BERNING
EA-2101 AMP
& TF-12 PREAMP
VERY MUSICAL

INTERVIEW
KURT MASUR
NEW YORK
PHILHARMONIC'S
MUSIC DIRECTOR:
"HI-FI SYSTEMS
MAKE ME
WORK HARDER"

TESTED
WESTLAKE
MONITOR
SPEAKER FOR
THE HOME
Adcom announces the cure for the common receiver.

Today, there is no reason to compromise your favorite music by listening to a common receiver. Because the Adcom GTP-400 tuner/preamplifier with GFA-535 (60 watts per channel)* amplifier gives you all the benefits of Adcom's legendary clear, dynamic sound for a price close to that of an ordinary receiver.

Why Separates?
The limited space in receivers prevents the use of heavy duty, high-current, high-voltage power supplies found in the best separate components. Consequently, the performance of receivers is compromised for their questionable advantage of all-in-one convenience.

By dividing the tuner/preamplifier from the power amplifier, Adcom isolates low-current, low-voltage circuits from high-current, high-voltage elements ensuring sonic purity and demonstrably superior performance.

More Sound—Less Money

Many of Adcom's components have been favorably compared to other components costing two and three times more. The GTP-400 with GFA-535 is a combination that promises to keep faith with this tradition of offering superb performance at a reasonable cost.

The price of these Adcom separates is close to that of an ordinary receiver. But no receiver will deliver the wide dynamic range and musical satisfaction of an Adcom system.

Ask your Adcom dealer for a demonstration of these affordable separates. You'll never listen to a common receiver again.

*Power output, watts/channel, continuous both channels driven into 8 ohms, 20 Hz - 20 kHz <0.09% THD.
EVERY ONCE IN A WHILE A PRODUCT COMES ALONG THAT NO AUDIOPHILE CAN DISPUTE.

The new M Series speaker cables go one step further, bringing you one step closer to reproducing the musical event. For the serious audiophile listener who wants to extrapolate every last nuance of the musical performance, we’ve developed new technologies. For example, there’s Multi Twist™ incorporated in every M Series cable. Multi Twist™ enhances the mechanical integrity of the cable for a more coherent reproduction of delicate harmonic structure and detail. Our new Isotec™ dampening material isolates individual conductors from outside vibrations which can generate signals that interfere with the music. We invite you to compare M Series speaker cables with other cables available at many times the price. We think you’ll discover why M Series music is indisputable.
FEATURES

THE AUDIO INTERVIEW:
KURT MASUR
Robert Angus 44

SURROUND SOUND
WITHOUT PICTURES
L. Feldman and J. Sunier 50
1991 ANNUAL INDEX 168

EQUIPMENT PROFILES

DAVID BERNING EA-2101 AMP AND TF-12 PREAMP
Bascom H. King 56

WESTLAKE AUDIO
BBBM-6F SPEAKER
D. B. Keele, Jr 78

PIONEER PREMIER KEX-M900 CAR STEREO WITH DSP
L. Feldman and I. Berger 98

AUDIOSOURCE SS THREE SURROUND DECODER
Howard A. Roberson 114

AURICLE: JECKLIN FLOAT ESC EARPHONES
Edward M. Long 124

AURICLE: RECOTON FM200 INDOOR FM ANTENNA
Leonard Feldman 128

MUSIC REVIEWS

CLASSICAL RECORDINGS 137

ROCK/POP RECORDINGS 142

JAZZ & BLUES 148

DEPARTMENTS

SIGNALS & NOISE 4
Herman Burstein

TAPE GUIDE 6
Joseph Giovannelli

AUDIOCLINIC 8
John Eargle 10

CURRENTS 14
Bert Whyte

BEHIND THE SCENES 16
Jon R. Sank

FORUM 20
Edward Taitnall Canby

The Cover Equipment: David Berning EA-2101 amp and TF-12 preamp
The Cover Photographer: ©1991, Bill Kourinis Studio

Audio Publishing, Editorial, and Advertising Offices,
1633 Broadway, New York, N.Y. 10019

Subscription Inquiries, (800) 274-8808;
in Canada or other foreign countries, (303) 447-9330.
"Have you seen Elvis?"

Convenient, compact, durable, wonderful sound—the endearing qualities of compact discs. Trouble is, you've quickly collected so many CDs that finding Blue Suede Shoes when you want to play it has become a real problem.

Until now.

The Proceed CD Library stores, organizes, and gives you flexible access to your one hundred favorite compact discs. Not just a high-capacity CD changer, the CD Library lets you organize your CD collection, in the way that works best for you.

No more juggling jewel boxes. No more scrambling to find the right liner notes. The CD Library's powerful remote-control unit, the Communicator, displays titles, artists, and tracks not by number but by name. You'll also be able to define up to fifteen "music types" (we don't choose them—you do).

From playing a single track on a specific CD to playing a custom sequence of dozens of tracks or CDs, the CD Library lets you choose how to play your favorite music—from anywhere in your home. Want to play an hour of baroque music?

How about all of your jazz CDs? Or a continuously repeating sequence of pro-'68 Beatles? It's up to you.

Such power and convenience don't come at the expense of first-class sound. Comparable to any of today's "audiophile-quality" single-disc CD players, the CD Library's superb sonics are the result of the same engineering that produced the acclaimed Proceed PCD, PDP, and PD®.

Visit your nearest Proceed dealer, and discover what the Proceed CD Library can do for you and your music. Who knows what you'll find?
Don’t Mention It

Dear Editor:

I suppose we don’t need unsightly or confusing interconnects or power cords to use the Lipra Labs Stealth DSP module (April).

Lipra Labs was not mentioned in the Ad Index. The reality of this product is dubious at best, but if it is real, please place my name on the interested buyer’s list. My system needs new and interesting components to keep it happy. To my meager knowledge, there are no other surrealism processors available.

Drain B ammunition
Seattle, Wash.

Wise Investment

Dear Editor:

I recently inquired about a loose power switch on my Adcom GFT-555 tuner. An Adcom representative asked me if I thought I could replace the switch myself since there was no soldering involved. I assured him that I would be able to perform the task. He agreed to send me the needed part free of charge, and I was in receipt of the part in just two days.

It’s nice to know that some companies, such as Adcom, take care of the people who have invested (wisely) in their products.

Ronald Bassell
South Euclid, Ohio

Rapture in Maryland

Dear Editor:

As a dedicated reader of your publication and an ardent music enthusiast, I always appreciate learning about and hearing equipment constructed with quality and care in which I may have a buying interest. In the past, both your readers and staff have provided me with this vital information, and now I’d like to return the service.

During a recent search for a second set of speakers, I “discovered” a small but talented local speaker manufacturer who builds both finished speaker systems and speaker kits for discriminating audiophiles who don’t want to (or can’t) spend their very last dollar on high-end speakers but still want to enjoy the best in sound reproduction. For the past 30 years, The Speaker Factory at 9141 Arbuckle Drive, Gaithersburg, Md., has been manufacturing systems of impeccable sound-reproduction quality compared to highly advertised systems selling for three and four times as much. It’s musical capture you experience when you listen to the smooth response, clean bass, and extended highs produced by The Speaker Factory’s array of systems.

I feel an obligation to other readers to let them know that The Speaker Factory exists. I am sure most readers will agree that not only is the talent which creates the sound important to us, but the accurate reproduction of that recorded sound is equally important, especially at reasonable cost.

Richard H. Bender
Gaithersburg, Md.

Fight the Power

Dear Editor:

The quality of recorded music is approaching that which is live. It’s a pleasure playing with tapes of Pocket Songs and the Singing Machine, integrating my clarinet in its three registers. I play the gambit, from glockenspiel blues, symphonic themes, and ethnic music—all with authentic background music on tape. I take full blame if my clarinet squeaks. I also take home a salary above that which most band-leaders receive.

There is, however, a contributing factor that subtracts from my musical performances here in South Florida. The power is inconsistent, and as a result I find myself playing at times a half-tone lower, thereby changing the character of the original key heard by the orchestrator.

If it can happen to me, it is happening to audio connoisseurs with state-of-the-art technology. They are not hearing musical instruments playing in the recording studio at 440 pitch reproduced as such on their expensive audio equipment. It is not fair for power companies to decrease by even a half-tone. Everything, including highway lights, runs well at 440 pitched power. All they need do is use their access to technology so that we may have the best use of ours. If they flinch, a “battery” of a boycott will alter their mind-set, although audio connoisseurs among the employees of utility companies are not asked to support us.

Owen Engel
Lauderhill, Fla.
Museatex has always designed compact and elegant components with the convenience of remote control. The Melior Audio/Video Control Center inherits all of the convenience and critically acclaimed performance of our audio preamplifiers, and adds DC-coupled video switching to ensure perfect black-level retention for all video sources. Signal purity is maintained by completely isolating the video and audio signals through the use of special shielding, separate power supplies, and careful ground connections.

The Melior A/V is capable of integrating virtually any combination of audio and video components into a single system that is easy to use and convenient to control. The unit includes inputs, outputs, and tape loops for both regular and S-VHS video devices in addition to audio. A switchable processor loop is also included so that an external processor, such as a Dolby surround decoder, can be completely removed from the audio signal path when not required. Separate outputs with reversed phase permit amplifier bridging and a MIDI interface is provided for connection to the Melior Multi-Room System. And of course the Melior A/V Control Center is compact, elegant, and includes remote control.

In 1986, Museatex introduced the first audiophile components with remote control.

In 1991, the rest of the high-end industry began to follow suit.

This year we have introduced the first audio/video control center for audiophiles.

The way we see it, you can either buy one from us now or wait five years to get one from someone else.
### Disabling the Erase Head

Q. Tapes that I bulk-erase are quieter than those erased by my deck's erase head. Also, they don't have the low-level buzzing noise that I occasionally hear. Would a switch for the erase head's current allow me to turn it off and get a few more dB of signal-to-noise ratio when I use bulk-erased tapes? Is there a good reason why manufacturers don't include this feature?—William Shipman, Fredericksburg, Va.

A. Yes, disabling the erase head—by switching off the oscillator current going to it—can give you a somewhat quieter recording than if the erase head is active. However, if the heavy load presented by the erase head is removed from the bias oscillator, the amount of bias current going to the record head is likely to rise. Therefore, if you plan to erase only by means of a bulk eraser, it becomes necessary to readjust the bias current going to the record head.

On the other hand, you may want the option of using either the bulk eraser or the erase head. For example, if you want to erase only the tracks on side A of a cassette, you must use the erase head; a bulk eraser necessarily erases all tracks, from both sides. In this situation, you would require a substitute load and a switching arrangement that diverts the erase current to the substitute load when the erase head is cut out. The substitute load would have to present the same impedance to the oscillator as does the erase head.

Altogether, you face a technical problem of at least moderate difficulty, although far from an insuperable one. If I recall correctly, many years ago there was an open-reel deck which incorporated the feature you desire, using an actual erase head as the substitute load. However, this feature added significantly to cost and helps explain why we don't see it, particularly since there seems to be little demand for it in the market.

### Effectiveness of Play Trim

Q. A few cassette decks include a Play Trim feature to correct for azimuth mismatch between the tape and the playback head. How effective is Play Trim? Is there a difference between two-head and three-head decks with respect to its effectiveness?—Anthony Hudaverdi, Santa Monica, Cal.

A. Play Trim can correct for modest treble losses due to azimuth mismatch and other factors, in the range from 10 to 20 kHz, it can provide about 3 to 6 dB of treble boost.

Losses due to imperfect treble equalization in recording are apt to be quite minor, relatively speaking. Losses due to excessive bias tend to be larger but not all that great unless the deck manufacturer or the user has not taken due care with respect to proper bias. So treble loss due to these two factors can be handled quite effectively by Play Trim in most cases, but losses due to azimuth misalignment can be quite profound even if the

---

### Strike Up A Deal With Sony.

**Buy any Sony home or car CD player...**
misalignment is quite small. To take an example, assume misalignment of only 10° (1/8 of a degree, which is too small to be discerned by eye). At 10 kHz, the resulting loss is 2.1 dB, which is within Play Trim’s ability to correct. But at 20 kHz, the loss is 10.2 dB, which is well outside Play Trim’s ability to correct completely.

I see no reason why Play Trim’s effectiveness should be different between two-head and three-head decks. However, the chance of azimuth misalignment is greater for a three-head deck. Obviously, misalignment cannot occur if one record and plays with the same two-head deck. But with a three-head deck, owing to use or misadventure, the record and play heads can become misaligned with respect to each other.

Radio Interference in Tape Decks

Q. I have a problem with background noise on tapes recorded on my reel deck. Specifically, I am picking up a radio station. This can't be bleeding from a tuner because I don't have one hooked up to my system. Do you have a solution to this? I have heard of a component from Adcom that is supposed to clean up a.c. power, but I don't know if this will help. —David Cooper, Rochester, N.Y.

A. Radio frequency interference (r.f.i.) can come into your deck in various ways. One is through the power cord of the deck or the input cables to the deck; another is through the power line. Perhaps the radio station is being picked up by the first stage of the deck's own record electronics, or the preamp stage of your amplifier may be doing so, particularly if you are using its phono stage, which has high gain and is therefore sensitive to extraneous signals. You can probably figure out where the interference is originating by disconnecting components that feed into the deck.

Dressing (rearranging the path of) power cords might help if r.f.i. is picked up by one of them. Reversing a plug's position in the wall outlet is also worth trying. Dressing cables leading to the deck—or the cables between your signal source and amplifier—may help. If r.f.i. is entering the deck directly, reorient the deck and/or place it somewhere else.

An a.c.-line interference filter, available at audio dealers and elsewhere, may be useful. Line conditioners made by Adcom, Tice, and other companies are basically intended to suppress the effects of spikes, hash, surges, and other anomalies in the power line. Such devices are not cheap, and I think that the chance of one solving your problem is small. Therefore, if you do decide to try one, I suggest buying it on a trial basis.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at Au-

dio, 1633 Broadway, New York, N.Y. 10019. All letters are answered. Please enclose a stamped, self-addressed envelope.

Get the great performance of a Sony and your choice of three CD's free when you purchase a Sony home or car CD player between Oct. 1, 1991 and Jan. 31, 1992. Choose any 3 of these CD's.

- Heart - "Little Queen"
- The Byrds - "Greatest Hits"
- Brass Bonanza - "The Sound of Silence"
- ZZ Top - "Cooper's Hawk"
- Dizzy Orinoco - "Sailor & the Wolf"
- Queen - "A Night at the Opera"
- Red Hot Chili Peppers - "Midnight Run" 3
- The Beatles - "Abbey Road"

To receive your CD's, mail this coupon postmarked no later than 2/79/92 along with the original bar code (with the model number on it) from the cover of your Sony CD player, a copy of your dated sales receipt and a check or money order (no cash) for $2.95 (payable to Sony Corp.) for shipping & handling to: Sony 336-89, P.O. Box 5467, Terre Haute, Indiana 47809.

To order, write: "SONY SPECIAL OFFER" 2000, 2633 Broadway, New York, N.Y. 10019.

Include your choice of the following:

- Heart - "Little Queen"
- The Byrds - "Greatest Hits"
- Brass Bonanza - "The Sound of Silence"
- ZZ Top - "Cooper's Hawk"
- Dizzy Orinoco - "Sailor & the Wolf"
- Queen - "A Night at the Opera"
- Red Hot Chili Peppers - "Midnight Run" 3
- The Beatles - "Abbey Road"

Offer good only on Sony home or car CD players—those model numbers beginning with CD- 1, CDX, CDP, CDX-R, CDX-D, CDX-3, CDX-4, CDX-5, CDX-6, CDX-7, CDX-8, CDX-9, and CDX-10. Model numbers beginning with CD- 1000, NCP and V10 are not considered home or car CD players and are not eligible. Sony reserves the right to substitute compact discs based on supply availability. Limit one 3.00 Value Package per qualifying Sony CD Player purchase. Offer valid only in the Continental U.S. (Excludes Alaska, Hawaii, Puerto Rico). Void where prohibited by law. August of offer will void coupon. Please allow 6-8 weeks for delivery.

©1991 Sony Corporation of America. All rights reserved. Sony is a trademark of Sony.

And get 3 great CD titles. FREE

($3.00 shipping & handling)
Introducing The Surround™ By Henry Kloss.

The Surround is a new kind of speaker system. One of the first specifically designed for use as rear speakers in surround sound systems of all types. Dolby Surround™ and Dolby Pro Logic™ systems...or Digital Signal Processing (DSP) systems. It will even create surround sound effects when added as rear speakers to a conventional stereo system. The Surround meets even the most stringent criteria for use in a home surround sound system.*

Dipole Radiator Technology.

Unlike other speakers, the purpose of rear speakers in a Dolby Surround or DSP system is to “surround” the listener with uniform, non-directional ambient sounds. Conventional speakers are designed to create a precise, “stereo stage” – the opposite of what you want from a surround speaker. The Surround, however, is a dipole radiator. It contains a 4.5 low frequency driver facing “forward” out of the cabinet, and two 3” high frequency drivers—one on each side of the cabinet.

When mounted on the side walls of your listening room, The Surround’s two high frequency drivers direct sound towards the front and rear of the room. The sounds then reflect off the surfaces of the room, and finally reach the listener from all directions...almost as if the music was “coming out of nowhere.” The result is surround sound the way it was meant to be heard.

Price Breakthrough.

Like all our products, The Surround was designed by Audio Hall of Fame member Henry Kloss. It is manufactured in Newton, Mass., and sold only factory-direct. Because we eliminate expensive middle-men, our products sell for much less than they would in stores. We are able to introduce The Surround at $399 per pair—less than half of any other surround loudspeaker in its category.

Try The Surround Risk-Free For 30 Days.

The Surround is backed by the Cambridge SoundWorks 30 Day Total Satisfaction Guarantee. So there’s no risk. Our audio experts (not phone clerks) are on duty 365 days a year to answer your questions. This is the simplest, most risk-free way to get the right deal on the right stereo components.

Free Audio Catalog.

Our new 48-page color catalog has specials on systems and components from Pioneer, Philips, Denon, Nakamichi, Thorens and Cambridge SoundWorks—including outstanding values on complete Dolby Surround systems from $499 to $2,799.*

*Cambridge SoundWorks is a trademark of Lucasfilm Ltd. Lucasfilm THX is a trademark of Lucasfilm Entertainment Company.

A new kind of audio company, with factory-direct savings.

CAMBRIDGE SOUNDWORKS
154 California St., Suite 104D, Newton, MA 02158
1-800-AKA-HIFI

VCR Mystery Mono

I take keyboard in hand to offer another possible solution to the “No Surround Sound” problem as related by Steve Metz in your column in the January issue.

It has been my experience that very few Hi-Fi VCRs (actually, none that I can think of) include multiplexed stereo as part of their modulated-r.f. output. They only feed stereo from their audio output jacks. Further, most salespeople and many technicians are unaware of this.

It has also been my experience that many people upgrading to a stereo video system have simply replaced their older, monophonic VCR and followed tradition by connecting the VCR as part of the r.f. signal loop (i.e., feeding the r.f. signal from the antenna or cable box to the VCR’s r.f. input, then feeding the VCR’s r.f. output to the TV receiver’s r.f. input).

When you’re not playing a tape, the VCR will usually just pass through whatever r.f. broadcast or cable signal it receives, and the TV (which I assume to be stereo-capable) then decodes any stereo signals and provides stereo audio to the sound system. During tape playback, however, the VCR’s modulator creates an r.f. output signal (usually on VHF channels 3 or 4), with monophonic audio (sometimes obtained from the linear audio track). This signal is then presented to the TV receiver, which can then send only monophonic sound to the preamplifier/decoder.

The solution to this can take many forms, depending on the capabilities of the TV receiver. If the TV has separate AV inputs and outputs, and input selection of either r.f. or line sources, then the video (either composite or “S”) and left and right audio outputs of the VCR should be routed to the video and audio inputs of the TV. The TV’s AV outputs should then be routed to the sound system. To view the broadcast or cable signals, the TV receiver’s input switch is set to “TV” (antenna/r.f. or whatever). To view a videotape, you switch the TV to the appropriate input (which might be labelled “Video,” “Line,” “VCR,” “AV,” or the like). If your TV has no such inputs, you can feed your VCR’s audio outputs directly to any unused line inputs on your audio system.
There are many other possibilities depending on the equipment being used. The key is to abandon the r.f. link in favor of the separate audio and video connections. This should produce a cleaner picture than using the VCR's r.f. modulator.—Clifford I. Knight, Plymouth, Mass.

Using Tape Loops

Q. My preamp has only one tape loop. I have a Hi-Fi VCR, a cassette recorder, and some signal processors. How can I set up this conglomeration?—Gordon R. Taylor, Bowling Green, Ohio

A. If all you had was one recorder and one signal processor, you could probably hook the processor to the tape loop and the recorder to that, because most processors now have tape loops of their own. You might even be able to daisy-chain another processor or two if each unit has a true bypass switch. Otherwise, you might pick up noise and other problems from such a connection.

In your case, you'll need some kind of external switchbox to which all your gear can be connected. An article in our June 1989 issue covered such switchers from Canton, DB Systems, Niles Audio, QED, Radio Shack, Russound/FMP, and Vanco. Sony also makes switchboxes, and dbx used to make a fancy unit that had indicator lights to show which components were in-circuit. Most switchboxes include tape-dubbing switches that allow you to feed the output of one tape deck to the input of another; these switches can also be used to feed a processed signal to a tape deck during recording or to process the tape deck's output during playback.

Output Tubes Glow

Q. I recently purchased a receiver, vintage 1968 or earlier, and I liked it so much that I also got a Fisher Model 800C receiver for its excellent AM section. The output tubes of both receivers glow a blue or purple color—some not at all, some only a little, and some quite a bit. Is this bad? Is it the fault of the receiver or the tubes themselves? All of the tubes test out fine. When should output tubes be replaced? How much power do I lose as they age?—William Lugibuhl, Buffalo, Ohio

A. Glowing output tubes can be the result of various factors. The tubes themselves could be gassy. There may be insufficient bias applied to the grids. This can be caused by problems with the bias itself or by leaky coupling capacitors feeding the grids. That could even make the grids positive with respect to cathode. If such an extreme condition exists, the tubes will be destroyed relatively quickly. The sound will be very distorted as well.

If you notice that you can no longer obtain proper output without audible distortion, change the tubes. Deteriorating driver stages can also produce some of these same symptoms.

If you cannot bring the plate current to specification, even when the bias is set properly, the tubes are probably bad and should be replaced.

CD Deterioration

Q. I have read several articles regarding the deterioration of CDs over time. Is there any truth to these allegations, or is it a controversial question without a definite answer? If CDs do have a limited life and will not last forever, will there ever be a medium that will?—Joe Jarocki, Franklin Park, Ill.

A. So far as I know, there is no problem of CD deterioration. I have not had such problems, nor have I received even one letter from a reader indicating that they have.

As for what medium is truly permanent, nothing on earth is permanent. Magnetic tapes can be erased, or their plastics can lose plasticizer. Vinyl phonograph discs can wear out. Perhaps the DAT system offers at least some hope of being archival—not because the tapes can't be erased, but because the information can be copied from one generation to the next by digital means. This is a virtually lossless process as long as the copies are made before the master has had time to deteriorate.

If you have a problem or question about audio, write to Mr. Joseph Giovaneli at AUDIO Magazine, 1633 Broadway, New York, N.Y. 10019. All letters are answered. Please enclose a stamped, self-addressed envelope.
In the meantime, the parade of new products continues, and major companies continue to battle it out for technological supremacy in the areas of low-cost digital recording and interactive CD. We'll discuss both of these later.

First, let's recap high-end audio. You remember exhibitors' plight at last year's show: No space at the inn—in fact, nothing but prefab demo rooms in the lower level of the North Hall. Shortly before the show, a large number of high-end exhibitors bolted and set up their own displays at the Chicago Historical Museum, well north of the Loop. Fortunately, CES management took the necessary steps to reverse the trend, and this year the high-end exhibits were back at the Conrad Hilton Hotel, a site they had occupied in earlier years. However, the smallish rooms in the Hilton are not conducive to accurate sound reproduction, and the larger rooms, which work much better, are limited in number and cost a good bit.

A highlight of the Hilton was the Marantz USA exhibit. As you may know, Philips has acquired the Marantz trade name in the U.S. and is working hard to put that company back on the pedestal it occupied 30 years ago. That will take some doing, but they are making strides. In addition to standard models, Marantz was showing a DCC (Digital Compact Cassette) recorder and a write-once CD recorder.

Marantz also presented a generalized audio computer that can perform several functions. It can automatically equalize the stereo system for a given listening position in the room and provide additional user-adjustable parametric equalization. It has multi-channel outputs for ambience generation and Dolby Surround for video presentation. It offers stereo width control and headphone signal processing for accurate "out of head" localization. Signal compression/expansion and scratch elimination for older LPs is also included. As if this weren't enough, the unit also operates as a versatile test set with sine-wave and noise output signals and a 27-band real-time analyzer. Operation of the unit is made relatively easy through dual video displays which let the user see two menus concurrently.

At McCormick Place, Sharp was showing its latest designs in LCD video projection. The convenience of these projectors lies in the simplicity of set-up—no converging is necessary. The unique design makes use of standard (non-phosphor) white-light sources which are split into three paths, one for each primary color. These three paths are independently modulated by LCD elements, then are recombined and projected via a single lens. The picture has no flicker, but the individual pixels (picture elements) are quite apparent and are annoying to many viewers.

For the first time, Sharp was showing an HDTV projector. Here the pixels are so small (over 3 million in the composite picture) that none of them could be seen as such. Colors were accurate, and saturation was excellent. While this projector is a standard model in Japan, its only use in the U.S. would be in industrial HDTV applications.

Denon exhibited an interesting variation on standard CD technology, a 3-inch disc capable of 80 minutes of playing time, using no data compression at all. This is accomplished essentially by using a shorter laser wavelength and refined optics to give a pit size about one-half that of the standard CD's. This in turn results in four times the signal density on the disc, as shown in the photomicrograph. While this may never become a music format, it has tremendous potential for CD-ROM and related applications.

Hughes Aircraft is getting into the consumer electronics business! Its products will be a Sound Retrieval System (SRS) adaptor and a series of satellite stereo loudspeakers with subwoofers. While SRS was licensed for TV use by Sony and RCA/GE earlier, Hughes' adaptor is intended for use with normal home stereo electronics, where it will fit into the external processor loop. When SRS is engaged, the adaptor dynamically acts on the stereo difference channel (L – R), creating an increased stereo stage width, largely in the midrange. The listener must sit virtually on the plane of loudspeaker symmetry if the effect is to be heard best. However, in TV application, where the loudspeakers are generally closer together, the listener-location constraints are more relaxed. The control unit provides a good range of SRS settings, from subtle to quite pronounced. My feeling is that most listeners will probably settle into an operating point midway on...
Not even the Nakamichi engineers who created the 1000 mb expected it to sound so good. Not that it was a total surprise. After all, Nakamichi’s extensive research had already proven conclusively that vibration—all kinds of vibration, but especially the airborne variety—is bad news for CD reproduction. But when all of the sophisticated countermeasures collectively known as the Nakamichi Acoustic Isolation™ system were harnessed to combat vibration in the 1000mb CD transport, even its creators were impressed. Then again, Nakamichi products bearing the “1000” model designation have always managed to drop a few jaws. Ask to hear it through the Nakamichi 1000p Digital Audio Processor fitted with the new DA-111p DA converter upgrade. And expect the unexpected.

* Acoustic Isolation™ system • MusicBank™ system • Digital outputs only (coaxial and optical) • Full function wireless remote control

Acoustic Isolation and MusicBank are trademarks of Nakamichi Corporation
A NEW REFERENCE STANDARD

Company Address: 9450 7th Street, Unit F, Rancho Cucamonga, CA 91730 (714) 466-4662.

If you spend days running around auditioning speakers on somebody else’s electronics in somebody else’s sound room, you’re wasting your time. And you run the risk of wasting large sums of money on speakers that sound terrible in your home. Be smart. Pick the speakers that best suit your needs from the state-of-the-art VORTEX COLLECTION. And if you are one of the first 100 buyers, you will receive UP TO $300.00 in FREE Mobile Fidelity compact discs.

YOU CAN BUY A GREAT PREAMP WITH THE MONEY YOU SAVE ON THE LEGENDARY VORTEX SCREENS. PRICE: $1750.

But you won’t need to buy another amplifier because these large floor standing systems feature our Patent Pending “Servo Control” crossover network. This revolutionary development automatically compensates for impedance variations and has the effect of actually upgrading your amplifier!

The Screens also give you triple transmission line bass modules for the tightest, deepest bass possible in speaker construction, and transmission line midrange loading for maximum imaging and accuracy. These are the speakers chosen by Mobile Fidelity Sound Lab as their reference system. You have to listen to these speakers to believe how good your system can sound.


These transmission line speakers use the most expensive materials and cutting-edge technology in their construction. The bass and mid-range drivers are formed from Kevlar, a space-age material so light and strong that it is used to make bulletproof vests. Corey Greenberg was “really knocked out” by these speakers, calling them “highly musical with pinpoint imaging and depth out the . . .”

(Corey Greenberg on the sound of the Kevlar Reference Screens at the 1991 SCES. Stereophile, Vol. 14 No. 8-August 1991)

A REMARKABLE BREAKTHROUGH IN SPEAKERS UNDER $1000.
INTroducing THE VORTEX FORCEFIELD SERIES.

THINK CLEAN. GO DEEP. THE SUPER-Efficient FORCEFIELD 600.
INTRODUCTORY PRICE: $595.

You won’t need a megawatt amplifier to feel the shudder of low organ pipes or the weight of orchestral bass violins through the twin, heavy-duty 6-1/2” woofers of these remarkable speakers. That’s because we’ve made them incredibly efficient 91db @ 1 watt/meter! Even moderately powered receivers or video systems will come alive in front of you with a clean, solid 3-dimensional forcefield. And our patented wide angle tweeter guarantees you pinpoint imaging. You also get compact size for more flexibility in smaller rooms. What you don’t get is compromise.

THE BIPOLAR FORCEFIELD 800.
INTRODUCTORY PRICE: $795.

Surround yourself with exciting sound and music with precise image and depth projection — these new bipolar speakers turn your listening room into a concert hall! You actually get two complete speaker systems mounted back-to-back in each cabinet. Because you get twice the number of drivers in each cabinet, each driver only works half as hard. A total of eight woofers unite to give you the effect of one giant 15” subwoofer for effortlessly clean and powerful deep bass. The four 1” tweeters are so understressed that you get clear, undistorted highs even at extreme volume levels. We have optimized the treble for vocal reproduction. So these speakers are ideal for use in high end video systems where you must have perfect clarity for dialogue and the singing voice.

CONVENIENCE AND QUALITY: THE FORCEFIELD MINI MONITORS.
INTRODUCTORY PRICE: $295.
OPTIONAL SUBWOOFER MODULE.
INTRODUCTORY PRICE: $295.

Even if Vortex’s very affordable satellite/subwoofers are the only speakers you ever own, you won’t miss out on musically accurate, clean, deep sound. And these speakers also give you the ultimate in unobtrusive convenience. They can become almost invisible. And they make an almost invisible dent in your checkbook. But we guarantee the sound you get will be very pleasing to your ears. We like these speakers so much that we think every home should have a set!

REMEMBER — VORTEX IS AFFORDABLE STATE-OF-THE-ART.

Don’t miss out! Call 1 (800) 437-VORTEX right now and get your FREE compact discs.

VORTEX ACOUSTICS, INC.
P.O. BOX 1316
GUASTI, CA 91743
1-800-437-VORTEX
In Philips’ dream of the future, analog cassettes would last into the next century; in Sony’s, they would wind up in the closet.

This scale, Hughes’ satellite loudspeakers are designed for uniform radiation into a 180° horizontal angle and are small enough to permit more flexible options than conventional bookshelf loudspeakers.

Now for the corporate battles. When Philips introduced DCC last winter, the record industry pretty much felt it had a reasonable, viable replacement for the cassette. In fact, the backward compatibility of DCC meant that the changeover from analog to digital could be carefully planned to mesh with hardware growth. The approval of DCC by Matsushita and tape manufacturer BASF looks good, too.

Sony has now introduced the Mini Disc as its answer to the consumer’s need for a recordable digital medium. The advantages of the Mini Disc are its convenience and ruggedness. It can hold 70-plus minutes of music and will come in two forms. Like the CD, it can be pressed and, as such, will simply be another carrier of recorded music. A recordable blank disc will be available for about the cost of a metal cassette, and this disc can be rerecorded any number of times. Like DCC, the Mini Disc makes use of data compression, so its performance will not be of the same quality level as the CD.

If Sony’s dream comes true, the consumer of the future will have only CDs and Mini Discs. Cassettes would ultimately, like the LP, be relegated to the closet as the industry wound down the manufacture of cassette recorders. (Sony’s dream for DAT as a consumer medium has never materialized, despite the wide acceptance of DAT as a professional recording medium.)

If Philips’ dream is realized, the consumer of the future will have CDs, DCC, and a viable collection of analog cassettes with a continuing supply of new machines to play them on. The analog cassette would last well into the next century, in this scenario.

It’s too early to call, but the outcome could hinge merely on the relative start-up costs of software and hardware manufacture for the two media.

The other battle now taking place is between proponents of CD-I and CDTV. CD-I stands for Compact Disc Interactive, while CDTV stands for Compact Disc Television. Both terms refer to the use of specially coded CDs, in combination with a dedicated processor, TV monitor, and a hand-held control unit, to provide the user with graphics and text data bases on a wide variety of subjects. The user “interacts” with the system by giving commands via the control unit. Subjects range from informational/instructive to various games.

CD-I is promoted by Philips, Magnavox, Sony, Matsushita, and Nintendo. CDTV is promoted by Commodore.

CDTV has a slight edge in that it has already been shipped to the market, albeit on a limited basis. CDTV also has a strong proponent in Nolan Bushnell, the man who put Atari on the map in the early days of video games. And—you guessed it—the two systems are not compatible.
Motion pictures encoded with Dolby Stereo sound were introduced in the mid-1970s and became commonplace by 1979. Presently, there are more than 3,000 such films, and more than 16,000 theaters throughout the world are equipped to show them. Dolby Stereo is the acknowledged format for modern motion picture sound and has been in place for 16 years. In a sense, it is the only game in town.

In 1990, direct theater presentation of movies accounted for more than $5 billion worth of business in the United States. However, rentals of movies on videocassette that same year exceeded $10 billion, and sales of videocassettes exceeded $7 billion. A substantial percentage of the rentals were for movies that have Dolby Surround soundtracks. (Dolby Stereo is the term used in movie theater sound, and Dolby Surround applies to home video presentation.)

Although, obviously, not everyone who rents such videocassettes has a Dolby Surround decoder and surround speakers, a surprisingly large number of people do have Dolby Surround playback facilities. According to Dolby Labs, over 5 million decoders are currently in use, most of them in the growing number of home theater systems. My own system is fairly elaborate, but even the most basic Dolby Surround systems have left- and right-front speakers plus left- and right-rear or side speakers to reproduce surround information from videotapes or LaserDiscs. Users of Dolby Pro-Logic decoders are likely to add center-channel speakers, and many people add subwoofers as well.

Owners of home theater systems soon learn that not all Dolby Surround movies are created equal. Initially, the surround sound enthusiast is fascinated and overwhelmed by the motional dynamics of the special effects in blockbuster action films. However, many films have no motional surround effects at all. Only ambience information comes from the surround speakers behind the viewer, music, dialog, and sound effects come from the front channels alone.

As might be expected, some people who have a home theater system once owned a quadraphonic system. In fact, many people are curious as to why Dolby Surround is surviving, since it seems similar to the quadraphonic systems that were commercial failures. The usual answer is that there were too many competing quadraphonic systems—all incompatible. But beyond this was the misuse of the quadraphonic format. In pop music, which is normally subject to all kinds of sonic manipulations in the recording studio, it was a case of “anything goes.” Having music from various instruments or groups of instruments cavort among the front and rear loudspeakers was not only acceptable, it was desirable. But the formalized, sacrosanct structures of classical music were torn asunder by arbitrary placement of discrete musical elements in the rear channels, contravening centuries of concert-hall listening—an unforgivable affront to musical sensibilities. Sadly, though the potential of quadraphonic sound was always evident to discriminating producers and engineers, it was never realized. Yes, a number of people, including yours truly, made discrete four-channel recordings with the rear channels properly used for hall ambience. But this was not enough to turn the tide against all of the quadraphonic catastrophes. In retrospect, in its purest form of discrete four-channel ambience recording, we had the advantage of true stereophonic four channels.

The primary intent of Dolby Stereo recording is the production of motion picture soundtracks for subsequent replay in theaters equipped with Dolby cinema decoders. This imposes some special requirements. In particular, Dolby Laboratories requires that a theater’s rear surround channels be limited to a top response of 7 kHz. Dolby Labs also requires that the surround signal be monophonic. This ensures that patrons sitting in the extreme left or right rear of the theater will hear the same effects. If the rear channels were stereo, there would be localization problems.

In home surround systems, the same provisos are usually observed, even though the theater’s technical constraints are no longer present. There is no denying that it would be nice to have full-range, true stereo ambience in the rear channels of a Dolby Surround home system. But it must be remembered that almost every movie shown in home theaters was made for theatrical release. (However, it’s not inconceivable that someday there might be enough home surround theaters to justify movies produced specifically for that market.)
It has not escaped the attention of the electronics and recording industries that a lot of surround sound systems are now in use. Might they be speculating that this could be a most opportune time to revive quadraphonic sound? After all, consumers who own surround systems are accustomed to sound emanating from rear speakers, and they already have those speakers and the amps to drive them. From what I can gather, the CD Standard (but probably not the Digital Compact Cassette or Mini Disc) includes provisions for four discrete channels of audio, though special discs and players would be required. If such technology were to become available, would the average consumer perceive and appreciate the difference between true stereo ambience and his present monophonic ambience system?

This scenario is not even on the horizon, but a few record companies have noted the popularity of the home theater concept and have issued CDs encoded with Dolby Surround. The main proponent of this system, RCA Victor/BMG, has released a number of CDs in this format. As might be expected, most Dolby Surround CDs are recordings of movie music. They are not derived from actual movie soundtracks but are either new or existing recordings of movie music, mixed or remixed with Dolby Surround encoding. Whether these recordings are new or remixed, the Dolby Surround encoding is supervised by a consultant from Dolby Labs.

In April 1990, RCA Victor recorded Henry Mancini and the Mancini Pops Orchestra at the CTS studios in Wembly, England. The Dolby Surround mixes were done at Village Recorders in Los Angeles, by Grover Helsley, an engineer with extensive experience in mixing Dolby Stereo soundtracks. (Editor's Note: For reviews of this and the following RCA Victor CD projects, see the feature article by John Sunier in this issue.) RCA next turned to its catalog for a notable series of movie music, with Charles Gerhardt conducting the National Philharmonic Orchestra. These were recorded by Decca's legendary engineer Ken Wilkinson in the famed acoustics of Kingsway Hall in London. (Sadly, traffic has now made this venue unsuitable.) Rounding out the RCA Victor collection are a project derived from the voluminous recordings of Arthur Fiedler and the Boston Pops and another involving the music of Isao Tomita, who made fascinating use of synthesizers in four-channel recordings. (Five Tomita CDs have already been processed.) Another 25 or 30 surround CDs of various pop and classical music productions will be forthcoming, including Broadway musicals such as Stephen Sondheim's Into the Woods.

A surround CD from Telarc, Spies: By Way of the World (CD-83305), is a jazz recording encoded with Shure's Stereosurround processing. This format is analogous to Dolby Surround and can be decoded through Dolby processors as well as Shure's HTS 5300. There is also a Stereosurround-encoded CD of Holst's The Planets, with Eduardo Mata conducting the Dallas Symphony Orchestra on ProArte (CDS 542).

I listened to RCA Victor's, Telarc's, and ProArte's surround CDs through my home theater system and through my main audio system. In the production of these Dolby Surround and Stereosurround CDs, the engineering was very wisely on the conservative side, using only the "difference," out-of-phase ambience information of the recording hall. There was no "stunting" in trying to put discrete instruments in the rear channels or in using any motion effects. In my opinion, the music is better served by this straightforward mixing.

How did these CDs sound? I had no doubt that the rear-channel ambience, even if monophonic, markedly improved the acoustic presentation of the music. It was definitely a worthwhile embellishment, affording a more spacious and natural perspective. These surround CDs couldn't match the heightened realism and the expansion of the acoustic space afforded by stereophonic ambience, but they are a plus for those with home theater systems and significantly increase listening pleasure.
CONSTRUCTIVE COMMENTARY

I was pleased to see that Audio has addressed the topic of sound transmission between dwellings with "Muffling the Neighbors" by F. Alton Everest (November 1990) and "Good Walls Make Good Neighbors" by Peter Jurew (December 1990).

When not preparing reviews and articles for Audio, I am in private practice as an acoustical consultant. Part of this work involves preparing acoustical studies for proposed residential developments; much of it relates to outdoor noise being transmitted indoors. Sometimes I am asked to review the drawings for a multi-unit apartment complex or hotel/motel and make suggestions so that the Sound Transmission Class (STC) values will conform to certain criteria.

Occasionally I receive calls from homeowners about excessive indoor noise. Many of these calls relate to outdoor noise such as traffic or commercial/industrial sources. Other calls are typically from more distraught homeowners who, like the people in the Jurew article, have moved into an apartment and discovered that they hear too much sound from their neighbors. It is difficult to help these individuals because the costs of acoustical testing and consulting, plus the construction to effect improvements, are more than they can afford. Now, at last, I can refer the people who call me to the two excellent Audio articles, with hope that they can solve the problems themselves.

A significant number of inquiries relate to what I call "unusual perception." In nearly 20 years of consulting, I have only defined two categories of unusual perception. In the first category, I have investigated two cases where the person was disturbed by tonal noise in the region from 60 to 80 Hz. I amplified the noise in the building and had them listen via headphones and tune in the disturbing noise through a tunable one-third octave filter. The measured SPL of the noise indicated that the clients' threshold of hearing at 60 to 80 Hz was only 20 to 30 dB below the normal value for a young person, and these clients were about 60 years old! (I couldn't hear the noise without amplification.) I am sure that these people would have been highly disturbed by the bass sound of contemporary music coming through their walls! (The sources of sound in these cases were outdoors.)

The second category involves perception of sound from nonacoustical stimuli. I have investigated only one of these reports. A woman started hearing tonal-type noises in the region from 500 to 2,000 Hz (identified by comparing a tone from an audio oscillator) just after her community was wired for cable TV. The noise levels in her home were very low, as it was a country town with little traffic at night and no businesses open nearby. The perceived sound did not change when she wore ear protection, and her audiologist said that she did not have tinnitus (ringing in the ears). My investigation ended without finding the source. Another woman indicated hearing high-pitched audio at times when a nearby military installation was testing a high-powered radar, but an investigation was impossible because the military operations were classified. It is difficult to conjecture about the possibilities of such a person hearing her neighbor's audio system via a nonacoustical path. It is interesting to note that, in today's audio systems, we are pumping high currents via 12-gauge wire into very low-impedance, and perhaps inefficient, speakers.

These examples indicate that perception variations among different people may greatly exceed the variations in the sound transmission paths. These variations could confound any efforts to retard the passage of sound.

The Everest article is comprehensive and accurate. I have just a few points to add. I think that it may be instructive to note some of the numerical criteria that we commonly work with in the acoustics of dwellings. First, and most important, is the actual noise level indoors: The Department of Housing and Urban Development (HUD) recommends a maximum day/night average sound level (Ldn) of 45 dBA. This is a bit complicated, but suffice it to say that if the level is 45 dBA from 7 a.m. to 10 p.m., and 35 dBA from 10 p.m. to 7 a.m., the Ldn will be 45 dBA. The FNMA specifies an STC of 45, minimum, for partitions between living units, and 50 from public spaces to living units. The FNMA minimum STC values for floors between individual living units and between living units and public spaces are 45 and 50, respectively. The Impact Isolation Class (IIC) values for floors between these spaces are also 45 and 50, respectively. California State regulations for multi-family dwellings require a minimum STC of 50 for party walls and floors. The California Office of Noise Control published a 500-page book of acoustical test reports on many wall and floor structures in 1981. (The book is, regrettably, out of print now.) This remains the best reference to estimating wall/floor STC, and determining what to do to improve the STC. These, and many lab test reports on floors that are available from manufacturers of building materials, do include the STC rating plus the Transmission Loss (TL) values at standard third-octave frequencies.

Contrary to what Everest indicates, both STC and IIC ratings are generally measured by acoustical laboratories for floor/ceilings and are stated in their reports. The STC rating relates to reduction of airborne noise, typically speech, and the IIC relates to reduction of footfall noise, which is structure-borne sound. The IIC is most easily improved by a thick carpet and pad, but this will not improve the floor's STC. However, there are many products available, along with tested designs for floor assemblies, which have high STC and IIC values. Some of these may be retrofitted to finished dwellings.
GET 8 COMPACT DISCS FOR THE PRICE OF 1 with nothing more to buy...EVER!

Start with 4 COMPACT DISCS NOW! Say any shipping & handling with membership
Buy just 1 smash hit in one year's time
Then get 3 CDs of your choice, FREE*
Enjoy 8 CDs for the price of one
Nothing more to buy...EVER!

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 5071 INDIANAPOLIS, IN

POSTAGE WILL BE PAID BY ADDRESSEE

BMG COMPACT DISC CLUB
P.O. Box 91412
INDIANAPOLIS IN 46209-9758

START WITH 4 COMPACT DISCS NOW! Yes, start with any 4 compact discs shown here! You need buy just 1 more hit at regular Club prices ($14.98 and up), and take up to one 30% off to do it. Then enjoy 3 more CDs Free. That's 8 CDs for the price of 1 with nothing more to buy...ever! (A shipping and handling charge is added to each shipment.)

HOW THE CLUB OPERATES: You select from hundreds of exciting CDs described in the Club's magazine which is mailed to you approximately every three weeks (19 times a year). Each issue highlights a Featured Selection in your preferred music category, plus alternate selections. If you'd like the Featured Selection, do nothing. It will be sent to you automatically. If you'd prefer an alternate selection, or none at all, just return the card enclosed with each issue of your magazine by the date specified on the card. You will have at least 10 days to decide or you may return your Featured Selection at our expense. Cancel your membership at any time after completing your enrollment agreement simply by writing to us, or remain and take advantage of instant 50%-off bonus discounts!

FREE 10-DAY TRIAL: Listen to your introductory selections for a full 10 days. If not satisfied, return them with postage and handling charge to cancel. You'll receive at least 5 free selections that you can keep, even if you return the rest!

* A shipping and handling charge is added to each shipment.
Adding material to the existing wall, combined with the neighbor's cooperation, is usually more cost-effective.

The STC rating is centered about the performance of the partition in the 500-Hz region and is useful for predicting the attenuation of speech. When I am working with rock music as the source, I disregard STC in favor of the Transmission Loss value at 125 Hz. When the source is mechanical equipment, such as air conditioners, I use the TL value at 250 Hz for calculations. A workable rule of thumb, therefore, is to measure the A-weighted sound level (dBA) in the source room and subtract the appropriate TL value to estimate the (dBA) level in the receiving room. I note that the United States Gypsum Co. specifies a Mechanical Transmission Class (MTC) value for many partitions. This MTC number is centered on 250-Hz performance.

Although the Noise Criteria (NC) curves in the Everest article are all correct, they will be difficult for the reader to work with, as the reader is probably limited to measurements with a handheld sound level meter, which measures A-weighted decibels. To work with the NC criteria, an octave-band analyzer is needed. That is why I gave the estimating procedure above.

Although I hate articles with math in them, there is one simple relation that may lend an understanding of Everest’s graphs of sound transmission loss of walls. It is called the Mass Law, and expresses the obvious fact that sound attenuation increases with the mass of the wall:

\[ TL = 20 \log f + 20 \log W - 33 \]

where \( f \) is the frequency in Hz and \( W \) is the weight of the wall in pounds per square foot.

The audiophile may recognize that the slope of TL versus frequency is 6 dB per octave, the same as for an RC equalizer, rising with increasing frequency. If frequency or weight is doubled, TL increases by 6 dB. The formula is accurate for a monolithic wall such as concrete, but a well-designed stud wall should perform better than mass law at low frequencies. At high frequencies, the TL of real walls does not continue to rise, due to resonance phenomena and flanking paths.

Adding a complete extra wall, as reported by Jurew, can be very effective but is not usually recommended. A complete partition is very heavy and should not be placed on an existing floor unless a structural engineer indicates that the building will support the added weight. Local building codes will probably forbid this construction without a permit. The materials listed by Jurew may weigh half a ton; I am worried that a reader may build a wall that will end up in the apartment below. Also, the footprint of the wall may significantly reduce the floor area of a small room. The wall’s STC may be much greater than those of the flanking paths, such as doors, windows, ductwork, floors, etc., and in those cases the wall represents costly overkill. It is usually more cost-effective to add materials to the existing wall, such as furring strips, resilient channels, and drywall layers, with (uncompressed) insulation in the intervening air spaces. This kind of improvement, combined with the neighbor's cooperation in relocating speakers and possibly adding materials to his side, is an optimum solution.

The references in the Everest article are excellent, but some may be too technical for the audiophile/home carpenter. I would like to add two books to his list that may be more understandable to the layperson. Sound Control Construction, originally available from the United States Gypsum Co., is now out of print but is helpful if you can find it in a library. Quieting: A Practical Guide to Noise Control, written by R. D. Berendt, E. L. R. Corliss, and M. S. Ojalvo, was published by the National Bureau of Standards in July 1976 and is now available from the National Technical Information Service in Springfield, Va. Call (703) 487-4650 and ask for Handbook 119.

