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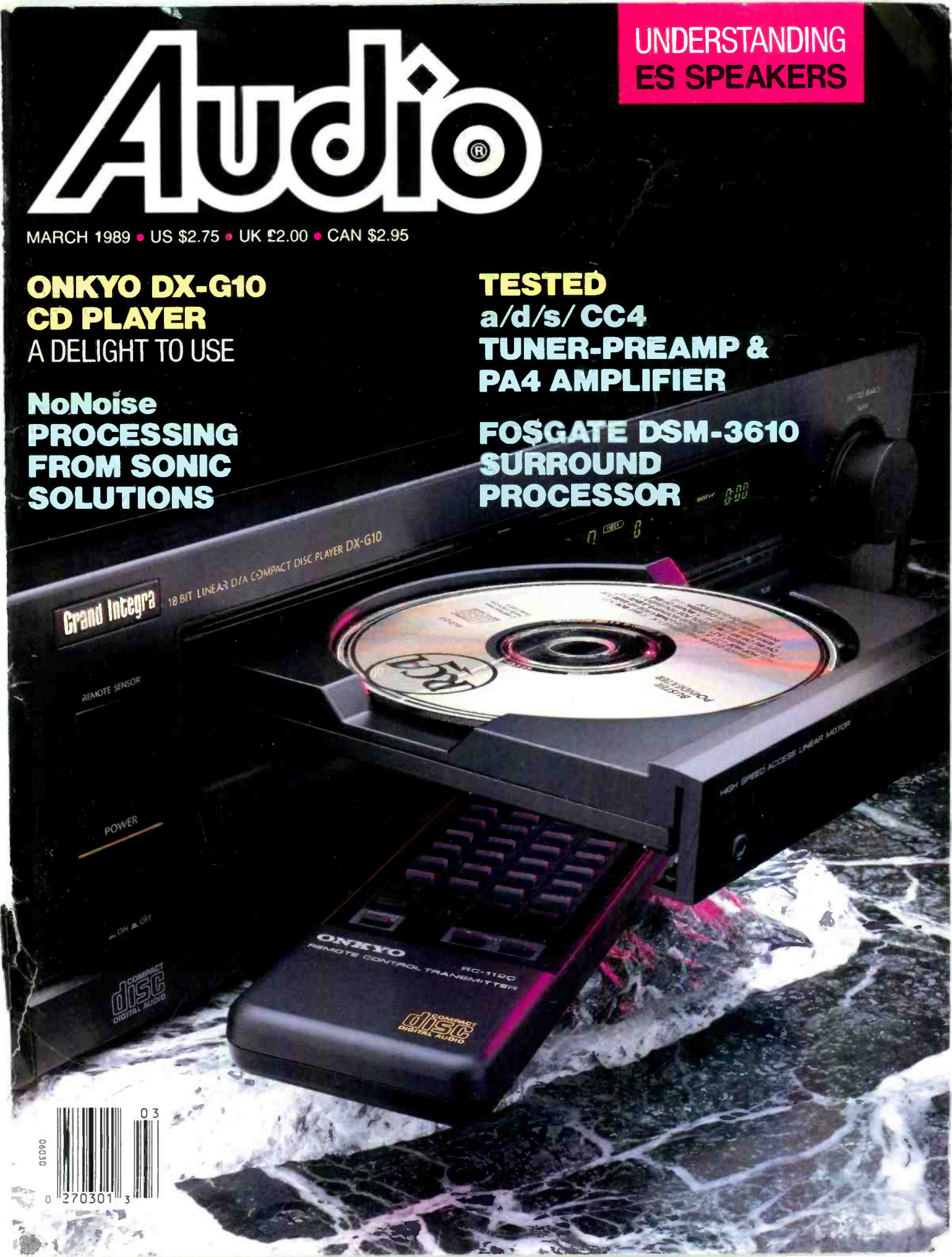

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The SDA SRS Series

"The sound is superbly balanced and totally effortless." Stereo Review Magazine

"Matthew Polk's SDA-SRS Speakers Bring You the Ultimate Listening Experience"

"Spectacular... it is quite an experience." **Stereo Review Magazine**

The Joy of Owning the Ultimate Dream Speakers

Music lovers who are privileged to own a pair of SRS's will share in Matthew Polk's dream every time they sit down and enjoy the spine-tingling excitement of listening to their favorite music. And demonstrating them to admiring friends ultimately increases their pride-of-ownership. "Awesome" is the word most often used to describe the sound of an SRS system. They are capable of playing at live concert levels for long periods of time, with a surprising lack of effort and without producing ear-fatigue.

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SDA SRS 1.2 — $1495 ea.

Two time Audio Video Grand Prix Winner

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SDA SRS 2.3 — $1099.95 ea.

Audio Video Grand Prix Winner

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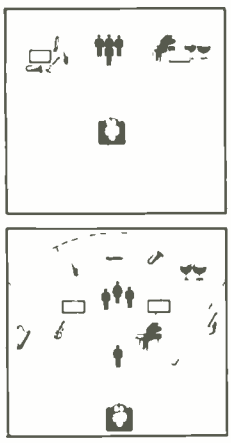

BENEFITS OF THE POLK SDA LOUDSPEAKERS

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Accurate Reproduction of the Full Sound Stage by the SDA Loudspeakers

Polk Audio's SDA SRS: The Quest for Perfection

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Matthew Polk with the ultimate expressions of loudspeaker technology: The SDA SRS 1.2 and SDA SRS 2.3.

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7. Hand-Crafted Limited Production — The one-at-a-time attention that goes into the production of every Polk SDA-SRS speaker system means that your pair will sound and look as good as Matthew Polk's own.

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Where to buy Polk Speakers? For your nearest dealer, see page 116.

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MUSIC REVIEWS

DEPARTMENTS

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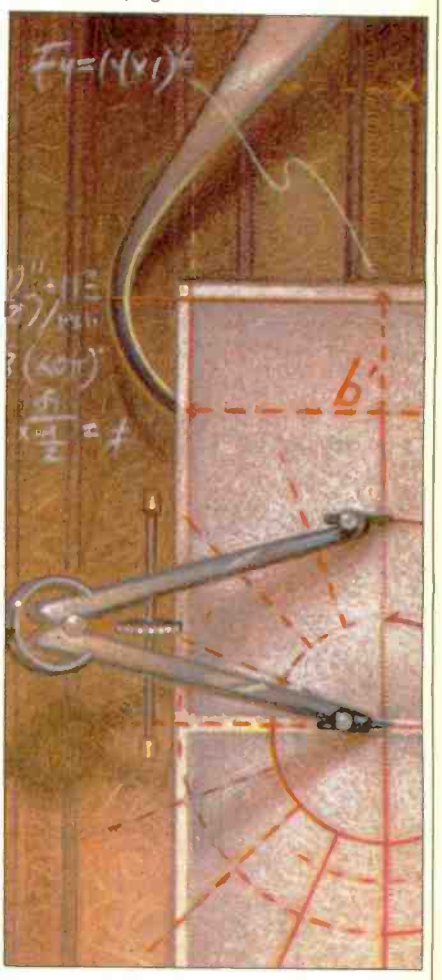

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SIGNALS & NOISE

AM Advice

Dear Editor:

In the August 1988 issue's "Audioclinic," Wayne Warren asked advice on buying an AM/FM tuner with a good AM section ("Long-Distance AM Reception"). He was advised to buy a separate shortwave receiver for AM and a separate AM/FM tuner for FM. Bad advice!

There is one manufacturer who makes wonderful AM/FM tuners and receivers which have superb AM sections, some with AM stereo: Carver.

With only a short wire antenna, my Carver unit outperforms all of my very expensive shortwave sets in sensitivity and audio quality on the AM broadcast band. It has a switchable wide/narrow bandwidth control. I receive distant AM stations from Louisville, Atlanta, Chicago, etc. in full stereo and with excellent fidelity, and this really enhances talk shows.

Let's encourage good American-owned companies, like Carver, who make high-quality, innovative audio products.

Bill Pope
Jackson, Miss.

Playing Favorites

Dear Editor:

I have been reading *Audio* for about a year and really enjoy your articles on stereo components. Nevertheless, I do have some complaints. I believe that you should publish more "Equipment Profiles," as I consider them to be the best part of your magazine. Also, in your equipment reviews—particularly those on speakers—I constantly read about classical music being played on the speakers under review. A lot of "Equipment Profiles" don't even mention how rock and pop music sound on the speakers. There *are* people out there who prefer rock 'n' roll and want it to be reproduced with audiophile quality. I know I do, and I'm sure I'm not alone.

Gordon Pyzik
Toldeo, Ohio

Charcoal Brickbats

Dear Editor:

Have you noticed that shopping for audio equipment is like shopping in a coal mine? Audio displays are unlit caves wherein one needs a flashlight to differentiate between types of components. It's all bituminous and all looks the same. When will digital audio move out of the Model-T phase? Are audio plants underground? Do the employees wear lighted helmets?

Somewhere along the way, the digital music guru decided against wood tones, bronze, and brushed aluminum. Even magazine ads look totally drab in their varying shades of gray. Try identifying the controls on the equipment in some of the photos. In one ad, even the beach and ocean are blackened in an effort to enhance the looks of the components.

Eureka! Some manufacturers are adding wood tones to their high-end lines! Maybe, as is usual with new ideas, the price of wood tones and other colors will come down with time. Come on, folks, do you really put that ugly stuff in *your* living room?

Phillip E. Ahrens
El Paso, Tex.

The Price Is Still Wrong

Dear Editor:

The November '88 letter, "The Price Isn't Right," is right on. Compact Discs cost too much. Recent television ads of youths triumphantly purchasing $15.98 CDs reveal the "buck is all" approach taken by the recording industry. Yet these same companies cry against the evils of home taping and DAT. I credit the Japanese for their attitude that a dollar in an American pocket is a potential dollar to be spent on Japanese products. On this side of the Pacific Ocean, music distributors tell most of us that we haven't enough money to buy music.

Richard Stevens
Phillipsburg, N.J.

A Gas of a System

Dear Editor:

I would like to thank you for the November 1988 Range Rover feature article, "4 × 4 By Two." Being an audio enthusiast—mobile audio, specifically—I am always happy to see mobile audio systems covered in your magazine. Even better than the story was my privilege in hearing that system.

I manage a service station in Lakeville, Connecticut and was lucky enough to have the very same Range Roger drive in before the article ap-

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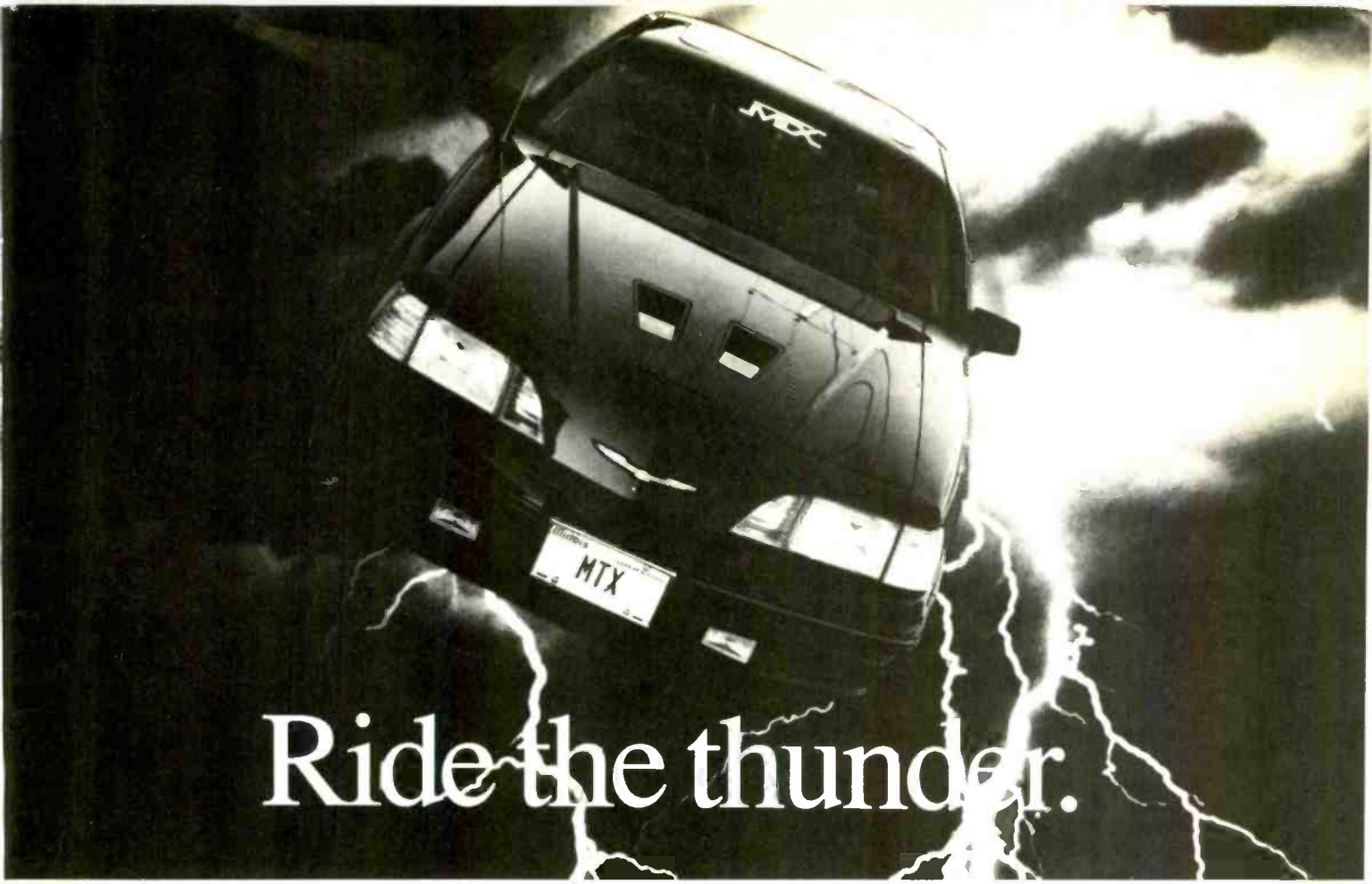

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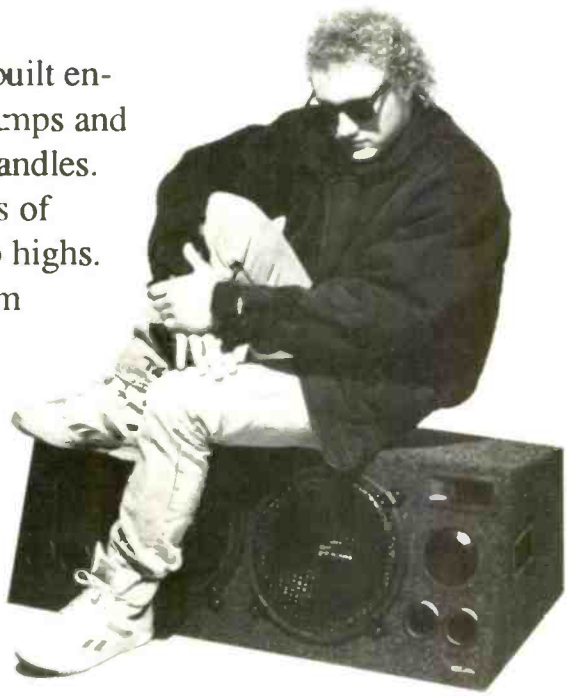

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The quest for ever greater technical achievement goes on, putting the hearing of generations of rock concert audiences at risk.

peared. I was inside the station doing inventory when I heard glorious jazz coming from outdoors. Going outside, I told the Range Rover's driver that his stereo was obviously not a stock unit. Just then, the passenger emerged from the vehicle saying, "This sounds pretty good for $16,000 worth of stereo equipment."

While still in awe, I received my November issue and was able to visualize the whole system while looking at the article layout. That system looked and sounded incredible. Needless to say, I will be keeping my issue for years to come.

William R. Thomas
Lakeville, Conn.

Do You Hear What I Hear?

Dear Editor:

I am pleased to see an article in *Audio* calling attention to the hearing-damage risk of modern rock concerts ("Earning a Deaf Ear," January 1989). Leigh Silverman's article is both scholarly and pertinent.

However, she seems conservative in her stated concert sound levels. Silverman says, "Rock concerts expose most audience members to about 105 dB. . . ." When I was researching a magazine article in the early '70s ("Live Rock: How It Is," *db* magazine, October '71), I measured such powerhouse groups as Iron Butterfly and Chicago, playing in a relatively small but live auditorium, at levels of 110 to 113 dB. These levels weren't just occasional peaks, but a steady, solid wall of sound, remarkably uniform throughout the listening area. Lacking ear protection at the time, I wore undriven headphones in an effort to reduce distortion generated within my ears and to protect my hearing from damage. And this was before the rock groups commissioned their own sound companies to provide audio systems approaching megawatts of output!

It's ironic that much of Silverman's article concerns various forms of ear protection for musicians. It's a bizarre comment on today's professional performance values when the ears of musicians and audiences need protection from sounds generated for the express purpose of being heard. Fifteen years ago, I entertained the hope that audio professionals would exercise responsibility, risking the rancor of rock performers and audiences by enforcing reasonable concert levels, if not for the sake of the audiences' ears, at least for their own. Instead, their quest for ever greater technical achievement continues unabated, putting the hearing of several generations of rock concert-goers at risk. Perhaps we should all invest in hearing-aid manufacturing firms, which promise to have a prosperous future.

R. H. Coddington
Richmond, Va.

Buying in the Boondocks

Dear Editor:

I'd like to comment on the relationship between audio equipment, manufacturers, and the consumer.

I live in a rural area that is about two hours from the nearest city of any consequence. If I want to expand my selection, the ante goes up to 3½ hours. Because of this, I have done a lot of my shopping by mail. Things such as functions I want the unit to perform, specifications (within reason!), appearance, and user-friendly ergonomics can often be evaluated with the aid of a brochure that's well thought out. But one of the most important things I look for among the glossy photographs is a listing of dealers. Without knowing where I can see the equipment, all the brochures in the world do nothing but make a nice fire. I am amazed at the number of manufacturers that fail to include this—even though I always request it. I've been surprised by the number of well-known audio companies that do not even respond, despite four or five requests.

I've almost reached my goal of saving $7,500 to buy my new system. The manufacturers I'm considering are not just of good reputation but have demonstrated the desire to meet the needs of the individual consumer—out in the boonies though he may be.

Ken Olson
Kelseyville, Cal.

Old Business, New Business

Dear Editor:

Some of your readers may be confused about my relationship with New York Audio Labs and the audio industry, so I am writing this letter to clear up any misunderstandings.

I was chief engineer and the designer of the Moscode line of audio products for New York Audio Labs from 1983 through October 1986. In October 1986, I left New York Audio Labs to go out on my own and have now founded Classic Audio, Ltd.

We recently introduced the Classic Audio Model CA 260 dual mono amplifier. This is a 50-watt/channel unit that uses actual McIntosh output and power transformers from the 1960s that were obtained, brand new, through a special surplus purchase. These units are available factory direct and are in stock at this time.

Now that New York Audio has been declared out of business, many customers want to know where to get support and service. Through Sound Services, our service division, we can fix and/or modify any Moscode, Futterman (Julius or NYAL version), and NYAL products. We are happy to help out anyone in need.

I have developed modifications for the Moscode 300 and 600 that I consider to be major improvements. These are not capacitor/jack/wiring upgrades but a total reworking of the main circuit, complete with Gold Aero tubes. We can also modify any NYAL product and make it sound better.

Both Classic Audio, Ltd. and Sound Services are located at 238 Liberty Ave., New Rochelle, N.Y. 10805; (914) 633-3039.

George Kaye
Classic Audio, Ltd./Sound Services
New Rochelle, N.Y.

The Sporting Audiophile

Dear Editor:

I would like to take this opportunity to thank Anthony H. Cordesman for his informative and well-written review of the Audio Research M-300 amp ("Auricle," November 1988). One of the strongest points of the review was the conclusion. The "sport of high end" is an enjoyable one, given participants do not lose sight of what it is all about. I would like to end my letter similarly to the way Cordesman ended his review: "For a precious few, however, [the sport of high end] will be their introduction to a game that can be almost as enjoyable as listening to music."

Steven O'Neal
St. Louis, Mo.

WE'RE NOT RESTING ON OUR REELS.

We've built such a reputation for making precision open reel tape recorders, some people think that's all we do. The fact is, we make a full line of audio components. From compact disc players to speakers, receivers to video cassette recorders, equalizers, and audio/video controllers. And of course, a full line of cassette decks and open reel recorders.

One thing, however, will never change. Our uncompromising commitment to building components that last. Every aspect of design, engineering, and manufacturing is driven by this singular goal. To assure every Teac we make is built to provide years of flawless performance.

Performance after performance.

TEAC

The First Thing We Do Is Build Them To Last.

ARIA. SUMO proudly introduces a revolutionary new planar loudspeaker, Aria, which after years of development promises to change our conception of reproduced music.

Aria provides a remarkably coherent, almost tactile, soundstage. A presentation so natural, so believable that we are left without adjectives – or words. Only the experience of having heard what is truly one of the most important loudspeakers to be offered in decades.

Like ripples spreading in a pond, sound emerges in nature to reach our ears with an integrity that is clearly different from reproduced sound. This is particularly true of musical instruments; whether plucked, struck, or blown.

Aria recreates sound in much the manner it occurs naturally. Like many other planar loudspeakers, Aria's radiating surface is a thin polyester membrane. There are no cone drivers. However, unlike other designs – whether conventional or planar – Aria does not attempt to move air as a piston. Instead, drive is precisely applied to a small area at the center of the diaphragm, elegantly approximating a point source. A series of controlled traveling waves then spread passively from the middle of the diaphragm, producing a spherical waveform – the virtual ideal. Energy is distributed with remarkable uniformity across the audible band. Treble dispersion is excellent. And with a single element generating sound, there is an incredibly coherent sonic picture.

Aria reproduces sound the way it occurs in nature. Much the same way that a pebble thrown into a still pond spreads waves across the water's surface. As a single element full range loudspeaker, its design is also a clear departure from approaches that have gone before. There are no crossovers. There are no delay lines. There is no response shading; nor are there associated electronics, either active or passive. Aria breaks new ground to such an extent that patents have been applied for and are pending worldwide.

Designed and manufactured exclusively for SUMO by Highwood Audio in Canada, Aria will be available at only a few very select dealer locations. Among those dealers displaying Aria are:

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AUDIOCLINIC

JOSEPH GIOVANELLI

Copying 78-rpm Discs

Q. For more than 50 years I have collected and preserved 78-rpm albums in the hope that one day a device would come along that would enhance, to a degree, these wonderful recordings and permit me to tape and share them with others. Do you know of anything of this kind? I have tried using various settings on my equalizer without much success.—Marshal C. Ramsey, Columbia, S.C.

A. I was faced with the same recording problem, and I made my tapes monophonically. Thus, the procedures I will explain here involve using two channels of a single graphic equalizer; if you plan to make your recordings stereophonically, you would use two separate equalizers.

Connect a monophonic output from your preamplifier to your equalizer's left-channel input. Then, to double the equalizer's potential effect, feed its left output back to its right-channel input. The right-channel output is then fed, via a Y connector, to the recorder's two stereo inputs.

With all of this in place, you are ready to start work. First, make sure your cartridge's stylus is the right type for the 78's wider groove and that your arm's tracking force is set high enough to avoid distortion. Next, set all equalizer controls to their flat positions. Play one of your discs. If the equalizer has volume controls, set them so that volume remains the same, whether or not the equalizer is switched in. Having all equalizer controls set at flat will help you adjust the equalizer properly.

Listen to the disc critically. Is there enough bass? If not, experiment with various low-frequency controls of one channel until you find one or two which, when readjusted, produce music which sounds good to you. To avoid rumble, I believe that you will wind up setting the lowest octave of both equalizer channels to their maximum cut positions. In most cases, this won't affect the amount of bass heard. Of course, if you happen to have a well-recorded organ disc, you may have to back off a bit on these controls.

Chances are that no high frequencies will be lost by turning the highest frequency bands of both equalizer channels down to their maximum cut positions. This will remove high-frequency scratch and hiss without removing highs from the music.

Continue listening critically, this time to the higher frequencies and harmonics. If you hear a hint of highs, you may want to boost the controls associated with that frequency range. It is likely that you will want to boost just one channel, and perhaps only slightly. Naturally, noise will also increase along with the desired highs. I would rather put up with this background noise than have the highs rolled off for the sake of a quieter background.

You may discover that some frequencies sound too prominent. Locate the controls which affect these frequencies and adjust one channel. Often, this predominant frequency range will lie between 2 and 3 kHz.

From time to time, switch the equalizer in and out of the circuit in order to compare your equalized signal to that of the untouched audio.

Many people will suggest that you set your equipment to compensate for the recording curves used when making the original discs. Even when these curves are published, deviations are so great that I believe using your own ears will allow you to make better adjustments. If you do attempt to match the original playback curves, you will have to figure out the difference, in each frequency band, between the original curve and the RIAA playback curve in your preamplifier. Then set your equalizer to compensate for these differences.

(*Editor's Note*: The Esoteric Sound Re-Equalizer, reviewed in our November 1985 issue, does precisely such equalization corrections. To make 78s sound quieter, the Packburn 323 A dynamic transient-noise suppressor has an excellent reputation among 78-rpm collectors. I've had good results with an old Burwen dynamic noise-reduction system, which has a setting especially for 78-rpm records; it's long discontinued, but you might be able to find a used one. —*I.B.*)

Overdoing Subsonic Filters

Q. I always leave the subsonic filters on my amplifier and outboard noise-reduction unit switched in. Further, I use my equalizer's 16-Hz band as a subsonic control. Does all this subsonic filtering degrade my system's bass response? I know that such filters are helpful, but how much is enough?—Name withheld

A. Chances are that all this subsonic filtering is more than is necessary. It is certainly possible that some deep bass (30 Hz and below) is rolled off as a result, especially as the effects of the equalizer's 16-Hz band probably extend to 32 Hz or higher.

