout. I know my present deck will eventually stop working, and I worry about the availability of open-reel decks, at least in my price range. Will new open-reel decks still be available in 10 years? While my collection is small at this time—about 50 reels—I can see the possibility of eventually having several hundred reels dedicated to old radio shows. What are your views on the question of open-reel versus cassette for my expanding library?—Steve Mallon, Chicago, Ill.

A. I am inclined to advise you to shift to cassettes. While your open-reel deck is still in good repair, you can dub onto cassettes. For $300 or less, you should be able to get all the quality you need for your purpose, possibly even better than your open-reel deck.

The disadvantage of cassettes is that you will get much less recording time per tape. If you use C-120 cassettes—which now yield quite satisfactory results, according to a number of readers—you will get two hours per cassette, instead of the six-plus hours that an 1,800-foot open reel provides at 3¾ ips. However, this disadvantage is partly overcome by the fact that a cassette takes up considerably less storage space than does a 7-inch reel.

I am puzzled by your statement about recording four mono tracks onto a single reel. Possibly an exception exists, but none of the cassette decks I know of permit recording four mono tracks in one direction and then two in the other. If a deck could record one track at a time, or if you could modify a deck to do so, you would have a problem: Tracks one and two are very close together, and so are tracks three and four. Hence, you will get much less recording time per tape. If you use C-120 cassettes—which now yield quite satisfactory results, according to a number of readers—you will get two hours per cassette, instead of the six-plus hours that an 1,800-foot open reel provides at 3¾ ips. I am inclined to advise you to shift to cassettes. While your open-reel deck is still in good repair, you can dub onto cassettes. For $300 or less, you should be able to get all the quality you need for your purpose, possibly even better than your open-reel deck.

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If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1633 Broadway, New York, N.Y. 10019. All letters are answered. Please enclose a stamped, self-addressed envelope.
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ALTEC LANSING LOUDSPEAKERS FOR THE WELL TRAINED EAR.
For some decades, tonmeister training in Germany has provided the nexus between audio technology and the musical/artistic judgments which make for successful recording and broadcast engineering. Michael Dickreiter is a product of such training and is currently on the staff of the teaching facility of the German Broadcast Systems in Nuremberg. While the complete tonmeister course includes rigorous musical training, it is the technical side of the discipline which is the subject of Dickreiter's book.

Stephen Temmer is well known to the international audio community, largely through his pursuit of high standards in the studio technologies of disc mastering and microphones. Since his retirement from Gotham Audio, he has taken up a number of projects of personal and technical interest. If his translation of the Dickreiter book is an indication of what is to come, we should all be grateful.

In the author's 1983 preface, he states that the essential aim of this book is to relate recording environment, sound source, and microphone technique as the integral topics they are. Matters of console architecture, recording, signal processing, and the like are not covered here because they are secondary to the task at hand. The book concentrates on three major areas: The recording environment, sound sources, and microphone pickup. I will cover each of these in detail.

The acoustical requirements for music are covered in detail, with practical emphasis on reverberation as a function of room size and on the notion of reverberation radius. This last concept is then related to the various directional microphone patterns, noting their capability of altering the effective reverberation radius through their various on-axis and random-incidence sensitivities.

The section on sound sources begins with a discussion of the various kinds of musical ensembles, both large and small. Such matters as instrumentation, seating plans, and dynamic range are treated; this is followed by a general discussion of steady-state tone analysis, including a useful display of formants (characteristic colors) of the major instrumental groups. Overall frequency and dynamic range properties of the major groups are presented, as are the notions of level, loudness, and the effects of dynamics on instrumental timbre. Dickreiter details the basic acoustics, playing techniques, and radiating characteristics of each major group of instruments. The first two sections account for slightly less than half of Tonmeister Technology's content, and of course may be viewed as prerequisites to the book's major technical thrust.

Microphones are analyzed in detail, in terms of operating principles, basic patterns, frequency response, and departures from ideal performance. The fundamentals of spatial hearing, both in nature and via two loudspeakers, lead naturally to an overview of stereo recording. The basic techniques of coincident (X-Y), spaced (A-B), and artificial-head recording are treated in terms of their fundamental localization (spatial) characteristics, mono compatibility, signal coherence, channel correlation, and general application. Methods of stereo signal monitoring are covered in terms of standard level metering and correlation metering, as well as acoustical monitoring requirements.

Following this introductory section, intensity stereo, in both X-Y and M-S forms, is analyzed in detail. Studio setup methods are presented, and the user is given hints on adjusting the microphones for optimum image width on the "stereo horizon" (stereo soundstage). Graphic material covers each step here, and various X-Y pairs are shown in their equivalent M-S forms and their useful stereo pickup angles. Practical advice is given regarding stereo stage width for various sound sources, and the all-important observation is made that only diffuse (reflected or reverberant) sound should reach the mikes outside the main pickup angle. The author clearly points out the following advantages of M-S over X-Y:

- Remote control of pickup angle.
- (With X-Y, the microphones themselves have to be physically adjusted.)
- Clarity of mid-stage images due to the fact that those images lie on the main axis of the M microphone. (In X-Y, the mid-stage events are picked up from off-axis directions by both microphones, thus incurring some risk of off-axis coloration for those images.)
- Flexibility in creating a wide range of useful patterns, as required by the recording venue. (In X-Y, each desired pattern requires an actual pair of microphones with that pattern.)

Multi-track recording is discussed as another method of using intensity relationships in creating an array of stereo images via panpots. The ideal requirements set down by the author are:

- Each microphone should essentially pick up sound from one instrument, so that leakage and off-axis coloration are minimized.
- The musicians should be placed in the studio so that louder instruments...
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Tonmeister Technology is an accessible and valuable book for the lay person as well as the recording engineer.

Do not swamp out the softer ones because of proximity; acoustical baffles are helpful here. (At the same time, the maintenance of eye contact between the players is essential.) Directional microphones should be used almost exclusively to minimize leakage.

- Mikes should be closely placed—even directly on the instrument—for greater presence.
- The spaced, or A-B, technique is then discussed. Here, microphones are placed sufficiently far apart so that localization on the stereo stage is highly dependent on timing cues picked up by the microphone pair. The advantages and disadvantages of this method are fully detailed.

Dickreiter then turns to the subject of quasi-coincident microphone arrays (here referred to as "mixed stereo techniques"), in which both amplitude and time differences contribute to stereo localization through spacing of the microphone pair at about ear distance. Both splayed directional microphones and omni microphones with a baffle between them can be used to achieve the desired left/right amplitude differentiation.

For each of these many techniques, the author clearly explains the advantages and the problems, giving the reader a clear idea of when to use a specific technique.

The use of accent microphones (here called "support" microphones) is given a thorough treatment and should be required reading for all audiophiles who damn the idea outright. It is true that a heavy hand on accent microphones can ruin a recording, but if this technique is properly implemented, almost any recording involving large resources can be made better.

Accent microphones are subsidiary to the main pickup array and are intended to contribute to the stereo presentation in the following ways:
- Adding clarity and presence. The main stereo pickup microphones are normally much closer to the front of the orchestra than they are to the middle and back. Thus, there is a chance that the instruments farther away will be picked up with less presence. A properly spaced subsidiary stereo pair, back in the orchestra, will correct this. The job is made easier for the tonmeister if the subsidiary microphones are delayed electronically so that normal timing cues are left intact.
- Correcting subtle balance problems. Many times, and for many reasons, a given player or section may need to be recorded at a higher level for proper musical balance.
- Assisting in localization. Either in stereo pairs or in mono, support microphones can help define image posi-

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Clearly superior, the DQ-20 stands as the ultimate stereo vehicle that will transport you into the realm of pure sound. This incredible achievement lets you surround yourself with the captivating reality of brilliant musical performances and listening pleasure.

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- Pop
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Aerosmith—Pump. Love in an Elevator
Gun's N' Roses—Use Your Illusion II
Janet Jackson—Rhythm Nation 1814
Jr. Walker—You Can Have Her
The B-52's—Cosmic Thing. Love Shack
Don Henley—The End Of Innocence
Elaine Eltes—So Far So Good
Big Audio Dynamite—Megastop
Camper Van Boethoven—Key Lime Pie
Paul Carrack—Groove (Crysalis)
Kate Bush—The Sensual World (Epic)
Paul Kelly And The Messengers—So Much Money Now—Just Mail the Card.
Quincy Jones—(Chrysalis)

On The Cutting Edge

Toad, The Wet Sprocket—Fate (Columbia)
The Blue Nile—Hats (A&M)
Julia Fordham—Porcelain (Columbia)
Van Halen—Streets Ain't Like They Used To Be
Paul Carrack—Groove (Crysalis)
Kate Bush—The Sensual World (Epic)
Erasure—Wild (Reprise/Sire)
Bryan Ferry/Roxy Music—Street Life (Reprise)
Peter Gabriel—Passion (Geffen)
Lloyd Cole & The Commotions—1984-1989 (Columbia)
Pixies—Doolittle (Epic)
The Cure—Dance (Epic)
Indigo Girls—Strange Fire (Epic)
Reba McEntire—Live 300.838
Randy Travis—No Holding Back (Virgin)

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The Do the Right Thing—Selections—$6.95 per CD
The Jesus And Mary Chain—Automatic (Warner Bros.)

The Jesus And Mary Chain—Automatic (Warner Bros.)

Monty Python—Men At Work (Epic/Reprise)

Don Henley—The End Of Innocence
Elaine Eltes—So Far So Good
Big Audio Dynamite—Megastop
Camper Van Boethoven—Key Lime Pie
Paul Carrack—Groove (Crysalis)
Kate Bush—The Sensual World (Epic)
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Monty Python—Men At Work (Epic/Reprise)
Instead of giving us the usual short, pithy entries with big color pictures, Stambler approaches his subject like the music reporter he is. Entries unfold in little stories, sprinkled with newspaper quotes and other touches which humanize the artists under discussion. This makes for a very readable style and a rather hefty volume (881 pages!). Instead of discography lists, which are convenient aids, Stambler organizes each essay around record releases, so basic dates and labels are there, but you have to read or scan the article to find them. Band entries are preceded by a handy listing of person-

cations more specifically. The author cautions the user here and suggests that careful rolling off of high frequencies, along with time delay and proper level relationships, may be essential to the process.

Binaural recording is discussed briefly, and its role in conjunction with other recording techniques is underscored. An interesting section follows, in which the author provides guidelines for close pickup of instruments—as in a studio multi-channel context. The basic approach the author takes is not to lay down the law, so to speak, but rather to show a range of possible microphone placements, with descriptions of the sound quality over that range. All of the instrumental groups are covered here.

Speech recording is covered, in terms of microphone pattern choice and correct positioning to avoid popping and adverse reflections from the desk top. Field jobs such as interviews and round-table discussions are also detailed. The last topic in the microphone usage section is the recording of vocal soloists and ensembles.

The final section deals with the important topic of recording aesthetics and with the definition of recording as an art form in its own right. Such matters as setting up the stereo stage, both in terms of stage width and depth, are given a thoughtful discussion as to the seasoned recording engineer. It contains just about everything as to the seasoned recording engineer. It contains just about everything.

In general, Tonmeister Technology is a most accessible book and can be of great value to the lay person as well as to the seasoned recording engineer. It contains just about everything the concerned Audio reader is ever likely to want to know about recording. The graphics are detailed but succinct, and there are no equations! I highly recommend this book.

John Eargle


All music dictionaries are not alike, as evidenced by Irwin Stambler's The Encyclopedia of Pop, Rock and Soul, originally published in 1974 and now extensively revised and updated.

The section on accent mikes should be required reading for those audiophiles who damn the idea outright.
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This Encyclopedia's entries unfold as little stories, with touches that humanize the artists they discuss.

Heavy metal gets shortest shrift; you'll look in vain for Def Leppard or Metallica, for instance.

Updates to the first edition are considerable, as you might expect. Once in a while, you can detect the throwbacks; Alice Cooper quotations, for example, are mostly from 1971, clearly a pickup from the earlier edition. In other instances, Stambler reflects critical opinions which aren't necessarily current. For example, the essay on Led Zeppelin favors the negative critical view popular in the late '70s, which has been pretty much reversed by now. Generally, Stambler manages to stay clear of "criticism," remaining fairly objective and opinion-free. And actually, the fact that this book was first published in the early '70s and only now updated, some 15 years later, means that many artists who do not appear in a number of the more contemporary encyclopedias are still present (e.g., The Youngbloods).

There are occasional lapses in editorial consistency, especially regarding dates, which too often appear as "late '70s" rather than something more specific. For example, in the essay on The Supremes, Stambler has the members of the group as 15 years old in 1959, winning an audition with Motown's Berry Gordy in 1960, finally getting signed as "high school girls" . . . in the late 1960s, and cutting their first record in 1960. Though forgivable in a work this monumental, such errors can still be annoying.

Stambler's Encyclopedia has several curious appendices, including lists of RIAA gold- and platinum-record award winners, Grammy Award winners, and nominees and winners of music Academy Awards. At the end is an odd bibliography consisting not of other reference books, but mostly of newspaper and magazine articles apparently used by the author.

Irwin Stambler's revised Encyclopedia of Pop, Rock and Soul probably won't be the only book on this subject on your bookshelf, but it will be a valuable addition, especially with its wide range of artists, including some of the more obscure groups of rock's rich and colorful past. These virtues, combined with an entertaining style, make the work a good companion to your record collection. Michael Wright
For FM Stereo Listeners Who Demand More Than Background Music...
For serious music lovers, the quality of FM stereo is often unacceptable except as background music. Adcom's new GFT-555 II tuner confronts these inadequacies, and in most instances, makes it possible for FM broadcasts to sound as good as the transmitted signal allows.

**Adcom Offers A Note of Encouragement.**

FM performance depends, in part, on where you are located with respect to the broadcast stations. Most tuners perform satisfactorily in suburban areas. But in cities with tall buildings and strong stations crowding the dial, or in rural areas where signals are weak and received from many directions, FM reception quickly deteriorates.

Through design ingenuity and relentless attention to detail, the new Adcom GFT-555 II addresses these problems. By finding the optimum balance of sensitivity, selectivity and low distortion, Adcom once again has created a component that compares sonically to others costing much more.

Ask your Authorized Adcom Dealer for a demonstration of this remarkable new tuner. You’ll be encouraged to know that you can now enjoy FM broadcasts more than ever before...and not just for background music.

*Shown with the GFP-555 II and the GFA-545*
New And Improved
The design of the new GFT-555 II is based on the highly acclaimed Adcom GFT-555. Sonic improvements have been achieved by using upgraded circuitry and the highest quality component parts. The GFT-555 II is now the logical complement to the newest and finest Adcom preamps and power amplifiers.

The Adcom GFT-555 II FM Stereo/AM Tuner

Pure Performance
Adcom designers have done everything possible to reduce noise and distortion (the major enemies of FM reception) to a minimum in the GFT-555 II. Ultimately, it is the fact that everything works so well that makes this tuner a joy to own.

Details You Can Hear
A new low-loss PC board is used to minimize signal degradation. Laboratory-grade component parts, including 1% Roederstein metal-film resistors and metal-film capacitors in critical areas, assure outstanding performance and maintain their quality for longer periods of time.

Buffered output stages using “Class A” linear amplifiers (based on the design of Adcom’s high-performance GFP-555 II preamplifier) deliver a dynamic sound quality not previously available in other tuners, regardless of cost. An all new multiplex decoder also significantly improves listening quality.

The Importance Of Compatibility
Its complete compatibility with Adcom equipment (as well as anyone else's) allows the exceptional qualities of the GFT-555 II to be fully realized in your own home music system. (It is also usable as a tuner source for Adcom's new multi-room/multi-source remote control system.)

A switch-adjustable output with three positions (0.5V, 1V and 2V) permits matching to the input requirements of all preamps and passive control devices (such as Adcom's SLC-505) as well as the output levels of cassette recorders, CD players, etc.

And, its new, ultra-low output impedance of 100 ohms minimizes interaction with connecting cables and preamplifiers.

More Sound, Less Money
Adcom consistently delivers superior performance at uninflated prices. Listen to a good FM broadcast on the GFT-555 II and you’ll hear why Adcom stereo components consistently receive rave reviews from audiophile publications...satisfying the most knowledgeable music lovers, as well as the perfectionist critics.

Specifications

| IHF sensitivity, mono:         | 11 dBf |
| Signal strength for -50 dB quieting, mono/stereo: | 13.5/36 dBf |
| Capture ratio: 1.7 dB |
| Alternate channel selectivity: 75 dB |
| Separation at 1 kHz: 60 dB |
| THD/stereo at 1 kHz: 0.1% |
| CHASSIS dimensions: 17" x 11 3/8" x 3" |
| Maximum signal-to-noise ratio, mono/stereo: 80/75 dB |
| Frequency response: 30 Hz - 15 kHz ± 0.5 dB |
| Antenna impedance: 75 or 300 ohms |
| Weight: 10.5 lbs. |
| Optional: RM-3 Rack Mount Adaptors; white front panel |

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Enter No. 2 on Reader Service Card
I do not want to hear another radio ad—ever. But I probably will. How can we avoid what is our own civilization, so irrevocably us?

I passed up the ads here last month. I needed time. After all my talk about our not listening to audio music, imagine a project where I forced myself to pay my most assiduous and direct attention to this particular form of audible music! Fun for a while—a very short while. Then I began to feel trapped, engulfed, overwhelmed in utter mediocrity, and in the end, bored silly. Talk about wastelands.

Yes, I continued to take notes, aimed at this worthy column. But my tolerance as a direct listener went down at appalling speed. The fact is that out of a thousand typical ads, maybe five or six have anything audibly notable of any sort of all. The rest are just mass-production advertising wallpaper, dismal clones each one of all the others. And this both in words and music. "Hurry, hurry!" I would hear every 8½ minutes. "Now, more than ever"—one of the world's greatest examples of saying nothing at all—is said in one ad or another every two minutes, 24 hours a day. "The Best has just got Better"—somebody thought that one up around 1877, or maybe 1492. Or 1066? As for the music, right now 90 percent of it is unintelligible sonic mush and the rest is okay stuff, or even high classic, but mangled literally beyond recognition.

How could I go on this way? Over the years, this department has been highly notable for its optimism. Perhaps I was over-enthusiastic when the LP came along, and when the CD first was proposed—so many years back. I've gasped breathlessly at such marvels as photonics—signals conveyed by channeled light—years ago, when the application was strictly as photonics—signals conveyed by channeled light. It did. I even enthused over quadraphonic (that word again?) in spite of the dismal imperfections and the even more discouraging inter-system rows that resulted in its "total" failure. Not really total, as we now can see in a revived "surround sound." But how, tell me how, can I be enthusiastic about audio in ads, notably those that are all audio, without the aid of pictures, whether video or in print . . . ?

And so I reverted to a much safer, more logical research technique. I let the ads play loud and clear on my table radio (instead of turning them down so I wouldn't have to listen). And then I put my mind firmly, resolutely, elsewhere. I stopped direct listening! Instead, I studiously paid no attention at all. I could help myself nobly in this by all sorts of distractions—reading Spinoza or Shakespeare, or Audio; imbibing a beer, taking in steak with mushrooms and asparagus. Anything to divert my mind, and that's a pun. It worked! For, after all, advertising depends on marginal listening (and subsequent buying). Subliminal is the fancy word for the process. Non-listening is the way the ads make their sales. You aren't supposed to listen, and you mostly don't. You hear—but you do not listen, which implies direct attention. Billions of $$$ of biz has been successfully based on this idea—so how could I presume to listen directly?

So I ceased and desisted. And felt a lot better. As I have said, anything in music that is the least bit noticeable, good or bad, gets through to me directly without any effort on my part. These items present themselves to my ear automatically, if perhaps not to yours, and so I need merely to note them down for future reference, and go on with my Spinoza or beefsteak. This has indeed slowed down my project but at least it enabled me to survive it. That seemed to be important.

Do I halfa tell you all about those individual ads? My pile of notes, a couple of inches thick, is at hand. But first (another ad cliché)—a bit of background.

There's nothing basically wrong with a combination of speaking voice and music. It's an idea very much older than radio. These two categories of sound are so intrinsically different that the ears, given half a chance, can listen to both at once and hear the two quite independently. Even on the stage, without audio's aid, it has often been tried. But real practicality had to wait for the loudspeaker, however tiny in a pocket radio or headphones, to remove the distractions of the live presence and bring both sounds together in equality. For a quarter-century, this was my own technique in my talks on music via radio. Fitting my speech carefully to the shape of the music about which I talked, contouring it to fill the quiet spots, allowing loud music to come "up" in its own fashion.

If I may say so, I treated music, even the fanciest, with absolute respect for
The hacking up of classics for mere advertising is an intolerable desecration. It is awful, this, and nobody can make me say less.

its own meaning—which, of course, was what I was talking about. It’s a good technique when done right and it does not interfere with music’s sense, if you know what you are doing.

Early radio advertising was good at it. Music was treated as music, a real part of the commercial pitch which gave the whole a then-new and interesting vitality, as compared with mere speech by itself. This discovery added a freshness to radio selling that some of us still remember. That is of course where I got the idea for my radio program on strictly classical music. It could be done there too! I’d do it all over again, with a change.

Just to remind you, I think the famous historical example from that epoch was the longtime ad for a well-known soft drink, combining a wonderfully catchy tune and a catchy rhymed message, the first line of which told us that the drink "hit the spot”—a term that has stuck in the language ever since. The second line (definitely not used by the company today) was something about 12 full ounces being a lot. Which it certainly was, for a nick-el. Truth in advertising.

The tune that went with those words was a dilly, top-rank and memorable. In no time everybody knew it. No matter that, aside from minor fitting to the new words, it was identical to an old English/Scottish song, vaguely 18th-century and more ballad than folk, called "Do You Ken John Peel" (with his coat so red), a hunting tune about those colorful gentry who rode to the chase. Only the last line of this tune was changed, giving it an appropriate little jazzy twist at the end. After hearing this ad, any huntsman or hunts-lady, even today, would be glad for those 12 ounces of refreshment! But it was the great American public that heard the tune and enjoyed the product.

In radio, a convention soon grew up that was quite strict for a while. An ad started with a tune, "theme" music, then faded it "under," or down, for the spoken pitch, and then back "up" again for a musical repeat, ABA. On the whole, not bad, and there was extensive musical identification with the product, simply by the ad association. Can’t complain! This was legitimate and the music played its useful part in its own way, cooperatively. Thank heavens we still have a good many such old-fashioned ads around today, after so many years.

Out of this, as I see it, grew the present convention, in billions of examples, that music "under" or behind, below, a voice indicates "advertisement." We discover these shortcuts in most of the media and of course they are useful, getting info over instantaneously and effortlessly. (My favorite zany example at the moment, not in radio, is the marking of traffic lanes with huge letters saying ONLY. Only what? Sometimes I really can’t figure these out.) On radio, the background of music or a chase was a quick, easy way to tell the casual listener (not paying any attention) that an ad was going on.

Conversely, the very absence of music, the speaking voice alone, came to mean that the content was news or some other non-ad material. Of course, the advertising voice very soon took on its own special sound (see last month!) as opposed to the straight information voice: even so, it was quicker to put music behind the ad material, for then you didn’t have to listen to find out what was going on—you knew. Your wonderfully absent or subliminal mind automatically tuned to its non-listening mode. Whereas, say, the news, minus music, switched you to a slightly more conscious kind of listening. It all happens by itself, like the Pavlov salivating dog of psychological fame. Fascinating, right? It’s a wonderful world.

Unfortunately, not that wonderful in the present instance. The system worked only too well. The more music was relegated to the background as an indicator, the more it lost its own meaning in musical terms. This has been the slow disaster that has turned useful radio music, gradually but implacably, into so much noise. Any old musical noise, whether a quickie on the synthesizer or a grand concerto by a great composer. And what followed inevitably was that as useful noise, music—any music—could be conveniently tailored to fit, sometimes gracefully (it can be done, with a bit of effort), much more often carelessly, even brutally. Now, you see, I have to return to the negative. Nothing could make me enthuse over this treatment! It is uncompromisingly awful. And it gets worse every day.