In addition, one should consult the Sweet’s Catalog File, available in libraries, for data and design information in the catalogs of building material manufacturers. A favorite book with acoustical data is mentioned in section nine of Sweet’s, Fire Resistance Design Manual, and is available for $6.50 plus postage from the Gypsum Association, 810 First Street N.E., Suite 510, Washington, D.C. 20002 or by calling (202) 289-5440.

I trust that you will find the bulk of these comments constructive, no pun intended.
AUDIO isn't a big enough word for the whole of sound reproduction as we know it now and see it still developing with such incredible speed. Is it enough to say that the world has been changed? That's a platitude. We must bring things to discussable size, like an astronomer searching among galaxies.

Take the human voice and the microphone, for instance. No, not the technological history of the mike—the effects of it. I've been reading a novel set in ancient Greece, well over 2,000 years back, where the formal outdoor theater and written-out play seem to have originated. No mikes! A marvelously skilled technique of vocal projection superbly aided by surrounding architectural reflection and a slanted bowl for the audience, allowing thousands to hear every word. An old story! My last on this concerned Saint Bernard preaching the Crusade from a French clifftop to a hundred thousand or so in a valley below. They got the message, all of them, or so we are told.

What people don't know about mike technique today is hard to believe, considering all those video interviews we see every day with handheld mikes switching back and forth and a smooth and easy volume level. I've seen kids do it with play mikes. Adults make a mess of it, with hideous blasts and near silences.

I am recently back from a camp-in that included a variety of events requiring microphone usage. There was, for instance, a big amateur stage show à la Hollywood and a character named Lola; all flounces and hairdo, who walked around on stage and up the aisles (indoor gym) with a wireless mike in hand—complete with big pop screen—as she interviewed many in the audience. She waved that mike around as though it were a pearl-handled fan, the kind that folds up and then, flip, opens into some gent's happy face. Very Spanish. Great fun to watch. But the sound! Lola would sometimes remember, and whisk the mike up to her capacious mouth; a roar like 50 lions would emerge. But then away went the mike off to one side, coquetishly: A murmur was all we heard. The interviews, of course, were unintelligible, but Lola wasn't aware.

The Boss Man who ran the whole camp was no performer, just a high-level manager and organizer, but his mike technique was faultless. Every word of his frequent announcements was clear. Same mike, merely moved to the huge dining hall, where announcements were made at meals.

The most insidious effect, if I may say so, that mike technique has brought upon us is a disastrous loss of the normal connection between the human voice and its environment at the moment, any moment. Even with a mike. One of the curious effects that the mike novice discovers when he makes a public speech is that he cannot hear his own sound. Behind the "public address" mike, whether at a football stadium or an indoor banquet, a man (or a woman) simply loses touch with the acoustic surrounding. At first he simply does not know whether he is speaking (or singing) loudly or softly, whether he is audible or perhaps overloading the ears in the far-distant areas. It is a thing we must learn—and do. Some of us.

I hate to say so, but the art of singing minus the mike is in a somewhat sorry state these days, as compared to the same in pre-mike times. It's the same story. In the old times, a singer learned not merely to project a loud sound, to fill up a big space beautifully, but also to harmonize that voice with each and every space, according to its requirements—to resonate, if you will, for the optimum coupling between the sound producer and the spatial receiver of that sound. Opera singers well into this century were as skilled as the old Greek actors in this sort of voice control. If singing in a small hall, the performer sang the same music but with less power—for the same effect. If singing Lieder, solo songs, in somebody's private music room, the performer expertly shrank his voice to its most minuscule beauty. Some singers still do! And if he had to fill an opera house five times as big as any house in the style and time of the opera he was singing, then he bellowed an enormous blast. Some singers can do that beautifully.

All, you see, without microphone. The entire range of classical music was designed by the composers to suit the acoustic requirements of their period and of the medium. Operas began small, no more than solo voices with continuo accompaniment, a few soft instruments. Operas grew larger and larger through no less than almost four mistakeless centuries. Vocal technique increasingly went for sheer volume, very much at the expense of the precision that was the wonder of the 18th and early 19th centuries. Today, if the soundman has a larger hall to fill, he throws in more amp power, and maybe more speakers. In the past we used more vocal potency. Alas, we still do.

The mike has invaded musical comedy and the Broadway show, thus al-
Panasonic Multi Laser Disc Players. They can play CDs and movies that look and sound incredible.

Imagine a CD player that also plays the thousands of movies and videos available on laser discs. That's the programmable LX-101, a multi laser disc player that plays all five types of discs.

It has digital Y/C and digital time base correction for uncompromising video quality. Along with a scan function and shuttle that lets you see a clear picture in forward or reverse.

And for equally sharp sound, its MASH* digital audio technology reproduces even the faintest sound to its fullest.

So when there's a multi laser disc player that looks and sounds this sensational, why settle for anything less?

To speak to a Panasonic dealer nearest you about our Multi Laser Disc Players, call 1-800-365-1515, ext. 456.

* Panasonic developed the world's first MASH-type DAC. MASH technology was invented by NTT (LSI Labs). MASH is a trademark of NTT.

BACK TO THE FUTURE™ © 1985 Universal City Studios, Inc. & Amblin Entertainment, Inc. All rights reserved. Licensed by MCA/Universal Merchandising, Inc. TV picture simulated.
An insidious effect that mike technique has brought on us is loss of connection between the human voice and its environment.

O What A Season! Capture The Moments With Olympus

AUDIO Magazine invites you to focus on OLYMPUS.

For a chance to win an OLYMPUS IS-1 35mm Zoom Lens Reflex camera or a Sony portable CD player, simply fill in the blanks, then send us this page or a copy with your name, complete address and telephone number to be received by January 1, 1992. All entries with the correct answers will automatically be entered in a random drawing. Answers can be found in this issue.

1. Capturing memories has never been easier than with...

2. For the serious photographer, there's the...

3. For point and shoot photographers, there's the...

4. Olympus quality even comes in...

Mail to: Olympus Sweepstakes
AUDIO Magazine
1633 Broadway
New York, NY 10019

First Prize:
* OLYMPUS IS-1 35mm Zoom Lens Reflex Camera (approximate retail value: $800)

Second Prize:
* Three second prize winners will receive Sony portable CD players (retail value: $240)

No Purchase Necessary. Only one entry per person allowed. No entries will be returned. Winners will be selected from all entries received with the correct answers, in a random drawing to be held on or about January 15, 1992. Sponsors not responsible for late or lost mail. Sweepstakes open to residents of the U.S., 18 years or older, except employees of AUDIO Magazine, Olympus, their subsidiaries and affiliates, and members of their immediate families. Void in Puerto Rico or wherever prohibited. Prizes are non-transferable and no substitutions or cash redemptions allowed. Prizes must be claimed within 14 days of notification attempt or winner is subject to forfeiture, in which case a substitute winner will be selected. All taxes are the responsibility of the winner. Winners may be required to execute an affidavit of eligibility and release. Odds of winning depend upon the number of correct entries received. For a winners list, please send a self-addressed, stamped envelope by January 15, 1992 to: AUDIO Magazine, Olympus Sweepstakes Winners, 1633 Broadway, New York, NY 10019.
Oh
This holiday, the best things you can open are your eyes. Capturing memories has never been easier than
What Would
with Olympus. Take our compact zoom cameras. They’re loaded with thoughtful technology such as red-eye
Christmas Be Like
reduction and power zooms to let you get close to the moment in a moment. For the serious photographer,
Without O? There’d
there’s the IS-1, the world’s first integrated system Zoom Lens Reflex camera. One camera with hundreds
Be No Snowflakes. No Eggnog.
of options and one incredibly sharp Olympus 35-135mm zoom lens. For point and shoot photographers,
Nothing To Open. There Would Be
you can choose the Infinity Jr. or the new auto-focus Infinity Stylus—the most advanced ultra-compact
Santa Claus, But He Wouldn’t Be Jolly.
camera ever. Olympus quality even comes in compact 8mm video camcorders. There’s a
whole range of cameras at a whole range
of prices. So put Olympus under your tree this Christmas and never miss another ho, ho, ho.
And There’d Be No Olympus Cameras
To Wish For Because You’ve Been So Good.
Never miss another O.
Signature Reference Series: The Very Best of the Best

The legendary sound of Polk loudspeakers has for years been exemplified by its flagship Signature Reference Series (SRS), the speakers that carry Matthew Polk’s signature.

Polk now introduces its SRS 1.2TL, 2.3TL, and 3.1TL, each featuring the latest breakthroughs in loudspeaker technology. Following is a technical brief of why the SRS speakers sound so remarkably like a live performance. After reading this information, it is hoped that you listen carefully to the SRS loudspeakers at your Polk Audio dealer. While you will probably hear things you have never heard from a stereo system, you can be assured that everything you hear is true.

It All Begins With the Sonic Excitement of Polk’s Stereo Dimensional Array (SDA)

Years ago Polk Audio recognized the importance of more absolute separation of information reaching each ear. Of course, the fundamental concept of stereo reproduction is that there are two separate channels of information, each intended for one ear only (i.e. “true stereo”).

To more accurately reproduce sound as it was originally created, it is vital that the integrity of this separation of information be maintained. With conventional speaker systems, each ear hears both speakers, and the separation is minimized. The resulting soundstage is reduced to the small space between the speakers. A large symphony orchestra is reduced to only a few feet wide and a few inches deep.

Polk’s “True Stereo” SDA technology delivers left signal information to your left ear and right signal information to your right ear. Each ear only hears its proper signal, thereby maintaining full stereo separation. The resulting soundstage is dramatic.

Experts have called the Polk SRS Series featuring the revolutionary Stereo Dimensional Array (SDA) technology “mindboggling... astounding...flabbergasting...a new dimension in sound.” Others have discovered new life in their favorite musical selections. It is “True Stereo” by Polk.
Yes, Everything You Hear is True

Listen to what the critics say: "Mindboggling... astounding...flabbergasting." Listen to what other Polk owners say: "I've never heard anything like it...it's whole new world."

But no number of written accolades will prepare you for the experience of listening to the SRS loudspeakers at your Polk Audio dealer.

We invite you to your local Polk Audio dealer for a demonstration of this technology. Because everything you hear is true.

You will hear the next generation of loudspeakers.

polkaudio
The Speaker Specialists®

5601 Metro Drive
Baltimore, MD 21215 USA
(301) 358 - 3600

For More Information
Call 1-800-992-2520

©1991, Polk Audio, Inc. All rights reserved.
YOU’VE LITERALLY NEVER SEEN OR HEARD ANYTHING LIKE IT.

IT PLAYS MOVIES, CONCERTS AND EDUCATIONAL PROGRAMS ON LASERDISC WITH STUNNING PICTURE CLARITY AND CD SOUND.

IT ALSO LETS YOU PLAY AND PROGRAM FIVE CDs.

INTRODUCING THE WORLD’S FIRST 5-CD/LASERDISC PLAYER, THE CLD-M90 FROM PIONEER.

FIVE HOURS OF CDs. TWO HOURS OF LASERDISC. ZERO BOREDOM.

Call 1-800-421-1606, ext. 102, for the dealer nearest you.
HOLLYWOOD AT HOME

AUDIO's Guide To The New Home Theater Experience
Surround Sound decoders and acoustic environment simulators are supposed to give you a heightened sense of reality when you're listening to music or watching a movie. Unfortunately, most of their effects circuitry robs the original performance of fidelity.

That's why Denon created the AVC-3020 Surround Amplifier and the AVR-810 and AVR-610 Surround Receivers. Their special Dolby® Pro-Logic™ Surround Sound processor outperforms all previous analog or digital decoding circuitry in terms of delivering true high fidelity. You'll hear greater dynamic range, more channel separation, lower distortion and precise low level steering—the ability to place sounds exactly where the director intended them.

Remember, without high fidelity, there can be no "reality." And what's the point of a Surround Sound system, if it doesn't sound real?
Home Theater is now an integral part of the ‘90s’ audio/video landscape. The much awaited—and discussed—marriage of audio and video is now a reality. For potential consumers, however, a crucial ingredient to this high-tech link-up is communication. One person’s definition of Home Theater is another’s fantasy, particularly when visions of Hollywood screening rooms at home fill the air. The reality—and essence—of Home Theater is simply “Big Picture, Big Sound.”

While some enthusiasts will spend a fortune for a cutting edge system, according to industry experts, it’s not really necessary to do so. You can build a system one component at a time, as your budget permits, all the while working toward the goal of bringing a thrilling movie theater experience right in the middle of your livingroom.

While enthusiasts can argue which specific components are the best for a Home Theater, they all agree that it takes five ingredients to really get the job done. They are a big-screen TV (27-inch screen and above), an A/V receiver with Dolby Surround, a laser disc player, a Hi-Fi VCR and at least four quality speakers for the front and rear channels. Within this basic quintet are literally hundreds of options with a variety of special features and a wide range of prices. In fact, manufacturers are constantly improving overall quality and conveniences. And, fortunately, prices have dropped in the key Home Theater categories.

This special section will provide an overview of Home Theater ’92. We’ll take a close look at the components that can easily turn your sofa into front-row center seating for your own screening of “Fantasia” or “Terminator 2.” The prices are right and more importantly, the experience is a knockout.
A television is not only your eyes on the world, a big-screen TV is an integral part of the “Hollywood At Home” experience. And today’s big-screen sets offer finer images, more advanced features and higher-quality audio circuitry than ever before.

There are three types of television sets currently available—direct view, rear and front projection—giving enthusiasts an extremely wide variety of screen and feature options for their growing Home Theaters. Direct view sets can reach a screen size of 35 inches and deliver powerful picture performance while projection TVs can reach 15 feet! A critical measurement of TV quality is resolution, the amount of picture detail in a single scanning line; it is measured in lines. Better sets will have specifications of over 500 lines, which will be more than enough for laser discs, the best prerecorded software at this time.

Top direct view sets, like the Mitsubishi CK-3535R ($2,899), use cathode ray tubes (CRTs) with High Contrast coating, digital comb filters, a dot pitch of .85mm and Invar shadow masks to produce 700 lines of resolution. The image really sparkles. The tabletop monitor/receiver has a 181-channel tuner, 15 watts of audio power as well as picture-in-picture so you can watch two programs at once. The CK-3535R and select Mitsubishi sets also feature the ViewPoint on-screen operating system. According to Bill Loewenthal, the company’s Product Marketing Manager, ViewPoint is an “integral part of our ‘systems’ approach to Home Theater. This lets people buy our components as their budgets permit and the equipment will always be compatible. They can start with a 27-inch set or larger, add a Hi-Fi VCR then advance to Dolby Pro Logic and larger projection TVs. And since the components all use a common operating system, it makes sophisticated equipment very easy to use.”

Other manufacturers also use cutting edge technologies to wring every possible ounce of picture quality from a video signal. Sony’s KV-29XBR85 ($2,099) uses ASC Active Signal Correction circuitry to increase sharpness and
Critical viewing measurements for rear projection TVs are horizontal resolution, brightness and viewing angle. Unlike direct view TVs, rear projection sets use three CRTs (red, green, blue), hybrid lenses and a mirror reflector system to form the image you see on the screen. The design of the CRTs and lenses are vitally important for picture performance (see diagram). They directly impact on resolution, brightness (measured in footlamberts) and viewing angle (measured in degrees). Examples of top shelf rear projection sets include the Mitsubishi 50-inch VS-5017S ($3,699), Hitachi's 60-inch 60SX1K ($4,400), the 50-inch Pioneer Elite Pro-95 ($4,800) and the 52-inch Philips 52LP50 ($3,299).

Front projection TVs provide the biggest picture of all, up to 15 feet with 10 the most commonly found. This type of set consists of two separate pieces: a projector (using three CRTs) and a screen. Like rear projection sets, resolution, brightness and viewing angle are especially important specifications.

Several front projection TVs are now using LCD (Liquid Crystal Display) technology to produce an image, rather than CRTs. Sharp was the first to offer one and now has the third generation XV-190ZU ($4,000). Philips will also have an LCD projector available early in 1992.

No matter which type of television fits your interpretation of Home Theater—and budget—quality and performance have now reached the cutting edge of video technology.
Some on-screen TV and VCR menu systems utilize all upper case letters that are hard to read, mysterious instructions, or strange, meaningless abbreviations that you have to be psychic to understand.
When Mitsubishi created the concept of Home Theater, we figured it didn't make sense for people to sit down in front of the most incredible sights and sounds television could offer, only to focus most of their attention on making the thing work. We wanted our technical expertise to enhance the experience, not to complicate it. To work for good, not evil.

This year, we're introducing one of the most remarkable examples of our philosophy to date. An advanced on-screen operating system called ViewPoint which, using our latest interface technology, lets you control your Home Theater System without distracting from the enjoyment you bought it for.

The System is so elegantly simple, two buttons are all you need to operate it. The on-screen information is displayed in upper and lower case letters for better readability, and communicates in a familiar language: English.

That means fewer abbreviations to decipher. Functions like “Time Set” and “Ch Prog” become “Set the clock” and “Memorize channels.”

For more complex operations, a logical question-and-answer format guides you through.

Our unique point-and-click interface allows you to simply point to the on-screen item you need. While a P.I.P. window lets you monitor the TV picture as you use any of the menu features.

ViewPoint is available with many of our big screen TV’s, our 31” and 35” direct-view TV’s, and three of our VCR models.

And because all Mitsubishi components are designed to integrate fully—not just from component to component, but from year to year, as far back as 1986—ViewPoint is also compatible with our previous menu systems.

So whether you’re looking for a complete system, adding to an existing one, or building one a few components at a time, everything works together not only esthetically and electronically, but functionally as well.

Which is exactly what you should expect from a great Home Theater system.

At least, that’s our viewpoint.
Sound Sensations

Whether it's "Hasta La Vista, Baby" from "Terminator 2" or the wonderfully restored soundtrack of "Fantasia," listening to a movie is almost as important as the visuals. In order to fully re-create the movie theater experience at home (minus the popcorn, of course) a Dolby Surround or Pro Logic audio system is a must. And one of the most cost effective ways to reach this goal is the A/V receiver.

Top quality A/V receivers feature enough dynamic power to drive the most complex speakers, extensive audio/video switching capability and have either a Dolby Surround or Pro Logic decoder for true Hollywood-At-Home sound. Almost every blockbuster movie has a Dolby Stereo soundtrack which contains four channels of audio information—front left/right, center dialog and rear surround. Components with Dolby Surround decoding will deliver three of the channels, front left/right and surround, which provides the bone-crunching ambient sound effects moviegoers enjoy so much. It takes four speakers for this version. Dolby Pro Logic goes a big step further and decodes all four channels, including the important center dialog information (requiring a total of five speakers). Just how important is the center channel? For many experts, it takes precedence over any other. It anchors the dialog in the middle of the screen, just like in a movie theater, and accurately localizes the effects channels.

At one time components with Dolby Pro Logic were out of the reach of most consumers. Today it's a completely different story. Companies like Onkyo, Denon, Pioneer, Kenwood and many others now offer high-powered, high-quality Dolby Pro Logic receivers. A good example is Onkyo's TX-SV7OPRO ($850). The Pro Logic receiver is rated at 90 watts per channel into 8 ohms in the stereo mode. When punched into surround, power ratings are 85 watts-per-channel across the three front speakers and 30 for the rear surround channel. Unlike many other manufacturers Onkyo uses discrete power sources for all Pro Logic channels to improve the overall sound experience. The TX-SV7OPRO also has extensive on-screen displays and a full-featured remote to easily access all of its sophisticated functions. It even has multi-room capability to bring high-quality audio to other parts of the house (by adding optional infrared repeaters).

Denon has taken the advanced single IC Dolby Pro Logic circuitry once only found on its AVC-3020 A/V Surround Amplifier and incorporated it into the new AVR-610 ($600). The new chip delivers improved channel separation, reduced distortion, wider dynamic range and increased signal-to-noise ratios. The result is a dramatic at-home movie experience. By using discrete components, the AVR-610 pumps out 75 watts-per-channel each for the three front speakers and 20 watts each for the rear surround speakers. Along with Pro Logic, the AVR-610 has Hall and Studio modes for non-Dolby encoded material that provide either the big
sound quality of a hall or the intimate feeling of a studio. There are also three video inputs and three audio inputs to handle growing systems.

Kenwood's KR-V9030 ($979) is part of the new breed of A/V receivers that not only have Pro Logic but Digital Signal Processing (DSP) as well. DSP simulates different sound fields and acoustically turns any room into an auditorium or concert hall. The KR-V9030 has six DSP options and is rated at 75 watts-per-channel across the three front speakers, 15 rear. Pioneer was the first company to offer a receiver with DSP, the VSX-D1S, and has added the VSX-9900S ($1,100) to its line. It is rated at 125 watts for the front left and right, 40 center and 40 for the rear. This receiver has six video and five audio inputs, 30 AM/FM presets, a programmable Smart remote and a split screen video enhancer.

Other new A/V Pro Logic receivers of note include Mitsubishi's M-R8010 ($1,399), JVC's RX-1050VTN with CompuLink ($1,500), Yamaha's RX-V1050 with DSP ($1,199), the Luxman RV-371 ($1,400), Technics SA-GX710 ($699), Sansui's RZ-9500AV ($769) and the Fisher RS646 ($499).

Along with the recent accessibility of Pro Logic, enthusiasts are now able to enjoy THX movie theater components for their Home Theaters. This sophisticated system is an enhancement of Dolby Pro Logic and requires special amplifiers, decoders and speakers. Technics was the first to offer a complete system and recently high-end manufacturers such as Cambridge SoundWorks, Fosgate, Lexicon, NAD, Triad and Snell have become THX licensees.

While THX is considered by many to be the “ultimate” Home Theater sound system, there are many other high-quality Pro Logic components available. Some of the most highly regarded are Yamaha's DSP-A1000 ($1,500) integrated A/V amplifier, Kenwood's KA-V9500 amp ($1,499), Sony's TA-E1000ESD preamp with Pro Logic and Carver's CT-17 A/V preamp/tuner with Pro Logic and Sonic Holography ($799).
In the desire to turn everyone's living room into a movie theater, more and more manufacturers are featuring Dolby Pro Logic Surround Sound in their components.

But, **featuring** Dolby Pro Logic and **delivering** Dolby Pro Logic aren't necessarily the same thing. Onkyo understands this difference, unlike those manufacturers interested only in their products having the latest "hot button" regardless of how well they incorporate it.

The promise of the Dolby system lies in its ability to create an extraordinary sensory experience. One you shouldn't be powerless to enjoy because your receiver or amplifier can't handle the demands of dialogue, soundtrack and special effects all at the same time.

That's why Onkyo Dolby Pro Logic components are built with a strong amplifier foundation. Every model features Low Impedance Drive power supplies, consisting of heavy duty transformers (40% larger than many of our competitors), oversized capacitors and discrete output circuits.
And because we've taken no sonic shortcuts, our A/V components are rated into low impedance loads down to 2 or 3 ohms. These measurements, called Dynamic Power Ratings on a spec sheet, reflect the power reserves an amplifier must have to handle peak power demands. Onkyo A/V components give you the best of both worlds—power to spare for movies, the performance of separates for music.

At Onkyo, we don't believe in shortchanging the critical center channel either. Many of our Pro Logic A/V components have 5 separate amplifier sections, one for each channel, with the power matched between the left & right front and center channels. In this way, the relationship between the dialogue, effects, and music is in the exact proportion the director intended. If they're not, sounds that are supposed to come towards you and envelop you lose their impact, and whispered dialogue becomes overwhelmed.

Onkyo's home theater philosophy also takes into account the physical configuration of your home. An adjustable rear channel digital delay lets you tailor the surround effect to the size and shape of any room. For even more flexibility, our A-SV810PRO features an 8 Mode Digital Soundfield Processor, plus the ability to individually equalize the bass/mid/treble frequencies for each channel.

So, before you invest in any A/V receiver or amp, check to see how it stacks up in terms of Dynamic Power, center channel wattage, and the ability to shape the sound to your needs. Remember, a great Dolby Pro Logic experience requires more than just a logo on a faceplate.

It demands a company as dedicated as Onkyo to bring it to life.

Onkyo’s achievements in Dolby Pro Logic have been recognized by the industry through Audio Video International’s awarding their 1991 HiFi Grand Prix Awards as "Product Of The Year" to our TX-SV70PRO Pro Logic Surround Sound Receiver, A-SV810PRO Pro Logic Surround Sound Integrated Amplifier and ES-600PRO Pro Logic Surround Sound Processor.
The Laser’s Edge

There is simply no question about it: In order for your Home Theater to be worthy of the designation, it must have a laser disc player. Laser disc players deliver the finest picture and sound quality currently available. Resolution ratings are typically 400 lines, which is far better than the 240 of standard VHS. And the audio circuits pump out typically superb CD specifications with dynamic range and signal-to-noise ratios of over 96 dB.

There are now over 30 different laser disc players available, ranging from those that play a single side of a disc at a time to models that automatically play both sides and offer digital special effects for any type of platter. Laser discs come in either CLV (long play) or CAV (short play) formats. Special effects, such as crystal-clear freeze frames, cannot be viewed in CLV yet they are available in the more expensive CAV versions. Top-end LD players with “digital frame memory” turn every CLV disc into CAV. Movie lovers should seriously consider this high-end option.

“walk” through a disc frame-by-frame or “run” through it at 30X speed. The Denon LA-3000 has the same LAMBDA circuits found on the company’s best CD-only players. Dynamic range is 100 dB, channel separation 103 dB and audio S/N is 109 dB.

Other players of note include Kenwood’s LV-700 ($999) which has digital time base correction for “jitter-free” video, Panasonic’s new low-priced LX-101 ($600), Sony’s top MDP-605 ($1,000), Philips CDV600 ($1,000) and Pioneer’s CLD-M90 ($700).

The new Pioneer player is unique in that it has a six-disc rotary CD changer combined with a laser player. You’ll be able to listen to six Madonna CDs then watch her “Blond Ambition” concert on laser! And enthusiasts should know Pioneer’s LD-S2 ($3,500) is still the finest laser player made. Laser and Home Theater simply go hand in hand, just like audio and video.

Examples of top players include the Mitsubishi M-V8000 ($1,499) and Denon’s LA-3000 ($1,000). The Mitsubishi machine offers two-side play and digital special effects for any disc. The full-featured remote also has a jog/shuttle dial that lets you
Two Reasons To Trade In Your Speakers Now!

1. The Bose Acoustimass-5 Series II speaker system. Technology that sets a new standard for purer sound with even smaller size.

   The Acoustimass-5 Series II speaker system uses Bose patented Acoustimass speaker technology to simultaneously overcome the placement limitations of large speakers and the performance compromises of conventional small speakers.

   We believe this combination of full fidelity sound and small size make it the best reason to trade in your present speakers.

   "Listening to a wide variety of compact discs, we were constantly impressed by how much this system sounded like a larger, much more expensive speaker."


2. A $100 trade-in allowance from your Bose dealer.

   For a limited time, our participating dealers nationwide will give you at least $100 as a trade-in for your speakers – regardless of size, age, or condition – when you trade up to the new Bose Acoustimass-5 Series II speaker system.

   These dealers are also offering a generous trade-in allowance on the Virtually Invisible Lifestyle music system, the complete stereo system from Bose.

   To find out more about this limited time offer, the benefits of trading up to Bose speaker technology, and names of Bose dealers near you, call toll-free: 1-800-444-BOSE Ext. 79

USA: Monday-Friday, 8:30AM-9:00PM (ET); Weekends, 9AM-5PM (ET)
Canada: Monday-Friday, 9:00AM-5:00PM (ET)
Why This Ad Is Making The Other Loudspeaker Company Nervous.

We think the Ensemble II speaker system by Henry Kloss is better than the BOSE AM-5 Series II. And because Cambridge SoundWorks sells direct...it’s half the price.

Audio Hall of Fame member, Henry Kloss. All Cambridge SoundWorks products are designed by our co-founder and chairman, Henry Kloss, who created the dominant speakers of the ’50s (AR), ’60s (KLH) and ’70s (Advent). Our high performance, high-value speakers and systems are all manufactured in our factory in Newton, Massachusetts.

Audio experts on call 365 days a year. Our helpful, knowledgeable audio experts (not clerks) are on duty for advice, hook-up information or orders. 8AM-midnight, every day, including holidays. They don’t know the meaning of the phrase “hard sell.” A customer wrote “The quality of your product is matched by your attitude towards your customers.”

"Ensemble II, like its companions in the Cambridge SoundWorks lineup, performs so far beyond its price and size class that it can be compared only with much larger speakers at substantially higher prices.”

— Stereo Review.


Ensemble II performance for half the Bose price. Ensemble® II is the latest version of the subwoofer-satellite speakers: Audio magazine said “may be the best value in the world.” Unlike the Bose® system, it uses two-way satellite speakers and acoustic suspension subwoofers (with 35% more cone area), it can sound identical to our original Ensemble system.

We’ve eliminated the expensive “middle-men.” All Cambridge SoundWorks components and systems are sold factory-direct to the public, eliminating huge distribution expenses. Don’t be fooled by our reasonable prices—our products are very well made, with premium quality components throughout. With our 30-day satisfaction guarantee, you can’t lose.

FREE catalog—Pioneer, Philips, Denon and more. Our full-color catalog is loaded with systems and components from top name brands, including our own. Our systems deliver a lot of performance for the money, especially our Dolby® Surround systems, which we feel are the best values in the country. For your free catalog, call 1-800-AKA-HIFI, 24 hours a day.

Cambridge SoundWorks
A new kind of audio company, with factory-direct savings.
154 California St., Suite 104D, Newton, MA 02158 1-800-AKA-HIFI (800-252-4434)
Fax: 617-332-9229 In Canada: 1-800-525-4434 Switchboard: 617-332-5936
America's registered trademarks of Bose Corp. All others are trademarks of International Jensen, Inc.

Find out how good we are: experts on call 8AM-midnight (ET) every day 1-800-AKA-HIFI
Enter No. 52 on Reader Service Card
Hi-Fi VCRs—Total Entertainment

Video stores are on practically every corner in America...and VCRs are now in over 70 percent of TV households. This almost unlimited access to Hollywood hits has been one of the driving forces behind the Home Theater movement. Another key ingredient for a great video experience is the Hi-Fi VCR, one of the most reasonably-priced Home Theater hardware requirements.

Hi-Fi VCRs deliver sound that is almost CD quality with a dynamic range of more than 90 dB, frequency response of 20-20,000 Hertz and wow-and-flutter of .005% or less. And practically every Hollywood blockbuster on videotape has a Hi-Fi soundtrack. Simply by hooking a Hi-Fi VCR to your stereo and high-resolution big-screen TV, you'll be well on your way toward the goal of "Big Picture, Big Sound."

One of the newest VCR trends goes beyond Hi-Fi sound and attempts to solve one of the most baffling tasks confronting Americans—how to program an unattended VCR to tape a TV show. Manufacturers took a big step forward in solving the mystery several years ago with on-screen displays. They have refined them further, making them easier to use. A good example is Mitsubishi's ViewPoint operating system, which is found on their top models such as the HS-U82 ($999). ViewPoint instructions are clearly written, making even the most advanced functions easy to use. RCA has taken another approach and incorporated VCR Plus codes into three of their new VCRs (VR680HF at $579 is the least expensive). The codes are found in major newspapers, entered into the remote and programming's done. Also of note is Panasonic's simple-to-use LCD Program Director found on their better Hi-Fi models such as the PV-S4167 ($799).

HARDWARE HINTS

Other '92 VCR pointers: new models with center loading slots are available from Sharp and Fisher. The companies state this "mid mount" design cuts down on vibration and adds to image stability particularly for big-screen TVs (Sharp VC-H85U, $569 and Fisher's FVH-4903, $499). Prices of Super VHS VCRs are now more attractive. This higher-quality version of VHS offers little prerecorded software but make excellent tapes of off-air broadcasts and "work prints" for owners of high-band camcorders.
Magic Boxes

Since audio quality is the second half of the Big Picture-Big Sound equation, choosing loudspeakers is as important as the television set or A/V receiver for true Hollywood At Home.

One of the key questions confronting Home Theater enthusiasts and their families is where to put all of the required speakers. Bose took a giant step toward solving this problem four years ago with the development of the Acoustimass three-piece satellite speaker system. Since bass notes do not need to be localized as do the higher frequencies, the Acoustimass divided the speaker elements. There’s a woofer that can be placed anywhere in the room and small, unobtrusive cubes for the tweeter and midrange. The Acoustimass 5 Series 2 ($799) fits nicely with any decor and delivers superior sound quality. Their Lifestyle System also uses Acoustimass technology.

Cambridge SoundWorks by Henry Kloss has a high-performance three-piece speaker system that also takes up very little space. The Ensemble II ($399) features an acoustic suspension subwoofer for accurate bass and true two-ways in the satellites. Cambridge SoundWorks recently unveiled The Surround, the lowest-priced THX approved surround channel speakers currently available ($400 per pair). They have been designed to radiate sound in a way that listeners cannot hear where it’s coming from, just like in the movie theater. They are excellent add-ons for those who already have the two quality front speakers.

Other quality speaker builders have designed speakers specifically for Home Theater and THX use—including M&K, Boston Acoustics, Snell, Triad, Atlantic Technologies and Altec Lansing.

Recently in-wall speakers have soared in popularity because of the Hollywood-At-Home movement. They are perfect for hiding the center dialog and rear surround channels. Perform an “ears-on” test of in-walls from a/d/s/, the Sonance AIS 500, Infinity ERS 800s, and the Polk AB 700 system to hear just how far the technology has advanced.

The components are now all here for a great Home Theater experience. The final choice is yours but we can guarantee you will be moved—and that’s what Hollywood At Home is all about.
The performance that continues where others end can be yours tonight with this Optimus® carousel CD changer. The CD-6120 plays up to five compact discs in sequence for hours of music, or up to 32 selections in the order you desire. You can choose random play, repeat or skip selections, even enjoy a 10-second "preview" before you decide. The convenient design lets you easily view disc titles and add or remove discs during play. Most importantly, the sound is superb—pure digital stereo with the energy of the live performance. Optimus brand equipment is designed, crafted and tested to the highest quality standards in consumer electronics. It's technology that performs for you. Hear it today.
Concertgoers' expectations today are vastly different from those of their parents 20 years ago, says the new music director of the New York Philharmonic—and high-quality sound and video recordings have a lot to do with it.

"Back then, the average concertgoer was content to see the conductor and the first row of violins, with the rest of the orchestra incognito. But that was before technology told him that a lot of interesting things were going on back there," Kurt Masur explains, leaning back in his chair in a lounge backstage at the Gewandhaus concert hall in Leipzig, where he's been conducting since 1970. In September of this year, Masur, a genial bear of a man, began his service as music director of not just one, but two of the world's great orchestras—the Philharmonic in New York and the 210-year-old Gewandhaus Orchestra in Leipzig, in what was East Germany.

Masur, who has nearly 100 recordings to his credit, mostly with the Leipzig Orchestra, believes that low-cost, readily available recordings have made today's audiences familiar with a much wider range of music than ever before. And he believes that the steady development of recording technology—high fidelity in the late 1940s, stereo in the 1950s, and the digital recording of the 1980s—has enabled listeners to hear things in the music that earlier generations may have missed, such as the musicality of a contrabass that in analog days was reproduced as little more than bass percussion, or a solo flute that was once lost in an orchestral climax.
"People are used to hearing those details at home, and when they come to the concert hall, they want to see the musicians and the instruments that make those sounds," Masur says, warming to his subject. "It's something like the beginning of the movies. The first films were silent. Then a piano player was added, changing the division between sight and sound. Movie producers found that music could help create a mood, or highlight the action, or advance the story. That changed the expectation of the audience, and by the end of the silent era you found serious composers writing music to accompany silent films, a practice that expanded with the coming of sound. Audiences were getting more sophisticated with each improvement. Now you have theaters where the sound completely envelops the moviegoer and puts the audience into the action.

"Audiences are better educated, generally, than those of 20 years ago, perhaps because people are forced to have a high degree of technical knowledge in their jobs or professions, and they don't check that at the door when they leave the office. When they come to a concert, they want to understand what is happening and how, to take part in the technical aspects of music making. Today's audiences are no longer content to close their eyes and let the music wash over them."

The trick, Masur admits, is to enable his listeners to do that without making changes in the music and how the audience hears it. Shortly after he assumed the conductorship of the Leipzig orchestra, plans were announced for a Gewandhaus to replace the "new" one built in 1884 and bombed into oblivion 60 years later, toward the end of World War II. Since the War, the Gewandhaus Orchestra had performed in the Congress Hall a quarter of a mile away. That hall, built for meetings and exhibitions, never seemed quite right, acoustically, as a concert auditorium.

From the beginning, the authorities invited Maestro Masur and the members of the orchestra to participate actively in planning for the new building. The result, the third Gewandhaus, opened to critical acclaim in 1981. Its eggshell construction, a sort of late 20th-century version of a Roman amphitheater, allows most listeners to look down on the orchestra from the terraced balconies that surround it. Risers at the back of the stage make it possible for the brass, percussion, and string bass sections to be seen by listeners on the main floor as well. Masur takes immense pride in the eggshell design, a sort of building within a building that isolates the chamber from the noise of streetcars and other traffic passing by outside, all too evident in the lobbies that grace the front of the building. It is, he notes, perfectly suited to the making of recordings; virtually all of the orchestra's sessions have been held there over the past 10 years.

Musician input didn't stop in the planning stage. The architect created a 1:20 scale model of what the new auditorium would look like, complete with seats and other fixtures, in which it was possible to make acoustic tests. Orchestra members suggested raising the roof to increase reverberation time to 2.1 seconds. They also pressed for "sound-neutral" seats—comfortable units that have the same acoustical properties whether or not someone is sitting in them. The proportion of sound-reflective to sound-absorbent materials used in the seats varies depending on their locations throughout the Gewandhaus. "We learned lessons from Avery Fisher Hall," an orchestra spokesperson added.

Explaining his egg metaphor, Masur says, "We have only to adjust the sound for the middle of the egg. If it is right there, then it is right throughout the hall." The acoustics are so good, in fact, that the late Leonard Bernstein reportedly complained that he could hear players at the back of the orchestra turning the pages of their music as they played, and it was distracting him.

Kurt Masur was born on July 18, 1927 in Brieg, Silesia, now part of Poland. His first musical training was at the keyboard. Attending the Collegium Musicum of Leipzig, he studied cello, percussion, and conducting. After graduation he was appointed orchestra coach at the Halle County Theatre, followed by positions as Kapellmeister at the opera theaters in Erfurt and Leipzig. In 1955, he became a conductor of the Dresden Philharmonic and in 1956 returned to opera as the general director of music at the Mecklenburg State Theatre. Two years later, he was named senior director of music at the Komische Oper in East Berlin, a post that brought him to the attention of international audiences when the Komische Oper toured parts of Western Europe, Japan, and elsewhere.

In 1967, Masur moved to the Dresden Philharmonic as chief conductor, a post he held until 1972. His United States debut came with the Cleveland Orchestra in 1974, the same year he first toured America with the Gewandhaus Orchestra. In 1987, he took the Gewandhaus Orchestra on an extensive tour that included the United Kingdom, the United States, Japan, and China.

On October 9, 1989, Leipzigers assembled in the city's two main churches—the Thomaskirche, where Bach played the organ, and the Nikolaikirche—for a candlelight vigil protesting the Communist government. During the evening, more than 200,000 people spilled out of the churches and marched to the Augustusplatz, across the street from the Gewandhaus. Standing in its magnificent glass foyer, Masur had a dramatic view of history.
being made outside. He opened the doors of the concert hall to the marchers and, together with religious leaders, a prominent theater director, and even three secretaries of the Communist Party, served as a moral focus for the peaceful revolution.

"In a way," he said, "I was only carrying on those principles that I try to uphold when I conduct: Beethoven's hope in the 'Choral' Symphony was exactly for that which was happening all over Eastern Europe." Mentioned frequently as a candidate for president of the free transitional government, he declined the honor and today refuses to discuss politics when interviewed.

Other topics that are off limits include the relative merits of the Gewandhaus, which Masur helped to create, and Avery Fisher Hall, where he has been busy making improvements in the acoustics. He does acknowledge that he "will try to make some small corrections" to make the concert experience more attractive to the Lincoln Center audience.

"In most halls, musicians must adjust to the acoustical properties of the hall," Masur observes. "They don't have to do that in the Gewandhaus. Because the sound is so even and because every member of the orchestra can hear what every other member of the orchestra is doing, there is a comfortable feeling about playing in it. Because they can hear so well, they can play without a conductor." He concedes that's not the case at Avery Fisher. "There, you can't hear all of the other musicians. Because the acoustic situation is not so natural, the orches-

From the beginning, Masur and orchestra members actively participated in the planning of the Gewandhaus.

Tchaikovsky: Symphony No. 4.
Leipzig Gewandhaus Orchestra, Kurt Masur, conductor.
Eterna 3 29, 068, CD; 42:33

The recent appointments of Kurt Masur to the New York Philharmonic, Wolfgang Sawallisch to the Philadelphia Orchestra, and Daniel Barenboim to the Chicago Symphony bode well for music making in those cities. These are conductors whose careers have been shaped more by musical opportunities than commercial ones. They bring a "middle European" style of playing that favors traditional orchestral balances, unforced dynamics, and, above all, delineation of musical structure. While the orchestra personnel will certainly appreciate this, it remains to be seen whether the ticket-buying public is ready for so great a change from what has gone before. One wonders, too, how record companies may regard the disappearance of fast-track superstars from these three podiums. Gunther Breest, head of Sony Classical, stated in an interview with Martin Bernheimer for the Los Angeles Times ("A Tokyo, New York, Hamburg Connection," April 22, 1990) that he considered Masur "not good enough" for his label. This judgment might better read "not fast enough" or "not loud enough," considering Masur's predecessor at the helm of the Philharmonic. We may not know for several years whether the trend is a permanent one.

Masur's recording of the Tchaikovsky Fourth reflects the values stated above. The music is rationally paced throughout; the opening fanfare is appropriately dramatic—not the apocalyptic affair many conductors make of it. Likewise, the last movement has drive and urgency with no trace of frenzy. The essential lyricism of the writing is given its due, and sectional contrasts are never overdrawn.

The recording may seem a little distant over low-resolution stereo systems and, in my opinion, could have benefited from slightly more contribution from accent microphones. However, over a high-end system, there is nothing problematic at all. There is a sense of correct hall ambience, and the "Row M" perspective may be appreciated by listeners satiated with the excesses that plague too much current recording.

John Eargle
Masur and the musicians of the Gewandhaus Orchestra offered suggestions that contributed to the final design of their concert hall.

Today before him, the orchestra played by itself. Both men fought for the musical life of Leipzig.

"Nonetheless, there are some outstanding American composers whose work deserves to be better known. I'd like to bring unknown pieces worth being heard to the audiences in New York, along with some of the better known but neglected works of the 19th century. I'd like to arrange exchange programs which would let young conductors from America perform in Leipzig, and young German conductors appear with the Philharmonic.

Because I'll be resident with both orchestras for the next five years, I believe that I have a chance to build bridges that will benefit not only the musicians but also their audiences."

Besides exploring music that is new and unfamiliar to them, Masur finds today's young listeners delving into the musical past. "Throughout the 1960s, the 1970s, and the 1980s, people bought only what was new, looking for recordings with the highest technical standards. Now they're finding that contemporary conductors are not the last word on musical interpretation. They're rediscovering Toscanini and Bruno Walter, largely with the help of recordings which may lack the ultimate in sound quality but have a great deal to say musically."

The post of music director of the New York Philharmonic is the sort of thing that young conductors only dream about and older conductors contemplate killing for. Masur got the job almost without his knowledge. The Orchestra's search committee, which included a number of its musicians, voted to ask the Maestro from Leipzig to take the job, without checking to see if he was available. When a delegation visited Masur in Salzburg to tell him, "He was nearly knocked off his chair," his friend Peter Gurtler remembers. "He really didn't want to leave Leipzig, and he accepted only on the condition that he could continue as music director at the Gewandhaus."

When the time came to leave for New York, members of the Gewandhaus ensemble presented Kurt Masur with a framed poster containing the opinion of one of his predecessors about the Philharmonic. "A miserable orchestra," Mahler called it. Masur, joining in the joke, assured his colleagues that times have changed—but he won't say what happened to the poster.

---

48
TAKE ANY 8 CDs FOR 1¢
PLUS A CHANCE TO GET ONE MORE CD—FREE!

Come to Columbia House each month and take any of the records you like! Each month you can choose from over 10,000 selections. If you're interested in any of the records listed below, simply circle the number of each selection you'd like to receive on the card in the envelope and return them to us within 15 days for your free 8 CDs. If you don't want any of the selections, return nothing at all. You have 15 days to return the cards, and you will only be charged if you select one or more CDs. If you do not wish to receive any selection for the next month, please return the cards. If you do not return them within 15 days, you will receive the selections listed below.

Note: We reserve the right to reject any application or cancel any membership. These offers are available in APO, FPO addresses. Please write for details of alternative offer. Canadian residents will be serviced by our Canadian distributor. (For more information write to: Columbia House Canada, Suite 300, 1000 Technology Drive, Ottawa, Ont., Canada K2H 0A6. After 48 hours, call 1-800-268-9799.)

1. Selections with two numbers count as two selections.
2. Write one number per envelope box.

All members receive everything within 15 days of receipt of cards.

COLUMBIA HOUSE
P.O. Box 1129, Terre Haute, Indiana 47811-1129

PLEASE ACCEPT MY MEMBERSHIP APPLICATION UNDER THE TERMS OUTLINED IN THIS ADVERTISEMENT. I AM ENROLLING TO RECEIVE THE foregoing eight 8 CDs FOR 1¢, PLUS A CHANCE TO GET ONE MORE CD FREE.

Name
Address
City
State
Zip

Send these 8 CDs for 1¢ Write one number in each box.

1. Sting—The Soul Cages (A&M) 424-440
2. The Who—Who’s Next (MCA) 376-567
3. Boyz II Men—Cooleyhighharmony (Motown) 244-754
4. Best Of The Doors (Epic) 377-1692-612
5. Stone Roses—Sick Of Spots (Motown) 244-425
6. James Brown—The CD Of JB (Sex Machine) 244-3792
7. The Allman Brothers Band—Brothers & Sisters (Polydor) 244-824
8. David Bowie—Tonight (European) 244-467
9. Skid Row—Slave To The Grid (Atlantic) 220-220

EAM—Schubert Imp (EMI) 421-487
Elton John—Greatest Hits II (MCA) 319-541
Creedence Clearwater Revival—20 Greatest Hits (Mercury) 308-049
Led Zeppelin IV (Atlantic) 291-435
Eagles—Greatest Hits 1972-1975 (Asylum) 287-003
Simon & Garfunkel—The Box (Columbia) 219-477
Marc Cohen (Atlantic) 242-552

Luther Vandross—Power Of Love (Ed). 418-849
Eric Clapton—Journey Man (Reprise) 400-457

The Rippingtons—Curves Ahead (GRP) 426-874
Spyro Gyra—Collection (GRP) 420-950
Lee Ritenour Collection (GRP) 425-876
Harper Brothers—Arty (Epic) 425-082

Michael Bolton—Time, Love & Tenderness (Columbia) 415-711

Mariah Carey—Emotions (Columbia) 428-029

C & C Music Factory—Gonna Make You Sweat (Columbia) 416-933
INXS—X (Warner Bros) 412-824
Jesus Jones— Doubt (Sire/Reprise) 412-106

Boyz Selections—Best Of The Rose (Capitol) 416-957

The “Amadeus” Mozart—Medley (Columbia) 415-953
Vladimir Horowitz—The Last Recording (Sony Classical) 415-985
Island Carney (Columbia) 414-557

Donna Reaves—I Remember (Blue Note) 418-756
Winton Marsalis—Invisible Calling (Columbia) 417-675
Earl Klugh—Midnight In San Juan (Warner Bros) 418-176

All This Jazz

Rush—Chronicles (Greatest Hits) (Mercury) 423-780/392-785
Scorpions—Crazy World (Mercury) 423-508
John Cougar Mellencamp—Uh—Huh (RCA) 423-574

Amy Grant—Heart In Motion (A&M) 424-457
Simple Minds—Real Life (A&M) 427-203
Seal—(Sire/Warner Bros) 425-827
Akon Neville—Warm Your Heart (A&M) 425-611
Heavy D & The Boyz—Peaceful Journey (A&M) 424-416
Boston (C) 426-209
Rosetta—Joyride (Epic) 419-556

Lyndy Skymnd Band—423-238
The Allman Brothers Band—Shades Of Two Worlds (Capitol) 422-212
Bad English—Backlash (Capitol) 422-170
Frank Sinatra—Capitol Collectors Series Greatest Hits (Capitol) 421-651
DJ Jazzy Jeff & Fresh Prince—Homebase (Jive) 421-028
Escape Club—Dolls And Sex (Atlantic) 417-964
The ROLLING STONES—Midnight Screaming The Memphis Horns (Mercury) 426-276
Stevie Wonder—Jungle Fever Soundtrack (Motown) 419-132

Michael Bolton—Time, Love & Tenderness (Columbia) 415-711

Mr. & Mrs. (Yuppie) 374/592
Do you have a VCR? (Yes) 374/592
Do you have a credit card? (Yes) 374/592

Note: We reserve the right to reject any application or cancel any membership. These offers are available in APO, FPO, or JPO addresses. Please write for details of alternative offer. Canadian residents will be serviced by our Canadian distributor. (For more information write to: Columbia House Canada, Suite 300, 1000 Technology Drive, Ottawa, Ont., Canada K2H 0A6. After 48 hours, call 1-800-268-9799.)

Send these 8 CDs for 1¢ Write one number in each box.