Many factors affect the need for rumble filtering. These include the combined resonance of your arm and cartridge, the amount of rumble in your turntable, the amount of warp in your records, the internal circuitry of your amp, and the design of your loudspeakers. Depending on how favorable or unfavorable those factors are, one subsonic filter should suffice, and you may not need any such filters.

One way to check is to remove your speakers' grilles and watch your woofers when you play a record; if the woofers move slowly in and out, you have subsonic problems which require filtering. As to the question of bass response, try playing a recording with good bass and then switch the filters in and out independently, to see what effect each has.

Old Is Better?

Q. Why is it that I have been searching for the last 25 years for the great sound that I had from 1960 to '65, and I just can't find it? You see, in 1960 I purchased—of all things—a Motorola console mono hi-fi set! Its sound was even superior to live music! It had everything: Clarity, stunning impact, and power. It was also distortionless, with terrific dynamic range and depth, and favored no type of music over another. This old set in an open-back cabinet, using paper cones for all speakers and a 15-inch woofer, would put today's $20,000 stereo outfits to shame. What goes on here?—Gerald H. Miller, Rochester, Minn.

A. Your console was produced at a time when the standard for consumer audio gear was 5% THD. Yes, that amount of distortion was acceptable.

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.


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Before you buy a CD changer, there are two things you should consider. Your home. And your car.

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The key to home and car compatibility

is Pioneer's ingenious 6-disc magazine, which works in all Pioneer home and car CD changers. It's the most convenient way to load, store and catalog your CDs.

All of Pioneer's home CD changers feature the latest innovations in digital

technology, as well as multiple programming capability and random play.

As for versatility, you simply won't find a better car CD changer system. A Pioneer car CD changer can either replace or be added on to your current car stereo, using one of four advanced CD controller units.

Of course, there are still some places where you won't be able to enjoy Pioneer's 6-disc CD Changer system. But we're working on it.

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When a listener complains about his system's sound, the problem often is that he just doesn't like the sound of his speakers.

Of course, even then, equipment could be made to have much less distortion than 5%, but mass-market equipment often did measure out to that amount of degradation. So why did your old gear sound so good?

Maybe it had to do with some of the recordings you played. In an effort to make poor equipment sound good, many recordings are made with a "presence" peak. This is a response peak in the range of 2 to 3 kHz. Such a peak sounds harsh through equipment which already has good presence. If some of your recordings have this peak, they won't sound right on a good system—especially once you have gotten used to smoother sound. I suppose, too, that the converse might be true, that your ears were trained to hear and enjoy a presence peak that either was created by some recordings or by peaks in the tweeters. Obviously, I can't know how you perceive sound.

It is difficult to find really bad equipment. When a person complains that he does not like the sound of his system, most of the time the problem is with the loudspeakers. Not that the speakers are bad, but that the particular listener just does not like them. So listen to other loudspeakers, using recordings with which you are very familiar. You should find at least one make and model speaker system which sounds good to you.

An interesting, but perhaps impossible, experiment would be for you to listen to that console again. It just could be that your perception of sound has become more acute and that you would no longer be satisfied with the old system's performance.

If, by chance, you still have any of the recordings you played on that console, listen to them again on your newer system. These recordings might even take on a character and definition you never heard before.

As for the fact that old consoles did not produce high electrical power output, well, it was a very expensive matter to produce amplifiers capable of high output power. Fortunately, when we only needed one speaker system, it could be a large one. These speakers could produce good low-frequency response and be efficient in terms of converting electrical power to acoustical power. Stereo brought a need for at least two loudspeaker systems, and space limitations meant that smaller systems had to be developed. If they were to produce solid bass, they needed lots of power. Solid-state electronics made high power a much less expensive proposition than it had been with tube gear.

Sadly, it is also possible that age has taken its toll on your hearing, which is not uncommon. If you had combat experience, the high noise level of artillery could have caused some damage. Working in machine shops can also cause gradual destruction of the nerve in the inner ear.

Azimuth Problems

Q. No two tape decks in the universe match exactly in terms of azimuth alignment; even my two Nakamichi decks do not produce a tape that sounds the same when recorded on one deck and played on the other. What is the use of paying high prices for good equipment if the only tapes one can play satisfactorily are those recorded on the same deck? With high-quality components and speakers, I always hear a difference when a tape recorded on one deck is played on another, no matter what brand the decks are. Tape deck manufacturers devote their efforts to gimmicks such as auto-reverse, tape timers, music search, logic controls, double wells, etc., but they don't solve the fundamental problem of correct azimuth alignment. Other than confining the choice of cassette decks to the $2,200 Nakamichi Dragon, which provides automatic azimuth alignment in playback, what is the answer?—Anthony Hudaverdi, Santa Monica, Cal.

A. There are several possible answers to the problem, in addition to purchasing the Dragon deck.

Use the treble or equalizer controls of your audio system to spruce up the high end, where azimuth misalignment takes its toll.

Put pressure on manufacturers, through the audio press and by letter-writing campaigns, to equip their units with an easy-to-use azimuth control for the playback head or the record-playback head. This control should be accompanied by a fine scale and a detent that enables the user to return to any setting which he has found optimal, or to the factory setting. Thus, for each cassette, one could find the best azimuth setting and note it on the tape.

Purchase one of the few decks on the market with a PlayTrim control. This supplies treble boost only at the very high end, to compensate for treble loss due to azimuth misalignment.

Learn to live with the situation. Treble response is not the same in all concert halls or in all seats in a given hall, and audio engineers at a recording session do not ignore their sophisticated equalizers and leave the controls at a flat setting at all times. The azimuth problem is just one more in a whole group of deviations from that chimerical notion of perfect frequency response. Try to listen more to the music and less to the sound.

Speed Mismatch

Q. I recently purchased an Onkyo cassette deck and found that tapes I record on the Onkyo and play back on my Akai deck sound speeded up. Conversely, tapes recorded on the Akai and played back on the Onkyo sound slow. Tapes recorded and played on the same deck sound fine when compared to the source. Why do tapes exchanged between decks sound fast or slow? Could adjustments be made to correct this?—Jesse R. Bishop, Dundee, N.Y.

A. Cassette decks frequently vary from exact speed by 0.5% to 1%, and sometimes by as much as 2%. If one deck is running fast while a second is running slow, a tape made on one and played on the other will sound a bit high- or low-pitched to a keen ear. Either your Onkyo, your Akai, or both are off-speed. (The Onkyo would appear to be slow and/or the Akai fast.) Some cassette decks have internal adustments to fine-tune speed, and the procedure is usually simple. Check with the manufacturer or an authorized service shop. Further, your new deck should still be under warranty, so there should be no charge.

When using the same deck for record and playback, even if speed is incorrect, the same error occurs in both record and playback, thereby cancelling itself out. For example, if the recording is 1% slow and playback is also 1% slow, pitch will remain correct.

Dubbing and NR Systems

Q. I use two decks to make copies with Dolby B noise reduction of cassette master tapes encoded with dbx NR. I play the master on a Proton 740 and make the dubs on a Realistic SCT-28. The signal from the Proton is fed through an equalizer to improve sound quality. The problem I have is overprocessing: How can I possibly avoid this? I have tried recording without Dolby NR but still have experienced great treble loss.—Ryan Tamares, San Bernardino, Cal.

A. For best results, your dubbing and equalizing procedure should be as follows: Play the dbx-encoded tape with the dbx decoding of your Proton on. This will produce a nominally flat output signal from the Proton. Feed this signal to the equalizer but try to avoid more than a modest amount of bass and/or treble boost, in order to prevent overloading the Realistic deck. The signal from the equalizer then goes to the Realistic for recording, with Dolby encoding applied if desired.

It might be best if you avoided the equalizer during recording, using it only in playback. A general rule is that an equalizer should be used in recording only to correct gross defects of the source tape.

How High the Treble?

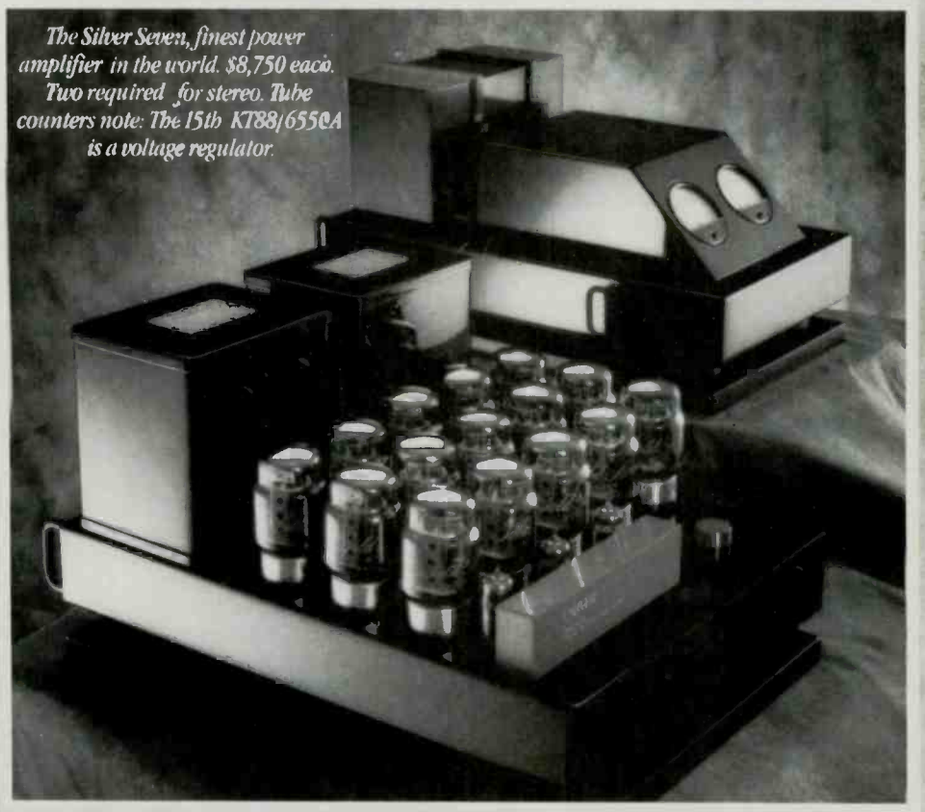
Q. I am wondering why my car stereo, which is rated 30 Hz to 12 kHz, plays my homemade tapes with crystal-clear highs, despite its narrow frequency response. When I play a friend's homemade tapes, recorded on a unit with frequency response of 30 Hz to 15 kHz, they sound worse than my tapes. Shouldn't they all sound the same?—Name withheld

A. I do not know your age, which tends to have an inverse relationship to high-frequency perception. Also, hearing can be damaged by excessive exposure to high-amplitude sounds: Many under the age of 30 have suffered permanent, partial hearing loss due to everything from rock music concerts to jackhammers. Thus, for many audiophiles, young and old, the hearing limit is well under 20 kHz, and often under 12 kHz. Therefore, an audio system which plays substantially flat to 12 kHz will sound good to most persons. Another factor to be taken into consideration is that in many music sources, there isn't all that much content above this frequency.

It appears that the playback azimuth alignment of your car's deck is in close agreement with that of the home deck you used to record your tapes, but your friend's tapes were made on a deck with somewhat different azimuth alignment. Thus, the treble response of your tapes is better preserved.

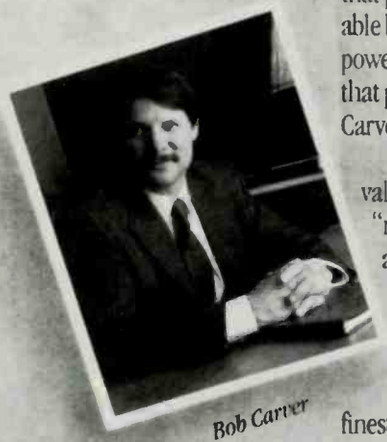
If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

"Because I wanted to have the world's finest amplifier and the world's greatest transfer function, I built the astonishing Silver Seven."



The Silver Seven, finest power amplifier in the world. $8,750 each. Two required for stereo. Tube counters note: The 15th KT88/6550A is a voltage regulator.

Before you meet the new M-4.0t, Bob Carver wants you to meet its inspiration, the money-is-no-object Silver Seven.



Bob Carver

"One of my important design precepts is that power amplifiers should be easily affordable but last year, when I began designing a powerful new amplifier, I temporarily set aside that precept of affordability. The result is the Carver Silver Seven Mono Power Amplifier."

Destined to redefine ultra-high-end values forever, the Silver Seven is truly a "money-is-no-object" design. In fact, just a single pair of its fourteen KT88/6550A Beam Power output tubes cost more than some budget amplifiers.

The Silver Seven employs classic, fully balanced circuit topology and the finest components in existence.

A-450 Ultra Linear output transformers with oxygen-free primary leads and pure silver secondaries.

- *Wonder Cap capacitors throughout.*
- *Interconnects are Van den Hul Silver.*
- *Internal wiring is pure silver.*
- *Wonder Solder throughout.*
- *Gold input connectors and high current gold output connectors.*

The Silver Seven's polished granite anti-vibration base floats on four Simm's vibration dampers. The separate power supply's power transformer end-bells are machined from a solid block of high-density aluminum.

Capable of an astonishing 390 joules energy storage, the Silver Seven delivers ***a conservatively rated 375 watts into 8 ohms from 20Hz to 20kHz with no more than 0.5% distortion.*** On the 1-ohm tap, peak current is in excess of 35 amps!

Sonically, a pair (for stereo) of the flawless Silver Sevens almost defies description.

Powerful

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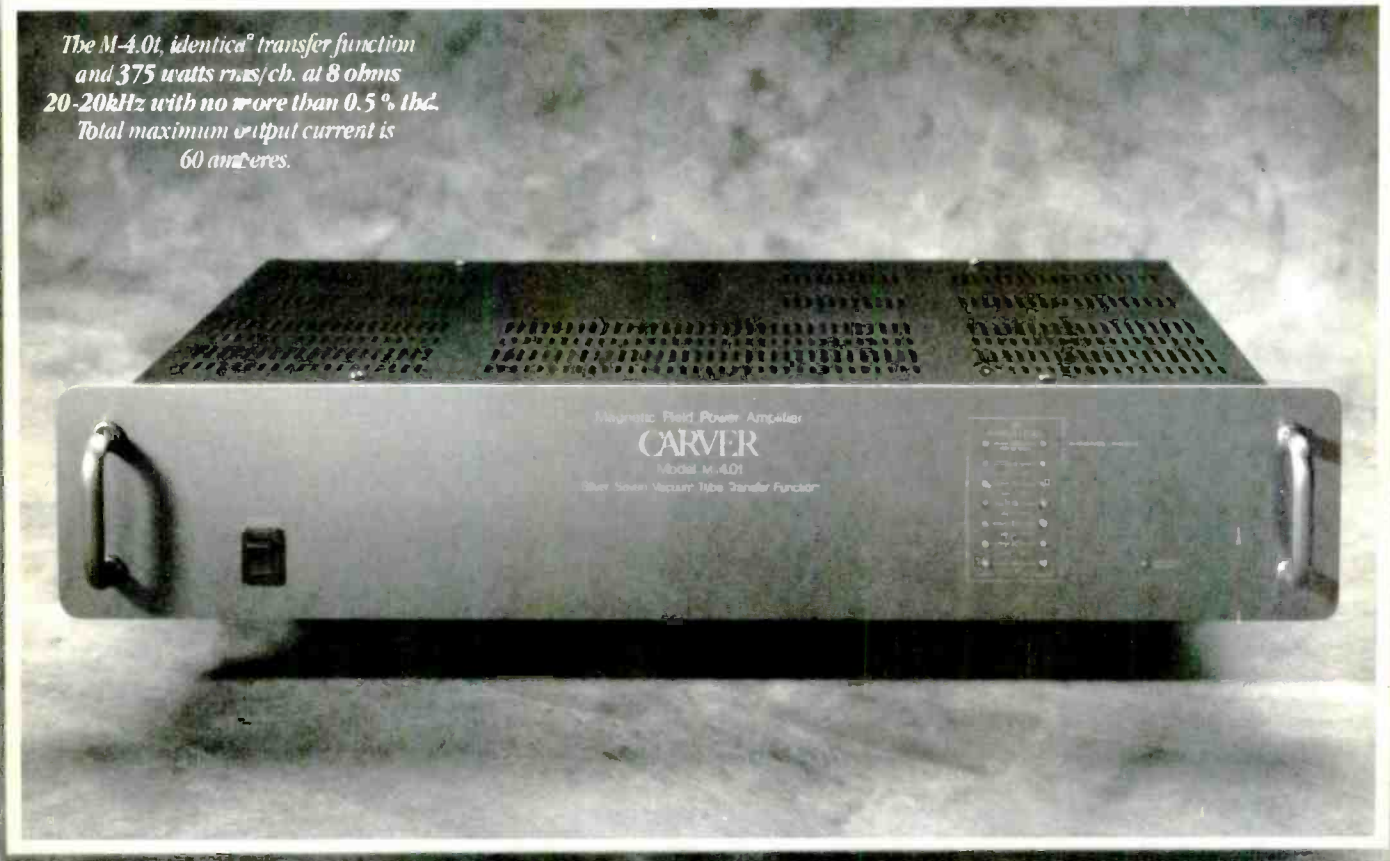
"Because I wanted to share its magnificent sound with you we built the new Carver M-4.0t."



Superlatives are insufficient.

What does this have to do with the new M-4.0t?

Everything. Because the M-4.0t precisely duplicates the transfer function of the Silver Seven.

Ever wondered why two amplifiers of identical wattage can sound different? Or why two designs with different output ratings can sound much the same? In many cases, it's because each power amplifier exhibits a unique relationship between its input and output signals. Like human fingerprints, this *transfer function* is subtly distinct, defining much of the sonic character of the design. Bob has not only perfected the art of measuring an amplifier's transfer function, but is able to duplicate it in a completely dissimilar amplifier design! That's how he invested his solid state M-1.0t with the transfer function of a set of $5000 esoteric tube amps several years ago.

This time he's gone one better. Or two.

He's used this powerful scientific method to duplicate the transfer function of the Silver Seven in the new M-4.0t (now you know what the "t" signifies). Mind you, we are not saying the M-4.0t is *identical* to a pair of Silver Sevens. An M-4.0t weighs 23 pounds versus the Silver Seven at 300 pounds a pair. The Silver Seven stores 390 joules of energy while the M-4.0t stores none. As a Magnetic Field Power Amplifier the M-4.0t instantly draws the power it needs directly from the AC line.

Though in choosing the M-4.0t you may miss the warm glow of the Silver Seven's silver tipped vacuum tubes reflecting in polished black lacquer, be assured both amplifiers are the most musical, effortless, and open sounding you have ever heard. Bass is full and tight, midrange is detailed, treble is pure and transparent.

Each can float a full symphony orchestra across the hemisphere of your living room with striking realism.

Bob Carver developed this incredible design for one reason: to bring you the best the world has to offer and the best amplifier value ever, and he has succeeded handsomely.

Listen to the new, incredibly affordable M-4.0t at your nearest Carver dealer. Or write us for more information. We'll even send you data on the Silver Seven. After all, if you ever want to move up from the M-4.0t, there's only one possible alternative.

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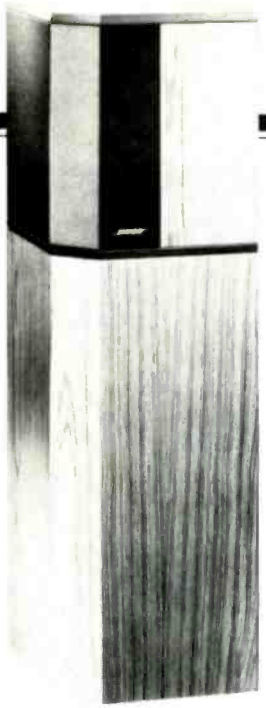
WHAT'S NEW



Bose Loudspeaker

The 10.2 Series II Stereo Everywhere loudspeaker angles its 8-inch midrange and two 2-inch tweeters to keep sound intensities relatively constant across the room—rather than having the speaker that is nearer to the listener sound louder. Its 8-inch woofer has a bandpass enclosure that keeps its harmonics from being heard and reduces distortion when playing bass tones. The floor-standing unit measures 40 inches high, and it occupies only 1 square foot of floor space. Nominal impedance is 8 ohms. Price: $1,299 per pair.

For literature, circle No. 100

Audiovox Truck Stereos

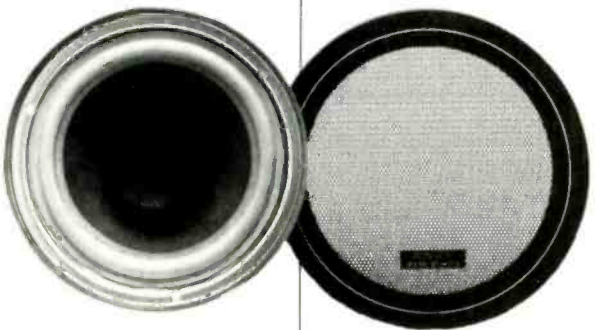
The GMT-ETX electronic-tuning AM/FM radio and GMT-DCK cassette deck fit General Motors pickup trucks, which have separate radio and cassette slots. The radio, which can be used alone, has sliding controls, seek and scan controls, six-button/12-station preset tuning, and switchable loudness contour. The cassette deck features auto-reverse and a slot to hold extra cassettes. Prices: GMT-ETX, $300; GMT-DCK, $199.

For literature, circle No. 102

Optonica Surround Amplifier

Featuring a 16-bit, two-channel digital delay, the Optonica SM-A75 contains an amplifier section that delivers 25 watts per channel in four-channel mode or 35 watts per channel in stereo mode. Surround choices include Dolby Surround plus 13 other acoustic effects, three of which can be programmed by the user. The unit has video inputs on both front and rear, tape-dubbing facilities, and separate front- and rear-channel headphone outputs. A remote control is supplied. Price: $599.95.

For literature, circle No. 103



Jensen Car Speaker

The JFX 165 is a 6½-inch dual-cone speaker with rated power of 30 watts continuous and 75 watts peak. Mounting depth is only $2^{3}/_{16}$ inches. The unit has a high-temperature Noryl plastic frame and comes with a metal grille. Price: $59.95 per pair.

For literature, circle No. 101

Carver Amplifier

Belying its maker's reputation for light, compact, transistor stereo amplifiers, the Silver Seven weighs 150 pounds, occupies the two large chassis shown, uses vacuum tubes, and is monophonic. Output is 375 watts into 8 or 4 ohms, with less than 0.5% THD, from 20 Hz to 20 kHz. Output taps are also provided for 1-ohm loads. The amplifier's power supply has 390 joules of energy storage, and the output transformers have oxygen-free copper primary and pure-silver secondary windings. The amplifier is finished with five coats of hand-rubbed black lacquer and sits on a polished marble base supported by Sims vibration dampers. Price: $17,500 per pair.

For literature, circle No. 104

ORA Plugs and Cables

Twist-locking gold phono plugs make it simple to configure ORA GCX cables to any desired length. The cables come in lengths of 10 and 25 feet and can be custom-ordered on 500-foot rolls; plugs are sold separately. The connectors have heavy outer shells and spring strain reliefs. Prices: 10-foot, $7.99; 25-foot, $17.99; two plugs, $6.99; four plugs, $12.99.

For literature, circle No. 105

Orban Parametric Equalizer/Notch Filter

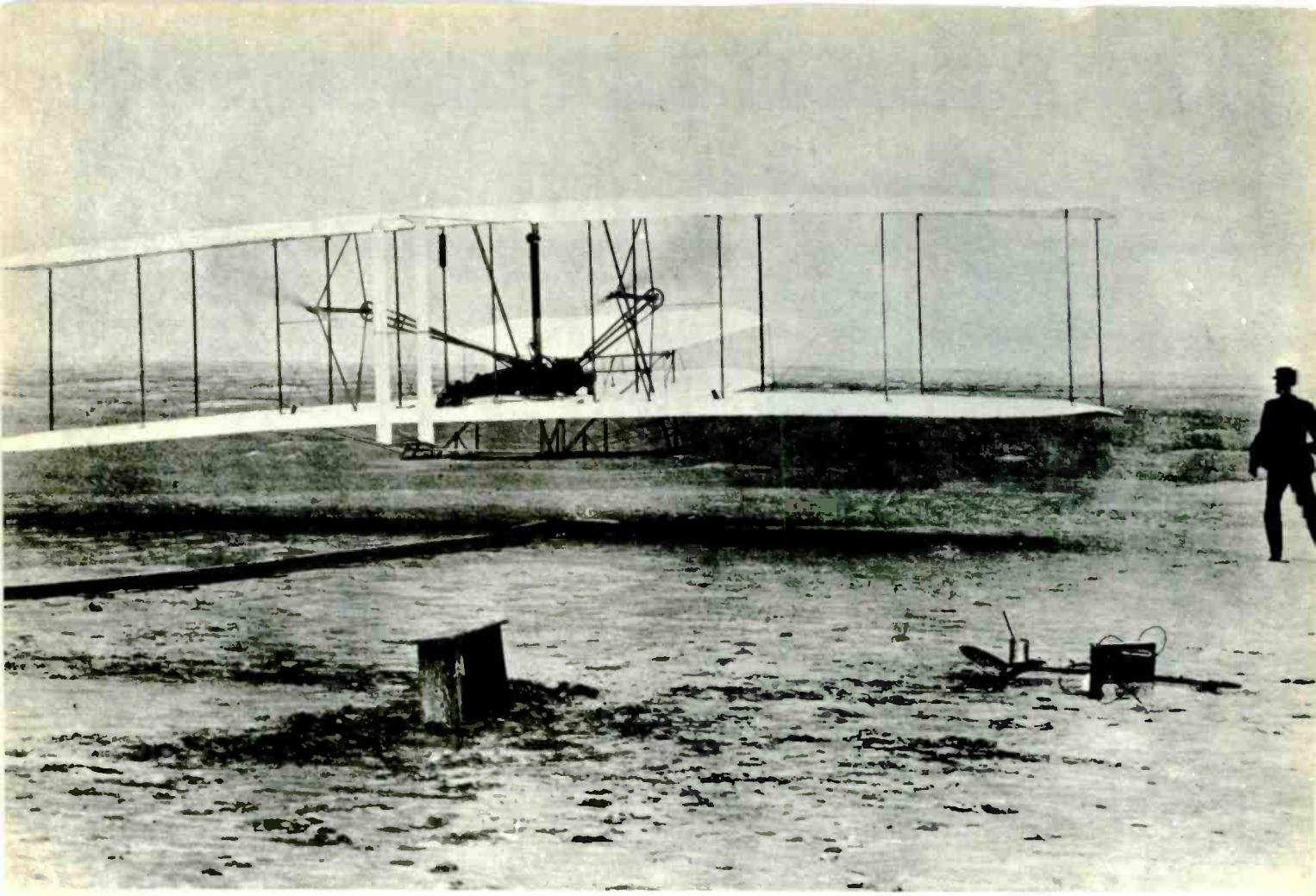
Orban's 642B features dual 4-band or mono 8-band configurations, with each band tunable over a 20:1 frequency range. The filter design provides 16-dB boost and 45-dB cut in each band, resulting in full notch capability. Frequency controls for each band consist of a dual-ring knob with vernier increments on the outer ring and a fine-tuning inner ring. The 642B includes a continuously tunable 18 dB/octave high-pass filter and a 12 dB/octave low-pass filter for flexibility in limiting bandwidth. Absolute noise level is better than −90 dBm. The equalizer is also available with modifications for specialized needs such as in-room and system tuning or duplication of bands in lower frequency ranges. Price: $995.