The ultimate disaster, the inevitable one, is the compression circuitry which is heard everywhere a million times a day in present ads that have, er, music (that vague muttering and heaving sound) in the background. I do pity those people who write down, synthesize, or play the minimal music that is right for most ads, only to have even that minimum chewed up and destroyed. But when it comes to our old friend Beethoven and his numerous colleagues, I really get mad. Not that it will do much good.

The hacking up of classics in music for mere advertising convenience is a desecration that is intolerable. I mean, the destruction of the sense of the music, not only the compression until unrecognizable (though my musical ear often catches it) but the arbitrary slicing, the instant cut or fade-out regardless of where the music is in its own words, if you see what I mean. It is awful, this, and nobody can make me say less.

But worst of all—to finish off this dismal subject for the time being—is the use of precisely this sort of hatchet technique by all sorts of worthy cultural organizations. The opera houses, the big symphony orchestras, for instance: The very people who produce the music they are advertising!

And all of this, to return to my very first and biggest point, is contributing everyday to our loss of musical understanding and awareness. The technique of destruction becomes a symptom of our increasing deafness towards much of the present musical language in all its diversity. Definitely, in this situation, audio does not have its best foot forward.

Well, folks, what I need at this point is to pump up my rechargeables, those mental storage batteries that keep my enthusiasm. I’m not going to give you any ads yet. I mean, comment on the same. But with time to recycle (to shift my electrical analogy), I think I can amuse you with a few of them—later. Some were funny, some really good, and a few were plain zany—I couldn’t even figure what they were advertising. It happens. And then there’s the March of Time. I haven’t told that story for decades. Sometimes I think the March of Time started the whole thing, back when the talkies were still new.
Whether you are building a car audio system for competition or just want to get the "most out of the system in your everyday car, StreetWires®️ is a must. Only StreetWires®️ gives you the performance, fit and finish you need for a competition quality installation. Only StreetWires®️ has the unique advantage of in-house product research, innovative design and engineering. And only StreetWires®️ guarantees superior material selection, 100% quality control and "state of the art" manufacturing. StreetWires®️️ is more than just wires. StreetWires®️️ provides you with all the innovative accessories you need to create a system that will interface better, perform better, look better, and last longer. That's why virtually all competition show cars and car audio manufacturers use StreetWires®️️ in their demonstration vehicles. They know StreetWires®️️ are the best money can buy. Visit your local StreetWires®️️ dealer and make the "StreetWires®️️ Connection"... and let your system be the best it can be!
Although most people became familiar with digital audio through the introduction of the Compact Disc in 1982, audiophiles had been listening to analog LP discs cut from digital tape masters since sometime in the '70s. (Of course, the rabid phonophiles were against digital mastering of analog LPs right from its inception.) In those earlier days, the sampling rates of digital tape recordings varied according to the type of digital recorder employed. London/Decca’s proprietary digital tape recorder had a sampling rate of 48 kHz, while Telarc used a Soundstream recorder with a sampling rate of 50 kHz. In 1977, I recorded Virgil Fox with an earlier Soundstream recorder operating at 48 kHz; 3M’s digital recorder operated at 50 kHz.

Actually, digital recording was being used by Nippon Columbia (Denon) in Japan as early as 1969! This was a 13-bit system with pre-emphasis, using 32-kHz sampling. Since only the analog output of the digital recorders was used for cutting LP lacquer masters, their different sampling rates were of no consequence. The sampling rates of current recorders still vary, but all can be converted to the 44.1-kHz standard for CD mastering.

Today many record companies have either stopped making LPs or are issuing them on a very limited basis. This is especially true for classical music recordings. Moreover, virtually all classical music is now recorded digitally, and more than 40% of pop/rock recordings are now digitally mastered.

The CD has become the highest quality medium for home reproduction of music. However, many people have found that its greatly expanded dynamic range and extended bass may impose extraordinary performance demands on their playback equipment, and that it may also require them to modify their listening habits. To those who listen mainly to pop/rock, whether on modest mass-market rack systems or elaborate and expensive audio components, the enhanced sonic qualities of the CD medium should pose no problems. This is true, of course, to the fact that such music is normally recorded with a very limited dynamic range, even if recorded digitally. It is not uncommon for pop/rock recordings to have a dynamic range of no more than 10 to 12 dB, and few exceed 20 dB. This is true in spite of all the signal-processing equipment available to the recording engineer, which enables him to create elaborate sound effects. In other words, pop/rock CDs usually reach very high output levels, which are sustained throughout playback. Actual playback loudness in the average home listening environment is a matter of individual preference, although it is dependent on the output capabilities of the audio system.

A factor related to playback loudness levels of pop/rock CDs is their low-frequency content. The widespread use of synthesizers and electronic instruments in these recordings can provide bass of great power that can extend to near-subsonic frequencies. It should also be noted that synthesizers can generate very high levels of high frequencies. The high- and low-frequency energy output of synthesizers is far beyond the capabilities of any acoustic instrument. Thus, although pop/rock CDs usually have restricted dynamic range, they afford consistently high output level and powerful, extended (usually exaggerated) bass response.

It is interesting to consider that a pop/rock CD, even if made from a digital tape master recorded by the most skilled engineer employing state-of-the-art equipment, is still to many a contrived product in spite of its musical values. An audiophile who is willing to spend the money can duplicate the playback system that was used to monitor the recording in the studio. By reasonably approximating the studio control room’s acoustics, an audiophile with this duplicate system can precisely and unambiguously reproduce the music as heard by the engineer on the edited tape used for CD production.

In contrast, the truly accurate reproduction of a classical music CD is an exercise in frustration. The goal of fully
PRESENTING

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THE BOSE® ACOUSTIMASS-3 SPEAKER SYSTEM

A technological breakthrough exclusively from Bose! Patented Acoustimass speaker technology is the key to large speaker performance from a package so small, you can hold one in the palm of your hand. When the Acoustimass-5 system was first introduced, Julian Hirsch wrote in Stereo Review, "...side by side with speakers costing three to five times as much, the AM-5 consistently produced the more exciting and listenable sound." Now the benefits of this revolutionary technology and much of the performance of the Acoustimass-5 system are available in the Acoustimass-3 system, for approximately half the price.

THE CRITICS SPEAK:

"Bose continues turning the speaker world upside down. It qualifies as one of the handful of companies researching the frontiers of acoustics and speaker design."
Chicago Tribune
Rich Warren

"The results are impressive."
Buffalo News
Tom Krehbiel

"...the Bose speakers are a stunning example of the miracles possible when physics is applied to the audio business."
The Oregonian
Wayne Thompson

CUSTOMERS SPEAK:

"Solid bass and crisp high(s)."
Newton Mapoa
Manhattan Beach, CA

"Small size and great sound."
Scott Schifferly
Maumee, OH

System consists of two cube speakers and an easily concealable Acoustimass bass module. Mounting accessories available.

For more information and the name of your nearest authorized Bose dealer, call
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Better sound through research.

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reproducing both the dynamic range and the lowest bass fundamentals of organ and orchestra is very difficult to realize. This is true even with the very best, cost-no-object audio components. Any approach to the reality of the concert hall listening experience necessitates an approximation or simulation of the recording hall's acoustics. The monitoring systems used by recording engineers on classical music sessions convey neither the full dynamic range nor the lowest frequencies of the music. Dynamic range, sound pressure level (SPL), bass response, and signal-to-noise ratio are interrelated. In spite of advertising hyperbole, relatively few loudspeakers have significant response below 40 Hz, and rare indeed is the speaker that is flat down to 30 Hz, let alone 20 Hz—or 16 Hz, the fundamental of a 32-foot organ pipe. To give some indication of the kind of loudspeaker response needed to reproduce the lowest frequencies on classical music CDs, we have invaluable data in a paper, "Subwoofer Performance for Accurate Reproduction of Music," in the June 1988 Journal of the Audio Engineering Society. Its authors, Louis Fielder of Dolby Laboratories and consultant Eric Benjamin, did a fairly exhaustive study of classical music CDs containing significant low-frequency energy. They selected 13 CDs and reproduced them through a CD hold circuits. The authors established a maximum peak CD output equivalent to 13 selected discs. The recordings were analyzed at the moment of maximum low-frequency energy, using a Hewlett-Packard 3561A spectrum analyzer with peak frequency energy, using a Hewlett-Packard 3561A spectrum analyzer with peak -...
From the highly acclaimed, budget priced 761 to the magnificent, semi-active 767, the Mission range of loudspeakers was designed and developed by Henry Azima and his award-winning team. Dedicated to music, they enjoy the finest research facilities in Europe.

Fanc-built by British craftsmen and available in real wood veneers, Mission's latest generation of loudspeakers are the culmination of 12 years of achievement in sound reproduction.

Whether your listening environment is large or small, Mission can provide a superior and elegant solution to your musical needs.

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In Canada: PACO ELECTRONICS LTD., 20 STEELCASE RD. WEST, UNIT 10, MARKHAM, ONTARIO, L3R 1B2, CANADA. PHONE (416) 475 0740.

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Cambridge SoundWorks' Model Eleven is the world's first transportable full-range, high-performance component system. It consists of a powerful 3-channel amplifier and two "satellite" mid/high-frequency speakers—all packed in a rugged "BassCase" that, when empty, serves as the system's subwoofer. Model Eleven's performance, when coupled with your portable CD or tape player, rivals that of the most expensive component systems. And because we market it directly from our factory, it costs hundreds less than it would in stores.

The drivers used in Model Eleven's two-way satellite speakers are no-compromise, high-performance components—just like you'd expect to find in the finest home speaker systems. Performance that rivals the best home component systems. Until now portable music systems were, at best, a compromise. Even the most expensive ones lack the deep bass necessary for full, natural sound. But Model Eleven delivers the all-out performance previously found only in high-quality home component systems. Its three speakers are designed to work with a room's acoustics for optimum performance.

The BassCase where it reinforces low frequency output—on the floor, even behind furniture. The result is musically accurate sound virtually identical to our acclaimed Ensemble® speaker system.

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Ambiance is an ultra-compact speaker that proves high performance, small size and low cost need not be mutually exclusive. Ambiance is ideal for bedrooms, dens, dorm rooms...or for use as an extension speaker or in surround sound systems. While no speaker of its size can provide the same low bass as our Ensemble and Model Eleven systems, Ambiance has more output in the 40Hz region than any "mini speaker" we've encountered. Stereo Review magazine described Ambiance as "...beautifully balanced, delivering a full-size sound image with not a hint of its origin in two small boxes...very few small speakers we have heard can match the overall sound of Ambiance, and we know of none that surpass it." Available in Nextel or primed for painting for $109 each, or in solid oak for $129 each—backed by our 30-day money-back guarantee—direct from Cambridge SoundWorks.
“Cambridge SoundWorks May Have The Best Value In The World. A Winner.”

David Clark—Audio Magazine

Ensemble

BY HENRY KLOSS

Ensemble is a speaker system that can provide the sound once reserved for the best speakers under laboratory conditions. It virtually disappears in your room. And because we market it directly, it costs hundreds less than it would in stores.

Ensemble consists of four speaker units. Two compact low-frequency speakers reproduce the deep bass, while two small satellite units reproduce the rest of the music, making it possible to reproduce just the right amount of energy in each part of the musical range without turning your listening room into a stereo showroom.

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No matter how well a speaker performs, at home the listening room takes over. If you put a conventional speaker where the room can help the low bass, it may hinder the upper ranges, or vice-versa. Ensemble, on the other hand, takes advantage of your room's acoustics. The ear can't tell where bass comes from, which is why Ensemble's bass units can be tucked out of the way—on the floor, atop bookshelves, or under furniture. The satellites can be hung directly on the wall, or placed on windowsills or shelves. No bulky speaker boxes dominate your living space, yet Ensemble reproduces the deep bass that no mini speakers can.

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Placement for best bass reinforcement.

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30-day money-back satisfaction guarantee.

At only $499†—complete with all hardware and 100' of speaker cable—Ensemble is the value on today's speaker market. Esquire magazine describes them by saying, "You get a month to play with the speakers before you either return them or keep them. But you'll keep them." Stereo Review said "It's hard to imagine going wrong with Ensemble." For literature, reviews or to order, write us at the address in the coupon, or call 1-800-AKA-HIFI.*

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The evolution of musical instruments over the centuries has been driven by the demands of virtuoso players who have constantly sought greater facility, better intonation, and more acoustical output from their instruments. The modern concert grand piano, for example, evolved out of efforts to produce an instrument that could withstand the demanding technique of Franz Liszt and the other great pianists who followed him. The high-tension stringing on a cast iron frame of today's instruments produces considerable tone and is a far cry from the simple design of the early pianoforte. Today's highly articulated action is miles ahead in its ability to negotiate repeated notes and rapid scale passages.

In the symphony orchestra, wind and percussion instruments have continued to evolve, even into modern times, as the players have sought greater facility and the capability of playing louder without intonation (pitch) problems.

The oldest section of the orchestra, the strings, often includes highly prized instruments made more than 200 years ago. Early in the 19th century, most of these instruments were re-built with a steeper neck and fingerboard that could support a higher bridge and, consequently, higher tension stringing (Fig. 1). The curve, or crowning, of the bridge top (not visible in this side view) was also increased so that violinists could play more vigorously without accidentally touching two strings at once. The emergence of the violin as a virtuoso instrument, in the hands of Niccolo Paganini and the like, forced such modifications. The instruments have changed little since then, except for the introduction early in this century of wire-wound strings (and a steel E-string) in place of the original gut strings.

Even the bow underwent a marked change. Baroque bows were shaped in such a way that increased pressure on the string resulted in “wrapping” the hair of the bow around two or more strings, making it difficult to play loudly without sounding the adjacent strings. About 1775, Tourte devised a bow with a reverse curve, which caused the hair of the bow to stiffen with increased pressure on the strings, thus allowing the player a greater range of dynamics. Figure 2 shows the basic differences in profile of the older bow as compared with today’s instrument.

For most of this century, the works of the baroque masters, such as Bach, Handel, and Vivaldi, have been played on modern instruments, whether on recordings or in the concert hall. On college campuses, *collegium musicum* groups were often formed for the authentic performance of Renaissance and earlier works, but music of the baroque (1600 to 1750) and classical (1750 to 1825) periods was routinely done on modern instruments.

During the 1960s, the recordings of Nikolaus Harnoncourt and the Vienna Concentus Musicus brought to a large base of listeners a degree of authenticity in baroque music via early instruments and scholarship in performance practice. And as the ’70s progressed, the so-called “early music” business took off in a big way. Many record labels embraced it, and the number of conductors and ensembles (at least in name) proliferated. Purely from a recording point of view, these ensembles had the good fortune of benefitting from newer approaches to recording ushered in by the digital era: Direct-to-stereo (two-channel) recording, improved microphones, and the general return to natural perspectives. Most of the groups are European or English, so it was relatively easy for them to identify recording venues appropriate for the program at hand, since the Old World abounds in unspoiled 200-year-old structures.

Record companies have a bonanza here: They have opened up a new branch of music, so to speak. New conductors and players, a fresh look at playing familiar music—this is grist for the record mills at much less than the cost of a major symphony orchestra, and all without the agony of dealing with superstar conductors and soloists, or their agents.

Today, our ears have become so conditioned to the sound of authentic instruments in music of the baroque era that modern instruments seem strangely out of place. No record company today would think seriously about issuing a set of Handel Concerti Grossi or Bach Brandenburg Concerti using modern instruments, no matter what the reputation or competence of the group and its conductor. The competition on early instruments is simply too great, and the performances often do...
"A generation later, transistor designs by such companies as Levinson, Krell, and Threshold have gained my respect as being eminently musical despite their silicon hearts. To this list I can now add Kinergetics Research."
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Lewis Lipnick
Stereophile Vol. 0, No. 5.

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John Atkinson
Stereophile Vol. 3, No. 1.

"...Kinergetics K-40 has become an integral part of my playback system. I recommend it very highly, especially to those who have had monumental difficulty coming to any terms with the CD format."
Neil Levenson
Fanfare, Jan/Feb 1990.

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"International Audio Review", Hotline #43-45.

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**Pro-Power Four**

**DESCRIPTION:** The New PRO-POWER amplifiers are especially designed for the extended Dynamic Range requirements of today's Compact Disc players and Hi-Fi VCRs. The ULTRA HIGH CURRENT design offers you incredibly high power without sacrificing distortion-free performance, superb reliability, and the utmost in sonic purity. These new amplifiers operate flawlessly under all operating conditions. It is well known that most of today's highly regarded loudspeakers exhibit impedance curves which drop to 1 or 2 ohms at some frequencies, and in conventional amplifiers this results in severe clipping and the triggering of protective circuitry. However, our new PRO-POWER Phase Control amplifiers continue to operate even under those extremely low impedance conditions. Current limiting had been eliminated entirely by the use of the latest POWER MOSFET technology, thus avoiding the sonic degradation typically found when limiting circuitry is employed.

Says Leonard Feldman in his Test Report in AUDIO Magazine, Vol. 71, No.8: "...it brought out the best in all of the loud speaker systems with which I tried it. I sensed an effortlessness about the musical crescendos reproduced from some of my CD specturals..." "In my view, you can spend five times as much as what this amp costs, but you won't get a better, more reliable, or more musical unit."

**FEATURES:** MOSFET amplification stages provide the utmost in sonic purity, rivaling that of vacuum tube amplifiers... Precision-Calibrated LED power meters (0-400 watts at 8 ohms)... Speaker switching for two pair of stereo speakers...

**SPECIFICATIONS:** CONTINUOUS RMS POWER: 205 watts per channel @ 8 ohms, 20Hz-20kHz, 300 watts per channel @ 4 ohms, 20Hz-20kHz, 450 watts per channel @ 2 ohms, 1kHz...THD—less than 0.05%. 19"Wx5 3/4"Hx12"D, 30 pounds.

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The PCR800 amplifier is similar to the PRO-POWER ONE, rated at 205 watts per channel @ 8 ohms, but with plain overlay front panel.

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**Pro-Power Ten 2/3/4 Channel 600-watt Mosfet Amplifier**

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The PRO-POWER TEN, used in this mode, is the ultimate in high current, high power amplifiers, and provides a massive 600 w/p/c @ 8 ohms.

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This mode provides 205 w/p/c for a stereo pair of satellite speakers for mids and highs, plus 600 watts to guarantee optimum sub-woofer bass performance.

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The ultimate in audio/video systems is the Surround Sound system, where the Theatre environment is recreated by stereo front and stereo rear speakers.
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NEW Remote-Control Preamp-Tuner

...the perfect Control Center to match your choice of any Power Amplifier...

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Due to space and technical design limitations, ordinary receivers cannot be equipped with the high-current, high-voltage power stages found in even modestly-priced separate power amplifiers. In receiver, these heavy-duty power stages, necessary for high dynamic range amplification, would generate levels of heat, hum, and noise unacceptable to the tuner and preamplifier’s low level, sensitive circuits. The new PRE-ceiver eliminates all of these compromises by keeping the low-level preamplifier and tuner stages completely separate from the incompatible high-level power amplifier stages; thus providing a near-perfect and distortion-free output signal to drive any amplifier, from 50 watts to 600 watts.

The PRO-PT FIVE-R’s PREAMPLIFIER SECTION has the quality and features you need as the cornerstone of your audio system.

Discrete FET transistors are used in critical circuits for lowest distortion and noise. Our unique Spectral Gradient circuit provides extremely critical discrete filtering to eliminate the harsh characteristics associated with many analog/digital Compact Discs. Our unique Variable Contour Loudness Control allows precise and easy selection of frequency balance at any volume level.

The PRO-PT FIVE-R’s TUNER SECTION’s advanced technology incorporates a DIGITALLY SYNTHESIZED, quartz-referenced crystal oscillator, Differential MPX High-Blend circuit, Microcomputer memory system, Direct access retrieval of any of your preprogrammed stations is as simple as pressing one or two buttons. The Scan Selector provides you with easy access to strong stations or direct access to the even the weakest of weak stereo broadcasts.

The PRO-PT FIVE-R’s PRE-ceiver©...
Ironically, the success of early-music groups has made many symphony orchestras stop playing Handel, Bach, and other baroque music.

capture an eloquence and spirit hard to duplicate with modern instruments.

There are a few adjustments the listener must make on the way to enjoying period instrument performances. First, there is the matter of intonation in the wind and brass sections of the ensembles. The suavity of modern woodwinds will be missed, and in their place will be somewhat rough-edged sounds of lesser dynamic range and less precise tuning. The brass instruments are valveless, and as such depend on the player’s “lipping” tones, up or down as needed, to place the pitch. These problems in pitch accuracy simply must be accepted as such. The strings are played without a vibrato, and string attacks are apt to be less incisive, due to the lightness of the bowing.

The small size of most early-music ensembles is welcomed in most cases, as are the more modest recording venues. Recording directors often seek out venues which have lots of “bloom,” an immediate sense of reverberation and ambience. The venues which work best are often old ballrooms with lots of plaster, wood, articulated surfaces, and coffered ceilings. When vocal resources are included, the singing style is light, unforced, and most “unoperatic” in the conventional 19th-century sense.

Few standing early-music groups perform regularly in concert. Most of their activity is in the recording studio, and the pervasiveness of their efforts, via FM broadcast and disc sales, is a measure of just how significant the record industry has become in shaping musical tastes. More to the point is the effect on programming of concerts by major orchestras.

An ironic consequence of early-music groups’ success is that many symphony orchestras have simply stopped programming the compositions of Bach and Handel, and other baroque works. This is a musical loss for the audience and may be a downright liability for the orchestra. As conductor Gerard Schwarz pointed out last year in “A Conductor Must Help to Shape Public Taste”—an article in the September 17 issue of The New York Times—orchestras which ignore 18th-century repertoire in favor of 19th- and 20th-century music lose certain ensemble skills which the earlier music reinforces, and general competence may suffer as a result.

This last point is especially of concern at present, in that the early-music forces have embraced music of the classical era. The symphonies of Haydn, Mozart, and Beethoven are now available in many performances by authentic instrument ensembles, and the fortepiano has made a triumphant return as these ensembles’ chosen vehicle for Mozart and Beethoven piano concertos. Pity the modern orchestra that is daunted by this and stops programming Mozart, Haydn, and Beethoven!

It may be quite a while before most of us are willing to trade in new instruments for old in the classical literature. After all, we have been so thoroughly conditioned in this repertoire by the great conductors and orchestras of this century, not to mention the legendary keyboard virtuosi who have performed the concertos. Musicality, not authenticity, is likely to be our chief concern here, even though it is relatively easy to demonstrate that the fortepiano is, in a purely acoustical sense, a better match for a classical size ensemble than is the modern concert grand piano.

The most venturesome conductor and ensemble on the period instrument scene are, unquestionably, Roger Norrington and the London Classi-
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We're conditioned to baroque on early instruments, but it may be a while before we're ready for old instruments in the classical literature.

Having gone through most of the Beethoven symphonies, Norrington and his group issued late in 1989 a period-instrument recording of "Symphonie Fantastique" by Berlioz. The recording is immensely successful and has moments of considerable insight. Perhaps the problem most people have listening to it is the preconception that it is a large "Romantic" work requiring resources akin to those common toward the end of the 19th century. The fact is that the work dates from 1830, just barely out of the classical era into the Romantic. The identification of Berlioz as the Father of the Modern Orchestra further confuses our expectations and judgments.

If Berlioz, then why not the early Romantics: Schubert, Mendelssohn, and Schumann? There are no reasons why, if the motives are right. What about extending the notion forward to period-instrument performance of Brahms, Tchaikovsky, and Wagner? This is okay if the notion of "original instruments" is tempered to include certain performance values.

For example, Brahms wrote for the so-called "natural" French horn, an instrument without valves. He preferred it for its purity of tone, as compared with the valved form of the instrument. While there are some expert players on the natural horn, all major symphonic horn players today use the ubiquitous "double horn" version, which has extra sets of tubing and makes for greater accuracy in playing. Would we be willing to put up with split horn notes in Brahms' symphonies for the sake of authenticity? I don't think so—at least not for long.

Perhaps the best way to approach the late Romantic period is to start at the present, analyzing current performance practices and working backward. If we did this, we would find that modern orchestras play far too loudly. We would remove some of the wire-wound strings from the violins, violas, and cellos, and we would certainly ask the brass players to tone things down considerably so that the strings could be heard without forcing.