Extra Bonus Offer: also send one more CD free now, for which I am enrolling an additional $6.95.
A few enterprising record companies have taken the initiative to produce Compact Discs encoded with Dolby Surround. Unlike the earliest quadrophonic albums of the 1970s, these recordings were made by producers who have generally used intelligence and discretion in assigning sound to the surround channels. After listening to a number of these recordings for several weeks, I found that the use of surround sound techniques on some (not all) of them increased my involvement in the music.

One disc, from Telarc, uses Shure's Stereosurround format; five other titles were recorded digitally by Intersound, Inc. under the ProArte Audio + label. The surround sound preamplifier I used to listen to these CDs was Sony's TA-E1000ESD; its digital signal processing allowed me to adjust parameters for the various musical selections. With this preamp, I could have used as many as six speakers (including a subwoofer), since it was designed to be the central component for a home theater system. For audio-only listening, however, I settled for a simpler setup. Front speakers were a pair of KEF 105-II units driven by a Carver 1.5t amplifier. Rear speakers were a pair of Bose Powered Roommate 11s mounted high above my head and some 2 feet behind my listening position. Ideally, I would have preferred to have a center-channel speaker and a subwoofer, but since my seating position remained fixed during the tests, I wasn't bothered by 'drifting' instrumental or vocal sounds. The following comments detail my reactions to the Dolby Surround-encoded CDs.

Fireworks for Orchestra (ProArte CDS 527) is a sampler disc that serves as a good introduction to Dolby Surround Sound. The trouble is that its wide variety of short selections (11 in all, for a total playing time of just over 70 minutes) was not equally effective with a fixed setting of surround sound parameters; I had to vary rear levels and surround-channel delay times for many of the selections. For the Hallelujah Chorus from Handel's Messiah (track 9) and the choral section of the last movement of Beethoven's Ninth Symphony (track 8), I turned up rear-channel levels so that I could obtain a feeling of being totally surrounded by the chorus. The result was spine-tingling. It was as if I were standing (or sitting) amid the choristers, and both of these familiar works never sounded better. On the other hand, when I played Copland's 'Fanfare for the Common Man' (track 1), I had to turn down rear-channel levels considerably and return the surround-channel time delay to its standard 15 ms. Had I not made these adjustments, the brass and percussion instruments would have sounded as if they were in a cavernous cathedral or castle, which would have been most inappropriate for this brief selection. I played "The Sorcerer's Apprentice" (track 10) with standard settings, and the presence of surround sound contributed to the excitement this piece generates as it reaches its climax. Of course, I couldn't help seeing Mickey Mouse as the hapless apprentice in my mind's eye—such is the influence of the Disney classic, Fantasia.

Sample Surround Sound (ProArte CDX 013), another sampler, has several tracks of aircraft fly-bys—one of them mixed with cannon fire. If you like such effects, you'll want to turn up the rear-channel levels to match those in the front. Be sure to pull that rear level down again before you listen to track 12, a pop selection entitled "You're Nothing Without Me." If you don't, you may find yourself objecting to the "mix" and hear sonic exaggerations. Two of the selections that benefited most from Dolby Surround encoding were "Raiders of the Lost Ark March" (track 7) and "Music of the Night" from Phantom of the Opera (track 8). Only a moderate amount of sound energy was directed to the surround speakers in these selections—just enough to lend the music a richness and texture that it did not have in two-channel stereo. (If you are conscious of separate and distinct sounds
coming from the rear speakers during either of these selections, you’ve probably tuned up the rear levels too much or you’re sitting too close to the surround speakers.)

Opening Night (ProArte CDS 528) contains theater music particularly suited to Dolby Surround. All of the selections here seem to have been mixed with essentially the same channel assignments. Closing my eyes, I was reminded of the sound I experienced when attending a Broadway musical. Ambience in a typical New York theater is somewhat less pronounced than in a larger concert hall, and this disc’s recording engineers captured that precise and more modulated sense of space perfectly—from the opening bars of Leonard Bernstein’s overture to Candide to Marvin Hamlisch’s hit songs from A Chorus Line. The only track that suffers from a bit too much ambience is the fourth, which contains several selections from The Sound of Music by Richard Rodgers. Although it is appropriate to hear echoes on songs in the Swiss Alps, the effects were a bit exaggerated for my taste—especially in the familiar “Do-Re-Mi” song. On the other hand, the selections from the Broadway hit 42nd Street seemed to position me in about the fifth row orchestra of the theater.

Hitchcock—Master of Mayhem (ProArte CDS 524) includes passages composed for the soundtracks of some of Alfred Hitchcock’s best-loved films, such as Psycho, Rear Window, Vertigo, and North by Northwest. It made me wonder how much more effective these and other Hitchcock films would have been if their soundtracks had been able to take advantage of the Dolby Stereo process. Happily, the work of Hollywood composers such as Bernard Herrmann and Franz Waxman is given a new and more exciting life; the music is even more exciting than when it was tied to the films. However, although the orchestrations and arrangements created for this disc are impressive, the visual element is missed when using the CD alone. I couldn’t help wonder how much more the general public that reproduction of recorded music would be limited to two channels. Yet in recent years, alternatives to standard stereo have come on the scene in a big way as part of the home theater revolution. Now, surround sound has come back to audio, with the excitement of movie theater sound beginning to be issued on standard music-only CDs. The same Dolby Surround decoder used for processing the playback of video can also be used to its fullest effect on these special discs. The most extensive of the offerings is RCA Victor’s Dolby Surround Series. Most of the titles so far are soundtrack music, a genre that has a niche of its own, distinct from classical, pop, and jazz.

The failure of the early 1970s quadraphonic formats convinced most audio buffs and the general public that reproduction of recorded music would be limited to two channels. Yet in recent years, alternatives to standard stereo have come on the scene in a big way as part of the home theater revolution. Now, surround sound has come back to audio, with the excitement of movie theater sound beginning to be issued on standard music-only CDs. The same Dolby Surround decoder used for processing the playback of video can also be used to its fullest effect on these special discs. The most extensive of the offerings is RCA Victor’s Dolby Surround Series. Most of the titles so far are soundtrack music, a genre that has a niche of its own, distinct from classical, pop, and jazz.

The Home Video Album (60354-2-RC), the first disc in the Dolby Surround Series, was originally used as a promotion by home video dealers—some of whom even included the popcorn. It is a sampler of themes from various classic films and also includes six different musical fanfares for the big movie studios, some overture and intermission music, and even two pieces for silent films. The soundtrack music was culled from a number of symphonic recordings Victor issued in the ’70s and from old tapes of Arthur Fiedler performances of movie themes. A 10-minute suite of Dimitri Tiomkin’s music for The Thing is full of scary surround effects. The studio fanfares, in particular, are fun to hear again, and the “Intermission Music” tracks will transport you back to the ’40s and ’50s.

In Mancini in Surround: Mostly Monsters, Murders & Mysteries (60471-2-RC), the noted composer/arranger/conductor Henry Mancini leads his own pops orchestra in his music from, among others, The White Dawn, Mommie Dearest, It Came From Outer Space, Fear, The Prisoner of Zenda, and Sunset. The new digital recordings make full use of the surround process to add to the...
FELDMAN

but wish that I had videodiscs of the films to watch as I listened. Still, if you’re a Hitchcock buff, you can close your eyes and conjure up the scenes from memory.

Peter Nero—Anything but Lonely (Pro-Arte CDS 522) features more music from some of the great musicals, treated in much the same way as on Opening Night. The common thread here is that pianist/conductor Peter Nero is featured on all selections along with the Columbus Symphony Orchestra. Surround sound is particularly effective in imparting just the right quality to “Memory” from Andrew Lloyd Webber’s Cats and Leonard Bernstein’s ballad “Maria” from his classic West Side Story. The album title comes from the song of the same name from Webber’s Aspects of Love, one of his lesser successes.

Perhaps the most outstanding track is the last one, which contains about 35 short excerpts from the most popular songs written by Richard Rodgers. Not all benefit equally from Dolby Surround, but that didn’t decrease my enjoyment as I recalled the many years of pleasure that the collaboration of Rodgers and Hammerstein and Rodgers and Hart had brought us.

The Telarc CD, Spies: By Way of the World (CD-83305), contains a variety of popular music involving instruments (natural and electronic), vocals, and percussion sounds. What makes this disc different is that it was specifically mixed using Shure’s Stereosurround audio format. (Shure, most noted for its superb line of phono cartridges, is also very active in professional audio circles through its microphones, mixers, and other electronic equipment.) From what I was able to gather about Shure HTS Stereosurround, it requires a center channel and a subwoofer, in addition to front and surround channels, to be most effective. (The Shure HTS Theater Reference System includes every audio component you need for this system, which is similar—but not identical—to a full Dolby Surround setup with Dolby Pro-Logic decoding for enhanced separation between channels.) Played through my four-speaker system, spatial positioning was precise. There was no image wandering, and the sound seemed to emanate from well beyond the two front speakers even when the disc was reproduced in basic stereo.

In the future, I am certain we can look forward to additional CDs with encoded surround sound, in case you needed any more reasons for assembling your own home theater sound system!

SUNIER

the raise-the-hackles mood of many of the scores. Mancini’s Monster Hits (60577-2-RV; 16 minutes; Collector’s Edition, disc glows in the dark) features three tracks from some of the composer’s less well-known monster movie themes (included on Mancini in Surround) plus “Surround Fantastique.” The latter was composed for a one-minute trailer used as a demonstration of Dolby Surround in theaters. Both discs may still be available at select Yamaha dealers as part of a special promotion.

In the ’70s, Charles Gerhardt conducted the National Philharmonic Orchestra in new recordings played directly from the original scores of famous film classics. Collectors rated the LPs of Gerhardt’s Classic Film Scores equal to the RCA Fritz Reiner/Chicago Symphony LPs and the Mercury Living Presence series. However, when RCA reissued two of the titles on standard CD, they didn’t get things quite right; the sound was often harsh. Now these recordings have been reissued as part of the RCA Victor Dolby Surround Series, and the seven titles I auditioned are beautifully presented and sonically satisfying, though the surround effects are often subtle. But even when nothing seems to be happening in the rear channels, all you need do is to mute them to have the soundstage collapse to a lifeless cardboard image. The most exciting effects can be heard on Lost Horizon (1669-2-RG), Dimitri Tiomkin’s lovely and lavish score often features a choir in the rear channels and bells that ring all around the listening room. Although only the first track of the Casablanca CD (0422-2-RG) is from that classic, the other themes from Humphrey Bogart films will strike a chord with any Bogie fan. The same goes for the dozen themes on Classic Film Scores for Bette Davis (0183-2-RG), of which the music from Dark Victory is the “major work.” On Gone with the Wind (0452-2-RG), the movie’s wide-screen visual impact is

Listening to show music through Dolby Surround will transport you to the best seat in a Broadway theater.
matched by the rich surround feeling of Max Steiner's familiar music. Spellbound (0911-2-RG), a collection of the work of Miklos Rozsa, displays this important composer's powerfully dramatic scores rooted in Hungarian origins. Spellbound was the first well-known use of the theremin's spooky sound in movie music, but the main work here is a suite from the thriller The Red House. These discs, plus Now, Voyager: Classic Film Scores of Max Steiner (0136-2-RG) and Captain from Castle: Classic Film Scores of Alfred Newman (0184-2-RG), should make you want to haunt the "classics" section of your local video emporium to rent the great titles that go with these moving scores.

Laura/Forever Amber/The Bad and the Beautiful (1490-2-RG) is an offshoot of the Gerhardt project and was produced by him. This disc is distinctive in that the composer, David Raksin, conducts the New Philharmonia Orchestra in his own music from the three films. Raksin observed that he felt both his music and the orchestra were "being flattered, that the gorgeous opulence of the Dolby Surround system enables me to hear the music as I had hoped it would one day be heard."

The most rousing of the soundtrack CDs is Altered States (3983-2-RG). John Corigliano's often atonal music for the 1981 film is nevertheless extremely visual, since it evokes the main character's hallucinations during mind-expanding trips and the ensuing physical transformations he undergoes. The deep bass end of the spectrum is conveyed with tremendous impact on all channels, not just those in front. Using one or more subwoofers will add substantially to the playback of this disc.

Motion Picture Classics, Volume One (60392-2-RG) and Volume Two (60393-2-RG) were culled from original tapes of Arthur Fiedler conducting the Boston Pops from 1954 through 1971. In toto, there are 34 tracks of hit themes, in familiar Pops arrangements. On the first volume, the most lengthy treatments are given to music from...
Love Story (from 1944) and the Warsaw Concerto (which was used in a British film, Suicide Squadron). The surround effects on these discs are not particularly strong.

Several recordings in the RCA Victor series are by the Japanese synthesist Isao Tomita and were originally four-channel. The first of these, Snowflakes Are Dancing (60579-2-RG), has been a favorite of music listeners—including many in the anti-electronic music camp—since its first appearance back in 1974. Tomita's performances of Claude Debussy's tone paintings use electronic and spatial trickery to underscore the lush, impressionistic mood of "Reverie," "Clair de lune," and "The Girl with the Flaxen Hair." In "The Sunken Cathedral," you can visualize the cathedral slowly rising out of the water, with the sound of tolling bells gradually becoming closer and more and more distinct.

The 1982 stereo CD of Tomita's Snowflakes Are Dancing does have some back-channel information, but it is thin and does not contribute to the effect of sound spinning around the room—which does occur in the RCA Victor Dolby Surround Series version. A similar comparison can be made using the original LP versions of some Gerhardt soundtracks, although, because the difference information was primarily ambience, there was even less rear signal. However, comparison with some old four-channel discrete quadraphonic open-reel tapes of both the Gerhardt and Tomita recordings demonstrated that the reduction from four channels to three, and the change from a discrete process to a matrix process, did cause some losses. This would be expected. But since these tapes are long out of print, were more expensive then than the CDs are now, are inconvenient to play, and few people have open-reel decks any longer (let alone, quad open reel!), this is not really pertinent. The CDs in RCA Victor's Dolby Surround Series are totally free of the annoying hiss that plagued the open-reel tapes (which were mostly made without the benefits of noise reduction), they are super-convenient and readily available, and the decoding process is a standard that many homes now enjoy.
A professor couldn’t tell them apart.

"The world's most accurate loudspeaker" a magazine reviewer claimed.

So, a well-known television programme decided to put us to the test.

A professor of musicology sat before a performer and a pair of our Sovereigns.

So real was their sound reproduction, the professor couldn't tell where the live performance left off and the recording began.

It was, perhaps, the toughest test any loudspeaker has faced and a very credible indication of the sound quality you can expect from the entire Duntech range.

Yet our engineers continue to push the edge of technology in our quest for perfect sound reproduction.

Visit an authorised Duntech retailer soon and judge our success for yourself.

DUNTECH
APPLIED INTELLIGENCE
DUNTECH AUSTRALIA 60 JACOBSEN CRESCENT HOLDEN HILL SOUTH AUSTRALIA 5088. TEL (618) 369 0600, FAX (618) 369 0604.
DAVID BERNING
EA-2101 AMP & TF-12 PREAMP

Manufacturer's Specifications

Preamplifier

Frequency Response: Phono, RIAA ±0.25 dB, 20 Hz to 20 kHz; high level, 4 Hz to 50 kHz, ±1 dB.

Gain: Phono to main output, 64 dB at 1 kHz; phono to tape output, 30 dB at 1 kHz; high level to main output, 32 dB.

Gain Accuracy: Gain and balance within 1 dB of setting over 80-dB range.

S/N (Unweighted, 20 Hz to 20 kHz): Phono, 60 dB re: 1 mV rms input; high level, 84 dB re: 1 V rms output, with gain set for unity (-32 dB level setting).

Distortion at 1 V rms Output: Less than 0.03% second or third harmonic, less than 0.002% fourth and higher harmonics.

Sensitivity for 1 V rms Output: Phono, 0.63 mV; high level, 25 mV.

Input Overload: Phono, 200 mV rms at 1 kHz; high level, 10 V rms.

Input Impedance: Phono, 47 kilohms, with provision for additional loading; high level, 100 kilohms.

Output Characteristics: Impedance, 3 kilohms, maximum level, 5 V rms.

Wireless Remote Control: Operates volume, balance, and muting, transmission range, 30 feet (10 meters).

Power Requirements: 100 to 130 V or 200 to 260 V a.c., 50 to 400 Hz; 40 watts.

Dimensions: 19 in. W x 3½ in. H x 13 in. D (48 cm x 8.9 cm x 33 cm) with standard rack panel; with rubber feet, 3¼ in. H (9.6 cm).

Weight: 11 lbs. (5 kg).

Price: $3,245; balanced line outputs, $550 additional; buffered outputs, $440 additional.

Amplifier

Power Output: 100 watts or more per channel, 30 Hz to 15 kHz, at 2% total distortion, with both channels driven.

Frequency Response: 4 Hz to 40 kHz, +0, -3 dB, at 1 watt out.

S/N: 80 dB, d.c. to 1 MHz; 100 dB, 20 Hz to 20 kHz.

Typical Harmonic Distortion Products for 1-kHz Signal:
- 0.4% second harmonic, 0.3% third, 0.1% fourth, and 0.3% fifth
- Sensitivity for 100 Watts Output: 0.8 V rms, balanced or unbalanced.

Input Impedance: 100 kilohms.

Ideal Output-Matching Impedance: 0.89, 3.55, 8, and 14.22 ohms for 1-, 4-, 8-, and 16-ohm taps, respectively.

Internal Small-Signal Output Impedance: 3.8 ohms for 8-ohm connection.

Power Requirements: 100 to 120 V or 200 to 240 V a.c., 50 to 440 Hz; 130 watts at idle, 550 watts max.

Dimensions: 19 in. W x 5¼ in. H x 17¼ in. D (48 cm x 13.3 cm x 44 cm) plus handles and connectors, standard rack mount.

Weight: 40 lbs. (18.1 kg).

Price: $4,290.

Company Address: 12430 McCroskin Lane, Potomac, Md. 20854.

For literature, circle No. 90.
My first experience with one of David Berning’s designs was with a TF-10 preamp some years ago. I fondly remember it being a very good-sounding unit. If I recall correctly, it had a switching power supply and used a hybrid FET/tube circuit for each amplification stage.

Like its predecessor, the TF-12 has a switching power supply and uses tubes as amplifying devices; however, it doesn’t use FETs as in the earlier, hybrid circuitry. One of the design goals for this new preamp was to make possible reproduction from high-level sources, like CD players, without noticeable alteration of the sound—a laudable goal, for sure. Berning implemented this approach with a new dual-stage digital switching-matrix system for volume and balance control. This system yields very good interchannel tracking and a wide range of control (some 80 dB). The Berning company feels that this digital switching matrix degrades the sound much less than the standard but high-quality potentiometers used as volume and balance elements in the majority of preamps. I thought it would be interesting to see to what degree the line section is audible.

What further sets the TF-12 apart from earlier Berning preamps is the inclusion of a wireless remote for volume, balance, and muting. A front-panel LED display gives the attenuation setting, in dB, for each channel, a very nice feature indeed. This permits you to note and reproduce the “just right” volume of different program sources.

The EA-2101 power amplifier also has a number of interesting technical innovations that set it apart from other amps. To start with, the power supply is a switching design (a Berning specialty) that provides regulated voltages to all stages, including the output stage! There are not very many tube power amplifiers around with regulated high voltage to their output stages (actually, I don’t recall any). The other major innovation in the EA-2101 is the manner in which the output stage is operated, a patented “triode” mode that is completely different from the conventional way of driving an output stage (more about this under “Circuit Description”). The circuitry is fully balanced from input to output, allowing feed from unbalanced or balanced lines. Finally, and dear to my heart, the front-end tubes are all 6SN7s, octal-base dual triodes that are very linear.

The controls on the preamp’s front panel include a five-position rotary source selector and four toggle switches (“Tape/Input” for tape monitoring, “Mono/Stereo,” “Power/Off,” and “Balance/Volume”). These are followed by a rotary “Level” control whose function is selected by the last toggle switch. Since the actual element turned by the “Level” control knob is an optical encoder, it doesn’t have stops at the usual counterclockwise and clockwise limits of rotation, as regular potentiometers do. Instead, you can turn it indefinitely. When the circuit is powered up, one revolution of the control corresponds to 16 dB of attenuation change. (It feels weird to have such a control for volume—these newfangled digital things!) An attenuation display in the middle of the panel, shows each channel’s setting, in dB, to two significant digits. In the center of this display is the optical detector for the remote control. It’s a very attractive front panel, in my opinion. On the rear panel are a power-cord socket/r.f. line-filter unit, Tiffany input/output phono connectors, and a gold-plated ground post.
Interesting technical innovations set the TF-12 preamp and the EA-2101 amp apart from more conventional components.

Inside the TF-12, the circuitry is broken into three major functions on as many circuit boards. Taking up more than 50% of the internal area, and located to the left as seen from the front, is the p.c. board carrying the signal circuitry and attenuator elements. This board is made of Teflon and is said to allow a more transparent sound than the usual epoxy/glass laminates. The channels are laid out separately but identically, in a dual mono arrangement. To the right of the signal board is the switching power-supply board. Numerous inductors and other parts indigenous to switching power-supply circuitry are in evidence. Mounted on stand-offs, behind the inside surface of the front sub-panel, is the third circuit board, which mainly houses the digital control for the unit's switching attenuator matrix. Part of the audio signal path appears to be on this board too, as the p.c.-mount "Tape/Input" monitor and "Mono/Stereo" toggle switches terminate here. Interconnection of signal circuitry is via discrete wiring. The other two toggle switches also terminate on the third board; in fact, the board is entirely supported by these four switches. Multi-color ribbon cables interconnect the power supply, the front-panel control circuitry, the tubes' power circuitry, and the input control to the switching matrix on the signal board.

The front panel of the EA-2101 amplifier has a nice, eye-catching touch: Most of it is taken up by a red plastic window that lets you see the warm glow from the heaters of the eight output tubes lined up across the amplifier's width. Rack handles are located on either side of the window, and a horizontally oriented rocker power switch is centered below it. Just to the right of the switch is a red LED for indicating power on.

The amplifier's output arrangement on the rear panel is a bit unusual in its flexibility of configuration. Two large barrier strips, with eight connection screws each, are set end to end and take up a major portion of the rear panel's width. Pairs of five-way binding posts flank the barrier strips for connection to the speaker wires. The barrier strips are used for setting up each channel's four identical output windings to match the load in use. The EA-2101 comes with all windings wired in series by jumper links between the winding ends. A pair of wires attached to the output binding posts is connected to the desired taps for matching nominal 1-, 4-, 8-, and 16-ohm loads. You can also attach spade-lug terminations to the speaker cables and connect them directly to the barrier strip. If you wanted to commit the amp to use with 1- or 4-ohm loads, you could make optimal use of the transformer's four secondary windings by putting them in parallel (for 4 ohms) or series parallel (for 1 ohm). Other connectors on the rear panel include a socket for a standard a.c. line cord, Tiffany phono connectors for unbalanced inputs, and a pair of XLR connectors for balanced inputs. A small toggle switch between the unbalanced input jacks sets the unit for balanced or unbalanced mode.

Interior space of the EA-2101 is about equally divided between power-supply and amplifier circuitry. A large p.c. board contains the power-supply circuitry. A portion of the circuitry that is prone to radiate is covered by a perforated metal shield. The two channels of actual amplifier circuitry are arranged end to end and take up about the front 25% of the chassis. These amplifier circuit boards are made of Teflon, as in the preamp. In the space that remains, to the right of the power-supply board, the output transformers are mounted to the chassis bottom. This unit is fairly light for its power output rating, because the switching power supply operates at a higher frequency than the a.c. line, allowing the use of a smaller power transformer, and because the chassis is aluminum. Having the output transformers along the right edge makes the amp a little unbalanced and somewhat unwieldy.

Metalwork for both units is very simple, consisting of a bent-up piece of aluminum that forms the rear panel, bottom, and front sub-panel, while a perforated metal piece is bent to form the top and sides. The front panel of each is a quarter-inch piece of aluminum. Incidentally, the chassis is made of aluminum in order to be nonmagnetic and to prevent distortion induced by skin effect.

Parts appeared to be of good quality. Although workmanship was good, some of the leads could have been dressed a bit more attractively. The amplifier circuit boards seemed a little flimsy when I pushed in the middle of the board. This could cause some potential breakage in shipment due to vibration. The same comments apply to the main signal board in the preamp. I thought at first that a standoff under the middle of these boards would help, but the manufacturer said that there already is such a support there, and that the boards only seemed unsupported because Teflon circuit boards are so flexible.
The power amp’s circuitry is fully balanced from input to output, allowing feed from either balanced or unbalanced sources.

Circuit Description

As can be seen in Fig. 1, a block diagram of the TF-12 preamp, the general topology is fairly straightforward except for the absence of the usual volume and balance controls following the "Mono/Stereo" switch. A departure from conventional signal-circuit practice is the use of an output amplifier with digitally programmable gain. The overall approach taken in the design of the programmable amplifier uses two amplifier gain blocks with two digitally controlled variable attenuators arranged as shown in somewhat simplified form, in Fig. 2. The operating principle is to vary the amount of shunt resistance by turning on the various switching transistors and to have the resulting shunt resistance act against fixed series resistance. By arranging the value of the various shunt resistors and the logic states of the switch transistors, various attenuation settings can be achieved by changing control-line logic states. The Berning literature indicates that the control switches are out of the direct signal path; this is relatively but not strictly true, in my opinion. Although the nonlinearity of a turned-on switching transistor’s "on resistance" is small compared to the linear resistance of the attenuator resistor that is in series with it, this nonlinearity would still have some very small effect on the signal path.

The amplifier circuitry within the blocks is composed in each case of a single differential amplifier using 6DJ8 dual triodes. A differential topology was chosen, to be more immune to any effects of the power supply and to get a large measure of distortion reduction without loop negative feedback. Operating conditions are somewhat different for the two amplifier blocks. The first stage has some cathode feedback and plate-load resistors of higher value than the second, or output, block. In the output differential amplifier, the value of the plate-load resistor is in the low tens of kohms, and a feedback loop from the tube’s output plate back to its own control grid reduces the net output impedance to about 3000 ohms. Incoming supply voltage for the four differential-amplifier stages (two per channel) is dropped by decoupling resistors from the power supply’s ±190 V output to about ±160 V at the actual circuits. Obviously, suitable bypass capacitance is present at all of the decoupled supply points. Another interesting but not unprecedented feature is that each amplifier block is capacitor-coupled at its input and direct-coupled at its output. Solid-state op-amp circuitry acts as output offset servos, keeping d.c. offset at each block’s output to low values.

The phono circuitry looks to be somewhat more conventional. Operating from a positive supply only, the first stage consists of both halves of a 12AX7 in parallel, acting as a common-cathode amplifier. Output of the first stage is capacitor-coupled to a second stage, again configured as a common-cathode amplifier; it uses one-half of a 12AT7 tube. An RC equalization network is connected from the output of the second stage back to the first stage’s cathode resistor, thus causing the required RIAA curve to be generated by feedback equalization. The other half of the 12AT7 tube is used for the tape output buffer. Configuration is as a cathode follower with capacitor-coupled input and direct-coupled output. An op-amp servo operates on the input-grid potential so as to keep the d.c. output close to 0 V.

I am not going to delve into the specific details of the power supply, other than to say that it appears to be a rather sophisticated design. It uses a half-bridge topology to drive the main high-frequency power transformer, rather than the more usual push-pull drive.

In the EA-2101 amplifier, let’s start with the unique operation of the output stage. In most such stages, the input signals go to the control grids of the output tubes. When the output tubes are beam-power types or power pentodes (such as EL34s) with suppressor grids instead of beam-forming plates, the screen grid is either tied to a regulated supply, tied to a primary tap on the output transformer (as in ultralinear operation), or tied to the plate of the tube when normal triode operation is desired. In each case, the screen grid has a high positive potential, and the control grid has a negative potential to control the overall current conduction through the tube. Looking at volt-ampere curves for output tubes reveals that, for a fixed control-grid voltage, the conduction is also a function of the screen-grid voltage. However, each volt of change on the control grid still has more effect on the output current than each volt of change on the screen grid does. What Berning has done is to set the control grid at the same potential as the cathode, by shorting these elements together! The idling screen-grid voltage
The EA-2101 power amp’s patented “triode” mode of operation is completely unconventional.

Fig. 3—Plate voltage (horizontal axis) vs. plate current (vertical axis) of 6JN6 tube for normal pentode-connected operation, at several different control-grid voltages differing by 2 V per step. Plate currents here and in Fig. 4 are lower than they would be in actual output tube operation. Scales: Vertical, 5 mA per div.; horizontal, 200 V per div.

Fig. 4—Same as Fig. 3 but for Berning’s screen-grid drive, with screen-grid voltages varying by 5 V per step. Notice the even spacing between traces and the resemblance to triode operation in the trace shapes at these low levels.

Fig. 5—Same as Fig. 4 but for medium currents and increases in screen-grid voltage of 10 V per step. Note the change of vertical scale to 20 mA/div.

Fig. 6—Same as Fig. 4 but for high currents typical of output tube operation; screen-grid voltage is changing here by 20 V per step. Note the low voltage across the tube when driven sufficiently hard. Scales: Vertical, 100 mA/div.; horizontal, 50 V/div.

is at some very low value to reduce the plate current to a very low value, 3.75 mA per tube. Four tubes in push-pull parallel are used in the EA-2101, so the idling plate current for an output stage is four times 3.75 mA, or some 15 mA. The reason the idling plate current can be so low is that the linearity of the tubes, when screen driven, is much better than when control-grid driven. Figures 3 to 6 show some of this in graphic form. Figure 3 is for a normal output tube when operated at lower currents. As can be seen from the uneven spacing between the traces in the figure, linearity is pretty lousy in this mode, which is why no one, including Berning, uses it with these tubes. By contrast, Fig. 4, which shows the low-current linearity of the same tube operated with screen-grid drive, is much better. Further, the traces look like triode characteristics at these current levels. Figure 5 shows the characteristics at somewhat higher levels. What is interesting is that the traces look like those of a normal triode but with both positive and negative grid voltages. If this were an actual triode, the curve that originates at the vertex of the vertical and horizontal axes would be for a grid voltage of 0, with the curves to the left of and above it representing positive voltages and those below and to the right of it representing negative voltages. Lastly, Fig. 6 shows the VI characteristics at the higher current levels that would be typical of full-power operation of the tube. Some of the other benefits of this mode of operation, besides linearity, are efficiency of operation and extended tube life. Thanks to the low idling plate current, the a.c. power drawn...
Perhaps the best way to explain the new Philips compact disc interactive system is to explain what it's not.

First of all, this is not your normal, everyday CD.

What you’re looking at is not a CD. Well, not exactly. It’s actually a new kind of CD called a CD-I. You’ve probably already read that CD-I’s were coming. And you probably already know that CD-I stands for Compact Disc Interactive. What you may not know is that just one 5” disc can contain the combined works of Shakespeare, Dickens and Mark Twain. It can bring to life the paintings and photographs of the great museums of the world. And it can enable your children to exercise their creativity by using television as an interactive educational tool. CD-I technology is not like anything you’ve seen or heard before. And the possibilities it creates are, truly, limited only by your imagination.
PHILIPS PRESENTS THE IMAGINATION MACHINE.

The Inventor of CD Technology Introduces A Whole New Way Of Looking At Television.

When the engineers at Philips figured out how to turn an audio signal into a series of digital impulses, a format was born that provided an everlasting alternative to the LP. Of course, what can be done to an audio signal can be done to a video signal as well. Thus, the advent of CD-I.

A combination of both technologies, the Imagination Machine is greater than the sum of its parts. As a CD player, it provides stunning musical clarity thanks to Philips "Bitstream processing." And, as a CD-I player, it creates an exciting new world of interactive audio/video, animated graphics and text. A world you can manipulate and control.

The Imagination Machine Creates An Interactive Reality.

Imagine taking your family on a leisurely stroll through the back rooms of the Smithsonian.

Imagine hearing an ABC golf announcer comment on the great chip shot you just made from your easy chair.

Imagine it's Saturday morning and, instead of watching cartoons, your kids are creating their own.

The Imagination Machine creates, in 21st-century language, an "audio/video reality." Just slide in a CD-I disc, point and click the unique "thumbstick remote" and you're in control. For the first time in the history of television, you plot the course. You call the shots.

**IT'LL TEACH, ENTERTAIN, AND INVOLVE FOR YEARS TO COME.**

As the leading developer of CD-I titles, Philips is working closely with the world's most renowned publishing and entertainment groups such as Rand McNally, Time-Life and ABC Sports. And in 1992, through an agreement with Kodak, you'll even be able to create your own CD-I family albums.

**TAKE YOUR IMAGINATION FOR A SPIN.**

To let you sample this amazing technology in action, we've set up an Imagination Machine demonstration kiosk at an electronics dealer near you. And, for a limited time, we're offering a special introductory package of two free CD-I titles, one free audio CD, and coupons toward Photo CD Sampler and CD+Graphics discs with your Imagination Machine purchase.

The Imagination Machine from Philips. It's not like anything you've experienced before. For the name of the Philips dealer nearest you, simply call 1-800-223-7772.
An unusually flexible output strapping system lets you take maximum advantage of the output transformer's windings.

![Diagram](image1)

**Fig. 7**—THD + N vs. frequency and power, EA-2101 amp.

![Diagram](image2)

**Fig. 8**—THD + N for 1-kHz input, and SMPTE-IM distortion, vs. output power for 4-ohm load.

![Diagram](image3)

**Fig. 9**—Output and distortion residue for 10 watts out into 8 ohms at 1 kHz. The THD + N measured 1%.

![Diagram](image4)

**Fig. 10**—Spectrum analysis of distortion residue shown in Fig. 9.

off the line at idle should be less than with conventional output stages. The lower idling plate dissipation also means that the tube runs much cooler and will therefore last longer.

As nice as all this looks, there is a price to pay, and that is in the drive required to fully modulate such an output stage. I would estimate that the amplification factor of such a stage might be five to six times lower than in normal tube operation. This means that the voltage gain required to get full power would be much greater, and perhaps just as important, the amount of signal swing at the controlling screen grid would be a lot higher too—some 200 to 400 V peak. Therefore, more stages of amplification are likely to be required in such a scheme. Sure enough, the EA-2101 has three differential triode gain stages in cascade. The last gain stage drives a cathode follower that is direct-coupled to the output-stage screen grids. One thing I failed to mention is that the input impedance at the screen grid is somewhat nonlinear and not the high impedance seen at the control grid in normal tube operation. The cathode follower helps to drive the output-tube screen grids with reasonable linearity. Of the four front-end stages, the second and third are direct-coupled and the others are capacitor-coupled. Cathodes of the first and third differential voltage-amplifier stages are tied together for no local feedback and have tail resistors down to a ~180 V source. Feedback resistors are used in the second voltage-amplifier stage, and in fact, a
In 1986, Yamaha developed what many industry experts consider the most significant audio advancement since stereo. We're referring to Digital Soundfield Processing.

Digital sampling of actual soundstages to recreate the same acoustic environments you once had to go out to enjoy.

Now this remarkable technology is available in an audio/video receiver. The one you see before you, Yamaha's new RX-V1050.

The RX-V1050 has four DSP settings, in fact. Concert Video, Mono Movie, Rock Concert and Concert Hall.

But what may ultimately be more exciting is something no other receiver can offer: Dolby Pro Logic Enhanced. A technical feat which combines DSP and Digital Dolby Pro Logic.

An incredible enhancement which allows you to enjoy all the sonic information embedded in the movie soundtrack, as well as the acoustics of the theatre, all without leaving the house.

Under the hood, the RX-V1050 sports five power amplifiers—110-watt amplifiers for the left, right and center front channels, and 30-watt amplifiers for each of the rear effects channels.

A high-powered center channel combined with Yamaha's DSP and Digital Dolby Pro Logic enables Yamaha's RX-V1050 receiver to recreate the experience other receivers have promised, but have never quite delivered.

Stop by your nearest Yamaha dealer and hear the new RX-V1050 receiver. The best argument for staying home anyone's ever come up with. YAMAHA®

The only receiver that can make your home theatre sound as good as the original.
The EA-2101 is fairly light for its 100-watt/channel power rating, thanks to its switching power supply and aluminum chassis.

![Frequency response of EA-2101 vs. load.](image)

![Square-wave response of EA-2101 at 10 kHz into 8-ohm load (top trace), 10 kHz into 8 ohms paraleled by 2 µF (middle), and 40 Hz into 8 ohms (bottom). Scales: Vertical, 5 V/div.; horizontal, 20 µS/div. for 10-kHz traces, 5 mS/div. for 40-Hz trace.](image)

![Damping factor vs. frequency for 4-ohm load.](image)

Push-pull feedback loop from the output tube plates is taken back to this stage's cathodes. The control-grid circuits of the cathode-follower driver stage have separately adjustable bias control of the screen-grid potential of the output stage tubes. As mentioned previously, the input can be driven balanced or unbalanced with equal ease.

The power supply is a resonant, switching type. As discussed, the various outputs of this supply are regulated, even the +700 V to the output stage. All of the tube heaters, including those in the output tubes, are operated off regulated d.c. A number of safety features are unique to the EA-2101. The power supply has a multi-step, soft-start sequence that reduces the inrush current when the amp is first turned on. This eliminates burning of the power switch's contacts, as the main current draw is delayed about a second after the switch is closed. Low line voltage is sensed in this power supply, and if the line voltage is below a certain threshold, the unit won't turn on. Further, when the EA-2101 is operating and the line voltage drops to a sustained voltage below the nominal value, the power supply shuts down and must be manually restarted. A protection circuit monitors the current level in each pair of output tubes; if current is judged to be excessive, the power supply goes into a foldback mode, protecting the output tubes and the power supply. Overall, a very interesting circuit.

**Measurements**

Before measuring the EA-2101, I had been listening to it with the output windings strapped in a series-parallel mode for 4-ohm loading. I left it in that connection for the first tests I made, which were for distortion characteristics. The distortion shown is for the left channel, an arbitrary choice, as both channels behaved very much alike. Figure 7 shows how THD + N varies as a function of power output and frequency. While the amount of distortion is high, it doesn't rise much with increasing frequency above 1 kHz. At rated power of 100 watts, distortion rises rapidly below 30 Hz, presumably due to onset of output transformer saturation. Figure 8 illustrates how 1-kHz THD + N and SMPTE-IM distortion vary with power output. The results for operation with the output windings in series and with 8-ohm loads on the 8-ohm taps remained essentially as shown. What is interesting to me is that the amount of distortion is pretty constant with power above 2 or 3 watts and that the IM is about four times the THD over most of the power range. The latter is a classic, theoretical relationship between the two kinds of distortion when the distortion characteristic is simple and does not change with level. The nature of the distortion residue above 3 watts is what I call “gain reduction at the origin,” or crossover-type, distortion. This kind of distortion is worse at low levels and usually decreases as the power goes up because the nonlinearity is an increasingly smaller fraction of the waveform’s amplitude. In contrast, this amplifier has lower and simpler distortion below 3 watts and essentially constant distortion above that level. Figures 9 and 10 show, respectively, the THD residue at 10 watts into 8 ohms on the 8-ohm tap and its corresponding spectral nature. There is a considerable amount of higher order harmonic residue here, although the magnitude does decay with harmonic order. A conventional tube output...
In the beginning is music.
It grows from silence deep as thought itself. Images sparkle and disappear with quicksilver speed. Bathed in a crystalline sea of pure sound, you yield to surging currents of music.

Through Martin-Logan's exclusive electrostatic technology, music is recreated. Flawless in every nuance and fine detail, whisperquiet, lightningquick, thunderloud. And always, with pristine transparency.

Challenge Create a speaker diaphragm light enough to play 20,000 Hz yet powerful enough to play 100 Hz, thus eliminating crossovers and achieving a true wavelaunch, absolute phase linearity and group delay characteristics approaching zero.

Solution: A diaphragm lighter than one cubic inch of air. Over more than three years, Martin-Logan developed a vapor-deposition system that imprints a conductive coating only 20 atoms thick onto an ultrafine polyester film.

The Quest.
Where music is the beginning and the end.
No one has a longer or more distinguished history of leadership and innovation in metal tape than TDK. So when we introduced the MA-R back in 1979, it instantly became the benchmark all other metal tapes would be measured against.

Since that time, however, the evolution of digital recording sources has progressed far beyond what anyone ever expected. Beyond what even the most advanced metal tapes in the world are capable of reproducing.

Which is why we created the new MA-XG. A tape which is not only the best audio tape in TDK's history. But the best tape in recorded history.

**DIGITAL MUSIC DEMANDS PERFECTION IN A CASSETTE.**

Music from digital sources is dynamic to say the least. It can go from absolute silence to maximum loudness instantaneously. And for an audio cassette to reproduce its power and dynamic range accurately and free from distortion, the audio tape has to have extremely high output capability or what is known as MOL (Maximum Output Level).

But digital music can also go from maximum loudness to absolute silence instantaneously. And the lack of background hiss makes the clarity of the pianissimos and the transparency of the passages that linger and fade striking. To convincingly reproduce this kind of delicacy requires a tape with extremely low bias noise. Otherwise, music signals which are softer than the tape noise will be masked and inaudible.

The perfect recording tape then, for CDs and other digital sources, is one with the highest possible output and the lowest possible noise. The kind of tape it was almost impossible to design. Almost.

**THE WORLD'S BEST DUAL-LAYER PURE METAL TAPE.**

Rather than settle for a tape which compromises output for low noise, or low noise for output, TDK opted for a tape that compromised nothing. So the MA-XG combines two separately "tuned" layers of ultrafine Finavinx magnetic particles. The bottom layer utilizes a unique high-density Finavinx particle designed for highest possible output. The upper layer consists of low.
noise ultrafine Finavinx particles arranged in a high-density coating with the help of TDK's proprietary particle orientation technology. What this unique design results in is a metal tape with the highest output (+7.5 dB at 315 Hz) and the lowest noise (−59 dB) of any analog cassette. Or more simply put, the ultimate “digital ready” tape.

**A MECHANISM AS SOLECIICATED AS THE TAPE.**

You don’t even have to listen to the MA-XG to know how advanced its design is. Just hold it in your hand. Its extra heavy-weight RS-III mechanism utilizes an unprecedented super-rigid five-piece construction which provides the ultimate defense against vibration and the sound-smearing effects of modulation noise as shown on the modulation noise chart. The unified dual-layer molded face plates consist of a non-rigid plastic outer layer for resonance reduction and an inner layer of fiberglass-reinforced plastic for strength. These two plates and three side frames are held together by ten screws (three different kinds), applied both vertically and sideways, resulting in dimensional precision and structural integrity previously impossible to achieve. It even employs a system of internal sound stabilizer weights and super high-precision guide pieces to ensure maximum vibration attenuation and the highest degree of azimuth accuracy.

**AUDIO MAGAZINE AGREES MA-XG IS THE BEST EVER.**

That the TDK MA-XG is the ultimate recording tape is not just our opinion. It’s a belief shared by the ultimate authority: Audio magazine. After an exhaustive test of 88 audio cassettes (the results of which were published in the March 1990 issue), Audio found the MA-XG to be not only the best of any metal (Type IV) tape, but the best of any tape. Period.

So, if you’re going to record digital music, make sure you record it on the new MA-XG. Because the best music in recorded history shouldn’t lose anything in the translation. ♫♩
Driving the screen grids rather than the control grids of the EA-2101's output tubes yields good linearity and efficiency.

Table I—Output noise, EA-2101 amplifier. The IHF S/N was 76.3 dB for the left channel and 87.2 dB for the right channel. Switching noise from the power supply was the main contributor to the left channel's wideband reading, while harmonics of the 60-Hz line frequency dominated the other left-channel measurements.

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>Output Noise, mV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LEFT</td>
</tr>
<tr>
<td>Wideband</td>
<td>2.3</td>
</tr>
<tr>
<td>22 Hz to 22 kHz</td>
<td>0.84</td>
</tr>
<tr>
<td>400 Hz to 22 kHz</td>
<td>0.44</td>
</tr>
<tr>
<td>A-Weighted</td>
<td>0.42</td>
</tr>
</tbody>
</table>

±5 V output level into 8 ohms were about 8 µS. In the square-wave pictures (Fig. 12), the 10-kHz trace (top) is nicely damped in terms of overshoot, but some ringing can be seen at about 100 kHz, which may relate to the response glitch in this frequency region seen in Fig. 11. Behavior with an added 2-µF load (middle trace) is quite good, with overshoot and ringing well controlled. The amount of tilt in the 40-Hz trace (bottom) is reasonable but not as low as I have seen in some other tube amplifiers.

Damping factor versus frequency for the series-parallel connection of output windings is shown in Fig. 13, referenced to a 4-ohm load. With the windings all in series configuration and the measurement made at the 8-ohm tap, the damping factor remained about the same.

Interchannel crosstalk was found to be greater than 80 dB down in both directions, which is quite good.

Output noise as a function of measurement bandwidth is listed in Table I. Leakage of the switching frequency in the power supply makes up most of the wideband reading. Although it is higher in the left channel, it is still very low in absolute terms. With this high frequency removed by limiting the bandwidth to 22 kHz, the remaining noise in the left channel is mostly hum, which could be audible in some situations with high-efficiency speakers. The right channel is considerably better.

Even though the high-voltage supply is said to be regulated, the pulse power is slightly greater than the steady-state power in the EA-2101. Consequently, dynamic headroom measured 156 watts, or 1.9 dB above rated continuous power, and clipping headroom was 145 watts, or 1.6 dB, for 8-ohm loading on the 8-ohm taps. With a 1-ohm load on the 8-ohm tap and with one channel driven, a peak current of some ±10 amperes could be obtained with the tone-burst signal for dynamic headroom. When the 1-ohm load was connected to the nominal 1-ohm tap (actually 0.89 ohm, one secondary winding alone), the available current before visible distortion set in was ±15 amperes. If the secondary windings were all paralleled, the amount of available current would probably increase a little more.

A couple of miscellaneous notes on the amplifier: The a.c. line draw was about 2.1 amperes at idle and 6.4 amperes when delivering 100 watts per channel. For the EA-2101's low computed idling plate dissipation of some 10 watts per channel, 2.1 amperes strikes me as a lot of input line current for a high-efficiency switching power supply. Berning's specs indicate an idling power draw of some 130 watts. I computed the power drawn by the tube heaters as being about 90 watts (120 V times 2.1 amperes equals 252 VA). Either this power-supply design has a rather poor power factor (more likely) or the 130-watt figure is low.

The TF-12 preamp's gain and sensitivity for the various inputs and outputs are presented in Table II. A minor glitch in the operation of the gain-control system made the gain of the left channel 1 dB higher than that of the right when the attenuations read the same on the front-panel indicators. Because I couldn't decide which channel's indicator was correct, I equalized the gains by setting the left channel's display to indicate 1 dB more than the right channel's. I then used this setting for the preamp gain measurements shown in the Table.

Table II—Gain and sensitivity, TF-12 preamplifier.

<table>
<thead>
<tr>
<th>Gain, dB</th>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instr.</td>
<td>IHF</td>
</tr>
<tr>
<td>AUX to Main Out</td>
<td>32.8</td>
<td>29.5</td>
</tr>
<tr>
<td>AUX to Tape Out</td>
<td>-1.0</td>
<td>-3.1</td>
</tr>
<tr>
<td>Phono to Main Out</td>
<td>64.2</td>
<td>62.0</td>
</tr>
<tr>
<td>Phono to Tape Out</td>
<td>31.4</td>
<td>29.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IHF Sensitivity</th>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX to Main Out</td>
<td>16.7 mV</td>
<td>16.7 mV</td>
</tr>
<tr>
<td>AUX to Tape Out</td>
<td>0.72 V</td>
<td>0.72 V</td>
</tr>
<tr>
<td>Phono to Main Out</td>
<td>400 µV</td>
<td>400 µV</td>
</tr>
<tr>
<td>Phono to Tape Out</td>
<td>17.1 mV</td>
<td>17.3 mV</td>
</tr>
</tbody>
</table>

stage operated at this very low idling current would have a lot more distortion than the Berning design. Even so, this characteristic and amount of distortion could give the amp's sound a measure of brightness and harshness.

Voltage gain was measured next. With the output strapped in the "normal mode" (all the secondary windings in series) and with 8-ohm loads on the 8-ohm taps, gain was 30.9 and 30.6 dB for left and right channels, respectively. Corresponding IHF sensitivities were 82.5 and 85 mV.

Frequency response at an output level of 1 watt is shown in Fig. 11 for open-circuit, 4-ohm, and 2-ohm loading on the 4-ohm tap. This presentation provides insight to a number of things. First, the magnitude of output impedance can be judged by how far apart these curves are spaced: since the voltage output doesn't vary much with loading, the output impedance is low. Second, the degree and uniformity of high-frequency damping is shown by the consistent shape of the curves above, say, 30 kHz. The amount of output impedance is typical for a tube output stage with output transformers, and the high-frequency damping is nicely controlled as a function of loading. Rise- and fall-times at a
LOOKS LIKE NO OTHER...
SOUNDS LIKE NO OTHER...
SOUNDS LIKE NOTHING AT ALL.
THE BEST IN THE WORLD.

XLO ELECTRIC

Interconnects and Speaker Cables. Made in USA

XLO Electric Company, Inc.
9164 Hidden Farm Road
Rancho Cucamonga
California, 91730
Phone (714) 466-0382

Enter No. 50 on Reader Service Card
The TF-12's line amp section does pretty well into 10-kilohm loads, which a lot of tube preamps can't begin to handle.

Impedances of the main and tape outputs were near the claimed value of 3 kilohms, about 2.9 kilohms for the main outputs and about 2.6 kilohms at tape out.