For literature, circle No. 106

Pioneer Car Amplifier

No, that's not a speaker grille on the side of the GM-4000 stereo power amp; it's a ventilation grille for the unit's built-in cooling fan. Output is 100 watts per channel into 4 ohms, from 20 Hz to 20 kHz, with 0.008% THD. The unit can also be bridged to provide 200 watts into a single channel, and a switch allows for driving 2-ohm loads. The amp features MOS-FET power transistors, input gain controls, and a built-in low-pass filter and low-boost switch (+12 dB at 100 Hz). Price: $550.

For literature, circle No. 107



Lofty ideas can open new frontiers.

Coming up with a good idea and making it work are two different things. Without technical expertise, even good ideas fail to go anywhere.

So when we set out to elevate the art of sound reproduction, some people thought we were just dreamers. But by using vacuum tube technology, applying new ideas, then engineering, designing and refining each step, we raised the quality of sonic realism to new heights.

A perfect example is the SA-9/11 Isolinear Preamplification System. Our uncompromising approach means maximum clarity and dynamic response. The completely dual-mono design in every single stage creates a perfect stereo image. Add to that an infrared remote control and you'll enjoy convenience as well as ultimate sound.

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GOLDEN-EAR RING

Illustration: Michael A. Donato

So you did it—went out and bought that little cardboard box full of Richard Wagner double-length CDs, some 14+ hours of high-class audio, as discussed here last month? Well, maybe. It was indeed a giant package in terms of sheer elapsed time—four enormous operas, the entire "Ring" cycle, with more actual unbroken continuity (fewer breaks) than in the original live performances at the Bayreuth Festival in 1953. Astonishing! But if this was too much for you, there will be plenty more of the same, less flamboyantly. Another little box, an inch or so deep, contains *all nine* Beethoven symphonies, for example. Is this the start of a new audio listening age? You bet it is.

To remind you, that Wagner box contains seven rather special CDs to encompass the four operas of the "Ring," better known by their first names: *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*. The recording was made in mono on state-of-the-art tape equipment of that day and represents the sophisticated high point of mono technology, before stereo and dozens of other ancillary improvements—Dolby NR was a decade in the future. The clever idea behind this new album was to spread the mono sound on one CD track at a time, so that each CD is played twice through—first track A, then track B, each fed into both of your stereo speakers. Most equipment does this simple switching with no problems, and surely we will have more of the same, at the lower cost. Another later recording of the same four operas in full stereo needs 15 CDs, with many more breaks, to cover the music that these seven mono discs encompass. Continuity is the very soul of Wagner.

I noted last month that the sound of the 1953 recording was "terrific." Some of our younger readers may find that a startling thought: Real audio out of those quaint, nostalgic times? But I do not intend to back down on the superlative. Definitely, there *was* high-quality audio then, as we are increasingly discovering in our quest for new CD reissue material.

The reasoning behind the present spate of audio oldies-but-goodies is simple enough. The stuff was there, on master tapes—but for all this time, the general public and even many technicians have had no *direct* means of access to these sounds from the audio summit. Now, and really for the first time, thanks to digital, we can all hear them virtually in the original, as CD copies with the added useful subtleties of digital processing.

Two interesting further circumstances affect that superlative, "terrific," as applied to the 1953 Wagner audio.

First, though magnetic tape was still quite new to us here in 1953, it was old stuff to the Germans, who had been using it—all unbeknownst to us—since the mid-'30s. (How Sir Thomas Beecham managed to record his symphonic music on tape around 1936—was it?—without our knowing it, is a mystery to me! Old Tommy was not the modest type.) Thus, there is no reason why a 1953 *master tape* (as opposed to any sort of derived analog copy) shouldn't now rate as "terrific" in the audio essentials, even from 35 years ago, and as transferred to digital.

Reminds me of the big flap among the record companies over DAT. It's the same: A master tape (DAT) made out of a master (CD) and brought straight to the public. Piracy in every living room? It's possible technically, but not really very likely.

The second interesting factor in 1953 sound quality is a matter of ear training. During these many years of continued audio progress, there has been the inevitable diminishing return. The closer we get to the perfect, the more micro are the improvements. Not that they aren't worthwhile. As the changes become more subtle, our ears grow more discriminating. It's fun, it's useful—perceptive and practical, too. Good audio sells. It takes good ears to hear good things.

But the ever-smaller increments have one disadvantage. We find it more and more difficult to adjust backwards, so to speak, to reset our ears for an appreciation of past audio accomplishments as they were understood in former times. Our hepped-up sensibilities exaggerate. I have run into this phenomenon numerous times among those who disagree with me as to the sound quality of this or that earlier recording. We are judging from different bases, mine being generally on a longer time scale.

The Wagner in 1953 is surely an example. That monumental job must have rated as remarkable and state of the art for recording in Germany at the time, which means *good*. The auspices

During these many years of audio progress, there has been a diminishing return: As we get close to perfect, the improvements shrink.

were the highest—Bayreuth Wagner attracts prestige and always has. And for my ears, the sound *is* indeed remarkable, minus so much that we have now, including, beyond Dolby NR, the whole range of newer tape formulations, recording heads, and so on. Those audio men were sophisticated. They could, so to speak, compensate for the future in numerous ingenious ways. Maybe, for instance, high-speed taping? Anyhow, what came forth was splendid, increments or no increments.

And the sheer length! Remember that the LP was only a few years into production, still a miracle of unbroken continuity for those of us who were brought up on the old four-minute 78 system—wax, shellac, lacquer, and all. On those tapes, undoubtedly produced on two machines—overlapping reel by reel—the unbroken sound continuity was still a brand-new thing and almost unbelievable. It is still hard to believe today, in the CD form. But what a load this puts on home listening!

I've taken up the 1953 audio itself first, because that is only part of what you will hear. There is the "hi-fi" mike technique of 1953, unmistakable for older ears, quite startling to younger ears that do not remember. It was a vital time of transition in the art of microphone use, part old and from the recent past, part pioneering and new. This quite aside from the objective audio quality.

No, I do not mean the mono. True, for a short time, listening with both your speakers, the mono sound will seem compressed and squeezed close to the center area, lacking in stereo's expansiveness. But in a very few minutes, you will adapt. As I say, the mono technique was at its highest point around 1953, a very polished art even though a single audio channel, after some 30 years of microphone usage. They knew very well how to compensate for the "lack" of our present stereo spread.

No, not the mono sound itself, but the spatial balance, as between large opera voices and the large orchestra playing with them—that is what will immediately strike you. These singers are recorded quite close and relatively very loud, only a few feet from your listening spot, or so it seems. You can hear their breaths, the teeth sounds, the twang of the vocal cords, the powerful diction, all with startling reality. This is the old-fashioned aspect of the recording technique, oddly enough! Nowadays, we tend to record opera with the singers at stage distance, back in the orchestra—in part, thanks to stereo's more detailed spatial pinpointing. But before 1953 and on back to the acoustic era, voices were recorded even closer—tonsil-close, I used to call it. A necessity in the acoustic period. A novelty in early electric recording where, suddenly, the microphone could do all sorts of tricky highlighting—to choice.

The mono technique was at its highest point around 1953. Those engineers knew well how to compensate for the "lack" of stereo.

In 1953, the voices were still close and loud in the older manner, but the orchestra was beautifully handled to surround the singers and make its own vital statements on its own. *That* was new, following the astonishing close-up vocal recordings of the '30s and '40s, where the big voices were about 2 feet from your ears against a faint and distant orchestral background.

That kind of electrical recording, of course, had to do with the first realization of the selective powers of the microphone, not only in amplification but in selective distance. It was a heady idea, and we went nuts over it until the novelty wore thin. The very birth of multi-mike! But oddly enough, the early electrics sounded very much like the previous acoustics, if with much more body and top and bottom: Still that same closeness for the solos and distant faintness for the accompaniment. It was a style listeners found familiar.

The difference was that the acoustic close-up was not subject to control: No amplification, just the impact of the sound on the cutting stylus. Beyond the recording horn's mouth, your volume dropped exponentially, even with much clever fixing—hoked-up loud violins and blasting brass. The solo with almost inaudible accompaniment was all we could do. The mike suddenly gave us immense control, but things didn't change. The balance was now quite arbitrary. Until we learned better.

If you have heard the early U.S. Wagner recordings of Flagstad and Melchior, the two large singers I mentioned last month, you will know what I mean. (Actually, they were relatively late, though "early" in technique.) Flagstad sings—her very best—with an appalling nearness, almost on top of you (tonsil-close). Her orchestral "accompaniment" (it is *not* an accompaniment but a major part of the music) is far away in the background—the San Francisco Symphony, if I am right. It might as well be a beat-up hotel piano, as in early Caruso. Same with Melchior, and the two of them sing together in *Tristan*, all loud voice, faint orchestra. A grotesque sound, a highly misguided recording technique.

These records and others did serve to bring out the celebrity impact on shellac records and the dull-sounding machines we all used. No excuse! The music was poorly served. Flagstad's later recordings are better, but she could no longer sing as well.

Meanwhile, and in parallel (there were many different centers for recording music), many engineers and producers began to understand that a more natural balance was needed for recordings with orchestra and solos, both vocal and instrumental: More orchestra, closer; less solo, a bit more distant. There are plenty of 1930s recordings with a better compromise in this respect—particularly when the solo performer was not so famous! He or she or they could be moved back a bit without political repercussions. The big names, as always, wanted all the glory and usually got it—close up and loud. They still do, often enough.

In 1953 Bayreuth, there was indeed a star-studded collection of Wagnerian soloists, and yet somehow, the producers were able, *not* to record them at a distance—far from it—but instead to wrap the orchestra around them on equal terms, even in mono. That is what is so astonishing in this relatively ancient recording. The producers were aware that almost 15 hours of close-up solo voices with the gorgeous Wagner orchestra far off in the distance was simply unthinkable. Stars or no stars, they had to keep the orchestral balance where it belonged, so that the frequent long orchestral passages (minus any singing) would come through as convincingly as the parts with voices. At the time, it was a tricky thing, to manage the politics of it and still come out with a worthy, not to say superb, representation of the *whole* of Wagner, not just the big loud stars.

That is why I was able to say "terrific," both for the audio itself and for the recording technique. Happily, the same goes for the performances, as I said last month. Tremendous intensity, made more so but not unduly exaggerated by the close presence of each singer.

Otherwise, I would not be writing here. The 1953 Bayreuth Festival, recorded, would be no more than an historical archive tape, good for study but not for any sort of home listening.

I think that if Wagner knew all this, he would be chortling in his grave—what's left of him. He died 106 years ago last month.


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A SIGNAL ACCOMPLISHMENT

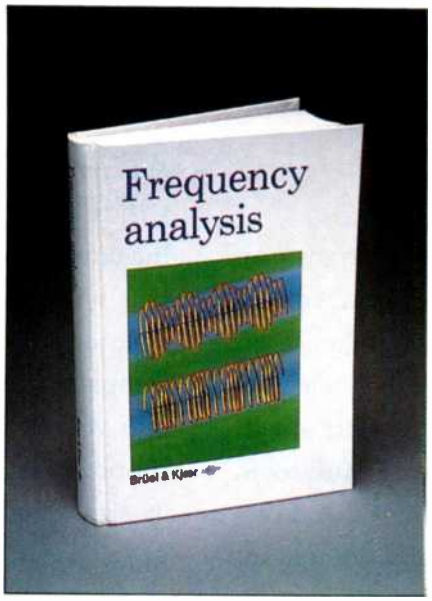
Frequency Analysis by R. B. Randall. Brüel & Kjaer, 344 pp., hardback, $50.

It was certainly a treat to get to review the third edition of this book published by Brüel & Kjaer under the title *Frequency Analysis*. The second edition was released in 1977, and in the intervening 10+ years, a great deal has happened in the field of signal analysis. I have followed these developments closely in a variety of textbooks and especially have been impressed by the many articles that have appeared in the Brüel & Kjaer *Technical Review*. Much of the content of this new edition comes out of those articles. For those not familiar with the name Brüel & Kjaer, it is appropriate to mention that this company is one of the most renowned, worldwide, as a manufacturer of acoustic measuring instruments. We used to say, "If you haven't measured it with a B & K microphone, you haven't measured it." To a great extent, this is still true.

Frequency Analysis is much more than a simple revision of a 12-year-old book, and the title may be a bit misleading since this work includes discussion of a wide variety of signal analysis techniques. At least half of it is new material, and the remainder has been substantially rewritten. The book is accurate and authoritative, and includes coverage of most of the significant aspects of analysis of audio frequency and vibrational signals. It is a book which requires some mathematical preparation for a complete understanding of the analysis processes described. However, it also contains a broad variety of practical application examples and a thorough discussion of the application of both time- and frequency-domain instruments to the analysis of signals.

One test of a good book is, of course, its accuracy, and this book is tops in that respect. But a more subtle test is to see if it lends new insight into issues that are already well understood. This book does just that. Without being verbose, the author describes mathematical processes with a clarity rarely found in textbooks on matters as technical as signal analysis. It is clear that this author is trying, and I would say successfully, to make the reader understand the processes of analysis as well as presenting the equations and techniques. As is apparent, my enthusiasm for this book is quite high. Even the foreword and introduction are well written and informative.

In the past decade, there has been greatly increased emphasis on digital, rather than analog, analysis of signals. The use of digital filters to replace analog filters and the ascendancy of the fast Fourier transform, which is of course implemented digitally, has led



to greatly improved accuracy, stability, and precision of the analysis process. Nowhere has the impact of digital processing been more greatly felt than in the area of precision audio frequency measurements.

However, this book recognizes that it is not so much digital techniques which distinguish the two principal analysis schemes—time domain and frequency domain—but the fact that in the time domain, data is analyzed continuously in real-time sequence, while in the frequency domain, data is analyzed by means of the Fourier transform in data blocks. Recognizing the breakdown in this manner leads to a more thorough and understandable treatment of the whole body of signal analysis methods.

In addition to the standard and necessary topics, *Frequency Analysis* presents a fine treatment of the Hilbert transform and cepstral techniques. Stationary, or so-called steady-state, signals are treated, as are non-stationary, or transient, signals. While the discussion is mathematically correct, the author does not bury the reader in equations. In fact, equations are used rather sparingly, and a very large number of graphs, unique figures, and examples are used to clarify the text at many points in the discussion.

A review of this book, chapter by chapter, demonstrates its logic and content. The first chapter, only four pages long, is an introduction. Chapter 2 has the ominous title, "Theoretical Frequency Analysis." In it are discussed time-domain signals, complex representation of time-domain signals, the Fourier transform, convolution, and the Hilbert transform. These are indeed theoretical topics, but they must be understood since they are the necessary basis of signal analysis. They are treated, in about 60 pages, with a clarity that is as good as I have seen. I believe that both the mathematically inclined novice and the expert will learn much from this treatment. The numerous figures in Chapter 2 are especially helpful in understanding the equations which describe time-function signals.

The third chapter, 68 pages, gets down to one of the two main topics of the book: The filter analysis of stationary signals. This chapter gives broad and thorough coverage of the properties and use of both analog and digital filters to do what is generally considered traditional frequency analysis of time-dependent but stationary signals. This material is very much the same as in the older, 1977 edition, but it has been rewritten for greater clarity and modernized to include the newest techniques. The chapter is amazingly thorough in discussing octave, fractional octave (such as one-third octave), and narrow-band frequency analysis. The discussion of the choice of the correct filter bandwidth and speed of analysis for typical applications is excellent. A bit of commercialization is found in the specific description and use of the B & K Digital Frequency Analyzer Type 2131 as the target instrument for the examples, but the principles apply for any similarly equipped instrument. The section on calibration of the measurements is an important one, since it is all too easy to

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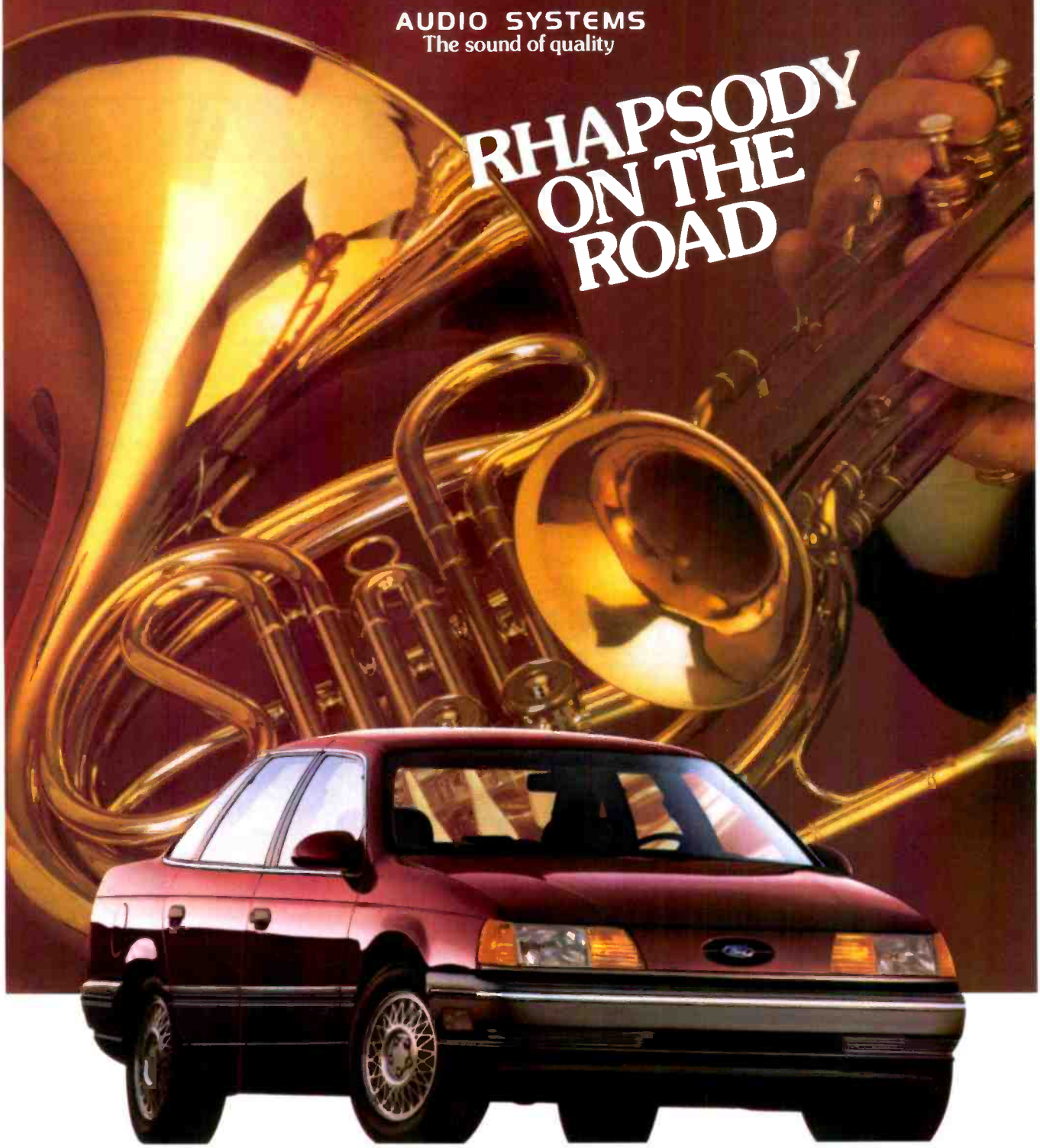

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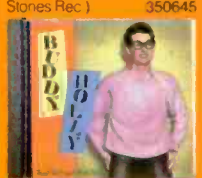

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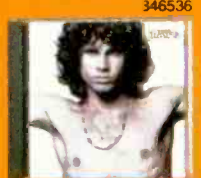

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Frequency Analysis offers those with a more casual interest in the subject an opportunity to learn a great deal.

record a lot of data with modern instruments and then overlook the meaning of all the "nice graphs and charts" that are so readily produced. This thorough chapter also includes many details on the "how to" of selecting correct filter response, averaging time, dwell time, speed of analysis, and the like.

The fourth chapter, "Fast Fourier Transform," is a bit brief at 39 pages, but really is quite adequate in that it lays the groundwork for the following four chapters. The fast Fourier transform is the modern foundation of all digital time- and frequency-domain signal processing. The treatment given is only as mathematical as necessary and is augmented by the attractive use of diagrams which help to explain the fast transform method. It may not satisfy the more mathematically inclined but does lead nicely into the following discussions of aliasing, picket-fencing, windowing, and other artifacts of the sampling process. The treatment of zoom techniques and the section on practical analysis of stationary signals are very good.

Two short chapters follow. The chapter on transient analysis is rather brief and places considerable emphasis on analysis of long transients. While this is a good introduction to the subsequent chapter on non-stationary signals, both chapters are treated in such a way as to be of principal interest for analysis of machinery, vibration, or speech rather than for most audio signal applications. The treatments are not adequate for the rather more elaborate analysis of musical signals, which are the ultimate non-stationary signals of main interest to the audio community.

Chapter 7 is devoted to two-channel spectral analysis. While only 42 pages long, it gives a nice introduction to the use of two-channel methods for obtaining the transfer function of systems, cross spectra, and coherence functions. Some discussion of noise and leakage in the measurement procedure is included. Auto- and cross-correlation functions are treated briefly, and the impulse response of systems is reviewed in some detail. The applications and discussion are of primary value to readers interested in vibration of structures. There is limited discussion of two-channel measurements applied to acoustical problems. B & K's Analyzer Type 2032 is used extensively as the measurement instrument for the examples, as might be expected. The chapter is a brief summation of the material that has appeared in the B & K *Technical Review* over the past 12 years. Unfortunately, many applications to acoustic measurements, such as sound intensity and acoustic room response, are omitted—except for a reference or two. Of course, the extensive applications of two-channel spectral analysis to electronic equipment, audio signals, and acoustics would more than fill a book by themselves. The material

Continued on page 36

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MATRIX 801 SERIES 2

B&W 801 MATRIX SERIES 2 PROFESSIONAL MONITOR LOUDSPEAKER

Three-way loudspeaker system. Drive units: one 26mm metal-dome tweeter, one 126mm Kevlarcone midrange, one 300mm high-power polymer-cone woofer. Crossover frequencies: 380Hz and 3kHz. Frequency response: 20Hz-20kHz ± 2dB free-field. Sensitivity: 87dB/W/m. Nominal Impedance: 8 ohms (not falling below 4 ohms). Amplifier requirements: 50-600W. Dimensions: 39 11/16" H by 17" W by 22" D. Weight: 110 lbs. Price $5,000/pair in black ash or walnut, $6,000/pair in rosewood. Including external bass-alignment filter. Speaker stands optional, $200/pair. Approximate number of dealers: 100. Manufacturer: B&W Loudspeakers, Ltd., Meadow Road, Worthing, BN11 2RX, England. U.S. Distributor: B&W Loudspeakers of America, P.O. Box 653, Buffalo, NY 14240. Tel: (416) 751-4520.

Lewis Lipnick

Since the introduction of the original B&W 801 monitor loudspeaker in 1980, it has been adopted as a reference by several recording studios around the world. Over the past five years, I have seen 801s present in just about every recording session with which I have been artistically involved. While the original 801 monitor had its strong points, I was never satisfied with the detached and muddy-sounding bass, discontinuous driver balance, and low sensitivity. Unless this speaker was driven by an enormous solid-state power amplifier, with an elevated high-frequency response, the tubby and slow bass response often obliterated any detail in the two bottom octaves of musical material.

Well, all this has changed. . . for the better. The new 801 Matrix Series 2 is as different from the original 801 as apples are from oranges. For me to say that this is just another excellent loudspeaker would make me guilty of gross understatement. In short, this is the most musically complete and revealing full-range dynamic loudspeaker that I have heard to date, effectively redefining such terms as coherent, dynamic, open, and involving.

Technical Highlights

The Matrix 801 Monitor is a large loudspeaker, employing a massive, front-vented cabinet housing the low-frequency driver and crossover network, with a separate fibercrete head housing the midrange driver (the tweeter is mounted in free field above) placed directly atop the bass cabinet. The midrange/tweeter head is electrically connected with the lower cabinet via a short umbilical and an XLR connector, and is secured by a very long bolt that runs completely through the head, down into the bass enclosure. There are two sets of speaker terminal connectors on the bottom rear of the bass cabinet, in order to allow the listener to bi-wire the speakers (these connectors are normally internally bridged, so in order to bi-wire, the bottom cover under the bass cabinet must be removed, and two very short jumpers removed. . . a less-than-ideal setup). The cabinet construction is excellent, showing a great deal of attention to assembly and aesthetic detail, except for the quality of the speaker terminal connectors. Rather than utilizing standard five-way binding posts (as B&W does with their less expensive 802 speakers), they have opted for some rather poor-quality, screw-type terminals that just don't belong on a product of this quality. Except for the round port vented on the front of the bass cabinet directly below the woofer, the new 801 Matrix is visibly similar to its predecessor. The casters mounted on the bottom are nice to have when moving these behemoths around the house or studio. But since the speakers really need to be placed on stands in order to operate at full potential, this otherwise practical addition is somewhat useless.