We would take a look at middle-European orchestral practice, which favors a soft-edged approach to sound production and reaches a real fortissimo only once or twice during a typical concert.

We would take note that modern woodwind instruments can play so well in tune, but we would ask them to play still a bit more softly.

We would implore our architects and acoustical consultants to be leery of what Michael Forsyth refers to in his MIT Press book, Buildings for Music, as the Hi-Fi Concert Hall, and return to earlier values.

Finally, we would ask recording engineers and producers to use fewer microphones, do less gain riding and "spotlighting," and strive for the pickup of natural stereo perspectives.
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AUDIO DEALER LISTING
When I first heard mention of "compatibility" and "standards" problems in the development of recordable CD, I was rather puzzled. There's already a standard that ensures compatibility between all CD recordings and players. If a device can make recordings that CD players can't distinguish from commercial pressings, then compatibility has been achieved, right?

But if two companies come up with different ways of achieving it, they'll probably use different recording media requiring different laser output settings. Each company's machine would be able to play back recordings made on the other's, but probably neither would be able to record on the other's blanks. The systems would plug it out in the marketplace until a winner emerged, whereupon blank discs for the losing systems would become harder and harder to find. Eventually, the recorders that used those discs would become useless, but the discs they'd made would still be universally playable.

So far, the only recording systems I've heard of that produce discs compatible with CD playback are WORM (write-once, read-many) systems, such as the ones from START Labs and Gotham Audio, whose discs can't be erased and rerecorded. Some people don't see this as a problem; after all, most cassettes are only recorded once—if they weren't, blank cassette sales would be dwindling as the tapes sold years ago were rerecorded. Still, a write-once system leaves you no room for mistakes such as miscues and errors in level setting.

There are systems whose discs can be erased and reused at will. All those I've heard of are magneto-optical disc (MOD) systems, such as the Thomson system featured in our March issue and a Sony consumer prototype I saw at last October's Japan Audio Fair. The MODs don't reflect light in quite the same way conventional CDs do, so they can't be played on current CD equipment. (The recorders can play conventional CDs, though.)

This is why there's a cry for standards and compatibility. Making a player that can handle both CDs and MODs is apparently not much of a problem, but no manufacturer wants to do it until they know just what kind of MODs such a player would face. Should a single MOD standard be established, combination CD/MOD players would begin to appear. Should MOD catch on, eventually all new players would be this dual-purpose type. And as new players replaced the old, MODs would be almost as universally playable as CDs (and WORM discs) are today.

The ideal system would be both compatible with CD players and erasable, but no such systems seem to have surfaced yet. This leaves MOD and WORM adherents jockeying for position—sometimes even within a single company (such as Sony, a partner with Taiyo Yuden in the START Lab WORM process as well as a MOD developer).

If I had to choose between a CD-compatible write-once system and an incompatible, erasable system, I'd take the former. But then, I'm equipped to make my mistakes on DAT, so I could transfer only my successes onto disc. (Other Editor's Note: I'd take the other system—E.P.)

For most people, a CD-compatible recording system would let them use CD for everything. No more buying recordings in one format for the house and in another for the car, no more time wasted dubbing new CDs onto tape for car use. No more crotchety turntables, once you've dubbed the records you really treasure onto CD. There would still be audiophiles who cherish the old formats, but Compact Disc would become the medium for home, car, and portable use.

This could prove to be a boon to the record companies. They could stop issuing and stocking recordings as CDs, cassettes, DATs (if they ever really start), and LPs (which they've already all but pulled the plug on) and produce only CDs. They'd save millions just in stocking and handling costs, not to mention earning more by dropping all their lower profit media in favor of the medium they make their highest profits on. As the availability of home recorders allows listeners to use CD for all their music needs, consumers will buy more CD players, creating a demand for still more recordings on CD.
WE'RE PUTTING IT ON AT THE RITZ.

FROM THE AFFORDABLE "STAGE" TO THE INCREDIBLE "DIVA", APOGEE BLENDS ADVANCED DESIGN WITH CUTTING EDGE TECHNOLOGY. APOGEE'S RIBBON TECHNOLOGY CONTINUALLY WINS BEST SOUND DISTINCTIONS AT AUDIO SHOWS WORLDWIDE. COME HEAR US DURING THE JUNE CONSUMER ELECTRONICS SHOW, SUITE 3105, THE RITZ CARLTON, 160 EAST PEARSON STREET AT WATERTOWER PLACE IN CHICAGO, OR CONTACT APOGEE ACOUSTICS FOR THE DEALER NEAREST YOU.
Recordable CD could usher in a golden age for the record companies, but they'll fight like blazes to prevent it.

Only two things stand in the way of this new golden age of record industry sales and profits. First, the hardware and standards that will set it off are still under development. Second, I'm sure the recording industry will fight like blazes to keep CD recorders out of people's homes, just as they fought DAT and, too late, to fight cassettes (which now account for a substantial chunk of their revenues). Just wait.

Case of the Purloined Sapphire

The turntable I was using last spring was a SOTA, on loan from the manufacturer. So when Robert Becker, SOTA's chief executive, called to say he was lending it to someone else, I had no kick coming. As it turned out, however, Becker did.

The turntable's new would-be borrower had called SOTA to say he worked for an ad agency and wanted to use a Star Sapphire as a photo prop in a carpet commercial. Since the ad agency was both in New York City, it was simpler for Becker to have him pick up my loaner than to shelve a new one out—especially as the fellow said he had a deadline to meet.

As it turned out, he now has a more serious deadline. A few weeks after the turntable had been picked up, Becker got a call from a postal inspector, asking if the turntable was his. It turns out that our "ad man" was nothing of the kind. The whole affair had been a scam. For many months, the turntable that had been in my listening room was locked in an evidence room somewhere in Manhattan, awaiting its day in court. Becker ruefully sees the whole affair as a validation of the high-end concept: "It's a sign of the times," he says. "Even con men recognize the value of good audio equipment. I just hope the next one will recognize the value of someone else's."

Wait for the Wafer?

It's been predicted that the CD's eventual replacement will be a solid-state memory system with no moving parts. A small move in this direction is the Wafer Stack, a memory system from Anamartic Inc. of San Jose, California. The system uses the uncut wafer discs from which individual memory ICs are usually sliced. A sealed, two-wafer module holds 40 megabytes, but six such modules can be stacked into a unit that holds 240 megabytes.

That's still no substitute for the CD. Of course. The Water Stack's capacity is still a bit less than one-half as much as the CD's. The memory is also volatile, forgetting its contents as soon as it's powered down. And it costs $38,850 for a 240-megabyte board with controller and SCSI digital interface.

If systems like this ever make it into audio, they'll probably start in studios, for digital editing, which can take advantage of the Wafer Stack's ultra-fast data access, about 200 times as fast as computer hard-disk drives. Even so, the price will have to drop and the capacity rise to make it practical.
EXPENSIVE SOUNDED SPEAKERS!

Speakers are the most important part of your stereo system. It is the speaker that turns amplifier signal into sound and so ultimately determines what you hear. If your speakers do not perform well, your stereo system will simply not sound like music.

The search for musically satisfying speakers, however, can lead to some very expensive products. And if you have already bought those high priced speakers, then you better not listen to Paradigms. But if you haven't, better not miss them. Why? Because from the time they were first introduced, Paradigm's sheer musical ability utterly amazed listeners... but what caused even more amazement was the unprecedented low price.

So go ahead, get expensive sounding speakers... without the expense. Visit your authorized Paradigm dealer... and listen.

The critics agree:

"... For once we wholeheartedly agree... the Paradigm is most definitely a no-compromise two-way design capable of outperforming systems costing several times as much."
- Hi Fidelity Magazine

"... natural, open and clear... excellent depth... lots of hall sound... big, expansive soundstage... well defined... a rare achievement for any loudspeaker, but when the price is taken into account the Paradigm's performance must be considered as nothing short of remarkable."
- Sound & Vision Magazine

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Enter No. 10 on Reader Service Card
For Sony ES, redefining the Compact Disc Player means changing more than a bit.
Today, the entire focus of Compact Disc player development appears to have been reduced to a single bit. While this approach has some merit, to the engineers of Sony ES it is merely the starting point in redefining the CD player.

But then, the ES engineers have always charted their own course. These are the same people whose independent thinking created the world's first Compact Disc player. And their digital insights have enabled them to engineer proprietary advances in D/A conversion, digital filtering, data synchronization, error correction, laser optics and chassis rigidity—in short, all the elements necessary to establish an entirely new benchmark in Compact Disc performance.

A converter with a pulse all its own.

Sony started with the High Density Linear Converter™ system. Based on an all-new integrated circuit, the CXD-2552, this pulse system replaces the typical converter's sixteen or more switches with a simpler, more efficient design. With a single stroke, it eliminates non-linearity, glitches, and crossover problems. The HDLC system also operates at the unprecedented speed of 45 MHz—the world's fastest conversion rate—to help substantially reduce harmonic and intermodulation distortion.

As a result, converter distortion measures an astonishing 0.001%. Dynamic range is 124 dB—exceeding the theoretical maximum of the CD itself. The audible benefits are equally impressive. You'll experience music that is warmer and less clinical, with a more spacious stereo soundstage.

Nothing less than a total system approach.

We've matched the new HDLC system to our legendary CXD-1244 digital filter, a Sony design that overcomes requantization error through superlative calculating accuracy. And Sony overcomes a principal source of error in pulse converters: the time-base inaccuracies called "jitter." These errors cause modulation in the analog signal, veiling the music and altering the sound stage. By integrating our Direct Digital Sync™ circuitry directly on the converter chip, the Sony HDLC system corrects jitter automatically and decisively.

Similar inspiration led to other pivotal developments in rigid anti-resonant chassis design, linear motor transports, and low-noise servo stabilizer circuits. These developments motivated Stereo Review to make this pronouncement: "Our test results leave no doubt that the Sony CDP-X55ES represents the current state of the art in CD players. Virtually every measurement surpassed those of the best players we have tested in the past."

Best of all, these landmark advancements are not reserved for one or two high-priced models. They grace every ES single-disc player and both ES five-disc changers. And each model is backed by a three-year limited parts and labor warranty. (See your authorized ES dealer for details.)

Extended playback meets an extensive technical resume with the CDP-C8SES five-disc carousel changer.

Spectrum analysis of a 10 kHz signal with a typical pulse converter (top) shows additional non-harmonic distortion. With the Sony HDLC system (bottom) this distortion is negligible.

So call 201-930-7156 (Monday–Friday, 9:00 am–5:00 pm EST) to locate an ES dealer. Then audition the ES Compact Disc players. Just don't be surprised if other players seem to fall a bit short.
Since the introduction of the Dolby SR (spectral recording) process in 1986, the professional music recording, broadcast, and cinema industries have equipped more than 35,000 analog audio channels worldwide with this recording enhancement system. Dolby S-type, a new noise-reduction system from Dolby Laboratories for improving the popular home audio cassette, uses several of Dolby SR's proven techniques to achieve similar ends—increased headroom, lowered distortion, and greatly reduced noise. Dolby S-type is less complex and less costly than Dolby SR. Among other reasons, this is possible because home listening levels are lower than those in studios, and because the spectral content of cassette noise differs from that of open-reel tape. However, both systems share such objectives as freedom from audible side effects, and are based upon similar principles of operation.

Principle of Least Treatment

Complementary noise-reduction systems, such as those developed by Dolby Laboratories, boost the signal as it is recorded (compression) and then reduce the boosted signal by the same amount (expansion) in playback; tape noise is also reduced by the same amount. The original signal theoretically survives the complementary process unscathed, as opposed to playback-only NR systems, where the original signal is inevitably damaged in the attempt to remove noise retroactively.

The companding action need not be the same at all frequencies. For example, in cassette recording, tape hiss so predominates that it is desirable to concentrate the noise-reduction action at higher frequencies. Yet whatever the spectral effect of the action, it must be confined to lower level signals to prevent overloading the medium (e.g., saturating magnetic tape) when high-level signals occur.
Dolby A-type NR uses four fixed-action bands; Dolby B and C use one sliding band. Dolby S uses both sliding and fixed bands.

At first glance, designing a system to operate only at lower levels makes sense, because high-level signals are assumed to mask noise. Wide-band companders, which boost the entire frequency spectrum at low levels upon recording and lower it at playback, work on this assumption. Unfortunately, it is not entirely valid.

On quiet signals, noise reduction is indeed effective, because full recording boost is applied (Fig. 1A). However, because it is necessary to prevent overload by not boosting higher level signals as they are recorded, these systems allow the noise level to go up upon playback as signals get louder, an effect called noise modulation (Fig. 1B). The higher noise can be heard under certain circumstances, because it is only at and near a signal’s frequency that masking occurs. If the music is loud in only part of the spectrum, noise will be heard in the other parts, where there is neither masking nor boost (i.e., no NR effect). The result is annoying changes in noise level concurrent with changes in signal level.

The ideal noise-reduction system, on the other hand, would act wherever signals fall below a certain threshold, even when there are loud signals elsewhere in the spectrum. Ideally, with a loud rap on a bass drum, there would be no record boost on the drum itself, to prevent overloading the recording medium. But there would be full boost, and therefore effective noise reduction upon playback, over the rest of the spectrum.

We call the application of constant gain wherever there are no high-level signals, even in the presence of such signals elsewhere in the spectrum, "the principle of least treatment." Reductions in record boost to prevent overload should be confined just to those parts of the spectrum where loud signals, and thus natural masking, occur (Fig. 2A). This results in audibly consistent noise reduction. By contrast, in the presence of any loud signal, a wide-band compander reduces the record boost throughout the spectrum, resulting in audible changes in the NR effect (Fig. 2B).

The Dolby A-type professional noise-reduction system strives for the ideal by splitting the spectrum into four bands with independently acting companders. Thus, with a loud bass drum, Dolby A-type NR does not operate in the low-frequency band where masking occurs, but does act in the higher frequency bands where there is no masking. In Dolby B-type and C-type NR, a single companding band of frequencies slides up out of the way of the bass drum, keeping the NR effect active at higher frequencies where tape hiss is audible. In Dolby S-type and Dolby SR, a combination of fixed and sliding bands, along with other new developments, results in the closest adherence yet to the principle of least treatment.

**Benefits of Least Treatment**

The major benefit of adhering to the principle of least treatment is a better recording system, virtually free of such side effects as noise modulation. However, the fact that high-level signals have little effect on low-level signals has significant additional advantages in the real world, where encoded recordings are subject to decoding errors. Decoding errors can be divided into two categories. The first we might call "inadvertent," that is, errors resulting from frequency response or level changes introduced between original encoding and ultimate decoding with the same complementary system.
These are the kind of errors that occur, for example, when using a tape formulation for which the original recorder was not optimized. The other category we might call "deliberate," that is, errors that would result, say, from playing back Dolby S-type cassettes on a machine that is equipped only with Dolby B-type NR.

As a result of its adherence to the least-treatment principle, Dolby S-type is robust. If a tape is made on a recorder with less than perfect response, the listener is unlikely to notice anything wrong beyond the original imperfection itself (if indeed it is audible). If a tape is recorded with S-type and played with B-type, a critical listener may notice a reduction in dynamic range, which may even be desirable in a noisy environment such as an automobile. However, there is virtually no distracting "pumping" or other dynamic artifacts. Minimizing the effect of high-level signals on low-level signals, which eliminates the principal mechanism by which the ear detects the use of level-sensitive processing, may well become a factor in the software industry's consideration of releasing Dolby S-type prerecorded cassettes.

Action Substitution

"Action substitution," which was applied first in Dolby SR and is now being used in Dolby S-type, is a new development enabling closer adherence to the principle of least treatment. It results from combining both fixed-band and sliding-band techniques in a way that maintains their advantages while mitigating their disadvantages.

Figure 3A illustrates a sliding-band system. When high-level signals, if any, are relatively low in frequency, the band assumes the quiescent characteristic represented by the solid curve. If a higher frequency signal then comes along at a level high enough to require less boost, the band must slide up considerably, even to achieve only 2 dB less boost as shown (dashed curve). Thus, considerable noise reduction below the dominant signal's frequency is lost (as shown by the shaded area)—a disadvantage. However, above that frequency, the NR effect is essentially unchanged—an advantage.

Figure 3B illustrates a fixed-band system having the same quiescent characteristic, again represented by the solid curve. When, as above, the dominant signal is loud enough to require less boost, there is an overall reduction of boost (dashed curve) and an equivalent loss of NR effect (shaded area). This means that unlike the sliding band, the fixed-band system causes a loss of NR effect above the dominant frequency—a disadvantage. However, there is significantly less loss of noise-reduction effect below the dominant frequency than with the sliding band—an advantage.

At higher frequencies, where tape hiss predominates, Dolby S-type combines both sliding and fixed bands in a way which results in what we call "action substitution."

Fig. 2—The effect of high-level signals on cassette noise-reduction systems vary with the system used. In systems such as Dolby S-type, which follow the principle of least treatment (A), gain is reduced only at and near the frequency of a loud signal. Record boost, and thus noise reduction, is therefore unaffected except in a region masked by the signal itself. In a wide-band compander system (B), gain is reduced throughout the spectrum, regardless of the loud signal's frequency. Record boost, and thus NR, is therefore lowered or eliminated everywhere that masking does not occur.

Figure 3C illustrates an action-substitution system having the same quiescent characteristic as the individual system discussed above (solid curve). When less boost is required (dashed curve), the action of the fixed band predominates below the dominant frequency, so that less NR effect is lost than when using a sliding band alone. Above the dominant frequency, the sliding band predominates, resulting in none of the NR loss which would occur with a fixed band alone. Thus, with action substitution the boost of low-level signals is more constant, as is the
If a tape is recorded with Dolby S-type NR and played back with B-type, you may only notice a reduction in dynamic range between the two.

Fig. 3—Effects of dominant signals within the NR band also vary with the system. To effect a given decrease in gain (2 dB shown) at the dominant frequency, the NR band of a sliding-band system (A) slides up, reducing NR at frequencies below the signal. In fixed-band system (B), boost (and thus NR) is reduced throughout the band by the amount of gain decrease required at the dominant frequency. Combining fixed and sliding bands (the “action substitution” system used in Dolby S-type NR) confines the gain decrease more closely to the dominant frequency, resulting in less loss of NR (C).

NR effect, so that the system conforms more closely to the principle of least treatment.

Action substitution has an additional benefit. With a complementary NR system, changes in level introduced after the signal is initially processed can cause the playback processor to mistrack, that is, it may not act as a precise mirror image of the record processor. With a sliding-band system, a relatively small (and otherwise innocuous) level change introduced by the recorder at the dominant frequency can cause disproportionate, and potentially audible, decoder mistracking at lower frequencies. With Dolby S-type, however, the fixed band predominates at frequencies below the dominant frequency, reducing the potential for audible mistracking.

Modulation Control

In contrast to action substitution, modulation control, also developed originally for Dolby SR, deals with the effects of high-level signals outside the NR bands which need not, and should not, be boosted. With a sliding-band system, such high-level signals cause the band to slide up in frequency, out of their way. However, the higher the signal level at a given frequency, the further away the band slides. If left to its own devices, a sliding band can move so far away as to create a gap between its noise-reduction effect and the natural masking of the high-level signal, thereby causing a subtle form of noise modulation.

With a fixed-band system, dominant high-level signals nominally outside, but close to, the band can cause an undesirable reduction in the band’s boost. This is because the filter used to create the bandpass cannot have an infinitely steep slope. If the dominant signal is strong enough, even quite far down the slope it will have the same effect as a lower-level dominant signal well within the bandpass. As with the sliding band, the high-level signal causes a reduction in NR effect where there should be none; that is, it causes noise modulation.

With Dolby S-type, a special technique called modulation control is applied to both the sliding and the fixed bands. It reduces the tendency of a sliding band to move further away from high-level signals than necessary (Fig. 4A), and reduces a fixed band’s tendency to react to high-level signals outside, but close to, the band (Fig. 4B). Thus, like action substitution, modulation control helps to keep all low-level signals in a more constantly boosted state in accordance with the principle of least treatment.

Spectral Skewing and Antisaturation

Spectral skewing and antisaturation techniques have been incorporated in Dolby S-type, as in Dolby SR. Spectral skewing consists of networks in the encoder which roll off the extreme low and high ends of the spectrum; complementary networks in the decoder restore flat response. The networks re-
duce the dependency of the system’s action on signals at the extreme ends of the spectrum, thereby reducing decoder mistracking as the result of response errors introduced by the recorder in those regions. Such errors include those at low frequencies caused by head bumps, and those at high frequencies caused by variations among tape formulations even within the same nominal category, and by head-azimuth variations between the machine on which a tape is recorded and those on which it is played back. While spectral skewing results in some loss of NR effect at those extremes, the ear is so insensitive to noise at the extremes that the benefits far outweigh the theoretical NR loss.

Antisaturation consists of high-frequency shelving networks which operate at high signal levels; complementary networks restore flat response at playback. The shelving significantly reduces the high-frequency losses and distortion caused by tape saturation, thereby significantly extending headroom and further reducing the likelihood of decoder mistracking. Antisaturation reaches lower in frequency than spectral skewing, so its effects are limited to high levels to prevent any audible loss of NR effect.

Antisaturation effects are also contributed by both the low- and high-frequency spectral skewing networks. The low-frequency network, for example, virtually cancels out the low-frequency boost imparted by standard 3,180-μS cassette equalization, resulting in a notable reduction in distortion on strong low-frequency signals. This improvement is possible because Dolby S-type provides noise reduction at low frequencies, without which eliminating the standard pre-emphasis would increase low-frequency noise. The combined effects of spectral skewing and antisaturation techniques at both low and high frequencies can be seen in Fig. 5, which illustrates Dolby S-type's overall encode characteristics.

Multi-Level Staggered Action

The principle of least treatment calls for a fixed gain, determined by the amount of noise reduction desired, wherever in the spectrum signals fall below some threshold. But there is also a need to fix the gain on signals which occur above a higher threshold, to reduce the effects of high-level overshoots. Overshoots are brief, exaggerated increases in level which occur during the time it takes for a compressor to react to a suddenly louder signal and start reducing the gain. At low signal levels, overshoots, overloads are of little concern; They are recorded onto the tape and then "undone" by the decoder at playback. But at high signal levels, overshoots from the encoder can get lost as a result of tape overload, resulting in distortion and decoder mistracking.

Therefore, changes in gain should occur only at intermediate levels, a characteristic we call bilinear compression and expansion (Fig. 6). To achieve this characteristic with

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Fig. 5—Dolby S-type encode characteristics, showing the effects of spectral skewing and antisaturation at various input levels. The decode characteristics are the inverse of these curves.

Fig. 6—Idealized bilinear compression and expansion.

Fig. 7—In Dolby S-type, as in Dolby SR and the Dolby A, B, and C NR systems, processing takes place in a side chain, whose output is added to the main signal path for encoding and subtracted from it for decoding.

Fig. 8—In Dolby S-type, two high-frequency stages, sensitive to different signal levels, are used in the side chain (encoder shown).
Combining fixed-band with sliding-band NR techniques maintains the advantages of both while mitigating disadvantages.

Fig. 9—The Dolby S-type NR system prevents multiplication of compression ratios by staggering the signal levels at which gain changes occur, as shown for the high-level stage (A) and low-level stage (B). However, at low levels, the boosts of the two stages add (C) to provide more noise reduction.

Dolby S-type, as in all our systems, a dual-path circuit configuration is used whereby processing takes place only in a side chain, whose output is added to the main signal path for encoding and subtracted from the main signal for decoding (Fig. 7). At low input levels, the side chain's compressed output makes a significant contribution to the encoder's total output. Because the encoded signal is still comparatively low, the overshoots introduced are of little consequence, as described above. However, as the input signal level increases, the side chain's contribution lessens proportionally, so that the unprocessed main path predominates. Eventually a level is reached above which the side chain might as well not be there; changes in gain, and therefore overshoots, virtually cease.