The two channels of the line amplifier section behaved pretty much alike in regards to distortion, so I arbitrarily decided to discuss only the results for the left channel. Maximum output at the visual onset of clipping was 7.8 V with either instrument or IHF load. Total harmonic distortion plus noise was not easy to measure, as some amount of power-supply switching frequency was present on the main outputs. Interestingly, there was more of this leakage with full line gain than with normally used settings of attenuation. When I used a low-pass filter to eliminate the high-frequency switching leakage, THD + N with instrument load was less than 0.1% at 2 V output up to about 2 kHz, rising to about 0.2% at 10 kHz. With an IHF load, the distortion was more than four times as great but did not rise as much at high frequencies. This line amp is a competent driver and does pretty well into a 10-kilohm load, which a lot of tube preamps can't begin to handle.

How accurate are the actual output attenuations compared to the front-panel readout values? Generally pretty good, with no more than ±0.5 dB of error down to 70 dB of attenuation. Channel-to-channel attenuation settings were even closer, within 0.3 dB down to 70 dB of attenuation once the initial 1-dB imbalance was adjusted.

Interchannel crosstalk had a characteristic that was flat up to about 100 Hz; it then rose at a 6-dB/octave rate. With gain at maximum, crosstalk was worse in the right-to-left direction, being more than 80 dB down up to 200 Hz and, on that 6-dB/octave slope, down about 41 dB at 20 kHz. The left-to-right direction was about 10 dB better. When attenuation was set at 30 dB, a more likely setting, crosstalk was more symmetrical in the two directions and about the same amount as in the left-to-right direction just mentioned. Line amplifier crosstalk was in phase, meaning that, for a pulse on the driven channel, the crosstalk leakage's leading edge is in the same direction as the driving pulse.

Rise- and fall-times of the output amplifier were measured at maximum gain and at an attenuation of 30 dB. At maximum gain, rise- and fall-times at an output level of ±5 V were about 5.8 μS with instrument loading and 9.0 μS with IHF loading. (My instrument load is about 90 kilohms in parallel with about 200 pF, and the IHF load is 10 kilohms in parallel with 1,000 pF.) At the 30-dB attenuation setting, the figures were 2.8 and 7.0 μS. Oscilloscope pictures of 20-kHz square waves at these two gain settings, and of a 20-Hz square wave at 0-dB attenuation, are shown in Fig. 14. Each of the trace pairs is for instrument and IHF loading; the smaller amplitudes in each pair are for the IHF load. Evident in the figure are the nicely damped exponential edge shapes. The effect of the IHF load's 1,000 pF on the high-frequency response can be seen, as well as the change in rise-time between the two attenuation settings. In the bottom trace (20 Hz), the amount of tilt is reasonable, and the IHF loading has no particular effect on frequency. The overall waveshape suggests a very mild, shelving bass boost, since the trace as seen from the 0-V axis is not convex.

In testing for output noise, I decided to measure the output magnitude itself rather than my usual convention of...
It’s a 1-Bit.
It’s fully programmable.
And it’s a Theta.

Introducing
Theta DS Pro prime

The latest and most affordable in Theta Digital’s award winning family of digital to analog converters.
The only one-bit D to A with a fully programmable high speed computer.
A breakthrough at only $1250.

Digital Done Right

Theta Digital Corporation
5330 Derry Ave., Suite R; Agoura Hills, CA 91301
(818) 597-9195  FAX (818) 597-1079

Enter No. 47 on Reader Service Card
I began to find the TF-12's remote volume control a necessity for getting the "just right" volume at my listening position.

Table III—Output noise, TF-12 line amp section, at two attenuation settings. The IHF S/N at -30 dB was 71.5 dB for the left channel and 65.7 dB for the right channel.

<table>
<thead>
<tr>
<th>Attenuation Setting</th>
<th>LEFT</th>
<th>RIGHT</th>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wideband</td>
<td>890 µV</td>
<td>1.9 mV</td>
<td>18.2 mV*</td>
<td>16.0 mV*</td>
</tr>
<tr>
<td>22 Hz to 22 kHz</td>
<td>50 µV</td>
<td>62 µV</td>
<td>830 µV</td>
<td>750 µV</td>
</tr>
<tr>
<td>400 Hz to 22 kHz</td>
<td>28.5 µV</td>
<td>48 µV</td>
<td>780 µV</td>
<td>700 µV</td>
</tr>
<tr>
<td>A-Weighted</td>
<td>110 µV</td>
<td>230 µV</td>
<td>340 µV</td>
<td>295 µV</td>
</tr>
</tbody>
</table>

*See text.

referring it to the input of the line amplifier. Results are shown in Table III. Although amounts of noise per se in the audio band are perfectly acceptable with the 30-dB attenuation setting, which is representative of what the unit does under normal conditions, I feel that the amount of switching noise indicated by the wideband reading with the attenuation set at zero is a bit much from a technical standpoint. Who knows, though; it might differ the following power amplifier and make it sound better!

RIAA equalization error of the phono stage is plotted in Fig. 15 for left and right channels with instrument loading; these are the top two curves in the figure. Equalization accuracy of the left channel is very, very good. Shown in the bottom two curves is the effect of IHF loading and, interestingly, the effect of switching the monitor to tape input, thereby unloading the phono preamp output from driving the following circuitry. This rise in the low-end response also occurs for higher impedance loading of the tape output on phono function. It does have a subtle consequence that you might not think about, in that when you are recording from phono onto tape and are monitoring the tape, the recorded low-frequency response would change by the amount shown in the figure.

Figure 16 illustrates response to pre-equalized square waves through the phono section. Results are shown for the less flat (right) channel. Again, the effects of IHF loading are seen in the multi-plots for each frequency. Generally speaking, the waveforms look pretty good. Asymmetrical behavior, the result of high-frequency loading, started to set in at about ±1.5 V output, 50% greater output than shown in the figure.

Distortion behavior of the phono circuit, like that of the line amplifier, was very consistent between channels, so subsequent discussion on distortion will be for the left channel. The phono circuit's THD + N was quite uniform over the audio range with either instrument or IHF loading. At 1 V output, it was on the order of 0.018% with the instrument load and rose to about 0.5% with the IHF load. Like the line amplifier, the phono circuit will drive 10 kilohms with higher distortion but otherwise with few ill effects.

Figure 17 shows one of the many neat things that I can easily configure my fabulous Audio Precision measurement machine to do. This is a plot of phono overload as a function of frequency, showing the attainable output level as a function of frequency and loading at a specified regulated dis-
Your old record or CD player can put you $150 closer to the Luxman DC-114, arguably the world’s finest CD changer. The Luxman DC-114 is the ultimate upgrade for your CD listening pleasure. If you’re really serious about the quality of audio reproduction in your home, you won’t settle for anything less.

Here’s why we can call the DC-114 fully-featured, fully-programmable CD changer “the ultimate” without blushing:

- Duo-Beta circuitry.
- STAR circuit topology.
- Voltage-driven amplification.
- Two 18-bit, 8x Oversampling D/A converters.
- Handtrimmed MSB potentiometers for improved linearity.
- High-precision transport.
- Fully compatible with all Alpine CD changers for the car.

- Six disc magazine plus single play drawer.
- 5-year parts and labor warranty.

The $150 Trade-Up Special.

Take any record player or CD player to a participating Luxman dealer and get a $150 credit toward the purchase of the state-of-the-art Luxman DC-114 compact disc changer from the manufacturer’s suggested retail price of $800. Think of how many CDs you can buy with the $150 you save. And you’ll hear them the way they were meant to be heard — with the purity and clarity of Luxman sound reproduction.

Sonic characteristics of Berning's amp and preamp complement each other nicely when the units are paired together.

Table IV—Phono section noise, referred to input. Switching noise dominated the wideband and A-weighted 100-ohm measurements for both channels and the left-channel A-weighted figure for IHF loading. The IHF S/N was 72.4 dB for the left channel and 74.0 dB for the right.

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>Source Impedance</th>
<th>Referred Input Noise, µV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LEFT</td>
</tr>
<tr>
<td>Wideband</td>
<td>100 Ohms</td>
<td>2</td>
</tr>
<tr>
<td>22 Hz to 22 kHz</td>
<td>100 Ohms</td>
<td>0.72</td>
</tr>
<tr>
<td>400 Hz to 22 kHz</td>
<td>100 Ohms</td>
<td>1.3</td>
</tr>
<tr>
<td>A-Weighted</td>
<td>100 Ohms</td>
<td>1.2</td>
</tr>
<tr>
<td>A-Weighted</td>
<td>IHF Load</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Use and Listening Tests

Signal sources used to evaluate the Berning gear included an Oracle turntable fitted with a Well Tempered Arm and Spectral Audio MCR-1 Select MC cartridge, a Magnavox CDB-560 CD player feeding a Wadia 2000 decoding computer, a Nakamichi 250 cassette deck, a Nakamichi ST-7 tuner, and a Technics open-reel recorder. My reference setup includes a selector-switch and switched-attenuator unit that I built; my reference tube preamp is one selectable source. Other high-level sources, like the CD system or the Vendetta Research SCP-2B MC phono preamp that I use for playing records most of the time, are selected for listening with this control unit. Power amps on hand included a pair of Carver Silver Sevens, my reference EAR 519s, an Air Tight ATM-1, and a reference set of Cary Audio CAD-50s. A Gryphon Audio preamp was in residence for the latter part of the review period. Speakers used were pairs of the Spica Angelus, Siefert Research Magnum III, and Martin-Logan Monolith III. I also used experimental two-way systems loaned to me by Arnold Nudell.

I listened to the EA-2101 amp on all of the speakers mentioned above and would characterize its sound as very spacious and detailed, with a tendency to some upper midrange irritation or edginess. Compared to some of the tube amps I had on hand, the EA-2101 sounded a little underdamped in the low end. Every time I would hook it up, I would say, "Wow, listen to that!" But after using it for a while, it would begin to irritate me. I should mention that I am perhaps overly sensitive to this phenomenon; others could just as well respond only positively to the amp’s qualities.

I approached the sonic evaluation of the TF-12 preamp by comparing the sound of the line amplifier with my reference input selector switch and level attenuators. I can report that the TF-12 did a good job of preserving the music. The differences I noted were sins of omission, subtractive in nature. Detail and space were softened a bit, and the overall believability of the music was accordingly reduced. Playing vinyl discs through the whole preamp produced a nonirritating sound that was perhaps a shade too soft.

It sure was nice to have the remote volume control when using this preamp! I am beginning to think that being able to get the "just right" volume at the listening position via a remote is really almost a necessity in order to get the most out of your system. When I used the remote muting function, there was a mild pop when coming out of mute.

When I paired the Berning units together, their individual characteristics were complementary, and the overall sound was very listenable and musical indeed. The amplifier’s tendency to be slightly irritating came through on some material but not nearly as much as when used alone. In summary, I think the Berning gear is technically innovative and that it produced some very good sound in my environment. I would definitely recommend going out and giving this amp and preamp an audition.

Bascom H. King
CREATION
OF A NEW
GENERATION

Hafler
"THE AFFORDABLE HIGH END"

Hafler's passion for audio excellence unleashed the power of a new dimension of audio products: The Series PC00.

The uncompromising pursuit to maximize sonic performance has resulted in a line of audio products that rival the world's best high-fidelity components - at very modest prices. The synergy that emerged from the combination of leading audio experts, and the highest quality circuitry (like the patentec trans nova circuitry) has empowered Hafler to offer a new 7 year warranty.

Experience the Hafler difference. Call today for the dealer nearest you.

Hafler, a division of Roadrock Corporation, Tempe, Arizona 85281 U.S.A. (602) 967-3565 In Canada, call Korban Trading (416) 567-8990 In Europe, FAX (31) 1726-1364 In Pacific Asia (65) 339-0364

Enter No. 22 on Reader Service Card
**EQUIPMENT PROFILE**

**WESTLAKE AUDIO**

**BBSM-6F SPEAKER**

Manufacturer's Specifications

**System Type:** Three-way, vented-box system.

**Drivers:** Two 6-in. cone woofers, 3½-in. cone midrange, and 1-in. soft-dome tweeter.

**Frequency Response:** 60 Hz to 18 kHz, ±3 dB, on axis.

**Sensitivity:** 91 dB, ±0.5 dB, at 1 meter, with 2.83 V rms applied.

**Crossover Frequencies:** 600 Hz and 6 kHz, both 24 dB/octave, phase-compensated within 30°.

**Impedance:** 4 ohms nominal, 2 ohms minimum.

**Nominal Power Rating:** 80 watts below 600 Hz, 50 watts from 600 Hz to 6 kHz, 30 watts above 6 kHz.

**Recommended Amplifier Power:** Minimum of 100 watts per channel.

**Dimensions:** 22 in. W x 10¾ in. H x 13 in. D (55.9 cm x 27.3 cm x 33 cm)

**Weight:** 50 lbs. (22.7 kg) each.

**Price:** $2,400 per pair in oiled walnut (BBSM-6F) or black utility (BBSM-6); optional BWI-0410 bi-wire cables, $446 per pair.

**Company Address:** 2696 Lavery Ct., Newbury Park, Cal. 91320.

For literature, circle No. 91

---

Westlake Audio is best known in the professional sound market, where they are a major supplier of monitors for recording studios. Westlake Audio’s extensive monitor line consists of 15 systems ranging from the small, $1,600/pair BBSM-4F two-way direct-radiator design up to the massive, five-way SM-1F that can be purchased complete with electronic crossovers and pedestal for $50,000 per pair!

I evaluated the third system in Westlake’s monitor line, the BBSM-6F direct-radiator system, which represents their first entry into the consumer market. According to the specification sheet, the BBSM-6F has been designed for “wide bandwidth, low IM distortion, good power handling, pinpoint stereo imaging, and a coherent wavefront...” The most distinguishing feature of the BBSM-6F is its use of dual...
The Most Economical
Of Adcom's Award-Winning, Best Selling,
Critically Acclaimed Amplifiers Is...
Adcom has built its reputation on building a family of amplifiers which has consistently outperformed components costing two and three times as much. The breakthrough GFA-555 "...went on to become one of the best-selling amplifiers of all time" and is now available as the improved GFA-555II. The new GFA-545II follows in the footsteps of the ever-popular GFA-545. And, the 300 watt GFA-565 mono amplifier continues to astound serious music lovers with its awesome display of pure power.

Now, following the success of the value-packed GFA-535, Adcom introduces its new 60-watt-per-channel GFA-535II. Although its power rating is conservative, its ability to provide pure, distortion-free performance is no small wonder. And, its power output may be considered more than adequate for most home applications using loudspeakers of at least moderate efficiency.

The Adcom Hallmark Of High Current Output

A major factor contributing to the superior performance of all its amplifiers is Adcom's understanding of the benefits derived from high current output design. The ability to deliver large amounts of current instantaneously and continuously into varying load conditions is a true test of an amplifier's performance. In fact, it is this demanding condition of varying impedances and reactive loads that causes most other amplifiers to become unstable and shut down. Adcom high current amplifiers, on the contrary, are designed to cope with these real-life conditions and perform without stress.

Specifically, the Triple-Darlington output stage of the GFA-535II is designed to reduce the effects of speaker impedance variations thereby minimizing...
distortion throughout the entire audio spectrum even when driving difficult speakers.

While the GFA-535II is the smallest of the Adcom family, it shares the same high-current design philosophy that has made its bigger brothers so highly respected.

Additionally, by taking advantage of direct coupling, Adcom eliminates the use of coupling capacitors and their inherent tendency of introducing subtle, but detectible distortion. Its circuitry also keeps the damping factor high at all frequencies, lowers phase shift and improves performance into all speakers systems including electrostatics.

**Keeping Cool Even Under The Most Difficult Conditions**

The cooler an amplifier operates, the longer its life will be. Over time, excessive heat build-up causes component values to change, if not break down.

The new Adcom GFA-535II incorporates several improvements designed to minimize heat build-up. Larger heat sinks for each channel increase heat dissipation while improving dynamic bias tracking. Greater overall thermal stability has been achieved.

More cooling vents on the top cover and chassis also contribute to the GFA-535II’s cooler operation, even when driving speakers of lower impedances.

Sustained and excessive high power operation may activate a thermal overload protection circuit which will be indicated by an LED on the front panel. When the GFA-535II cools to a safe temperature, its operation is automatically restored. This protection feature assures the continued, long life of the GFA-535II.

*Stereophile, October 1990*
Details You Can Hear

Many other refinements have been incorporated into the new GFA-535II to improve its performance and make it an even better value.

Higher grade power supply filter capacitors have been utilized to provide greater power delivery at low frequencies and lower distortion.

A new servo circuit reduces DC voltage at the output. This minimizes woofer cone offset with no signal present, which not only can degrade short term speaker performance, but can reduce their life expectancy because of higher voice coil temperatures.

Even the smallest details are considered important at Adcom. Higher quality, gold-plated input jacks feature Teflon insulators for quieter, dependable source connections. Upgraded gold-plated binding posts make speaker hookups easy, secure and loss-free.

More Sound, Less Money

All Adcom components are known for their high value, consistently offering superior performance at a reasonable cost. The GFA-535II is perhaps the finest example of Adcom’s ability to deliver extraordinary value. Sharing many of the technical breakthroughs of Adcom’s bigger models, the GFA-535II provides the remarkably lifelike sound of Adcom, yet at a moderate power level.

The GFA-535II is perfect for those who appreciate state-of-the-art performance and do not require high power levels. For a minimum investment, it is a popular entrée into the world of high-end audio.

Specifications
(to FTC Requirements)

Power output, watts/channel, continuous, 20 Hz - 20 kHz, 
<0.04% THD: 8 ohms/60
4 ohms/100

Signal-to-noise ratio, A-weighted, 60 watts into 8 ohms: >110 dB

Input impedance: 100,000 ohms

Input sensitivity:
60 watts into 8 ohms: 0.97 V rms
1 watt into 8 ohms: 130 mV rms

Damping factor (20 Hz - 20 kHz): >180

Dynamic headroom into 4 ohms: 3.0 dB

Chassis dimensions: 3" (76mm) x 17" (432mm) x 11 1/4" (286mm)

Maximum dimensions: 3 3/8" (86mm) x 17" (432mm) x 12 1/2" (317mm)

Shipping weight: 23 lbs. (10 1/2 kg)

Available options:
RM-3 rack mount adaptors.
White front panel.

The Adcom GTP-400 Tuner/Preamplifier and GFA-535II has been called the "Cure for the Common Receiver." This combination offers all the advantages of Adcom separate components for about the price of a common receiver.

The Adcom GCD-575 CD Player with Remote Control is a perfect complement to your Adcom music system.

The Adcom GTP-500II Remote Control Tuner/Preamplifier offers superior performance and the convenience of remotely controlling your music system from different rooms.

ADCOM
11 Elkins Road, East Brunswick, NJ 08816 U.S.A. (908) 390-1130
Distributed in Canada by PRO ACOUSTICS INC. Pointe Claire, Quebec H9R 4X5

Enter No. 4 on Reader Service Card
woofers in a horizontal, side-by-side, configuration. This configuration is common to all of Westlake’s monitors and is primarily driven by the desire of most studios to have a monitor that has ample low-frequency acoustic output but is mounted in a box that is wider than it is tall, to fit their space requirements.

The BBSM-6F has a tweeter centrally mounted, above the midrange, and is flanked by the two woofers and their associated vented-box ports. Its totally symmetrical design eliminates the need for dedicated right and left systems. The front-panel driver placement of the BBSM-6F facilitates the speakers’ use as so-called “near-field” or “close-field” monitors in the studio. Recording engineers typically will place small monitors (believe it or not, these systems are quite small compared to typical behemoth studio monitors) on the top rear of the recording console, which places them within only 2 to 3 feet of the listener. Westlake Audio claims that you can even listen to the BBSM-6F’s as close as 18 inches away without sacrificing any of the system’s imaging qualities.

The enclosure is fairly large and quite heavy, considering the size of the woofers. Most of the crossover is mounted on the detachable rear panel of the BBSM-6F, with the remaining portion behind one of the woofers. Connection is made through a large barrier terminal strip on the rear of the system. The high- and low-frequency portions of the crossover are separately connected to the terminal strip, to facilitate bi-wiring. Westlake Audio sells a fairly extensive line of single and bi-wire cable assemblies for use with their systems. The review samples were supplied with a set of 10-foot bi-wire cables using 4-AWG conductors.

Removing the system’s drivers revealed a tight-fitting, well-constructed enclosure using all ⅜-inch-thick medium-density fiberboard. Diagonal braces are used inside both ends of the enclosure to strengthen the side walls. The midrange is housed in a separate enclosure attached to the rear panel of the main enclosure by a brace to minimize vibration. All inside surfaces of the enclosure are covered with thick fiberglass; the midrange enclosure was completely stuffed. Curiously, the magnetic pot structures of all the drivers were completely covered with a rubber-like adhesive or damping material similar to a silicone compound used for caulking bathtubs.

Removing the cabinet’s rear panel (which is attached by 21 screws!) exposed the main part of the crossover, which is constructed point-to-point on the rear panel and takes up most of the panel’s area of 9 × 20 inches. This complex crossover consists of 30 parts: 10 inductors, 11 capacitors, and nine resistors. All inductors are air-core. Most capacitors are high-quality, ±5% Solen brand parts, the largest of which is a 200-μF unit 2¼ inches in diameter and 2¼ inches long! The high-frequency portion of the crossover is wired on a hardboard panel separately mounted behind the right woofer. The crossover of the BBSM-6F is one of the largest and most complex I’ve seen, second only to the extremely large network of the Thiel CS5 (reviewed February 1991).

All connections to the drivers consisted of stranded, 12- and 14-gauge hookup wire that was soldered to the driver terminals rather than attached by clips. However, in a number of places in the crossover, the workmanship left some-thing to be desired. Many solder connections were not mechanically secure and were held only with solder. When I removed the rear panel, one set of leads connecting the hot terminals of the woofers to a terminal strip on the crossover board became unattached due to a cold-solder joint.

The crossover consists of a sixth-order, low-pass filter (three capacitors and three inductors) driving the woofers and a fourth-order, high-pass filter driving the midrange. The 6-kHz crossover was formed by a sixth-order low-pass for the midrange and an eighth-order high-pass for the tweeter (four series capacitors and four shunt inductors to ground)! The manufacturer did not state the crossover design philosophy except to mention that high-order roll-offs were used for all transitions.

Fig. 1—One-meter, on-axis, anechoic frequency response, for an input of 2 watts into 4 ohms (2.83 V).

Measurements

Figure 1 shows the anechoic, on-axis, equivalent 1-meter frequency response, smoothed with a 10th-octave filter, for 2.83 V rms input (2 watts into the rated 4 ohms). The curve was taken at 2 meters and referenced to a distance of 1 meter; the microphone was normal to the enclosure’s front surface, midway between the midrange and tweeter (which happens to correspond to the actual center of the box’s front panel). Also shown is the effect of the grille on the response. The grille added significant deviations in the response above 1 kHz of about +2, −3 dB, with a boost in the range from 1 to 3 kHz and a depression between 3 and 7 kHz. Interestingly, I noted that Westlake Audio’s instructions recommend that the grille be removed for calibrated accuracy and not to “disturb dispersion and frequency response.” I agree! All other tests were made with the grille removed.
The woofers had a linear excursion capability of 0.3 inch peak to peak and a limit of 0.7 inch, quite good for 6-inch drivers.

The phase response exhibits a moderate total phase rotation of about 290° between 1 and 20 kHz. A comparison of the average group delay of the midrange (2 to 6 kHz) to the tweeter’s range (10 to 20 kHz) indicates that the midrange driver lags the tweeter by about 0.15 mS. Although this time offset is fairly short, it is nearly one wavelength at the relatively high, 6-kHz crossover.

The energy/time response of the BBSM-6F is shown in Fig. 3. Because the linear sweep from 200 Hz to 10 kHz is roughly centered over the 6-kHz crossover, the main peak at 3 mS contains roughly equal contributions from the midrange and tweeter. The 90-dB main arrival at 3 mS is quite compact and only exhibits broadening at levels below 70 dB SPL, with a couple of lower level returns between 3.8 and 4.2 mS. A perfect energy/time response curve would appear as a single sharp spike centered at 3 mS, with a width of about 1 mS at the base (50-dB line) and tapering to a rounded point at the top.

A high-level, low-frequency sine-wave sweep revealed no significant cabinet side-wall resonances. A comparison of the woofer’s excursion with the port open and covered by hand demonstrated that the port reduced the woofer’s excursion a good 60% at the 42-Hz Helmholitz box-resonance frequency. The woofers did exhibit significant dynamic offset in the range from 70 to 160 Hz (also between 25 and 36 Hz) above 8 V rms, where the cones displaced outward. In addition, at 34 Hz with levels above 10 V rms, the low-frequency drivers would go into a strange half-frequency subharmonic oscillation mode, where the cone would visually vibrate at about 17 Hz. Presumably this nonlinearity was also related to the same problems that generate dynamic offset. Port noises were minimal at high drive levels. However, at high input levels and near the 42-Hz box tuning, port air velocity was very high. At 42 Hz, an input of 17 V rms generated port air blasts that would blow out a match 5 feet away. (Yes, I really tried this.)

The woofers’ linear excursion capability was a good 0.3 inch peak to peak, with an excursion limit of about 0.7 inch peak to peak, quite good for 6-inch woofers. The woofers overloaded gracefully at high levels, with no objectionable noises. The effective piston diameter of the 6-inch woofer (actual outside frame diameter was 6½ inches) was about 5 inches (measured from the middle of the surround on one side to the middle of the surround on the other). The air-moving capability of the two 6-inch drivers corresponds roughly to that of a single 8- or 9-inch driver of the same excursion.

Figure 4 is a “3-D” plot of the BBSM-6F’s responses on and off the horizontal axis. For a system with perfect off-axis response, all the off-axis curves would have exactly the same shape as the on-axis curve (the bold curve at the rear of the diagram), including any aberrations seen in the on-axis curve. The curves seen here are fairly well behaved and indicate good wide horizontal high-frequency coverage. The off-axis ridge between 1 and 3 kHz indicates some broadening of the polar response, presumably related to box dimensions. The vertical response curves are shown in Fig. 5, with the on-axis response shown as a bold curve halfway between the front and rear of the plot. The white space in the middle
AudioControl is the world's leading manufacturer of high quality equalizers and spectrum analyzers.

We are the best because we specialize in forming a perfect match between stereo components and listening rooms. We are the best because of our pro sound heritage, passion for musical pleasure, quest for the highest possible quality, and adherence to our principles for the last 14 years. Built in the USA. Five year warranty.

AudioControl

making good stereo sound better

22313 70th Avenue West • Mountlake Terrace, WA 98043 • Phone 206/775-8461 • Fax 206/778-3166

Shown the finest products ever from AudioControl - the new C-131 one-third octave, constant Q precision equalizer and companion R-130 one-third octave real time spectrum analyzer.

Enter No. 6 on Reader Service Card
Maxell XLII-S achieves new highs in Maximum Output Levels, offers wider dynamic range, along with significant reductions in AC Bias Noise and Modulation Noise. This is an all-new Maxell audiotape formulation capable of blowing you away like never before.

We started from scratch, creating XLII-S from the base-film up. In fact, the base-film is unlike anyone else’s and our patent on it is pending.

We call it “dual-surface base-film.” One side is smooth, the other rough. The smooth side provides the sound and the rough side provides a stable, non-sticky ride through the tape deck’s transport mechanism with the least possible tape jitter.

Excessive tape jitter causes phase deviation which results in echo “shading.” Musically, this would make the violinists in a symphony orchestra sound as though they were strolling around the stage instead of sitting still. You don’t want gypsy violinists wandering through your symphony.

The standard magnetic coating on nearly all audiotapes today consists of gamma ferric oxide particles.

But standard wasn’t what we were shooting for when we developed XLII-S. Instead, we harnessed a higher energy magnetic particle we call Black Magnetite. It has 13% greater magnetic power and is a major contributor to the outstanding MOL of this new tape.

Another is the superior dispersion technique we employ in placing the Black Magnetite particles onto the tape.
During manufacture, some tapes are run through a magnetic field and the magnetic particles adhere to the film in a willy-nilly, helter-skelter pattern—similar to the arrangement you’d find on the end of a magnet if you dunked it into a bowl of metal filings.

At Maxell, we use a unique and complex process called “multi-orientation.” Simply stated, it allows us to place smaller, Black Magnetite particles onto the tape in greater density, in near perfect alignment. The result is a smoother, more uniform coating which produces less AC Bias Noise.

Finally, there’s a newly engineered cassette shell that doesn’t merely house the tape. It contributes to the tape’s outstanding performance.

Through the use of a new composite material—a blend of ceramic and polymer resins—we created a high resonance-damping cassette shell. More rigid and weightier than standard cassettes, it reduces modulation noise and helps maintain phase accuracy. Also, by making the window smaller, we were able to improve the cassette’s overall structural integrity, building in five support points instead of the standard three.

All in all, we think you’ll find that Maxell XLII-S is the finest High Bias audio cassette available today.

Make it your first choice for program material that demands the highest standards of performance. Buying anything less is like knowingly setting out to take your music to the min.

The XLII-S Performance Story.

XLII-S vibration-damping cassette shell has five support points for increased rigidity and durability.

TAKE YOUR MUSIC TO THE MAX.

Enter No. 28 on Reader Service Card
Up/down behavior is quite symmetrical because the directional lobe is aimed straight ahead, just as it should be.

![Figures 4 and 5: Horizontal and vertical off-axis frequency responses.](image)

**Fig. 4—Horizontal off-axis frequency responses, taken from the front, around the side, and to the rear of the speaker.**

**Fig. 5—Vertical off-axis responses, taken from below, up the front, and to the top of the speaker.**

**Fig. 6—Mean horizontal responses, derived from data of Fig. 4.**

**Fig. 7—Mean vertical responses, derived from data of Fig. 5.**

of the graph indicates increased directivity in the upper crossover region, from 4 to 8 kHz. Only the on-axis and ±5° curves are relatively flat through this region; the high crossover frequency of 6 kHz is the main contributor to this problem. Not shown clearly in the graph is the system's very symmetrical up/down response behavior through the crossover region, which indicates that the tweeter and midrange are essentially in phase with each other. This means that even though the system is quite directional vertically throughout the crossover region, the directional lobe is aimed straight ahead (minimum lobing error), precisely as it should be.

Figures 6 and 7 show, respectively, the horizontal and vertical on- and off-axis response curves. The mean axial (+15° to -15°) horizontal response curve in Fig. 6 is quite flat and extended except for some high-frequency roll-off above 17 kHz and a slight dip in the region from 8 to 10 kHz. The 30° to 45° mean response is fairly similar to the axial curve but exhibits a gentle downward trend above 2 kHz and a sharp roll-off above 12 kHz. The 60° to 75° off-axis response is much rougher than the previous two responses, with higher directivity below 1 kHz and a more rapid roll-off above 3 kHz. The similarity of the three curves through the area from 1 to 3 kHz shows the loss of directivity noted earlier in the “3-D” curves of on- and off-axis response.

Figure 7 shows the vertical responses of the BBSM-6F. The mean vertical axial curve (+15° to -15°) is rough between 1 and 4 kHz and has a hole at crossover, between 4 and 7 kHz. Examination of the individual curves that comprise the mean axial response (not shown) indicated that up/down behavior was quite symmetrical but that high side-to-side directivity made the responses beyond ±5° exhibit a hole at crossover. The lower curve in Fig. 7, an average of just the -5°, 0°, and +5° responses, is much
Parasound announces our world-class amplifier, designed by John Curl.

World-renowned over 20 years for his brilliant advances in high-end audio. You can feel his genius in the stunning new HCA-2200.

Hear it now.

Parasound
Affordable audio for the critical listener

- 50 amp continuous, 90 amp peak current
- 220 watts/ch. 8Ω, 365 watts/ch. 4Ω or 2Ω
- 750 watts mono 8Ω, 1,000 watts mono 4Ω
- 130V/µsecond slew rate, DC servo coupled
- Dual-mono twin 1200VA toroid transformers
- 100,000µF computer grade capacitors
- Independent regulation of Mosfet drivers
- Matched complementary J-FET inputs
- 24 β-matched 60MHz, 15A output transistors
- Balanced XLR and gold unbalanced inputs
- Two pairs of 5-way terminals for bi-wiring
"Kinergetic's KCD-20... the first CD player to crack the Class 1 Sound barrier"
Peter Montcriaff
"International Audio Review", Hotline #43-45.

"...Kinergetics KCD-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.

"...Kinergetics offers its purchaser more than a glimpse of what the best CD sound is all about."
John Atkinson
Stereophile Vol. 13, No. 1.

"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."
Dick Olsher
Stereophile Vol. 13, No. 1.

"Kinergetics pulled off what I considered to be a near miracle. They successfully integrated a subwoofer with the twitchy Martin-Logan CLSes... the tonal balance through the lower octaves was just right. The deep bass and midbass were tight and well-detailed"
Dick Olsher
Stereophile Vol. 13, No. 3.

We will continue to create improvements in areas of psychoacoustic that others have yet to discover.

KINERGETICS RESEARCH
5029 Reseda Blvd., Tarzana, CA 91356
818/345-5339 Fax: 818/699-8576
Enter No. 25 on Reader Service Card
smoother. This indicates that a listener must be within approximately ±5° of the axis vertically to hear a smooth response. The 30° to 45° response is significantly smoother than the on-axis averaged response but has greater high-frequency roll-off. The 60° to 75° mean response exhibits even greater high-frequency roll-off coupled with a hole in the frequency range from 3.5 to 6 kHz.

The BBSM-6F's impedance, from 10 Hz to 20 kHz, is shown in Fig. 8. Immediately evident is the amplifier-punishing impedance low of 1.9 ohms at 140 Hz. Between 100 and 500 Hz, the system's impedance does not rise above 2.2 ohms! Only amplifiers with high current capability should be used with the BBSM-6F. The system's minimum impedance of 1.9 ohms, coupled with its passband maximum of 13 ohms (a ratio of 6.8), make the BBSM-6F very sensitive to cable resistance. To keep cable-drop effects from causing peaks and dips in response greater than 0.1 cB, cable series resistance should be limited to a (very low) maximum of about 0.026 ohm. This means that cable no smaller than 10 AWG should be used for a typical 10-foot run.

Figure 9 shows the complex phase plot of the BBSM-6F's impedance, over the range from 8 Hz to 30 kHz. The smoothly changing spirals indicate an absence of resonance problems. The impedance phase angle (not shown) reached a maximum of +39° at 28.8 kHz, which is above the audible range, and a minimum of −59° at the bass frequency of 72 Hz.

Westlake Audio supplied optional cables designed for biwiring (feeding the crossover's high- and low-pass sections with separate cables from the same amp terminals). An excellent recent engineering report by Fred E. Davis ("Effects of Cable, Loudspeaker, and Amplifier Interactions," Journal of the Audio Engineering Society, June 1991) prompted measurements of the two cables by comparing the voltages at the amplifier and speaker ends of the cable during a frequency sweep from 20 Hz to 20 kHz. The Straight Wire cable I ordinarily use has an almost linear attenuation of between 0 and 0.1 dB over the frequency range, with maximum attenuation at the BBSM-6F's impedance minimums. In contrast, the Westlake Audio cable had a relatively low attenuation of about 0.02 dB up to 7 kHz, a slight boost of about 0.02 dB in the range from 2.5 to 5 kHz, and a roll-off above 7 kHz that reached −0.27 dB at 20 kHz. This roll-off is due to the high inductance of the large 4-gauge wire used in this cable, and the 0.02-dB boost is due to resonance of this inductance with the capacitive reactance of the speaker system's input impedance.

The 3-meter room curve of the system, including both raw and sixth-octave smoothed responses, is shown in Fig. 10. The BBSM-6F was located in the right-hand stereo position, aimed at the listening location, and the mike was placed at ear height (36 inches) at the listener's position. The system was swept from 100 Hz to 20 kHz with a sine-wave signal at 2.83 V rms (corresponding to 2 watts into the 4-ohm rated impedance). The parameters of the test sweep were chosen so that the direct sound plus 13 mS of the room's reverberation were included. The curve is fairly flat and extended except for some midrange emphasis between 480 Hz and 1.8 kHz and room-effect response roughness at lower frequencies.

Distortion drops rapidly, from the significant to the unmeasurable, as frequency rises from 41.2 Hz (E1) to 440 Hz (A4).
Perfect for an E&J and soda.
The BBSM-6Fs render drum rim shots and such quite realistically, and on high-level playback of jazz or rock, they really boogie!

Distortion with increasing power of musical notes $E_1$ (41.2 Hz) and $A_2$ (110 Hz) is shown in Figs. 11 and 12. No graph for $A_4$ (440 Hz) is shown because the distortion products were below the measuring capability of my equipment.

The $E_1$ (41.2-Hz) harmonic distortion data shows that full-power second- and third-harmonic distortion reaches a significant 18% to 19%. At 41.2 Hz, 100 watts generates a loud 100.5 dB SPL at 1 meter. In the $A_2$ (110-Hz) harmonic data shown in Fig. 12, the second harmonic reaches a significant 14.1% at full power, with the third reaching only 1.5%. Interestingly, the third reaches an intermediate maximum of about the same level at a lower power level. At 110 Hz, the Westlake system generates a loud 1-meter level of 108 dB SPL at 100 watts.

The IM on a 440-Hz ($A_4$) tone, created by an equal input level 41.2-Hz ($E_1$) tone, is shown in Fig. 13. At full power, the distortion reaches a moderate 10%.

After the sine-wave distortion tests, an examination of the crossover network revealed that the tests had severely overheated a resistor in the bass leg of the network. This resistor, a 0.33-ohm, 5-watt unit (marked R1 on the schematic), is in series with the large 200-µF capacitor mentioned previously. Fortunately, the resistor continued to work and did not require replacement.

The system’s short-term peak input and output power capabilities for tone bursts are shown in Fig. 14. The peak input power was calculated by assuming the measured peak voltage was applied across the rated 4-ohm impedance. At frequencies where the BBSM-6Fs impedance is much lower than 4 ohms, the actual input power is higher.

The maximum peak electrical power-handling capacity of the BBSM-6F is shown in the lower curve of Fig. 14. Above 200 Hz, the power limit of my Crown Macro Reference amplifier was reached before the speaker’s limit was reached. Between 70 and 160 Hz, the input power was limited by the dynamic offset of the woofers, where the cones would visibly move forward during the burst.

The upper curve in Fig. 14 shows the maximum peak sound pressure levels the BBSM-6F can generate. Also shown is the “room gain” of a typical listening room, which adds about 3 dB to the response at 80 Hz and 9 dB at 20 Hz. Above 600 Hz, the peak maximum output rises to a loud 126 dB! With room gain, a single BBSM-6F can generate peaks in excess of 110 dB SPL above 42 Hz, and 120 dB above 180 Hz. Even higher low-frequency peak levels can be expected for two systems operating in a standard stereo configuration.

Use and Listening Tests

Westlake Audio provides excellent use and setup information for the BBSM-6Fs. Their professional roots show in a series of very detailed application notes that cover everything from cabling and bi-wiring to setup information. An application note was even supplied for the proper procedures for driver replacement. The caliber and amount of technical information supplied in these notes exceeds any that I have received from other manufacturers.

In general, Westlake Audio recommends a fairly dead acoustical environment for the BBSM-6Fs. This includes treatment of all reflecting surfaces between the system and...
ANNOUNCING THE NEW GENERATION OF BRYSTON AMPLIFIERS

The new 7B and 4B amplifiers represent our next generation of amplifiers; a culmination of nearly two decades of research into the art and science of accurate audio amplification.

Bryston's design goals of superb sound quality, excellent value, and long term reliability has resulted in a new series of amplifiers unequalled in previous designs. An all new physical layout provides improvements in dissipating the heat generated by the high current demands of the latest versions of some loudspeakers. Completely revised power supplies provide superb high frequency isolation and reductions in noise and distortion. Selectable gold plated RCA or balanced XLR input connectors provide flexibility for different system requirements. Bryston's new custom made capacitors lower internal resistance for even more instantaneous current delivery providing a transparency and clarity not previously available.

The new Bryston 7B and 4B amplifiers exemplify Bryston's continuing commitment to "lifetime" products with extreme long term reliability as expressed by our full 20 Year Warranty.

Bryston believes these new amplifiers result in a new classic design which preserves the unique combination of strengths which were embodied in our original designs, while offering genuine advances in every area.

We invite you to experience the new generation of Bryston 7B and 4B amplifiers. We think you'll agree that the new cosmetics coupled with the extensive improvements in power delivery provide an amplifier with unquestioned superiority in sound quality, value and reliability.

20 YEAR WARRANTY - A GENERATION OF MUSIC

Bryston Ltd. Telephone (416) 746-1800
Fax (416) 746-0308
Brystonvermont Ltd. Tel: 1-802-223-6159
Enter No. 12 on Reader Service Card
In a relatively small package, the BBSM-6Fs deliver even coverage, high output, accuracy, and smoothness.

![Graph showing maximum peak input power and maximum peak sound output vs. frequency at 1 meter on axis.](image)

Fig. 14—Maximum peak input power and maximum peak sound output vs. frequency at 1 meter on axis.

... listener that might generate potential interfering acoustic signals. They state that the "best sound and imaging will usually occur when the speakers are focused directly at the listener." Detailed alignment instructions are included to ensure that the distances from each speaker to the listener's head are matched to within 1/8 inch. Fortunately, these setup instructions agree quite closely with the way I normally evaluate systems, with the possible exception of the dead environment.

The input connector of the BBSM-6F is a large, heavy-duty, four-terminal barrier strip with high- and low-frequency portions of the system separately connected. Short, heavy-gauge wires with spade lugs attached are provided to connect these sections in parallel when the system is not bi-wired. Although Westlake Audio provided a well-constructed set of heavy-gauge cables for bi-wired operation, I did not bi-wire the systems for my listening. This was partly due to the results of the cable measurements mentioned previously as well as for convenience.

The review systems were supplied in a very good-looking oiled walnut finish with brown grilles. With grilles on, the systems are quite handsome, accented with a rectangular cutout on the lower right of the grille displaying a silver nameplate with black and red lettering. However, with grilles off, the systems take on a heavy-duty, business-industrial look that doesn't quite fit the domestic environment. I did all my listening with the grilles off, as Westlake recommends.

For listening, I mounted the speakers horizontally on stands (not provided), which placed them so that the center of each box was about 32 inches high. As this height was about 4 inches lower than I desired, I slightly adjusted the stands' feet to tilt the box axis upward, so that it was aimed at my head. The horizontal orientation of the boxes initially looked strange as compared to the normal vertical orientation of other similarly sized speakers.

Initial listening revealed a system that was significantly more sensitive than my reference B & W 801 Matrix Series 2. The Westlake Audio BBSM-6Fs had good overall balance and excellent imaging; however, they had significantly less bass impact than the reference and a somewhat forward sound. The BBSM-6Fs just about equaled the high-frequency smoothness and extension of my reference but exhibited some midrange tonal differences that were not to my taste.

The BBSM-6F's excellent peak output and dynamic range capability were demonstrated very well on Hiroko Kokubu's *Light and Color* CD of Brazilian-style music (JVC VIC61), which I recently brought back from Japan. The dynamic range and high-level cleanliness of the systems were demonstrated by their reproduction of Carl Czerny's four-hand piano works played by Tal and Groethuysen (Sony SK 45936). The Westlake speakers exhibited a smooth upper midrange and treble, which allowed me to follow very nicely the individual flute parts over the harpsichord and piano backing on the Rampal, Kudo, and Ritter CD of music by Telemann, Kuhlau, Bach, Mozart, and Doppler (Sony Classical SK 46482). The systems portrayed a very realistic room sound and reverberation decay on the same CD.

Only slight tonal changes were evident on the pink-noise stand-up/sit-down test, with the change mainly occurring only in the stand-up position. The BBSM-6F's low-frequency output on third-octave band-limited pink noise was quite strong at 40 Hz and above. In the 31.5-Hz third-octave and below, the output was greatly diminished and was accompanied by noticeable cone motion and high out-of-phase port activity. In the 40-Hz third-octave, corresponding to the 42-Hz box tuning, high input levels generated port air blasts that could be felt at the listening position! Fortunately, although port air velocities were high, wind noise was not objectionable.

On appropriately recorded program material, the lateral imaging and soundstage presentation of the BBSM-6Fs were excellent. On high-level playback of jazz and rock 'n' roll, the speakers would really boogie! The high peak levels of drum rim shots and the like were rendered quite realistically. Reproduction of spoken male voice did reveal some upper midrange emphasis when compared to my reference systems.

In summary, the BBSM-6Fs deliver a number of important performance attributes in a relatively small package. These include high output capability, accuracy, precise imaging, smoothness, and even coverage. In addition, the Westlake Audio speakers work very well in situations where the listener has to be physically close to the systems, such as in small listening rooms and remote recording situations. On the downside, they require high-quality amplification that can drive low-impedance loads of only 2 to 3 ohms, along with minimum-loss cabling. Although these facts, coupled with the speaker's relatively high cost of $2,400 per pair, complicate a buying decision, the BBSM-6Fs do deserve serious consideration and evaluation by those requiring a relatively compact, high-performance loudspeaker system.

D. B. Keele, Jr.
Build your audio/video system on a solid bass.

Velodyne subwoofers are already known as the finest in the world. Now, the same revolutionary patented technology is available in an exciting new design.

Introducing "The Foundation Series"
The new Servo F-1000, Servo F-1200, and Servo F-1500:
Designed with style and elegance to fit every need.

The clean, undistorted bass of a Velodyne subwoofer provides the solid foundation on which to build a superb sound system. By reducing the rigorous demands of low bass from your main speakers, your system will have increased dynamic range and clarity that you never thought possible.

Each unit in The Foundation Series is completely self-contained with amplifier and adjustable cross-over; and upholds our commitment to quality: As long as there are people who appreciate perfection, Velodyne will continue to produce it.

Velodyne
The Bottom Line In Bass

Velodyne Acoustics, Inc.
1070 Commercial St., Suite 101 San Jose, CA 95112 408/436-7270 800/VELODYNE
In Canada: Positive Marketing 416/671-8990
In Europe: Boffi Audio Rack Hi-Fi 39-02/331-04266

For More Information
Call 1-800-451-2248

Enter No. 48 on Reader Service Card
PIONEER PREMIER KEX-M900 CAR STEREO WITH DSP

Manufacturer's Specifications

**Digital Signal Processing Section**

**Tone Controls:** Shelving, bass control adjustable by ±12 dB at 63, 100, 160, or 250 Hz; treble control by ±12 dB at 4, 6.3, 10, or 16 kHz.

**Three-Band Quasi-Parametric Equalizer:** Adjustable by ±12 dB at center frequencies of 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, and 800 Hz and 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3, 8, 10, 12.5, 16, and 20 kHz; three user memories.

**Seven-Band Graphic Equalizer:** Adjustable by ±12 dB at center frequencies of 60, 125, 250, and 500 Hz and at 1, 3.15, and 10 kHz; six user memories.

**Three-Band Quasi-Parametric Equalizer:** Adjustable by ±12 dB at center frequencies of 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, and 800 Hz and 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3, 8, 10, 12.5, 16, and 20 kHz; three user memories.

**Loudness Contour:** +12 dB at 100 Hz, +7 dB at 10 kHz, with volume at -30 dB.

**Sound-Field Control:** Fixed settings for "Studio," "Jazz Club," "Concert Hall," and "Stadium."

**FM Tuner Section**

**Usable Sensitivity:** 7 dBf for 30-dB S/N (see text).

**Mono 50-dB Quieting Sensitivity:** 10 dBf.

**Mono S/N:** 74 dB, IHF A-weighted.

**THD:** Stereo, 0.3% at 1 kHz for 65-dBf signal input.

**Frequency Response:** 30 Hz to 15 kHz, ±3 dB.

**Alternate-Channel Selectivity:** 70 dB.

**Stereo Separation:** 40 dB at 1 kHz for 65-dBf signal input.

**AM Tuner Section**

**Usable Sensitivity:** 18 µV for 20-dB S/N.

**Selectivity:** 50 dB.

**Cassette Player Section**

**Frequency Response:** 25 Hz to 22 kHz, ±3 dB, with metal tape.

**S/N:** 73 dB with Dolby C NR, 67 dB with Dolby B NR, 61 dB without NR.

**Wow and Flutter:** 0.06% wtd. rms.

**Stereo Separation:** 45 dB.

**Fast Forward/Rewind Time:** Approximately 100 S for C-60 tape.

**General Specifications**

**Power Requirements:** 14.4 V d.c.; 10.8 to 15.6 V allowable.

**Dimensions:** Main chassis, 7 in. W x 2 in. H x 6 3/4 in. D (17.8 cm x 5.0 cm x 16.8 cm), tuner chassis, 7 in. W x 1 ½ in. H x 5 ½ in. D (17.8 cm x 2.7 cm x 15.0 cm).

**Weights:** Main chassis, 4.0 lbs. (1.8 kg), tuner chassis, 1.8 lbs. (0.8 kg).

**Price:** $1,200.

**Company Address:** P.O. Box 1540, Long Beach, Cal. 90801.

For literature, circle No. 92.
The Pioneer KEX-M900 is, as far as I know, the first DIN-sized head unit with built-in digital signal processing (DSP) as well as the first three-source DSP head unit. Like standalone car and home DSP units, the KEX-M900's DSP section lets you simulate various listening environments (a studio, jazz club, concert hall, or stadium) through digital simulation of the direct and indirect reflections from the walls, ceiling, and floor that make up the complex sound fields of such locations.

But this DSP section also performs three different types of equalization, whose effects can be tracked on a large dot-matrix display. The section includes a seven-band graphic equalizer, a three-band "parametric" equalizer with center frequencies selectable in third-octave increments from 20 Hz to 20 kHz (actually quasi-parametric, as its bandwidths aren't variable), and bass and treble controls with several frequency hinge, or turnover, points. Bass and treble settings can be combined with either type of equalizer settings, and all settings can be stored in memories (three for parametric, six for graphic EQ settings) for quick recall. Not only that, but bass, treble, and parametric EQ settings can be applied separately to the front or rear speaker pairs or to all speakers together.