The internal design and components represent a clear departure from the earlier 801. By using their effective Matrix technology of incorporating an internal system of honeycombs within the bass cabinet, the engineers at B&W claim to have reduced low-frequency enclosure resonances and colorations to a significant degree (I agree). Additionally, but using a sixth-order Butterworth alignment through the addition of an outboard equalizer, they have been able to achieve extraordinary low-frequency response (-6dB at 17.5Hz) without compromising bass attack and clarity. Although the speaker can operate without this optional equalizer (thereby effectively representing a fourth-order Bessel filter with a -9dB point at 19Hz), the addition of this device clearly enhances its overall musical accuracy. The midrange fibercrete head assembly and Kevlar-coned driver remain basically unchanged from the earlier 801. The high-frequency driver (the TS26 tweeter), on the other hand, represents an entirely new design, incorporating a metal-domed diaphragm. This design was arrived at partially through B&W's computer-aided design (CAD), and is a modified version of the metal-dome tweeter used in the less costly Concept 90 series of loudspeakers. B&W claims that this new tweeter "exhibits perfect piston-like behavior to frequencies well beyond audibility." The newly redesigned bass driver has a cone of specially formulated plastic compound, is heavily damped to remove sonic colorations, and employs a 13lb, 13,000 Gauss magnet.

In order to protect the drivers from overload, B&W has upgraded the already existing Audio-Powered Overload Circuit (APOC) by incorporating two such units: one operates on the bass section, the other on the midrange/tweeter, allowing complete protection even when the system is bi-wired.

Design of a True Monitor: Not Just Another Loudspeaker

While attending last summer's CES in Chicago, I had the pleasure of a lengthy discussion with John Bowers, the driving force behind B&W

loudspeaker design. His musically intuitive design approach and clearly defined product goals (something too often lacking in high-end audio) gave me the impression that he knew exactly what he wanted to achieve, and how best to do so. When I asked him about the role of monitor speakers *vs* those without such designation, he stated that a true monitor should reproduce exactly what is contained in the recorded material, good or bad, rather than presenting an editorialized picture of what one might want to hear. His point is well taken, since many audiophiles choose their loudspeakers for various sonic attributes that add colorations to effectively create a predetermined spectral balance or acoustic environment. Of course, we all know that such a thing as an accurate loudspeaker does not exist, and even if it did, we would have no way of ascertaining its accuracy unless the recordings were identical to live music. How, then, can anyone claim that they are able to design an accurate loudspeaker? Realizing this problem, Bowers uses panels of musicians who have performed in specific recordings to ascertain musical integrity between originals and facsimiles. If they and the recording engineers involved are satisfied that what they hear through the speakers accurately reproduces what occurred in the sessions, he feels that some of the subjectivity connected with loudspeaker design has been eliminated.

Which brings us back to the 801 Matrix. This is not a speaker for those with preconceived notions of what should be, but for those who wish to hear what *is*. I have yet to hear another speaker that gives me as much musical information as this one, without any of the usual sonic intrusions that remind me that I am listening to music through a mechanical device. The 801 Matrix is a true musician's reference transducer, a point made by several of my colleagues in the National Symphony who have had the opportunity to hear it. Unfortunately, many of the musical attributes that distinguish the new 801 from other products will probably be lost on those audiophiles looking for the latest trends in loudspeaker design, rather than recreation of recorded artistic events.

Sonic Qualities

Being a musician first, and audiophile second, I subscribe to the thesis that musical validity and accuracy is of foremost importance, and that sonics should be viewed as only one component within the overall musical picture. There are, however, those few products that utilize their sonic strengths as a means to musical integrity, rather than the more common "let's see how we can make our speakers sound different from anyone else's." The 801 Matrix is one such product; here are some of the purely sonic attributes that set it apart from so many other also-rans.

First of all, I don't feel that this speaker has any significant sonic weaknesses. It is ruthlessly revealing of everything up front (source material, electronics, interconnects, line-cord polarity, etc.), and this is what might ultimately get it into trouble. Many U.S. dealers who will be selling this product are not members of the high-end community, and will probably mate the 801 with greatly inferior electronics. I can tell you that, after living with these speakers for the past two weeks, anything less than the finest electronics and source material can cause serious listening trauma. As an experiment, I connected a representative Japanese receiver (name not important, since they all basically sound alike) to the 801s, and the results were devastating. The sound was thin, grainy, and white, with no depth or bass extension. And although readers might find this amusing, it really is not—many potential buyers will audition this product with similarly mismatched ancillary equipment, and will very likely blame the speaker for the sonic shortcomings. The people at B&W figuratively "shot themselves in the foot" when pricing this speaker. . . it is simply too inexpensive for what it does. While it outperforms other products costing at least twice as much, its requirements for the finest electronics will place B&W dealers in a difficult situation.

While the 801 Matrix works well with both solid-state and tube amplifiers, I definitely prefer the results when using solid-state. Although the manufacturer claims that one can use as little as 50W/pc with the new 801, I would think that at least 100W/pc should be the minimum (especially if you are going to play full orchestral material). Of the three amplifiers that I have tried on these speakers (conrad-johnson Premier Five, Mirror Image 1.1S, and Rowland Research Model 5), the Rowland Research came out the clear winner. I still think that, overall, the Model 5 is the most neutral and musically revealing amplifier I've had the opportunity to hear, and the 801 Matrix speaker once more confirmed my findings. While the Premier Five presented itself very well, with beautifully defined midrange and silky high frequencies, low frequencies were slightly muddy and indistinct. The Mirror Image was not even in the running, sounding unrefined, raw, and congested. Although I heard all of the above before through my Martin-Logan Monoliths, the differences between these three amplifiers became much more pronounced with the 801s.

The "optional" 11" stands are quite necessary. With the assistance of two professional musical colleagues (Robert Kraft, bass trombonist with the National Symphony, and Joseph Kainz, visiting flutist from Chicago), the 801s were auditioned on the floor, sitting on the attached casters, on the floor with the supplied spikes, and on the dedicated stands. Both floor-mounted positions resulted in loss of ambience and musical information, along with noticeably slowed low- and midbass response. When we placed the speakers on the stands, the sound magically blossomed, and the spectral balance became neutral and even. Additionally, the contra octave of bass became tighter, deeper, and noticeably faster.

This all happened before the optional outboard bass-alignment filter (aka equalizer) arrived, or the speakers had been bi-wired. Again, B&W's "option" is a necessity. While I liked the speakers before, the addition of this little black box between preamp and power amp made an enormous difference. . . for the better. This is the first such device I've heard that doesn't adversely affect the midrange and high frequencies. B&W has wisely not included hard-wired interconnects, so the audiophile can still use his favorite brand of wiring. What amazed me was how this gizmo improved the entire sonic picture, not just the very deep bass, as we had expected. The sound became more clear and extended (in both directions), and the soundstage opened up, portraying hall ambience and dimension more effectively. I could more clearly define individual musicians in space, as well as the degree of natural hall resonance *vs* artificially induced reverberation in recordings. Not being an engineer, I won't attempt to speculate on exactly what this "optional" filter does, but one thing is for sure: if you're thinking of auditioning a pair of Matrix 801s, be sure the dealer uses the bass-alignment filter and the stands.

The Matrix 801s should be bi-wired. Although they work quite well in the conventional setup, the balance between the midrange/tweeter and woofer sections is tipped upward toward the former, thereby presenting a slightly lean, hollow quality to the mid-bass that might cause the listener to think these speakers unnaturally bright and aggressive in the upper midrange. When bi-wired (be sure to use the same speaker cable on top and bottom; these speakers are too coherent to tolerate mix and match), everything came into alignment, with all three drivers becoming more transparent and coherent, and any hint of over-brightness completely vanishing. (As an aside, I would like to mention that Straight Wire Music Conductor Speaker Cable appears to sound the best with the 801s in my system.) All of my subsequent critical observations concerning the sonic and musical qualities of the Matrix 801s were made with the inclusion of bass-alignment filter, speaker stands, and bi-wired installation.

The 801 Matrix is spectrally seamless from top to bottom, dynamic, refined, harmonically accurate, open, and, last but certainly not least, revealing. The only other speaker that I have had the opportunity to live with that successfully competes (and I have owned several large speaker systems) is the Martin-Logan Monolith. Whereas the 801 does not always present as large a soundstage as the Monolith, it does appear to present soundstage more accurately. Ensemble and stage size are more

clearly defined, and what sometimes appears as spatial information through the Monolith is obviously artificially induced reverberation and multi-miked bleed-through with the 801. Perspective is more obvious with the 801: forward, aggressively recorded material can really "come out and grab you by the throat," while the opposite perspective places the musicians well behind the speakers. The 801 is more coherent from top to bottom, more open, more revealing of recording techniques, and much more dynamic. The only area in which the Monolith is the clear winner is transparency: electrostatics just simply do better with dynamic speakers in this category. They are both great loudspeakers (musically exceeding everything else that I've heard, except perhaps for the new Apogee Diva, which I have not yet had the opportunity to extensively audition), each presenting musical information in a valid, but totally different perspective. The Monolith might ultimately be the better speaker for long-term listening, being less analytical, while the 801 gives more of what is really there, albeit possibly a bit intimidating. The 801 is a monitor, and some listeners just might not want to hear everything the 801s will tell them, musical and not.

Musical Attributes

I was not prepared for what I heard the first time I played the 801s. After finally getting these monsters set up and wired, my colleagues and I sat down to listen to a new compact disc of Vaughan-Williams's *Job* (Vernon Handley, London Philharmonic, EMI Eminence CD; superb performance and recording), having just heard it recently on the Monoliths. We sat silent throughout the entire performance (something that has never happened before), and after it was over, we looked at one another without a word. Finally collecting ourselves, recovering from the initial shock of what we had just heard, someone quietly said, "I've got to have those speakers."

When it comes to audio, musicians are hard to please. Perhaps that's why so many of them have such poor audio systems: if you can't have it all, why even try? The new 801 is a musician's reference; it simply reproduces music with more immediacy and honesty than anything I (or any of my colleagues) have previously heard. It is quite unlike any other speaker, inasmuch as it goes far beyond any previous design in drawing the listener into the performance, almost as if the listener's ears and microphones were one and the same. My first impression of the sound was one of unrestrained openness, along with the sensation that the music was expanding out into the hall acoustic, not being stopped by an artificial barrier such as a loudspeaker. This is something previously experienced by this musician only at live performances, and is one of the things that separates the "life" in live music from the constriction of electronic reproduction. Whereas many other speakers have given me the impression of seeing the music through a very clean window, the 801 Matrix not only opens this window, but places me outside, actually becoming involved with the musical picture.

The 801 Matrix outperforms every other loudspeaker I've heard in its ability to recreate the wall-bending visceral weight produced by full symphony orchestra, chorus, and organ. Until I heard the 801s, I was convinced that no loudspeaker could credibly reproduce the dynamic impact that I feel during live performances. For the first time, I can sense the massive wavefronts of sound created by full orchestral climaxes, without any timbrel change, constriction, or hardness. And at the same time, this speaker recaptures the finest low-level musical details, allowing the listener to see into, rather than just look at, the performance. All other speakers that I've heard to date (except for the Monoliths and Divas) create a "haze" over the music, effectively separating the listener from the performance. This typically causes loss of clarity and immediacy in quiet passages, as well as constriction and "sonic backup" at higher volume levels.

The 801 Matrix does not discriminate between good and bad . . . it bares all. The nonmusical aspects of performance (background noise, instrumental key noise, turning pages, etc.) can really place the listener into the recording session, something made all too clear to us during a playback of Andrew Litton's recent recording of Mahler's First Symphony. We were listening to Andrew's audition copy of the master tape, when a couple of my colleagues detected a bass-drum roll not in the score. When we ran the tape back, and listened again, that bass-drum roll was clearly a rather loud truck outside the hall . . . something that infuriated Andrew, especially since the sessions had been monitored with a pair of older B&W 801s. According to him, this was not at all audible during session playbacks (and we were only listening to a cassette dub of the master!).

I am also now discovering new tidbits of musical information in many of my recordings that shed new light on the quality of performance. Several recordings, that I had previously thought were musically flawless, have now become less than perfect. In Frederick Fennell's performance of Holst's First Suite in E flat for Military Band, with the Cleveland Symphonic Winds, I have discovered a very soft, but magically effective suspended cymbal roll during the first movement, used by the composer as a precursor to the following snare drum roll. Having not heard this through previous speakers, and thinking that the 801s were producing some aberration, I checked the score, and sure enough, there was the cymbal roll. Another interesting but heretofore unidentified aspect of Fennell's performance came to light with the euphonium solo (introduction of the second theme), also in the first movement. Before the 801 Matrix, I thought that I heard a tonally vague, not very well played euphonium. But now, I could detect two euphoniums (the score calls for only one . . . for some reason Fennell opted to double the solo part), which were neither together nor in tune. While this might not be very important, nor of any interest to the average listener, it serves as an example of the low-level musical detail retrieval capabilities of the 801 Matrix.

This speaker's low- and midbass reproduction are the most accurate I've heard so far. While some other products (such as the Infinity IRS, RS-1b, and KEF R107) probably supply more quantities of bass, the harmonic integrity, texture, and overall quality of low-frequency reproduction is considerably more realistic with the 801 Matrix. Edward Skidmore, another National Symphony colleague (double bass) and member of our musicians' audio listening group, flatly stated that the 801 Matrix was the finest speaker he had heard that reproduces the double bass accurately. He went on to point out that the bass does not sound like a low cello, or any other stringed instrument for that matter. According to Ed, each particular bass has its own unique sonic qualities that, until the new 801, had been lost.

The same must also be said for my instruments, the bassoon and contrabassoon. With this speaker, I can not only determine what manufacture of instrument the musician is playing, but the vintage as well (*ie*. the darker, more open and focused 7000 series *vs* the duller, fatter-sounding 10,000-series Heckel bassoons; the lighter, clearer, but less impactful-sounding prewar Heckel contrabassoons *vs* the fatter-sounding, more resonant postwar models). While many other speakers provide the listener with accurate bass attack, no others, that I have heard, reproduce the decay of low frequencies as well as the 801 Matrix. This important information supplies the listener with the harmonic and textural components of low instrumental tonal propagation. Additionally, this helps to define the space in which the performance is taking place, since decay time of omnidirectional low frequencies is one of the key elements in determining the spatial dimensions of the recording venue.

Transient attack of the 801 Matrix, throughout the entire frequency spectrum, is the most musically accurate and coherent of any speaker I have heard (except for full-range electrostatics). Deep-bass transients are remarkably clear (but not artificially dry), an attribute made evident through the reproduction of the bass drum in the third movement of Frederick Fennell's First Holst Suite (same as above). While many other full-range speakers have provided me with lots of window-rattling bass response, the 801 Matrix was the first to delineate the type of beater the bass-drum player was using. Whereas I had previously

been aware of unusually sharp bass-drum attacks in this recording, I could now definitely determine that the instrument was being struck with a wooden bass-drum stick wrapped with chamois (a trick sometimes used in order to get more immediate attack), rather than the more usual felt beater.

The qualitative differences in attack speed between cello and double bass, bassoon and contrabassoon, bass and tenor tuba, bass drum and tympani, trumpet and flugelhorn, oboe and English horn, flute and piccolo, and violin and viola, are clearly delineated. I can also detect the amount of energy (weight of bow on the string, and amount of air support behind the tonal attack in woodwinds and brass) being expended by individual musicians within an ensemble. This effectively gives the listener a more immediate, rather than vicarious view of the performance (as one of my colleagues so colorfully stated, "this is like having sex, rather than watching it").

The 801 Matrix also sets new standards for instrumental and vocal harmonic integrity. Differences between American- and German-manufactured Steinway pianos are clearly discernible: the former are more immediate and bright at the two frequency extremes, with a slight suckout in the middle registers; the latter have a more even, resonant, but less brilliant and forward quality. The slight harmonic differences between the bright, forward-sounding trumpets *vs* the darker, more covered cornets in Berlioz's *Symphonie Fantastique* are clearly evident through the 801 Matrix—the first speaker I've heard to successfully make this distinction.

And while I'm on the subject of brass: these instruments played at high volume levels create sonic distortions, caused principally by nonlinear ringing of the actual brass material (especially in the flared bells). Played *en masse*, combinations of french horns, trumpets, trombones, and tubas create "difference tones" and beat frequencies that add brilliance and character to the overall orchestral sound. The same holds true for large pipe organs—beat frequencies created by slight harmonic and atonal discrepancies between the various ranks add interesting coloristic effects to the overall presentation. The 801 Matrix is the first speaker that I've heard that can actually reproduce these harmonic phenomenon, effectively contributing to the overall sensation of reality.

Vocal reproduction, both solo and ensemble, is superb. This speaker will, however, accurately portray voices too closely miked; the excessive sibilance in hotly EQ'd pop selections can drive you out of the room. But when the source material is more neutral, the intensity and hard kernel of vocal resonance is remarkably well reproduced. The specific characteristics of different vocal *tessituras* are, for the first time, as apparent as in live performance. The nasal, forced quality of sound indigenous to the tenor sections of many choral groups, as well as the usual flat-sounding, unsupported sopranos, are clearly evident. Text in all vocal music is well delineated, without any unnatural sibilant emphasis. The 801 Matrix can even unravel the most complex voice leadings found in multipart contemporary choral works.

String instruments produce very different harmonic tonal structures when played with and without mutes. In live performance, muted massed strings produce a covered but resonant carpet of sound (*ie*, the opening of *Symphonie Fantastique*), and until the 801 Matrix came along, I had not heard this accurately reproduced. Most speakers represent this effect as a hushed "buzz" lacking pitch center and tonal focus. But the 801 Matrix lets all the resonance, tonal warmth, and pitch definition come through.

And speaking of pitch definition, this is where most speakers fail miserably. Instruments and voices have (or should have) tonal centers that are clearly heard in live performance. But so many speakers scramble this, representing tonal pitch centers on either the high or low side of the sound, producing overly bright or dull sonic distortions (overly sharp pitch appears to the ear as brighter; low pitch as duller). And with most speakers, this pitch distortion is not consistent: characteristics change with each separate driver, causing frequency-related colorations (this is one advantage of full-range electrostatics). The 801 Matrix is dead on, giving the listener a completely undistorted view of pitch focus and intonation, regardless of instrumental range or vocal *tessitura*.

The new 801 also allows the listener to follow individual instrumental and vocal lines into and through complex passages. This is not achieved by artificially boosting the upper midrange or high frequencies (as some other products do), since it remains consistent for instruments through the contra octave of bass. Compared with the 801 Matrix in this area of musical reproduction, most other dynamic loudspeakers sound unclear, congested, and amorphous.

Everyone who has heard the 801 Matrix Monitors has unconditionally stated that they hear more music than ever before. Some have felt that they hear too much, and would rather be left a little more in the dark. I don't. But it's interesting to note that, ever since my musical colleagues first heard the 801s, the topic of discussion during rehearsal breaks and concert intermissions at the National Symphony has revolved around "those fantastic new speakers that Lipnick has." I even overheard a few of them muttering something about how they could try to justify buying a $4500 pair of loudspeakers.

Shortcomings

As I mentioned earlier, this speaker has no major shortcomings *per se*. However, since it is so revealing of source material and ancillary electronic weaknesses, the upper midrange and lower high frequencies can become a bit much. Compact discs that suffer from excessive digititis, as well as those electronics that contain enough grain to build a beach, will be unlistenable on these speakers. For those reasons alone, I cannot understand why the B&W engineers have deleted the environmental balance control on the rear of the midrange/tweeter head assembly that was standard with both the earlier 801 and 802 speakers. This control effectively allowed the listener to attenuate or boost the mids and highs according to personal taste, room acoustics, and associated equipment. Although it might be cheating, in some cases a slight degree of lost clarity may be preferable to an ear bleed, and might also make this product more saleable to people with less than perfect ancillary equipment.

My other reservations are strictly practical. The very awkward procedure required to disconnect the bridge inputs for bi-wiring is unnecessary. There must be a better way. And those horrible input connectors really should be replaced with something more consistent with a product of this caliber.

Conclusion

In my opinion, the B&W 801 Matrix Monitor represents the pinnacle of current full-range dynamic loudspeaker design. It does not have the "see-through" transparency of the best electrostatics, and can sound forward and hard. Because it is so ruthlessly revealing, it may not be the speaker for everyone. But it is the first such product to convince me that it might eventually be possible to accurately reproduce live music. Do not audition this speaker with anything less than the finest source material and electronics—you will be wasting your time. And as good as this speaker is, I am sure that there are plenty of lunatic-fringe audiophiles who will find it unexciting and boring. So be it. But if you are searching for the emotional involvement only live performance can provide, and are willing to live with absolute sonic honesty, then the B&W 801 Series 2 Matrix Monitor is, musically, the end of the road. S

In *Celebrating Bird*, the author has brought forth a well-written conceptual essay on the life and times of Charlie Parker.

Continued from page 30

here is only the starting point of what could and should be an entire book.

The final chapter, 33 pages, is on a topic called "Cepstrum Analysis." This is a subject which is very much for specialists in the field of machinery and vibration analysis. One can, if he wishes, learn about such terms as "quefrency," "rahmonics," "liftering," and the like. Very specialized terms, indeed. It is an adequate treatment for the specialist but not of much immediate use to those interested in audio systems and signals.

The book is rounded out with three short appendices on Fourier analysis, narrow-band noise statistics, and the transfer functions of physical systems.

All in all, I like this book. It is a good summary for the specialist and still a book from which those with a more casual interest in frequency analysis will learn a great deal. It does not, however, cover applications to acoustics and audio signal analysis, which would make it a complete book for the audio practitioner. Incidentally, in Wisconsin's dry winter climate, the covers on my copy curled up rather severely. This book is more cardboard-bound than cloth-bound. *R. A. Greiner*

Celebrating Bird: The Triumph of Charlie Parker by Gary Giddins. Beech Tree Books/William Morrow, 128 pp., softback, $9.95.

The most prominent and perhaps the most widely read of contemporary jazz critics, Gary Giddins' previous award-winning books have been compilations of columns that appeared in *The Village Voice*. Now, in *Celebrating Bird*, he has brought forth a well-written conceptual essay on the life and times of Charlie Parker. This is a nicely produced book by packager Toby Byron's Multiprises, and is the first in a series subtitled *Masters of American Music*.

Giddins makes it clear that Parker truly changed forever the shape and direction of jazz by evolving a way of playing—with Dizzy Gillespie, Thelonious Monk, and a handful of other younger musicians—that often utilized higher intervals in chord structures and changes, along with rhythmic alterations made at blinding tempos. This produced the first abstract and basically nonmelodic form of jazz, one which has survived almost intact to this day.

It was the first time in the short history of jazz that one style would so completely obliterate, at least for the next generation of musicians, everything that had gone before. After Parker's achievements in the mid- and late '40s, very few young musicians would consider playing in any other style.