However, as more boost is designed into the compressor to achieve more noise reduction, the levels below and above which gain is fixed tend to move lower and higher, respectively. Preventing the one from going too low and the other from going too high runs the risk of introducing too high a compression ratio, which could magnify response and level errors in the recorder and thereby increase the potential for decoder mistracking. Therefore, at the high frequencies, where cassette noise predominates, Dolby S-type uses two 12-dB companding stages connected in series to provide what we call "multi-level staggered action," a technique developed originally for Dolby C-type NR and refined for Dolby SR (Fig. 8). The use of two stages enables us to achieve more noise reduction and maintain the advantages of a bilinear characteristic, without introducing unduly high compression.

Each 12-dB stage has a bilinear compression/expansion characteristic. At the low signal levels where maximum noise reduction is desired, the boosts imparted by the two stages add to provide the desired 24 dB. However, the thresholds of the stages are staggered: in what we call the low-level stage, the levels above and below which gain is fixed are lower than those for what we call the high-level stage. As a result, their compression ratios do not multiply, and the signal is never subjected to a higher ratio than that of an individual stage (Fig. 9).

Multi-level staggered action has additional benefits. For example, the slopes of both stages' NR bands combine to provide steeper overall characteristics (Fig. 10), so dominant high-level signals can be that much closer in frequency to the bands without causing their gain, and thus the NR effect, to change. In addition, production tolerances for the individual stages of a multi-level configuration can be wider than for a single-level configuration with similar parameters, resulting in a system more readily mass-produced.

Final Elements

Figure 11 is a block diagram of a complete Dolby S-type encoder (the decoder is essen-
DOLBY S-TYPE
AT A GLANCE

- New system for cassette recording derived from Dolby SR combines both fixed and sliding bands.
- 24 dB of noise reduction at higher frequencies, with 10 dB at lower frequencies.
- Increased headroom, particularly at frequency extremes.
- Minimal effect of high-level signals on low-level signals minimizes noise modulation as well as decoding errors.
- Encoded signal free of dynamic artifacts.
- Newly developed dedicated IC configuration for use in consumer products.
- New higher performance standards for products licensed to incorporate Dolby S-type.


tially a mirror image of this). There is one element on the diagram that we have not yet discussed: A single-stage fixed band providing 10 dB of low-frequency noise reduction, in addition to the high-frequency stages' 24 dB. Because of the spectral content of cassette noise, the ear's reduced sensitivity to low-frequency noise, and the high-frequency stages' relatively low reach, the low-frequency band has to provide only modest noise reduction, and only below 200 Hz. For these reasons it was also judged that providing both fixed and sliding low-frequency bands was not subjectively worth the added cost. The low-frequency band also helps balance the encoded signal spectrally for playback without Dolby S-type decoding.

Another element in Dolby S-type is not on the block diagram at all: Dolby Laboratories' requirement that recorders with Dolby S-type meet new, higher performance standards. These include extended high-frequency response, tighter overall response tolerances, a new standard ensuring head height accuracy, increased overload margin in the electronics, lower wow and flutter, and, for the first time in the cassette recorder industry, a head azimuth standard. These new standards will not only contribute to unprecedented cassette performance but will also help to ensure that tapes recorded on one machine—including prerecorded cassettes—will play back with unprecedented accuracy on any other.

Development stages of the new Dolby S NR system: Right background, multi-board configuration used to finalize Dolby S-type circuit design; left, two-channel card with new Dolby S-type three-IC sets suitable for production tape decks; center, space-saving single-channel hybrid circuits.

Fig. 10—Dolby S-type's multi-level configuration steepens the slopes of the NR band, further minimizing the effects of high-level signals on low-level ones.

Fig. 11—Block diagram of the S-type encoder. The decoder diagram would be essentially a mirror image of this.
Recorders licensed for Dolby Sloe Nil must meet new performance standards that would also help ensure better compatibility.

The first tape decks with Dolby S-type will use a new, dedicated three-IC set developed with our cooperation by Sony's IC division, which will be making them available to all Dolby licensees. Later this year, Sony expects to complete the development of a single-chip version having identical performance and other IC manufacturers have expressed interest in doing so as well. However, Dolby S-type is always likely to cost more than our current consumer systems. That higher cost, combined with the higher overall performance required of the machine, means that cassette recorders with Dolby S-type may remain at the higher end of the price range. The first models, expected later this year, definitely will be so.

**Dolby S-Type and The Future**

We cannot predict now many home listeners might want better cassette performance, and how much more they will be willing to pay for it. However, the success of the CD indicates that higher quality sound is appealing to a significant market, and we have found that, at the highest playback levels likely to be encountered in the home, sophisticated listeners subjected to A/B comparisons of CDs and Dolby S-type cassettes are unable to identify which is which with any regularity. We are also unable to predict if the prerecorded cassette industry, unwilling to release titles in more than one format, will consider Dolby S-type cassettes sufficiently "compatible" with B-type playback to issue significant numbers in the new format. Be that as it may, the initial response to demonstrations we have conducted for the industry is generally favorable, and we are proceeding with the development of an appropriate professional encoder. Adding to these factors is the enormous investment in the cassette format by consumers, the music industry, and the audio industry (prerecorded cassettes significantly outsell CDs and LPs combined, and more than 280 million cassette machines with Dolby noise reduction alone have been sold). Therefore, there is a real possibility that Dolby S-type will extend and increase the returns on that investment, just as Dolby SR is already doing for professional analog formats.

This short evaluation of Dolby Laboratories' new Dolby S NR system was made using a Teac V-10000 Esoteric cassette deck, which also has Dolby B and C NR. In addition, it has signal generators which produce a 400-Hz tone for level calibration and a 10-kHz tone for bias setting. I used Fuji FR Metal tape for all my tests. Pink noise, band-limited at 15 Hz and 25 kHz, was the source for the first tests. After deck calibration, a third-octave RTA showed a rising response above 10 kHz at -20 dB, so I increased the bias slightly to get flatter overall responses. Figure B1 shows record/playback responses from +5 dB (relative to meter zero, which is at Dolby level) down to -25 dB, in 5-dB steps. The highest levels show some saturation effects, but the curves are very flat, in general, over the wide range in levels.

One of the more interesting features of Dolby S NR is the spectral skewing at both low and high frequencies. (Dolby C NR has it at high frequencies only.) Both Dolby C and S NR have high-frequency antisaturation circuits. I measured the saturation caused by increasing levels (from -20 to +10 dB) for Dolby B, C, and S NR and without NR. The great improvement across the entire band with Dolby S NR, compared to Dolby B or no NR, was immediately very obvious. Resistance to saturation with Dolby C NR was close to that for Dolby S NR at the high frequencies but was clearly not as good as with Dolby S NR at the low frequencies. The low-frequency maximum output level (MOL) results with Dolby C NR were very slightly better than with Dolby B NR. With Dolby S NR, however, the MOL improvement over Dolby C NR was 0.7 dB at 1 kHz, in-
creasing at lower frequencies to over 8 dB at 20 Hz, a significant change. The Dolby S saturation output level (SOL) results were better than those for Dolby C NR from 3 kHz to about 14 kHz, where they dropped just below those for Dolby C.

I recorded the band-limited pink noise at -20 dB with Dolby C NR and played it back using Dolby B (Fig. B2). There was some boost around 8 kHz and a roll-off above 10 kHz, but these were not bad, overall, for a change in mode at a level sensitive to errors. I also recorded with Dolby S and played this back with Dolby B NR. In this case, the changes in frequency response were more widespread and the level shifts were greater. I tried the same two combinations over a range of levels, and the basic results generally remained the same: For playback with Dolby B NR, the response deviations were less with the Dolby C recording than with the Dolby S recording.

I purposely misadjusted bias and level calibrations a few different ways and confirmed Dolby Laboratories' claim that Dolby S NR is more resistant than Dolby C NR to mistracking from calibration errors. Final conclusions awaited results from the listening tests.

Next, I ran signal-to-noise tests, referred to Dolby level, using all NR modes. With A-weighting, the ratios were 55.0, 63.4, 72.1, and 73.4 dBA for no NR, B, C, and S NR, respectively. With CCIR/ARM weighting, the figures were 52.0, 62.2, 71.8, and 71.8 dB, in the same order. Checking noise in the third-octave bands. I confirmed that low-frequency noise (around 80 to 100 Hz) was 10 dB lower with Dolby S NR than with any other NR choice. The noise with Dolby S NR was slightly higher than with Dolby C NR from 2.5 to 5 kHz, but noise with C NR was noticeably higher than with S NR from 20 Hz to 2 kHz and from 10 to 20 kHz. From the RTA display, the maximum reduction in third-octave noise with Dolby S NR was 20.5 dB at 1 and 1.6 kHz. With the 400-Hz MOLs, the signal-to-noise ratios were 72.6, 81.6, and 84.2 dBA for Dolby B, C, and S NR, respectively.

The first CD I tried recording was Bach: The Organs at First Congregational Church, Los Angeles, with Michael Murray (Telarc CD-80088). I was quickly convinced that at high recording levels, Dolby S NR yielded superior results on the low pedal notes between tracks. I detected no difference in noise level between the CD source and the tape playback with Dolby S NR; with Dolby C NR, I had heard a slight difference. The next CD was Tchaikovsky's 1812 Overture (Telarc CD-80041), performed by Kunzel and the Cincinnati Symphony Orchestra. I concentrated on recording and playing back the last minute of the overture. Very quickly, I demonstrated the correctness of recording this CD. I thought I had set the input pots conservatively, but the cannons caused levels way above +10 and the sound was badly distorted, so I reduced level a bit. At that point, I got very acceptable results with Dolby S NR, even though momentary peaks still came up to +10. For the first time, I truly appreciated the cannon sound in the playback. Other NR modes were definitely not acceptable unless the level was lowered greatly.

Stravinsky's Firebird Suite (Telarc CD-80039), with Shaw and the Atlanta Symphony Orchestra, was very well recorded with Dolby S NR. The playback of the "Infernal Dance of King Kastchei" and the finale was low in distortion and well detailed from the bass drum to the cymbal crashes. I then tried recording other sections of this CD with Dolby S NR, switching back and forth in playback between this NR system and Dolby B or C NR. In the medium- and low-level passages, I could hear the response shifts which had shown up in the bench tests. I certainly preferred the sound when playing this Dolby S-encoded tape through the Dolby S decoder. Yet when listening to this same tape through Dolby B and C decoders, though the spectral balance was no longer accurate, it did not change when the level of the signal changed even though the levels varied over a wide range. I did not detect any disturbing pumping or obvious shifts in spectral characteristics. Overall, the sonic compatibility with Dolby B and C was definitely better than I thought it would be.

Dolby S NR has established itself as my preferred noise-reduction process for its resistance to overload across the band, good signal-to-noise ratio at all levels, low distortion, and resistance to calibration errors. Let's hope the chip makers can bring the cost down to facilitate including Dolby S NR in more than just the top-of-the-line cassette decks.

Howard A. Roberson
Given his relatively few years, Steve Epstein has produced an enormous number of recordings. Among the artists this Sony Classical (formerly CBS Masterworks) executive producer most frequently records are trumpeter Wynton Marsalis, cellist Yo-Yo Ma, violinists Cho-Liang Lin and Isaac Stern, and pianists Murray Perahia and Vladimir Feltsman. The Chicago Symphony, Berlin Philharmonic, and Vienna Philharmonic are all entrusted to Epstein, as are Michael Tilson Thomas, Lorin Maazel, and Zubin Mehta.

Epstein started his career at CBS Records in 1973, when he was hired as a music editor fresh out of college. (He holds a B.S. in music education from Hofstra University.) He apprenticed for a year with Tom Frost before being given his first major project at age 23, and since then has produced well over 100 recordings, many of them garnering highly prestigious awards.

Five of his nine Grammy-winning discs are Wynton Marsalis projects; Epstein produces this talented trumpeter both as a classical and a jazz artist. Given Epstein's successful fence-straddling, it was interesting to learn the particulars of his approaches to the two different genres.

S.E.

You've produced nine out of the 12 records Wynton Marsalis has made for CBS/Sony. How did you two hook up in the first place?

Buddy Graham [who now engineers Marsalis' classical recordings] and I were in Vienna, where we had just finished recording Mahler's Fourth—the first Mahler record I had done—with Lorin Maazel and the Vienna Philharmonic. This was 1983. We were in the airport on our way back to the States, and who do we see but Wynton. I had met him once before, so I went up and reintroduced myself. The three of us sat down for a drink—Wynton had a Perrier, he doesn't drink—and started talking about recordings. Wynton mentioned that he liked the live Gershwin record I had made with Sarah Vaughan and the Los Angeles Philharmonic. He had two jazz records out, and he was telling me that he wanted a bigger sound on his next one. He knew I was going to be producing his next classical album, so he asked if I'd be interested in doing his jazz album too. I said sure, I'd love to.

I'd never done a jazz album before, other than the Gershwin, and that was more symphony orchestra/pops than jazz. But he liked my philosophy of recording jazz—that it should be done in real time (that is, live with no overdubbing) in a nice-sized room. The whole idea is for everyone to play off everyone else in real time. That's what makes jazz jazz.
His previous jazz recordings had been done at Media Sound, which is a fine studio, but my instinct told me that RCA's Studio A would be a better room for jazz. It's large enough to allow an ensemble with potentially high volume levels to "breathe," while at the same time it's not overly reverberant, which would yield a less intimate environment than you want for jazz. The first record we did was *Hot House Flowers*. That was larger scaled than most jazz records.

True. It had a small orchestra—a string section, some winds and brass—which, of course, played from charts. So that made it a little more like a classical recording, and I was able to hone in on things by using bar numbers and so forth—"bar so and so is not great." It was a nice gradual way for me to slip into jazz.

*Hot House Flowers* won a Grammy, as have most of your jazz records with Wynton.

Right, it turned out just fine. Ever since then, Tim Geelan [who engineers Marsalis' jazz records] and I have been honing and refining our technique, using the multi-track digital machine to experiment with different microphones, which we also do with classical. That's the fun of recording—experimenting. *Do you have a background in jazz?* Not really. My father loved it, and I listened to it through him. My background is classical, but I love what jazz is about and I'm moved by it. Certainly, producing Wynton I realize that I have a lot to learn about jazz. But that's one of the joys of working with him. *But you must have some frame of reference.*

Well, sure, I've listened to recordings. But basically I feel someone who has good ears, good taste, a solid musical upbringing, and a knowledge of how instruments are supposed to sound can do a good recording, be it jazz, pop, or classical. There's really no magic; you just have to know what you sense to be correct.

You might find producers who are better versed in jazz than I am or who play jazz part-time or even full-time, but who may not know how to transfer what happens in the studio onto the tape. That's what's important. *During the sessions for Wynton's recent jazz disc, The Majesty of the Blues,* I noticed you doing little drum fills with your hands.

Oh yeah, I probably was. I guess I'm a frustrated drummer, just like I'm a frustrated conductor. You get into it. Some people tap their feet. I play it out with my fingers. *What's your general philosophy about recording jazz?*

From a recording standpoint, jazz falls right between pop and classical. It comes closer to classical, in that it's all done in real time and pop is mostly layered. In jazz, you don't mike at the same distance you do in classical. Jazz is more intimate and is meant to be heard in a closer perspective, like in a club, than classical. At the same time, you don't want to record it in a closet and have it sound dead. Instruments are instruments. And jazz acoustic instruments are meant to be heard in a reasonably sized room. Wynton has a beautiful trumpet sound. You want to allow it to blossom a little bit. You don't want it to be stuck in front of a microphone in an anechoic chamber. That is what Wynton liked about our approach. Of course, this was the approach they used back in the '50s.
JAZZ SHOULD BE RECORDED LIVE, IN A NICE-SIZED ROOM. THE IDEA IS FOR EVERYONE TO PLAY OFF EVERYONE ELSE—THAT’S WHAT MAKES IT JAZZ.

And the more recent approach has moved away from that? It seems that on some recordings I’ve heard, yes, the tendency is to get pretty close and to have this closet-like, claustrophobic sound. I wonder why. The pop mentality, perhaps?

Well, it’s funny. It’s almost cyclical. Before the days of multi-tracking, people recorded in large rooms with just the few tracks that were available. With the advent of multiple tracks, the tendency of some producers and engineers in the late ’60s and ’70s was to use more mikes and therefore get closer to the instruments. This affected pop, jazz, even classical recording. And consumers liked hearing close-sounding recordings because they were impressive—stereo components didn’t have the sensitivity they do these days. Close-miking pretty much prevailed throughout the ’70s, but now—and hopefully we’ve had something to do with this—the tendency is to get back to a more natural sound. Instruments are meant to be heard from a certain distance. And in digital, and with the quality of playback equipment today, you really don’t have to mike that closely. A symphony orchestra is meant to be heard not from a foot away from the center of the orchestra, but from at least 10 rows back. It takes at least that distance for the bass frequencies to blossom. And now, with the high sensitivity of digital recording, you can capture that. By the way, I’m not addressing mike placement here, just the listening environment.

What about jazz?

You’re compelled to mike closer than in classical because you want the music to have the impact it would have, say, in a nightclub. But if you get too close, then you’ll distort the frequency spectrum, which makes for a rather unpleasant, strident sound. Again, you want the instruments to sound like real instruments.

I hear a lot of crossover recordings, bordering between pop and classical, where a large symphony orchestra is called for and it’s been recorded in a dead studio. It sounds awful. You might as well use a small orchestra. Why waste all those musicians?

Was it a conscious decision on your part to take jazz into the classical recording context?

Absolutely. It was the jazz recordings I’d heard that had been done in a very dry studio that compelled me to try the change. It just seemed the natural way to go.

I also think that with Hot House Flowers, we were the first to record jazz digitally, although I can’t say that for sure. A lot of classical recordings were being made digitally then [1984], but a lot of the pop people didn’t like the medium and were afraid of it.

I’ve read that you use a modified Decca tree in making classical recordings. Can you explain how it works?

The original one was devised by Kenneth Wilkinson, one of the Decca engineers from the ’50s through the ’70s. He made some great recordings. It’s a very simple setup using three omnidirectional microphones mounted on a tree in a “T” configuration. The leg of the “T” predominantly picks up the center of the orchestra, and the two other microphones pick up the left and right—high strings and low strings. The center picks up the other mass of strings and, mostly, woodwinds. Everything else has depth because it comes into those mikes at the proper time.

The use of omnidirectionals placed accordingly pretty much yields the balance the conductor himself hears. Years back, Buddy and I used mostly cardioid microphones. We wouldn’t have dared using omnis—too dangerous! Some companies still do use cardioids as a main pickup. They’ll put four or five on the strings—one for each section—and four or five for woodwinds, plus mikes for all the brass, horns, and percussion, and maybe ambience mikes. Buddy and I have been moving away from multiple miking for at least five or six years. Many times, you’ll hear conductors who are used to that old technique say to the orchestra, “Oh well, they can take that down in the mix later, don’t worry about it.” I’m finding that I constantly have to re-educate on that point. Before recording, I explain, “We have very little flexibility after the fact. What you, the conductor, hear is pretty much what we’re getting. If I get too much trumpet on the tape, it’s not us; it’s happening out there in the hall.”

Do you use mikes in the hall at all?

Sometimes we do. If it’s a fairly reverberant hall, like the Concertgebouw or Musikvereinsaal, where we record the Vienna Philharmonic, we won’t because there’s enough ambient information coming into the main microphones. That’s why mike placement is critical: We’re using only a few mikes to capture the immense sound of a large symphony orchestra.

Do you prefer recording in a hall to recording in a studio?

Yes. Always. At least in classical. Not in jazz, where listening to a quartet or quintet in a concert hall is antithetical to what it’s all about. You have this big cavernous sound, and the music just loses all its effect.

Aside from achieving a natural sound, what is your approach to classical recording?

Ever since I was a little kid, I’ve always liked to close my eyes when listening to a recording and pretend I was in a
concert hall. That's what I try to create on record—an illusion. In the concert hall, you have many senses being stimulated. You hear a little bit with your eyes. You see a massive string section, and your mind synthesizes more strings than are really there. A recording has to make up for the lack of that visual aspect. You have to set up your mikes to take full advantage of a massive string sound. And chances are, what will be deemed natural over speakers will be a fuller string sound than what you might hear in a live concert. Sometimes it takes a little bit of artifice to make up for no artifice. Two or three microphones placed in an ideal position in an audience will sound hollow and cavernous over loudspeakers. And the ideal placement for microphones is not the ideal placement for listening to an orchestra, just by the nature of psychoacoustics.

How important is the hall in classical recording?

In the '60s and early '70s, the quality and size of the hall were not as important because closer miking meant you would have less of the hall's influence. Equipment wasn't as sensitive. And in the analog days, you didn't have to worry as much about ambient noise, rumble, and traffic noise.

So finding a good hall that is quiet and has good acoustics has become much more important than it was. The success of the sound of a classical recording is 90% dependent on the hall that is selected.

What's the best hall you've ever worked in for classical?
The Concertgebouw in Amsterdam. It just has a golden glow of reverberation. The characteristics are so uniform and umbrella-like, in the sense of an even tapering off of sound. We record on the floor, not the stage, and take out all the seats except those on the perimeter of the room, which we leave in to soak up some of the excess reverberation.

For your standard five-microphone setup, how many tracks do you use?

Since, to my knowledge, no four- or eight-track digital machine is currently on the market, our choice in classical and jazz is two- or 24-track. Effectively, we could very easily make an adequate two-track recording simply by blending those five mikes into a two-track picture. But I refuse to go into a session with only two tracks at our disposal. Suppose we're in a hall that we don't use everyday—and after all, we're sort of like nomads, going from great hall to great hall—with a control room that I'm not entirely familiar with; it might have acoustic anomalies and resonances that could give us the wrong picture of what we're getting on tape. So we get back to a control room that we're familiar with—you know, the real world—and we discover that, say, in the case of a piano concerto, the piano is either way too loud or way too soft. If we're only in two-track, we're locked into that balance. Multitracking offers us the opportunity to critically and properly balance in a room we're familiar with. Another example: If we do use ambience mikes, I don't want to lock myself into a blend of ambience and main microphones and end up with an overly reverberant recording.

Frankly, I'd be very happy to have a four-track, an eight-track, or, for opera, a 16-track recorder. But the fact that we have 24 tracks gives us a little more flexibility and also enables us to experiment.

Of course, as soon as you mention multi-track in classical recording, some audiophiles raise their eyebrows because they feel it's not the purist's way. And even though we're only using a few of the 24 tracks, people see the 24-track machine noted on the liner information and say, "Hah, they're using multiple microphones, they're in multi-mono and it's a big corporation and what do they know about classical recording?" You find that in many reviews. Rather than just listening to what they hear, people get caught up by what they see or read and become misled. They feel that those in the establishment, in a big corporation, have untold amounts of dollars, so they just use everything—multiple mikes, multiple tracks—and it's all supervised by a fat-cig producer with a big cigar. It just isn't that way.

You usually edit on the Soundstream (digital editing system). Doesn't that limit you to eight tracks?

Right. And we think that system is wonderful. It cuts our editing time tremendously because it's instant-access editing on hard disk, as opposed to real-time editing, where you have to record each take onto another ma-
chine just to build a master. Sony has also developed software to enable their DAE-3000 two-track editor to interface with their 24-track digital recorder. This works quite well and allows us to edit the full 24 tracks.

Do you use a Sony 24-track in recording jazz as well as classical?

Yes, we have. Until Sony comes out with a smaller machine that supplies us with only eight tracks, I'm happy with that.

I understand Sony has come out with a new version of the 3324.

It's called the 3324A, and it's got improved analog-to-digital and digital-to-analog converters that, in my opinion, are the best on the market.

How has Sony’s acquisition of CBS Records affected your division?

Very positively. Messrs. Ohga and Breest have made some very positive statements about making Sony the Number One classical label in the world. Obviously, that made us very happy. [Norio Ohga is president of Sony Corp.; Guenther Breest is president of Sony Classical, of which Masterworks is now a U.S. division.]

Does this mean you’ll only be able to use Sony equipment?

The choice of microphones, and things that are basically a question of taste at the time of recording, will be left up to the producer and the engineer. But we will be using Sony digital consoles and Sony equipment in the control rooms and post-production rooms. We'll be experimenting with prototypes too. For instance, Sony is in the process of developing studio microphones. The prototypes are very promising.