A digital filter with eight-times oversampling and a one-bit, zero-crossing D/A converter with double-step noise shaping are used to decode digital signals from the DSP section or from the fiber-optic digital input. This input and an analog input permit hooking in separate Compact Disc players. Pioneer advises that the KEX-M900 has built-in control for Pioneer's CDX-M40 and -M50 and Premier CDX-M60 CD changers, including the ability to program up to 32 selections from each six-disc magazine and to program as many as 72 disc titles to appear on the dot-matrix display when each titled disc is played.

With so much digital circuitry crammed into the chassis and creating potential r.f. noise, Pioneer has made the AM/FM tuner section a separate chassis. This is the latest version of Pioneer's highly acclaimed Supertuner car audio AM/FM sections, the Supertuner IV. It features 24 station presets (18 FM and six AM) with preset scan, seek tuning, and "Best Stations Memory," which scans the tuning band to select the six strongest stations in unfamiliar territory.

The cassette tape player section, incorporated in the KEX-M900 itself, features full logic control, a dual-azimuth tape head, music search, and Dolby B and C noise reduction. Other features of the KEX-M900 include an Automatic Sound Levelizer that raises or lowers the volume level in response to changes in the car's interior noise, and a Source Levelizer Adjuster that maintains the same relative volume levels when switching between sources.

The unit can also be controlled with Pioneer's "smart" remote control, which is included. It allows you to program one button to handle a selected, frequently performed operation not already present on the remote. Though equipped with only six pushbuttons, an up/down volume rocker button, and another two-way rocker switch whose function depends on the program source in use (tape, tuner, or CD), the remote offers about as much control as a passenger or driver would normally expect in a car audio system. Additionally, the KEX-M900's front panel is detachable to discourage theft, allowing you to remove the display and controls and leave only an unusable black box with a blank faceplate in the dashboard.

The unit's multiplicity of functions, and its use of multifunction control buttons whose effects vary with the program source and mode of operation, requires an owner's manual of 50 pages (not counting those devoted to installation and troubleshooting).

Control Layout

Just about every control button on the KEX-M900 changes function at least some of the time. For example, the six small buttons at the upper left, closest to the driver, can be used for clock time adjustment, for memorizing tone control settings, or CD disc-number searching (if a CD changer is installed), and for tuner preset selection. Four other buttons, clustered somewhat like a "+" sign or the cursor keys on some computer keyboards, serve either as left/right balance and forward/rear fader controls, or as EQ level up/down adjusters and frequency selectors, or as CD disc-title controllers. A small button nearby switches from the normal control mode for the current source into one of three "volume-tone control modes." In the first of these, the four buttons beneath the display (labelled "F1" through "F4") are designated "Bass," "Treb," "EQ," and "Flat." In the second mode, those same buttons take on the functions needed for initiating the Automatic Sound Levelizer ("ASL"), loudness compensation, Sound Field Control ("SFC") on/off, and SFC "Mode" selection. Finally, in the third mode, these four buttons are used to select the equalizer mode (parametric or graphic), choose combined or separate front and rear frequency adjustment, set the Source Levelizer Adjuster ("SLA") for the desired balance between radio, tape, and CD volume levels, and optimize the Sound Field Control for listeners in the left or right seats. As these are mainly setup adjustments, they're accessed only if the mode selector button is held down for at least 2 S. A rocker to the right of the mode selector button is used for obtaining fast forward, reverse, and music search in tape or CD mode; searching for selections in programmed CD play.
Introducing 20/20 hearing.

Introducing the L-Series. A new generation of speakers gene-spliced from our legendary professional studio monitors. JBL's signature sound but with one spectacular difference: They break out of the box. We found that tall and narrow is a much friendlier shape. It lets sound travel in a smooth circular pattern for a better image. (Now you'll hear the orchestra like you see it on stage.)

We slant the front baffle, too. So that internal reflections can't play ping-pong on non-parallel surfaces.

We align our drivers so high, mid and low signals reach your ear at the same time. And we push the sound through something new. The highest performance system we've ever built. The new L-Series. Listen. And you'll never look at sound the same way again.
DSP circuits handle spatial simulations, compensation for road noise, graphic and quasi-parametric EQ, as well as tone control.

Fig. 1—Tuner frequency response for FM stereo (left channel is solid curve, right channel is dashed) and for AM signal with 74-μS pre-emphasis.

Fig. 2—FM quieting characteristics.

tuning up or down, and adjusting seek-tuning sensitivity. A double-arrowed button between this rocker and the “F1” button selects tape direction, erases CD programs, and switches tuner bands.

When playing cassettes, the “F1” through “F4” buttons select Dolby B and C NR, “Blank Skip” (which fast-winds past unrecorded tape sections of 15 S or longer), single-song repeat, and “Radio Intercept” (which sets the radio to play during fast forward or rewind). When “R. Int” is pressed, the display changes to show the current station, and two buttons change functions again to operate preset scan and stereo/mono selection.

During CD play, if a changer is installed, the four “F” buttons change functions again, to play the first 10 S of each track (“T.Scan”), to memorize and recall programs (“ITP”), to choose track-by-track selection or audible fast forward and reverse (“Manu”), and to select repeat or random play “Mode.” The “DSP” button just to the right of these can be used to switch into disc-ttiling mode or to display previously entered disc titles up to 10 characters long. The four keys in the “+” configuration are used to select and enter the alphanumeric title characters.

Finally, when listening to radio, the four buttons beneath the major display area, as well as the nearby rocker buttons, take on such other functions as tuning and local mode sensitivity selection, band selection, preset scan tuning, seek or manual tuning selection, and FM mono selection. In addition, a tiny button at the upper right of the panel is used for “Best Station Memorization,” selecting and memorizing the six strongest signals in a given area. Just below this is a button used to bring up the time display.

A few buttons I haven’t mentioned yet are the source select button (which also turns the unit on or off) to the right of the display and the large “+” and “−” buttons to the left of the display that usually adjust volume but are also used for setting the Source Levelizer Adjuster and the sensitivity of the Automatic Sound Levelizer. In the event of abnormal symptoms such as failure to power up or failure of other buttons to respond when pushed, a tiny “Clear” button resets all controls to their factory settings, erasing any settings you have entered in the memory. Note, too, that disconnecting the car battery will also require you to reset all your desired presets and other memory settings.

The last control that needs to be mentioned is one located at the upper right of the front panel. Pressing this button causes the entire front panel to swing down, revealing the slot for tape cassette insertion. More important, swinging down this entire front panel is the first step in removing the panel from the rest of the set! A handy little case is supplied for storing the detachable panel at home or in your pocket, and I can’t think of a better theft-prevention technique for a fairly expensive car audio component. With the front panel removed and the inner flap closed, no one would guess that this sophisticated head unit is installed in your dash. And even if they do, there’s no way that a potential thief could use (or sell) the unit! This arrangement sure beats the four-digit code-number anti-theft methods I’ve encountered. Those may prevent a thief from operating the stolen component, but the thief may not know that till he tries to use or sell the item, after ripping apart your dashboard.

Measurements

Most of the features found in this combination of components are, of course, best evaluated with listening tests in a mobile environment. Still, some lab measurements were in order, especially concerning tuner and tape player performance, but also including the action of the various equalizer modes and tone controls. As for reaction to the DSP environment simulations, and the complexity of the front panel, I leave those to Technical Editor Ivan Berger, who, as in previous reports of this type of equipment, will be installing this Pioneer Premier component in his car for his usual “listen while driving” evaluation.

Frequency responses for the FM and AM tuner sections of the KEX-M900 are plotted in Fig. 1. In FM, roll-off at 30 Hz
State-of-the-art jewels from AudioQuest.

AudioQuest® cables and plugs are distinguished by intelligent designs, the finest metals and superior insulation. Emerald™ uses 99.99997% pure copper, Lapis™ and Diamond™ use pure solid silver. All three are resistance welded to direct-gold plated FPC copper plugs (RCA or XLR). From Turquoise™ through Diamond, AudioQuest makes seven jewels you will appreciate and enjoy everyday — not just on special occasions.

audioquest
PO. Box 3060, San Clemente, CA 92674 USA  Tel: 714/498-2770  Fax: 714/498-5112
Removing the front panel makes it hard for thieves to spot the Pioneer and virtually impossible for them to use or sell it.

![Graph showing THD + N vs. signal strength for FM section.](image)

Fig. 3—THD + N vs. signal strength, FM section.

![Graph showing distortion + noise versus frequency for FM tuner Pioneer KEX-900.](image)

Fig. 4—THD + N vs. frequency.

![Graph showing separation (dB) vs. frequency (kHz) for modulated and unmodulated channels.](image)

Fig. 5—Frequency response and stereo separation at two signal levels.

amounted to about 2.4 dB, while at the treble end of the FM audio band, response was down by only 0.7 dB. As usual, AM tuner response suffered by comparison. The -6 dB points for AM response occurred at 40 Hz and at just over 4 kHz, but response was anything but "flat" between those two frequencies, as can be seen.

It is easy to understand why Pioneer calls this a "Super-tuner." The KEX-M900's FM circuitry exhibited quieting characteristics comparable to those found in better home FM tuners—which is not typical of car FM. As Fig. 2 shows, 50-dB quieting for my sample required an input signal level of only 13 dBf, a little higher than the 10 dBf Pioneer specifies, and best S/N measured 72 dB for mono and nearly 68 dB for stereo. My only gripe with Pioneer concerns their "usable sensitivity" specification of 7 dBf. They are quick to qualify it; the company means the signal level that produces a 30-dB signal-to-noise ratio—but the industry definition of usable sensitivity is the point at which the sum of noise and distortion (THD + N) is 30 dB below the audio output level. While Fig. 2 does show that the 30-dB S/N point is indeed at 7 dBf, I soon learned that the actual usable sensitivity is considerably higher.

Figure 3 shows that the usable sensitivity point, equivalent to 3% THD + N, is at about the same 13-dBf level as the 50-dB quieting point. As Fig. 3 also shows, mono THD + N for strong signals was only 0.43%; surprisingly, THD + N for stereo reception was considerably lower, measuring only 0.26% for a 1-kHz modulating signal at 65-dBf signal strength, a bit lower than the 0.3% claimed by Pioneer. The plots shown in Fig. 4 (THD + N versus frequency for a fixed signal strength of 65 dBf) serve to confirm the results of Fig. 3 almost perfectly and also show that distortion plus noise remained fairly constant over much of the audio spectrum. The sudden rise of apparent THD + N for stereo operation at high audio frequencies was caused by spurious high-frequency "beats" rather than by actual harmonic distortion or random noise.

Stereo FM channel separation (Fig. 5) was excellent too, measuring nearly 50 dB at 1 kHz and remaining above 40 dB even at 10 kHz. Of course, as is usual with car audio FM tuners, Pioneer allows the tuner to "blend" left and right channels at weaker signal levels, thereby reducing background noise and also reducing separation. Thus, at a signal level of 45 dBf, separation decreased to about 12 dB at midfrequencies, still enough to deliver some sense of stereo imaging within the confines of an automobile's interior.

To separate actual harmonic distortion from noise, and to get an idea of other crosstalk components during stereo FM reception, I ran a spectrum analysis of the outputs of both channels with a strong FM signal, modulated by 5 kHz in the left channel only, applied to the tuner. The upper curve of Fig. 6 shows the output of the left channel, while the lower, dashed-line curve (using the right-hand dB scale) shows separation of about 47 dB at 5 kHz as well as other harmonic and crosstalk components. Notice the excellent 38-kHz suppression—rather unusual in a car FM tuner.

Tests of the tape player section came next. Calibrated TDK test tapes, recorded with spot frequencies at -20 dB below 250 nWb/m, were used to plot the results shown in Figs. 7A (normal-bias tape) and 7B (high-bias tape). Both of
THE QUESTION

that has driven us crazy for years is “where do I go to buy AudioQuest® products?” The challenge was
that even AudioQuest had a hard time knowing which of our hundreds of dealers carried
which AudioQuest products. It drove you and us crazy.

Now, at last, we have

THE ANSWER

AudioQuest Centers are dealers who have contracted to keep in stock most AudioQuest
cables and accessories, including at least four models of interconnect, eight speaker cables,
four video and S-video cables, digital and fiber optic cables, Sorbothane® CD Feet,”“ Big
Feet™” and LaserGuide™. AQ Centers also have these cables on demonstration and
available for loan!

AudioQuest also has hundreds of other dealers who will be pleased to help you with your
AudioQuest needs, however the AudioQuest Center dealers listed below have made an
extra commitment to help guarantee your satisfaction.

AUDIOQUEST CENTERS

The following dealers are listed alphabetically within each state.

CA, San Francisco
Performance Audio
(415) 883-0030

CA, Santa Monica
Optimal Enchantment
(213) 393-4434

CA, Redondo Beach
Systems Design Group
(213) 379-3755

CA, Monterey
Montery Stereo
(408) 649-6303

CA, Santa Barbara
Mission Audio
(805) 682-7575

CA, Los Angeles
Paris Audio
(213) 920-1397

CA, San Francisco
Performance Audio
(415) 543-4505

CA, Oakland
Pro Audio Electronics
(510) 654-6630

CO, Boulder
Listen Up
(303) 444-0479

CO, Colorado Springs
Listen Up
(303) 633-2600

CO, Denver
Listen Up
(303) 778-0780

CO, Marietta
Audio Atlanta
(404) 499-0145

IL, Chicago
Superior Audio Systems
(312) 226-4848

KS, Overland Park
Audioport Ltd
(913) 341-2222

KS, Lawrence
Kef’s Audio Video
(913) 842-1811

ME, Scarborough
New England Music Co.
(207) 883-4173

MD, Kensington
Soundworks
(301) 929-8600

MI, Farmington Hills
Almas Hi Fi
(313) 553-4360

MI, Rochester
Almas Hi Fi
(313) 650-1700

MI, Royal Oak
Almas Hi Fi
(313) 549-8090

MI, Grand Rapids
Classic Stereo Ltd.
(616) 957-2130

MO, Columbia
Columbia Photo & Video
(314) 443-0503

NE, Lincoln
Sound Environment
(402) 489-8766

NE, Omaha
Sound Environment
(402) 489-8766

NJ, Lawrenceville
Hal’s Stereo
(609) 883-6339

NY, New York
Sound By Singer
(212) 924-8600

NC, Raleigh
Audio Advice
(919) 828-9221

OH, Columbus
Progressive Audio
(614) 299-0565

PA, Edgewood
Better Sound Concepts
(412) 731-3737

PA, Willow Grove
Soundex Electronics
(215) 659-8815

TN, Nashville
Nicholson’s Stereo
(615) 327-4312

TX, El Paso
Soundquest
(915) 779-5421

WA, Seattle
Definitive Audio
(206) 524-6633

WV, Wheeling
Sterling Sound
(304) 243-1033

NM, Albuquerque
Absolute Audio Store
(505) 293-9092

AUDIOQUEST FULL LINE CENTERS

A few very dedicated dealers have made a total commitment to guarantee you access to
all AudioQuest cables.

AQ Full Line Centers stock, demonstrate, and loan virtually the entire AudioQuest cable
range. These dealers have made a very serious commitment. They can satisfy all your cable
and accessory needs.

AZ, Phoenix
Sounds Like Music
(602) 993-3351

FL, Tampa
Audio Visions
(813) 671-2899

MA, Arlington
Audio Vision
(617) 648-4434

MI, Dearborn
Almas Hi Fi
(313) 584-1860

NY, New York
Sound By Singer
(212) 924-8600

Both lists have grown since preparing this ad. Please call 714-498-2770 to ask about new AQ Centers near you.

FREE LASERGUIDE SAMPLE

Please fill in this coupon and take it to your
nearest AQ Center to receive a free sample of
LaserGuide, the optical disc treatment (CD, LaserDisc, CD-ROM)
specifically designed to cut refraction on polycarbonate discs by 50%. A
difference you can plainly see and hear.

Name ____________________________
Address __________________________
City ___________________ State ________ Zip ______

With its 50-dB quieting at 13 dBf, like a good home tuner's, it is easy to see why Pioneer calls this a "Supertuner."

Fig. 6—Spectrum analysis, FM stereo mode, one channel modulated with 5 kHz (solid curve), other channel unmodulated (dashed curve). Use the right-hand scale for the lower curve.

Fig. 7—Frequency response playing Type I calibrated reference tape (A) and Type II calibrated reference tape (B). Solid curves are left channel, dashed curves are right channel.

these test tapes have spot frequencies extending up to 18 kHz and down to 31.5 Hz. Allowing for some discrepancies in azimuth alignment, my conclusions were that the tape player performed extremely well compared with many other car tape players I have measured recently.

Using a previously recorded "silent" tape (recorded with bias signal but no audio input signal), I measured overall signal-to-noise ratio without Dolby NR (-56.1 dB), with Dolby B NR (-64.16 dB), and with Dolby C NR (-71.54 dB). While these figures fall a bit short of those claimed by Pioneer, it is more than likely that Pioneer's figures are referenced to the recording level at which 3% THD is reached (the standard reference for S/N readings), whereas my reference was with respect to Dolby level, 200 nWb/m. In any case, all three readings compare favorably with results obtained for top-grade home cassette decks measured the same way.

To further illustrate the effectiveness of the Dolby B and Dolby C noise-reduction systems, I plotted the distribution of noise versus frequency (using a 1/2-octave filter) in Fig. 8. Notice that the noise reduction extends to lower frequencies with Dolby C than it does with Dolby B.

Figure 9 shows a dual plot of wow and flutter for the tape player section. The upper, more erratic curve was made using IEC peak weighting and shows a wow and flutter that averaged about 0.1% over the 30-S duration of the test. Using Japan Industry Standard weighting (also known as weighted rms), the approach used by most tape player manufacturers when quoting wow and flutter, I measured just over 50.06%, as indicated by the smoother, lower curve of Fig. 9.

Before disconnecting the two components from my bench d.c. power supply, I decided to check out at least some of the equalization capabilities of the system. From my earlier description you can understand that the number of possible EQ combinations that can be achieved with this equipment is almost beyond measure. Accordingly, I set up an arbitrary response curve using the parametric EQ facilities of the KEX-M900. I did not know the pinouts for the unit's DIN multi-pin AUX input jack, so the only way I could plot the response of my arbitrary settings was to sweep an audio signal and use it to modulate my FM signal generator. Results are shown in Fig. 10, where I have also replotted the response of the tuner with all tone and EQ controls set to their neutral, or "flat," positions. The same approach was used to plot the action of the loudness control at various volume-control settings from 0 dB to approximately -35 dB (Fig. 11). Finally, to illustrate the flexibiltiy of the tone controls and the ability to change their turnover frequencies, I ran a multiple sweep (again, via the FM system) showing first, for reference, the "flat" response of the FM tuner section. This was followed by successive sweeps of the maximum bass and treble boost and cut settings, using the highest and lowest turnover frequencies available for each control (Fig. 12).

There is certainly no doubt in my mind that Pioneer has done a remarkable—perhaps miraculous—job of cramming all of these control features, including the digital sound-field system, into a DIN-sized head unit and half-DIN auxiliary tuner chassis. I just worry that this complex unit's myriad
acurus
Accuracy from the U.S.

"...this new Acurus stuff from Mondial must be heard to be believed –
fabulous sound for the price of Japanese Mid-Fi."
— Lewis Lipnick, Stereophile Magazine August 1991, Volume 14 Number 8

America has just eliminated any reason to buy a foreign made product from the brands listed below. We guarantee Acurus components are superior in sound quality and construction. If after one week of Acurus ownership you think one of the foreign made components is better, your Acurus dealer will give you a full refund. Call for a participating Acurus Dealer near you.

Adcom  
Denon  
Harmon Kardon  
JVC  
Kenwood  
Luxman  
Marantz  
NAD  
Nakamichi  
Onkyo  
Pioneer  
Proton  
Rotel  
Sansui  
Sherwood  
Sony  
Technics  
Yamaha

Mondial Designs Limited
2 Elm Street, Ardsley New York 10502 • 914-693-8008

Enter No. 33 on Reader Service Card
Pioneer did a wonderful—maybe miraculous—job of cramming so many digital functions into a DIN-sized head unit.

![Spectrum Analysis of Residual Tape Noise](image)

**Fig. 8**—Spectral distribution of tape noise.

![Wow and Flutter Tape Section](image)

**Fig. 9**—Wow and flutter over a 30-S period, using IEC peak weighting (top curve) and JIS weighting, or wtd. rms (bottom curve).

![Example of Parametric EQ Curve Set on Pioneer KEX-M900](image)

**Fig. 10**—Sample curve of three-band parametric EQ, taken via FM input (see text), with FM frequency response superimposed for reference.

Adjustments and control functions may be a bit much for even an audiophile to handle while driving. I'll be interested to see what Mr. Berger has to say on that score and whether or not he thinks that DSP soundstage processing in a car is all that Pioneer says it is. One thing's for sure: If you're going to spend $1,200 on this unit, do yourself a favor and spring for one of the matching CD players. And whatever else you do, don't skimp on the amplifiers and speakers you use with this system. And now, Mr. Berger, take to the road!

*Leonard Feldman*

**Behind the Wheel**

The KEX-M900 has a good selection of features—almost every feature known to man, in fact. Its performance, especially on FM, is superb. Its ergonomics are reasonable for such a function-packed unit. Its detachable faceplate is the most perfect theft-discourager I know of. My one real complaint is about its display.

Like most other complex LCD displays (and this one is super-complex, to handle all the DSP functions), the display in the KEX-M900 loses contrast rapidly as you move away from its designed viewing angle. If your car's console angles the stereo upward, so it faces you directly (and if you have no glass moon roof to reflect sunlight on the stereo's face), the Pioneer's display will probably cause you little difficulty. But in cars like my Scorpio, where the stereo's front panel faces the back of the car, people in the front seats are far off the display axis, making the screen dim by night and unreadable by day. (Back-seat passengers do better in this setup—and one can run the unit from there with the supplied remote.)

With performance like the Pioneer's, I could live with the dim display if all I needed it for was to tell me what station I was tuned to. But without the display, you can't tell which control mode you're in, and without that info, you don't know what the four large buttons under the display will do when you press them, and you are unsure about the functions of some other controls as well.

That's a pity, because many of the functions controlled by the "F1" through "F4" buttons are extremely useful. For example, you can custom tailor the KEX-M900's sound by using the equalizer either as a three-band quasi-parametric (not true parametric because bandwidth is not controllable) or as a seven-band graphic. The bass and treble controls have selectable turnover frequencies. And you can use either equalizer with the tone controls or separately, with the additional option of changing tone and EQ for front and rear simultaneously or individually. You can, for example, set up separate equalization for each end of the car, then adjust overall bass and treble for each recording.

On the road, I found the Automatic Sound Levelizer very useful, because its sensitivity let me set it up for just the degree of effect I needed. And I found the digital soundfield control a definite asset most of the time.

Of the four Sound Field Control settings ("Studio," "Jazz Club," "Concert Hall," and "Stadium"), I found only the first and mildest usable for most music. "Jazz Club" sounded more like a very reverberant concert hall (I liked it fine for slow symphonic works), and "Concert Hall" was more like a cathedral. The "Stadium" setting did reproduce the diffuse effects of a symphony hall.
MTX Blue Thunder. A redefinition of "state of the art". Designed with the serious listener in mind, MTX Blue Thunder offers mobile enclosure systems, subwoofers, separates, and components engineered with the latest technology and materials. Noticeably different. Noticeably better. The BTW 1044, our 10" subwoofer, was selected by Car Audio as the best 10" subwoofer for 1990, and the BTE10W, the 10" enclosure system, ranked first in an independent review by Car Audio. Computer-controlled design for accuracy...distinctive blue long-flare cones...butyl rubber surrounds...proprietary perimeter vented voice coils...modular crossover/terminal assemblies...integrated grille design.

Isn't it about time you played the blues? For your nearest dealer call 1-800-223-5266, or write us at 555 W Lamm Road, Freeport, IL 61032.

MTX
Serious about sound
Pioneer's Supertuner IV is unquestionably the hottest tuner I've used on the road, invariably matching or beating my reference unit.

and boomy sound of a stadium concert quite accurately, but that's never been a sound I liked. To me, it would have made more sense to have setup adjustments that could moderate the effects of the preset sound fields, and possibly to have put more of the added delays and reverberations into the rear channels and a bit less in the front. Nonetheless, I found myself using the Sound Field Control, in its "Studio" mode, almost all the time. It gave the music a little more room to breathe—and generated such a tightly focused center image that I could almost believe a center speaker had been added. I only had to switch "SFC" off for speech, as one must with every mobile DSP unit I've heard so far. Some DSP maker should develop an algorithm that senses when the signal includes only a single, centered voice and cuts out the ambience on the assumption that someone's talking.

While I kept wishing the KEX-M900 played CDs, I did not get a chance to try either of its external CD options. These include not only control of a CD changer with a fiber-optic signal cable, but also control of a single-disc CD player with a wired connection. Judging from the manual, you could have a changer in your trunk for your everyday listening as well as an in-dash player for whatever CD suddenly takes your fancy. Other features worth a quick mention include the digital clock and the wireless remote control. The remote has an up/down volume rocker, an instant "Attenuator" button (not duplicated on the unit itself, alas), source selector buttons, and multi-purpose buttons to select tape direction and track, Compact Disc and track, or radio band (three FM and one AM) and preset. It also has a unique "Learn" button that can be taught to trigger any other front-panel button you wish. However, it triggers a specific button, not a specific function—so its effect will depend on the current function of whichever button it's been taught. The remote works over a very wide range of angles but not quite wide enough to work if it's attached to the steering wheel.

As to performance, Pioneer's Supertuner IV is unquestionably the hottest tuner I've used on the road. It invariably picked up stations as well as, or better than, my reference Soundsream, though I still have a very slight preference for the latter's sound. Even AM was excellent, sounding better than Fig. 1 would lead you to believe. The AM sound is warm but clear, enough to fool my sharp-eared wife into thinking it was FM when we tuned in WQXR, a New York classical AM station. There is no scan tuning, but every other tuning facility I know of is present, together with a local/distant setting with four levels of sensitivity for FM and two for AM. The only tuner problem I ran into was that, except in fringe areas, "Seek" worked for me only when the "Loc.S" mode was on, which raised the station-finding threshold a bit higher than I wanted it.

Tape sound was also good, with no Dolby-tracking problems even with Dolby C NR and no sign of overload when playing even metal tapes with high recording levels. At night, the display made very clear exactly what the transport was doing, another plus. I'd have preferred not having to lower the front panel to insert or eject tapes but recognize Pioneer's reasons for this. And aside from the display, the ergonomics are really admirable for a unit that offers as many worthwhile features as the KEX-M900.  Ivan Berger
The most important opinion IS YOURS...

"I shall say, however, that when listening to the SA-1000/100 at low volume, in the early hours of the morning when everything is quiet, these components produce the best sound I have heard in my house. Exceptional in every way or from any point of view from which you care to analyze it."

Jorge Goncalves
Audio, Portugal

"The Counterpoint SA-100 has no negatives. To the contrary, it is always great: the sound is rich and sweet, the voices and instruments are clear and exciting, and the image is superb. Who could ask for more?"

-Henry See
UHF, Canada

"However compact and reasonably priced the SA-100, it behaved like a behemoth in the Krell league."

-Ken Kessler
Hi Fi News & Record Review, England

The Counterpoint SA100 is the essence of great craftsmanship... its sound is majestic, authoritative, and exciting, with a balance of strength and grace...

-Ugo Stella
Stereo Hi Fi, Italy

Call 1-800-275-2743
Fax 619-598-9418
Enter No. 16 on Reader Service Card
CAN TUBES WARM UP CD SOUND?

How a very old technology can make a brand new compact disc player sound extraordinarily good.

Our new SD/A-490i has a clock that "ticks" 33 million times a second, multi-stage noise shaping, pulse width modulators and enough other edge-of-the-art circuitry to finally qualify us for entry into the hallowed Compact Disc Techno-Jargon Hall of Fame. But it also includes two vacuum tubes whose classic design has remained unchanged for over 35 years. Tubes? Those warm glass things that used to glow cheerily through the grilles of old radios and black & white TVs? Yes. In an important circuit stage that comes after all the digital wizardry.

We and many other critical listeners believe that this anachronistic addition to an already excellent CD player design significantly enhances its sound. Read on and decide for yourself.

THE AMPLIFIER THAT DOESN'T AMPLIFY.

Between a CD player's D/A converter and external outputs is circuitry called a buffer amplifier stage. When you hear the word amplifier, you think of something which makes a signal louder. But that's not a buffer amp's purpose. In fact, contrary to popular lore, a CD player's buffer amplifier doesn't boost the signal strength at all — the final output of a CD player's D/A converter already has sufficient voltage to directly drive a power amplifier.

Instead, the buffer amp is a unity gain device which 1) increases output current, and 2) in the process, acts as a sort of electronic shock absorber.

A signal emerging from a CD player's digital-to-analog conversion process has sufficient voltage but insufficient current for proper interaction with a preamplifier or power amp. By acting as a current amplifier, the buffer stage helps lower impedance to a level that's compatible with modern components — about 50 ohms in the case of the SD/A-490i.

At the same time, the buffer stage helps isolate the relatively fragile D/A chip set from the nasty outside world of demanding analog components.

TUBES VERSUS SOLID STATE.

All compact disc players have buffer amplifiers. But more than 98% of them use solid state devices for this stage: either integrated op-amp circuits or discrete transistors.

A handful of hard-to-find, esoteric designs in the $1200 to $2500 range employ one or more tubes instead. As does our newly-available $699 SD/A-490i. For fundamental physical reasons, tubes have different transfer function characteristics than transistors. When used in ultra-expensive, audiophile preamplifiers and power amplifiers, their sound is variously described as "mellower", "warmer", "more open and natural" or simply "less harsh than solid state".

At the heart of these perceived differences are three basic facts:

1. Tubes produce even-order distortion (i.e. 2nd, 4th, 6th harmonics, etc.) while transistors create odd-order distortion, particularly 3rd harmonics which are less psychacoustically pleasant.

2. In a buffer stage, a tube acts as a pure Class A device, which is considered the optimal amplifier configuration. Op-amps function as Class A in and Class B out, with potential crossover distortion as voltage swings from positive to negative.

3. Tubes "round off" the waveform when they clip. When over-driven, solid state devices cut off sharply, causing audible distortion.

THE SD/A-490i'S OUTPUT SECTION

Our new CD player uses two 6DJ8 dual triodes (each literally two separate tubes in a single glass envelope) placed between the digital-to-analog converter and a motorized volume control.**

Operated at less than 30% of their maximum capacity, these tubes achieve a highly linear output voltage with very low static and transient distortion while providing very high dynamic headroom.

And because they're "loafing" at 1/3 their rated current capability, the SD/A-490i's tubes are designed to last the life of the CD player without replacement or need for adjustment.

A "LESS IS MORE" DIGITAL APPROACH FOR CLEANER ANALOG SOUND.

It would be pointless to have a tube output stage if the digital circuitry which precedes it
wasn't first rate. The SD/A-490t uses Single-Bit D/A circuitry to eliminate a form of exceedingly audible distortion inherent in most current CD player designs, and to provide better signal linearity than ever before.

If you've read current CD player brochures, you've probably stumbled across descriptions of de-glitcher circuits, laser trimming and even 22-bit converters. All these are merely fixes, applied to the same basic kind of D/A converter in an attempt to overcome built-in shortcomings.

In contrast, the SD/A-490t uses a completely new technology which avoids many of the problems that older approaches have struggled to surmount. We'd have to buy a whole section in this magazine to fully explain the differences if you're interested. call 1-800-443-CAVR for an appropriately long and detailed brochure, but here's a short synopsis.

Traditional converters require 16 separate reference circuits, each of which must be accurate to one part in 65,536 — but, due to the realities of mass production, rarely are. If they're not "dead-on", an unpleasant form of noise called zero-cross distortion is produced. Because Carver's Single Bit D/A Converter transforms a 16-bit signal into a 1-bit pulse signal array, the "ladder" of 16 ultra-high-precision reference devices is not required. In effect, the SD/A-490t need only manipulate a stream of varying-width on/off pulses instead of having to accurately create 65,536 different amplitude levels at all times.

Zero-cross distortion is non-existent, and the SD/A-490t's Single Bit converter is able to decode linearity in excess of 115 dB below peak level with exceptionally low noise. You'll particularly notice the difference in the heightened purity and clarity of music during very quiet passages. Every nuance, intonation and harmonic of the original recording is there. Yet "digital" harshness is noticeably absent even before it enters the SD/A-490t's mink-lined tube stage.

**AN ARRAY OF FEATURES AS RICH AS ITS SOUND.**

We've designed the SD/A-490t to be both useful and easy-to-use: 21-key front panel or remote programming. Fixed and variable output. Programming grid display. Random "shuffle" play. Variable length fade. Automatic song selection to fit any length of tape. Even index programming for classical CD's. Plus our proprietary Soft EQ circuitry which compensates for variables in spacial (L-R) information and midrange equalization found in many CD's mastered from analog tapes.

**BRING YOUR TWO BEST CRITICS TO A CARVER DEALER.**

It's tempting to further regale you with how well we think the SD/A-490t's tubes and Single Bit circuitry improve the sound of a compact disc. But your own ears should be the final arbiter of quality.

Thus you are invited to bring a few familiar compact discs down to your local Carver dealer and compare for yourself, hopefully creating your own superlatives in the process.

Suffice it to say that almost all critical listeners not only are able to hear a difference, but prefer the sound of the remarkably affordable SD/A-490t's dual triode transfer function.

---

The Carver SD/A-490t.
At $995, its suggested retail is $500 less than the nearest competitor with tube output***

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility

---

**THE SD/A-490T**
- Dual 6DJ8 Vacuum Tube Output Stage
- Over-sized Disc Stabilizer Transport
- 24-Track Programming with 21-key front panel & remote input
- Music Calendar Display
- Indexing
- Random Play
- Motorized Volume Control
- Time Edit/Fade Taping Feature with user-variable time parameters
- 2 to 10 Second Variable Length Fade
- Exclusive Carver Soft EQ (Digital Time Lens) circuitry
- Optical and Coaxial
- Digital Outputs
- 3-Inch (8cm) CD Compatibility
**AudioSource SS Three Surround Processor**

The AudioSource SS Three processor features Dolby Pro-Logic, which achieves better surround sound localization than passive-matrix decoders can. The unit includes automatic input balancing to minimize leakage to the surround channels and to eliminate the need to adjust balance for different sources. A "Hall" surround mode generates spaciousness with stereo material that does not have Dolby Surround encoding, and a "Matrix" mode synthesizes stereo from monaural sources. The subwoofer output has switch-selectable 80- and 150-Hz roll-offs, and its level is adjustable over a 20-dB range. An LED-type meter displays the four channel levels and automatically switches, when

<table>
<thead>
<tr>
<th>Manufacturer's Specifications</th>
<th>Power Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surround Modes:</strong> Dolby Pro-Logic, &quot;Hall,&quot; and &quot;Matrix.&quot;</td>
<td>Processor, 90 watts, 120 V a.c., 60 Hz; remote, two AA batteries.</td>
</tr>
<tr>
<td><strong>Frequency Response:</strong> &quot;Matrix,&quot; 20 Hz to 20 kHz; &quot;Hall&quot; and &quot;Dolby Surround,&quot; 100 Hz to 7 kHz.</td>
<td><strong>Dimensions:</strong> Processor, 16½ in. W × 2½ in. H × 9½ in. D (41.9 cm × 5.2 cm × 23.2 cm); remote, 2½ in. W × 6½ in. H × ¾ in. D (6.4 cm × 17.0 cm × 1.8 cm).</td>
</tr>
<tr>
<td><strong>Signal/Noise Ratio:</strong> Surround decoder, 98 dB.</td>
<td><strong>Price:</strong> $399.95, including remote control.</td>
</tr>
<tr>
<td><strong>Delay Time:</strong> 20 or 30 mS.</td>
<td><strong>Company Address:</strong> 1327 North Carolan Ave., Burlingame, Cal. 94010. For literature, circle No. 93</td>
</tr>
<tr>
<td><strong>Input Sensitivity:</strong> 150 mV.</td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Input Level:</strong> 2.5 V.</td>
<td></td>
</tr>
<tr>
<td><strong>Line Outputs:</strong> Main, center, surround, subwoofer, and tape.</td>
<td></td>
</tr>
<tr>
<td><strong>Line Output Levels:</strong> Center and surround, 1.5 V; subwoofer, 0.25 to 2.5 V, adjustable.</td>
<td></td>
</tr>
<tr>
<td><strong>Subwoofer Crossover:</strong> 80 or 150 Hz.</td>
<td></td>
</tr>
<tr>
<td><strong>Amplifier Output:</strong> Two channels, 30 watts per channel.</td>
<td></td>
</tr>
</tbody>
</table>
needed, to show the settings of the output-channel volume controls. A built-in test-signal generator sequences automatically from channel to channel when actuated. To help set up a first surround system, the SS Three includes a built-in amplifier with outputs for center and surround speakers. The power transformer is of toroidal design for high current output with minimum magnetic leakage. The processor includes a full-function remote control.

Control Layout

The front panel of the SS Three is simple in comparison to some other decoders. The arrangement of the controls and switches is logical and not confusing. The orange push-on/push-off power switch is at the lower left of the panel. When power is on, the switch is illuminated and a little spot near the top is bright red. Some distance to the right are eight round, black switch buttons. The top four, from left to right in a row, are "Monitor," "Matrix," "Test," and "Normal/Phantom." The bottom four, from left to right, are "Hall," "Dolby Surround," and "20" and "30" mS for "Delay." A white line below ties "Hall," "Dolby Surround," and "Delay" together. Either delay time can be selected for Dolby Surround, but 30 mS is the fixed delay time for "Matrix" and "Hall" modes. A push of any button yields audible and tactile clues on its activation. Most of the button labels are self-explanatory, but some are not. "Test" feeds a noise signal successively to each output except the subwoofer. Balancing the channel speaker levels is much easier when using this important feature. "Normal/Phantom" controls the operation of the center channel. In "Normal" position (indicator off), monaural and center signals feed to the center channel. In the "Phantom" position (indicator on), for systems not having a center-channel amplifier and speaker, any monaural or center signals go equally to the left and right channels. Each button has a small, bright red indicator near its top to show when that function is on. The test signal is easily heard.

Further to the right is the four-channel level meter, with the "Input Level" pot to its right. Each meter column has a total of six rectangular LEDs, five green and a red one at the top. The bottom of the columns, from left to right, are "S," "L," "C," and "R" for surround, left, center, and right channels, respectively. Next to the right-channel LEDs, from bottom to top, is a scale reading "+10," "-5," "0," "+3," "+6," and "Max." Normally, the meter display shows channel input levels. The input level control affects all levels equally. Pushing one of the output volume controls (covered later) switches the display to show the four output volume settings—another helpful feature. Notice the difference: The input display shows actual levels; the output display shows volume settings. At the right end of the panel are spring-loaded, momentary-contact rocker switches for, from left to right, "Rear" (surround), "Center," and "Master Volume." A push on the top of any of the three switches increases that volume, a push on the bottom decreases it. "Master Volume" affects all outputs, including subwoofer. At the lower right end of the panel is the "Remote Sensor" port. All the labels are white, perhaps a little small but fully legible against the black panel.

Six pairs of phono jacks are at the left end of the back panel, with the top row usually for left and the bottom row for right. Jacks are provided for main-signal input and output, tape output and input, plus outputs for "Center," "Subwoofer (Mono)," and "Surround Out." A screwdriver-slotted "Level" trim pot and an "80 Hz/150 Hz" slide switch are provided for subwoofer control. Also on the rear are color-coded, spring-loaded terminals for the center and surround speakers and a switch to feed both 30-watt channels to the rear speakers or to feed one channel to the center speaker and split the other 30 watts between the rear speakers.

I removed the top and side cover to examine the internal construction. I was immediately struck by the large, chassis-size p.c. board, cut out just enough for the good-size toroidal power transformer next to the back panel. All the components are identified, and circuit sections are labelled. Integrated circuits are widely used, and discrete transistors are relatively few. Support for the board is just adequate; less springiness would be desirable. Interconnections to the front-panel p.c. board use multi-conductor cabling. I could see the soldering on the back of this board, and it was excellent. The transformer was just warm to the touch after hours of processor evaluation. It was higher in temperature when I purposely drove the surround amplifier. A fuse is mounted in clips on the main p.c. board. I could flex the chassis using low force, but the assembly became acceptably rigid with the cover back in place.

The remote control has a total of 15 buttons, fewer than some have but enough for controlling all important functions. The "Power" on/off button is closest to the transmitting
The display can be switched to show true volume levels or volume-control settings, a helpful feature.

Fig. 1—Frequency response of main outputs at 1 V input and output, with both channels driven. Response shape with center channel on complements center-channel response; see text and Fig. 2.

Fig. 2—Frequency response of center and subwoofer outputs, showing effects of changing subwoofer levels and roll-off frequencies (lower curves with 80-Hz setting, upper curves with 150-Hz setting).

Measurements

Let me first point out that I made all measurements after my listening and viewing. When the same signal \( L = R = \text{monaural} \) drove both main channels and the center channel was off ("Phantom" mode), the response (Fig. 1) was close to flat, with a 1.2-dB elevation at 20 Hz and a 0.9-dB roll-off at 20 kHz. The -3 dB points were at 5 Hz and 55 kHz. In normal center mode and using the monaural input, the main-channel output levels are reduced greatly except at the lowest frequencies. This response, also shown in the figure, is complementary to the center-channel response shown in the next figure. The rationale for this design is that the main speakers are more likely to have good responses and better power handling below 100 Hz. When just one main channel was driven, the frequency response was -0.35 dB at 20 Hz and -0.75 dB at 20 kHz. This would be the resoone whenever the left signal is not the same as the right.

Figure 2 shows the subwoofer and center-channel responses. The subwoofer roll-offs, at 12 dB/octave, are 3 dB down at 45 and 150 Hz for the 80- and 150-Hz settings, respectively. The center-channel response rolled off below 200 Hz and was -3 dB at 86 Hz. The high-frequency end was down 0.7 dB at 20 kHz. As I noted above, the low-frequency response is complementary to the boost in the main-channel response when the center channel is on. The crossover points with equal subwoofer and center output levels were -5.5 dB at 60 Hz and -2.2 dB at 125 Hz for the two switch settings. The exact subwoofer/center crossover points are not very significant because the output from the main speakers is also part of the total bass. The subwoofer output level can be adjusted with a trimmer, which is desirable, over a total range of more than 17 dB.

Figure 3 shows the response of the prechannels in Dolby Pro-Logic and "Hall" modes. The Dolby Pro-Logic response was 3 dB down at 120 Hz and 8.8 kHz, showing general agreement with Dolby Surround standards. I obtained this curve by feeding the test signal (a swept sine wave) to the left channel and a separate signal source to the right channel to ensure a continual difference (surround) signal during the sweep. I ran the "Hall" mode response at an arbitrary level to show the odd comb-filter effects. Figure 4 shows the cross-talk in the surround channels in Dolby Pro-Logic mode when feeding the sweeping sine wave to both left and right inputs. No manual adjustments of input balance were needed or possible, as the SS Three has automatic input balancing. The figure shows the cross-talk was down a good 35 dB or more across the entire band.
A New Classic

THE McIntosh MC 7300 AMPLIFIER

Over the last 42 years, McIntosh products have achieved a worldwide reputation for engineering excellence.

Today, the same engineering excellence, the same painstaking workmanship, and the same attention to detail are evident in the MC 7300 Power Amplifier.

THE McIntosh OUTPUT CIRCUIT

The MC 7300 output circuit uses 20 metal cased bipolar epitaxial power transistors and 4 metal cased driver transistors. The output transistors feature high $f_T$ (gain - frequency product) and large SOA (safe operating area). The power transistor characteristics, the power supply voltage used, and the output autotransformer ratio have been matched for high efficiency, maximum power output with low distortion, and reliable long life operation.

THE McIntosh AUTOTRANSFORMER

The McIntosh output circuit, superior in its performance, demands a superior method of coupling the amplifier output to the loudspeaker load. A McIntosh designed and manufactured autotransformer ensures peak performance and protection, as well as outstanding compatibility between amplifier and speaker.

McINTOSH HIGH OUTPUT CURRENT

Today’s advanced loudspeaker designs have presented amplifiers with a new set of problems. Although a speaker impedance may be rated at a nominal 8 ohms, the actual load can drop to 2 ohms at certain frequencies. Some esoteric speakers may present as little as 1 ohm at certain frequencies. This presents an excessive demand for more current from an amplifier’s output stage.

The MC 7300’s new output stage is designed to deliver 85 amperes of peak current into low impedances with McIntosh safety and McIntosh reliability.

McINTOSH POWER GUARD™

Clipping, which looks and acts like nonmusical square waves (music produces rounded waves), is caused when the amplifier is required to produce more power output (with low distortion) than it is designed to deliver. Amplifiers, when driven to clipping, can deliver up to 40% harmonic distortion - distortion that significantly decreases listening enjoyment, and increases listening fatigue. A clipped signal also produces extra distortion energy, which can damage speakers.

McIntosh precision engineering has developed the Power Guard circuit” to prevent amplifiers from being overdriven into hard clipping; ensure that the amplifier produces its maximum output without increased distortion; and protect the speaker from excessive heating.

(“Power Guard is a patented McIntosh design, U.S. patent #4048573)

It is no accident, then, that a McIntosh amplifier is a smart investment, one that will fill your home with years of audio excitement:

- It is more reliable than other amplifiers
- It has a longer, trouble-free life than other amplifiers
- It sounds better than other amplifiers
- Its resale value is the highest of all amplifiers

McIntosh

For information on McIntosh products and product reviews, please send your name, address and phone number to:

McIntosh Laboratory Inc.
Department A1291
P.O. Box 96 East Side Station
Binghamton, NY 13904-0096

Enter No. 29 on Reader Service Card

Copyright © 1991 by McIntosh Laboratory Inc.
When a center speaker is in use, the main and center channel responses become complementary, feeding bass to the main speakers.

---

The thresholds of the input-level meter segments did not match the dB calibrations, turning on at \(-6.6\) \((-10\)\), \(-3.4\) \((-5\)\), 0 reference \((0)\), \(+2.2\) \((+3)\), \(+4.9\) \((+6)\), and \(+8.5\) \((Max)\). All four meters tracked closely. The "Max" LED turned on with a 155-mS, 5-KHz tone burst having a continuous level 1 dB above indicator turn-on. This response time is too long to detect the shortest high-level peaks. The time for the "-10" LED to just turn off was 380 mS, longer than for a U.V meter. The time is shorter than for a standard peak-responding meter but goes well with the measured turn-on time. In actual use, I judged the meter dynamics to be fine for monitoring input level.

With the input level control at maximum, sensitivity was 261 mV for maximum acceptable input level according to the meter "Max" indicators. The "0" indicator turned on at 100 mV. Clipping first appeared at the surround amplifier output. The maximum, no-clip input level varied from 200 to 650 mV depending on the combination of the settings on the input and master volume controls. The surround-channel "Max" LED reliably indicated when clipping was nearing for most of the volume combinations. With the input volume reduced, amplifier overload appeared at an input level of 11.2 V. The main (line) output clipped at 4.1 V.

When the dB display showed volume settings, its LEDs turned on at \(-15.8\) \((-10)\), \(-9.1\) \((-5)\), 0 reference \((0)\), \(+9.8\) \((+3)\), \(+19.9\) flickering to \(+30.0\) steady \((+6)\), and \(+58.5\) \((Max)\). Notice in particular the \(+6\) indicator's turn-on range of 30 to 40 dB. This very wide range might lead to some user confusion because the other steps are much smaller. Holding in the "Master Volume" button raises or lowers overall level without changing the relative levels between channels—until any channel reaches its minimum or maximum volume. Continuing to press the same end of the "Master Volume" control after that, or pressing it again, will change the settings of any other channels that have not yet reached the limits of their range. To maintain relative levels, therefore, this button should not be held in any longer than it takes for any channel to reach its maximum or minimum indication.

The output polarity in the main, center, and subwoofer channels was the same as the input polarity. The input-to-output level change for the main channels was \(-9\) dB with the input level control at 3 o'clock and "Master Volume" set to just turn \(+6\) on. Gain of unity or higher was easily reached by increasing the volume settings. The input impedance was 55 kilohms; the output impedance was 3 kilohms, which is low enough in most cases but could be too high when feeding 10-kilohm inputs. The two sections of the input level pot tracked within 0.5 dB from wide open to 25 dB down, its maximum attenuation. The attenuation of the "Master Volume" control sections tracked within 0.3 dB all the way to about 80 dB down, excellent performance. The attenuators have about 38 steps of 2 dB apiece and then a couple of larger final steps, reaching a total of 80 to 85 dB down, depending on the channel. With the down button held in, the total attenuation from 0 dB (max) to muting level was covered in 5 S. I also muted the signal by switching to "Monitor," which reduced the output by 85 dB. The measured delay settings were 20.0 and 30.0 mS, exactly to specification.

---

The signal-to-noise ratio in Dolby Pro-Logic mode for a 1-V reference was 81.0 dBA for the main channels and 84.1 dBA for the surround channels. The ratios were 84.5 dBA and 87.6 dBA, respectively, with the 1.5-V rated output level as the reference.

Figure 5 displays THD + N across the band for the main channels at 1.0 V input and output. The distortion was 0.06% or less over most of the band, but there was a somewhat odd rise to 0.16% around 30 Hz.

---

Fig. 3—Frequency responses of surround channels; see text.