Only star soloists and band leaders managed to survive the onslaught of Parker's style and its slavish emulation by a generation of young players who came up in Parker's wake. The older musicians, who brought jazz to a high

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Elton John: Reg Strikes Back • I Don't Wanna Go On With You Like That. MCA 100602

D.J. Jazzy Jeff & The Fresh Prince: He's The D.J., I'm The Rapper • Jive 264134

Pet Shop Boys: Introspective • Domino Dancing, etc. EMI 100681

Tracy Chapman • Fast Car, Talkin' 'Bout A Revolution, etc. Elektra 153582

Bobby McFerrin: Simple Pleasures Don't Worry Be Happy, etc. EMI 164165

Simon & Garfunkel: The Concert In Central Park • Mrs. Robinson, etc. Warner Bros. 244006

Steve Earle: Copperhead Road • Snake Oil, title song, more. UNI 100679

Cocktail (Original Soundtrack) Elektra 100459

Canadian Brass: More Greatest Hits Sabre Dance, more. RCA 164348

45's On CD, Vol. 1 • Big Bopper, Rick Nelson, Sheb Wooley, etc. Polydor 150044

John Cougar Mellencamp: The Lonesome Jubilee Paper In Fire, more. Mercury 134420

Randy Travis: Old 8x10 • Honky Tonk Moon, more. Warner Bros. 100008

By Request...The Best Of John Williams & The Boston Pops Philips 125360

The Police: Every Breath You Take—The Singles A&M 173924

Benny Goodman: Sing, Sing, Sing Title song, more. RCA 104857

Talking Heads: Naked • (Nothing But) Flowers, Mr. Jones, etc. Sire/Fly 153810

Beethoven, Symphony No. 9 (Choral) R. Norrington, conductor. Angel 100467

Diana Ross & The Supremes: 20 Greatest Hits • Motown 163867

Dokken: Beast From The East • "Live" hits Walk Away, etc. Elektra 200717

The Traveling Wilburys: Volume One 100711

Air Supply: Greatest Hits • Making Love (Out Of Nothing At All), etc. Arista 134424

Count Basie: April In Paris • Title song, Shiny Stockings, etc. Verve 164004

Itzhak Perlman: French Violin Showpieces • DG 115457

Gordon Lightfoot: Gord's Gold • Folk classics! Reprise 224008

Ella Fitzgerald & Louis Armstrong: Ella & Louis • April In Paris, etc. Verve 133381

Duran Duran: Big Thing • Title song, Too Late Marlene, etc. Capitol 100682

Rick Astley: Whenever You Need Somebody • RCA 140026

Charlie Parker & Dizzy Gillespie: Bird And Diz • Leap Frog, etc. Verve 173413

Patsy Cline: 12 Greatest Hits • I Fall To Pieces, Crazy, more. MCA 153849

Van Halen: OU812 • When It's Love, Black And Blue, etc. Warner Bros. 150913

More Dirty Dancing • RCA 130766

Jimi Hendrix: Kiss The Sky • Purple Haze, Voodoo Child, etc. Reprise 161345

The Sound Of Music • Original motion picture soundtrack. RCA 100046

Jazz CD Sampler • Classic performances by Ella, Basie, etc. Polygram 173406

James Taylor: Greatest Hits • Fire & Rain, more. Warner Bros. 123790

Horowitz Plays Mozart 115436

Tangerine Dream: Phaedra • New Age title suite, etc. Virgin 100510

Najee: Day By Day • Personality, title song, Gina, etc. EMI 100001

Taylor Dayne: Tell It To My Heart • Prove Your Love, etc. Arista 124759

k.d. lang: Shadowland • I'm Down To My Last Cigarette, etc. Sire 134567

George Harrison: Cloud Nine • Beatle great! Dark Horse 174328

Solti, Chicago Symphony: Dvořák, Symphony No. 9 (New World) London 115168

Steve Winwood: Chronicles • His biggest hits! Island 134501

Debbie Gibson: Out Of The Blue • Only In My Dreams, more. Atlantic 154066

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The Sun Story • Songs from Elvis Presley, Johnny Cash, etc. Rhino 244534

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Peter Cetera: One More Story Warner Bros. 100463

Pavarotti At Carnegie Hall • The world-famous tenor in concert! London 115311

Classic Old & Gold, Vol. 1 • Music Explosion, more. Laurie 134627

Eric Clapton: Time Pieces (The Best Of) • Layla, etc. Polydor 123385

K.T. Oslin: This Woman • Hold Me, Money, title song, etc. RCA 100579

Vangelis: Direct • The Motion Of Stars, First Approach, etc. Arista 100470

Charlie Parker: Compact Jazz Bird lives! Verve 153983

Tiffany: Hold An Old Friend's Hand 100707

Crosby, Stills, Nash & Young: American Dream 100714

Larry Adler: Live At The Ballroom • Harmonica magic! Newport Classic 100735

The Best Of Steely Dan: Decade • 14 hits. MCA 154135

Supertramp: Classics (14 Greatest Hits) • A&M 104871

Alabama: Greatest Hits • Why Lady Why, Feels So Right, etc. RCA 120247

Jethro Tull: Aqualung • Locomotive Breath, title song, etc. Chrysalis 124705

Cinderella: Long Cold Winter • Gypsy Road, more. Mercury 114780

John Williams & The Boston Pops: Digital Jukebox • More, more. Philips 125059

An Evening With Louis Armstrong GNP Crescendo 270106

Bobby Brown: Don't Be Cruel • My Perogative, Roni, etc. MCA 100621

Huey Lewis: Small World • Perfect World, etc. Chrysalis 134347

R.E.M.: Eponymous • Fall On Me, The One I Love, etc. IRS 100701

Dwight Yoakam: Buenas Noches From A Lonely Room • Reprise 100009

Jimmy Page: Outrider • Led Zeppelin guitarist solo! Geffen 123721

Robert Plant: Now And Zen • Heaven Knows, etc. Es Paranza 134392

Led Zeppelin: Houses Of The Holy D'yer Maker, etc. Atlantic 134321

20 Great Love Songs Of The 50s & 60s Vol. 1 • Only You, more. Laurie 120768

Viennese Bonbons • Vienna Phil. Orch./ Lorin Maazel. DG 115287

INXS: Kick • Need You Tonight, Devil Inside, title song, etc. Atlantic 153606

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Although the author vividly shows how Parker succeeded despite a dreadful personal life, Giddins makes several errors in the process.

art before Parker's time—Louis Armstrong, Count Basie, Lionel Hampton, Sidney Bechet, Coleman Hawkins, Lester Young, Benny Goodman, Roy Eldridge, Benny Carter, Earl Hines, and Duke Ellington—were among the very few who were not swept away in the vast tidal wave known as be-bop.

Giddins writes that pre-bop jazz was directly related to popular music and dancing in the years through World War II, and details somewhat briefly a few of the many factors which helped bring be-bop to the fore and which simultaneously unravelled the older styles. He correctly calls bop a celebration of the self: For the first time, musicians were playing strictly for themselves, rather than to please the audiences which paid to hear them. The tremendous upheaval in jazz and popular music during that frantic decade is a fitting subject for an in-depth and objective work.

Using original research by fellow writer/critic Stanley Crouch, Giddins colorfully elaborates how Charlie Parker succeeded despite his almost continually desperate personal life. Whatever the reliance on Crouch's research, however, Giddins allows several factual errors to appear in *Celebrating Bird*. The most fascinating of these, for me, is the tale of Parker's desire to join the Basie band when both musicians were supposedly working in Boston in 1940. I know of nothing to substantiate Parker's presence in Boston at any time during 1940. In fact, he was then in the Kansas City area, playing with the Jay McShann band, and did not come east again until McShann's band appeared at the Savoy Ballroom in 1942. If Parker had wanted to join Basie's band at all, it seems to me more likely that this would have taken place when Tab Smith left Basie in April 1942. That year, McShann's band appeared in Boston twice, performing under Don Redman's name when they had no work of their own. I'm inclined to think this is when the two jazz greats might have crossed paths. Charlie Parker's genius notwithstanding, I don't think he would have fit in or lasted very long with any of the classic bands Basie led.

Factual errors aside, the truth remains that Charlie Parker was a remarkable and incandescent figure in the history of American music, one whose work made perhaps *too* deep an impression. For years after his death in 1955 at the age of 34, young jazz musicians would barely acknowledge what had gone before Parker, because they had become so wrapped up in his be-bop style. Today, almost 34 years later, his is the basic language of jazz—not Louis Armstrong's, not Count Basie's, not even Duke Ellington's. I wonder how many more years it will take before young musicians realize just how rich and vital jazz was before Charlie Parker came along. *Frank Driggs*

THE SOUND AND THE FUROR

Compact Discord

It looks like the first company to produce a recordable Compact Disc system won't be Philips or Radio Shack (both of which had made big noises about it) but Taiyo Yuden, of Japan. The company, best known for Triad cassettes, says it plans to have recordable discs for sale in Europe in the first half of this year, though recorders, according to *Billboard*, won't be out until late 1989.

The discs will be of the WORM (write once, read many) type, which cannot be erased and reused. Both 3-inch and 4.7-inch blank discs will be available; the latter will cost about $9 apiece and carry up to 74 minutes of program material.

Last October, Philips released a statement that "CD-R [recordable CD] is likely to cause an even bigger and more immediate private copying problem than DAT. Copying with CD-R is not only cloning, just like DAT, but in addition, the copy is the same format as the original." Philips has also, according to *Billboard*, pledged not to launch CD-R while the hardware and software industries are still discussing the question of DAT. It therefore surprised no one that the International Federation of Phonogram and Videogram Producers (the international equivalent of the RIAA)

branded Taiyo Yuden's plans as "deplorable."

That company, meanwhile, says it recognizes the potential for copyright problems and will therefore market its CD-R mainly for such professional uses as broadcasting and small-run custom CD manufacture.

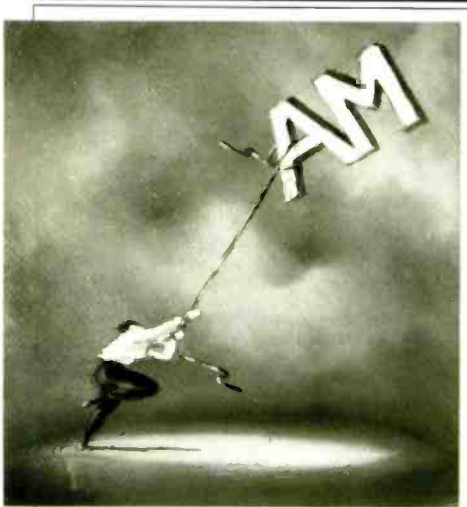
Professional Skepticism

Back in the days of Dynakits, a friend of mine went into the professional recording-console business. As his company was still too small to make everything itself, he had to buy his RIAA preamps from an outside source. After checking specs and prices, he picked the Dynakit preamp (which then sold for about $70 in kit form and $100 to $130 wired). To make it suitable for studio use, he removed all of the preamp's controls and all of its input/output jacks (except phono in and tape out), hard-wired the selector to the phono setting, and mounted the result on a rack panel. Figuring in the preamp's cost and the labor he'd put in adapting it, he charged about $250 for the modified preamp, but he couldn't sell it.

Too expensive? No—not even in 1970 dollars. The preamp was too cheap, compared to other pro equipment with comparable specs. That was no surprise, as home equipment regularly outperforms pro gear. Pro equipment's superiority is less in performance than in reliability, ruggedness, repairability, and studio-oriented features.

Eventually, however, my friend did find a way to sell his Dyna hybrid. He raised its price.

Illustrations: Karen Stolper



Dymek Didn't Die

It's so much easier to get good sound and good reception from FM than from AM, that most people (including most radio and tuner manufacturers) have forgotten just how good AM can be. It therefore came as something of a shock when McKay Dymek came out with a line of AM receivers and antennas that showed just what AM radio could do. When we reviewed their Model DR-33 receiver (September 1979), we measured frequency response that started rolling off above 7 kHz, with 0.45% harmonic distortion, and sensitivity of 0.7 μV for 20 dB S/N. The DR-33 also covered the band from 50 kHz to 29.7 MHz and could decipher single-sideband and continuous-wave (CW) signals. I know from my own experience that the company's DA-9 active indoor loop antenna could make distant signals sound like local ones, while tuning out strong local interference; presumably, the DA-100 active outdoor whip could do even better. So when an "Audioclinic" reader asked about long-distance AM reception (August 1988), we recommended that he look for these products on the used-equipment market.

Only, as we've now learned, they're still available as new products! While the original company has gone out of business, its products can now be had from Stoner Communications, 9119 Milliken Ave., Rancho Cucamonga, Cal. 91730. The Dymek receivers are no longer being made, but Stoner still has about 30 of them available—for half their 1983 list price. That comes to $800 for the DR-33. The antennas are still being manufactured. Their prices are $335 for the DA-9 with one antenna head (extras, for other bands, cost $110 each) and $179 for the DA-100 outdoor whip.

Indirect Current

Like Edward Tatnall Canby ("Audio ETC," November 1988), I've faced the problem of running a.c.-only audio equipment where only d.c. power was supplied. My college dorm had d.c.—not surprising, when you consider that the college had a Gothic powerhouse. Like Canby, we found that the a.c. output of a motor-generator was too unreliable in frequency to drive turntables, so we turned to a vibrator-type d.c.-to-a.c. "inverter." The vibrator's frequency was a steady 60 Hz, but its output (square waves, essentially) was too full of harmonics to run our amp, preamp, and tuner. We wound up using both types of converter—the vibrator for the turntable, and the motor generator for all the electronics and our refrigerator.

Our problems didn't end there, though. We had to keep the motor-generator in a distant closet, so its noises wouldn't drown out the music. (The chained extension cords we used for that would never have gotten UL approval!) We also had to switch the vibrator off when listening to the tuner—certainly for AM stations, and sometimes for FM, too.

But our biggest problem was not related to audio. Over Christmas vacation, we shut down the vibrator as well as the motor-generator. Unfortunately, nobody remembered to empty the refrigerator and leave its door open. When we sold the fridge, a semester and a half later, we *still* hadn't gotten rid of the offensive odor completely.

A/D Convertible

Most tape decks make and play only analog recordings, while some handle only digital tapes. This may change. Stellavox plans to produce plug-in electronics, head blocks, and other items which will convert their TD9 recorder to a digital deck. Plug-ins are planned for different digital standards, present and future. With two TD9s and two sets of plug-ins, users will be able to dub to and from digital and analog formats.

This ambitious idea comes in the wake of Stellavox's purchase by another Swiss firm, Goldmund. As you'd expect from the union of a high-precision maker of pro equipment like Stellavox and a maker of exotic home gear like Goldmund, a complete digital-plus-analog TD9 system won't be cheap. Prices for the analog TD9 will be "in the five-figure range," says International Audio Technologies, which imports Goldmund and Stellavox.

XLP Records

No one objects when the cassette and LP releases of a given recording both contain the same amount of music, even though cassettes can (and sometimes do) hold more; after all, they sell for about the same price. But the higher cost of Compact Discs made many consumers wonder why the CD issues couldn't be filled out with additional music—and many Compact Discs now carry extra tracks that wouldn't fit onto the original LP recordings.

This, in turn, has led a few musicians to think in terms of 50- or 60-minute albums instead of the 45-minute or shorter albums typical of LP. So now there are extra-long-playing records to accommodate them. Two recent LPs, *Hysteria* by Def Leppard and *Back for the Attack* by Dokken, carry more than 60 minutes of music apiece, while Metallica's *Kill 'Em All* has been reissued with enough extra songs to bring its length to 66 minutes. Such LPs will probably become more common if Direct Metal Mastering, which allows more music to fit onto an LP without severe volume limitations or distortion, becomes widespread. Longer LPs should cost no more to press and little if any more to master, but they will cost more in artist royalties and in recording costs.

The Digital '30s

Alec Reeves invented pulse-code modulation, which lies at the heart of today's CD and DAT systems, in 1938. He should have waited.

While the idea was brilliant, the hardware technologies of the day were ill-equipped to take advantage of it. By the time cheap transistors and ICs made PCM a commercial possibility, the patents (held by Reeves' employer, Standard Telephones and Cables) had run out.

For this and other developments, however, Reeves did receive many honors—including the issuance in

1969, two years before his death, of a British postage stamp commemorating the invention of PCM.

Not-So-Neologism

Audiophiles now commonly refer to monophonic power amplifiers as "monoblocks." The usage is new (perhaps within the past three years), but the word is not. Back when my father was a tot, the term was applied to automotive engines whose cylinders were part of the same casting as the crankcase—like today's car engines—rather than cast and fastened to the crankcase individually (like many motorcycle engines, until recently). So originally, it meant many units in one block, the opposite of its current meaning.

IVAN BERGER

CANCEL EVERYTHING

Illustrations: Holly Kowitt

Quiet, Please!

In our school years, we dream up wonderfully simple, clear solutions for the problems of the world. Mine was noise cancellation. Since equal electrical signals of opposite polarity cancel each other out, it should be possible to make a device to silence ambient acoustic noise—such as road noise in cars—by generating equal noises of opposite polarity.

The first practical embodiment of that idea, the Bose Acoustic Noise Cancelling headset system, didn't arrive for 30 years after I got the idea. It took that long because "my" idea (I'm sure I wasn't the first to think of it), like most such wonderful notions, was just a bit too simple to work the way I'd thought. Dr. Amar Bose explained its pitfalls at the introduction of Cadillac's new Delco/Bose Gold Series sound systems.

Bose had tried using speakers to create anti-phase sound in cars, and it worked well in dummy-head tests. But when people listened, they reported that the noise was *louder* with the noise-cancelling system turned on. "We measure what's convenient, then start believing it corresponds to what we perceive," says Dr. Bose. "What we forgot is that people hear *directionality*, too. They perceived the car's noise and our anti-noise as separate sounds, coming from different places."

If you put the anti-noise sources where the noise is generated, that problem disappears. Dr. Bose mentioned the possibility of making active mufflers that fed anti-noise into a car's tailpipe. This approach is already being promoted by a New York City company called Noise Cancellation Technologies (which has also designed noise-cancelling headphones).

The active muffler proposed by NCT lacks conventional mufflers' noise baffles. Instead, it contains a rugged loudspeaker designed to withstand hot exhaust gas. A microphone at the tailpipe determines what kinds of sound must be cancelled, while a sync sensor at the engine checks how often, and when, those sounds will occur. Signals from the mike and sensor control a waveform synthesizer whose output feeds the speaker. This may or may not be quieter than existing mufflers, but it's certainly more efficient. A passive muffler's baffles restrict engine breathing, which limits engine output—with a muffler like NCT's, existing engines could be made more powerful (10% to 15%, says NCT) or more gas-efficient.

Not all noise sources in a car are as concentrated as exhaust pipes, so other approaches would be needed for road rumble, wind whistle, and engine noise. Noises reaching the car's interior through body vibrations could be reduced by using active engine mounts and by attaching anti-noise transducers to the body.

Adaptive Controls Ltd., of Southampton, England, has applied for patents on a noise-cancellation system that cancels only the most audible tones and harmonics in the noise. The system was developed by Southampton University's Institute of Sound and Vibration Research, which has been working with Lotus for several years to develop practical cancellation systems. Lotus' test vehicles use off-the-shelf equipment, such as KEF speakers and Clarion amps, wherever possible. The company says that a production system could be installed in cars for about 100 pounds sterling ($185), with the anti-noise coming from the car's speakers.

I'm a mite skeptical on that point. Will optimum speaker placement be the same for making music as for cancelling noise? And will sound quality be maintained when the system is simultaneously trying to deliver 50 to 70 dB of anti-noise plus 40 to 100 dB or so of music? To do that, those speakers will have to be *very* good.

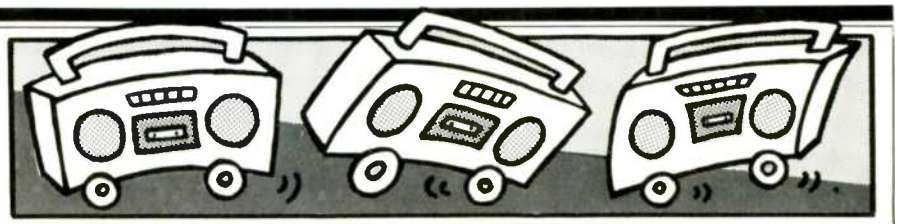
Of course, you wouldn't want your car to silence *all* noise. You still need to hear horns, sirens, and brake screeches, as well as any sudden loud sounds produced by your auto's innards. You probably want to hear passenger conversation (back-seat drivers excepted). And you definitely want to hear your stereo.

Luckily, there's little chance of cancelling those sounds. For one thing, cancellation systems work best with repetitive sounds. For another, according to some researchers in the field, they're far more effective on low frequencies than on high frequencies. They're also needed far more for low-frequency noises, since highs can be muffled pretty easily by existing techniques.

I'm pleased to see that my simple noise solution is now workable—and working—even if it's not really simple and was never really mine.

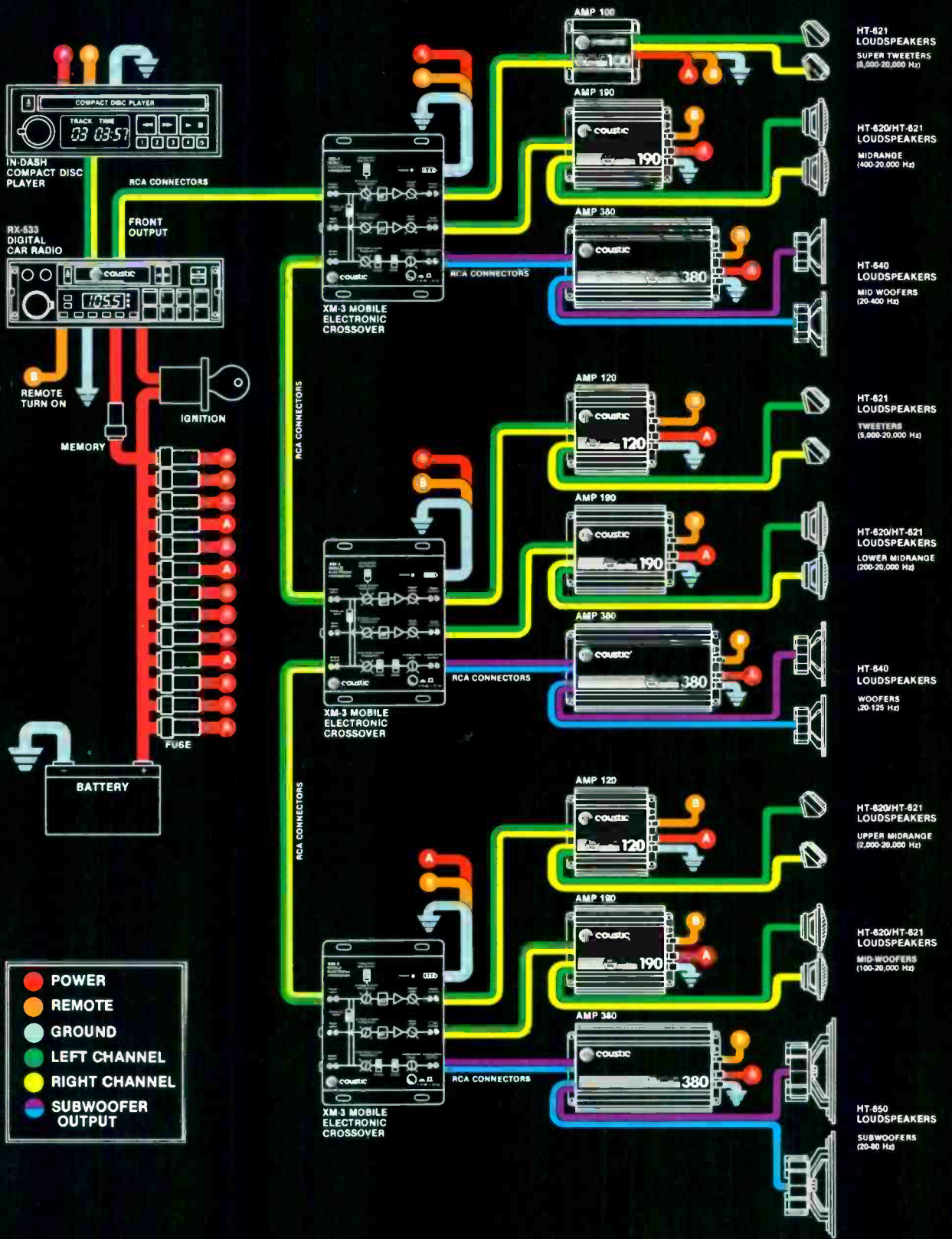
Semi-Mobile Sound

It had to happen. Boom boxes have grown and grown until even strapping young shoulders buckle under the strain. Helix Electronics, of Carson, Cal., has recognized the fact, and put one of their boom boxes on wheels.



Plain Vanilla

Not only do we design and build it, we know how to put it together ...simple as plain vanilla.



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Balanced-line connections, long used in studio gear and now appearing in home components, would be even more useful in car stereo.

Take a Balanced View

Balanced, differential signal connections have gotten a lot of coverage in these pages in the past year or so. R. N. Marsh's article on improving common-mode rejection (February 1988) showed why professional audio equipment has long been linked this way. And balanced-line connections have shown up on two pieces of home equipment we've reviewed: Sansui's CD-X901 CD player and the Klyne SK-5A preamp (January 1988).

This is an idea whose time seems to have come—except where it is needed most, in car stereo equipment. The car is a maelstrom of electrical interference. Some companies do use differential inputs to combat this, as John R. Bishop mentioned in his article on car amplifiers (May 1988), but they all hook those input circuits to unbalanced lines.

Balanced input and output circuitry would raise the cost of car stereo equipment and the interconnect cables used with it. But it would probably be used mainly in high-end car stereo gear, where the price increase might not seem significant.

It would also require special cables and connections, although car stereo is already rife with them. But the only reason so many car stereo makers use different connectors or pinouts now is to make it harder to link up to components made by their competitors. Aside from the convenience of using a single DIN plug for both stereo channels and perhaps the power leads, this bears no benefit to the consumer. With balanced lines, there *would* be a consumer benefit.

Alarm Alert

If you're shopping for a car alarm system, listen to a similar system under the kind of noise conditions that are likely to prevail where you park, and make sure it's sufficiently audible. Most alarm sirens are rated at about 120 dB SPL, which is plenty loud. But that's the output right at the alarm, under the car's hood. What you hear outside the car, with the hood down, is far more modest—98 dB at about 3 feet from the hood, in my newly installed alarm system. Since New York is a noisy place, I'm having the siren replaced with air horns, an option offered by many alarm installers and suppliers. I'll let you know how they perform once they're installed.

Post Mortem

An article in Britain's *Electronics & Wireless World* ("Analogue Circuits for Automotive Uses" by Rocco Shah, September 1988) has enlightened me about just how the failure of my old car's voltage regulator wiped out most of my sound system. Without the voltage regulator to control things, the alternator was feeding a steady 18 V to the battery. That was only a few volts above the 14.4-V operating point usually cited as normal (in fact, the article says, such voltages often reach 16 V), which is why it took a few hundred miles of driving to boil the battery to death.

Without a regulator, the alternator was presumably charging its little heart out, which means, according to Shah, that the voltage surge when the battery stopped conducting could have been as high as 125 V. This voltage spike would only have lasted about 4.5 to 100 mS, but with semiconductors, that's long enough!