Tell me about Wynton’s classical recordings.

We've done four together. Our first was a baroque album recorded in St. Barnabas Church, north of London. Excellent acoustics, although we had something of a noise problem with trains and cars. The second one was a French album with the Philharmonia Orchestra and Esa-Pekka Salonen. That was done in Walthamstow Town Hall, also an hour away from the center of London. It's one of the best places to record a symphony orchestra in London. The third, Carnival, was a cornet record Wynton did with the Eastman Wind Ensemble in the Eastman Theatre. The most recent one was multiple baroque trumpet, which was done in St. Barnabas with the English Chamber Orchestra and conductor Raymond Leppard. Saint Barnabas Church has a very nice, atmospheric, warm sound. It's not overly reverberant and yet it allows instrumental choirs to blend very naturally, so it's well suited for baroque music. It's too small to house a much larger ensemble.

What was the mike setup on Wynton’s most recent classical disc, Baroque Music for Trumpets?

Actually, the most recent album was very unconventional because it employed a lot of overdubbing. Wynton played eight trumpets on one of the pieces. [The procedure was quite tricky: After laying down the basic trumpet-with-orchestra tracks in St. Barnabas, Epstein returned to New York to edit. He and Marsalis then returned to the church and overdubbed live: While one machine played back the original tracks, another recorded them with Marsalis playing the second trumpet part. This process was repeated for as many trumpets as were called for—in one case, eight—with the soloist positioned as near or far from the microphone as authenticity dictated. Due to variances in reverbation time, Marsalis frequently had to play slightly before the prerecorded music in order to be in sync with what was already on the tape. Epstein's liner notes on this album explain the process in greater depth.]

To lay down the basic trumpet with orchestra, we used our standard setup: Five omnidirectional mikes spread across the orchestra, giving a basic, general nondiscriminating pickup. We also used a woodwind microphone and a spot mike for the trumpet, to define it. But the majority of the sound was the leakage into the five main microphones. As usual, we had very little control on rebalancing.

How do your philosophies for miking Wynton differ, jazz from classical?

In classical, the whole idea is to pick him up in the main microphones. They are responsible for providing the body of his sound and the main tone that he imparts. His particular mike is only there to define the sound. In jazz, we rely much more on that solo mike; it's responsible for his primary sound.

In a general sense, how does his sound differ?

He likes more air in his jazz recordings and likes a rounder sound for classical, both of which he gets on his own.

Is Wynton more at ease in jazz than classical?

Yes. Jazz is his first love, and he feels more comfortable in that setting. He knows exactly what he wants. He's even admitted to being a bit nervous in
a classical session. But as soon as he puts the mouthpiece on his lips, his nerves are dispelled.

You would never know that he devotes most of his life to jazz when you hear him play the baroque trumpet. It's just uncanny. He's also an unrelenting perfectionist about getting the sound he wants on the tape. That can be very frustrating at times because you want to hear what he's hearing or what he wants to have happen, but you can't. I've gotten to the point where my ears are so attuned to his perfectionism about sound and attack, that in other sessions, I'm always surprised at what other trumpet players deem acceptable. Wynton would not accept what most players do.

In sitting in on the session for The Majesty of the Blues, I noticed that you were using several mikes on his trumpet. Why?

With Wynton, we always make it a point to try a new microphone at every session. We'll put it on its own track, which we may never even use. This goes for classical as well as jazz. As happy as he is with the trumpet sound, he always likes to see how far we can go to improve it. So we always experiment.

What are your preferences in microphones?

It's interesting, because two microphones can have exactly the same specification and yet sound completely different. Almost like a phono cartridge or speakers. B & K has been very helpful in keeping us apprised of their latest products. For the most part, they're our preferred microphones, particularly for classical. They've just come out with a new cardioid mike that, so far, has worked in more applications than other mikes we've used.

You used the B & K on Wynton for The Majesty of the Blues?

Right. The B & K 4011 cardioid has a very full-bodied sound and works well on loud material and on soft.

Weren't you also using a Schoeps?

That sounds very good, too. Sometimes we switch mikes when Wynton's using a mute. A muted trumpet can have a great deal more high-frequency material in it, and a particular mike, such as the Schoeps, may be better suited for that.

For this session, there were the B & K, the Schoeps, and one more.

We also used a Neumann U67, which is an old standby and has been very successful for trumpets. It's still a competitive mike in some ways. It has a large diaphragm; you can derive a lot
of warmth out of a sound with a large-diaphragm microphone.

**What about the piano mikes?**

Here we could experiment as well, because of the abundant tracks. Recently, we've been using an AKG C422 stereo mike, which gives us a nice, accurate pickup for the piano. We've also been using two Neumann UB7's. Then we decide at a later date, with critical listening, which we're going to use. So you're talking about four tracks now for the piano, of which two will be used in the final mix.

**How close to the strings are the mikes?**

Certainly closer than in classical recording. The mikes are pretty much over the strings, but the cover is up. On a lot of pop recordings, the cover is down and they put blankets over it. We don't do that.

**What about the bass?**

For the bass pickup we place an Electro-Voice RE-55 omni mike under the bridge. What we've been using recently as a main bass mke is a Neumann TLM 170i, which is new. It has superb applications for voice, for pizzicato bass, and particularly for brass and saxophone.

**Do you ever go direct in bass?**

Bass direct is pretty much a no-no in jazz, but if we're doing a real burnout piece, where everybody's playing at very high levels, we will have a direct track on the tape just in case the bass has gotten lost.

You also always have this problem of bass drum and bass fiddle conflicting in their similar frequency ranges. On some occasions we may ask the bass drum to voice his instrument a little higher to mitigate the problem. That way you can still hear the impact of the bass drum and recognize the low frequencies from the bass fiddle.

So, yes, we'll edge in the bass direct in those circumstances where we've really lost articulation. But we prefer not to.

**Drums?**

In the old days, we used a mike on every tom-tom, on the splash and ride cymbals, and on the bass and snare drums. I wanted to do away with all those mikes because it turns the drum set into its own recording studio. It draws too much attention to itself. So recently we've cut down on the number of mikes and tried using two omnidirectional as an overhead pickup. You'd think omnidirectional wouldn't be advisable because it's picking up everything, and what you really want is the impact. So you'd use maybe two cardiods to give it that hot sound.

But we use two B & K 4003 omnidirectional microphones, an AKG D12 mke on the bass drum, and an AKG 451 on the snare drum, which picks up the high-hat too. You get a much more natural sound using that setup, and you still have the impact. There's plenty of energy.

**How close?**

Relatively close—the main microphones are maybe a foot-and-a-half over the cymbals.

**Sax?**

The Neumann that we used on the bass is also the best saxophone mke. We've tried a lot of saxophone mikes, and we think the TLM 170i is the best available.

**Do you use any room mikes?**

We use two. We've been using a pair of Schoeps MK2S microphones and also B & K 4003 omnis. In a ballad, we'll edge them into the mix a little more. If it's a real burnout we won't, because there's so much leakage.

**How about outboard equipment?**

We use very little during recording, though we might do some things for the monitor mix or use a little equalization on the bass drum. But we try to do as little as possible.

We generally put the monitor mix onto two tracks of the digital machine, just to see what we did at the time of recording. You would be surprised at how close we come in the final mix to what we did for the monitor during the session.

When we mix, we might use a limiter on the bass to give it a more linear response, to even out the resonances. And we'll definitely use reverberation, but just a little bit, because the whole idea of using a big room is to let it speak for itself. On the other hand, the room may not always have a nice tail or decay, which we can achieve with digital reverberation.

**Do you use digital reverberation in classical too?**

Yes, sometimes. Thank God for equipment such as the Lexicon 480 digital reverberation unit, particularly if we record in a very dry hall. What we'll do, if necessary, is add a little bit of reverberation to the ambience mikes, just to give it a natural-sounding decay. We did that for Wynton's Eastman Wind Ensemble album. The Eastman Theatre has a nice acoustic, but it's dry. In the Musikvereinsaal, we do not add reverberation because it's a fairly live venue.

**Do you use equalization in classical?**

Rarely, if ever. The quality of microphones is so fine, we don't need to. This is also true of Wynton's jazz recordings.

No. In a jazz recording, we will use equalization, though only to assist in what wasn't picked up accurately by the microphones or what the studio wasn't offering.

**What's your all-time favorite studio?**

For classical, it used to be the CBS 30th Street studio. That was the greatest room in the country. Tragically, it was sold in the early '80s and torn down. It was an old church, barely big enough for a symphony orchestra. All the Broadway shows were recorded there; even Stravinsky used it. No one had the foresight to realize its importance. It was the quick-buck mentality, which fortunately Sony doesn't have. Now that 30th Street is gone, EMI Studio—Abbey Road—is probably the world's best symphonic studio. It's acoustically superb. You can do anything there. It's a very live room, so if you're doing chamber music or pop, you have to screen it off a little bit to soak up some of the reverb.

**Is that for jazz as well?**

No, a studio that is ideal for classical is not ideal for jazz, pop, or show music because you need a longer reverberation time in classical. For jazz, I prefer to work in RCA Studio A.

**As a producer, how does your role differ, jazz to classical?**

In a jazz recording, the artists are always composing. As a producer it's somewhat frustrating, because I'm used to contributing a lot to classical recordings, commenting on right notes, wrong notes, interpretation, and sound. In jazz, how do you tell an artist, "I don't like what you just played, when it's something he played—improvised—from his heart? It's not a question of interpretation, it's a question of taste, of actual music being composed, rather than right or wrong or notes on a page.

**So what contributions do you make in a jazz recording?**

Offering the odd comment about performance. If I think something is a little slow, a little fast. I might suggest a cymbal roll here or for the bass to cut out there. Just to make sure the sound is correct, the balances are right, and to follow the recording through to its final end, till it comes out on CD.

My main job, classical or jazz, is to capture on tape what the artist does best. That's what I'm here to do.
Breathtaking
The breathtaking performance of Polk Audio's new RTA 15t loudspeaker system is the result of the rare combination of state-of-the-art technology and superior design.

Incorporating technology from Polk Audio's Limited Production SRS (Signature Reference Loudspeaker System), the RTA 15t uses advanced components and design technologies to achieve outstanding musicality, detail and imaging. The heart of this design is a line source array that achieves an openness and spaciousness permitting a wide range of optimum listening positions. At the center of this line source is Polk’s SL3000 tri-laminate tweeter, an engineering triumph in high frequency smoothness and dispersion.

Outstanding bass impact and dynamic range is realized by using two 10” sub-bass radiators (one front mounted and one rear mounted). This dual bass radiator technology achieves deeper, flatter, more accurate bass than conventional designs.

The new Polk RTA 15t … one listen will take your breath away.
## Sony CDP-X77ES CD Player

<table>
<thead>
<tr>
<th>Manufacturer's Specifications</th>
<th>Number of Programmable Items per Disc: 20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency Response:</strong> 2 Hz to 20 kHz, ±0.3 dB.</td>
<td><strong>Power Requirements:</strong> 120 V a.c., 50/60 Hz, 22 watts</td>
</tr>
<tr>
<td><strong>S/N:</strong> Greater than 117 dB.</td>
<td><strong>Dimensions:</strong> 18⅛ in. W x 5 in. H x 14¾ in. D (47.2 cm x 12.7 cm x 37.1 cm)</td>
</tr>
<tr>
<td><strong>Dynamic Range:</strong> Greater than 100 dB.</td>
<td><strong>Weight:</strong> 37.4 lbs. (17 kg)</td>
</tr>
<tr>
<td><strong>THD:</strong> 0.0015%.</td>
<td><strong>Price:</strong> $1,700</td>
</tr>
<tr>
<td><strong>Channel Separation:</strong> Greater than 110 dB.</td>
<td><strong>Company Address:</strong> Sony Dr., Park Ridge, N.J. 07656</td>
</tr>
<tr>
<td><strong>Wow and Flutter:</strong> Below measurable limits (±0.001% wtd. peak).</td>
<td>For literature, circle No. 90</td>
</tr>
<tr>
<td><strong>Analog Output Levels and Impedances:</strong> Unbalanced, fixed, 2.0 V/10 kilohms; variable, 0 to 2.0 V/50 kilohms; balanced, 2.0 V/10 kilohms; headphone, 40 mW/32 ohms.</td>
<td></td>
</tr>
<tr>
<td><strong>Digital Output Levels and Impedances:</strong> Coaxial, 0.5 V peak to peak, 75 ohms; optical, −18 dBm (660-nm wavelength).</td>
<td></td>
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</tbody>
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### Company Address

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- For literature, circle No. 90
Every time I think I have come up with a reference CD player in the under-$2,000 price category, along comes Sony with a next-generation player that surpasses my choice on just about every count. Such was the case with the CDP-X77ES, which is Sony’s successor to the acclaimed CDP-X7ESD, my previous selection as a reference player.

The refinements and enhancements in the CDP-X77ES include innovations and improvements in circuitry as well as user convenience features. Like many new CD players, this unit embraces what many call “one-bit” D/A technology (a bit of a misnomer, but not a serious one). Much has been written concerning the advantages of one-bit D/A conversion (which uses techniques developed by NTT, the Nippon Telegraph and Telephone Corp.), so I won’t spend time detailing its principles except to say that such converters can theoretically be free of several problems associated with conventional, step-waveform D/A converters. These problems include differential nonlinearity distortion, zero-crossing distortion, and glitches caused by minute timing differences between the various bit switches. Sony’s version of one-bit technology, which they call a High Density Linear Converter System, consists of a noise-shaping digital filter, a new “pulse D/A converter,” and an analog low-pass filter.

Noise-shaping filters are integral to the design of one-bit converters. Since such converters operate on one bit at a time, instead of all 16 bits simultaneously, the bit rate must be reduced to be practical with today’s IC technology. Noise shaping permits this bit reduction to be done without loss of audible dynamic range, by shifting much of the noise up to inaudible frequencies. In the CDP-X77ES, Sony employs a third-order filter system that operates at a 64-times oversampling rate.

While the output of a conventional D/A converter is a stepwise version of the original analog signal, the output of a pulse D/A converter consists of a train of pulse-length modulated (PLM) pulses which, like the stepwise outputs of other D/A circuits, can be converted to a smooth analog wave by a high-pass analog filter. To raise the pulse density for higher accuracy, the converter uses a clock generator that operates at a maximum of 50 MHz, about twice as high as that of ordinary high-speed C-MOS ICs. To eliminate minute, secondary distortion components that would show up predominantly when reproducing higher audio frequencies, Sony uses two pulse D/A converters per channel in complementary mode.

Since a pulse D/A converter defines musical signals by altering pulse density, it is important to time those pulses precisely to ensure conversion accuracy. Sony uses a Direct Digital Sync circuit to accomplish this. The circuit was incorporated in last year’s players as a separate IC, but has now been integrated into the new HDLC IC, enabling direct connection of a highly accurate quartz-oscillator master clock to the PLM pulse converter.

By using these techniques, Sony claims to have achieved a theoretical S/N ratio of 124 dB! These enhancements also contribute to what I found to be amazingly low residual distortion in the CDP-X77ES.

Custom Edit and Custom File, two convenience features which take advantage of the subcodes found on all CDs, are used here, as they were in earlier Sony players. Custom Edit makes it easy to calculate how many selections can fit on a cassette of given length. As you program the player, the time display shows the total accumulated time that you have programmed. A manual fade feature lets you smoothly fade a selection digitally if you must use up the last bit of tape while transcribing a CD, so that when it is played back, there is no abrupt interruption in sound as you come to the end of one side of the tape. Custom File lets you store your programming choices for a disc in a “program bank” so that you can call up the program whenever you play that disc again. Every time you insert the disc, the player can recall your selections and play them in the order you had previously selected. Of course, such features as shuffle play, single play, and the various types of repeat play are also available.

Control Layout
Most of the special features just described are accessible only from the supplied remote control, so as to keep the front panel’s layout relatively uncluttered. The main power switch, the headphone jack, and the level control (which affects both the headphone and variable line outputs) are at the left end of the panel. Nearby is the smoothly operating disc tray, and below it is a large display area. In addition to the usual displays of elapsed or remaining time and track and index numbers, this display shows playback mode (“Program Bank,” “Single,” and “Repeat A-B”), the presence of a disc, and “Custom index” status.
Every time I think I have found a reference CD player for under $2,000, Sony brings out something that completely surpasses it.

Immediately to the right are the "Display On/Off" and drawer "Open/Close" buttons. At the upper right of the panel is the button for selecting analog or digital output, with a pair of indicator lights to show the current output mode. Track advance and reverse buttons (Sony calls them "AMS," for Automatic Music Search), fast forward and reverse search buttons, and the usual play, stop, and pause buttons complete the panel layout.

The remote control’s keys duplicate all of the controls found on the front panel, even including the disc tray open/close function. In addition, there are 20 numbered buttons for instant track access and programming. If a disc contains more than 20 tracks, a ">20" button takes care of accessing the higher numbered tracks. Buttons for indexing, repeat play, and all playback modes (program, shuffle play, single track, custom index, and continuous play) are found on the remote, as are buttons labelled "File," "File Recall," "Erase," "program "Clear," and "Check" (to review a program you have assigned to a disc). While the fast-search buttons on the front panel allow audible searching at a fairly rapid speed, the remote has two sets of search buttons. The search speed initiated by the first set is the same as that initiated by the front-panel buttons, but the second set, labelled "Slow," reduces the speed of the audible search.

The rear panel of the CDP-X77ES is equipped with coaxial and EIAJ Standard optical digital output jacks, balanced analog output XLR connectors, and fixed and variable unbalanced RCA output jacks.

Measurements

Figure 1 shows the frequency response of this player, from 10 Hz to 20 kHz. Deviation from flat response never exceeded 0.07 dB, even at 20 kHz, where most CD players begin to have some rolloff. Of course, a slight deviation or rolloff at 20 kHz would hardly be cause for concern, so the flatter frequency response of the CDP-X77ES may not be a contributing factor to its superior sound quality. I am convinced, however, that the distortion measurements I obtained do show some of the reasons why this player sounds as good as it does. Consider Fig. 2, the plot of THD + N. When have you seen distortion in a CD player test report that never exceeded 0.002%, even at the high end of the frequency spectrum? And at 1 kHz, THD + N was an even lower 0.0013%. This level of THD + N (relative to maximum recorded level) is maintained or bettered at all playback levels, from 0 dB (maximum) down to −90 dB, as shown in Fig. 3. A further check was done using the FFT spectrum analysis capability of the Audio Precision System One, and the results for a 1-kHz, high-level signal are shown in Fig. 4A. The tall spike at the left represents the desired 1-kHz output. The test was repeated for a recorded level of −60 dB, and results are shown in Fig. 4B. The spike at the left is the new reference and corresponds to the recorded level of −60 dB, so as you can see, noise and distortion components of the CDP-X77ES are approximately at the 0.1% point relative to −60 dB signals! This corresponds to 60 dB below the −60 dB point, or −120 dB relative to a maximum-level signal.

Sony makes a point of the fact that their new D/A conversion system is particularly good at reducing distortion com-
KSA-250 AMPLIFIER

6
86 joules @ 1 ohm
for 22 milliseconds
120KHz
Equivalent force 507 lbs
236 amps

HAMMER

2.5
38 joules/impact
1.34KHz
219 lbs/stroke
N/A

For more information contact your nearest Krell Dealer. See the Krell Digital advertisement in this issue.
Its ultra-low distortion has more do with this Sony's good sound than does its ultra-flat response.

ponents normally associated with high-frequency program content. I was already pretty well convinced of this after examining the results in Fig. 2, but to further prove the point, I played back a maximum-level, 10-kHz signal from my CBS CD-1 test disc and did another spectrum analysis of the output. Results are shown in Fig. 5. No band limiting was used and the sweep was extended out to 80 kHz, which was sufficient to show how low the harmonic components associated with a 10-kHz playback signal were. I also made spot tests of SMPTE-IM distortion, using a maximum-level recorded signal; IM was 0.003% on the left channel and 0.0027% on the right. Even clock-frequency accuracy was better than I have ever measured. It was off by a mere -0.0006%, which corresponds to a 440-Hz musical tone being reproduced as 439.99736 Hz—not particularly "off key" by even the most stringent standards!

When playing the "no-signal" track of the CBS CD-1 test disc, I obtained a remarkably low A-weighted signal-to-noise ratio of -123 dB on the left channel and -123.4 dB on the right. I believe this is a new record for a CD player. Furthermore, a spectrum analysis of the residual noise, which can be seen in Fig. 6, showed that even at the power-supply frequency, noise was still more than 130 dB below maximum recorded level. Channel separation at 1 kHz was also superb, 188 dB from left to right channel and 111 dB from right to left; even at 20 kHz, separation was 100 dB or more.

Having studied the literature concerning Sony's new High Density Linear Converter System in some detail, I was not surprised that this player's linearity was the best I have ever measured. As shown in Fig. 7, deviation from linearity for nondithered signals was about +0.65 dB for signals at the -90 dB level; for dithered signals it was closer to zero—even at -100 dB—than I have seen for any CD player, regardless of price!

The fade-to-noise test, conducted as an additional check, served to confirm the incredible linearity achieved by the CDP-X77ES. As Fig. 8 shows, there was virtually no departure from perfect linearity, right down into the residual noise level at -120 dB. The EIA dynamic range reading that this plot enabled me establish was about 115 dB—which, by the way, is the theoretical maximum for CD players. Using the EIAJ method for measuring dynamic range, I obtained a value of only 100 dB, the figure that Sony claims. I presume, therefore, that Sony used the EIAJ's method to obtain the published spec.

My one remaining test, viewing the player's output for a unit pulse signal, showed that the CDP-X77ES does not invert polarity of recorded signals.

**Use and Listening Tests**

I was, of course, intrigued by the Custom File and Custom Edit features of this player, but before I started using them and before I set aside the test instruments and addressed the ultimate question about how music sounded when reproduced by this player, I wanted to check out its ability to handle discs with severe dropouts. The Sony's tracking ability and resistance to external vibration were as impressive as its lab measurements. The CDP-X77ES was able to play through dropouts 1.5 mm in length without so much as an audible glitch. Even when track pitch was reduced to the minimum allowed by the CD Standard, the player still was able to handle such long dropouts; when successive dropouts of that length were played, they too were handled by this player as though the digital data was unimpaired.

I chose two recent CD releases for my initial listening tests. The first was a Telarc recording, Beethoven: Piano Sonatas Nos. 1, 2 & 3, Op. 2 (CD-80214), played by John O'Conor. It is no secret by now that recording a piano digitally and having it reproduced so that it sounds like a real piano is not easy. Yet this recording, played on the

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**Fig. 4**—Spectrum analysis of 1-kHz signals recorded at 0-dB, or maximum, level (A) and at -60 dB (B).
Making music is an art; making loudspeakers is a science. Nowhere will you find leading-edge technology put to finer effect than with Monitor Audio.

Monitor Audio's gold-dome tweeters and ceramic coated metal cone woofers work as one, producing staggering detail and dynamics within a coherent sound stage.

Beautifully hand finished to the finest furniture standards using only premium matched, real-wood veneers, that's Monitor Audio - where art and science meet!

(Studio 10) . . ."I found listening to this design to be an exhilarating experience bordering on intoxicating at times, and one that didn't pall."

Hi-Fi Review (Feb. 90)
Linearity was the best I've ever measured: About +0.65 dB for undithered signals at −90 dB and nearly zero at −100 dB for dithered signals.

Sony, came as close to realizing that goal as anything I have ever heard. What’s more, as good as the recording is, I found that when it was used with two other CD players in the lab, the piano lacked some of the detail and took on a somewhat “colder” sound, with some of the subtler shadings of O’Conor’s playing no longer distinguishable.

For contrast, the second CD I chose was a Delos release (DE-3083) featuring the Seattle Symphony, conducted by Gerard Schwarz, playing the complete ballet music from Béla Bartók’s *The Miraculous Mandarin* and selections from Zoltán Kodály’s *Hary Janos*. Another selection on this disc, “Galanta Dances,” also by Kodály, features solo clarinetist Christopher Sereque. It was this last selection that impressed me particularly. I was able to clearly separate the mellow, smooth clarinet sounds from the rest of the orchestral structure even when both elements of the music were interwoven—something I found difficult to do as well when the same disc was played on other machines.