Fig. 4—Surround-channel output in Dolby Pro-Logic mode for mono signal in left and right channels, with either "Normal" or "Phantom" center mode.
Our Speakers Are So Sensitive, You Can Hear The Subtleties Of People Who Communicate With Their Hands.

Music, quite simply, is a mood-altering substance. With that in mind, we've built our DX loudspeakers on the belief that the more you hear, the more you'll feel.

Consequently, our DX midrange is designed to achieve such natural presence and clarity, you'll feel every stretch and strum in a guitar solo.

Perhaps it's because of our midrange voice coil, in which we've used an aluminum "former" to dissipate heat. Or the free-edge surround that ingeniously dampens cone movement. Then again, maybe it's our distortion-free crossover network. The combined result is a loudspeaker with the highest power handling and widest dynamic range of anything you might hear in the demo room. Of course, the DX also has something else you won't hear in other loudspeakers.

Cerwin-Vega bass. Which for over 35 years has been the ultimate mover and shaker in audio.

In fact, the DX-9 takes bass response all the way down to an earth-shaking 25Hz.

All of which is encouragement to drop by a Cerwin-Vega dealer and listen closely to our DX loudspeakers. And see how a totally instrumental piece of music can actually speak to you.
AudioSource's SS Three provided very good localization and smooth sound fields with most movies and videos.

Fig. 5—Main-channel THD + N in Dolby Pro-Logic mode, at 1 V in and out.

The built-in test signal is shaped pink noise, rolled off above and below 1 kHz. The −3 dB points were at 400 Hz and 2.5 kHz. Any spurious signals from the digital delay were at least 85 dB below a 1-V output signal. The remote control was reliable out to at least 25 feet on the sensor's axis and could be pointed as much as ±20° off at this distance. At normal viewing and listening distances, the control could be positioned up to ±60° off the sensor's axis when it was aimed at the unit, or it could be pointed ±60° off when located on the sensor's axis. The power amplifier had less than 0.5% distortion up to 10 watts per channel with both channels driven using 8-ohm loads. Distortion increased rapidly at higher power levels. The maximum output was about 50% higher (16 watts) with 4-ohm loads. The amplifier did not put out the specified 30 watts per channel (unspecified load) even when the tone bursts were of very short duration.

Use and Listening Tests

The associated equipment used for the in-use evaluation was the same as used in other recent profiles. As usual, I connected a two-channel oscilloscope across the left and right inputs and operated it in X-Y mode to show the existence or absence of stereo and surround information. (The reference surround unit was the combination of Yamaha's DSP-1 processor and their DSR-100PRO Dolby Pro-Logic decoder.)

The SS Three's owner's manual is brief and lucid, providing simple and direct instructions on setting modes for typical sources, but additional comments would benefit users who want to experiment. Four diagrams will help many users make connections. At least momentary confusion, however, might be generated, as all figures show "Video Out" on the VCR connected to "Monitor Video Out" on the video display instead of "Monitor Video In," as it is labelled in most systems. I used the built-in level-calibration signal for basic system balancing but trimmed center and surround levels during the movie viewing and listening later.

Return of the Jedi (with Harrison Ford, Carrie Fisher, and Mark Hamill on CBS/Fox Video VHS tape) demonstrated the great advantage of Dolby Pro-Logic in keeping dialog front and center. ("Hall" mode was sometimes better for surround sound by adding openness, but it was definitely poorer with dialog because it lost the desired center presence.) The SS Three effectively showed the excellence of the source and the obvious superiority over regular stereo for the sound. The subwoofer was a definite plus for this film. Most of the time I preferred the 20-mS delay, but I liked the expansion effect in the sound field when I used 30 mS for music. Out of Africa (with Robert Redford and Meryl Streep, an MCA Home Video VHS tape) got off to an impressive start with the sounds of trapshooting correctly localized. All on-screen dialog was strictly monaural, and it was very positively centered. Off-screen dialog was also well localized. The music surround had a spaciousness during the biplane scene that matched the panorama of the screen.

South Pacific (with Rossano Brazzi and Mitzi Gaynor on CBS/Fox Video VHS tape) required mode switching for the best results. I preferred Dolby Pro-Logic for all dialog, but I liked "Hall" better and "Matrix" much better for the songs. The X-Y display showed odd artifacts in the source at times, including an unwanted L − R spur across the L + R monaural signal. This caused some audible distortion in Dolby Pro-Logic mode. Michael Jackson's Moonwalker (on a CMV Enterprises videodisc) starts off with little surround sound. "Badder" and "Speed Demon" in the middle of the first side deliver more of interest, and I had the center/front/surround balance I wanted by that time. "Smooth Criminal" has much surround of high quality, with good effects, and Dolby Pro-Logic delivered good localization across and out of the scene. The subwoofer was helpful several times on this track. I increased the center level to get more vocal presence in "Come Together," another good track.

Next, I sampled a series of Compact Discs. Beethoven's String Quartets, Op. 18, Nos. 1 and 6, performed by the Colorado Quartet (Fidelio 8823), sounded most realistic with either "Hall" or "Dolby Surround." The center channel was on but at a low level. I preferred 20-mS delay with the Dolby mode. However, "Hall" was more than acceptable, and this mode has 30-mS delay only. The string tone had a slight bite in the loudest sections, a characteristic I had not heard at this quartet's live performance of the same works. I could not get the room ambience I wanted using either mode. The rendition of Handel's Concerti Grossi, Op. 6, Nos. 1-4 by Trevor Pinnock and the English Concert (DG/Archiv 410954-2) has noticeably more room sound than the quartet disc. The AudioSource decoder was more successful with this disc in delivering a satisfying illusion. Dolby Pro-Logic was the choice for a fuller sound overall, but "Hall" delivered better frontal articulation.

The next disc contained Sibelius' Symphony No. 4, "Luonnotar," and "Finlandia," performed by the Philharmonia Orchestra with Vladimir Ashkenazy conducting and Elisabeth Söderström, soprano (London 400562-10). I hadn't heard any of this music in some time. I got reaquainted and was reminded how "Finlandia" is more than a sweet song sung...
What could be simpler?

The control functions you use every day. Enough inputs to handle all your favorite sources. High-performance XLR and single-ended outputs. New circuitry which redefines lucidity and neutrality. And, a surprisingly affordable price: $2495, suggested retail.

Simple, isn’t it? From the company that’s been bringing high-end audio down to earth for more than twenty years.
by amateur choruses. I had to reduce the input level when I
heard obvious overload. The red LEDs had been flickering,
and I had not noticed them from my listening position.
I thought the surround was fuller with Dolby Pro-Logic, and
I preferred that mode. I preferred it even more for "Luunno-
tar" and the solo voice after I raised the center level.
The Symphony No. 9 of Robert Simpson was a new one to me.
The performance by Vernon Handley and the Bournemouth
Symphony Orchestra (Hyperion CDA66299) produced sev-
eral exciting climaxes. The music benefited from a high
surround level, 30-mS delay, and Dolby Surround. I couldn't
achieve the exact combination of frontal detail and full room
sound I wanted, but I got close to it.

Stravinsky's The Firebird: Suite (1919 version) is one of
my favorite showpieces, and I really enjoy listening to the
version by Robert Shaw and the Atlanta Symphony Orches-
tra (Telarc CD-80039). The start was good, with low rum-
bling from the tympani and double basses. Dolby Pro-Logic
was closer to the sound I wanted, and 30-mS delay was
better for a sense of fantasy in the character of the surround.
La Cage aux Folles, by Jerry Herman and Harvey Fierstein,
stars George Hearn and Gene Barry (RCA RCD14824).
The musical was a great contrast to The Firebird, and changes
were in order. Sometimes "Matrix" mode was better for the
voices. Shortening the delay to 20 mS and bringing the
center level up high, however, made Dolby Pro-Logic the
much better choice. Occasional center-level jumps were
distracting, but a check of the oscilloscope monitor re-
vealed they were characteristic of the source. Next I tried
Verdi's Un Ballo in Maschera, sung by Margaret Price and
Luciano Pavarotti with George Solti leading the National Phil-
harmonic Orchestra and the London Opera Chorus (London
410 210-2). The opera seemed best in "Hall" mode at first. I
felt challenged in trying to get both good vocal presence
and a full surround field. I went back to "Dolby Surround" and
the settings I had for the musical. I spent the time to trim
levels more carefully and found I could obtain really good
separation of the different vocal lines. Stage localization was
good for both width and depth.

Using a subwoofer showed its value at various points
during Saint-Saëns' Symphony No. 3 ("Organ") by Michael
Murray with Eugene Ormandy and the Philadelphia Orches-
tra (Telarc 80051). The entrance of the organ was more
solid in sound and in placement using Dolby Pro-Logic. I
did need to bring the center level down slightly to secure
good balance with the orchestra. The oscilloscope showed
noticeable room sound on Leo Sowerby Piano Works per-
formed by Gail Quilman (New World Records NW-376-2). I
didn't find it so obvious in the listening, however, and deci-
ded I preferred the relationship of piano and room sound in
"Hall" mode over the other modes. The situation was differ-
ent for Rutter's Requiem; I Will Lift up Mine Eyes, performed
by The Cambridge Singers and the City of London Sinfonia
and conducted by John Rutter (Collegium COLCD 103).
The liveness on the CD was readily apparent in the listen-
ing—whatever I did. I preferred 30 mS of delay and decided
that "Hall" and "Dolby Surround" were both good choices, a
matter of personal preference. I did set the center level low
since I wanted a cathedral sound quality, not fully realized
because of the lack of parameter control.

The Bop Brothers on Doing the Classics (Colossus
BCD2102) were much more than a noticeable change from
the Rutter choral works. When I saw how monaural the
vocals were, I tried "Matrix" mode and reduced the sur-
round level. Some effects from the source that appeared in
the surround field were interesting in ways, but I found them
odd. "Hall" mode with a high center level was the best
choice to secure a good combination of voice centering,
instrument localization, and room sound. "Hall" mode and
very close to the same settings were also best for the Dirty
Dozen Brass Band On My Feet Can't Fail Me Now (George
Wein Collection, CCD 43005). Many pop/rock discs require
strong centering and good presence for the vocals. The
lack of a center channel can greatly reduce the impact of
this type of music. Bruce Springsteen's famous Born in the
U.S.A. disc (Columbia CK 38653) has good stereo and
surround levels. I preferred "Hall" mode and the strong
center for the majority of this disc, but some tracks sounded
better to me with Dolby Pro-Logic. A couple of the more
monaural-like tracks were good in "Matrix" mode, and other
listeners might make that choice. The last CD tried was
Legendary Oldies of the 50's and 60's from Realistic (Radio
Shack Cat. No. 51-5009). Both monaural and stereo tracks
are on the disc, and the amount of surround varied greatly.
I set the center level high to enhance the vocals. I usually
used "Matrix" mode for monaural tracks and "Hall" mode
most often for the stereo ones.

The SS Three's four-channel input metering was regularly
helpful, and its convenience was increased by the automatic
switching to volume-setting mode whenever a volume
button was pressed. The broad turn-on range of the "+6"
volume step was a little distracting, but I always set volumes
by listening. I could quickly identify the status indicators in
the buttons from my viewing/listening position. The flexibility
of the remote control and the automatic balancing eliminat-
ed much of the need to go to the front panel to make
desired changes. Controls and switches were reliable
throughout the testing. I took me some practice to learn
exactly how long to hold a volume button down to get it to
make a change. Occasionally the front-panel power button
needed a second push, but the "Power" button on the
remote control never did.

The AudioSource processor was very successful in gen-
erating good localizations and smooth sound fields with
most movies and videos. Dolby Pro-Logic proved its value
regularly. With these sources, the SS Three was close in
performance to the reference decoder. For some CDs, the
SS Three delivered very satisfying surround sound; for other
discs, I wanted to change parameters of the sound field in
ways I could not. Particularly for classical music CDs, the
reference processor delivered much more in the way of
satisfying illusions. For music that I listened to at really high
levels, my evaluation system was putting more power into
the surround channels than could be delivered by the SS
Three's built-in amplifier. For limited needs, however, this
amplifier adds value and convenience, and a higher
powered amp can always be added later. In the past, Dolby
Pro-Logic has been an expensive, attractive feature. The
AudioSource processor provides this attraction and others
at a very reasonable price.

Howard A. Roberson
Musical Articulation. Details. Elusive qualities of superior sonic reproduction that are rarely found in even the most expensive subwoofers.

Until now! M&K’s new MX subwoofers bring you these high-performance qualities in a smaller cabinet and at a lower price.

In a cabinet the size of a bookshelf speaker, two new proprietary 12” subwoofer drivers produce the massive amounts of bass only expected from much larger cabinets. Better yet, M&K’s Push-Pull design produces a much higher quality of bass by virtually eliminating even-order harmonic distortion.

Enter No. 27 on Reader Service Card

MX-100, MX-90, MX-80 & MX-70
Four MX models, with internal amplifiers between 75 and 200 watts RMS, provide an ideal match for your system.

Building On Excellence
Seventeen years of M&K experience in Satellite-Subwoofer systems comes together again to create a new subwoofer performance standard. And with the 18” x 10” x 8.5” MX-70, M&K creates a new compact subwoofer standard.

The Ideal Choice
The unprecedented musical articulation and “ultra quick” sound of the MX subwoofers make them the perfect choice to complete any audio or audio/video system.
JECKLIN FLOAT ESC EARPHONES

Manufacturer's Specifications
Transducer Design: Electrostatic.
Coupling to the Ear: Special off-the-ear design.
Impedance: 4 ohms at input to electronic interface and power supply.
Absolute Polarity: Positive.
Cord: 15-foot, flat, straight multi-wire; terminated in six-pin plug for interface to power supply.
Weight: More than 16 ounces.
Price: $650
Company Address: c/o May Audio Marketing, P.O. Box 1048, Champlain, N.Y. 12919
For literature, circle No. 94

The Jecklin Float ESC earphones were designed to be used in recording studios by engineers for monitoring the sound as they make original recordings and final mixes. If an engineer hears things that are not right when a recording is first being made, he can fix them. These Jecklin earphones were designed to allow everything in the recording to be heard clearly, both the good and the bad. While most other monitoring earphones use dynamic transducers, Jecklin decided to use electrostatic elements in the Float ESC because of electrostatics' reputation for producing extremely transparent and detailed sound. These characteristics are essential for monitoring during recording, because any problems—such as noise, distortion, hum, tape drop-outs, etc.—must be clearly audible to the engineer.

The Jecklin Float ESC earphones are rather unusual in appearance. They are relatively large and cumbersome but, considering the application for which they were designed, are reasonably comfortable. It is, however, obvious that they are not designed to be used with pocket cassette players by joggers! They weigh over 1 pound, and their size and weight take some getting used to, but this is not hard because one is diverted from their physical aspects by their impressive sound. The Jecklin Float 'phones are designed to stand away from the ears, so the pinnae of the ears can function as they do when listening to speakers or live sounds. They are called "Float" because they rest lightly on the least sensitive parts of the head, supported on foam pads. These 'phones are not sealed against noise from the outside, but this should not present a problem in a recording studio or a home listening environment.

The Float ESC's electrostatic transducer elements are built into a large, one-piece headband shaped like an inverted "U." The headband is molded in a shape that provides the tension required to hold the earphones in place. A "one size fits all" philosophy is apparent, since the tension cannot be adjusted, but the manufacturer says their research shows that adult heads vary by only about 1.5 to 2 cm (0.6 to 0.8 inch). No one on my listening panel found them to be uncomfortable, so this may not be a problem for most people. Foam strips inside the headband, toward the rear on both sides, keep the headband from falling off when the listener bends forward and hold it in place when the listener's head moves. The driver elements are covered by acoustically transparent, open-cell foam.

Electrostatic transducers require high voltages to operate, and Jecklin provides this by an interface/power-supply box that must be plugged into an a.c. receptacle. The interface/power supply also acts as an impedance converter, since the electrostatic elements' high impedance must be matched to the low output impedance of your power amplifier. The power-supply box has sockets for two multi-pin earphone connectors and for the input connections which accept the output of the left and right channels of your power amplifier or receiver; it also allows you to switch between the earphones and your loudspeakers. The flat, straight multi-wire cord from the Float ESC to the interface/power supply measured 14 feet long in our sample, so you can place the power supply near your other equipment and still listen at a reasonable distance.

A number of people, most of whom have been members of my listening panel over the years, were asked to audition the Float ESC and write down their comments. I will try to correlate
Beginning with the first Mark Levinson® products, we defined quality in audio, using superior components and craftsmanship to heighten the experience of music in the home. Twenty years later we not only continue this tradition, but enhance it with state-of-the-art engineering and manufacturing, so that today's Mark Levinson audio equipment is a worldwide reference standard. The № 23.5 Dual Monaural Power Amplifier is one example of this evolution.

An improved version of the widely acclaimed № 23 amplifier, the № 23.5 is not the sort of update that merely takes advantage of newer and better parts, or that corrects flaws in the original design. Rather, it incorporates substantial improvements in four areas: self-referencing voltage reference in the power supply regulator amplifier, a new active balanced input stage, an enhanced current mirror, and differential cascode bootstrapping. If you don't understand this technical jargon, consider that it took a team of engineers using advanced computer-aided design tools over a year to perfect the № 23.5 and bring it into production. Such sophisticated engineering requires tools and skills seldom found at high-end audio manufacturers, and demands a quest for perfection that is at odds with supplying the mass market.

The sonic improvements are as easy to hear as the electronic theory behind them can be difficult to grasp: greater dynamic contrasts and clarity of fine details and harmonic structure yield a new level of musical excitement. The results are available for your evaluation at your nearest Mark Levinson dealer. Audition the № 23.5 for yourself, and learn why Mark Levinson products remain your best investment in home music reproduction.
The Jecklin Float 'phones present well-done "live" recordings very realistically, with good vocal articulation and a sense of space.

The subjective comments with some technical measurements that I made.

I measured the acoustical output of the Jecklin Float 'phones with the B & K Head and Torso Simulator (HATS). There was a rise in output at around 115 Hz that could be correlated with such listener comments as, "The bass is full and natural" and "great bass." This indicates that, although the bass output drops off below 115 Hz, the Jecklin Float earphones give the impression of very good bass reproduction; according to the manufacturer, measurements on a real head show about ½ octave lower response than is measured on an artificial one.

Jecklin has chosen design parameters which allow the natural resonance of the diaphragm to be underdamped. This is necessary to produce respectable bass output in an earphone that does not have a tight pressure seal between the transducer elements and the ears. It is similar to the engineering trade-off employed by the designers of large electrostatic panel loudspeakers, in which both sides of the diaphragm are open to the air.

Although the measurement using the B & K diffuse-field equalization showed the response between 2 and 7 kHz to be down as much as 5 dB, the listening panel rated the midrange sound quality as excellent. They rated the high-frequency sound characteristics as being very good. The Jecklin Float ESC 'phones clearly gave the Stax SR-Lambda Pro reference earphones a run for their money.

The square-wave measurement also indicated very good performance. Some squiggles on the leading edge of the waveform indicated some "ringing" in the high-frequency range. The spectrum of the square wave showed a gradual increase in output from the 19th harmonic (9.5 kHz) to the 25th harmonic (12.5 kHz). This would appear to be caused by a resonance around 11 or 12 kHz, though the manufacturer believes this resonance is masked when the 'phones are on a real head. The response dropped off above 12 kHz, so the ringing can also be attributed to the time delay caused by this natural filter action. Comments from panel members about the high frequencies being bright and sharp can be correlated with this measured resonance. When questioned later about their comments, however, no one said that they considered the sound objectionable.

The top waveform of Fig. 1 shows the 20-kHz cosine-pulse output of the power amplifier to the Float ESC's interface/power-supply box. There is some interaction between the input and the driving amplifier. The acoustical output of the earphones is shown in the bottom waveform. The ringing is very apparent. Other measurements, made using 3- and 7-kHz cosine pulses, showed less ringing. The resonance at 12 kHz was also corroborated by an FFT magnitude and phase transfer-function measurement I made of the Float 'phones: There was a rise in the magnitude transfer function of around 10 dB at 12.25 kHz. The phase transfer function indicated that the Float exhibits a "minimum phase" condition, which is very good.

The Jecklin Float ESC gives a very realistic presentation of well-done "live" recordings, such as opera, with excellent articulation of the voices and a sense of the acoustical environment. One reason for this is that they don't have the resonant, nasal, or canned sound of most enclosed earphones. They are physically unusual, and it may take some people time to get used to them. This time will pass quickly and enjoyably, because the sonic attributes of these earphones are excellent. If you like to turn up the sound occasionally and would like to have the sound quality provided by a pair of expensive loudspeakers, you should investigate the Jecklin Float ESC earphones. They allow you to hear everything clearly, with very good bass and as loud as you want, while still retaining an aural connection to the outside world.

Edward M. Long

**EARPHONE EVALUATION**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RATING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Sound</td>
<td>Very good</td>
<td>&quot;Full and natural&quot;</td>
</tr>
<tr>
<td>Bass</td>
<td>Good</td>
<td>&quot;Clear&quot; and &quot;Forward and sharp&quot;</td>
</tr>
<tr>
<td>Midrange</td>
<td>Excellent</td>
<td>&quot;Bright&quot; and &quot;Clear and sharp&quot;</td>
</tr>
<tr>
<td>Treble</td>
<td>Very good</td>
<td>&quot;Low sounds are easy to hear&quot;</td>
</tr>
<tr>
<td>Overall Isolation</td>
<td>Poor</td>
<td>&quot;Easy to hear outside</td>
</tr>
<tr>
<td>Bass</td>
<td>Poor</td>
<td>conversations, etc.&quot;</td>
</tr>
<tr>
<td>Midrange</td>
<td>Fair</td>
<td>&quot;Easy to hear from the outside&quot;</td>
</tr>
<tr>
<td>Treble</td>
<td>Good</td>
<td>&quot;It takes time to adjust to this unusual design&quot;</td>
</tr>
<tr>
<td>Comfort</td>
<td>Good</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL COMMENTS:** The stereo separation is very pronounced. Surface noise from records and background noise from radio are very apparent. The sound reproduction is excellent. The weight and the effects of the foam against the ears may make long-term listening sessions difficult for some people.
Pyle engineers originated and perfected the art of producing high power, superior quality, massive motor subwoofers. Now that tradition continues with the wild free spirit, raw power and natural bass of Pyle World Class Woofers.

Our new IronMax™ motor technology produces the industry's most indestructible voice coil, while our exclusive PrcLinear™ polyfoam suspensions are individually designed to provide optimum tuning.

Choose from 48 new World Class Woofers featuring polymer laminate cones, high energy magnet structures and vent-cooled motors to give you the perfect combination of pure musical quality and sheer sonic energy.

Listen to the low growl and loud roar of the wild side of sound — only with American-made Pyle World Class Woofers.

Pyle World Class Woofers

the wild side of sound!

New Wave Subwoofers — Superb free air bass for enclosureless applications

PRO Series — Subwoofers designed for the primal instincts of the true sound enthusiast

Pyle Driver™ — The newest technology and three generations of quality at a very affordable price

Made in U.S.A.

Member IASCA

For the name of the Pyle dealer nearest you write: Pyle Industries, Inc. • Huntington, IN 46750

For technical assistance call 1-800-852-9688.
Whenever I encounter a product designed by famed r.f. engineer Larry Schotz, I know that I won't be disappointed with its performance. This was especially true with the Recoton FM200, a powered, tunable indoor FM antenna. Recoton must feel the same way about Schotz, for they've put his picture, a 150-word biography, and a list of his inventions right on the FM200's carton.

As an FM enthusiast myself, and as a former designer of FM circuits, I could not help being a bit envious of Schotz's brilliant idea to construct a tunable powered indoor antenna. All of the indoor FM antennas I'd tested in recent years (including earlier ones from Recoton, Terk, and Parsec, which were also designed by Schotz) were powered, but none had a built-in tuning circuit. By incorporating a tuned r.f. gain stage in this antenna, Schotz effectively provides the user with what amounts to an extra tuned r.f. stage in whatever tuner or receiver he or she attaches the antenna to. The tuned stage in the Recoton FM200 has its good points and also one disadvantage, which I'll get to shortly.

The advantage of a tunable antenna is its ability to improve the selectivity of the system to which it is connected. Most indoor FM antenna advertising stresses "sensitivity" and "gain" when, in fact, sensitivity is rarely a problem in most metropolitan areas these days. The real problem is interference, either from adjacent-channel signals 200 kHz away or alternate-channel signals 400 kHz removed from the frequency of the desired signal. By providing a tuned stage rather than broadband gain, the FM200 can actually reduce interference, substantially improving both adjacent-channel and alternate-channel selectivity. In my tests, I estimated the improvement to be between 10 and 20 dB, depending on the initial signal strength of the received signal and the tuner's initial selectivity.

The antenna's negative aspect I mentioned earlier stems from the very thing that makes this antenna different from all the rest—the tuning feature. For listeners who tune to many different FM stations, it can be quite annoying to have to retune the antenna each time the station is changed. Yet, that's exactly what you must do if you want to obtain maximum performance and maximum gain from this antenna. On the other hand, if there is one particular station that you've had difficulty receiving with adequate signal strength and quieting, I know of no FM antenna—short of a properly oriented, multi-element outdoor antenna—that can bring in that station as well as the Recoton FM200.

As is true of most powered indoor FM antennas, this one is supplied with a separate a.c. adaptor that must be plugged in when using the antenna. If your tuner or receiver has one or more "switched" a.c. convenience outlets, the ideal way to power the antenna is from one of those receptacles. That way, power will be applied to the antenna whenever the tuner or receiver is turned on. The base of the antenna is fitted with four suction cups. Once you've decided where you want to place the antenna, the suction cups will keep it from being knocked over or moved. The circular "loop" that constitutes the antenna element itself can be tilted forward or backward over a total angle of about 90°. It can also be rotated by about the same amount. Controls include one thumbwheel knob...
CD Samplers from $4.99

Contemporary Jazz Masters Sampler, Vol 1. — 16 Cuts, including selections by Miles Davis, Paul Desmond, Art Farmer, Maynard Ferguson, Alain Holdsworth, Tom Scott and more. (43486) $9.99

JVC World Sounds Catalogue — 40 cuts, with music from all over the world. (Bulgaria, Zaire, Tibet and more!) (49063) $4.99


IMP Classics 3-CD Samplers—This collection includes three $5.00 coupons, which are redeemable by purchasing any IMP Classics title from Bose Express Music. (66896) 3 CDs $14.95

Dorian Digital Sampler Vol III - This sequel presents highlights from the On the Banks of Helicon and more. (51776) $4.99

Teldec Classics International - 22 Cuts, highlighting Teldec’s Spring 1991 releases. (61539) $4.99

Any Recording in This Issue $1299

You can order any title reviewed or advertised in this issue, that is regularly priced less than $17 per CD, for our new subscriber low price of $12.99/CD (only $7.99 for cassettes), plus $3.95 shipping and handling per order. Just call 1-800-233-6357 or use the coupon to order. Please include artist, title, format & inventory number, if known.

SUBSCRIPTION/MAIL ORDER FORM

☐ Start the Updates & send the 240-page Catalog ($6.00/yr, refundable on the first order from the Catalog)

☐ Yes. Please include my FREE Rykodisc Sampler, Steal This Disc 3. I’m enclosing an extra $3.95 for Shipping and Handling. (55328)

☐ Send me the attached list of recordings checked above (include artist, title, format [CD or CA] & number) or I’m enclosing $12.99/disc + $3.95 S&H per order (Music orders Only)

☐ Check or ☐ Credit Card ☐ Visa ☐ MC ☐ AMEX

(Outside U.S. Credit Card Only, Please)

Call 1-800-233-6357 or mail with payment to:

Bose Express Music
The Mountain, Framingham, MA 01701
Fax: 508-875-0604
Powered indoor antennas certainly are not new, even for Larry Schotz, but making a tunable one was truly brilliant.

that adjusts gain (and also turns off power, if signal gain is not needed) and a second thumbwheel knob that tunes the antenna to the desired frequency. You adjust the antenna’s tuning knob until you achieve maximum signal strength for a given gain setting. The signal-strength indicator on your tuner or receiver serves as a tuning

![Fig. 1—Comparative performance of Recoton FM200 and standard dipole; see text. Values shown in dBf correspond to multiples of 500 µV across 75 ohms.](image)

indicator for the FM200 as well; if your tuner or receiver has no such indicator, you will have to rely on your ears to determine when optimum tuning of each signal is achieved.

The bar graph of Fig. 1 shows the signal strengths of a sampling of stations in my listening area as received by a standard, stretched-out, half-wave dipole antenna mounted on an outside wall of my lab, facing most of my local FM stations, compared to the signal strengths received by the Recoton FM200. As indicated on the graph, for each frequency shown, the tuning control on the FM200 was adjusted for highest signal strength, while its adjustable element was also oriented for maximum gain. The fixed dipole antenna used for comparison purposes was not reoriented for each of the signal frequencies. That may not seem completely fair, but if you think about it, few users of fixed “wire” dipoles bother to reorient them for each station they wish to receive. (Few, in fact, even bother to stretch them out for their full length and tack them up on a wall so they won’t curl up on the floor behind the tuner!)

Note that for the signal received at 91.1 MHz, gain over a simple passive dipole was somewhat higher than 30 dB! The smallest improvement of the FM200 over passive-dipole performance was at 95.5 MHz, but I suspect that this may have been due to improp-

My conclusions about selectivity were confirmed when I hooked up the FM200 to my reference tuner. (The antenna has a 75-ohm shielded output, and a matching transformer is supplied for use with tuners having only 300-ohm inputs.) In the past, I have been able to pick up 54 stations with my outdoor antenna. The FM200, mounted indoors and at an elevation of no more than 6 feet above the terrain, picked up the same number of stations, but with one important difference: All 54 were usable, whereas with my passive outdoor antenna, at least six of the stations received were unusable because of adjacent-channel interference that could not be eliminated even by reorienting the outdoor antenna. The listening tests took far longer than they would have with a broadband antenna simply because, as stated earlier, I had to readjust the tuning knob on the FM200 for each signal received. Nevertheless, the antenna design is another remarkable achievement that combines Schotz’s engineering talents with the excellent industrial design talents of the people at Recoton. The retail price of $69.99 makes this antenna a real bargain for anyone who wants improved FM reception and either can’t install a good directional outdoor antenna or has found that even that type of antenna doesn’t solve the kinds of interference problems I’ve discussed.

Leonard Feldman
Audio's Guide to the New Mini Systems
DO YOU THINK MINI SYSTEMS GIVE YOU LITTLE MORE THAN THE BARE MINIMUM?
OBVIOUSLY, YOU HAVEN'T HEARD OURS. SHARP OFFERS FEATURES LIKE A CONVENIENT 6-DISC CD CHANGER,
FOR UP TO 7 1/2 HOURS OF UNINTERRUPTED MUSIC.
AND ONLY SHARP HAS AN ADDED SUBWOOFER FOR
OVERALL SOUND OF SUCH RICHNESS AND DIMENSION.
IT'S NOTHING SHORT OF MIRACULOUS. BUT LET THE
EXPERIENCE SPEAK FOR ITSELF. FOR YOUR NEAREST
SHARP AUDIO DEALER, CALL 1-800-BE-SHARP.
FIND OUT HOW YOU CAN HAVE INCREDIBLE SOUND AND FEATURES.
AND STILL HAVE YOUR SPACE.

SHARP
FROM SHARP MINDS
COME SHARP PRODUCTS™

Enter No. 51 on Reader Service Card
introduction to the new mini systems

Striving to re-create the "live" musical experience in every room of the house is the goal of every stereo enthusiast. For the truest sound, only the finest full-size components will do. But what about the music lover who demands great audio everywhere? Enter the "mini" or "bookshelf" system, a new generation of down-sized components that offer state-of-the-art sound in very small packages...for sound systems that can easily fit in a home, office, dorm room or anywhere else there's a need for great music.

Today's mini systems are actually marvels of electronic miniaturization. By using unique chassis designs, advanced digital circuitry and cutting-edge speaker technology, engineers are able to build systems that deliver all of the drama and dynamic range recorded music has to offer. Not only can they handle compact discs but audiocassettes as well—America's two favorite music formats. And they "handle" them with the quality that has taken quantum leaps over the past few years. Forget "The Ghost of Boomboxes Past!"

Bookshelf systems are increasingly popular because they are "one-stop" shopping at its best. In this swiftly changing society, to be able to find a fit-anywhere system in a reasonably-priced package is a joy. They are also simplicity itself to hook up. And since all of the components are from the same manufacturer, they can communicate with each other with ease, making it much simpler to make tapes from CDs for the car or portable cassette player. Also making modern life easier are remote controls that let you make a wide variety of adjustments from your chair.

Adding to the new "mini advantage" is their sleek, contemporary design. They not only sound good but look the part too. Most systems have a modular style, which allows you to stack the components or place them side-by-side to fit your special space and design requirements. On the following pages, you'll find a guide to the exciting new world of "Little Audio Dynamite!"
maximum minis

"The reason mini systems have taken off is simple," said Ken Furst. "They let people get high-performance sound from advanced components that don't take up a lot of room. Places that were once 'off limits' for high-quality listening because of space limitations now can have their own top-notch audio. The systems have gotten so small, consumers are only limited by their imaginations as to where to put them." Furst, a long-time industry observer and Marketing VP for Denon, points to his company's hot-selling D-2005 Personal Component System as an example of a "maximum mini." The four components consist of a 40 watt-per-channel amplifier, a tuner/timer, a high-quality 6-disc changer and a horizontal load autoreverse cassette deck. The entire system with speakers has a suggested retail of $1,500.

Dan Dattilo says Sharp's new CD-C900 "will change the way people look at small audio systems." The company's Audio Marketing Manager says the new mini not only has a 40 watt-per-channel amplifier, it has a 70-watt powered subwoofer to add real bottom to bass. The CD-C900 ($1,249) features a 6-disc changer, an autoreverse cassette deck, CD Synchro Dubbing for easy taping and a tuner with 30 presets. Special features include a 5-mode preprogrammed equalizer, a 4-mode Sound Expander to alter acoustics and a 63-key unified remote control.

Kenwood is one of the compact system leaders and their two new editions give several big reasons why. The UD-90 and UD-70 not only have sleek styling, they also have advanced features that fit the 21st century look. Both have Audio Intelligence (AI) circuitry which samples the musical content and automatically sets the optimum sonic levels for great listening. The top-of-the-line UD-90 ($1,399) can also act as the centerpiece of a Home Theater. It has a Dolby Pro Logic decoder for great at home cinema sound. The UD-90 even has a Digital Sound Processor (DSP) that can turn your room into any of six different venues. Both the UD-90 and UD-70 ($1,199) have 1-bit CD players, dual autoreverse decks, timers, easy tape dubbing and 40 watt-per-channel amps.

Panasonic also has a sophisticated mini. In keeping with its video leadership position, its SC-CH10 Lifestyle Component System ($1,050)
Special Advertising Supplement

offers Dolby Pro Logic for a superior home movie experience.

Other top manufacturers that offer sophisticated bookshelf systems with Home Theater features include Aiwa, JVC and Sansui. These companies have a wide variety of mini systems with their best incorporating Dolby Surround or Pro Logic. Aiwa’s NSX-D9 ($1,200) is rated 45 wpc front, 15 rear when in the Dolby Surround mode.

JVC’s MX-90 Compact Component System ($1,200) has six built-in amps to handle two front speakers, a subwoofer, and two rear Surround speakers. Along with Dolby Surround with digital delay, it has DSP and digital parametric EQ with 6 programmed equalizations and one you can set yourself. JVC is also on the cutting edge of the new "micro" systems. The width of the chassis is slightly more than the dimensions of a CD jewel box! The UX-1 ($599) uses Active Hyper-Bass circuitry to pump a big sound from a small system.

Sansui’s MC-X9AV ($1,599) offers eight surround settings—including Dolby Pro Logic, DSP and variable digital delay. This versatile mini delivers 30 watts-per-channel for the front speakers, 15 for the rear channel and 40 watts for the subwoofer.

Buyers will find no shortage of bookshelf systems when they walk into a dealer showroom. Sony offers a wide variety at different prices with the MHC-3600 ($1,200) the top-of-the-line. This attractive mini uses a Bi-Amplified speaker system for better efficiency and minimal distortion. Pioneer also has a full line of minis, ranging from the CCS-530 ($1,150) to the CCS-330 ($725). The CCS-530 has a 6-disc changer with 1-bit DAC and an 8x oversampling digital filter for excellent sound performance. Onkyo’s PCS-05 also stands out from the pack because of its dramatic cosmetics and sound quality. The PCS-05 has a 1-bit CD player, a dual cassette deck with Dolby B/C/HX Pro and a tuner/amplifier rated at 45 watts-per-channel. Yamaha’s YST-NC1 ($799) and YST-99CD ($399) have Active Servo Technology (AST) to get top sound from small speakers. Proton’s new attractive mini system is the Al-3200 ($799). Fisher’s new DCS-M44 ($899) has completely separate components, is rated 22 watts-per-channel and has a 7 band equalizer. Sherwood’s 1000 Series of minis uses the new Tri-Power Bass Servo amplifier for superior sound quality.

Today’s bookshelf systems simply deliver great sound. They are the maximum minis.

This special supplement was written for the Publisher of the Hachette Consumer Electronics Group. Editorial personnel of the magazines were not involved.
There's a school of music lovers that doesn't care what audio equipment looks like as long as it sounds good. And another that doesn't really care what it sounds like as long as it looks good.

Denon is proud to announce that, with the introduction of the D-Series Personal Component Systems, the sound-conscious and the style-conscious have been gracefully united—once and for all.

Although the D-Series systems are less than 1/2 the size of conventional systems, each consists of genuine hi-fi components, not mere look-alikes. They are constructed with strong metal chassis and front panels, high-current power supplies, and wide-bandwidth, low-noise circuitry, all hallmarks of high performance audio gear.

In the spirit of separate components, you can choose a D-Series system: (D-120, D-150 or D-200S) that's exactly right for you, giving you the option of a 6-disc CD changer; a horizontal-loading, auto-reverse Dolby® cassette deck; powerful, super sensitive AM/FM receivers and high performance, magnetically-shielded compact speakers.

With the Denon D-Series, the definition of style goes far deeper than appearance: not only do they all offer integrated remote control, they add such intuitive operational control as one-touch source selection and one-touch recording.

The Denon D-Series. The high fidelity components that are a joy to be heard and to behold.

Denon America, Inc., 222 New Road Parsippany, New Jersey 07054 (201) 575-7810

Enter No. 18 on Reader Service Card
Chicago Symphony Orchestra: The First 100 Years. Various performers and conductors with the CSO.

Chicago Symphony Orchestra, 12 CDs; AAD/ADD; approximately 14 hours. (Available from CSO Fulfillment Center, 847 West Jackson Blvd., Fifth Floor, Chicago, Ill. 60607.)

For its 100th anniversary season, the Chicago Symphony Orchestra has issued what may be one of the most important documents in American orchestral history, *The Chicago Symphony Orchestra: The First 100 Years* is a 12-CD retrospective of the CSO's sound from 1916 through 1988. Culled from live broadcast recordings (mostly made by WFMT in Orchestra Hall), as well as from out-of-print commercial sources, the set is remarkable for such landmarks as the only recorded version of Leopold Stokowski's taut and unflinching interpretation of Shostakovich's Symphony No. 10. But it is equally remarkable for the loving care that has gone into the transfers and restorations (how refreshing to hear NoNoise tastefully applied) and for the detailed documentation: Every entry has a recording date and place and, where applicable, matrix number. I suspect much of the credit for the quality of this set goes to CSO Executive Director Henry Fogel, whose informed enthusiasm for the recording art should set an example for orchestra administrators everywhere.

By and large, the collection is organized by music directors, among them Frederick Stock, Fritz Reiner, and Rafael Kubelik. Such Ravinia Festival directors as James Levine, Seiji Ozawa, and István Kertész are also represented, as is principal guest Claudio Abbado and longtime affiliates Leonard Slatkin and Erich Leinsdorf. The set begins with Stock, the CSO's second music director, who had firmly established the orchestra's big, full-bodied sound by 1926, as is evidenced here in that year's recording of Dvořák's orchestration of Brahms' Hungarian Dances, Nos. 17 to 21. (Like most of the entries, it's not been previously issued.) Stock also leads an extraordinarily rich and Germanic sounding Brahms Symphony No. 3, recorded in 1940 in New York's Liederkrantz or Carnegie Halls.

Allowances must be made, of course, for the age of the recordings and for the fact that most were made live and many were compressed for broadcasting. The sound on Désiré Defauw's 1947 interpretation of Strauss' "Death and Transfiguration," for instance, has little depth or dimension; extraneous noise comes and goes. But the performance is alive, vital, completely involving.

Similarly, the only extant recording of Josef Hofmann playing Beethoven's Fifth Piano Concerto is seriously marred, but the pianist's eccentric personality is so vivid, his interpretation so romantically broad, that this 1940 document of an era gone by is well worth hearing.

A relatively brisk, tightly played Mendelssohn "Scottish" Symphony from 1947 shows that Artur Rodzinski cultivated a lighter orchestral sound than his predecessors. But four years later, Rafael Kubelik was again eliciting marvelously full-blown textures on the Mussorgsky/Ravel "Pictures at an Exhibition," the first single-microphone Mercury Living Presence recording ever made and, like Kubelik's 1953 Hindemith "Symphonic Metamorphosis," not yet reissued on CD by Philips. "Pictures" jumps out of the speakers with a ferociously huge and, indeed, present sound, made all the more so by the orchestra's crisp brass and percussion playing.

Another high point is Kertész's 1968 interpretation of Bartók's suite from *The Miraculous Mandarin*, the most biting, bone-rattling interpretation these ears have ever heard and certainly the fast-
Cyprien Katsaris shows us how prodigiously skillful Franz Liszt really was at getting across Beethoven's symphonic message.

Among the very last of a long list of his works, the Cyprien Katsaris/ECM recording of No. 5 is a prodigious enterprise that must be thought of in terms of the entire Liszt oeuvre. The very first movement, "Intermezzo," or, more accurately, the first movement of the entirety, is actually a programmatic work with no more than a 10-second transition from its conclusion. The recording is nothing less than a triumph. The Lisztian vocabulary of the entire work is so large, so wide-ranging, that it would be impossible to encompass it in a single movement. The soloist plays with uncharacteristic liveness, and the orchestra is as resplendent as ever. The performance is also notable for cellist Frank Miller's lovely solo in the third movement.

Barenboim leads the newest entry, from 1988, the only extant recording of Shulamit Ran's Concerto for Orchestra; Sir Georg Solti, Barenboim's immediate predecessor, conducts the world premiere of Lutoslawski's Symphony No. 3, an economical, masterfully played musical statement with dramatic brass voicings. A year later, John Corigliano's comparatively lightweight "Tournament" Overture is thoughtfully realized.

There is much, much more. As the promotion goes, there are 12 CDs, 14 hours of music, 49 performances, 20 conductors. At $175 (plus $5 postage), this set is a bargain for the wealth of repertoire, the historic array of styles and interpretations, and the sheer virtuosity of the playing. This is, after all, one of the finest orchestras in the world. Susan Elliott

Beethoven/Liszt: Symphony No. 5 (piano); "Eroica" Variations, Op. 35. Cyprien Katsaris, piano. Teldec 44921, CD; DDD: 60:34.

Beethoven and Liszt! What a combination. We must remember that in the bravura 19th century, few listeners got to hear a symphony "live," and thus the market for piano transcriptions, both great and small, was a big one—especially for the touring pianist. This was the means by which the greatest of big music could be brought to larger audiences in a highly dramatic form; most of them had never heard the original and never would.

Liszt, for his own prodigious performances, made dozens of such transcriptions and in a Lisztian manner that might be thought questionable today, when millions know the music. Cyprien Katsaris, however, shows us how prodigiously skillful the old pianist was at getting the symphony's "message"
WHILE OTHERS PROMISE...SOUND CITY DELIVERS ON TIME AND ALL THE TIME!

EPICURE LIQUIDATION

MODEL 5
2-Way speakers with 6" woofers
$129.00
Originally $350

MODEL 4
2-Way speakers with 8" woofers
$179.00
Originally $499

POWERED PARTNER 570
Fini self contained powered. (35 watts dynamic) 2-way loudspeaker system with highly shielded drive units for TV system capability. 3" long throw woofer & 1" ciga. cooled tweeter & horn. best for Center Channel.

CALL FOR PRICE

Panasonic SC-CH10
MINI SYSTEM
- Dolby Pro Logic
- Onkyo stereo tuner w/26 presets
- 5 band graphic EQ
- Double auto-rot. cass. deck
- 1-way speaker system
- 25' ft. & remote

CALL FOR PRICE

LUXMAN P007
Automatic Turntable
- Linear tracking tone arm
- Belt driven DC motor
- Auto record sensor
- Cartridge included

CALL FOR PRICE

LUXMAN PO07
Automatic Turntable
- Linear tracking tone arm
- Belt driven DC motor
- Auto record sensor
- Cartridge included

CALL FOR PRICE

LUXMAN PO07
Automatic Turntable
- Linear tracking tone arm
- Belt driven DC motor
- Auto record sensor
- Cartridge included

CALL FOR PRICE

LUXMAN DZ-92
Remote Compact Disc Player
1. 800. 542. 7272 AVF

Features: Dual digital to analog converters • 4-way oversampling digital filter • All metal housing and cabs for excellent shielding • Advanced 3 beam laser • 20 selection programmed play • Multi-Function remote control

CALL FOR PRICE

DENON DT-400
Table Radio
Am/FM Hi-Fi stereo radio w/2rd speaker

CALL FOR PRICE

AMP/PREAMP SALE

ONLY authorized dealers offer you the protection of a manufacturers warranty with your purchase; at other dealers, you may have no warranty at all. Authorized dealers stock only components designed for the U.S., and have the training to help you select the right one for you.

FOR INFORMATION • CUSTOMER SERVICE
201-838-3444
Meadtown Shopping Center Order By Fax 201-838-2516 Route 23 Kinnelon N.J. 07405

Enter No. 43 on Reader Service Card
David Schrader presents an excellent, eye-opening survey of Soler’s works for harpsichord.

Variations—also neatly tied to the symphony by Beethoven himself—was both original and wonderfully perceptive if quite unlike earlier and more "classic" performances. This is one of Beethoven’s absolutely top works, and Katzaras is fully up to its physical and mental demands.

An extra note. As I listened, I said to myself: That’s got to be a European (Hamburg) Steinway! Just the sound of it. Recently it has dawned on me that this instrument, utterly unlike the American Steinway, is as close as one gets to the piano of the mid-19th century, still retaining that almost clanky sound of high notes under stress and their smooth whisper in pianissimo that was familiar to Beethoven, Schumann, and Liszt himself. It also has a harder, less mellow bass than the U.S. Steinway, and more color. No offense intended to either of these instruments—the two Steinways simply reflect two eras in their overlapping virtues.

Edward Tatnall Canby

---

Looks small. Sounds BIG!

We moved our 10” woofer to the bottom of the Design Acoustics PS10a, not just to make it look smaller, but to make it sound much better.

The compact front baffle creates a smaller acoustic source, reducing diffraction for superior definition and clarity, and more precise stereo imaging.

High-efficiency bass, radiated from the unique slot-loaded down-firing woofer, is consistently smooth and powerful anywhere in the room.

To learn more about the unique Point Source™ difference of the PS10a, write or call 1-800-933-9022 for literature and dealer list today.

PS10a Point Source™ 3-Way Loudspeaker System

Available in Oak and Contemporary Black Ash Finish

---

Soler: Fandango; Sonatas for Harpsichord. David Schrader, harpsichord. Cedille CDR 90000 004, CD; DDD, 73:51

One of the grand accomplishments of the classical CD—even beyond the LP—is the affordable experience of listening first-hand to composers relegated to some tiny corner of fame by past habit. Soler! Anyone who knows the harpsichord sonatas of D. Scarlatti has heard of Soler, a sort of Scarlatti shadow somewhere in the background—just an imitator. How many of us ever get further? In reality, Soler, a real Spaniard (Scarlatti was a transplanted Italian), was a generation younger and indeed did carry on the unique and somewhat isolated Spanish keyboard tradition, wonderfully unlike any other European music of the time and, as we now see it, a major force in 18th-century baroque music.

This excellent survey, early to late, is an eye-opener. Padre Antonio Francis-
Lydia Mordkovitch and the Ulster Orchestra, led by Vernon Handley, go beyond standard repertoire with Moeran’s violin concerto.

có Javier José Soler y Ramos was a lot more than a Scarlatti imitator; though the similarity in the style of the short, earlier one-movement sonatas is entirely clear and perfectly open. For one thing, Soler had a remarkable ear for harmony and frequent and pleasing modulations, to a degree that is well ahead of his time and, one might almost suggest sententiously, a forerunner of Richard Wagner. But Soler is all baroque bubbly richness and rhythm, a legacy from the past as well. In the longer late sonatas, now in several movements, we suddenly hear the gallant sound, out of the Bach sons and Haydn, as though some musical emissary had crossed the Pyrenees into Spain with the good news! Soler adapted quickly, but his earlier works are his best, I’d say.

David Schrader plays a somewhat twangy American-made harpsichord (twangy in spite of set-back mikes) with a single keyboard, but this was the instrumental type used by both Scarlatti and Soler. Caution reminds me that Italian and perhaps Spanish harpsichords were, in fact, twangier, more jangly, than the full-bottomed northern instruments.

This is an all-American venture into the depths of 18th-century Spain. The instrument, the performer, and the record label are based in Chicago. David Schrader is a fleet and vigorous player, easily matched to music that is extremely demanding both in finger technique and in rhythm and color. The recording (allowing for the twang) is excellent. Edward Tatnall Canby

Moeran: Violin Concerto. Ulster Orchestra; Vernon Handley, conductor; Lydia Mordkovitch, violin. Chandos CHAN 8807.