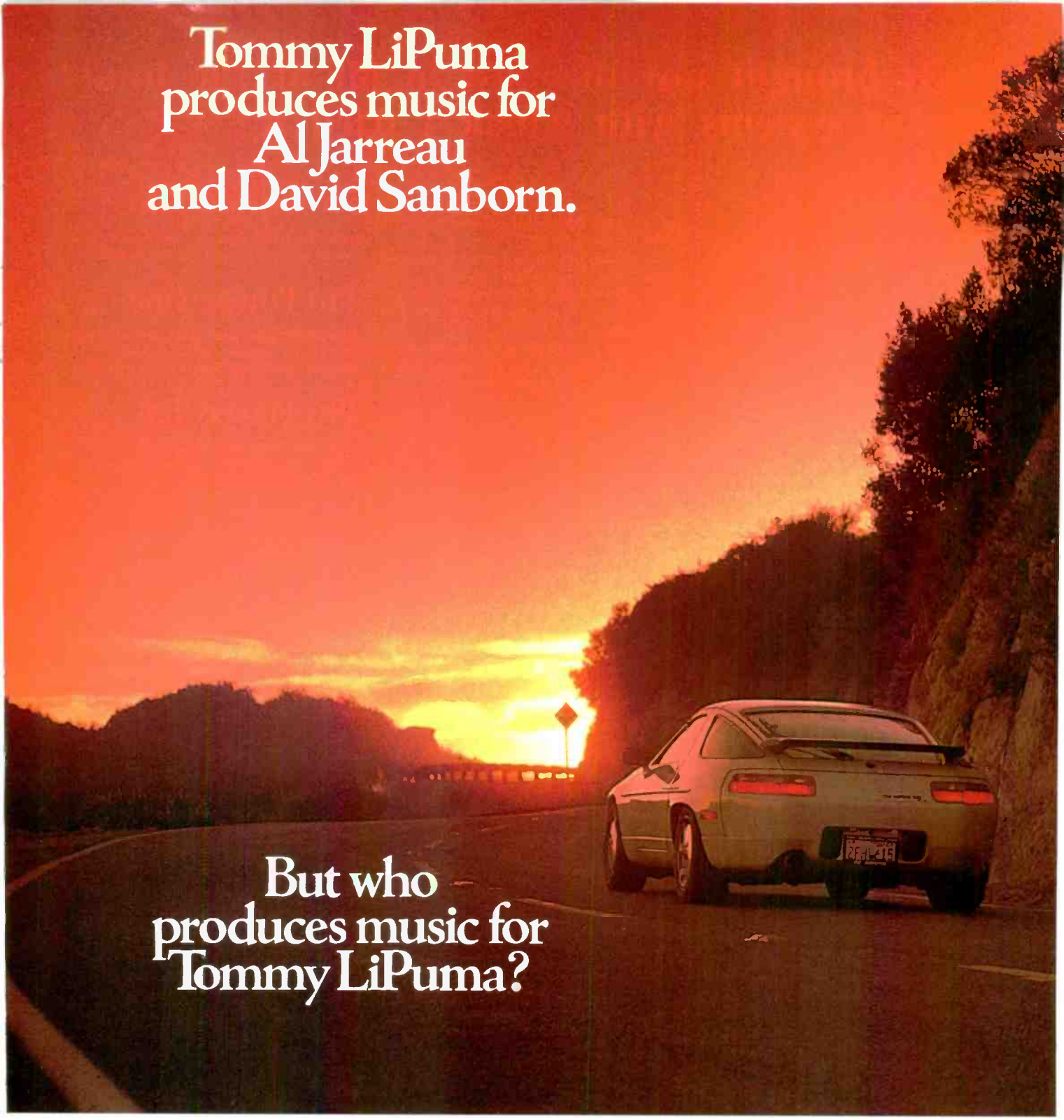
Knobby Problem

The controls in most new cars are matte black, softly curved buttons and knobs, as are the controls on many new car stereos. So when I started filling in my Scorpio's console with controls for the sound processors I'm installing in its trunk, I looked for similarly swoopy, matte black knobs. No luck. The Scorpio's own controls are all momentary-contact rockers, except for one knob that's too big for my purposes. The car stereo volume and tuning knobs I've tried are made for shafts smaller than the ¼-inch diameter of the controls I'm using. The knobs I find in catalogs are matte black but have squared-off tops, not rounded-off ones. And the three drawers of knobs in my home shop yield only those that are either rounded but shiny or matte but flat-topped. Installers I've spoken to were no help. So for now, I'm using the flat matte knobs from my parts drawers.

I had better luck with switches. Carling's curved-top, matte black Curvette rocker switches look just right in the Scorpio, even though I'd originally purchased a handful for use in my old Saab (where they also looked very nice—see the picture on page 16 of the March '84 *Audio*, if you still have it around). I don't remember where I bought mine, and I know they're not commonly found in stores, but you may be able to find some at industrial electronics distributors. If you can't, check out the Alcoswitch TRD series and the non-illuminated equivalents of ITT Schadow SC series switches, which are fairly similar. And if anyone can tell me of a retail, mail-order source for Curvettes, I will pass the word along.

Illustrations: Holly Kowitt

Tommy LiPuma produces music for Al Jarreau and David Sanborn.



But who produces music for Tommy LiPuma?

What kind of car audio system could meet the standards of a man with 4 Grammys?

It should have cassette, CD and DAT players that produce studio-quality response, immune from vibration.

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Which is why, when he leaves the studio, Tommy LiPuma goes on the road with Eclipse.™

ECLIPSE™

MOBILE SOUND SYSTEMS

"...it brought out the best in all of the loudspeaker systems with which I tried it..."

Pro-Power Four

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

Says Leonard Feldman in his Test Report in AUDIO Magazine, Vol. 71, No. 9:
"...it brought out the best in all of the loudspeaker systems with which I tried it. I sensed an effortlessness about the musical crescendos reproduced from some of my CD spectaculars..."
"In my view, you can spend five times as much as what this amp costs, but you won't get a better, more reliable, or more musical unit."

FEATURES: MOSFET amplification stages provide the utmost in sonic purity, rivaling that of vacuum tube amplifiers...Precision-Calibrated LED power meters (0–400 watts at 8 ohms)...Speaker switching for two pair of stereo speakers...
SPECIFICATIONS: CONTINUOUS RMS POWER: 205 watts per channel @ 8 ohms, 20Hz-20kHz, 300 watts per channel @ 4 ohms, 20Hz-20kHz, 450 watts per channel @ 2 ohms, 1kHz...THD—less than 0.05%. 19"Wx5¼"Hx12"D, 30 pounds.

Pro-Power Three

DESCRIPTION: Same as Pro-Power Four, except without the LED power meters.

Pro-Power One

DESCRIPTION: Same as Pro-Power Three, except in a smaller, non-rack-mount chassis, 8½"Wx5¼"Hx12"D, 20 pounds.

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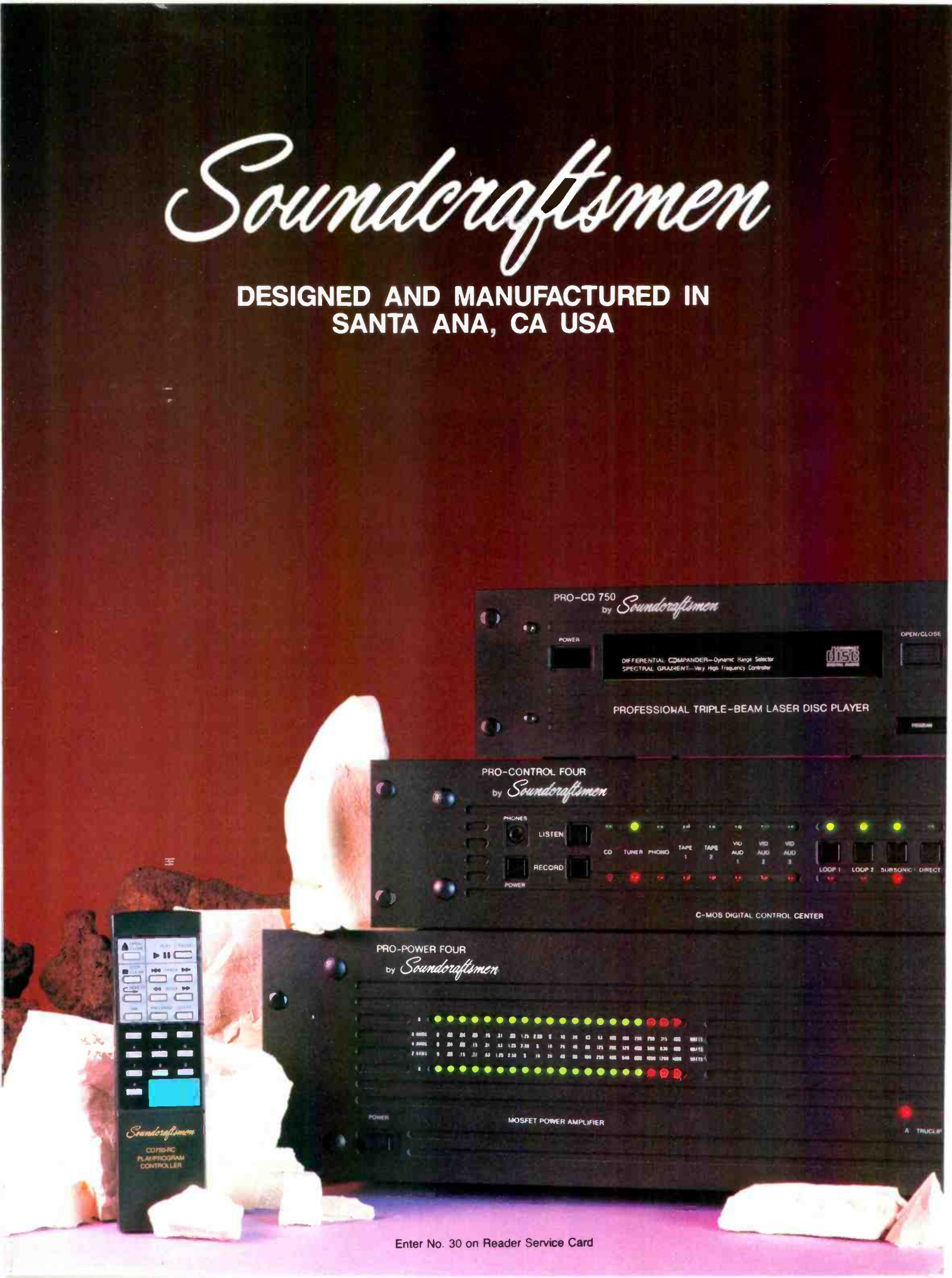

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ELECTROSTATIC SPEAKERS

Theory and Practice

Ronald Wagner

PART I

The primary purpose of a loudspeaker is to convert electrical energy into acoustical energy. This transfer, in a conventional or electromagnetic speaker, is a function of the force produced by a magnetic field. Basically, this type of speaker is made by connecting a coil of wire, wound on a form, to a paper or plastic cone. The coil is positioned inside a magnetic field produced by a permanent magnet. As the current from an audio amplifier flows through the coil, it creates another magnetic field. The relative polarity of the two fields will either produce a force of attraction or repulsion. The cone, which is attached to the coil, will follow this movement and will excite the air molecules next to its surface. This molecular movement will travel in waves away from the source. When it is detected by the ear, the brain will interpret this motion as a sound coming from the loudspeaker.

While the above type of sound reproducer is the most common, it is not the only type of transducer that can shift energy from the electric to the acoustic realm. Many aficionados of sound reproduction have discovered the outstanding performance of electrostatic loudspeakers (ESLs).

The name alone implies that there is a difference between electrostatic and electromagnetic speakers. While a conventional speaker relies on the force produced by a magnetic field, an ESL uses an electric field to accomplish a similar task. Because the electrostatic forces are usually smaller than their electromagnetic counterparts, the material that moves the air molecules must be much lighter.

HISTORICAL BACKGROUND

The principles which govern the performance of an ESL have been known for many years. The development of ESLs, however, was hindered by numerous problems. In the early days (before World War II), the limitations were mainly in the materials needed to make the diaphragm. Although this problem reduced the commercialization of ESLs, it did not stop their development. One inventor's solution was to make the diaphragm out of a cloth that had been impregnated with a metallic thread.

Ronald Wagner is the author of Electrostatic Loudspeaker Design and Construction. *Since 1968, he has been experimenting with electrostatic loudspeaker design.*

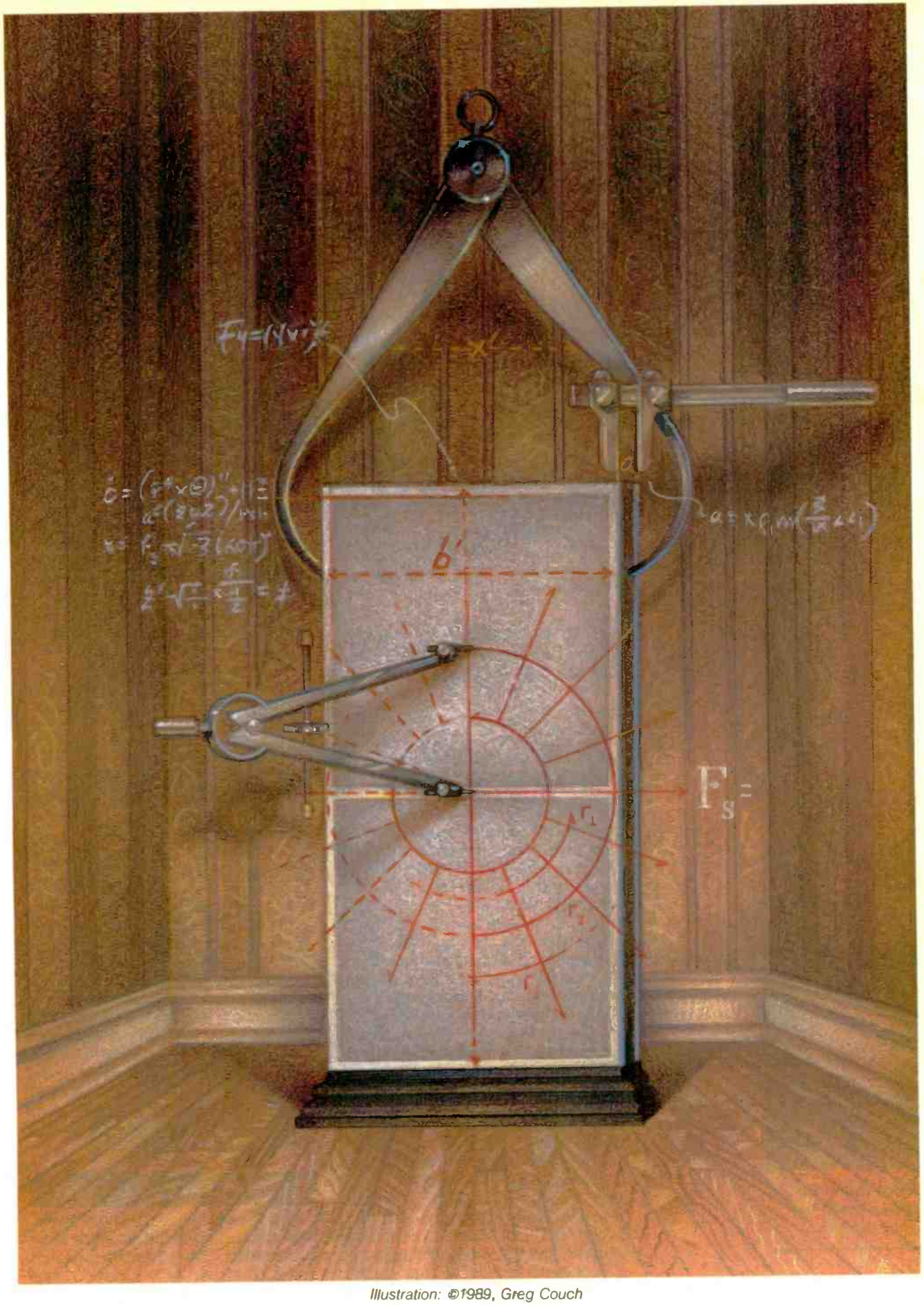
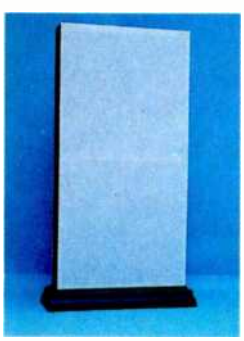


Illustration: ©1989, Greg Couch

ELECTROSTATIC SPEAKERS ARE NOT NEW, BUT LIMITED BASS BOOST, TECHNICAL PROBLEMS, AND HIGH COST HAVE CONSPIRED TO CURB THEIR POPULARITY.



Electrostatic loudspeaker designed by the author.

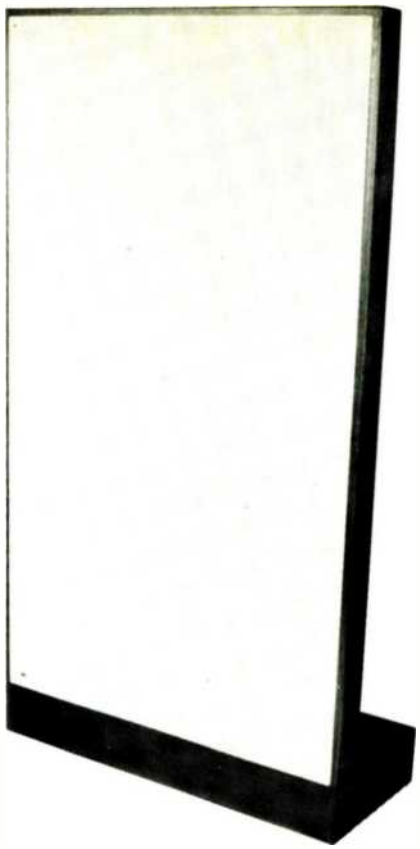


Fig. 1—An electrostatic speaker from Sound-Lab that has multiple diaphragms.

The most significant contribution to the development of the ESL was Mylar, invented by scientists at DuPont and patented in 1949. Since then, most commercial electrostatic speakers have used this material for their diaphragms. One of the first was made by Arthur Janszen. In the early '50s, Janszen produced an electrostatic tweeter array. His product was usually paired with a bookshelf speaker from Acoustic Research. Later, Janszen produced a full-range speaker, and it became known as the KLH Model Nine.

Another well-known speaker of that era was the Pickering Isophase. It was produced by the Pickering Company, which also made some of the best and most widely accepted phonograph cartridges. Unfortunately, this electrostatic speaker never enjoyed the same popularity.

In the United Kingdom, Peter Walker of the Acoustical Manufacturing Co. and D. T. N. Williamson of Ferranti Wireless Works designed and produced the first Quad electrostatic speaker. This ESL enjoyed many years of successful production, but in 1982, it was replaced by a newer and improved model, the Quad ESL-63.

Although each of the early electrostatic speakers had unique characteristics, they had trouble competing with conventional speakers. Besides having high price tags, ESLs lacked the power needed to adequately reproduce bass frequencies. Another factor affecting their acceptance was the public's opinion about what represented good bass response. Most listeners of that time associated good bass with the boomy box speakers that were popular in the '50s and early '60s.

Gradually, as the public's appreciation of high-quality sound improved, so did the technology of the electrostatic speaker. The Quad Model ESL-63, for instance, has an increased diaphragm area and uses an electrical delay line to create a sound field with a spherical wavefront. Not only is this a significant accomplishment for a flat diaphragm, but the result closely resembles the way a sound is produced by an ideal source.

In the early '70s, the engineers at Koss came up with another interesting concept for improving the performance of ESLs. Their idea was to increase the number of diaphragms. Many years later, in 1985, Harold Beveridge patented a technique for making a multiple-diaphragm speaker. Today, the Sound-Lab Co. of Park City, Utah makes an electrostatic speaker (Fig. 1) that uses a multiple diaphragm. It is this configuration which produces the serial function.

ELECTROSTATIC PRINCIPLES

Electrostatics is the science of electricity which deals with objects that have been electrically charged. When an object is charged, it will be surrounded by an electric field. This field, in turn, will produce a corresponding electrostatic force. If an uncharged object is brought near one that has been charged, it will be influenced by the force which surrounds the charged object. When two charged objects are situated near each other, they will produce an interactive force. The direction of this force is determined by the polarity of the charges and is similar to the force that exists around two magnets. That is, like charges will repel each other, and unlike charges will have a force of attraction.

ELECTRIC CHARGE

People are usually aware that liquids, gases, and solids are made up of many atoms. Every atom, in turn, has two basic parts. In the center is the

core, or nucleus, which has a positive charge. Orbiting this core is one or more electrons, each of which has a negative charge. The material's characteristics will determine how many electrons revolve around the nucleus. In most materials, the positive charge on the nucleus is equal to the negative charge produced by the electrons; thus, the atom remains neutral.

One important characteristic of an atom is its ability to gain or lose electrons. When it gains an electron, an atom is called a negative ion. This means that it will have a negative charge. Similarly, if an atom loses an electron, it becomes a positive ion and will have a positive charge.

The charge acquired by an object is determined by the total number of electrons revolving around the nucleus of each atom. Normally, this charge is very small, which makes it inconvenient to use in calculations. To overcome this situation, electrical charge is measured in coulombs; 1 coulomb is equal to 6.28×10^{18} electrons.

ELECTRIC FIELD

If a spherical object is electrically charged, there will be a uniform electric field surrounding it. This is shown in Fig. 2. The lines spreading out from the sphere represent the lines of the electric field, which diverge as they get farther away from the sphere. The strength of the field, at any distance, is dependent on the number of lines per unit area. At the inner arc (r_1), the electric field is greater than at the outer arc (r_2). For any position around the charged sphere, the strength of the electric field can be calculated by:

$$F_s = \frac{k \times Q}{R^2} \qquad (1)$$

where F_s is the field strength, in newtons per coulomb; k is a constant that depends on the units of measurement (in this case, 9.07); Q is the electric charge, in coulombs, and R is the radial distance from the sphere, in meters.

FORCE OF AN ELECTRIC FIELD

If an object is located some distance from a charged sphere, it will be influenced by the force of the electric field. This force can be calculated by:

$$F = F_s \times Q \qquad (2)$$

where F is the force, in newtons. The above formula only applies to a single object that has been placed in an electric field. It also assumes that the object is small and does not disturb the electric field produced by the sphere. When two charged objects are near each other, the force between them is equal to:

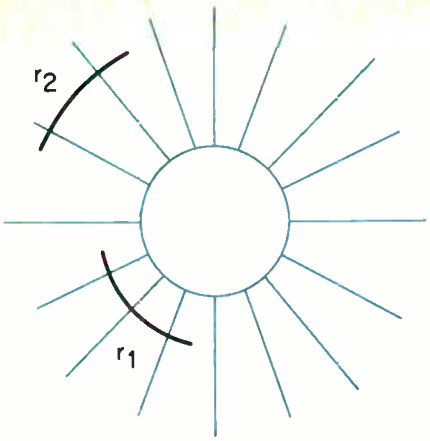


Fig. 2—Electric field around a charged object. Note how field density (strength per unit area) decreases from position r_1 to position r_2.

$$F = \frac{k \times Q1 \times Q2}{R^2} \qquad (3)$$

where Q1 is the charge on one object; Q2 is the charge on the other object, and R is the distance between objects, in meters. As an example of this last equation, suppose two spheres are located 1 meter apart. Each of the spheres has a negative charge of 1 coulomb. The force between the spheres (equation 3) is equal to:

$$F = \frac{9.07 \times -1 \times -1}{1^2}$$

$$= 9.07 \text{ newtons.}$$

Multiplying this result by 0.248 will produce an answer in pounds of force. Because both spheres have the same polarity, the force between them is one of repulsion. Changing the charge polarity, on either one of the spheres, will produce a force of attraction.

SPEAKER CAPACITANCE

In electronics, a device that has two or more plates and stores energy in an electric field is called a capacitor. An electrostatic speaker is analogous, in this respect, because it will store energy in the electric field between the plates and the diaphragm.

In an ESL, the energy-storage capacity is determined by the size of the

THE CHARGED PLATES OF AN ELECTROSTATIC LOUDSPEAKER DEFINE IT AS A CAPACITOR. THEREFORE, SUCH A SPEAKER STORES ENERGY.

IT'S EASIEST TO PICTURE AN ESL IF YOU THINK OF IT AS A CHEESE SANDWICH, WITH ITS PLATES SERVING AS THE BREAD AND ITS DIAPHRAGM AS THE CHEESE.

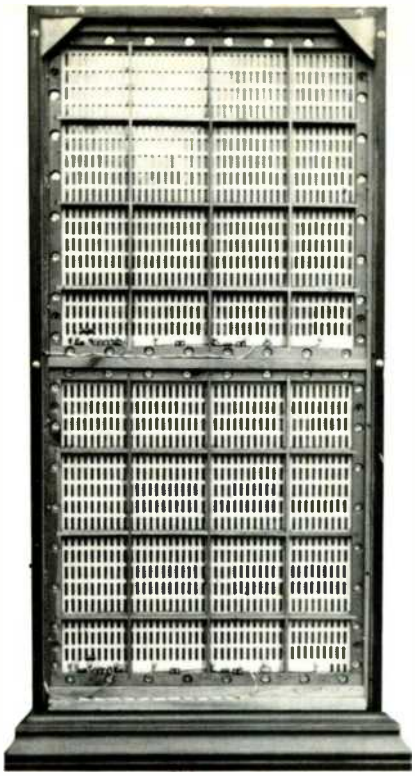


Fig. 3—An electrostatic speaker without its grille cloth. Note the grid perforations in the plate. (From Electrostatic Loudspeaker Design and Construction, *by the author.)*

plates and by the distance between them and the diaphragm. This capacity is measured in an electrical unit called the farad. The difficulty associated with the farad is that it is too coarse or large. Therefore, the storage capacity for a capacitor or an electrostatic speaker is indicated in smaller units, such as the microfarad (μF) or the picofarad (pF). The microfarad is one-millionth of a farad, while the picofarad is one-millionth of a microfarad.

The storage capacity of an ESL is also dependent on the material that separates the plate from the diaphragm. Usually, this space is filled with air, and the capacity can be determined by:

$$C = \frac{k \times A}{d} \qquad (4)$$

$$= \frac{8.85 \times 10^{-12} \times A}{d}$$

where C is the storage capacity, in farads; k is a constant that assumes the separation is filled with air and is equal to 8.85×10^{-12}; A is the area of the plates, in square meters, and d is the distance between either plate and the diaphragm, in meters. For a speaker with a plate size of 24 inches × 24 inches, the equivalent area is 0.372 square meter. If the distance between either one of the plates and the diaphragm is 0.0625 inch, this corresponds to 1.5875×10^{-3} meter. Using these metric values in equation 4, the storage capacity for this speaker becomes:

$$C = \frac{(8.85 \times 10^{-12})0.372}{1.5875 \times 10^{-3}}$$

$$= 2{,}074 \text{ pF.}$$

This is the capacity between the diaphragm and either one of the plates.

At this point, most of the basic factors pertinent to the field of electrostatics have been defined. This information can now be used to describe how they are incorporated into an electrostatic speaker. Before doing this, however, the following section will briefly describe how an ESL is made.