Needless to say, I played a wide assortment of other discs on the CDP-X77ES. While listening to all of this musical fare, my thoughts could not help wandering back to the beginning of the CD player era, and then to the players that I tested as recently as a few months to a year ago. I thought back to the superlatives I had used in my reports on earlier players and wondered how I could top them, in words, as Sony has managed to top its own earlier players, in technology. My most recently acclaimed player, the Sony CDP-X7ESD, was tested for *Audio* less than a year ago (November 1989). That player was actually more costly, proving that, if it’s executed properly, one-bit technology, by whatever name, not only results in superior D/A conversion but—all other things being equal—actually results in cost savings as well. So now the CDP-X77ES replaces the CDP-X7ESD as the player that others will have to challenge—at least in my laboratory and listening room. What a difference another “7” has made!
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EQUIPMENT PROFILE

ROCKFORD FOSGATE
RF200 PREAMP

Manufacturer's Specifications

Frequency Response: Phono and high level, 20 Hz to 20 kHz, ±0.4 dB.


Rated THD: 0.005%.

Input Sensitivity: MM phono, 0.6 mV; high level, 60 mV.

Phono Overload: 75 mV at 1 kHz.

Maximum Input Signal: High level, 7.4 V rms.

S/N Ratio: Phono, 83 dB; high level, 90 dB.

Tone Control Range: Bass, ±13 dB at 38 Hz; treble, ±11 dB at 20 kHz.

Crossover: 12 dB per octave; supplied as −3 dB at 100 Hz for both high and low cut, modules available for other frequencies.

Crosstalk: Phono, −78 dB; high level, −90 dB.

Separation: Phono, 72 dB; high level, 76 dB.

Input Impedance: Phono, 47 kilohms in parallel with 150-pF capacitance; high level, 19.5 kilohms.

Dimensions: 17⅝ in. W × 2⅜ in. H × 8⅝ in. D (44.5 cm × 7 cm × 20.6 cm).

Weight: 5.9 lbs. (2.7 kg).

Price: $575.

Company Address: 613 South Rockford Dr., Tempe, Ariz. 85281.

For literature, circle No. 91.

The Rockford Fosgate RF200 is a fitting companion for the RF2000 power amplifier, also tested for this issue. It is designed to be placed on a shelf, although a rack-mount front panel is

Continued on page 80
ROCKFORD FOSGATE
RF2000
POWER AMP

Manufacturer's Specifications

Power Output: 200 watts per channel into 8-ohm loads, 20 Hz to 20 kHz; 300 watts per channel into 4-ohm loads, 20 Hz to 20 kHz; bridged mode, 600 watts into 8-ohm load.
Rated THD: 0.05% with 8-ohm loads, 0.1% with 4-ohm loads.
Rated IM Distortion: 0.01% with 8-ohm loads, 0.02% with 4-ohm loads.
Slew Rate: 80 V/μS.
Frequency Response: 20 Hz to 20 kHz, +0.1, -0.25 dB; 5 Hz to 75 kHz, +0.1, -3.0 dB.
S/N Ratio: 110 dB, re: full power.
Peak Output Current: 50 amperes.
Dimensions: 17½ in. W × 4½ in. H × 13 in. D (44.5 cm × 11.4 cm × 33 cm).
Weight: 35 lbs. (15.9 kg).
Price: $1,250.
Company Address: 613 South Rockford Dr., Tempe, Ariz. 85281.

For literature, circle No. 92

The RF2000 power amplifier is the first in a series of high-performance audio components offered by Rockford Fosgate, an Arizona-based manufacturer which has gained a good reputation in the professional audio field. In fact, in most details, the RF2000 is similar to the company's PRF2000 professional model. The chief differences lie in the input arrangement: The professional permits balanced or unbalanced operation and uses XLR or phone-jack input terminals, whereas the version I tested has standard RCA phono jacks.

The RF2000 uses a total of 32 MOS-FET output devices, 16 per channel. Each device is rated at 4.0 amperes continuous current drain at a temperature of 100° C. The amp is fully rated for loads of 8 and 4 ohms and is stable down to load impedances of 2 ohms. A form of analog computing system protects the output devices. Device temperature is continuously calculated and compared to a maximum limit; if
Continued on page 84
The phono section's RIAA playback equalization was one of the best I've ever measured, never more than 0.2 dB from perfect.

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The RF200 has an external processing loop in addition to the usual tape monitor loop. There are also dual sets of preamp outputs so that several power amplifiers can be connected. An unusual feature is this preamp's set of active adjustable crossovers, which can be adjusted by exchanging modules (eight-pin DIP packages) accessible from the back panel.

The unit's power supply, like that of the matching RF2000 amp, employs a toroidally wound transformer. Its smaller size, higher efficiency, and freedom from stray magnetic fields make it an ideal choice for a preamplifier of this high quality. There are few frills on the RF200, which is perhaps indicative of the fact that Rockford has chosen to stress performance and sound quality rather than needless switches and knobs.

Control Layout

On the left of the preamp's front panel are four pushbutton selectors for choosing "Phono," "CD," "Tuner," or "Video/AUX" inputs. Nearby but separated from these others is a "Tape Monitor" pushbutton. "Bass" and "Treble" tone control knobs come next, together with a separate "Tone Bypass" switch. Between the rotary "Balance" and "Volume" knobs is a "Mono/Stereo" switch. A 'phone jack, power indicator light, and on/off power switch complete the front-panel layout.

The rear panel is equipped with the required pairs of input jacks. Phono jacks accommodate only moving-magnet cartridges, so if you want to use a moving-coil pickup, you will need either a suitable step-up transformer or a separate pre-preamplifier. Tape loop record-out and tape-in jack pairs are also found on the rear panel, as are the jacks for the external processor loop. These are shipped with jumper bars installed, but if the bars are removed, external processors, such as a graphic or parametric equalizer or a dynamic range expander, can be connected to the system.

In addition to the pair of "Main Out" jacks, outputs labelled "High Out" and "Low Out" are provided in case you plan to configure a biamplified system. As an option, you can press a button behind the crossover's cover to bypass the "High Out" crossover network. Doing so will cause the signal at the "High Out" jacks to be the same as that at the "Main Out" jacks. The RF200 is capable of simultaneously feeding all three sets of outputs—main, low, and high. A switched a.c. outlet and a ground terminal are also on the rear panel, as is a crossover module access cover. Removing this cover reveals the frequency module used to create the crossover filters. Other frequency modules are available, but if the specific crossover frequencies you want are not available, the owner's manual offers advice on how to build your own, complete with a table of resistor values for some 18 different crossover frequencies.

Measurements

High-level frequency response was virtually flat from 10 Hz to 200 kHz, as shown in Fig. 1. I also measured frequency response at the "High Out" and "Low Out" jacks and superimposed the curves in Fig. 2. As you can see, the crossover frequency, as supplied by Rockford, was almost precisely at 100 Hz, and attenuation was exactly -3 dB at that point. High-level, A-weighted S/N ratio measured 88.1 dB for the left channel and 86.8 dB for the right. These results were obtained using an input level of 0.5 V and adjusting the volume control to produce unity gain, or an output of 0.5 V.

Figure 3 is a spectrum analysis of residual noise versus frequency, referred to the same input and output levels. The plots reveal the advantages of using a toroidal power transformer and show its ability to contain any magnetic fields generated in the power supply.
Believe it or not, compact disc for the car has been around awhile. There are even a chosen few who could actually afford to buy one.

Well, now car CD is really here. Because Pioneer has advanced the technology so far and created a line of players so extensive that now it's possible for anyone to afford the clarity of digital CD sound.

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There's much more, of course. And to find out, call 1-800-421-1404. We'll send you a free copy of our new brochure. As well as give you the name of a Pioneer dealer near you, who will be glad to show you our complete line of car CD systems. After all, he's been waiting for this moment just as long as you have.

ANNOUNCING THE ARRIVAL OF CAR CD. FIVE YEARS AFTER IT WAS INTRODUCED.
Rockford has succeeded in their aim of making the RF200 a reliable, accurate, distortion-free preamp without needless frills.

Figure 4 shows how THD + N varied with increasing output levels, for 20-Hz, 1-kHz, and 20-kHz signals. It is important to understand that, while the percentages of THD + N seem higher for lower output levels, these tests include the sum of distortion plus noise. At lower levels, the residual noise adds to the overall percentage read by the test equipment; at higher levels, however, what you see is dominated by the distortion itself. At 5 V output, for example, the total THD + N at all three test frequencies was only about 0.004%.

Conclusion

As Rockford states in the owner’s manual, they set out to design and build a reliable preamplifier devoid of needless frills and capable of delivering accurate, distortion-free signals to a power amplifier. In this they have succeeded eminently well. Everything about this preamplifier connotes quality and care—from the nicely crafted knobs used for tone, balance, and volume control to the high-quality internal parts on the well laid-out circuit board. As for the RF200’s sound quality, I will discuss that in my companion report on the Rockford Fosgate RF2000 amplifier. These two components together, though not inexpensive, could certainly be the foundation for an audio component system anyone could happily live with.
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The same grand scale sound that has made JBL's larger speakers the No.1 choice of recording
studios, concert halls, clubs and rock stages worldwide is quite at home in the
ProPerformers.

The only limit on their performance is your imagination. They fit anywhere...from the living
room to the kitchen to the workshop to the office. The choice is yours.

There are ProPerformer Series Loudspeakers and subwoofer
combinations to match your musical desires. Come
in and audition JBL ProPerformer Series
Loudspeakers and bring pro sound home.
Its high dynamic headroom, 2.44 dB for 8-ohm loads, lets the RF2000 produce up to 350 watts per channel on power peaks.

Continued from page 79

the limit is reached, the power is automatically cut back and the front-panel LED for the affected channel turns red.

A pair of thermistors, one on each heat-sink, measures temperature of the input system. The thermistors control fan speed and provide thermal shutdown when temperatures are too high for safe operation. The cooling fan has continuously variable speed control and is extremely quiet. As the amp is driven harder, the fan turns on and gradually speeds up to whatever extent will allow the power dissipation needed for the operating conditions.

The amp's power supply uses a 1,000-VA toroidal transformer. Energy storage for the supply consists of two 42,000-μF capacitors. This large capacity provides a low-impedance source of high current to handle surges, musical transients, and wide variations in speaker impedance.

Four output modes of operation are available. The RF2000 can, of course, be operated as a two-channel stereo amplifier or, in bridged mode, as a single-channel amp for higher power requirements. In addition, the amplifier can be operated in dual mono, with both channels driven by the same input signal. You might, for example, use this configuration to biampify a speaker which has separate inputs for the high- and low-pass sections of its internal crossover network. Or you might want to drive multiple speakers whose parallel impedance would be too low if driven from the amplifier in its single-channel bridged mode. Finally, this amp can be operated in stereo-plus-bridged mode, which allows you to drive a pair of satellite speakers and a bridged mono subwoofer or bridged center channel speaker simultaneously, using only a single RF2000 amplifier. This is the first home stereo amplifier I've encountered that offers this last configuration, which I suspect will be welcomed by many owners of three-piece satellite/subwoofer systems.

Control Layout

A three-LED multicolor display on the unit's front panel shows amplifier status, including power, signal level, distortion, and thermal condition. The channel status LEDs remain off when there is no signal or when output levels are below about 200 mW; they turn green when output power exceeds this figure—so long as the amplifier's distortion remains low—and turn red when the output signal becomes distorted. The power status LED also has three indications, being off when the RF2000 is shut off, green in normal operation, and red when the amplifier's overheat-protection system is activated.

On the right of the rear panel are the left and right input jacks, each accompanied by its own gain control. Gain can be varied from 0 to 36 dB by means of these controls. The fan grille is at the center of the rear panel; to its left are color-coded, five-way speaker terminals and individual 5-ampere fuse-holders. The fuses are for speaker protection only; during my tests, I found it necessary to replace them with fuses of higher amperage in order to conduct tests of rated power output.

Pushbutton switches are provided for setting any of the operating modes previously described, so that it is not necessary to alter any internal wiring to achieve bridged

Fig. 1—Frequency response.

Fig. 2—THD + N vs. frequency, at rated power output of 200 watts per channel into 8 ohms and 300 watts per channel into 4 ohms.
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 mono, dual mono, stereo, or stereo plus bridged mono operation. Another pushbutton switch selects either “floating” ground (chassis and output sections grounded separately) or “Chassis” ground (chassis and output grounded together).

Measurements

Figure 1 is a plot of frequency response over the range from 10 Hz to 100 kHz. At 20 Hz, response was down about 0.2 dB, while at 20 kHz, it was off by a mere 0.14 dB. At 100 kHz, response was off by only 1.25 dB.

Figure 2 shows how THD + N varied with frequency for both 8- and 4-ohm loads. With input signals carefully regulated by my test system to maintain a constant output of 200 watts per channel into 8 ohms, I measured only around 0.002% below 200 Hz, 0.0041% at 1 kHz, and 0.043% at 20 kHz—all well within the manufacturer’s published claims. For 4-ohm loads, with output regulated to a constant 300 watts per channel, THD + N was only 0.0065% at 20 Hz, rising to an insignificant 0.018% at 1 kHz and to 0.03% at 20 kHz—all far lower than the 0.1% specified by Rockford.

I was curious to see just how much power the amplifier could produce for its rated THD, so I tried a new test: Plotting power output for rated distortion—in this case, 0.05% for 8 ohms. The results are shown in Fig. 3. I was amazed to find that this rugged amplifier was able to deliver around 250 watts per channel, with both channels driven into 8-ohm loads, over almost the entire audio spectrum.

Figures 4A and 4B show how THD + N varied as a function of power output for three test frequencies—20 Hz, 1 kHz, and 20 kHz—with 8- and 4-ohm loads. In making the 4-ohm measurement (Fig. 4B), I noted that THD + N at the rated power level of 300 watts per channel exceeded the manufacturer’s 0.1% rating. I was puzzled by this, until I discovered that the regulation of my variable-voltage transformer—used to maintain a steady 120 V a.c. for powering amps during these tests—was not as good as I had thought it was. As the sweeps of Figs. 4A and 4B progressed from low power levels (0.2 watt per channel or less) to higher power levels, I noted that the line voltage began to dip below the 120 mark at the end of each sweep. The lesson is, if you want to get full power out of any power amplifier, you’d better make sure your line voltage is really at 120 V!

Figure 5 shows how SMPTE-IM distortion varied with power output. With 8-ohm loads, SMPTE IM measured only 0.0066% at an output of 200 watts per channel; with 4-ohm loads, it was 0.03% at an output of 300 watts per channel. Once again, the poor regulation of my variable-voltage transformer caused the line voltage to dip slightly below 120 V at the high end of this sweep, which accounts for the SMPTE-IM figure being slightly higher than specified for 4-ohm loads. I confirmed that this was so by taking a fixed, or spot, reading of SMPTE IM, manually adjusting the line voltage to precisely 120 V. Now, for an output of 300 watts per channel with 4-ohm loads, SMPTE IM was indeed well below 0.02%, measuring only 0.015%. I also conducted a test of CCIF-IM (twin-tone) distortion as a function of power output, using 18- and 19-kHz test signals mixed in equal proportions (Fig. 6). For 8-ohm loads, CCIF IM was only 0.002% at an output of 200 watts per channel; for 4-ohm


\[
\text{Fig. 3—Power output for rated distortion of 0.05\% into 8 ohms.}
\]

\[
\text{Fig. 4—THD + N vs. power output per channel into 8 ohms (A) and 4 ohms (B). The distortion at high power output levels for 4-ohm loads is due to limitations of test setup; see text.}
\]
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This amplifier and preamp reproduced the majesty of the organ's sound without strain or overload—even on deep bass passages.

With 8-ohm loads, the RF2000 exhibited an extremely high dynamic headroom of 2.44 dB. So, for short bursts, the amp can be expected to deliver peaks up to 350 watts per channel! Damping factor, also referred to 8-ohm loads and using a test signal of 50 Hz, measured 210.

Input sensitivity was approximately 640 mV for rated output, with gain controls fully open. In terms of EIA standards, it would therefore take approximately 45 mV to produce 1 watt output into 8-ohm loads.

Use and Listening Tests
The attributes of the RF2000 can be summed up in a couple of sentences. It is a remarkably stable and reliable amplifier that seemed impervious to any failure—no matter how hard I drove it. Of course, I popped some speaker fuses during my tests, but not once did the amp shut down because of thermal problems or for any other reason. I can assure you that my bench tests subjected this amp to far more stressful conditions than it is likely to encounter under normal use as a music signal amplifier in a home system.

Since I tested the Rockford Fosgate RF2000 power amplifier and the RF200 preamplifier during the same couple of weeks, it seemed appropriate to do my listening tests with both units in the setup. The power amp was used to drive KEF 105/2 reference loudspeakers with a Sony CDP-650ESD reference CD player as a source. In addition, a DAT recorder I acquired overseas is not incorporated in my listening setup, so I played one of the few prerecorded DATs I own. It is a Classic Masters recording of Mozart piano sonatas played by Richard Shirk (CDMD-1005); the same program material is also available on CD (CMCD-1005). Among the newer CDs I used to confirm the sound quality of these components were two Telarc releases. The Young Bach (CD-80179) features Michael Murray playing the organ at the College of St. Thomas in St. Paul, Minn. The power and majesty of that organ sound was beautifully reproduced by this pair of components, which showed no sign of strain or overload—even during the deep bass passages. The second disc (CD-80186) presents four of Mozart's lesser known symphonies—Nos. 24, 26, 27, and 30—and was recorded with Sir Charles Mackerras and the Prague Chamber Orchestra. This disc illustrates how a relatively small instrumental ensemble can create a well-balanced sound on CD that, with the aid of good equipment such as this Rockford Fosgate pair, can transport the listener into an imaginary concert hall of the appropriately small dimensions suited to this music. Oh, yes—I subjected the combination to more contemporary works as well—including some New Wave music. No matter what I fed these top-performing components, they seemed equal to the task, and then some. Interestingly, although I sought material with extremes of dynamic range, I was never bothered by the fan in the RF2000 amplifier. Either it wasn't running at all or it was running at such slow speeds and so quietly that it did not serve as a noise-floor limit to my extended listening.

I had thought the RF2000's $1,250 price tag was a bit high. Happily, the $575 price for the RF2000 preamp is, if anything, on the low side, considering its performance. So, in my opinion, the total cost for these two components comes in just about where it belongs.

Leonard Feldman
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EQUIPMENT PROFILE

PIONEER TZ-9 SPEAKER

Manufacturer's Specifications
System Type: Bass reflex.
Drivers: Two 10-in. (25.4-cm) woofers; 2.56-in. (6.5-cm) dome mid-range; 1-in. (2.5-cm) dome tweeter.
Crossover Frequencies: 600 and 4,000 Hz.
Frequency Range: 20 Hz to 40 kHz.
Sensitivity: 91 dB SPL at 1 meter for 2.83 V input.
Nominal Impedance: 4 ohms.
Power Handling: 60 watts nominal, 300 watts maximum.
Dimensions: 48.6 in. H x 14.6 in. W x 20.1 in. D (123.4 cm x 37.1 cm x 51.1 cm).
Weight: 143.3 lbs. (65 kg).
Price: $4,000 per pair.
Company Address: P.O. Box 1540, Long Beach, Cal. 90801.

The TZ-9 is Pioneer's flagship loudspeaker system in its Elite series of audio/video components. Key specifications of the TZ-9 are: 143.3 pounds each, 48½ inches high, and $4,000 per pair. A little less of everything is available for $1,800 per pair in the TZ-7. Three new "ST" models in Pioneer's regular line incorporate as much of the "TZ" technology as Pioneer can translate to a lower price.

Pioneer has priced the TZ-9 against some formidable competition from Apogee, B & W, Infinity, KEF, Mirage, Quad, and Vandersteen, just to name a few examples. Also, for far less money, there are large and highly regarded floor-standing systems from AR, Klipsch, Polk, Thiel, VMPS, and others. Note also that all of the competitors I've listed are non-Japanese manufacturers. For whatever reason, North...
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The Pioneer TZ-9 is big for deep bass, heavy for good damping of the system, and expensive for high-tech parts and good construction.

American audiophiles have not generally accepted Japanese high-end loudspeakers as fully as they have accepted Japanese electronic components. So, what makes Pioneer think they have a shot at the high-end U.S. speaker market? Read on.

First, the TZ-9 is an American speaker. It was conceived, designed, and voiced out of Pioneer's Long Beach, Cal. facility, with drive units and technical development coming from Japan. The TZ-9 is manufactured in the U.S. and sold only in North America by fewer than 200 select high-end retailers. You won't find appliance-store "midnight madness" sales blowing TZ-9s out the door at half price, and you won't find the TZ-9 in Tokyo.

The second reason for Pioneer’s confidence is the size, experience, and technology of the parent company. A loudspeaker named “Pioneer” was the first product of Fukuin Denki Kabushiki Kaisha, founded by Nozomu Matsumoto in 1938. The company was renamed Pioneer in 1961 and grew quickly as a result of its innovations in car stereo, home electronics, loudspeakers, and the LaserDisc. A major resource currently is the speaker design team that designed the TAD professional loudspeakers. These drive units are widely considered to be the best available for high-level sound applications. In summary, Pioneer is larger and older than any of the competitors mentioned above.

The final reason to take the TZ-9 seriously is the advanced technology incorporated into it. A special process is used to form pure carbon into ceramic graphite domes for midrange and tweeter. Pioneer has found this brittle material to have mechanical characteristics superior to such exotic dome materials as titanium, carbon fiber, beryllium, boron alloy, carbon graphite, and ceramic carbon. Incidentally, most of these materials were first developed for loudspeakers by Pioneer.

The midrange dome and tweeter below it are mounted on a thick subpanel separated from the front baffle board by an isolating layer of foam. However, I question the extent of the isolation because the driver-mounting bolts extend through the foam, rigidly coupling the two panels. The crossover components are mounted on another subpanel in a similar manner. Input to the high- and low-frequency sections of the crossover are available separately for biamping. Four heavy-duty, gold-plated, five-way binding posts are normally strapped to accept a single speaker cable to each cabinet. There are no provisions for making level or equalization adjustments.

Two woofers, one on the front and one on the rear, are used in the TZ-9 to cancel reaction forces from cone acceleration. This reduces cabinet vibration and radiation of the panel walls. While the cabinet walls themselves could provide the mechanical coupling between the woofers, the TZ-9 goes a step further by internally connecting the speaker magnets with a steel rod. To my knowledge, KEF was the first to use this technique, in the Model 104. KEF also physically reversed one woofer (maintaining acoustic polarity) to cancel some motor nonlinearities as well.

Computer simulations, computer-based instrumentation, and Doppler laser techniques were used extensively by the Japanese engineers to design the enclosure. The design is covered in a paper delivered at the AES 85th Convention in November 1988 (Preprint No. 2739), “A New Loudspeaker System with Reduced Radiation of Sound Pressure from Parasitic Enclosure Vibration,” by Takashi Oyaba. Extensive mechanical, electrical, and acoustical measurements are also presented in a 41-page paper from Pioneer.

The result of all this is the TZ-9: Big, heavy, and expensive. Big means that you can get clean, deep bass response with good efficiency (although this speaker has a fairly small footprint). Heavy buys you thick enclosure walls, damping panels, and cast speaker frames. Expensive gets you the high-tech ceramic carbon domes (each protected by a wire mesh), precision, intricate construction, and a beautiful oak veneer. None of this guarantees great sound, but why start with compromises?

Measurements

Figure 1 plots the input impedance magnitude of the TZ-9. A minimum of just about 4 ohms is reached at the cabinet resonance frequency of almost exactly 30 Hz. Both the
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The TZ-9 speaker can be expected to sound great in a balanced, lively room that has good diffusion.

Magnitude and the complex impedance plot, Fig. 2, show a glitch at 280 Hz.