For those who would like to venture beyond the standard repertoire for violin concertos, this tuneful, folk music-inspired piece by underappreciated British composer E. J. Moeran is quite rewarding. Lydia Mordkovitch’s clean-lined violin, ably supported by Vernon Handley and the Ulster Orchestra, makes gorgeous music in the flattering acoustics of Ulster Hall. The pastoral-like "Lonely Waters" and "Whythorne’s Shadow" are nice fillers. Bert Whyte


Those who enjoy the big baroque choral works, notably the two Bach Passions, will find this a fascinating parallel, out of the same tradition. Telemann, like Bach, was a church cantor (Hamburg) who provided music for the events of the church year. In this Passion, the chorus sings only the hymns (chorales), but the rest is much as in Bach with recitatives and arias for the solo voices in superb baroque orchestrations. Beautifully performed, less dramatic, more contemplative than Bach. Edward Tatnall Canby

A point of view that you may never see but is an important feature of B&K units: all design, engineering, manufacturing and service takes place under one roof in Buffalo, New York. This allows B&K to integrate all phases of product development and manufacturing as a team. Our processes have been refined to provide you with state of the art audio equipment that is both reliable and affordable.

"How good is this preamp? Listen for yourself. But it may be good enough to go in some of the highest of high-end systems."


Sonata Series
Pro-10MC
Pre-amplifier

Enter No. 9 on Reader Service Card
MARK-ING TIME

From Strength to Strength: Peter Himmelman
Epic EK 47073, CD: Aad; 57:48
Sound: A Performance: A

Going against the grain of popular sound styles, Peter Himmelman has made a stripped-down album that presents his songs very straightforwardly. Some are played very simply and acoustically, while others have a full rock band. No drum machines or sequencers here, only "real" instruments such as Hammond organ, piano, and violin plus subtle percussion accents. The result is a genuinely organic sound, splendidly performed. The album's song sequence positions the acoustic numbers against the electric ones so that all the songs receive fair spotlighting, and the album gains a valuable dynamic.

But the focus remains squarely on Himmelman and his songs. These are songs with lyrics that reach and probe, with haunting melodies that keep coming back to me long after I've finished listening to the album. Often I feel the influence of fellow Minnesotan Bob Dylan in the riddles these songs pose and the liveliness of the performances. That Dylan is Peter's father-in-law has zizch to do with it. Himmelman's songs ooze a mystery that recalls Highway 61 Revisited and Blonde on Blonde without sounding very much like either. It's in the raw feel.

On Every Street: Dire Straits
Warner Bros. 9 26680-2, CD, Aad; 60:22
Sound: A Performance: B

Tension and mystery—a tightly stretched nexus of pulsing rhythms, swirling solo flights, and obliquely probing, often bittersweet lyrics—seem to be Mark Knopfler's obsession on Dire Straits' first album in six years.

Unlike the commercially and artistically mega-successful Brothers in Arms, this album mostly eschews wry-pointed commentary for sprawling sonic explorations. It's not exactly formulaic but filled with neo-improvisations thick in ethereal textures and tinged with Knopfler's continuously growing fascination with Nashville—organ-like fugues played by some Phantom of the Grand Ol' Opry. If you take songs like "Money for Nothing" and "Brothers in Arms" as the band's most recent poles of musical expression, On Every Street works almost entirely in the latter groove.

Much of the music's tension comes from Neil Dorfsman's curious mix. "Calling Elvis," the opening song, begins with a pumping energy that gradually builds under the ironic lyrics to a shimmering, distorted guitar break—flasby, yet hovering just back from the foreground—before veering into a long coda that wanders toward some far horizon, guided along a path defined by the cry of distant steel guitars. This pattern is often repeated, from the funky country rock of "When It Comes to You" and the smoky country jazz of "Fade to Black" to the dobro-laden, movie-soundtrack sparseness of "You and Your Friend," creating a music that implies more than it explicitly says and is never quite what you might expect. Knopfler's guitar playing is fluid, expressive, subtly inventive, and, like the musical structures it serves, almost meditative.

Knopfler's lyrics seem at times to mirror the uncentered focus of his music, relying on shifting points of view that require hard work to decipher. While there are several country-influenced lonesome love songs, other tracks—like the detective-story title cut, as well as "Heavy Fuel" (an anthem to substance abuse that almost cops the "Money for Nothing" riff) and the dripping irony cast in the voice of a follower of a TV evangelist in "Ticket to Heaven" (strings by George Martin)—aren't exactly crystal-clear, formulaic pop tunes.

On Every Street certainly won't be mistaken as being by anyone other than Dire Straits, and it's by no means a failure, but it does leave one with an uneasy feeling that this is more a creative pause than a bold new direction.

Michael Wright
Himmelman's work sounds neither trendy nor fashionable. It has only quality, depth, and sincerity to recommend it, and in the '90s, these are not necessarily tickets to commercial success. Don't let this one get by you—it's a wonderful album. Michael Tearson

Blow Up: The Smithereens
Capitol CDP 7-94963 2, CD; ADD: 48:06.

Sound: A-  Performance: B+

What started out as a working-class rock 'n' roll quartet, with at best an outside chance of breaking through on alternative radio, has become one of the best East Coast aggregates, outdistancing most of their college radio contemporaries while maintaining their integrity.

Blow Up will possibly alienate some of The Smithereens' early fans, as it is the band's most pop album they've made. Lead singer/songwriter Pat DiNizio has even gone so far as to collaborate on a song with Diane Warren, best known for supplying Cher, Milli Vanilli, Bon Jovi, and Chicago with Top 40 chartbusters. "Get a Hold of My Heart" is a likable song, yet it's the closest DiNizio comes to an innocuous lyric, while musically it owes too much to other songs. Blow Up also features a co-write with Julian Lennon, cameos by Carlene Carter and Steve Berlin, and a tribute to The Zombies called "Anywhere You Are," complete with a knock-off Rod Argent organ solo.

Producer Ed Stasium does the band justice. As usual, he achieves great clarity without loss of guts. Blow Up is further helped by the fact that in Dennis Diken and Mike Mesaros, The Smithereens have a strong rhythm section that can stand the scrutiny of high-fidelity recording. DiNizio's singing is better than ever, and Jim Babjak's guitars provide the bite that keeps The Smithereens from becoming a pure pop band. There is more textural variety here than on the band's previous two albums, and DiNizio's songs brim with sincerity. Although initially ignored by the New York music industry, The Smithereens have become not only one of the most successful bands to come out of the New York Tri-State area in the past 10 years, but certainly one of the best.

Jon & Sally Tiven

Drunk with Passion: The Golden Palominos
Charisma 91745-2, CD; AAD: 49:04.

Sound: B-  Performance: B

Anton Fier is a "downtown" N.Y.C. drummer with an established presence in an artsy consortium that includes John Zorn, Arto Lindsay, and Elliott Sharp. Some play homemade instruments that resemble logs with guitar pickups (Sharp). Others jump-cut from an Ennio Morricone movie theme to Metallica-like bashing (Zorn), while others, ever so casually, toss out-of-tune distortion box guitar solos in the middle of delicate sambas (Lindsay).

The Golden Palominos are Anton Fier's personal take on downtown eccentricity. Anchored by a core band of bassist Bill Laswell, guitarist Nicky Skopelitis, vocalist/keyboardsman Amanda Kramer, and himself as drummer/producer, Fier is like an alchemist master of ceremonies, pouring Richard Thompson's signature Stratocaster lines into an "Ampex kettle" with Michael Stipe's warble—something he's tried before—and then adding the brilliant Carla Bley on organ as well. Next, Fier asks, why not put Thompson on a

The Golden Palominos

The Smithereens

143
Dave Sharp leaves behind the nearly corporate rock of The Alarm for his brave electric/acoustic Hard Travellin'.

merging creative forces in a way that has become something of a trademark. Songs work, personnel work, what more can we expect? Maybe less reverb on the drums and vocals. Remember, this is Audio, and we pay attention to silly things like recording quality.

Michael Bieber

Hard Travellin': Dave Sharp
I.R.S. X2-13090, CD; AAD: 50:27.

Sound: B Performance: B+

Dave Sharp left The Alarm to do this album, and it's quite a turnabout from the nearly corporate rock of his old band. Hard Travellin is a neo-Bob Dylan album that works very well. For credibility, Sharp engaged Bob Johnston, producer of Dylan's Blonde on Blonde, John Wesley Harding, and Nashville Skyline, to helm his project. Al Kooper, who played organ on Highway 61 Revisited and Blonde, appears here too. Sharp's scratchy voice adds to the ambience as well.

Cordless Headphones — For Privacy With The Freedom To Roam

JVC's cordless headphone system lets you enjoy the freedom and sound of open speakers without distracting others. The HA-W70 Cordless Infrared Stereo Headphone System — the best of both worlds.

- Infrared cordless stereo headphone system. - JVC's advanced digital and optical technology that utilizes ultra-high frequency FM transmission signals. - 12 Transmission LEDs with a range of approximately 7 m (23 ft.). - 30 mm Dia. driver units for powerful sound with extended frequency response. - Comfortable design that allows hours of audio/video listening enjoyment.

Enter No. 24 on Reader Service Card
CATCH THE CHRISTMAS SPIRIT AGAIN!

A new collection of enduring Christmas favorites performed by each artist in their own unique style. A beautiful season's greetings successor to the best selling Volume I. Two Christmas volumes to brighten the holiday from GRP Records.
The Early Years shows that Tom Waits developed his street-gritty vision from the beginning.

The album is divided into electric and acoustic halves. The former has a rollicking, fun feel, "Wonderful World," even sounding like a second cousin to "Subterranean Homesick Blues," with its jam-packed lyrical imagery. The acoustic part is more somber, "Joey the Jone" recalling Dylan's "Hollis Brown." Sharp has put a lot of heart and conscience into his songs, and it shows in their very real depth.

Hard Travellin' is a brave album that goes against the grain, giving more than one would anticipate. A lyric sheet should have been included.

---


The relentless, closely harmonized, double-guitar onslaught of Irish rockers Thin Lizzy is recalled in this compilation, a tribute to the band and its now-departed charismatic frontman, Phil Lynott. The focus here is on the aggressive, melodic hard-rock side of Lizzy's personality ("The Boys Are Back in Town" and "Jailbreak"), as opposed to the often more original Celtic themes and rhythms the band also explored (check out Dedication on Mercury for those). All the legendary turbo-charged guitarists are heard—Eric Bell, Scott Gorham, Snowy White, Gary Moore, and Brian Robertson—reminders that Thin Lizzy's music is sophisticated, polished, and still very hot even after all these years.

---

Shut Up and Die Like an Aviator: Steve Earle and The Dukes. MCA MCAD-10315.

This 77-minute live recording answers the question "Is Steve Earle's music rock or country?" with a resounding "Both!" Earle rocks hard, yet he and his crack band, The Dukes, are certainly country too. The generous 16-song set includes most of Earle's best material plus covers of Doug Sahm's "She's About a Mover," Jimmie Rodgers' "Blue Yodel #9," and The Rolling Stones' "Dead Flowers." The digital sound is very raw yet appropriate for this raucous live performance.

---

THERE ARE MANY OPINIONS ABOUT AUDIO CABLE

Here are some facts about MIT:

- MIT has the most extensive research and development program in the audio cable industry.
- MIT holds more patents on audio cable technologies than any other cable company.
- MIT is the only cable company that can document cable performance through advanced instrumentation and testing techniques.
- MIT has the best selling premium performance audio cables.
- MIT is rated highest among cable manufacturers in customer satisfaction.
- MIT applies premium performance audio cable technologies to cables that sell for as little as $150 per foot.
- MIT cables can be auditioned at home at no risk.

---

Music Interface Technologies MIT
Windham Hill's
Music For The Season
features a flavorful
variety of music for
all listening tastes.

From solo piano to
jazz guitar, from the
beloved Nutcracker Suite
to the eclectic Winter Solstice
collections, these six
releases are available
on CD or cassette
wherever music is sold.

This winter, make sure
you have plenty of
Music for the Season.

Experience the Winter Solstice Concert Tour sponsored by Kellogg's®
Call 1-800-888-8544 for tour dates in your area.
The Complete Pablo Solo Masterpieces: Art Tatum
Pablo 7PACD-4404-2, seven CDs; AAD: 8 hours, 51 minutes.
Sound: B Performance: Genius

The Complete Pablo Group Masterpieces: Art Tatum
Pablo 6PACD-4401-2, six CDs; AAD: 7 hours, 40 minutes.
Sound: B Performance: See above

No one has ever exemplified the brilliance of jazz music better than pianist Art Tatum. Born in Toledo, Ohio, on October 13, 1910, he had some formal training but was largely self-taught, using radio broadcasts, piano rolls, and records to access the jazz repertoire that came before him. Although Tatum lived only to his mid-40s, his legacy as an improver and performer on his chosen instrument has never been matched.

Toward the end of Tatum’s career, producer Norman Granz had the good sense to bring him into the studio to record some 200 performances. More than half of these were solo sessions; the balance were with expert sidemen. Originally, Granz released the recordings as individual albums and multi-LP box sets of either the solo or group sessions. Releasing this monumental document on Compact Disc, however, is cause for celebration and certainly reason to remind ourselves (as if we had forgotten) of Tatum’s genius.

The seven discs of The Complete Pablo Solo Masterpieces comprise 119 selections, including four previously unreleased takes from a live performance at the Hollywood Bowl. Many of the songs chosen by Tatum are his interpretations of standbys of the American musical theater, standards by Duke Ellington and Thomas “Fats” Waller (said to be one of Tatum’s most important influences), tunes from Tin Pan Alley, and Tatum’s occasional nods to classical music, such as Dvořák’s “Humoresque.” All are performed with Tatum’s technical wizardry, simultaneously altering melody, harmony, and rhythm. Some compositions, like “Tea for Two,” owe their very place in posterity to Tatum’s brilliant interpretations. Others, like “Aunt Hagar’s Blues,” are so astounding in their harmonic permutations that they are likely to leave the listener gasping for breath. Still others, like Tatum’s rendition of “The Man I Love,” where he explores the musical text of Porgy and Bess in a framework of 4 1/2 minutes, are self-contained miniatures of jazz history.

Ballads like “Embraceable You” and “Come Rain or Come Shine” are no less introspective for the speed-of-light arpeggios, the varieties of tempo and emphasis, and the different substituted voicings that Tatum employs. Many observers have commented on his ability to divide and subdivide the beat into infinitesimal fractions of meter, frustrating many a critic who mistakenly believed he had a poor sense of time. In fact, Tatum was always on the mark, but the bar lines and accents would shift just as you would settle into a beat. Tatum’s left hand alone, with its coalescence of boogie, stride, and syncopated figures, is the subject of serious study among the more technically minded of the jazz set. Fortunately for the rest of us, Tatum’s considerable virtuosity served the idea of simply enjoying the musical experience.

There existed always the danger that Tatum’s performance would overpower the efforts of his accompanists. Norman Granz’s solution, which he used on the recordings included in The Complete Pablo Group Masterpieces, was to employ artists whose own contributions to the jazz legacy were of more than sufficient importance. Lionel Hampton, Ben Webster, Roy Eldridge, Benny Carter, Buddy DeFranco, and Harry “Sweets” Edison take front-line positions, and their solos are woven into the fabric of Tatum’s lush inventions with surprising success. It is the individual voices of these artists that ultimately sustain the group.

On one of the 13 previously unreleased takes added to this set by producer Eric Miller, a group rendition of “This Can’t Be Love,” DeFranco proves that his soul permeates his sound as he swings furiously with Tatum. Webster’s justly famous breathy, mature tone glides effortlessly over the intricate patterns and countermelodies that Tatum lays down on Jerome Kern’s “All the Things You Are,” which is refreshingly realized here as a ballad. When Red Callender’s bass enters, the whole mood of the tune is transformed.

This brings to mind the special challenges faced by the sessions’ rhythm players, who along with Callender are fellow bassist John Simmons, guitarist Barney Kessel, and drummers Buddy Rich, Louis Bellson, Alvin Stoller, and...
THE SHAPE OF MUSIC IN THE 90'S


Enter No. 21 on Reader Service Card

The great Pappa Jo Jones. Tatum's work with the legendary Tiny Grimes and Slam Stewart demonstrated early on his willingness to fit "other" voices into the scheme of things, be they melodic or rhythmic. For the most part, the drummers restrict themselves to brushes and light cymbal work. Hampton and Kessel both move effortlessly between rhythmic and melodic textures on their own instruments, responding to the aural cues that Tatum provides.

The monaural recordings that make up both CD sets contain some hiss and bass rumble, though nowhere near enough to bother anyone who understands the importance of these two collections. The digital transfers appear to sound faithful to the originals without evincing much in the way of corrective equalization. If you can't afford both sets right away, buy the Solo Masterpieces first. Each set is a lifetime's worth of listening pleasure.

Al Pryor

Hope You Like Our New Direction:
Henry Kaiser
Reckless CD RECK 21, CD; AAD 77:41
Sound: A Performance: A

"Be eclectic," exhorts guitarist Henry Kaiser, "and broaden all your horizons." Take him at his word as you venture into the brave new world of Hope You Like Our New Direction, a delightful 78-minute excursion into experimental improvisation and world musics.

However, as might be gleaned from the hopeful anticipation expressed in his title, you won't really need a seat belt to enter this music. If you're familiar with Kaiser's previous eccentric work, you won't find a new orientation here, just a refocusing towards accessibility of the wildly different interests he's explored before.

Kaiser's approach to music is highly improvisatory and collaborative. For this set, his imagination ranges over skittering interpretations of pop classics like The Mamas and The Papas' "California Dreamin'" and Buddy Holly's "Love's Made a Fool of You" to the wild Zappa-esque mayhem of "High School Hellcats." Along the way are satires like the atmospheric, string-sweetened "Windham Hell" (that keeps stumbling over its own rhythms), far-out psychedelic effects and speedo guitar on "The Sandman," and even an accompanied recitation of prose on "Prosaic Mosaic" (read by the poet Vernon Edgar). Kaiser's multi-cultural interests take him to Hawaii on "Kanaka Wai Wai" (featuring a duet by

---

SSI POWERFLEX V Modular Multi-Channel Amplifier

The POWERFLEX V is an idea whose time has come. With the proliferation of multiple speaker listening environments came a requirement for a special amplifier technology to service the special speaker configurations.

And now SSI, the same company that coined the term Surround Sound, is bringing their formidable amplifier building experience to the POWERFLEX V.

Using technology gleaned from the computer revolution SSI has made the POWERFLEX V expandable much the way that personal computers are. Each expansion module can be either 40 watts or 80 watts and since there are a total of five possible channels the combinations are numerous and unavailable with any other single amplifier in the market.

The technology used is also very impressive. With components such as true high fidelity toroidal power transformer, bipolar integrated line outputs, line input balance "trim" controls, instant muting circuitry, "straight line" board level signal paths, low light signal level indicators and, most importantly, expandable chassis; this amplifier is not only innovative, but reliable and great sounding.

And being completely designed and manufactured in the United States with a full 2 year warranty, the POWERFLEX V may be the only amplifier you'll ever need.

SSI Products, Inc.
11836 Clark Street
Arcadia, CA 91006

For more information or your local dealer, Please call 800-845-4 SSI
Enter No. 44 on Reader Service Card
### Cassette Decks

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teac V370X</td>
<td>$79</td>
</tr>
<tr>
<td>JVC TDV805 TN</td>
<td>Special</td>
</tr>
<tr>
<td>JVC TDV541 TN</td>
<td>Special</td>
</tr>
<tr>
<td>Sherwood DD1230</td>
<td>$166</td>
</tr>
</tbody>
</table>

### CD Players

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>JVC XLM505 TN</td>
<td>$228</td>
</tr>
<tr>
<td>JVC XLR441</td>
<td>$158</td>
</tr>
<tr>
<td>Sherwood CD1192R</td>
<td>$129</td>
</tr>
<tr>
<td>Magnavox CDC-552</td>
<td>$189</td>
</tr>
</tbody>
</table>

### Car Audio

**Speakers**

- **JBL L100 t3**
  - $699 pr.
  - 3-way, 400 wts, 12" woof, 5" midrange, 1" dome tweeter

- **JBL L80 t3** 300 wts, 3-way $598/pr
- **JBL 4800** 3 way tower spk $349/pr

**Clarion 9772**
- Removable, 20 presets, seek, scan, auto-reverse, 60 watts

**Clarion 9701**
- Standard chassis, seek, A/R, 25 watts, bass & treble

**JVC UX-1**
- $439

**Hyper-Bass, 2 way speakers, CD Player**

### Gift Electronics

- **BEL 966** $99
  - Top rated 3-band detector, digital display

- **Phone-Mate Voice Mail** $79
  - Personal answering machine/message center

- **Sony CFD755** $279
  - CD portable, mini component design, 3 band EQ

- **Sony D-33 Discman** $138
  - Dual D/A converter, Mega Bass, 20 track programming

- **Southwestern Bell** $59
  - Cordless phone, Top Rated, Last # Redial

### Stereo Receivers

- **JVC RX-705** $319
  - 100 watts, Dolby Pro Logic Surround Sound, 4 built-in amps

- **Marantz RS2253** $99
  - 50 watts, last chance closeout price

- **JVC RX-305** $169
  - 50 watts, A/V remote, 4 speaker surround sound, 40 presets

- **Sherwood RA-1142** $118
  - 50 watts, quartz tuning, 24 presets

### Mini Component Systems

- **JVC UX-1** $439

**Choose from one of the widest selections of Mini-Systems in the USA!**

- **Panasonic SC-CH7** Special
  - In Stock
  - **JVC MX-70**

**WDS—Your complete holiday shopping center for:**

- Sony • Hitachi • JVC • Magnavox • Canon • Panasonic • Quasar • Zenith • Sharp • Sylvania • Toshiba • Fisher • Sherwood • Soundcraftsmen
- Teac • Aiwa • Suono • Ortofon • Shure • Stanton • AAL • Bose • Advent • Design Acoustics • Infinity • Jamo • Blaupunkt • Clarion • Alphasonik
- MTX • Pyle • BEL • Bearcat • Cobra • American Bell • Code-A-Phone • Bell South • Phone Mate • Freedom Phone • Koss • Brother • Smith Corona
- Nintendo • ...and many more that cannot be nationally advertised!

**Call today for current product and pricing information.**

**WDS, 2417 W. Badger Road, Madison, WI 53713**

**Hours:**
- Monday-Friday: 8-8 • Saturday: 8-5:30
- Sunday: Closed
Make your Liszt last longer.

Your collection of classics will sound richer and last for ages with a new Shure phono cartridge and stylus. For the name of the Shure dealer nearest you, or for a free catalog, call 1-800-25-SHURE. Put it at the top of your "Liszt."

With JVC's Ethnic Sound CDs, you don't have to be a budding ethnomusicologist putting up with hissing field recordings.

The best way to a man's stomach...NordicTrack.

...and it's much less stressful on the body than running and high-impact sports. Working out on Nordic Track also boosts creativity and productivity and lowers stress, making you feel as good as you look.

It's time to change the spare tire.

Unlike most in-home exercisers, Nordic Track works all the major muscle groups of the body including the arms, legs, buttocks, shoulders and even stomach.

So what are you waiting for? Call Nordic Track today.

Call today for a 30-day in-home trial.

With JVC's Ethnic Sound CDs, you don't have to be a budding ethnomusicologist putting up with hissing field recordings.

The best way to a man's stomach...NordicTrack.

...and it's much less stressful on the body than running and high-impact sports. Working out on Nordic Track also boosts creativity and productivity and lowers stress, making you feel as good as you look.

It's time to change the spare tire.

Unlike most in-home exercisers, Nordic Track works all the major muscle groups of the body including the arms, legs, buttocks, shoulders and even stomach.

So what are you waiting for? Call Nordic Track today.

Call today for a 30-day in-home trial.

With JVC's Ethnic Sound CDs, you don't have to be a budding ethnomusicologist putting up with hissing field recordings.
Flutes of the Sufis by The Erguner Brothers of Turkey and The Art of Randafison Sylvestre from Madagascar evoke a similar type of bliss. Although neither moves with the undulating rhythmic sense of Hamza El Din, both recordings help to make a case for the consideration of various styles of ethnic music as a form of chamber music. The Erguner Brothers' music bobs and weaves with a stuttering stop-and-start persistence that's slowly yet inevitably entrancing. Rakoto Frah and Sylvestre combine sounds that seem as divergent as Asian bamboo flute, Andean panpipes, and European harpsichord into a delicate, wistful music.

My favorites thus far, however, are the Polyphony of the Deep Rain Forest Music of the Ituri Pygmies and The Art of Hukwe Ubi Zawose. Both of these are more traditionally African and heavily based on sanza (a type of thumb piano or Lamellophone) rhythms and call-and-response singing. On the Pygmy recording, it seems as if a bunch of people are just sitting around a campfire running through song cycles about bees or elephants or crickets. The sound is so in-your-face that you can virtually hear the stars winking at you. The whoops and clicks and buzzes of the voices and sanzas overlap and vault through choppy, complex patterns until the music is swirling around your head like a cloud. Hukwe Ubi Zawose uses some of the same techniques, as his sanza, violin, and kora ensemble creates overtones that penetrate the soul in the same manner of guitarist James "Blood" Ulmer's harmonica hewdowns. Ubi's prayerful, hymn-like vocals further elevate the music into a loping, meditative drone.

The only disappointment, thus far, is the cross beat drums of Shell Island. Senegal on Tom-Tom Arabesque. The recording is actually quite good. However, the drumming is directly related to a series of dances, and despite hearing the subtle shadings and changes in timbre, this recording begs for a visual. Considering some misgivings about the lack of information for the non-Japanese reader, the JVC Ethnic Sound Series at least provides an option for those who don't want their world music defined in the cynical terms of "world beat." Don Palmer
Proven: "The Best Sound in L.A."  

**Optimal Enchantment**  

Our customers are the discerning audiophiles of L.A. These are the DIE HARD MUSIC LOVERS who search everywhere before they buy. These are the most critical listeners, the least easily fooled, and the hardest to please. They seek UNQUALLED MUSICALITY, which is why they buy here. Allow us to demonstrate our award-winning sound & custom installations.

**audio research** - **audioquest** - **audible illusions** - **acoustic energy** - **cal** - **dynaco** - **oracle** - **pse** - **Rotel** - **rowland** - **sme** - **sota** - **spica** - **theta** - **vpi** - **versa** - **vandersteen** - & more. also: **audioophile recordings**

For personal appointment call:  

(310) 393-HIFI

---

**Illinois**

---

**ChicagO suburbs**

PERSONALIZED DESIGN AND INSTALLATION OF CUSTOM AUDIO/VIDEO SYSTEMS

- Soundstream
- Parasound
- Amrita
- Sonance
- Fosgate
- KEF
- Philips
- Audio/Video
- JBL Video
- B&K
- Paradigm and others

**Audiophile**

**OF ST. CHARLES**

411 South 2nd Street, St. Charles, Illinois 60174

708-513-1042

---

**Maine**

---

**Hi fi exchange**

**foreside mall** - **route one**

**Falmouth, ME 04105**

(207) 781-2326

---

**Massachusetts**

**The best values in Hi End Hi-fi**

**Audio studio**

Authorized sales and service for: 
Adcom, Advent, AR, Audible Illusions, Audioquest, B&K, Bedini, Beyerdynamic, Cardas, Celsison, Counterpoint, Dual, Harman, Harman/ 
Kardon, KEF, KLH, Klyne, Mapleneck, Marantz, Mirage, Monster Cable, Morel, NAD, Nakamichi, Ortolan, Proton, QUAD, Revox, Sennheiser, SME, Sony ES, Stax, Straight Wire, Teac, Technics, Thorens, Velodyne, VPI, and many more.

303 Newbury St, Boston, MA 02115

(617) 267-1001

414 Harvard St, Brookline, MA 02146

(617) 277-0111

INTERNATIONAL BUSINESS ACCEPTED
music LOFT
FEATURED OUTSTANDING NEW PRODUCTS FROM:
MELOS AUDIO
PLUS SERIES AMPS
220 PRE-AMP
CODA TECHNOLOGY
PRECISION BIAS CLASS A/B
MODEL 10
MODEL 01 PRE-AMP
POWER WEDGE
AC ISOLATION XFMRs
FMS AUDIO CABLES
- MICROWAVE -
AUDIO PRISM
STAX D/A
MUSIC LOFT
BY APPOINTMENT
(617) 695-2306
BOSTON, MA 02210

MONSTER CABLE
PICKERING
SONY
LUXMAN
(800) 628-0627 (609) 799-9664
HARMAN KARDON

O
Sluinurt
Ele.

systems

ClAy
Air
Music
Rorel

li

Gnsulmncs

iron
own

nee

7itnArnl

7itnArnl

Prison

Irsrullouor,

M1lodSquad

Eminent

Alnrrh

onus?

('htrits

('htrits

MSB
Maston
IDOS
Golden Dragon
Audio Alchemy
Audible Illusions

Convergent Audio
Cary Audio

Golden Dragon

IDOS

New Jersey

J
sA
J S AUDIO
Our line of handcrafted speakers
- Speaker parts - Repair - Audio
systems - Prologic surround sound
- Home installations.

FEATURING:
LUXMAN
HAFLER
SONY VIDEO
ONKYO
HARMAN KARDON
ORTOFON
PICKERING
AKG
MONSTER CABLE
Koss'
and more ... 
643 Speedwell Ave,
Morris Plains, NJ 07950
201-292-2799

NEW YORK

Savant
Audio & Video
Consultant - Custom Systems - Acoustic Treatment
Installation - Retail
Air Targent • Allegro • Apogee • Artusi • Athena
Audio Prima • AudioQuest • Blue • Brev • Cardas
Chlocks • Chloesser-Speakersound • Claris Audio
Clewiston • Creek • Delmar • Dormaudio
Electron Kinetic • Eminent Technology - Essence
First Sound • Forsythe • German Acoustics
Harmonia Mundia • Riten • Last • Leutron
Magnat • Merrill • Mod Squad • Mogami • March
Matsuen • Natural • Notices • Opus2 • Prav Ar
Q & D • Resil • Reference Recordings • Room Tones
Rotel • Sequoia • Sheffield Labs • Sonus • Sansui
Superphon • Symphonics Line • Tara Labs • Target
Vee Audio • Vendetta Research • Wadue
Water Labs • WBT • YRA • and More
(800) 628-0627 (609) 799-9664
in New York & New Jersey

NEW YORK

MBA TECHNOLOGY HAS ESTABLISHED A NEW AUDIO STANDARD FOR ONLY
$1895
The MSB Silver CD player matches a tuned precision transport to a superior signal
processor using all the latest MSB analog technology. The result is quality that
will trash any processor/transmit combination under $10,000. GUARANTEED!

Turning the Processor Market on End

NEW YORK

ALPHA STEREO
Quality Components. Professional Installation & Service

"We are known for the companies we keep"
Northern NY's oldest & most renowned dealer
345 Cornellia St., Plattsburgh, NY 12901
518-561-2822
Fax: 518-561-2961
Monday, Friday 10am-8pm. Saturday 10am-6pm
DEALER SHOWCASE

NEW YORK

AMERICAN AUDIOPHILE
FINER AUDIO & VIDEO FOR YOUR HOME
WHERE THE DIFFERENCE IS MUSICAL ACCURACY AND THE GOAL IS TO SATISFY

FEATURING PRODUCTS FROM:

ALPHASOUND, ARISTON AUDIOPHILE B&W, CARV
CELESTION, COUNTERPOINT, D&B, DIGITECH.
DUAL DYNACORD, EMINENT TECHNOLOGY
FOGATE, GRADO, GRUNDIG, INFINITY, JANIS
LEONCIO, MADRIGAL, MAGNUM Dynalab, MEL
OS, MIT, MONSTER CABLE, NITTY GRITTY, OPA
TONICA, PARASOUND, P.S. AUDIO, ROTTLE, SME
SONY, SONY ES, SPECTRUM, SPICA,
SIGNET, SONY EX, STAX, SUMIKO, SUMO, VAD
DERSTEEN, VIVIDRUM, VPI, WELL TEMPERED,
WHARFEDALE, YBA, & MANY MORE.

DELIVERY & CUSTOM INSTALLATION AVAILABLE.
MEDIA ROOMS & COMPLETE REMOTE CONTROL.
HOME SOUND, OUR SPECIALTY.

373 SUNSET HIGHWAY, LYNBROOK, NY 11563
887-7530

NEW YORK

KRELL, UNITY, PURIST, HARLEQUIN & YOU...
PARTNERS IN MUSIC.

We invite you to audition the world's first fully balanced audio system. Featuring fully balanced digital source and electronics by KRELL, balanced liquid jacket interconnects and speaker cable by PURIST AUDIO DESIGN, and the world's only fully balanced loudspeaker systems by UNITY AUDIO.

Featuring:

KRELL and Krell Digital
Air-Tangent, Audioquest, Basis, Day-Sequra, Grado Signature, Koetsu, Lineaum, McCormack, Mod Squad, Purist Audio Design, Tice Audio and Unity Audio

718-479-6155

216-11 Kingsbury Avenue, Bayside, New York 11364

NEW YORK

PARK PLACE AUDIO
55 PARK PLACE
NEW YORK, NY 10007
212-984-4570

2 Blocks N. of World Trade Center

Featured Products:

B&W, Niles
Boston, Optionica
Acoustics, Paradigm
CWD, Philips
Denon, Revolver
Fosgate, Rotel
Harman, Signet
Luxman, Straight
MB Quart, Wire
M&K, Thorens
Melos, Vivid R

Come and experience the magic of HOME THEATER.

COMMITED TO QUALITY.

North Carolina

monitor acoustics
SUB-WOOFER & SATELLITE SPEAKER SYSTEM

$299 ORDER BY 1/15/92
REG $499

CALL 1-800-326-6721
30 DAY MONEY BACK GUARANTEED

914 E FRANKLIN BLVD.
GASTONIA, NC 28054

Ohio

small town BIG SOUND
INFINITY KAPPA
DENON • YAMAHA
MITSUBISHI • JVC
PHOENIX GOLD
KLIPSCH

&
MITSUBISHI HOME THEATER

PHOTO CENTER
SOUND ROOM

132 Putnam St. • Marietta, OH
614 • 373 • 6737

Ontario

American Sound
of Canada

9108 Yonge St.
Richmond Hill, Ontario
L4C IT6

Phone (416) 886-7810
Fax (416) 886-6920

YOUR HIGH END CONNECTION IN CANADA

*WE ALSO BUY & SELL TRADES*
**Pennsylvania**

**ARCH ELECTRONICS INC.**
2006 Chestnut St., Phila, PA 19103
(215) 563-4660
Complete Audio Video Store for All Levels of HiFi Enthusiasts

Featuring:
- AIWA
- HIFLIER
- HAFLER
- ADVENT
- HARMAN KARDON
- ARISTON
- JBL
- BOKEN
- MONSTER CABLE
- CAMBRIDGE
- PASO
- CELESTION
- PINNACLE
- DISC WASH
- SONY HIFI/VIDEO
- GRADO
- TECHNICS

No charge for shipping

---

**Philadelphia Audioophiles**

<table>
<thead>
<tr>
<th>Acoustic Energy</th>
<th>JB Engineering</th>
<th>PS Audio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altis Audio</td>
<td>Kimber Kable</td>
<td>PSB</td>
</tr>
<tr>
<td>Audible Musicians</td>
<td>Kefersblubs</td>
<td>Rega Planar</td>
</tr>
<tr>
<td>Audio Antenna</td>
<td>Kniep</td>
<td>Rotot</td>
</tr>
<tr>
<td>Audioscribe</td>
<td>Koetsu</td>
<td>Rotal</td>
</tr>
<tr>
<td>Audioquest</td>
<td>Meissel</td>
<td>Sowell</td>
</tr>
<tr>
<td>Brainworx</td>
<td>Meridian</td>
<td>SoundLab</td>
</tr>
<tr>
<td>EutK Components</td>
<td>Moonegra</td>
<td>SoundLab</td>
</tr>
<tr>
<td>Celestion</td>
<td>Meeasure/Cyrus</td>
<td>Sowell</td>
</tr>
<tr>
<td>Classe</td>
<td>MIT</td>
<td>Straight</td>
</tr>
<tr>
<td>Counterpoint</td>
<td>MAKSound</td>
<td>Sumiso/SME</td>
</tr>
<tr>
<td>Deftech</td>
<td>Miter Audio</td>
<td>Superphon</td>
</tr>
<tr>
<td>Dunstech</td>
<td>Mite</td>
<td>Target</td>
</tr>
<tr>
<td>Dunvektor</td>
<td>Music Reference</td>
<td>Unity Audio</td>
</tr>
<tr>
<td>Emerald Tech.</td>
<td>NAD</td>
<td>Van Den Hul</td>
</tr>
<tr>
<td>Genesis</td>
<td>Oracle</td>
<td>VPI</td>
</tr>
<tr>
<td>Jadin</td>
<td>Parasond</td>
<td>Well Tempered</td>
</tr>
<tr>
<td>J.A. Michell</td>
<td>Philips CD</td>
<td>XLOElec</td>
</tr>
</tbody>
</table>

Plus a large selection of audio equipment LP's & CD's

**Cumberland Audio Group**

Representing:
- APOTHECARY AUDIO QUEST
- B&K AUDIO
- CALIFORNIA AUDIO LABS
- CELESTIAN-CLASS AUDIO
- CONRAD CHINNON
- COUNTERPOINT
- HALES AUDIO
- NAD / MARTIN LOGAN / MT-CABLE
- MOD SOUND / NITTY GRITTY
- REGA / KETEL
- JEFF BOWLAND DESIGN GROUP
- SOFA / STAR / LUMIKO
- TARGA / VAC
- THE DIGITAL
- VAHDERS
- W259: STEREO
- W259: TEMPERED
- W359: WILSON
- W359: & MORE
- CREDIT CARDS
- DELIVERY
- SET UP

MON-SAT 11-6
4119 HILLSBORO RD • NASHVILLE, TN 37215
(615) 297-4700

---

**Texas**

**Dana Audio Speakers**

"By far the least expensive loud speaker listed in Recommended Components"...

Stereophonic Recommended Components

ONLY

$179

PER PAIR

TO ORDER: DANA AUDIO DIRECT
512-454-3233

---

**Houston!**

The Esoteric Ear Expands

Announcing the opening of our second location at
2144 Portsmouth in the Shepherd Plaza. We're
across from the Sound Warehouse on Shepherd
Drive just north of Hwy 59. New central and south
Houstonians can discover how "The Esoteric Ear
has become Southeast Texas' leading A/V store.
Don't settle for MediFi any longer!

We Feature the Finest Audio/Video

- Acustas
- Aragon
- Audiophile
- Apogee
- AQ
- Centaur
- Cervex
- Cervex
- CODI
- Paradigm
- Pianosavon
- Pioneer Elite
- Simply-Physics
- MKO
- Fosgate
- TC Sounds
- LP's
- CD's
- Magazines...and more!

The Esoteric Ear
3158 Veterans Memorial Dr. • Tarrytown Retail Center
Phone 537-8108 • Fax 537-9619
2144 Portsmouth • Shepherd Plaza Shopping Center
Phone 523-8108 • Fax 532-4422

---

**Vermont**

**Vermont's Audio Leader!**

SUMICO
ARISTON
TARA LABS
PARADIGM - A&R CAMBRIDGE
DENON - SUPERPHON - KIPSCH
B&K - ADVENT - AOS - ROTEL
MARANTZ - REGA - STRAIGHTWIRE
PHONON - AUDIO CONTROL - AKG
SENNHEISER - CREEK - GRADO
TARGET - GOLDRING - AUDIO LAB
SPICA - KIMBER - AIWA
PRO-AC - VPI - MAGNUM
SHARP VISION - ATLANTIC PATTERN
ACURUS - PINNACLE - LINEAEUME

"INTELLIGENT AUDIO AT REASONABLE PRICES"
802-863-4372

---

**Texas**

**Shenfeld Adcom**

GUARANTEED
BEST PRICES
CUSTOM INSTALLS

NEW OWNERSHIP
FREE DELIVERY

HOUSTON
2831 Fondren (77063)
713-789-1180

---

**Vermont**

**Here in Vermont people demand value.**

We don't waste customers' money
And neither do these folks:

Adcom-ARISTON-AUDIOQUEST-Bowers-Gruen
HAFLER-Luxman-Moog-Saroun-Monitor
NAD-Oriental Oracle - Revel - SME - MIT
SUMICO - Thorens - Wharfedale
5-Year warranties on all new equipment
100% Financing Available
Free Installation in Greater Valley, NYC

**Scientific Stereo**

12B Main St., Brattleboro, VT 05301
802-257-5355
880-456-4434

---

**Tennessee**

**Carver Infinity**

DEALERS...

Just as you're reading this ad,
so are thousands of potential customers.

For complete information on placing your ad,
Call 800-445-6066
The mark of a true Denon.

This sticker tells you who is an authorized Denon dealer and who isn’t.

Some people who offer Denon products are not authorized dealers. That can lead to problems.

First, only authorized dealers offer you the protection of a Denon warranty with your purchase: at other dealers, you may have no warranty at all.

Authorized Denon dealers stock only components designed for the U.S. and have the training to help you select the one right for you.

Authorized dealers know Denon technology inside and out and stock factory parts for your Denon to preserve true Denon sound.

Before you buy your Denon, look for this Denon Authorized Dealer Sticker.

It assures you of the authentic Denon technology and support you expect. And nothing less.

To find your nearest AUTHORIZED Denon Dealer call:
1-201-575-7810
(9:00 am-5:00 pm EST)

DENON

ANNOUNCEMENTS

CASH PAID FOR AUDIO & VIDEO EQUIPMENT
BUY-SELL-TRADE & REPAIR. AUTHORIZED DEALER: HK, JBL, ROTEL, AUDIOQUEST, STEREO CLASSICS, 72 STREET, NEW BRUNSWICK, NJ 08901 (908) 220-1144, FAX (908) 220-1284.

ACT AUDIO gives good sound!
A professionally designed listening room costs less than some CDs. Send SASE for details. ACT AUDIO, 619 Moon Clinton Rd., Caroapolis, PA 15108.

AUDIO UNLIMITED in Colorado offers competitive values on Audio Acoustics, AcroTech, Airtight, Aural Symphonics, Chario (the new Italian monitor), Coda, Dynavector, Ensemble, Ikeda Cartridges, Lazarus, Magnun Dynalab, Mapleton, McCormack, Mod Squad, Musical Design, Mure 100-150 Amps, and Model 18 Subwoofer, Room Tuners, Tape and more. Call John Barn, (303) 922-8151. (303) 698-0136, fax (303) 922-0522.

ANNOUNCING “STEVE’S AUDIO ADVICE”. HUNDREDS of GREAT PRODUCTS AT THE ABSOLUTELY BEST PRICES. TALK DIRECTLY WITH STEVE. OVER 3 YEARS of EXPERIENCE. B&K, MAPLENO LL, MAGNUM, QUAD, CARY, AUDIOQUEST, MORDANT SHORT, JA, VMPS, & MUCH MORE! RECEIVE AN EXTREME 5% DISCOUNT BEFORE RELEASE OF OUR CATALOG. NATIONWIDE, CALL 1-800-752-4018.

SPEAKER COMPONENTS

CROSSOVER COMPONENTS

FAST CAPACITORS
Metalized Polypropylene (Non-Polarized) Values from 1 mfd to 200 mfd Voltage Rating: 250 VDC ± 150 VAC

SOLEN INDUCTORS
Perfect Lay Hexagonal Winding Air Cored Values from 10 mH to 30 mH, Wire Sizes from ±20 AWG to ±10 AWG

HEPTA-LITZ INDUCTORS
Seven Strands Litiz-Wire Constructions Values from ±10 mH to ±30 mH Wire Sizes from ±16 AWG to ±12 AWG

SOLEN CROSSOVERS
Custom Computer Design Passive Crossover for Professional, Hi-Fi and Car Hi-Fi, Power up to 1000 Watt

CROSSOVER SPEAKER PARTS
Gold Speaker Terminals, Gold Banana Plugs Gold Binding Posts, Crossover Terminals Power Resistors, Mylar Capacitors, Plastic Grill Fasteners, Non-Vy-Taps Grill Cloth, Car Speaker Grills, Misc. Parts

COMPUTER AIDED DESIGN FOR ENCLOSURE AND CROSSOVER AVAILABLE TO CUSTOMER
Product specifications and prices available upon request.
ANNOUNCEMENTS

Superior CD upgrades, all models with digital out, $399. Premium, affordable matched tubes, meticulous custom service, repairs, upgrades, tube or ss. Huge LP's & CD's catalog, $1. We sell virtually all quality new components authorized! We deliver or ship almost anywhere. AUDIO RESOURCE, 3133 Edenton Ave., Metairie, LA 70002. 504-885-6888. Tues-10-7, Sat 10-4.


TANDBERG STEREO
BRAND NEW & RECONDITIONED UNITS. BEST PRICES ANYWHERE. CONTINUED SERVICE. CLEARANCE PRICE. NEW TPT 303TA TUNER $500. FOR MORE INFORMATION CALL LARRY. DIALS. (914) 238-3055.

TREAT YOURSELF TO THE BEST!

THRESHOLD FACTORY UPDATES: Threshold Corporation will now provide circuit updates for all Preamplifiers purchased through the E-Commerce Site. Models include: NS-10, SL-10, FET-1 Series, FET-2 Series, FET-9, FET-10 PC, FET-10 HL. This program offers our customers the option of upgrading the circuitry while providing a relatively inexpensive path to maintaining State Of The Art performance. For more information or to schedule an appointment, please call Customer Service at 800-888-8056. (Ask us about our Amplifier update program.)

MISSOURI

B&W 801 LIMITED EDITION, ARCA, VPI TNT, ERATO, TERENCE, DUNLOP, KLEIN, AL-p, GOLD ORING, QUDOS 600 AND 300 AMPLIFIERS. HAMILTON, QINE, PINE, SINE SERIES V AND 300, CARAS, AL-PHASEN, DCM, PRECISION AUDIO COMPONENTS "IODS", MUSIC AND SOUND DCC-1, RICK SOLID, GROSCION, SIGNATURE, PROTEL, RCD 855/865, TARGET, TICE, CARY AUDIO CAD550 AND SLA-70, ROOM TUNE AND AmpliClamp. OEQ PASSIVE PREAMP, MAGNUM DYNA/AL ETUDE, SPICA ANGELUS, TC-50, SUMIKO, SUPERPHON SP-100, CARVER SILVER 90 AND G-19, GRADIENT SW-63 SUBWOOFER AND QUADES/S Leo.

KEITH AUDIO GROUP
10 W. NIFONG BLVD.
COLUMBIA, MO 65203.

UNIVERSITY AUDIO SHOP, MADISON, WI... Best sound for dollars? We have many solutions! Dealer B&K, KEF, Paradigm, Vandersteen, Parasound, Micromega, Audio Alchemy, Rega, Roksan, AudioQuest, Symphonic Line, MidSquad and others. (608) 284-0011.

FOR SALE

CASH for USED AUDIO EQUIP. BUYING and SELLING by PHONE. CALL FOR HIGHEST QUOTE. (800) 388-9443. The Stereo Trading Outlet, 320 Old York Road, Jenkintown, PA 19046.

AA/SOUND ADVICE

LOW PRICES/FAST DELIVERY! DENON, NAD, CELESTION, B&W, ADCOM, CARVER, NAKAMICHI, BOSTON ACOUSTICS, LUXMAN, HAFLER, ADSP, MAK, ONYX, B&K, PROTON, DCM, SNELL, VELODYNE, PHILIPS, SPICA, CENTERPOINT, AND MORE! 414-727-9071.

FULL WARRANTY!!
MOST ITEMS IN STOCK!!
OPEN SUNDAYS!!

CALL US!!

Custom cables and terminations. Camacs. XLR balance, hi-flexibility tonearm sets, complete latches, full cotton shell, vacuum controls; MIT Multicaps & Wonder Caps sold. wire: Vishay & Halco resistors, all types audio connectors, tonearm and chassis wires, wide selection of high-end accessories/mod parts. $1 catalog ($3 overseas). MICHAEL PERCY, BOX 526, INVERNESS, CA 94937. (415) 669-7181.

FOR SALE

AAA—AUDIO ELITE IN WISCONSIN!!!
HAFLER, PS AUDIO, B&W, JACE, NAKAMICHI, LOWE COMPONENTS, MARK LEONARD, PHILIPS, VELODYNE, and any others you desire. (414) 725-4431.

CALL US WE CARE!!!

AAA—LOW PRICES—HIGH END EQUIPMENT!!!
PS AUDIO, HAFLER, B&W, CARVER, NAKAMICHI, LUX-
MAN THORENS, MAK, SNELL, ONYKO, PROTON, FREED,
SUMIKO, BOOSE, PHILIPS, DCM, VELODYNE, ADS, VPI.
JSE and any others you desire. AUDIO ELITE. (414) 725-4431.

OUR PRICES CAN'T BE BEAT!!!

DYNACO ST70 UPGRADES: Gold EL34 Sockets, 1215 Microslab on-board solid state B+, triode output. more. DofRelic Audio Services, Box 6054, South Hackensack, N.J. 07606-4354. Phone Fax: (201) 843-0488.

SAVE 40% ON HIGH-END home speakers, subwoofers, amplifiers. FREE CAT-
ALOG, 3021 Sangamon Avenue, Springfield, IL 62702. 1-800-263-4644.
ATTENTION AUDIO BUYERS!!!

AUTHORIZED DEALER FOR... ADS, ALPHASONIK, CARRERER, BENON, DUAL, HAFLER, INFINITY, KENWOOD, KICKER, MONSTER CABLE, ONKYO, ORTOFON & SONANCE! THE SOUND APPROACH. 6067 JERICHO PKWY, COMMACK, NY 11725. (603) 389-5121.