ESL CONSTRUCTION

The photograph shown in Fig. 3 is an ESL with its grille cloth removed. This particular speaker system consists of two speaker panels plus some associated electronics. Because the two panels are the same, the following description can be applied to either one.

The easiest way to visualize how an electrostatic speaker is made is to think of it as a cheese sandwich. The "bread" is a pair of plates. In addition to being conductive, the plates must also be acoustically transparent. This is accomplished by making them out of a perforated material whose open area is approximately 50% of the total plate area.

The "cheese" is a thin, movable, conductive diaphragm. Just as a real sandwich's cheese and bread are often separated by butter, the speaker's diaphragm and plates are isolated by a layer of air. The diaphragm is supported by stretching it over a set of spacers located at the outer edge of the speaker panel. The diagram in Fig. 4 illustrates the basic construction of an electrostatic speaker.

ESL ELECTRICAL CHARACTERISTICS

The electrical characteristics of an ESL can be divided into two parts. The first will cover those factors that are associated with a stationary diaphragm, and the second will address what happens when the diaphragm is moving.

The charge used in an electrostatic speaker is produced by a high-voltage

power supply. Its purpose is to establish a linear electric field between each of the plates and the diaphragm. Its output voltage is determined by the type of speaker. A bass speaker, for instance, has a large plate-to-diaphragm separation. To establish the same linear electric field, it will require a greater voltage than either a mid-range driver or a tweeter requires. As shown in Fig. 5, this power supply is connected between the two plates and the diaphragm.

DIAPHRAGM FORCE

When the high voltage is applied, each plate produces a force of attraction for the charge on the diaphragm. This force is equal to:

$$F = \frac{9.07 \times Q}{d^2} \qquad (5)$$

This equation is similar to equation 1 in the section on the electric field. In this case, Q is the charge between either of the plates and the diaphragm. Its value can be determined by:

$$Q = C \times V \qquad (6)$$

where C is the plate-to-diaphragm capacity in farads, and V is the voltage between the plates and the diaphragm. For a loudspeaker having a capacity of 2,074 pF and a power supply, or bias voltage, of 3,000 V, the charge is:

$$Q = 2.074 \times 10^{-9} \times 3{,}000$$
$$= 6.22 \times 10^{-6} \text{ coulomb.}$$

Inserting this value into the force equation (equation 5) provides the following result:

$$F = \frac{9.07(6.22 \times 10^{-6})}{(1.5875 \times 10^{-3})^2}$$
$$= 22.4 \text{ newtons or } 5.55 \text{ pounds.}$$

Because the diaphragm and the conductive plates have opposite polarities, the force is one of attraction and tends to draw the diaphragm toward the plates. Because of the speaker's symmetrical construction, the diaphragm stays in stasis, equally attracted toward each plate.

FIELD STRENGTH

The application of a voltage between the plates and the diaphragm brings to bear another important speaker characteristic. In this case, it is the strength of the electric field. This value is usually specified in volts per mil (V/mil) and can be calculated by:

$$E = \frac{V}{d} \qquad (7)$$

where E is the field strength, in V/mil, and d is the distance between either plate and the diaphragm, in mils (1 mil

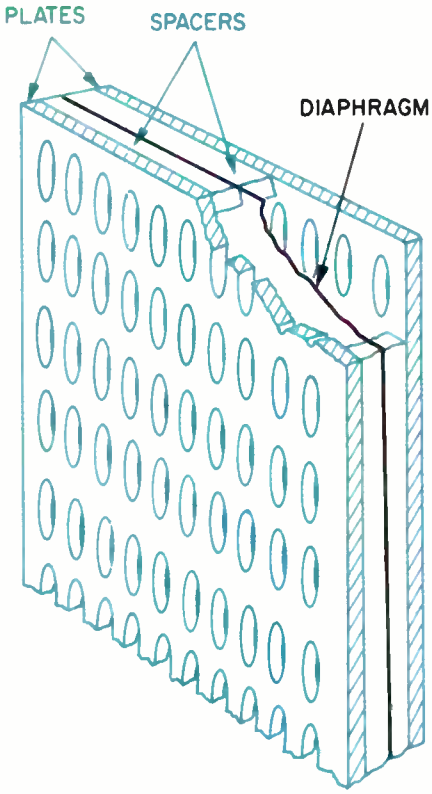


Fig. 4—In an electrostatic speaker, a moving diaphragm is fastened by spacers halfway between two charged plates.

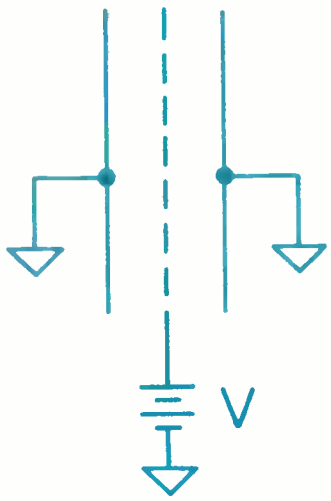


Fig. 5—The d.c. polarizing (bias) voltage is applied between the two plates and the diaphragm. See text.

THE HIGH-VOLTAGE POWER SUPPLY ESTABLISHES THE CHARGE ON THE PLATES AS WELL AS ON THE DIAPHRAGM; THE BASS DRIVER WILL NEED A HIGHER VOLTAGE THAN A UNIT FOR TWEETER USE.

USE OF A SYMMETRICAL CONSTRUCTION, WHERE THE DIAPHRAGM IS PLACED IN STASIS, PRODUCES AN EQUAL ATTRACTION BETWEEN THE DIAPHRAGM AND EITHER OF THE TWO PLATES.

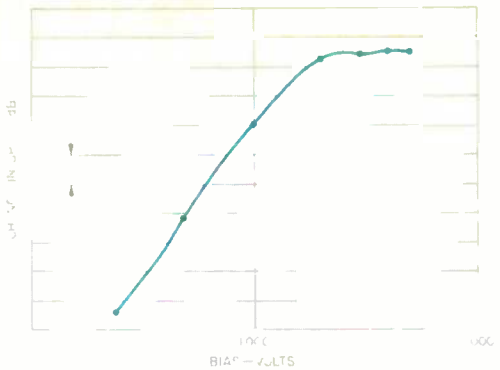


Fig. 6—How bias voltage affects speaker output for a 100-Hz test signal.

equals 0.001 inch). For a speaker with a plate-to-diaphragm spacing of 0.0625 inch and a polarizing voltage of 3,000 V, the field strength is 3,000 divided by 62.5, or 48 V/mil. The significance of this parameter is implied by Fig. 6, which shows how changing the polarizing voltage affects speaker output level.

FIELD STRENGTH LIMITS

The maximum limit to the field strength is determined by the material used to separate the charged surfaces. During an electrical storm, you see what happens when this material limit is exceeded. The two charged bodies have produced a very large electric field. When the strength of this field exceeds the limit of the material that separates them—in this case, the air—there is a flash of lightning.

For an ESL, the maximum limit is determined by the strength of the air gap. If enough voltage is applied across the plate-to-diaphragm spacing, the air between the plate and diaphragm will also break down. When that happens, a spark will jump between the two charged surfaces. The maximum voltage that can be placed across the air gap of an electrostatic speaker is 75 V/mil.

MAKING THE DIAPHRAGM MOVE

The preceding material has described some of the factors that affect an ESL with a stationary diaphragm. To make the diaphragm move, the plates must be connected to a source of a.c. voltage. The method for applying this voltage is shown in Fig. 7A. When the a.c. voltage from the source (e_s) is zero, the diaphragm will be in its centered position. As the source voltage increases, it will produce an a.c. voltage between points a and c in Fig. 7A.

The polarity of the voltage on the plates is determined by both the transformer connections and the a.c. signal. If the voltage between a and b has positive polarity, then the voltage between b and c will be equal in amplitude but have negative polarity. When the alternating voltage has reached its positive peak, the diaphragm will have reached the maximum limit of its excursion. In Fig. 7A, it will be closer to the plate connected to terminal c of the transformer. When the voltage reverses itself and the input reaches its negative peak, the diaphragm will be closer to the opposite plate.

In his 1954 book, *Electroacoustics*, F. V. Hunt of Harvard defined the relationship between the alternating voltage and the force on the diaphragm. Hunt stated that if an ESL uses a constant potential difference to establish a force on a moving diaphragm, it will have a nonlinear output; i.e., its output will be distorted. The solution he proposed was to create a constant charge on the diaphragm, achieved by placing a very large resistance in the power supply's output (Fig. 7B). The resistor does not affect the static force produced by the bias voltage.

To maintain a constant charge, the moving diaphragm must not produce a current flow in the resistor. This is accomplished by making the time constant, T = RC, very long. The R in this equation is the value of the resistor, and C is the speaker's capacitance. If the time constant is greater than the half period of the speaker's lowest frequency, there will be no current flow through the resistor, and the diaphragm will have a constant charge.

Once the diaphragm is charged, the a.c. voltage between a and c will produce an alternating force. When this voltage reaches its peak value, the force of attraction on the charged diaphragm is equal to:

$$F = E \times Q \qquad (8)$$

where E is the field strength, in volts per meter (V/meter), and Q is the charge on the diaphragm.

To obtain the maximum acoustic output, the peak-to-peak value of the a.c. voltage must be equal to the field intensity set by the charging voltage. Because the plate-to-plate separation is twice the plate-to-diaphragm spacing, the a.c. voltage must be at least twice the charging voltage. For a field intensity of 48 V/mil and a spacing (plate to plate) of 125 mils (0.125 inch), the a.c. voltage must be 6,000 V. Converting mils to meters, our field intensity of 48 V/mil comes to 1.9×10^6 V/meter.

We have previously calculated a diaphragm charge of:

$$2{,}074 \text{ pF} \times 3{,}000 \text{ V} = 6.22 \times 10^{-6} \text{ coulomb.}$$

Using equation 8, we multiply this charge by the field intensity to derive the force:

$$F = (1.9 \times 10^6)(6.22 \times 10^{-6})$$

$$= 11.82 \text{ newtons.}$$

DIAPHRAGM POWER

The power required to move the diaphragm can be determined by using the rms values for both the force and the distance. That is:

$$P = \frac{F_{rms} \times d_{rms}}{t} \qquad (9)$$

where P is the power required to move the diaphragm, in watts, and t is the time required to move the diaphragm. For a frequency of 100 Hz, this power is equal to:

$$P = \frac{\left(\frac{11.82}{2} \times 0.707\right)\left[\left(3.175 \times \frac{10^{-3}}{2}\right) 0.707\right]}{0.01}$$

$$= 0.468 \text{ watt or } 468 \text{ mW.}$$

At this point, we've covered the history of electrostatic speakers, basic electrostatic principles, and an analysis of the forces that make the diaphragm move. In Part II, we'll cover the transformer that acts as a signal interface between an amplifier and an ESL's diaphragm, acoustical parameters, and ways to improve an ESL's performance.

Suggested Reading

Hunt, F. V., *Electroacoustics*, Harvard University Press, Cambridge, Mass., 1954. (This book has recently been republished by the Acoustical Society of America.)

Wagner, Ronald, *Electrostatic Loudspeaker Design and Construction*, Tab Books, Blue Ridge Summit, Pa., 1987.

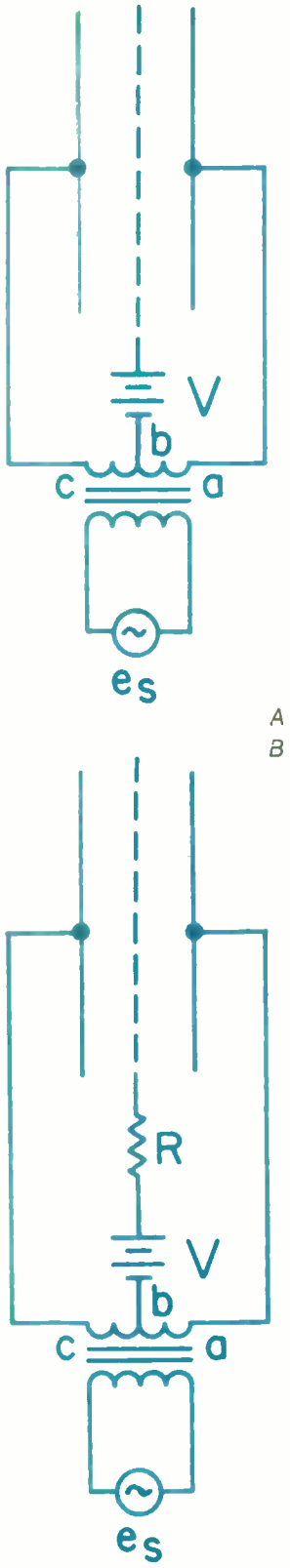


Fig. 7—Two ways of connecting d.c. bias and a.c. signals to an ESL. While simply coupling the signal to the plates (A) will work, the addition of a large resistance in the output power supply (B) keeps the diaphragm charge constant, for more linear operation.

APPLYING THE SIGNAL TO THE PLATES CHANGES THE VOLTAGE ON THEM, AND THE DIAPHRAGM IS ALTERNATELY ATTRACTED TO EACH PLATE.

Putting The Byte On Noise

Michael Wright

NoNoise From Sonic Solutions

Noise. Nasty interference that might be music to the ears of a John Cage but is more like Public Enemy Number One to audiophiles. For years, audio engineers have worked assiduously to keep this sonic miscreant on the run, improving hardware and wielding noise-reducing weapons with names like Dolby and dbx.

Enter the digital revolution, with its expanded frequency response and, more important, dramatically lowered noise floor. Record companies, scrambling to rush out catalogs in the new CD format, came face to face with the old nemesis again. Tape hiss, clicks, and pops stood ready to blare out of the background silence. How to fight back?

There's a promising new weapon in the arsenal of the Sound Police that uses computer treatment to de-noise the legacy of primitive recording techniques and deteriorated masters which hampers our enjoyment of a rich musical heritage. Called NoNoise by its inventors at San Francisco's Sonic Solutions, it's a method that's gaining rapid acceptance among producers.

You might say this new technology is another offspring of *Star Wars* (the movie, not the defense initiative). Sonic Solutions was founded in 1986 by Robert Doris, President; Mary Sauer, Vice President of Marketing and Operations, and James A. Moorer, Vice President of Audio Development, who were all involved with digital systems for film and television post-production at the Lucasfilm subsidiary, The Droid Works.

What is NoNoise? In a nutshell, it uses very sophisticated digital signal-processing software—combined with human interaction—to de-noise digitized audio data (usually) derived from analog sources.

Prior to receiving NoNoise treatment, the best analog source material available—anything from old 78-rpm records to shellac, metal, glass, acetate, multi-track tape, or even optical film soundtrack masters—is transferred by the record company to digital audio tape, usually the Sony PCM-1630 format, the current standard for CD master tapes. This digital audio data is then loaded via a special interface from the Sony PCM-1630 processor onto two very large 700-megabyte computer disk drives. Because digital audio is so data intensive, the storage requirements are enormous. In the Sony 1630 format, for example, there are 44,100 16-bit samples per second, requiring almost 11 megabytes of storage for each minute of recorded material. The NoNoise disk drives can hold roughly one hour of stereo music. If this amount of data were in the form of a written text, it would be 500,000 pages long!

Essentially, NoNoise is a two-phase process that combats two categories of noise: Transient or impulsive clicks and pops, and recurrent or ongoing hiss, surface noise, rumble, buzz, and hum. To achieve the best results, Sonic Solutions generally prefers to work with a flat transfer from the original recording. Equalization applied before de-noising usually brings up background noise, so it is typically performed after removal of tape hiss or background noise in order to give the producer more flexibility in applying EQ.

The NoNoise process begins with a visual analysis or diagnosis, which involves browsing through graphic waveform displays of the music presented in both time and frequency domains. This allows the operator to evaluate the extent of noise pollution and to identify areas which might present special problems. This review is repeated after treatment.

De-noising then begins with work on transient noise. Until NoNoise, the primary technique for eliminating clicks and pops involved editing them out of the program, leaving a minuscule gap—anywhere from 5 to 10 mS—in the music signal. Usually, this is closed up, slightly altering the piece's timing.

NoNoise transient processing involves not only removing the noise, but

ILLUSTRATION: JOHN HART

Jim Morrison

Once the recording has been digitized and fed into the computer, a human operator must scan it to determine what work must be done.

Duke Ellington

NoNoise removes clicks and pops without leaving holes in the music. It computes, synthesizes, and fills in the missing waveforms.

actually resynthesizing the waveform as well. Clicks and pops appear as spikes or plateaus on the waveform graphs (Fig. 1). Parameters are selected, and the NoNoise software automatically seeks out the aberrations and performs microsurgery. Once the offending noise is excised, the software employs artificial-intelligence techniques to sample the waveform areas surrounding the operative site. It then digitally reconstructs the sound beneath the click, using estimated projections based on the sampling of the surrounding waveforms (Fig. 2).

More difficult than excising transient noises, however, is the problem of lowering the noise floor—reducing recurrent hiss and background or surface noise. This is made even more complicated by the fact that noise frequencies usually coexist with program signal. It is at this point that the gray areas of aesthetics, subjective producer judgment and experience, and record company objectives also enter into the equation.

Without NoNoise, the primary techniques for handling continuous noise included re-equalization (especially rolling off high-end frequencies and boosting others), notch filtering, and broadband analog noise gating. Depending on how heavily they're used, these methods almost always result in a significant alteration of both the harmonic content and original intent of the music.

NoNoise de-hissing begins by seeking out as pure a sample of noise as possible. Ideally, this sample would be taken from a place without any program signal, such as at the head before the music begins, at the tail after a fade, or in a caesura between phrases. If no pure sample is available, the best noise sample possible is selected and its frequency spectrum edited by an operator to eliminate music or program content. This noise sample then becomes a noise "fingerprint" which is unique to each recording and is the critical element in the de-noising program.

At this point, the producer must decide how heavily the de-noising is to be applied. "Treatment can be light, medium, or heavy, depending on the noise level of the source and what the producer wants," explains Mary Sauer. "The heavier the treatment, the more the potential impact on the music." Tests are run to see how various parameters affect the music. Since these tests are conducted on perfect digital "copies" residing on the computer drives, variations may be spun out until the desired result is achieved.

In essence, what follows is a very sophisticated form of digital filtering directed by artificial intelligence. The audio data is divided into more than 2,000 very precise frequency bins. Each of these is analyzed, in turn, by the computer, using an elaborate algorithm which compares the sonic energy level of the program signal in each bin to the noise fingerprint.

If the signal energy level in a given frequency bin is greater than the fingerprint's parametric threshold, the signal is left untouched. If signal energy level is less than the noise fingerprint, an attenuation factor is applied to reduce the noise. Figure 3 shows a waveform display of an untreated piece of music and a close-up view of the energy spectrum between 11 and 12 kHz, where very little program signal, but much noise, is present. Figure 4 shows the same waveform and energy view after treatment. The music signal is virtually identical and intact (ex-

James A. Moorer, Sonic Solutions' Vice President of Audio Development, at the keyboard of the company's Macintosh-based work station.

cept for the removal of noise spikes). The energy spectrum from 11 to 12 kHz, however, shows that the average energy of the peaks has shifted down about 13 dB, from −92 to −105 dB.

This analysis and filtering is done continuously throughout the piece of music; during de-hissing, more than 53 million separate calculations will be performed on each second of sound! Complete final processing of the master is accomplished automatically, usually overnight. De-noising one hour of music takes roughly 8 to 10 hours. A de-noised digital master tape is made, and the record company can then begin its final prep work (editing, mixing, equalization, etc.).

That's how NoNoise processing works. How *well* it works is another question. As with situational ethics, the answer is, "It depends."

First of all, in terms of the elimination of *transient* noises and signal reconstruction, NoNoise is a stunning success. The most dramatic example of this kind of treatment can be heard in the reclamation of the audio portion of The Doors' 1968 concert film *Live At The Hollywood Bowl*, a CD version of which has been released by Elektra (60741-2). At the beginning of the performance, Jim Morrison knocked loose the mike lead running to the mobile recording unit. The PA system was unaffected, so the concert proceeded; it took engineers almost 15 minutes to isolate and correct the problem. The resulting noise rendered the footage useless until NoNoise was brought to bear, removing the noise caused by the loose connection and restoring Morrison's vocals. This saved an otherwise irretrievable event from oblivion. On the CD, you cannot tell that any of this happened.

Perhaps not as spectacular, but no less dramatic, have been the restorations performed on the RCA Bluebird CD releases of quintessential jazz from Duke Ellington, Bix Beiderbecke, and many others whose original masters have experienced substantial deterioration over the last 40 or 50 years. "Until we discovered NoNoise, we could not realistically produce CDs of performances from the pre-tape era, a cornerstone of the RCA jazz catalog," says executive producer Steve Backer. "Our goal was to remove the noise without distorting the music."

"For the typical song in the RCA project, we removed around 800 clicks," adds Sonic Solutions production man-

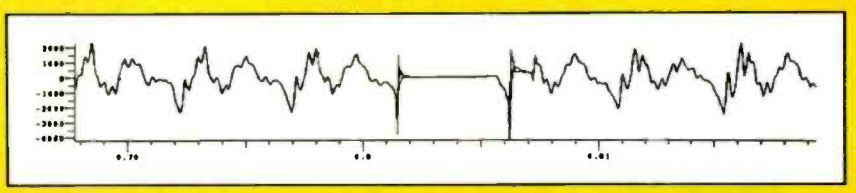


Fig. 1—Music waveform with two clicks and a dropout, from film soundtrack of Jim Morrison and The Doors, Live At The Hollywood Bowl.

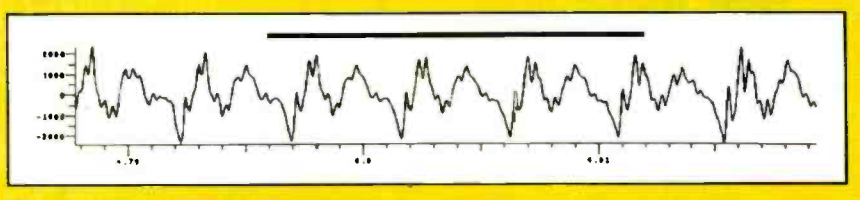


Fig. 2—Same waveform as Fig. 1 after de-clicking and reconstruction using the NoNoise process. The black bar shows where the signal has been reconstructed.

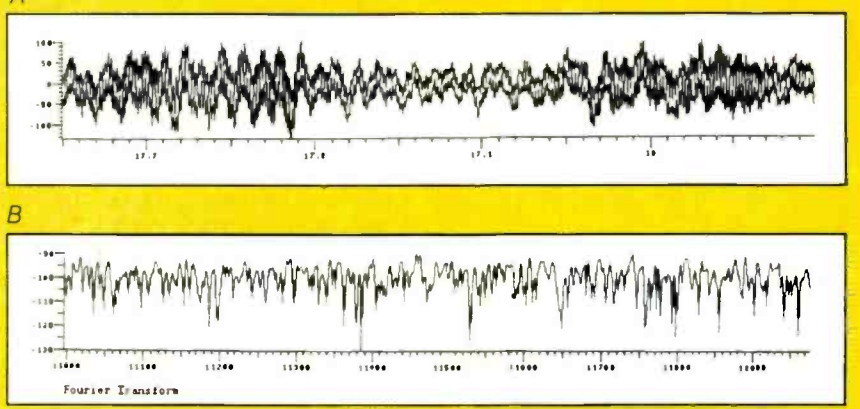


Fig. 3—Waveform of noisy signal (A) and close-up view of its energy spectrum from 11 to 12 kHz (B). For this signal, the energy in that spectral region is almost all noise.

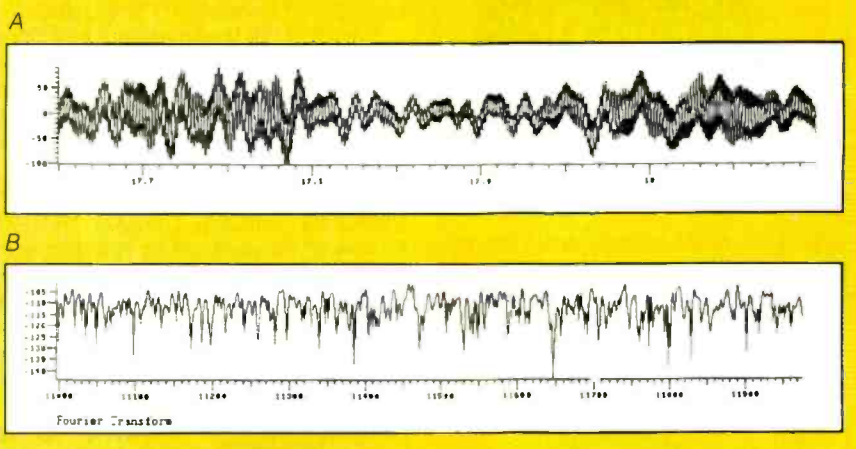


Fig. 4—Effects of NoNoise treatment on the signal of Fig. 3. Note that removal of the noise spikes from the waveform (A) has also reduced its amplitude, as shown by the scale at left, but has left its overall shape unchanged. The amplitude loss is even more marked (again, note the left-hand scale) in the noise-ridden spectral region from 11 to 12 kHz (B).

Courtesy of Sonic Solutions

Jelly Roll Morton

NoNoise de-hissing begins with the search for pure noise, uncontaminated by program material, to get its sonic fingerprint.

Michael Ochs Archives

The Grateful Dead

The basic problem is that noise and music coexist in the same frequency ranges, although the type of music also plays a part.

ager John Polito, "and in some tracks, as many as 3,500." A good example can be heard on Jelly Roll Morton's *The Pearls* (Bluebird 6588-2-RB), which still exhibits clicks and pops on some tunes but is vastly superior to the original.

The results of NoNoise treatment were presented in A/B comparisons at a recent press audition, and the contrast was truly impressive. You can perhaps simulate the effect if you have access to any of the original 78-rpm records and can play them side by side with the CD.