Anechoic frequency response of the TZ-9 was measured at a distance of 1 meter along a line from the acoustic center of the system to a seated listener 3 meters away and 1 meter high. Various measurement techniques were used to get high-frequency resolution at all frequencies without room reflections. The amplitude response of the first-arriving signal is plotted in Fig. 3. Except for a jump at 280 Hz, the response is very uniform, varying only about ±2 dB from below 40 Hz to the end of the frequency measurement at 20 kHz. The low end is solid to 30 Hz, with a fast roll-off—typical of vented designs—below that. Sensitivity for 1 watt input is about 88 dB SPL, which confirms Pioneer’s claim of 91 dB SPL with 2 watts input.

The amplitude glitch at 280 Hz puzzled me, and I traced it to a simple, internal standing wave between the top and the bottom of the cabinet. I first calculated its possible existence by dividing the 13,548 inches/s speed of sound by the 46-inch internal height of the TZ-9; this gives the frequency of a 46-inch wavelength. At this frequency (296 Hz calculated, close enough to the measured frequency), the center-mounted woofers activate the second top-to-bottom resonance mode. The standing-wave theory was confirmed by sound pressure measurements made inside the loudspeaker’s cabinet.

Inside the cabinet, at 280 Hz, the woofer cones have to work against the pressure wave they generated half a cycle earlier. This acoustic loading restricts woofer cone motion and delivers more power to the inside of the cabinet, which results in wall flex. From the outside of the cabinet, the reduced cone motion at 280 Hz means reduced sound radiated by the cones, and this combines with the out-of-phase cabinet-flex radiation to produce a sharp dip. Above this frequency, the air column goes off resonance and the phase shifts rapidly to produce a slight reinforcement.

Phase response was measured along with the amplitude response and is plotted in Fig. 4. Any phase shift caused by the acoustic resonance must be small, because no corresponding glitch is visible on the down-sloping plot of the TZ-9. The majority of this phase shift is produced by the conventional frequency-dividing networks necessary in a multi-way system. Most loudspeaker system designers do not consider it to be an audible problem if the two stereo speakers are identical, and I found unusually close tracking of the phase responses of my review pair.

Figure 5 plots the TZ-9’s amplitude response modified by early reflections in a room. The speaker positions used were those found to be optimum in the earlier listening evaluation, well out from the rear and side walls and rotated inward. The 0° plot was made at the listening position, and the 30° plot was made close to the side wall near the speaker. Reflections in this range can produce coloration to the sound, imaging instability, and—most believe—suppression of recorded ambience information. The TZ-9 performs well, keeping peaks and dips narrow and constrained to about ±6 dB. The usual floor-bounce cancellation around 300 Hz is thankfully missing. Perhaps this is due to the rear-firing woofer. The 30° off-axis, in-room performance is even better than the on-axis, ir-room response of this speaker.
The test of any great product comes with time, with years of use and years of reliably superb performance. When it passes the test, the marque carried by that product comes to signify something very special to thousands of owners, and to thousands more who hope to become owners. The name itself becomes a symbol of pride, of distinction.

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These speakers' size and weight dictate some planning. For instance, you will need a ceiling higher than 8 feet to unpack them easily.

Fig. 4—One-meter, on-axis anechoic phase response.

Fig. 5—Three-meter room response measured on axis and 30° off axis; for clarity, off-axis curve has been lowered.

Fig. 6—Horizontal off-axis polar response taken from the front, around the side, and to the rear of the speaker.

Fig. 7—Vertical off-axis polar response taken from below, up the front, to the top of the speaker.

Horizontal polar amplitude response was measured every 3°, starting behind the TZ-9, coming around the side, and finishing directly on axis; results are plotted on a linear frequency scale in Fig. 6. We see nearly ideal behavior in the gradual narrowing of the radiation angle at high frequencies. Thanks to well-chosen crossover frequencies, there is none of the alternating narrow and wide behavior found in most two-way, and some three-way, speaker systems. The presence of ranges of narrow directivity implies that less energy is radiated into the room in these ranges; the result would be corresponding imbalances in the reverberant energy heard by the listener. The Pioneer TZ-9, however, can be expected to sound great in a balanced, lively room that has good diffusion.
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All in all, the TZ-9 proved remarkably distortion-free, and it should handle very high power on musical peaks without signs of distress.

**Fig. 8**—Harmonic distortion products for the tone $E_1$ (41.2 Hz).

**Fig. 9**—Harmonic distortion products for the tone $A_2$ (110 Hz).

**Fig. 10**—Harmonic distortion products for the tone $A_4$ (440 Hz).

**Fig. 11**—IM distortion on 440 Hz ($A_4$) produced by 41.2 Hz ($E_1$) when mixed in one-to-one proportion.

A similar "3-D" display of vertical polar radiation is shown in Fig. 7. The curves were measured from below, up the front, to directly above the cabinet. Since each change in measurement angle also results in a change in distance from the vertically aligned drivers, there is interaction around the midrange-tweeter crossover frequency of 4 kHz. The amount shown is fairly small and occurs only at angles well off axis. Otherwise, the excellent, wide directivity found in the horizontal plane is maintained here as well. The wide overall directivity suggests that the TZ-9s be kept well away from side walls and overhangs to avoid early reflections.

Harmonic distortion products are shown as a function of drive level in the "3-D" plots of Figs. 8, 9, and 10 for input frequencies of 41.2 Hz, 110 Hz, and 440 Hz. For reference, the open E string on a string bass sounds at 41.2 Hz, while the other two frequencies are musical notes as well, $A_2$ and
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Stacked against its many high-end competitors, I'd say the Pioneer TZ-9s are in the running but they don't blow the others away.

Distortion at 110 Hz is an almost nonexistent 0.5% at maximum power. At 440 Hz, distortion is up somewhat because the midrange dome is just crossing in and is working hard. At higher frequencies, I expect distortion would go down again. All in all, the TZ-9 is a remarkably distortion-free speaker except for the chuffing low bass.

Another way of looking at low-frequency linearity is to measure a low-frequency sine wave's effect on a simultaneous higher frequency signal. Figure 11 shows the modulation of 440 Hz by 41.2 Hz (middle C by E₂) versus total input power. (Technically, the power calibration is that of a sine wave with the same peak voltage as the combined test signals. This is the same calibration method used for testing power amplifiers.) Again, the TZ-9 shows very linear behavior, which justifies the use of a high-power amplifier if you want very high sound pressure levels.

Energy versus time is plotted in Fig. 13. A perfect speaker would show a single spike, indicating that signals of all frequencies arrive at the same time and that there are no reflections or edge diffractions. The TZ-9 comes very close to this ideal.

Use and Listening Tests

The large size and heavy weight of the Pioneer TZ-9s make planning an important part of experimenting with them. For instance, to unpack them you need an 8-foot-plus ceiling to lift the box off easily. After unpacking, I used a small padded hand truck to move them around for best imaging. Once in place, the TZ-9s tend to blend in nicely because of their tall, slim shape and light, attractive finish.

Most users will not have many placement options for speakers of this size. Fortunately, I found the imaging and spectral balance to be relatively insensitive to location. At first, I used them well out from the wall behind, and about 8 feet apart, with very good results. As I became accustomed to these speakers’ superior power output, I opted for a more distant placement, close to the wall behind them and further apart. I angled them inward to reduce early, side-wall reflections and achieved a wide area of listenable stereo, although listening on the equidistance center line was still the best position.
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See the Krell Industries advertisement in this issue.
Overall, the TZ-9s excel in presenting an airy sense of space with either delicacy or power, as the case demands.

Listening to the CD Lyle Lovett and His Large Band (Curb MCAD-42263), I began to realize that I don’t always play this disc loudly enough on other speakers. This is brass and percussion recorded with a close-up perspective, which translates to loud. As I increased the volume to truly live levels, the TZ-9s responded, producing a big, airy soundstage with no sense of strain. They seemed to take command of room acoustics, rather than interact with them.

Other music auditioned included Jennifer Warnes’ Famous Blue Raincoat (Cypress 661 111-2). The music was open and bright with a hint of an electronic sound to the reverberation. I think this is an indication of the TZ-9s’ accuracy, because electronic reverb was undoubtedly used to make the recording. However, Jennifer’s voice was apparently split at times, seeming to come from both speakers, rather than locking in naturally at a single perceived location between the speakers. Also, low, mid, and high components of the voice did not blend seamlessly in depth perspective. In particular, a tendency for low-mids to come forward in the soundstage was noted. Perhaps this was an audible effect of the 280-Hz internal resonance found in the measurements.

As usual, I listened extensively to these speakers before making measurements, but nowhere in my notes did I say, "... upper bass resonance—check it out." I did comment on extra warmth and the subtle depth-imaging shift on cello and on Warnes’ voice. This resonance is at most a minor sonic issue and could probably be eliminated with additional internal layers of acoustic absorption material one-quarter and three-quarters of the way up the cabinet, where the particle velocity of this resonance is at its maximum.

All-out acoustic power of the TZ-9s was tested with “The Race” from the Flag CD by the group Yello (Mercury 836426-2). This is rubber-room music at its finest. Clean, chest-thumping volume and sense of space were excellent. I did notice that the information around 20 Hz, normally audible with large subwoofers, was not present. To the TZ-9s’ credit, this extreme signal condition did not cause its woofers any distress; they just ignored it. Overall, the TZ-9s excel in presenting an airy sense of space with either delicacy or power, as the music demands.

In relation to its many high-end competitors, I’d say the Pioneer TZ-9 is in the running, though it doesn’t blow the others away. For example, a competitive loudspeaker may respond all the way to 20 Hz but may not develop the clean, high sound pressure levels above 30 Hz that the TZ-9 did. Another may have pinpoint imaging at a stereo sweet spot but demand unpleasantly dead room acoustics. It’s a buyer’s market; at $4,000 per pair, there are many great loudspeakers available. For good looks, noncritical placement of speaker or listener, and an airy, powerful, clean sound, check out Pioneer’s TZ-9.

David L. Clark

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1746 Junction Ave., San Jose, CA 95112  408/436.0688  800/VELODYNE  In Canada: 416/671.8990
I have always been a fan of Onkyo tuner designs. The company's T-9090 tuner, both in its original form and in its Mark II update, represents the best of what is possible, given today's somewhat antiquated FM broadcast standards. I fully expected that this lower priced Onkyo tuner would prove to be a worthy successor to Onkyo's earlier Model 1-4087, which it replaces. In many ways, it was, but I must report that in some details my sample did not fully measure up to published specifications. That's not to say that the tuner is a poor performer; it's just that I expected the front-end of this tuner to be more sensitive than my measurements indicated. More about all of this later. First, a review of the T-4700's circuitry and convenience features.

Circuitry includes a seven-varactor, MOS-FET front-end, an i.f. strip that uses up to five ceramic filters (in its narrow tuning mode), dual antenna inputs, FM tuning adjustable in 25- or 50-kHz increments (useful if your cable TV company supplies FM at nonstandard frequencies within the FM band).
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The user can categorize and access preset stations by program type or by the name of the family member who listens to them.

Control Layout

The power pushbutton for this tuner is at the lower left of the front panel. Much of the upper area of the panel is given over to a display area. The left half of the display shows whether APR is activated and what its current settings are, which of the two antenna inputs is selected, and whether tuning is currently automatic or manual. The right section of the display shows tuned frequencies or alphanumeric characters, stereo indication, signal strength, memory classification, preset station number, and tuning level. Tuning level refers to a choice of muting threshold, which can be set at either 27 dBf or 37 dBf depending upon local reception conditions.

A row of narrow buttons just beneath the display area consists of a "Tuning Level" selector, a "Display" selector button, "Up" and "Down" buttons for tuning or character selection, "AM" and "FM" band switches, and a "Cable/Mute" button. This last one had me puzzled until I discovered that the only way to defeat this tuner's muting circuitry was to set it to tune in 25-kHz steps ("Cable") rather than in steps of 50 kHz. This is mentioned in the owner's manual only in connection with a paragraph on more precise tuning.

Further down below the left section of the display are pushbuttons to select antenna input, APR on/off, r.f. mode (local or distant), i.f. bandwidth, high blend on/off, mono or auto stereo, and tuning mode (automatic or manual). To the right of these are six larger buttons for preset-station classification assignment. In the panel's top right corner are 20 pushbuttons which are used for setting and accessing preset stations. A "Reset Shift" button doubles the number of presets available. A "Reset Scan" button, a "Memory" button, and a small "Output Level" control knob complete the front panel's layout.

Measurements

Figure 1 shows the frequency response of the FM tuner section, which was down 1.22 dB at 15 kHz. Figure 2 is my usual plot of S/N, or quieting, as a function of FM signal strength. From Fig. 2, I am able to report that 50-dB quieting in mono required 24 dBf (as opposed to 16.1 dBf claimed by Onkyo); in stereo, 50-dB quieting took nearly 45 dBf worth of input signal, much more than the 36.1 dBf claimed by the manufacturer. What was impressive, however, was the ultimate signal-to-noise ratio reached with strong signal inputs. It measured 83 dB in mono (a bit short of the claimed 85 dB, but still an excellent number) and about 70 dB in stereo. When signal strength was increased beyond the standard 65 dBf, to around 80 dBf, S/N in stereo continued to improve until I obtained a reading of 78.5 dB. I made these measurements for both the wide and narrow settings of the r.f. circuits but found little difference between the two sets of readings.
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The ultimate S/N ratio was impressive, reaching 83 dB in mono and, eventually, 78.5 dB in stereo.

Distortion + Noise versus Frequency: Onkyo T-4788 Tuner

My upgraded Audio Precision test gear now serves as a sophisticated spectrum analyzer, using Fast Fourier Transform (FFT) operation and digital signal processing. My gear enabled me to plot a narrow-band spectrum analysis of a 5-kHz signal modulating one channel (Fig. 6A), while in a second trace (Fig. 6B), spectrum analysis revealed the crosstalk component appearing in the unmodulated channel output. The tall spike reaching 0 dB in Fig. 6A represents the desired 5-kHz signal, while the shorter spike at that frequency in Fig. 6B reveals that separation at 5 kHz was −43.78 dB.

Such was not the case, naturally, when I plotted THD + N versus frequency (Fig. 3). In the wide i.f. mode, mono and stereo THD + N at 1 kHz was quite good, 0.029% for mono and 0.085% for stereo. At 6 kHz, THD + N measured a mere 0.02% in mono and 0.092% in stereo. When the tests were repeated using the narrow i.f. mode, stereo THD + N increased markedly, now measuring over 1.7% at 1 kHz, nearly 1.5% at 100 Hz, and just over 1% at 6 kHz. Mono THD + N remained low at 100 Hz (only 0.038%) but rose to 0.23% at 1 kHz and to 0.47% at 6 kHz.

Using a constant 1-kHz modulating signal, I next measured THD + N as a function of signal strength (Fig. 4), first using the wide i.f. setting and following up with the narrow i.f. measurements. Fairly good correlation was obtained between these readings at strong signal levels and those obtained in Fig. 3. The two sets of curves in Fig. 4 also enabled me to establish the least usable sensitivity figures for this tuner. Here, best results were obtained in the narrow i.f. mode, where usable sensitivity measured 20 dBf in mono and 14 dBf in stereo, as against the 10.3 dBf in mono and 17.2 dBf in stereo claimed by Onkyo.

Figure 5 shows how separation varied with frequency. The two dashed curves represent separation results (referred to the upper, solid traces) for the wide i.f. mode (upper solid curve and lower dashed curve) and for the narrow i.f. mode (lower solid curve used as reference to upper dashed curve). At 1.2 kHz (the closest data point to 1 kHz that the test system captured), a numeric readout showed that the modulated channel was within −0.1 dB of reference level and that separation was 49.33 dB below reference level. (Or, if you want to be as precise as my Audio Precision test gear, separation was therefore 49.23 dB at 1.24883 kHz!) At 10 kHz, separation was still a very impressive 41.3 dB, while at 100 Hz it remained as high as 46.5 dB. When the narrow i.f. mode was selected, separation decreased, as I would have expected, but still measured better than 35 dB at mid-frequencies.
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I pulled in 46 stations, 40 of them in acceptably noise-free stereo, with excellent sound quality and inaudible distortion.

was 82 dB; in the wide mode it decreased, as expected, to around 58 dB. AM suppression measured 56 dB, while the results for i.f. rejection and image rejection were both in excess of 100 dB.

Figure 7 shows the frequency response of the AM tuner section of the T-4700. Response was down -6 dB at 3.0 kHz, and it was also off by the same amount at 60 Hz. Total harmonic distortion for 30% modulation of the AM signal was 0.73%, close enough to the 0.7% claimed by Onkyo.

Use and Listening Tests

I had no problems with the way this tuner functioned and sounded or the way it made its decisions concerning wide/narrow i.f., high blend on or off, distant or local r.f. settings, or automatic mono/stereo switching. All of these aspects of Onkyo's APR system worked perfectly—I couldn't have made the selections any better myself, though I was pleased that I could override the APR decision if I chose to do so. What bothered me was the rather poor sensitivity figures obtained in mono for both wide-band and narrow-band i.f. settings.

For all of that, however, the 46 station signals that I did pull in when the tuner was connected to my outdoor antenna (40 of them in acceptably noise-free stereo) were reproduced with excellent sound quality and inaudibly low distortion. I needed to use the narrow mode for only two of those stations, which happened to be at frequencies only one channel away from powerful local stations in my area. The narrow mode eliminated the interference from stronger signals, as it was supposed to do.

The elegant automatic APR features of this tuner will appeal to the FM listener who simply wants the best possible reception of all incoming FM signals, even if that means occasionally giving up some separation or tolerating an increase in distortion. Being able to defeat APR also enables the more serious FM listener to decide which settings are preferable. If the sensitivity had been a bit better, the Onkyo Integra T-4700 would have earned highest marks from this FM fan. As it is, it comes close by being a superb value in its price class.

Leonard Feldman
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SLIGHTED SYMPHONY

Shostakovich: Symphony No. 4 in C Minor, Op. 43. Scottish National Orchestra; Neeme Jarvi, conductor; Brian Couzens, producer.

Chandos 8640, CD; DDD; 61:20.

This massive, commanding masterpiece has a troubled history, including not years but decades of neglect and oblivion. The blazing performance it gets here, brilliantly recorded, provides us a welcome opportunity for discovery.

The more we come to know about Dmitri Shostakovich, the more he emerges as an authentically tragic figure. He owed a great deal to the 1917 Bolshevik Revolution's brand-new Union of Soviet Socialist Republics—and vice versa: Shostakovich, the first important composer educated and trained entirely under the Soviet system, exemplified to the world the unshackled, revolutionary new artist. The first three decades of his life, he enjoyed every official privilege and apparently could do no wrong. His dazzling First Symphony (composed at age 19 for his graduation from the Leningrad Conservatory) conquered the world; even in this country, Leopold Stokowski recorded it with his Philadelphia Orchestra. Shostakovich gratefully wrote his Second Symphony, "October," for the revolution's 10th anniversary; he subtitled his Third, enthusiastically, "May Day." He began his Fourth in 1934; it had to wait 27 years, though, for its premiere. What in the world happened?

Shostakovich's powerful opera Lady Macbeth of Mtsensk had opened in Leningrad in January 1934, and it quickly chalked up 200 performances—an astonishing success for a contemporary work. Two years after the premiere, however, that eminent, ultimate authority on all the arts and every other aspect of Soviet life, Joseph Stalin, finally caught a performance of the great operatic hit by the Soviet music world's golden boy. An unsigned editorial (probably written by the eminent artistic authority Himself!) in the official Party organ, Pravda, promptly demolished the opera as totally unworthy of Soviet audiences. Shostakovich, terrified (and with ample reason), withdrew not only the opera but also his new ballet, Limpid Stream, and his brand-new Fourth Symphony as well, for fear of adding fuel to the Pravda flame. The age of Socialist Realism had begun; Soviet art went into a decline which made it the pitied laughingstock of the world for about the next half-century. Audiences in Moscow finally heard Shostakovich's Fourth Symphony in 1961; visitors to the Edinburgh Festival heard its "extra-Soviet" unveiling in 1962. Even today, the work has not yet caught up in currency or familiarity with Shostakovich's 14 other symphonies, and that makes this splendid recording of it all the more welcome.

When Günther Herbig conducted the Fourth during the San Francisco Symphony's 1989 to 1990 season—my own first encounter with it in live performance—its extraordinary power almost blew me out of the hall. Sheer volume played only a subsidiary part. The size of the orchestra that the score demands does testify to young Shostakovich's discovery of Gustav Mahler, whom he greatly admired: The score calls for quadruple woodwinds (plus second piccolo), eight horns, two tubas, etc. The symphony's real power, though, derives from the music itself. One can only speculate what the fiery, hot-blooded, fearlessly pioneering 31-year-old who created this masterpiece might have gone on to if concern for his very existence had not forced him to slam on the brakes and revise his style completely. Shostakovich's next time out with a symphony (associated for all eternity with the licksplittle phrase, "A Soviet artist's reply to just criticism"), he produced yet another genuine masterpiece—but one cast in such a conservative mold that the Fourth makes it sound rather pallid by comparison.

Never again would Shostakovich employ such wrenching dissonances as here. The first movement opens with a shriek of pain and goes on from there. Not for years to come would he dip even a tentative toe into the forbidden dodecaphonic waters of Arnold Schoenberg's compositional system, but for long stretches of music here the tonality of the moment remains ambiguous, imponderable. Shostakovich's gradual tragic personal transformation from an exuberant, cheeky young genius into a bitter, despairing old man provides one of the grimmest chapters in the history of Soviet art; one cannot help wondering whether the violent soul-storms throughout this unusually long symphony had their origins in what he had already begun to recog-
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Perhaps the soul-storms
in the Fourth stemmed from
Shostakovich's recognition
of the hideous realities
of his own Stalinist era.

nize as the manifold hideous realities
of his own barbarous Stalinist era.

Naturally, the score does have its
tighter moments, even its brief pas-
sages of comic relief—such as the end
of the second movement, when the or-
chestra seems to have converted itself
temporarily into a clockmaker's work-
shop. Yet as a whole, the work requires
courageous, adventurous listening. It
evokes a true story about that crusty
old Connecticut Yankee, Charles Ives,
when he addressed himself to a fellow
auditor ridiculing some brand-new
work on a concert program. "Don't be
such a God-dammed sissy," Mr. Ives
advised him. "When you hear strong
music like this, use your ears like a
man!"

Paul Moor

Famous Opera Arias. Munich Radio
Orchestra, Giuseppe Patané, Marjana
Lipovšek, mezzo-soprano.

If we have learned anything from our
era of vocalism, it should be that even
the greatest singers can make unin-
gratulating sounds. Think of Callas' raw
shriek or Sutherland's stifled cooing at
their respective worst. Lipovšek has no
such shortcomings. Moreover hers is
a rich, exciting mezzo-soprano voice
with a vibrant top, a secure bottom, a
lot of velvet in the midrange, and, evi-
dently, power to spare (though records
easily deceive on this last point, and I
haven't heard her live). Further, tem-
peramentally (again judging from this
record alone), she might be com-
pared, say, to Zinka Milanov.

Why do I balk at the idea that
Lipovšek may be an operatic superstar
in the making? I don't know. Admitted-
ly, there are some difficulties evident
in this program: Gluck, Handel, and Mas-
senet with one selection apiece, Mo-
zart and Bizet (two apiece), and Verdi
and Saint-Saëns (three apiece). Oper-
aphiles will easily guess almost all the
selections, particularly when I add that
the parts involved are Orfeo (Or-
pheus), Serse (Xerxes), Sesto, Dorab-
eila, Eboli, Azucena, Carmen, Char-
lotte, and Dalila (Delilah). But in this
sort of recital, the point is the singer,
not the song.

The least hackneyed selection is
"Parto, parto" from Mozart's La Cle-
menza di Tito—a wonderful piece but
not well served by, or flattering to, Li-
povšek because she makes somewhat
heavy going of the coloratura. Her very
determination to make every note
squeaky-clean underlines her failure to
do so. In some of the other tracks, her
top end evinces a tendency to turn
squally. There are annoying affecta-
tions in her Carmen, where her French
diction suffers from minor oddities.
Throughout, she has a way of placing
the voice too much in the throat: it's like
playing Lps—I sometimes fancy I can
hear the wear taking place.