THE AUDIO CHAMBER!!!


60 YEARS IN BUSINESS...WE MUST BE DOING SOMETHING RIGHT. If it's a much-in-demand audiophile product, we're likely to have it for immediate shipment. Consult with one of our quiet experts just order U.S. - warranted components directly VISA/MC. Ask for Steve K or Dan W. SQUARE DEAL. 456 Waverly Ave., Patchogue, NY 11772. (516) 475-1857; (800) 441-DEAL.

UPGRADE FOR LESSI ROGERS AUDIO IS OFFERING BEST PRICES ON USED AUDIO COMPONENTS- BUY-SELL-TRADE. CALL (509) 996-4431.

AUDIO BY VAN ALSTINE - AUDDIOPHILE QUALITY at affordable prices because we have direct to you. Our great new OMEGA and FET/VALUE (gain, pending) components are original new engineering designs that emulate transient distortion, have no on off thumps, are durable and rugged, and sound closer to live than anything else at a national price. Complete wonderful fully musical factory wired amplifiers, pre-amps, tube players, and a great $99 phono cartridge. DYNACO OWNERS - we can rebuild complete do-it-yourself kits for Dyna vacuum tube preamps and power amps are $200, including all new PC cards and the preamp has been STEREOPHILE rated very highly. We design new circuits for most Dyna and Hafler solid-state components too. Now ultimate musical enjoyment is much less expensive. Write or call for our new illustrated catalog. Audio by Van Alstine. 2202 River Hills Drive, Burnsville, MN 55337. (612) 890-3517.

CALL TOLL FREE! 1-(800) 626-0520. NAD + ONKYO + HARMAN KARDON + CARVER + HAYDEN + HAFER + M &K + LEXICON + CELESTION + AUDIOCONTROL + TARGET + ATLANTIC TECHNOLOGY + PROAC + ACOUSTIC + CWD + FRIED + MONSTER CABLE + NILES AUDIO + THORENS + STAX + GRADO + DAHLEQUIST + KINERGETICS + NITY GRITTY + PROTON + APATURE + TERK + SOUNDBELL, 2848 CAHILL RD., MARINETTE, WI 54443. FAX (715) 733-5338, PHONE (715) 733-5902.

For music listeners only. The finest in musical production. Custom design and installation is our specialty, with twenty years experience. Audiofiles, 3881 Timber Lane, Verona, WI 53593. (608) 833-6383. fax: (608) 829-2686. Bi-monthly newsletter subscription $5 per year.

PAUL HEATH AUDIO

AUDIOSTATIC, CONVERGENT AUDIO, FS AUDIO, VAC, GENESIS, B &K, STAX, MERLIN, AUDIBLE ILLUSION, CLEMENTS, MAPLELON, PHILIPS, MUSIC REFERENCE, QUICKSILVER, XLO, CARDAS, LINDSAY GUYER, SIMPLY PHYSICS, MFA MAGNUM DYNALAB, RAY LUMLEY & MENTOR 217 ALEX ANDER ST., ROCHESTER, NY 14607. (716) 262-4310.


FULL WARRANTY!!! MOST ITEMS IN STOCK!! OPEN SUNDAYS!!

AMRITA AUDIO

AMRITA AUDIO • P.O. Box 770, Fairfield, Iowa 52556 • (800) 4-AMRITA

MUSICAL DESIGN

A Modern Classic

MUSICAL DESIGN

Two Patterson Plaza • St Louis, Mo. 63103 • 314-381-5802

The Amriti-Heartland Towers...

“The best ‘front-row center’ speakers, ever!” - Fred Hulen

Audio Mart, Kansas City, KS

AMRITA AUDIO • P.O. Box 770, Fairfield, Iowa 52556 • (800) 4-AMRITA

CD STORAGE

Store 100 CD’s behind glass doors. Five adjustable shelves with brass bookends held single & multiple CD’s. Videos and Cassettes — in any combination. Comes in Solid Oak, Walnut, Teak or Cherry. Can stack or wall mount. FREE Literature and Prices: Call 1-800-432-8005. FAX 1-201-748-2592.
GAS EQUIPMENT OWNERS

From repairs and updates to complete rebuilds, we are the GREAT AMERICAN SOUND experts! Since 1977. GASWORKS, 8075 Northview St., Boise, Idaho, 83704. (208) 323-0686.

AUDIO DEN Authorized Sales and Service. ADCOM, ARAGON, ARCAM, B&O, CAL CELESTION, CONDOR, JORDAN, KINERGETICS, KUPERSCH, MAGNET-PAVE, MIRAGE, MONTER CABLE, NAD, NAKAMICHI, PARADIGM, ROGERS, SHURE ULTRA, SONUS, STRAY, THETA, DIGITAL, VELODYNE, VTL & YAMAHA. Audio Den, 2213 Smith Haven Plaza, Lake Grove, NY 11755. (516) 360-1990.

FOR TWENTY YEARS WE HAVE BEEN THE SOURCE FOR REEL-TO-REEL TAPES & HARD-TO-FIND RECORDING SUPPLIES AT DISCOUNT PRICES. CATALOG AVAILABLE. ALSO INCLUDES VIDEO. SOUNDR TECHNATION CORPORATION, 3586 PIERCE DR., CHAMBLEE, GA. 30341. (404) 658-8273. In GA. (404) 655-9686, FAX (404) 458-0276.


AUDIO BEST. L.A. ORANGE, SAN BERNARDINO, CALIFORNIA. HOT COMPONENTS, CELESTION 100, COUN- TERPOINT, TARALAB, PS DIGITAL AUDIBLE ILLU- SIONS, MDSOQUAD, ACUSAT, SPICA, VMPS, MAGNUM, FOSGATE, B&K, SUPERPHON, MUSIC REFER- EENCE, SOUNDLAB, MAPLENCOLL, SYSTEM- EX, GRADO, MONTER, STRAIGHTWIRE, MUSIC CON- CEPTS. (714) 661-5143. APPOINTMENT.

HI-FI CLASSICS.—USED HI-END.—HUGE SELECTION of components, cables, etc. Competent & helpful salespeople & the best prices around. WE BUY, SELL & TRADE. INVEN- TORY LIST AVAILABLE. TEL: (718) 319-6918, FAX: (718) 319-9872.

MOSCODES, FUTTERMANS.—ALL BRANDS TUBE ELECTRONICS—SERVICE AND CUSTOM MODIFI- CATIONS BY GEORGE KAYE, MOSCODE DESIGNER. CUSTOM FUTTERMAN OTL 1, CONVERT HAPFERS TO MOSCODES HYBRID. KAYE AUDIO LABS, INC. 230 Liberty Ave., New Rochelle, NY 10805. (914) 633-3039.

AAA! BLOW-OUT SALE!!!

CARVER C6 PREAMP $700 NOW $399. NAD 5100 CD PLAYER $500 NOW $299. ADCOM 155 TUNER $199. PROTON AVX03 RECEIVER $199. AR40 CD PLAYER $199. ONKYO CD/DB $190 $129. many others like HK, NAH, DEM, more!!!

100's OF BLOW-OUT SPECIALS ON VARIOUS PRODUCTS!!!

CALL NOW! 416-727-9071

EXPERIENCED, FRIENDLY ADVICE! FREE SHIPPING!

MIRAGE, PS, CDW, STAX, KINERGETICS, THORENS, PHILIPS, AUDIOQUEST, FRIEND, MONSTER, QUAD, SPICA, STRAIGHTWIRE, MORE!! READ BROTHERS, PARADIGM, ROGERS, SHURE ULTRA, MAGNEPAN, MIRAGE.

318-9623.

RICK KING, CHARLESTON, SOUTH CAROLINA 29403. (803) 723-7276.


AUDIO SOLUTIONS is Atlanta's dealer for Vandersteen, B&K, Classe, Snell, Thela, Rotel, VPI, and Straightwire. Tube mod- ications and custom loudspeakers are our specialty. 4880 Lawrenceville Highway. (404) 361-0778.

ONE OF A KIND • SOLID STATE LOVERS • ARC • CODA • CELLO • KRELL • LEVINSON • NEW AND MINT CONDITION • 313-644-4001

FOR SALE

CALL US FOR QUALITY AUDIO AT THE LOWEST PRICES WITH FAST SERVICE, EVEN ON ESOTERIC ITEMS

SOUND ADVICE ... without the price

(914) 666-0550

AUDIO OUTLET

PO Box 873
Bedford Hills, New York 10507-0673

STORADIST™

Fine-furniture quality CD storage systems with angled shelves & non-slip surface that holds a single CD upright. Solid hardwoods & textured finishes. 360 & 576 capacity shown. Smaller sizes available. Write or call 1-800-484-9811.

Davidson-Whitehall Company

555 Whitehall Street Atlanta, Georgia 30303

THE CLASSICS REVISITED

PV11 Preamplifier, MV52 Amplifier. All-tube components priced under $2000 each.

the conrad-johnson group

2800R Dorf Ave. • Fairfax, Virginia, 22031 • 703-698-8581

Audioworks DEC/EBEAY 1991

161
The VMPS Super Tower III is a very large, floor-standing, high efficiency speaker (80 watts/8 ohms driven, 25% bandwidth, lowest distortion, and greatest dynamic range of any production system regardless of price.

The still incorporates numerous design advances including: double thick front baffle, anti-diffraction round vertical cabinet edges, flush-mounted drivers, soundcoat cabinet damping, spacious woven Carbon Fiber mids, multigauge Teflon solid core internal wiring, all Wondercable crossovers, and more. Bass extension (1.5dB at 17Hz/1W driven), THD (less than 0.25% at 1W), sensitivity 94dB/1W/1m), and a natural tone balance combine to produce sound quality described as "magnificent" and "splendid" by leading reviewers (see The Absolute Sound, Sep/Oct 91 issue). Hear VMPS speakers and John Curl's Vendetta Research electronics (such as the newly developed SCP 240, phono preamp, $2495) at the dealer's below, or write for brochures and test reports on our Tower II Special Edition ($1378/pr, kit, $1778/pr, assembled). Our three highly acclaimed Subwoofers ($259-$599ea), QS0 Series bookshelf speakers, and luxury options available for most models. Prices include free shipping in 48 states and kits are supplied with fully assembled cabinets.

**VMPS AUDIO PRODUCTS**

div Icone Audio
3429 Morningside Dr. El Sobrante, CA 94803
(510) 222-4276 Fax: (510) 232-3837

Hear VMPS at: The Listening Studio, Boston; P.A. Troy Sound, Parkersburg, WV; Sound Incredible, Brookfield CT; Dynamic Sound, Washington DC; Essential Audio, Winchester VA; HiFi Farm, Beckley, WV; American Audio, Greenville SC; Arthur Morgan, Lake Mary FL; Sound Audio, Charlotte NC; Audio by Caruso, Miami FL; Audio by Jim Morrison, Detroit MI; Audio Specialties, South Bend IN; Audio Connection, Terre Haute, IN; Shadow Creek Ltd., Minneapolis Mn; Concert Sound, San Antonio TX; Parker Enterprises, Garland TX; Stereoworks, Houston TX; Encore Audio, Lees Summit, MO; Lookout: Electronics, Longview WA; Posh Audio, Lake Oswego OR; The Sound Room, Vancouver BC; Cen. Sounds Deluxe, Clerendon Hills IL; Golden Ear, Erie CO; Exclusively Entertainment, San Diego CA; Audio Haven, Highland CA; Sounds Unique, Sausalito CA; Private Line Home Entertainment, Stockton CA; Ultimate Sound, San Francisco CA; Icone Audio, El Sobrante CA.

**Gold Aero**

Reference Standard Audio Tubes
"For Those Who Can Hear The Difference"

Gold Aero tubes belong in every model of vacuum tube audio equipment...

- Air Tight, Audio Research, Cal Audio, Cary Audio, Conrad-Johnson, Counterpoint,

Gold Aero tubes make the difference between average tube sound and state-of-the-art performance.

Gold Aero Technology Group • 21113 Superior St. • Chatsworth, CA 91311
Phone: 818-882-3872 • 800-121-2129 • FAX: 818-882-3968

**FOR SALE**


**ALL NEW SIDEALERKAP!** The most highly reviewed pre-

ium audio grade capacitor has been completely redesigned. Artwork on the new SidealerKap for the ultimate in musical accuracy. Product information available. Sideeral Audio, 9747 Scraps Ranch Blvd. • $599ea)

...and details (801) 467-5918. Visa.


**MCINTOSH Bought-Sold-Traded-Repaired. FREE Catalogue. See our ad at the beginning of the classifieds.**

**CD PLAYERS!** We offer the finest modifications available for Phillips/Hotel-Magnavox CD players. Starting at just $199. Money back guarantee! SYNERGY: 1-542-7851.

A compact loudspeaker with extended highs, uncolored midrange AND solid bass? The Reference 1c proves that good things come in small packages! Free literature. Ariel Acoustics, P.O. Box 87261, Canton, MI 48187.

**FOR SALE**

BANG & OLUFSEN—B&W—CARVER—

KEF—ADC/M—NAKAMICHI—A/DS—

REVQ—DENON—HARMON/KARDON—

CELESTION—POLK—INFINITY—

KLIPSCH—BEST PRICES! MANUFACTURERS U.S.A. WARRANTIES, AMERI-

SOUND SALES INC. (904) 262-4000.

EXPERIENCE THE SOUND OF LIVE PERFORMANCE! CROWN IS NOW MAKING THEIR NEW MACRO-

REFERENCE AMPLIFIER AVAILABLE TO THE HOME MARKET THROUGH A VENOM DISTRIBUTION. THIS AMPLIFIER, USED BY MAJOR STUDIOS, IS UN-

PRECEDENTED FOR SONIC PURITY. YOU WILL SOON EXPERIENCE THE SOUND OF LIVE PERFORMANCE IN YOUR OWN HOME. FOR A MACRO-REFERENCE WHITE PAPER OR DEALER INFORMATION, CALL CROWN AT 1-800-533-6289.

ATTILA THE HUN ELECTRON TUBES. Fully tested & guaranteed. 12AX7 German (AEG)$10. Chinese $7.50; EL34 (Siemens)$25 mp; Russian KT66 $27.50 mp; American $650-$50/ea. Check, MO-4$: COD-5$. ATTILA THE HUN, P.O. Box 7145, Ann Arbor, MI 48103 (313) 668-6901.

CAR/HOME/VIDEO for: DENON, SONY, IN-

FINITY, AUDIO CONTROL, VELODYNE, CWID, COUSTIC, BAZOOKA, MONSTER CABLE, KICHER, ADVENT & PRECISION POWER. Full line authorized dealer. Call (800) 321-0685 for prices and orders. (301) 729-3711 for info and consultations. C&C Audio/Video 11am-9pm Mon-Sat EST.

HIGH END AT DEALER COST!!

STARRIN (LITERALLY) HI-FI SELLER SAVES YOU TO MAKE ENDS MEET BY SELLING HIS INVENTORY AT CLOSE-OUT PRICE! SOME PRICES ACTUAL DEALER COST! I CAN'T MENTION ALL OF MY LINES HERE, BUT I CAN TELL YOU THAT ALL MEINLTER AND MELDOR PRODUCTS ARE SELLING FOR MY COST OR BELOW! ALL SYSTEMDEAL TABLES ARE BEING BLOWN OUT MY DOORS, ALONG WITH TWENTY OTHER LINES! LET'S GET TOGETHER TOLL-FREE 800-438-6400.
Esoteric Sound welcomes McIntosh to our family of superb audio components. We're proud to be judged by the company we keep...

High End Components For The Audio Perfectionist

ESOTERIC SOUND SYSTEMS LTD.
COVENTRY COMMONS Rm 147
STONY BROOK, N. Y. 11790
516/679, 7744

FOR SALE

ANNUAL CLEARANCE SALE!

NEW LOCATION:

301-989-2500

B&W METRIC'S 801 SERIES 2 LOUDSPEAKERS, BRAND-NEW. FACTORY SEALED IN THE BOX. COST: $6000. SACRIFICE $4700. GREG (404) 436-3400 10:30AM-10:30PM.EST.

LOUDSPEAKERS

ADCOM, B&K, and HAFLER MODIFICATIONS by MUSICAL CONCEPTS (since 1979) offer refined, elegant sound. Modifications include basic circuit re-desig, Toroid transformers, high performance filter capacitors, total Dual-Mono conversions and MC-37T (Teflon') preamplifier circuit! NEW PA-1, front-end boards for HAFLER amps—budget bisslepf avail-

able!) SuperConnect IV interconnect and DigitalConnect—the best we've heard, or heard back! We modify your PHILIPS, ROTEL or MAGNAVOX CD players (6-bit, 1-bit). MUSICAL CONCEPTS, 11 PATTERSON ST. PLAZA, ST. LOUIS, MO 63101. 314-831-1822.

LOUDSPEAKERS

ABSOLUTE SATISFACTION guaranteed. We sell more high end speaker kits than anyone in the U.S. Eleven kits from $1199/pr. Free catalog. 1-800-346-9183. Audio Concepts, Inc. 901 No. 4th St., La Crosse, WI 54601.


LOUDSPEAKER CABINETS — Large selection of high-quality Cabinets ready to finish in oak, walnut and solid color laminates. Grenier Cabinets, 5901 Jennings Road, Horseheads, NY 14845. (607) 594-3838.

HIGH OUTPUT, HIGH EFFICIENCY, WIDE RANGE LOUDSPEAKER KITS. MAGNIFICENT SOUN DOFFABLE PRICE! CATALOG $1. LAWRENCE AUDIO, 1417 WARNER, PITTSBURGH, PA 15233.

A & S SPEAKERS imports the world's finest speaker components: crossover, wires, and kits. Dynaudio, Scan Speak, Focal, Morel, MB Electronics, Peerless, Polystox, SEAS, LPG, Eton. We also ship VMPS systems and kits and Reference Amplifiers. Free literature: 3110 22nd Street, San Francisco, CA 94110. (415) 641-4572. Fax: (415) 648-5306.

DON'T DISCARD OLD FAVORITES! Re-sound your own speakers. Easy to install foam surround kits. $24.95 pair $33.00 S & H. Ktel Hi-Fi Clinic, P.O. Box #1088, Flat Rock, NC 28731 or (704) 692-3459. Visa/MC.


LODGE Dự

ELECTROSTATIC SPEAKERS


SAVE YOUR SURROUNDS! Surrounds not. We have a new developed non-toxic sealer for cones and surrounds. Don't wait. $12.50. MC/FISA/AMEX. SPEAKERWORLD, 1-800-359-0366. (813) 544-3511.

The Speaker we've all been waiting for.
Introducing the Thiel CS 2.2. $2,250/pr. A new classic.

INNOVATIVE AUDIO VIDEO SHOWROOMS

The Thiel Speaker Line
SCS Bookshelf (New) $1,090/pr.
CS 1.2 $1,250/pr.
CS 2 $1,650/pr.
CS 2.2 (New) $2,250/pr.
CS 3.5 $2,850/pr.
CS 5 $9,200/pr.

Our Facility

Innovative represents the finest brands of audio and video components. Our 600 sq. ft. facility allows us to perform specific comparisons which include turntable vs. turntable. CD vs. CD, speaker vs. speaker, tape deck vs. tape deck, and comparisons among electronics. Complete Media Room/Video Dept.

DELIVERY, INSTALLATION, REPAIR SEVEN DAYS A WEEK

In the event you need service, we offer a free loaner for units purchased at Innovative. Service is performed on our premises. Located just five minutes from Wall Street. Easy to reach by subway or car. Parking nearby. Call for directions.

77 CLINTON STREET BROOKLYN HEIGHTS
NEW YORK 11201
(212) 619-3488
OR (718) 396-8888

NAD
The leader
in digital technology.
NILES
Highest Build Quality. 3 years parts and labor.
GRADO
PHILIPS
warranty.
LUXMAN
Compact disc players and changers.
PS AUDIO
DAT
THORENS
Recorders.
PARADIGM
Receivers.
AUDIODESIGN
Cassette Recorders, and used equipment.
Processors.
The wait is over…for the first time ever...
The Absolute Sound’s Guide to High End Components

This valuable resource book defines the High End companies and their products with:
- Over 100 pages of High End equipment specifications selected by TAS editors as being most useful in giving buyers a clear indication of sonics and interfacing.
- Tips on how to use the data.
- An introduction to each category, giving its history and function.
- An exclusive listing of High End accessories and their specs.
- A source guide for finding analogue records, plus HP’s SUPER DISCS LIST!

And much, much more!

For a copy, please send $9.95 plus $1.50 for postage & handling to TAS GUIDE • Box L • See Cliff, New York 11579 or call (800) 222-3201.

LOUDSPEAKERS

BOSE, ADVENT, JBL
Quality service on all brands since 1977. Call about Bose 901 upgrade/upgrade, reformatting, repl parts, low prices, last service. SPEAKER-WORLD. 1-800-359-0366, (813) 544-3511. MC/VISA/AMEX

NEAR - High Performance all metal-alloy speaker systems. $349 to $1,559 a pair "Excellent value". IAR (International Audio Review) New England Audio Radio, (207) 535-7307.

BOZAK SPEAKER REPAIRS, using original manufacturer's machinery, specifications, techniques and dies. Quality workmanship. NEAR 207-352-7307.

LOUDSPEAKERS

SPEAKER REPAIRS, Grills, Woofers, Mids, Tweeters & X-Over. 15 Yr Old Tampa Based Company specializing in All Brands Home Speaker Recon & Repairing. The Speaker Exchange. 1242 E. Hillsborough Avenue, Tampa, Florida 33604. 813-217-4800.

CHECK YOUR WOOFERS!
Save your woofers from destroying your amp! Quality reformatting on all sizes, all brands. Est. 1977. SPEAKER-WORLD. 1-800-359-0366, (813) 544-3511. MC/VISA/AMEX.

LOUDSPEAKER MFG CLEARING PARTS INVENTORY! EVERYTHING FROM MAGNETS TO CONES, CERAMIC, ELECTRONIC EQUIPMENT. CONTACT: A. Stoklos (619) 630-1540.

BANG & OLUFSEN—B&B-CARVER

ADVANCED AUDIO INC.—HIGH PERFORMANCE LOUDSPEAKERS AT FACTORY DIRECT PRICES. 30 Day Money Back Guarantee—Free Literature. P.O. BOX 18, LEECHBURG, PA 15656.

DYNAAUDIO SPEAKER KITS
We believe SUPERIOR SOUND QUALITY promotes itself, and invite you to DISCOVER AUTHENTIC FIDELITY. ADVANCED ACOUSTIC—7027 WOODSIDE—STOCKTON • CALIFORNIA • 95217 • 1992 Catalog $2.00 • 1-209-477-5045.

"1992" MkII TECHNOLOGY

CD PLAYERS

THE BEST WAY TO UPGRADE YOUR CD PLAYER?—Simply clamp BLOCKERS™ Cable Enhancers onto any audio/video/power CATV cable (up to 10mm thick) and enjoy cleaner audio (and video!), guaranteed! Set of 3 treats 1 CD player $24.95; 4 treats 1 Laserdisc/VCR. $31.95. Add $3.00 S&H. CA residents add 8 1/4% tax. Check/M.O. to BLOCKERS, 409 N. Pacific Coast Highway #106, Suite 300, Redondo Beach, CA 90277. InfoFax: (213) 323-1525.

MUSICAL CONCEPTS COMPACT DISC
ENCIGMA III. Our dealers rate it the best CD value, period! ERA II. Musical delicacy, tube-like liquidity. EPOCH III. 'More musically natural than any transport DAC combination—'breakthrough' naturalness and musicality! All players use 256 times oversampling CD TRANSPORT—There are major differences in transport "sound" try the CD—see what we mean! MUSICAL CONCEPTS, 15 PATTISON PLAZA, ST. LOUIS, MO 63101. 314-831-1822

RECORDS

NITTY GRITTY & RECORD DOCTOR UPGRADE! Boost turnover power & our cleaning time with the remarkable Gliding Platter™ Simple upgrade devastates rotational friction. Just $14.00 PPD. Check/M.O. KAB ELECTRO-Acoustics, Box 292B2, Plainfield, NJ, 07062-0322. (908) 754-1479.
LOW PRICES/CALL US!!

DENON, NAKAMICHI, CARVER, NAD, ADCOM, BOSTON
ACOUSTICS, B&K, ONKYO, B&W, ADS, M&K, VELODYNE,
SNELL, BOSE & MORE!

FULL WARRANTY • 414-727-0071 • FAST DELIVERY

RECORDS

RECORD COLLECTORS SUPPLIES. REPLACEMENT
JACKETS, INNER SLEEVEs, 78 RPM SLEEVEs, OPERA
BOXES, LASER DISK BOXES, ETC. FREE CATALOG.
CABCO PRODUCTS, BOX 8121, ROOM 662, COLUMBUS,
OHIO 43201

We buy and sell
LP vinyl records
Over 100,000 titles in stock.
139 West 72nd Street
New York, NY 10023
Rare Records Ltd.
212 877-5020

COMPACT DISCS

MOBILE FIDELITY ULTRADISCS, Sheffield, Telarc.
WE'LL BEAT ANY PRICE! Visa/ MC/Discover. SALCO
INC., P.O. BOX 1964, BUTLER, PA 16001. 1-800-562-1166.

DISCOUNT COMPACT
DISCS

Telarc $11.99/ct, Chesky $10.99/ct, DMP. Reference &
Sheffield $11.99/ct! Hundreds of other labels at low
prices. Send SASE for catalog or your order with Visa /
MC / Disc / Check + $4 shipping to: THE ACME
COMPACT DISC COMPANY, P.O. BOX 7004, EVAN-
STON, IL 60204.

AUDIOPHILE RECORDS

THE BINAURAL SOURCE-World's exclusive catalog of
true binaural CDs-cassettes for startling headphone
experiences; also speaker-compatible. Classical/jazz/
drama nature sounds. Visa MC accepted; new catalog
$1; (63 foreign, refunded first order): Box 1727A, Ross,
CA 94957. (415) 457-9052.

SEALED & MINT USED AUDIOPHILE RECORDS—Mobile
Fidelity, UHRs, Nautilus, CBS Half Speed Mastersounds,
A&M & MCA Half-Speeds, Japanese imports & more. Call
Steve (516) 681-4494.

AUDIOPHILE RECORD WAREHOUSE! Out-of-Print
Direct-To-Disc, Halfspeed, Quex II & Import Pressings.
Great selection of In-Print Records & CD's. Quantity Dis-
counts! Call for Free Catalog, Elusive Disc, 5346 N. Guilford
Ave., Indianapolis, IN 46220. (317) 255-3446.

WANTED TO BUY

AAAAALWAYS PAYING TOP $$/FOR CLEAN, COLLECT-
ABLE MCINTOSH TUBE AND SOLID STATE, MARANTZ
TUBE, WESTERN ELECTRIC, JBL-PARAGON, HART-
SFIELDS, ETC. & ALNICO PARTS. EV PATRICIANS,
GEORGIAUS & MIc. PARTS. M. LEVINSON, KRELL,
ARC, SPECTRAL ETC. CALL ME LAST ONLY WHEN
YOU'RE READY TO SELL! John: 1-800-628-0266.

Audio City Always Paying top for: Studer, Levinson, Mon-
torch, Marantz, C. J. ARC, Quad, Leak, Westerm Electric,
Telefunken, Siemens, Neuman. Vintage speaker systems,
raw units by Tannoy, W.E., E-V, JBL, Altec, Jensen. Audio
boxes by Telefunken, Gemini, etc. P.O. Box 802 Northridge,
CA 91329-0802. Tel: 818-701-5633. David Yo.

ALWAYS PAYING TOP PRICE: IT'S WORTH IT CALLING
ME! ALTEC, E-V, JENSEN, TANNOW, WESTERN,
OLD EQUIPMENT, MCINTOSH SOLID STATE, MARANTZ,
M & S, LEVINSON, THRESHOLD, HENRY CHANC.
We Make Good Amps & Preamps Sound Great!

At Professional Mod Service, we make new and used amps and preamps sound dramatically better. We make the bass more powerful and the mids and highs clearer. We make products sound better than when they left the factory!

We specialize in Adcom, B&K, and Hagger, but we love to work on Audac, Belles, Crown, Citation, Dynaco, McIntosh, Moscode, and many others, too. If it's a high end amp or preamp, we can upgrade and improve it.

So Much Improvement For So Little Money

Don't be fooled by our low prices. We install real improvements, developed with factory engineers. We use only premium materials including the finest capacitors, resistors, wires, and connectors. And our technicians are real pros with years of experience. All work is guaranteed for two full years.

Our Low Prices

| Deluxe Amp Mod | $199.95 |
| Super Amp Mod | $249.99 |
| Deluxe Tube Amp Mod/Refurbish | $229.95 |
| Deluxe Preamp Mod | $199.95 |
| Deluxe Tube Preamp Mod | $249.95 |
| Custom Mods/Repairs | at reasonable rates |

Add $14.95 return shipping for amps, $9.95 for preamps.

Dramatically Improved Sound—In Just Two Weeks

For a dramatic sonic improvement, send us your amp or preamp today. Enclave a check, money order, or credit card information. In just two weeks, we'll revamp it, thoroughly test it, and return it by UPS, insured. Your satisfaction is guaranteed.

1-800-334-0295

Amex/Visa/MC/Discover

Professionals Mod Service, Inc.

225 Oaks SW
Grand Rapids, MI 49503

616-451-3577 • FAX 616-451-0709

---

Madisound Speaker Components

8608 University Green

Box 4283

Madison, WI 53711

Phone:(608)831-3433

Fax:(608)831-3771

---

WANTED TO BUY

COLLECTOR Buying TUBE, MARIANTZ, McIntosh, TANNOY, A.R.C., KRELL, Levinson, Sequenza Tuner. Also, WRIST WATCHES: ROLLEX, PATEK, others. (718) 387-7216 IN NEW YORK.

HI-FI SUPPLIES—PAYS CASH FOR LEVINSON, ARC, C.J. KRELL, SPECTRAL, ROWLAND, THRESHOLD & OLD MARIANTZ, MCINTOSH TUBE EQUIP. (212) 219-3352, 7 DAYS 10AM-6PM (NY)

BLANK TAPES

1800' AMPEX REELS USED ONCE—SAMPLE: $3.00. NEW MAXELL REELS-CASSETTES, TDK AR 100C $1.49, SA 90: $1.79. AUDIO TAPES, BOX 9584-A, ALEXANDRIA, VA 22304. (703)370-5555. VISA MC. FREE LIST.

INVENTIONS WANTED

INVENTIONS / NEW PRODUCTS / IDEAS WANTED: Call TLC for free information & Inventors Newsletter. 1-800-468-7200, 24 hours/day—USA CANADA.

RETAIL MART

SAN FRANCISCO BAY AREA AUDIOPHILES audition


CAR STEREO

"STEREO WORLD" is your discount sound source with special deals on the following car and home stereo lines: Panasonic, JVC, Sony, Pyle, Alphasonic, Orion, Pioneer, Sherwood, Hi-Fonics, Blaupunkt, MTX, Ultimate, Kenwood, Scosche EFX, Autotek, JBL, GNS Amps, Excilairb and many others. We carry alarms and a full line of installation kits. Please call or write for FREE catalog. Free UPS in 48 states. 10AM-6pm Mon.-Fri. Visa/MC. COD accepted. P.O. Box 596, Monroe, NY 10950. (914) 782-6044.

SERVICES

Audio Repairs and Restorations by Clif Ramsey, former Senior Service Technician at McIntosh and Ron Olsen. Electrical Engineer. Tuner Modifications by Richard Modafferi, independent consultant to Audio Classics, inventor, and former Senior Engineer at McIntosh. Over 70 years combined experience. AUDIO CLASSICS. 6AM-5PM EST Mon.-Fri. POB 17550, Walston, NY 13856. 607-665-7200.

---

VAMPR Leading WIRE™

...audible results with the finest in connecting components.

SOUND CONNECTIONS INTERNATIONAL, INC.

203 Flagship Dr., Lutz, FL 33549 Ph: (813)294-2707

---

166

AUDIO/DECEMBER 1991
The THE SENSIBLE SOUND—After 14 years of helping audiophiles spend less and get more, we’ve bigger, bolder, and better than ever! Issue #43, now available, takes an in-depth look at today’s speaker market, featuring reviews of familiar brands (e.g., Fried, Vandersteen) and some remarkable models you may not have heard of such as Shahnian ARC, Brighi Star Audio, Icon Lumen, and more. #44 will cover the audio waterfaring—from turners to tweeters, from wires to woofer. Subscribe now! Two year (four issues) $20; two years, only $36. Plus, you can order all available back issues (more than two dozen!) for only $40 and get the audiophile education of a lifetime. The Sensible Sound. 403 Darwin Drive, Snyder, NY 14226. Or use Visa/MC by phone, (716) 681-3513, or FAX, (716) 839-2264.

DAT

Custom DAT tapes. Classic and theatre pipe organ digital mastering. Brochure 50¢ & SASE. TV RECORDING. BOX 79021. SUNNYVALE, CA 94086.}

BUSINESS OPPORTUNITIES

LET THE GOVERNMENT FINANCE your new or existing small business. Grants/loans to $500,000. Free recorded message: 707-448-0270. (KFI)

WE WILL PAY YOU TO TYPE NAMES AND ADDRESSES FROM HOME $50.00 PER 1000 FULL TIME. PART TIME CALL 1-900-246-3131($0.99/MIN) OR WRITE: PASCAD1921, 161 S. LINCOLNWAY, N. AURORA, IL 60522.

MAIL ORDER

ABARGAIN: STAX SIGN/LAMBDA $1.395; PRO/LAMBDa SRD7 $495; PRO/LAMBDa (#1) $459; SIGN/LAMBDa SRD7/? $599; GRACE F9ERUBY $199; DENON 1003D $199; FR1MK1F $199; ALL UNUSED (212) 966-1355.

THE BEST DISC AND TAPE STORAGE SYSTEM IN AMERICA. Stackable, portable oak units hold all recording formats. FREE Mailorder Brochure (please mention Audio). Per Madsen Design: (415) 928-4509. P.O. Box 300101, San Francisco, CA 94133.

ATTENTION CLASSIFIED ADVERTISERS

The CLASSIFIED MAGNET attracts prime prospects for your mail order products and services. Reach the readers (proven buyers) of this and other Hachette Magazines, Inc. titles through low-cost Marketplace Classified advertising. To place your ads, or for further information (including rates, ad styles, sizes, multi-title discounts) call Toll Free at:

1 (800) 445-6066
-9am to 5pm est-

AD INDEX

Firm (Reader Service No.) Page
Adcom (3, 4) Cover II, 79-82
Audio Control (6) 85
Audio Research (7) 121
AudioQuest 103, 105
Audiostream (6) Cover IV
B & K (9) 141
Beyerdynamic (10) 59
BMW 17 & 18
Bose (11) 95
Bose Express Music 129
Brystonenton (12) 95
Cambridge Soundworks (13, 14, 52) 8, 9, 40
Carvel (14) 112 & 113
Cerven-Vega (15) 119
Columbia House 49
Counterpoint (16) 111
Denon (17, 18) 28, 135
Design Acoustics 55
Dutchtech Audio (19) 55
Gallo 92 & 93
GRP (20, 21) 145, 149
Hallier (22) 77
Infinity Systems Inc. Cover IV
JBL (23) 100 & 101
JVC (24) 144
Kinergetics Research (25) 90
Levinson 125
Luxman (26) 75
M & K Sound (27) 123
Martin-Logan (32) 67
Maxell (28) 86 & 87
McIntosh (29) 117
Mitsubishi (31) 32 & 33
Mobile Fidelity (32) 13, 15
Mondial (33) 107
Monster Cable (34) 109
MTI 55
Music Tapes (53) 109
Music Interface Technology (34) 146
Nakamichi 11
Nordic Track 152
Olympus (36) 22, 23
Onkyo 36 & 37
Panasonic (37) 21
Parasound 89
Philips 61-65
Pioneer (38) 26
Polk (39) 24 & 25
Proceed 3
Pyle (40) 127
Radio Shack (41) 43
Sharp (51) 132
Shure Brothers (42) 152
Sony 6 & 7
Sound City (43) 139
SSS Projects Inc. (44) 148
Straight Wire (45) 19
TDK (46) 68 & 69
Theta (47) 73
Velodyne (48) 97
Whip Acoustics (49) 97
Windham Hill 147
Wisconsin Discount Stereo 151
XLO Electric (50) 71
Yamaha 65
Touch Tone Participant
The Motown Album, history by Ben Fong-Torres, essay by Elvis Mitchell, and discography by Dave Marsh, Jan., 22.

Music, Sound, & Technology by John M. Eargle, April, 12.

Hit Men by Fredric Dannen, April, 16.

Grateful Dead Family Album by Jerilyn Lee Brandelius (edited by Alan Trist), April, 16.

I Am the Blues: The Willie Dixon Story by Willie Dixon with Don Snowden, April, 21.

Cables
Impedance, Cables & Treble Loss, Herman Burstein, Nov., 42.

Car Stereo
Land of Trump and Glory (IASCA Finals and Expo, "Roadsigns"), Ivan Berger, Feb., 18.

Competition Grows in Tents (IASCA Finals and Expo, "Roadsigns"), Ivan Berger, March, 31.

From Here to Infiniti (Infiniti/Bose system, "Roadsigns"), Ivan Berger, April, 38.

Rolls-Royce: Sound in a Silver Cloud, Ivan Berger, May, 10.

17th Annual Car Stereo Directory, May, 49.

Auto Inquiries (AES conference, "Roadsigns"), David Clark, June, 28.

Construction Projects
Build a Simple Surround Decoder, Richard J. Kaufman, June, 48.

Digital Sound & Equipment

Music of the Bitstream, Prasanna Shah, Jan., 56 (Addendum, July, 4).

Digital Duel: Three Portable CD Players Tested (Denon DCP-100, NEC HES-CDR-01 TurboGrafx, and Sony C-555 Discman), Leonard Feldman, Feb., 32.

Playing CD Games (NEC TurboGrafx-16 system), Leonard Feldman, Feb., 36.


A Levy Is a Toll Is a Tax (royalty on digital audio recorders and media, "Spectrum"), Eugene Pitts, Sept., 4.

Have DAT Will Travel: To the Islands of Japan, Christopher Greenleaf, Sept., 26.

Have DAT... Will Travel: To the Galapagos Islands, John M. Woram, Sept., 27.

Noteworthy: Philips' Digital Compact Cassette and PASC Data Compression, David Ranada, Sept., 32.

Directories
Car Stereo Directory, May.

Introduction, 49; DAT Players, 49; Amps/Equalizers, 50; In-Dash CD Players, 78; CD Changers, 84; Radios/Tape Players, 86; Speakers, 96; Company Addresses, 135.

Annual Equipment Directory, October.

Introduction, 115; DAT Recorders, 118; CD Players & D/A Converters, 120; Amplifiers, 138; Preamplifiers, 165; Tuners, 179; Receivers, 185; Turntables, 192; Tonearms, 195; Phono Cartridges, 195; Cassette Decks, 209; Open-Reel Tape Decks, 216; Blank Tape, 216; Headphones, 223; Equalizers, 231; Ambience & Surround Sound Processors, 235; Signal Processors, 239; Crossovers, 241; Loudspeakers, 244; Company Addresses, 370.

Environmental Sound
Equipment Profiles
Air Tight ATM-1 Power Amplifier, June, 98.
Alpine 7909 Car Tuner/CD Player, Jan., 98.
Altec Lansing 511 Loudspeaker. April, 82.
AudioSource SS Three Surround Processor, Dec., 114.
David Berning EA-2101 Amplifier and TF-12 Preamplifier, Dec., 56.
Blaupunkt New York Car Tuner/CD Player, July, 56.
Boston Acoustics T1030 Loudspeaker, Jan., 78.
Cary Audio Silver Seven Mono Amplifier, Feb., 42.
Cary Audio CA-100 and CA-500s Mono Amplifiers, July, 68.
Delco/Bose Gold Series Car Audio System, Sept., 70.
Denon DCP-100 Portable CD Player, Feb., 32.
Esoteric P-2 CD Transport and D-2 D/A Converter, Sept., 42.
Forte Audio Model 4 Power Amplifier ("Auricle"), Nov., 84.
Harman Kardon TD4000 Cassette Deck, Feb., 78.
Jeccklin Float ESC Earphones ("Auricle"), Dec., 124.
JVC AX-V1050 Audio/Video Amplifier, Aug., 50.
KEF 105/3 Loudspeaker, June, 66.
Krell MD-1 CD Transport and SBP-64X Digital Signal Processor ("Auricle"), June, 114.
Lexicon CP-2 Digital Surround Processor, March, 48.
LUXMAN F-114 Surround Sound Processor/Ampifier, Nov., 60.
Martin-Logan Monolith IIx Loudspeaker, Sept., 50.
MAS DCC-1 Digital Control Center (from Music and Sound), Nov., 70.
Meridian D600B Loudspeaker, March, 62.
Meridian 208 Compact Disc Player/Preamplifier, April, 58.
Mission Cyrus One Integrated Amplifier, Aug., 70.
Monitor Audio Studio 10 Speaker, July, 44.
NEC HES-CDR-01 TurboGrafx Portable CD Player, Feb., 32.
Pioneer Premier KEX-M900 Car Stereo with DSP, Dec., 98.
Proced PCD Compact Disc Player and PDP D/A Converter ("Auricle"), April, 102.
Proton SD-1000 Surround Decoder, April, 70.
PSB Stratus Gold Loudspeaker, Nov., 46.
Recoton FM200 Indoor FM Antenna ("Auricle"), Dec., 128.
Sony TCD-D3 DAT Walkman Recorder, Jan., 66.
Sony D-555 Discman Portable CD Player, Feb., 32.
Sony TA-E1000ESD Digital Processing Preamplifier, June, 86.
Spica Angelus Loudspeaker ("Auricle"), Sept., 84.
SSI System 4000 II Dolby Surround Decoder, March, 78.
Stax SR-Lambda Pro EarSpeakers ("Auricle"), Jan., 110.
Thiel CS5 Loudspeaker, Feb., 56.
Threshold SA/4e Power Amplifier ("Auricle"), Jan., 110.
Westlake Audio BBSM-6F Loudspeaker, Dec., 78.
Wharfedale Diamond IV Loudspeaker, Aug., 60.
Yamaha DSP-A1000 Digital Sound-Field Processing Amplifier, June, 52.

FM Reception/Antennas
Plain Wire/Fancy Reception, Richard J. Kaufman, Jan., 46.

Forum
High Fidelity and Hearing Aids, Mead C. Killion, Jan., 42.
Constructive Commentary (response to two 1990 Audio articles on controlling indoor noise), Jon R. Sank, Dec., 16.

Headphones
Headphones: As Close As You Can Get, Edward M. Long, April, 50.

Hearing
Forum: High Fidelity and Hearing Aids, Mead C. Killion, Jan., 42.

History
The Audio Interview: Bill Levenson, Danny McCue, Jan., 50.
The Audio Interview: Robert Parker, John Sunier, Feb., 24.
The Phonograph’s Forgotten Heroes, John Alvin Pierce, March, 42.
The Audio Interview: Tom Frost, Susan Elliott, April, 42.
Carnegie Hall Centennial, Susan Elliott, May 16.
Sonic Restoration of Historical Recordings, Michael R. Lane, Part 1, June, 34; Part 2, July, 26.
The Audio Interview: Michael Cuscuna, Jon W. Poses, Aug., 32.

Interviews
Bill Levenson, Danny McCue, Jan., 50 (Polygram Records).
Robert Parker, John Sunier, Feb., 24 (BBC Records).
Tom Frost, Susan Elliott, April, 42 (Sony Classical and others).
Michael Cuscuna, Jon W. Poses, Aug., 32 (Blue Note and Mosaic Records).

Juilliard School of Music
Audio Magazine–Juilliard Scholarship Award, Susan Elliott, Jan., 118.

Loudspeakers
Tractrix Horns: Improved Imaging and Phasing, Roy Delgado, Kerry Geist, and Jim Hunter, March, 36.

Measurement Techniques
Headphones: As Close As You Can Get, Edward M. Long, April, 50.
Impedance, Cables & Treble Loss, Herman Bursten, Nov., 42.

Obituaries
Aaron Copland, Feb., 9.
Howard A. Roberson, May, 4.
1991 Annual Index

Author Index

Professional Recording
The Audio Interview: Bill Levenson, Danny McCue, Jan., 50.
The Audio Interview: Tom Frost, Susan Elliott, April, 42.
The Audio Interview: Michael Cuscuna, Jon W. Poses, Aug., 32.
Engineer's Perspective ("Currents"), John Eargle, Oct., 93.

Reissued Recordings
Mercury's Living Presence CDs (Living in the Presence, "Currents"), John Eargle, Jan., 12.
Polygram's Eric Clapton boxed sets (The Audio Interview: Bill Levenson), Danny McCue, Jan., 50.
BBC's Jazz Classics in Digital Stereo and Classic Years in Digital Stereo (The Audio Interview: Robert Parker), John Sunier, Feb., 24.

Restoration of Recordings
The Audio Interview: Robert Parker, John Sunier, Feb., 24.
Sonic Restoration of Historical Recordings, Michael R. Lane, Part 1, June, 34, Part 2, July, 26.

Surround Sound & Recordings
Build a Simple Surround Decoder, Richard J. Kaufman, June, 48.
Surround Sound Without Pictures (reviews of surround-encoded CDs), Leonard Feldman and John Sunier, Dec., 50.

Tape & Tape Recording
A Levy Is a Toll Is a Tax (royalty on digital audio recorders and media, "Spectrum"), Eugene Pitts, Sept., 4.
Have DAT . . . Will Travel: To The Islands of Japan, Christopher Greenleaf, Sept., 26.
Have DAT . . . Will Travel: To the Galápagos Islands, John M. Woram, Sept., 27.
Noteworthy: Philips' Digital Compact Cassette and PASC Data Compression, David Ranada, Sept., 32.

Theater Sound

Angus, Robert, The Audio Interview: Kurt Masur, Dec., 44.
Berger, Ivan, DCC Currents ("Spectrum"), Jan., 26; Land of Thump and Glory ("Roadsigns"), Feb., 18; Competition Grows in Tents ("Roadsigns"), March, 31.
Elliott, Susan, Audio Magazine–Juilliard Scholarship Award, Jan., 118; The Audio Interview: Tom Frost, April, 42; Carnegie Hall Centennial, May, 16.
Geist, Kerry, Roy Delgado, and Jim Hunter, Tractrix Horns: Improved Imaging and Phasing, March, 36.
Greenleaf, Christopher, Have DAT . . . Will Travel: To the Islands of Japan, Sept., 26.
Hunter, Jim, Roy Delgado, and Kerry Geist, Tractrix Horns: Improved Imaging and Phasing, March, 36.
Kaufman, Richard J., Plain Wires/Fancy Reception, Jan., 46; Build a Simple Surround Decoder, June, 48.
Killian, Mead C., Forum: High Fidelity and Hearing Aids, Jan., 42.
Lane, Michael R., Sonic Restoration of Historical Recordings, Part 1, June, 34; Part 2, July, 26.
Long, Edward M., Headphones: As Close As You Can Get, April, 50.
McCue, Danny, The Audio Interview: Bill Levenson, Jan., 50.
Pierce, John Alvin, The Phonograph's Forgotten Heroes, March, 42.
Pitts, Eugene, A Levy Is a Toll Is a Tax ("Spectrum"), Sept., 4.
Ranada, David, Noteworthy: Philips' Digital Compact Cassette and PASC Data Compression, Sept., 32.
Shah, Prasanna, Music of the Bitstream, Jan., 56 (Addendum, July, 4).
Woram, John M., Have DAT . . . Will Travel: To the Galápagos Islands, Sept., 27.
The $199* TITAN. Music... for a Song!

You only get what you pay for. Right? Well, not always. Paradigm, the leader in speaker performance/value, has done the impossible - made a speaker system that is an absolute audiophile delight for an incredible $199/pair... the TITAN!

What does it take to build the finest speaker at this price? Quite simply, better design execution and better materials. So, rather than typical inferior cone-type tweeters, the TITAN uses a wide-dispersion dome tweeter complete with high-temperature voice-coil, aluminum former and ferrofluid damping and cooling. Instead of lesser paper-cone-type woofers, the TITAN woofer uses a polypropylene cone with a high compliance suspension, high-temperature voice-coil and kapton former.

Add to this a seamless dividing network and the results are outstanding! Musical, three-dimensional, the TITAN offers performance that belies its astonishing low price.

You won't find Paradigm speakers everywhere. Product this good requires the expertise of a qualified audio specialist. So, before you buy any inexpensive speaker, visit your Authorized Paradigm Dealer and listen to the amazing TITAN. What you will hear is music... for a song!

For more information call 1-800-553-4355 Ext. 41274 or write: AudioStream, P.O. Box 2410 Niagara Falls, NY 14302. In Canada: Paradigm, 569 Fenmar Drive, Weston, ON M9L 2R6.

For More Information

Call 1-800-451-2248

Enter No. 8 on Reader Service Card
Renaissance... because nothing is sacred but the music

Introducing the Infinity Renaissance Series™. The result of a comprehensive re-evaluation of all we have learned during a quarter-century of crafting highly musical loudspeakers.

Renaissance. As its name implies, it is nothing less than the complete rebirth of the art of the high-end speaker...a tour-de-force of broad technological advancements combined with a myriad of small, yet absolutely crucial details creating a synergy that can only be described as "magical."

Renaissance. Elegant in design. Inspired in performance. Painstakingly, classically, musically, an Infinity loudspeaker. (And available only at select Authorized Infinity Renaissance Dealers.)

Renaissance. The golden age of loudspeaker design is upon us once more.

©1991 Infinity Systems, Inc.

A Harman International Company