Am I being unfair to Lipovšek? Am I
letting my distaste for this sort of mixed

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The more I listen, the less I notice Lipovšek's flaws and the more admiration I have for both the voice and the temperament.

Bag of chestnuts—where the want of context precludes dramatic and psychological development—color my feelings about a major operatic find? Quite possibly.

Among the parts she assumes for this record, only Dorabella is mentioned in Gottfried Kraus' effusive notes as one of Lipovšek's roles at the Hamburg State Opera (since 1981) or the Munich State Opera (more recently). He does say, however, that she made a hit as Delilah at the Bregenz Festival in 1988.

And that raises another problem. The climax of “Mon coeur s'ouvre à ta voix” is not in Delilah's part at all, but in Samson's capitulation to her seduction and the thunderclap by which Heaven makes its displeasure known. Without a Samson, there is no climax and no thunderclap. Any mezzo essaying “Mon coeur” sola is thus left to seduce thin air, and with no palpable result.

Granted that no true Samson—it requires a world-class heroic tenor—is likely to lend his services for the few phrases involved (though Georges Thill did it, superbly, for Germaine Cernay around 1930), so it would be idle to hope for a more adequate presentation when the mezzo herself has yet to achieve international stardom.

Such pitiable fragments are patently inadequate as “a kind of inventory of Marjana Lipovšek's art,” in Kraus' words. I can only say that the more I listen to the disc, the less acutely I'm aware of its vocal flaws and the more admiration I have for both the voice and the temperament.

The recording itself was made in April 1989 in Studio I of the Bavarian Radio. It is typical of its genre. Both implied space and dynamics are ample, with the voice neither entirely swamped by the orchestra nor unnaturally out in front of it—a thoroughly competent but not exceptional studio job. No texts or translations are supplied, but with such familiar material, they may be unnecessary. The sequence is fairly chronological and places all the Italian excerpts ahead of the French. Otherwise, it has no sense of organization or momentum and ends lamely with Delilah's “Amour, viens aider ma faiblesse,” oddly transposed after “Mon coeur,” which would have made a more satisfying finale, even mutilated.

Robert Long

Bartók: String Quartet No. 6; Piano Quintet. Chilingirian Quartet; Steven De Groote, piano. Chandos CHAN-8660, CD; DDD; 69:12.

This is the final installment in the Chilingirian's complete traversal of the Bartók string quartets, the earlier CDs of which were CHAN-8588 (Nos. 1 and 2) and CHAN-8634 (Nos. 3, 4, and 5). Quartet No. 6 dates from 1939—a tragic year for Bartók and for the world—and takes us into emotional realms.

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What makes this recording special is the relatively obscure Quintet for String Quartet and Piano, written when Bartók was just 22.

that, perhaps, had remained unexplored since Beethoven's last years. The comparison is often made, at any rate, and it has more than a little to recommend it.

The Chilingirian's approach is closer to the urgency and edge of the groundbreaking old Juilliard Quartet mono recording (on Columbia, replaced by a stereo remake) than to the justly celebrated and very polished Végh reading (on Telefunken, reissued on Astrée). Perhaps the Juilliard players were a little too ready to be swept away, and the slightly less headlong approach of the Chilingirian Quartet is more just. At any rate, it is a fine performance that I would choose, together with the Juilliard, over the Végh.

What makes this record really special, however, is the relatively obscure Quintet for String Quartet and Piano. It was written in 1904, when Bartók was 22. John Cox's notes describe it as "Brahmsian melancholy filtered through the influence of...Ernö [von] Dohnányi." That is a fair basic characterization, though the piece is far more. It is passionate and impulsive—particularly as played here—and altogether engaging.

Cox also makes much of the encounter, later in 1904, between Bartók and true Magyar folk music, which was to have a profound influence on his style and musical thinking. The deliberately nationalist quintet still accepts the traditional Haydn/Brahms/Liszt view equating Hungarian with Gypsy.

Yet, there's something distinctly Bartókian about the quintet. Its sense of how musical rhetoric works bears striking similarity to that of, say, the Concerto for Orchestra or the Third Piano Concerto. Many influences—Richard Strauss in particular, perhaps—are traceable in the quintet. A comparison might be drawn to Schoenberg's "Verklärte Nacht," which also makes bigger, denser, more Straussian sounds than are typical of its composer but hints at his mature identity.

Though the Chilingirian Quartet is resident in London at the Royal College of Music, both recordings were made out of town. The quartet was taped in July of 1988 in St. Bartholomew's Church, Orford. The miking is too close to project much of the church ambience. The sound is generally excellent, though some loud passages are slightly congested. The quintet was taped a few months later in The Maltings, Snape—home to the Aldeburgh Festival and a famous acoustic gem. The sound here is much fuller, with a somewhat greater sense of background space, though the overall effect still is intimate. I enjoyed it immensely, but with that rich a bass end, the piano tone may sound a mite thumpy on some equipment.

Don't let this deter you, however. The sound is never less than very good, the performances compelling, and the music superlative.

Robert Long

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118 AUDIO/JUNE 1990
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Stereophile Magazine  
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Vol. 12 No. 7, July 1989

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**The Caution Horses**: Cowboy Junkies  
RCA 2058-2-R, CD; DDD; 44:37.  
Sound: B  
Performance: B

This is definitely not the kind of music to play first thing in the morning to jolt yourself into your daily maneuvers. Gentle, permanently wistful, and lingering over each beat as if reluctant to part with it, Cowboy Junkies deliver a languid, strangely attractive sound that has propelled them from the bar band circuit to the arena in just a year. It’s a disarmingly simple sound, that of a countrified Canadian band with a sweet-sounding female singer. Nearly all their material is very fragile sounding and slowed way down, decelerated to the verge of torpor without the poetry, irony, or rough edges that Dylan, The Velvet Underground, or Neil Young have protected themselves with when they’ve slowed things down.  

But the sound is neither soporific nor enervating; it’s just specialized, perfect for certain moments and certain moods, though out of place at other times. The Cowboy Junkies largely save themselves from musical entropy with a sort of sheer and unsure beauty, and a stubborn fidelity to what they simply are.  

Both of these qualities are enhanced by the one-shot recording process used here. The Caution Horses, like the group’s first album, is a live, off-the-floor recording completed essentially in one day. Bereft of endless overdubbing and refinements that can take the life out of any music, the songs have both a live and a living sound, especially the opening track, “Sun Comes Up, It’s Tuesday Morning,” which sets the tone for the whole melancholy cycle of lost-love vignettes that ends on the positive notes of “You Will Be Loved Again.” Songwriter/producer Michael Timmons also credits the Calrec Soundfield Ambisonic microphone, which may be what turns the soft, tonally limited voice of sister Margo into a shivering doe nuzzling your ear, or the creative accordion embellishments of Jaro Czerwinec into piercing shafts of melody, especially on the Neil Young song, “Powderfinger.” In this song, slowed down and stretched to fill nearly six minutes, Margo Timmons flattens out Young’s haunting melody, and the Junkies do away with an essential lick. Yet these critical deviations (which would normally make for an evisceration of one of Young’s most poignant pieces) simply transform “Powderfinger,” etherealizing Young’s angst over the responsibilities of manhood into a dreamy resignation.  

I suppose most people would consider the heart of this band to be the Timmons siblings, who write and sing these songs. I’d like to include Jeff Bird on mandolin, harmonica, and fiddle; Kim Deschamps on steel guitars; David Houghton on percussion, and Jaro Czerwinec on accordion. Perennially credited merely as sidemen, it is predominantly their contributions that infuse the songs with color and character and, to be honest, save the music from blandness. 

Susan Borey Sherman

---

**The Million Dollar Quartet**:  
Elvis Presley  
Sound: B+  
Performance: A

Most of Elvis Presley’s recordings were carefully coached performances, distinguished not only by Presley’s vocal stylings but by the arrangement and production provided. Even on live recordings, there was very little spontaneity, as the band was well-rehearsed. However, the Million Dollar Quartet was formed to play for Presley’s fans during his later years. Jerry Lee Lewis, Carl Perkins, and Johnny Cash backed up Elvis Presley.
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and sings in an unbridled, exhilarating manner.

To provide a little background, Presley had already been sold off to RCA Records by Sun's Sam Phillips, who had a small stable of other artists with minor successes of their own. Perkins had made some noise on the pop charts earlier with "Blue Suede Shoes," but his hospitalization made personal promotion of the record impossible, and his version of that song (along with his career) was quickly eclipsed by Elvis' string of hits, including "Blue Suede Shoes." Jerry Lee Lewis, the third leg of this quartet, was just starting to make some noise as a singer but was playing sessions at Sun to keep the bill collector from his door. Johnny Cash, whose participation in the session was minimal, had sold some pop records but had more in common with the other three in terms of the music he had grown up with than in the sense of any of these guys could learn a lot from the other three. Perkes doesn't miss much. Those 24 hours of the session was minimal, had sold more comfortable. He had the same time. He was a country & western and spiritual clas.

For his part, Presley feeds off the Sun sound, sticks mainly to playing guitar. The liner notes explain that he'd been singing most of the day.

Returning to the scene of his early sessions, Elvis feeds off the Sun groove and sings in an unbridled, exhilarating manner. It's a pure joy to hear one of the great rock singers of any era leap loose without the self-consciousness that mars many of his recordings. The sparse musical backing makes the vocals breathe, and although the recording is not always perfect, Phillips doesn't miss much. Those who may doubt the purity of the music of any of these guys could learn a lot from a record like this, and enjoy it at the same time.

Jon & Sally Tiven

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Jon & Sally Tiven

Hats: The Blue Nile
A&M CD 5284, CD; ADD: 38.58:

Sound: A
Performance: A

Hats: The Blue Nile's second record, comes nearly seven years after
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The Blue Nile may sound monochromatic, but their dark-hued songs are very emotional—suitable for a particular mood. Their first album, *Hats*, is something like Roxy Music's *Avalon*, only more downbeat and sad. The seven selections, all written by singer Paul Buchanan, are dark-hued, late-night or gray-day sounding pieces—music for a particular mood. The Blue Nile’s songs may be somewhat monochromatic, almost station-ary, but they are very romantic and very emotional.

The Blue Nile is a group that other artists, like Rickie Lee Jones and Shawn Colvin, have taken pains to praise. Hats may be an acquired taste, but once met halfway, it wasn’t that hard to acquire. —Michael Tearson

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Live and Unreleased—The Radio Show: Jimi Hendrix
Castle Communications HBCD 100, three CDs; AAD; 58:24, 74:36, and 64:48.

Sound: A Performance: A

Maybe Jimi Hendrix was lucky. His career cut short after only a handful of records, he was spared the years in decline, burnout, and self-parody that seem to accompany quick rises to the top. In any case, just about any recording he was part of sounds like an important piece of history. This particular package (also available on cassette and LP) has lots of previously unavailable material, but what really distinguishes it is its documentary format, with interviews, narration, and, for the first time, an authoritative chronology of Hendrix's recording career.

First, the meat. In addition to really clean versions of most of his singles (noticeably different from the versions found on current CD releases), the package has a couple of pre-Experience guitar extravaganzas, culminating in Jimi's aggressive reading of "I'm a Man." There are some juicy outtakes from the regular albums: "Mr. Bad Luck" from *Are You Experienced?*, an early mix of "One Rainy Wish" from *Axis, Bold As Love*, and "Cherokee Mist," "Drifter's Escape," and alternate takes of "Come On" and "Voodoo Child (Slight Return)" from *Electric Ladyland*. The real delights for collectors are amazing home demos of "Angel" (this one, just guitar and voice recorded in Jimi's apartment, is alone worth the album's price), "Voodoo Child," and "Cherokee Mist," as well as some incomplete songs from 1969 and 1970 called "Valley of Neptune," "Send My Love to Linda," and "South Saturn Delta." After all, freshly unearthed Hendrix songs, heard nowhere else, are something special.

The narration is well-researched and includes interviews with Jimi, his band-
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- Julian Hirsch, Stereo Review

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- Hector G. La Torre, Audio Magazine

"This piece is impressive. The system sounded cleaner, a lot crisper, brighter, and -- simply put -- better. The improvement on compact discs, is indescribable. I am not going to tell you that the signal sounded live, but it sure got pretty close."

- DJ Times

To us, the sound was immediately brighter, airier, and more sparkling, with added punch and snap to transients, more bite to sharp attacks, and more sheen to strings and vocals... The result is nothing short of - using the term literally - sensational."

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Peter Wolf’s array of conventional instruments yields a sound that is soulful, not tarted-up like modern synth.

mates, his various girlfriends, his producers and engineers, and other musicians. My only complaint is that if the indexing had been done a little more carefully, you’d be able to access the musical tracks better. Not everyone wants to hear all the banter every time one listens to the music. There are also unidentified musical snippets playing underneath the narration; I’d like to know what they are and hear a little more of them. These are minor gripes with a package that’s a fine introduction for the uninitiated and a treat for fans who want a little more depth.

Jon & Sally Tiven

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Up To No Good!: Peter Wolf
MCA MCAD-6349, CD; AAD; 43:34.

Sound: B+ Performance: B

Nothing too subtle here. Former J. Geils frontman, the charismatic Peter Wolf has delivered an end-to-end set of party music: Rocking rhythm & blues with lots of sass and kick. Wolf has drawn on such favorite sources as Motown, Philly soul, and Chicago blues for inspiration and tossed it all into a lively, fun-filled brew.

This time around, Wolf avoids modern synth sounds in favor of the more traditional sounds of guitar, bass, keyboards, drums, horns, and harmonica. This leads the album to a real soulful sound that sounds true, not tarted-up.

Up To No Good! is a gas from note one all the way through. It’s gonna make you smile.

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The old saw about skinning cats couldn't be better demonstrated than by this pair of recordings by guitarists John Scofield and Stanley Jordan. Both offer "traditional" jazz in the sense of taking a tune to the moon with hot improvisation, but boy, do they achieve different effects.

John Scofield’s *Time On My Hands* displays the consummate be-bop axe-man, with the title referring equally to his highly developed rhythmic sense and the control in his magic fingers. For this set, Scofield has enlisted saxist Joe Lovano, bassist Charlie Haden, and drummer Jack DeJohnette to help him blow through 11 original numbers (including two bonus cuts on the CD). Featuring sax along with guitar makes for curious contrasts, especially since they play in similar frequency ranges. (It’s also the mark of mature musicians who are more into music than ego.) Rather than simply trading licks, Scofield frequently doubles Lovano’s silky smooth tone and slithering, cascading runs using a chorus effect which slightly detunes pitches and flares out the sound in a complementary fashion. Check out “Farmacology” and “So Sue Me” for some very fancy duets. In his soloing, Scofield deftly employs complex, bounding rhythmic figures and rubbery note bends, jerking time signatures around in subtle ways which totally activate the music. Also check out “Wabash III” and “Fat Lip” to hear Scofield take what could be ordinary lines to the outside. The album’s hottest spot is “Stranger to the Light,” a virtuosic jam which brings all of this together masterfully. John Scofield’s *Time On My Hands* should excite jazz and guitar fans alike.

Two-handed tapper Stanley Jordan’s *Cornucopia* is apparently named with the mixed bag of music on this disc—emphasis on the “mixed”—in mind. Unfortunately, we’re back to the “will the real Stanley Jordan please stand up” issue. Jordan has worked hard to establish the legitimacy of his tapping technique, which is now accepted as a mainstream tool. Finding his musical voice has been more difficult, the crackle in his notes a throwback to masters like Armstrong and Eldridge.

The first five cuts (including the CD bonus, “Fundance”) were recorded live and are killers, with Jordan tapping off improvs on standards like Coltrane’s “Impressions,” “Willow Weep for Me,” and “Autumn Leaves.” Two originals, “Still Got the Blues” and “Fundance,” will make you want to cheer. This is jazz.

Enter identity crisis as Jordan switches gears to three studio cuts which are highly sweetened Urban Contemporary pop. The synth piece “Asteroids” is almost New Age. The album’s final song, the title cut, is a 21-minute improvisation performed on the new Casio synth guitar; it takes us off into a reflective mood that’s completely at odds with the rest of the album. It’s not that these are bad tunes, just that Jordan needs to decide what kind of music he wants to make. If he wants to be eclectic, fine, but he should put it on different albums or else figure out how to make it all work together on one. Use of the programming feature on your CD player is recommended for Stanley Jordan’s *Cornucopia*.

John Scofield and Stanley Jordan are two cats who skin jazz in entirely different ways.

---

**Time On My Hands:** John Scofield  
**Blue Note CDP 7 92894 2, CD; ADD; 63:22.**  
**Sound:** A **Performance:** A

**Cornucopia:** Stanley Jordan  
**Blue Note CDP 7 92356 2, CD; AAD; 70:29**  
**Sound:** A **Performance:** B

---

**The Complete Blue Note and Pacific Jazz Recordings:** Clifford Brown  
**Mosaic 104, five LPs.**  
**Sound:** A- **Performance:** A to B

Thirty-five years ago, Clifford Brown was the hope on which much of the future of modern jazz seemed to rest. Everyone who heard him play, even as far back as 1949, when he sat in with Dizzy Gillespie’s band as a teenager, was sufficiently impressed to spread the word.

By 1953, Brown was in New York, and Blue Note had begun recording him. *Brownie Speaks*, a tour de force with underrated pianist Elmo Hope, shows how much of a musician Brown was before his 23rd birthday. Later that year, on a J. J. Johnson date, Brown played beautifully on “Capri” (with swinging piano work by John Lewis). Johnson’s prophetically named “Turnpike” and two takes of “Get Happy” show a young Brown soloing full of fire, the crackle in his notes a throwback to masters like Armstrong and Eldridge.

In August 1953, Brown had his first session under his own name. Notice how well, on (a very young) Quincy Jones’ “Wail Bait,” Brown handles the turnarounds (the bridges to the tunes);
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he races through them, ideas tumbling over one another, when many players were content to coast through this part of a composition. Brown had by now mastered the long, flowing bop line, as is clearly evident in "Hymn to the Orient," "Brownie Eyes" is a Quincy Jones ballad vehicle with Gigi Gryce in the background on flute.

We move to Los Angeles for the 1954 Pacific dates, with Zoot Sims and pianist Russ Freeman the most prominent sidemen. Brown's own "Dahoud" and "Joy Spring," two compositions associated with Fats Domino and, in an urban beat.

The balance of Mosaic's box has four sides devoted to a live 1954 Birdland recording engineered by the excellent Rudy Van Gelder and featuring Horace Silver on piano, Lou Donaldson on alto sax, and Art Blakey on drums. Silver's "Split Kick" produces some of the most memorable soloing by the maturing masters. Another 1954 date has Brown playing "Blueberry Hill," the 1940 song associated with Fats Domino and, in jazz, Armstrong.

In an age of super-sophisticated, high-tech guitarists, it's refreshing to dip back into the well from which these modern chops-meisters sprang. On Heart & Soul, Hubert Sumlin, who achieved recognition as axeman to the late Howlin' Wolf, gets down with some simple, soulful Delta-cum-Chi-town blues riffs.

Reunited with his childhood bandmate James Cotton on harp, Sumlin's backed by his current band, New York's electric sound. Sumlin's band cooks considerably hotter than any of these three covers: The Wolfs's "Sitting on Top of the World," Willie Dixon's "Little Red Rooster," and "Joy Spring," two compositions of a composition. Brown had by now mastered the long, flowing bop line, as is clearly evident in "Hymn to the Orient," "Brownie Eyes" is a Quincy Jones ballad vehicle with Gigi Gryce in the background on flute.

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Frank Driggs
Digital-to-Analog (D/A) converters in CD players are key to performance. Today, large scale, integrated circuit technology makes a new generation of converters possible. These pulse converters use LSI designs incorporating many circuits on a single chip. For example, Sony HDLC™ converters combine three fundamental functions on a single IC. This provides improved performance, long life and greater reliability.

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Marcus Roberts' album sounds like it came from another time, full of smoke and shadowy corners.

Wolf's sound, and it's fun to hear him step out and take center stage.  

Michael Wright

Deep in the Shed: Marcus Roberts  
RCA/Novus 3078, LP.

Sound: B—  Performance: B

Pianist Marcus Roberts proves he's steeped in the tradition with his second solo album, Deep in the Shed. That makes sense, since he's the young protégé of the still-young neotraditionalist trumpeter, Wynton Marsalis. To further entrench the jazz roots, it was produced by Delfeayo Marsalis. Deep in the Shed sounds like it came from another time, full of smoke and shadowy corners. Out of the warm beer and butt-filled ashtrays, Roberts writes his name in the blues, Duke Ellington, and Gershwin, creating translucent orchestrations and terse solos.

The title track comes deep out of the "Night in Tunisia" groove of Art Blakey. Herlin Riley keeps the high-hat and tenor toms rolling in this Middle Eastern groove, providing the dance rhythms for Wycliff Gordon's plunger trombone solo and Herb Harris' dark tenor meditation. Midway, it shifts into a straight-ahead bop groove for a ruminating solo by Roberts. It's an odd way of framing the star, creating a song within a song.

As an arranger and leader, Roberts creates an almost tangible atmosphere with his darkly shaded horn arrangements and some bleak, melancholic solos. "Mysterious Interlude" sounds like it's based on the chord changes to Gershwin's "Summertime" and takes that same sweltering-hot pulse, like moving in slow motion through the heat distortion of a noonday sun.

Recording live and in the studio, Delfeayo Marsalis seems to mix both formats within a song, as on "Nebuchadnezzar," where the sound suddenly shifts from a flat studio ambience to a live one. It might have been intentional, but it's dislocating to hear.

Marcus Roberts makes it a point of being a pianist with a heritage. Perhaps that's why I have trouble defining his sound, singling out that tendency or flair that will set him alongside the jazz greats he admires. He doesn't have his own stylistic home yet, but he certainly takes you where the legends lived, deep in the shed. John Dilberto

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Alone Together: Carol Britto  
Town Crier TCD 515, CD; DDD; 52:21.  
Sound: B  
Performance: B

For the past few months, I’ve enjoyed listening to a little-known and infrequently recorded jazz pianist named Carol Britto. I have in my possession two Britto releases, a cassette version of her 1985 Town Crier recording, Inner Voices (with bassist Michael Moore), and the 1987 session, Alone Together, featuring saxophonist Flip Phillips and bassist Moore, on Compact Disc.

Britto is a former classical pianist who came to New York, via Toronto, from her home town of Cleveland. Despite her talent and her experience accompanying numerous jazz greats, Britto remains a behind-the-scenes player. Her playing style is technically formidable, and she is not afraid to tackle jazz hall-of-fame pearls, as she does on this CD, jumping into “Stompin’ at the Savoy” and “Sophisticated Lady” as well as nine other challenging compositions.

Carol Britto manages to avoid the studied and stiff readings classically trained pianists often provide when interpreting other types of music. Although she doesn’t transmit the creative fire and swing associated with jazz keyboard legends, Britto has a wonderful sense of harmony and dynamics; her rhythm and lead lines always smoothly support each other. She has the ability to flawlessly integrate different time and key signatures as well as the playful creative wit to occasionally inject other compositions into the main composition’s theme.

Alone Together showcases Britto in solo modes and accompanied by Moore and Phillips. Moore, as usual, is impeccable both as a supporter and soloist, but it is tenor saxophonist Phillips who has a field day on this release. He swings his way through several tunes, at times evoking Ben Webster and Coleman Hawkins.

There is precious little technical information provided in Alone Together’s booklet, other than to state it was digitally recorded by producer Claudia Marx and engineer Tom Lazarus. The record company does inform us that Britto plays a Baldwin SD-10 concert grand, and its recording is one of the most natural sounding I’ve heard in some time. Although, on “Li’l Darlin’” and “Stompin’ at the Savoy,” the solo piano—especially in the lower registers—sounds as if it has been enhanced by a too-long decay-time setting on a special effects processor (delay, reverb), which contributes to a slightly unnatural decay of the notes. Nonetheless, overall the piano recording is excellent.

Listening to Carol Britto’s Alone Together leads me to wonder about the many very talented jazz players out there toiling in obscurity. Town Crier deserves thanks for bringing one of them to the front. Carol Britto is a real find.

Hector G. La Torre

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