Another example worth noting is from Philips' Legendary Classics series of recordings, many of which rely heavily on NoNoise processing (as discussed by Bert Whyte in "Behind the Scenes," August 1988). Because the masters were just too noisy, Philips had held back on CD releases of many of these historically significant recordings—dating back as far as 1928—by Casals, Monteux, Richter, and others.

Specifically, you can hear the results on the Dvořák Concerto in B Minor for Cello and Orchestra, Opus 104, with Emanuel Feuermann and the National Orchestral Association under Leon Barzin, recorded in New York in 1940 (Philips CD 420 776-2). While again you'll have to imagine the difference—unless you have an original—the master for the CD has been remarkably restored. You will still hear a great deal of surface noise, but the improvements are amazing. Fortunately, Philips produced a press-only CD which included A/B snippets from the series, so I have been able to compare the results.

Even though the treatment has been expensive—as much as $6,000 for one CD—Philips is pleased with the results. "We strove to keep the signal as close as possible to the original music, affecting only the noise itself," explains Taadatsu Atarashi, Vice President of Marketing of Philips Classics. Indeed, Philips is so pleased, it has licensed the use of NoNoise in Europe and Japan, hoping to establish a universal standard.

However, when evaluating the de-hissing process—removing *recurrent* noise—certain limitations of NoNoise treatment become apparent. To be fair, this is a very complex situation because these limitations are partly inherent, partly technological, and partly due to subjective factors which include the values and experience of the producer.

Issues such as type of music, instrumentation, and condition of the original aside, the primary inherent problem is simply that noise and music coexist within the same frequency ranges. And as long as the music is to be preserved, this noise cannot be entirely removed. Even with vastly greater computer processing power than is currently available, performing much finer sonic microsurgery (a costly proposition at this point in time) and eliminating noise through subtraction can never be absolute. In technological terms, this problem may never be overcome unless we're willing to allow digital reconstruction techniques far more complex than already discussed.

Certainly, in frequency ranges where no program signal is present, NoNoise is extremely effective. This can be easily observed in treated recordings. Listen, for example, to the 1962 recording of Stravinsky's *L'Histoire du Soldat* (Philips CD 420 773-2), featuring Jean Cocteau and Peter Ustinov under Igor Markevitch's direction. In the extended, unaccompanied dramatic passages, the noise reduction is particularly effective.

Also, in music where the program signal is maintained at a fairly constant level, either because of denser orchestration (e.g., symphonic music) or style (e.g., rock or be-bop), NoNoise performs splendidly. Check out the Warner Bros. reissue of The Grateful Dead's *Europe '72* (2668-2) for a good example of material that was recorded under less than ideal conditions but still generally sounds excellent after NoNoise treatment, with just a smidgen of hiss audible.

The real problem arises with music which is sparsely orchestrated (e.g., solo instruments) or has a very wide dynamic range. As long as the signal overpowers the noise, your ear is likely to ignore distractions such as hiss. But in quiet passages or as notes decay, the presence of hiss can actually seem exaggerated. This results in a disturbing "noise pumping" effect which can be quite disconcerting.

This can be heard on Volume 3 of MCA Classics' *The Segovia Collection* (MCAD-42069), which features some of *El Maestro*'s favorite works. To begin with, the classical guitar has such a fragile sound that it is already closely intertwined with hiss. When it plays forte, however, the hiss begins to recede. But as phrases conclude or the instrument turns dolce, the hiss surges

De-Noised Discs

Here is a partial list of titles processed by Sonic Solutions and NoNoise. In most cases, the entire master was processed; however, on some discs (notably The Beatles'), not all songs were de-noised. No track-by-track information is available from record companies. Although some labels, such as Philips and RCA, publicize use of NoNoise and feature the logo on treated recordings, others are very shy about admitting use of any treatment. ***M.W.***

Michael Ochs Archives

Jazz & Blues Recordings

Louis Armstrong, *Pops: The 1940s Small-Band Sides* (Bluebird 6378-2-RB). Classic combos; clean and consistent throughout.

Sidney Bechet, *The Legendary Sidney Bechet* (Bluebird 6590-2-RB). Recordings from 1932 to 1941 with various groups; amazingly clean and consistent; remarkable job.

Duke Ellington, *The Blanton-Webster Band* (Bluebird 5659-2-RB, three CDs). Super-smooth Duke from 1939 to 1942; clean and clear all the way through, with only a hint of noise at higher volumes.

Duke Ellington, *Black, Brown & Beige* (Bluebird 6641-2-RB, three CDs). A tad more hiss and surface noise than on *The Blanton-Webster Band* and from more diverse sources; still excellent, quintessential Duke from 1944 to 1946.

Duke Ellington, *The Great Ellington Units* (Bluebird 6751-2-RB). Extremely low hiss; mixed surface noise depending on the source; excellent 1940 to 1941 anthology.

Paul Horn, *Inside* (Rykodisc RCD-10040). Classic jazz event primitively recorded inside the Taj Mahal in 1969; greatly reduced tape hiss, although still audible at louder volumes.

Jelly Roll Morton, *The Pearls* (Bluebird 6588-2-RB). Hot classics given new life; noise floor dramatically reduced but occasionally inevitable surface noise due to 78-rpm sources.

Various, *At The Jazz Band Ball: Chicago/New York Dixieland* (Bluebird 6752-2-RB). Northern versions of 1929 to 1939 Southern jazz; remarkably clean and noise free.

Various, *Classic Jazz Piano—1927-1957* (Bluebird 6754-2-RB). Very little hiss, occasional surface noise; otherwise, a superb, consistent-sounding collection.

Various, *Great Trumpets: From Jazz to Swing* (Bluebird 6753-2-RB). Great blowing from 1927 to 1946; remarkably clear and consistent, with a minimum of hiss at very high volumes.

Various, *The Metronome All-Star Bands* (Bluebird 7636-2-RB). The best jazz artists from 1937 to 1949; generally clean, with low hiss and irregular low surface noise depending on source.

Classical Recordings

Pablo Casals, *Beethoven: Piano Trios No. 7 ("Archduke") and No. 5 ("Ghost")* (Philips CD 420 855-2). Cello maestro in live recordings; No. 7 (from 1958) has slight hiss, and No. 5 (from 1961) is very clean.

Jean Cocteau and Peter Ustinov (actors) and Igor Markevitch (conductor), *Igor Stravinsky: L'Histoire du Soldat* (Philips CD 420 773-2). A 1962 recording with excellent presence; minimal noise floor remains after consistent de-hissing.

Pierre Monteux and Concertgebouw Orchestra of Amsterdam, *Beethoven: Symphony No. 3 ("Eroica")* (Philips CD 420 853-2). Great performance, great sound from 1962.

Maurice Ravel and Serge Prokofiev, *Ravel Conducts Ravel/Prokofiev Conducts Prokofiev* (Philips CD 420 778-2). Definitive pieces of mixed quality depending on source; "Boléro" hissy; "Chansons Madécasses" clear but surface noise; "Romeo and Juliet, Suite No. 2" moderately noisy.

Sviatoslav Richter, *Mussorgsky: Pictures at an Exhibition; Schubert; Chopin; Liszt* (Philips CD 420 774-2). Remarkably clean 1959 live concert with noise floor audible as volume increases.

Andrés Segovia, *The Segovia Collection, Vols. 2 & 3* (MCA Classics MCAD-42067 and MCAD-42069). Legendary performances marred by prominent hiss and noise-pumping effects.

Gérard Souzay, *Schubert: Die Schöne Müllerin* (Philips CD 420 850-2). Extremely low noise floor for sparkling 1964 performance by legendary baritone with piano accompaniment.

Rock/Pop Recordings

The Andrews Sisters, *50th Anniversary Collection, Vol. 1* (MCA MCAD-42044). Walk down Memory Lane with hits from 1937 to 1950; varying levels of surface noise still present.

The Beatles, *Past Masters, Vols. 1 & 2* (Capitol C21Z-90043 and C21Z-90044). Great-sounding classics up to the high standards of the other Beatles CD reissues; NoNoise was applied selectively to unidentified cuts.

The Doors, *Live At The Hollywood Bowl* (Elektra 60741-2). Reconstruction of severely damaged vintage 1968 live concert; excellent sound; no hint of processing.

The Grateful Dead, *Europe '72* (Warner Bros. 2668-2, two CDs). Live recording substantially cleaned up, with some hiss audible at loud volumes.

George Harrison, *All Things Must Pass* (Capitol C22V-46688). Generally good, with several hissy pieces; mildly inconsistent sonic quality.

John Lennon, *Plastic Ono Band* (Capitol C21Z-46770). Generally very good sound quality; occasional muddiness not due to NoNoise.

John Lennon, *Rock 'n' Roll* (Capitol C21Z-46707). Superb, consistently clean sound.

Liberace, *The Best of Liberace* (MCA MCAD-4060). Pop piano, with fairly steady low-level hiss noticeable in the solos.

Various, *The Disney Collection, Vols. 1 & 2* (Walt Disney Records CD002 and CD003). Hard not to like; sonically uneven due to wide variety of difficult sources (including optical soundtracks) and processing done after editing, mixing, and equalization (the reverse of recommended procedure); still, clarity is remarkable.

John Lennon

When the music and noise don't overlap, or when the program level stays fairly constant, NoNoise performs quite splendidly.

Jimi Hendrix

Background noise becomes more conspicuous if it's faded to "black" between tracks—just as your ears have gotten used to it.

or "pumps" back. You'll notice this elsewhere in the Philips' Legendary Classics series as well. I'm sure the effect was not intended by the producer, but you'll encounter it nonetheless.

There's a second related effect on the Segovia anthologies, however, which brings us back to the interesting issue of subjectivity. This involves fading to a pure, noise-free "black" which you'll hear between selections or movements. Just as the ear has adjusted to the prominent hiss, it disappears rapidly. This further serves to emphasize the background noise and would have been better handled by allowing the fade to taper more gradually, and perhaps by actually leaving a little noise in the holes.

All of the producers with whom I've spoken acknowledge that the subjective factor must be reckoned with. Independent producer Ed Michel, who has worked on many of the Bluebird reissues, says, "It's important to remember that NoNoise is a *tool* that's only as good as the way you use it."

This point about subjectivity is reiterated by Michael Jarrett of EMI's Abbey Road Studios, who employed NoNoise on the CD of John Lennon's *Plastic Ono Band* (Capitol C21Z-46770). "Once you start making aesthetic judgments," says Jarrett, "you're on dangerous ground. For example, did Lennon use dreadful-sounding effects at the beginning of *Plastic* because that's all the BBC library held at the time, or because he wanted the corny, funky sound? If you clean it up, are you distorting the intent?" Jarrett left the noise in the bell effect.

Although many consumers have come to expect *no* noise on their CDs, this may not always be practical or desirable. "NoNoise is the best available right now, and I really like the way it does its math," explains Grateful Dead producer Joe Gastwirt, who's also used NoNoise on numerous CBS, Jimi Hendrix, and other projects. "But if it comes down to hiss versus high end, sacrificing the highs for less noise isn't worth it."

"We take a conservative approach," asserts Gene Wooley, Vice President of Recording and Quality Assurance at MCA. "The integrity of the music is most important to us. NoNoise is less destructive to the audio than other methods, but even at its best, it only allows you to achieve a happy medium, one which requires subjective judgment."

Once subjectivity is admitted, other questions are implicitly raised. Gastwirt points out a concern that inexperienced producers can inadvertently affect the original material seriously. "Tastes change in terms of what frequencies are preferred," he says. "It's important that a producer be familiar with the values at the time the material was recorded. And he must know how changing one part will affect another. Not all producers working on old masters know these things."

The issue of altering intent, of altering history, becomes most poignant if record companies think that de-noising and digitizing old masters means they no longer need to keep the originals around, which is often an expensive proposition. This concern has been raised by PolyGram catalog executive Bill Levensen, who is very cautious about the NoNoise process. (Only The Yardbirds demo tapes on his recent Eric Clapton retrospective, *Crossroads*, were de-noised by Sonic Solutions.) "What happens," he queries, "when a better technique comes along, and the original art is gone?"

In the final analysis, it's important to keep in mind that NoNoise is a process that's intrinsically *archeological* in nature. That is, it's not intended, like Dolby noise reduction, to decrease noise buildup by encoding the music signal during recording and decoding it in playback. Rather, it is being used to post-process material which is already very noisy and often in a deteriorated condition. If the sources weren't imperfect to begin with, NoNoise would have no raison d'être. Therefore, any judgments must be tempered by a comparative perspective. In many cases, employing NoNoise is the audiophilic equivalent of dealing with the ravages of time and acid rain on cultural artifacts like the Parthenon.

With the Philips license in Europe and Japan and the new Mac-II version for in-house use (which also includes digital editing, EQ, and mixing facilities), NoNoise has the inside track on becoming the standard processing methodology. Producers need to be sensitive to its limitations and to the philosophical implications of using such a tool. Audiophiles should evaluate the resulting product with a realistic understanding of what's going on.

But please, record companies, hold on to those original masters! The war against nasty noises isn't over yet! A

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1

ONKYO DX-G10 COMPACT DISC PLAYER

Manufacturer's Specifications
Frequency Response: 2 Hz to 20 kHz (no tolerance given).
Sampling Frequency: 352.8 kHz (eight-times oversampling).
THD: 0.0015% at 1 kHz.
Dynamic Range: 103 dB.
S/N: 110 dB.
Channel Separation: 103 dB at 1 kHz.
Number of Programmable Selections: 16.
Output Level: 2.0 V rms.
Power Requirements: 120 V a.c., 60 Hz, 24 watts.
Dimensions: 18¾ in. W × 5⁹⁄₁₆ in. H × 16¹³⁄₁₆ in. D (47.7 cm × 14.2 cm × 42.7 cm).
Weight: 59½ lbs. (27 kg).
Price: $2,500.
Company Address: 200 Williams Dr., Ramsey, N.J. 07446.
For literature, circle No. 90

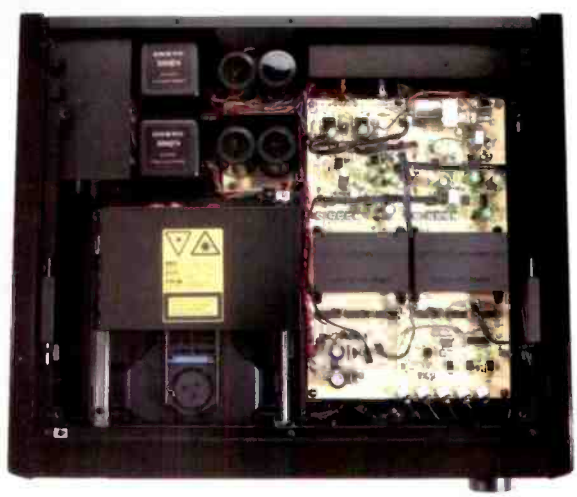
When the double-cartoned Onkyo DX-G10 first arrived at my laboratory, I was sure it was either a power amplifier or a high-powered integrated amp. After all, who would have suspected that a CD player would weigh nearly 60 pounds? But after carefully unpacking this heavyweight, it was soon obvious that this was, indeed, a Compact Disc player. It gave me the impression, even before I tested it or listened to it, that Onkyo's management must have said to its engineers, "Forget about cost! Just design the finest, most rugged, and technically sophisticated CD player you can. Let us worry about whether or not we can sell any at a $2,000+ price." In large measure, those engineers have succeeded.

Consider, first, this unit's extremely heavy weight. The DX-G10 is housed in an extremely rigid, graphite-reinforced steel chassis. The laser pickup mechanism and all modular circuit blocks are firmly anchored to this foundation. Onkyo maintains that this arrangement not only isolates the circuitry and mechanisms from any outside or external vibrations, but that it absorbs internally generated vibrations from the disc-drive motor, power transformers, and other sources.

The laser pickup assembly uses a total of four motors, each optimized for its specific task. The most critical of these, according to Onkyo, is the pickup drive motor. Here, the DX-G10 uses a linear motor capable of high-speed access.

As for circuit innovations, this is not the first time Onkyo has used a true linear 18-bit D/A conversion system, but in this unit, they have combined it with some pretty fancy optical circuitry which they call "Opto-Drive." It serves as the signal-current source for the converters, substituting an LED and phototransistor for the more conventional zener-diode current source. The phototransistor's output, says Onkyo, is far more stable than a zener's, and the optical coupling reduces the amount of interference reaching the D/A converters. To eliminate phase differences between stereo channels, two ladder-network D/A converters are used.

Another feature, which Onkyo calls "Opto-Coupling," involves electrical isolation of the digital and analog circuitry through the use of fiber optics. A total of five discrete optical fibers form a sort of "light bridge" or data link between the digital and analog sections of the player. The analog circuit blocks are fully shielded against any high-frequency interference from digital pulses. Just how much all of these internal refinements contribute to the ultimate sound quality of the player is something each listener will have to determine for himself, but I'll have more to say about it later on.



The unit comes with a full-function remote control. In addition to fixed and variable analog outputs, the DX-G10 has both optical and coaxial digital outputs, and a now-standard optical cable is supplied to hook up the digital output directly to an optical digital input on a stand-alone D/A converter or on one of those new amps which have built-in converters. (In view of the details lavished upon the Onkyo's built-in D/A conversion system, I wonder why anyone would go to that additional expense.) A "Shuttle Search" knob is used for fast-forward or reverse seeking of a specific moment of music. Various repeat-play modes are available, including A-to-B. Index points within a track may be directly accessed, and programmed play of up to 16 selections can be memorized by the player's microprocessor. You can even instruct the DX-G10 to begin play from a specific point (in minutes and seconds) within a given track by simply punching in the track number and the time.

Control Layout

Despite its rather massive appearance, the front panel of the DX-G10 is not terribly cluttered. That's because only the most used controls and pushbuttons are visible when the full-width drop-down door, along the lower edge of the panel, is in its closed position. A power switch and indicator are at the extreme left, adjacent to the disc tray. To the right of the tray is the display area; it shows track and index numbers, various time readouts, and other status indica-

Onkyo must have asked its engineers for the finest, most rugged, sophisticated CD player they could make, regardless of cost.

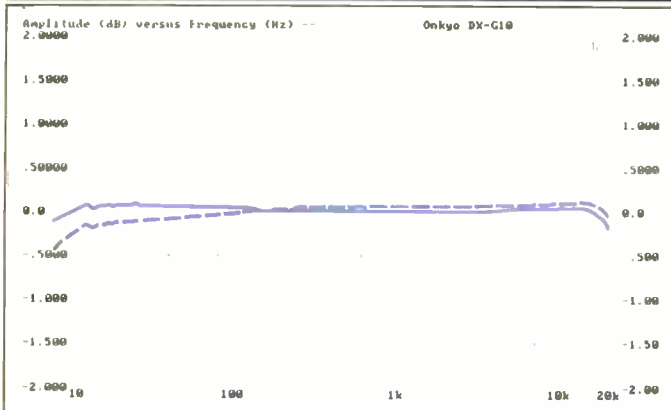


Fig. 1—Frequency response. In this and all subsequent figures, unless otherwise noted, left channel is solid curve and right channel is dashed.

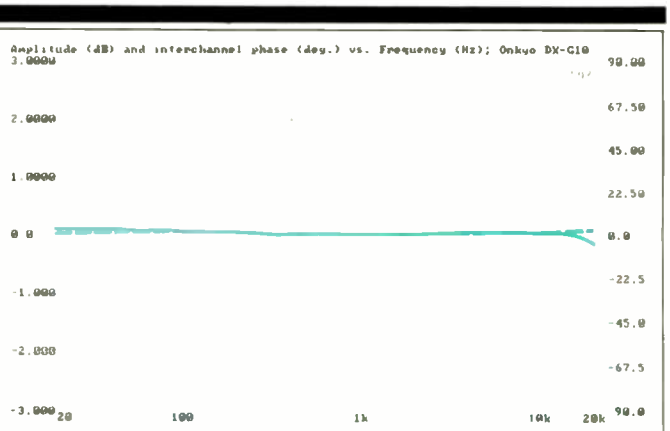


Fig. 2—Comparison of interchannel phase difference (dashed curve) and amplitude response (solid curve). Phase, in degrees, can be read from right-hand scale.

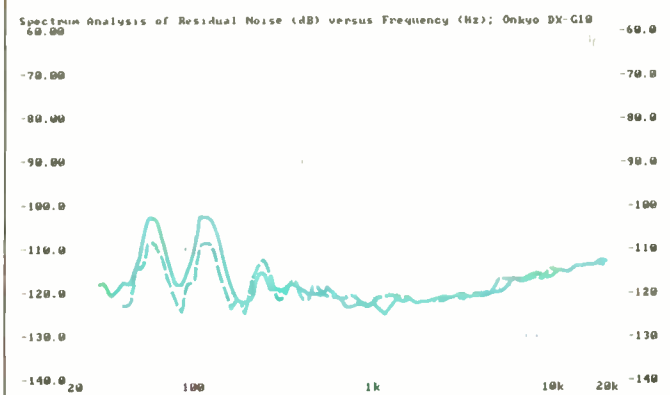


Fig. 3—Residual noise vs. frequency for "quiet" track of CD-1 test disc. Although there are noise peaks at the power-line frequency and its harmonics, they are very low in amplitude.

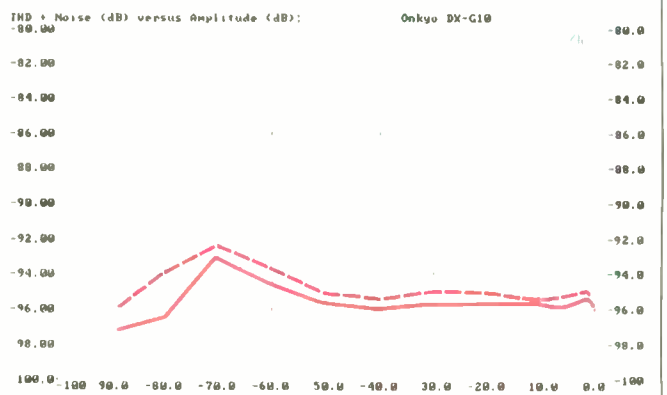


Fig. 4—THD + N vs. signal level.

tions. Pushbuttons beneath the display include "Open/Close" for the disc tray, track advance and reverse, stop, pause, and play. The large "Shuttle Search" knob at the right of the panel resembles a massive volume control, but when turned to the right, high-speed search in a forward direction is initiated; turning the knob to the left obtains the reverse direction. Search speed is determined by how far the user twists this spring-loaded knob in a given direction.

Opening the hinged door along the lower edge of the panel reveals the headphone jack (under the shuttle knob) and a number of control buttons. An "Invert Phase" button is provided for those who are sensitive to polarity reversals in the recording process. There are buttons for specifying a time within a track at which play will begin, for the various modes of repeat play, for index search, and for time-display mode (elapsed or remaining time within a track or total remaining time on the disc). There is even a "Dimmer" button that controls the display area's intensity. Also behind this door are the programming buttons, including the 10 number keys, "Memory," and "Clear." Larger buttons to the right control the volume level at the headphone and variable output jacks. Since the DX-G10 also has fixed-level outputs, its headphone level can be set without affecting output to the main system or a tape deck.

In addition to the variable and fixed analog output terminals, the rear panel has coaxial and optical digital output terminals with a companion slide switch that activates these outputs when needed. The optical output terminal accepts one end of the supplied optical cable, and is of the type that seems to have become the de facto standard.

Access to any point on a disc is superb; you can specify the time where play begins, find index points, or use the shuttle knob.

Measurements

The frequency response of both analog outputs is plotted in Fig. 1. While roll-off at 20 kHz was no more than 0.2 dB for the left channel and 0.1 dB for the right, the right channel exhibited a slight, 0.2-dB roll-off at 20 Hz as well. I can't imagine why this should have been so and suspect that this unusual effect may be the result of an out-of-tolerance component in the analog output stage of my sample. In any event, an imbalance of 0.2 dB between stereo channels at 20 Hz is not something to be very seriously concerned about. In Fig. 2, the plot of the left-channel frequency response is presented along with a plot of interchannel phase difference, which was negligible at all audio frequencies.

A-weighted S/N ratio for this player measured −106.7 dB for the left channel and an almost identical −106.66 dB for the right. Figure 3 is a spectrum analysis of residual noise when playing the "no-signal" track of my CD-1 test disc through the Onkyo unit. As I have explained in previous reports, this graph, as well as the figures just cited for S/N ratio, have nothing to do with the digital performance characteristics of the player; rather, they tell us something about the noise performance of its analog section. Interestingly, despite the extent to which this unit's power-supply section is shielded from its analog audio stages, you can still detect a minute amount of 60-Hz component and its harmonics in Fig. 3. The 60-Hz fundamental and its second harmonic are, however, more than 103 dB below maximum level.

Figure 4 is a plot of THD + N (expressed in dB below maximum output) versus recorded level. Ideally, this should be a straight line. Both channels exhibited a slight rise in THD + N at around 70 dB below maximum record level.

Figure 5 shows how THD + N varied as a function of frequency, for signals recorded at maximum level. Distortion and noise at 1 kHz were almost identical in both channels—0.0018% for the left channel and 0.001% for the right; the results varied only very slightly across the audio frequency spectrum. Rarely have I seen a CD player that did not exhibit a marked rise in THD at 20 kHz, but the Onkyo DX-G10 is one of those rare units. Figure 6 helps to explain why. It is a spectrum analysis of the player's output for a maximum-amplitude test tone at 20 kHz. There is not the slightest evidence of any beat tones, either within the audio band or above it.

Separation between channels was excellent (Fig. 7). Left-to-right channel separation was 111 dB at 1 kHz and 92 dB at 10 kHz, while right-to-left separation was 104.5 dB at 1 kHz and 88.5 dB at 10 kHz. Figure 8 shows a test of linearity, using an undithered, 1-kHz signal at levels ranging from 0 (maximum recorded level) to −90 dB. I noted that both channels began to depart from linearity very slightly (and in opposite directions) below −40 dB. Although their nonlinearity began to increase more rapidly below −70 dB, it was less than 2.0 dB in either channel, even at a level of −90 dB. When I used a low-level, dithered test signal, as shown in Fig. 9, left-channel linearity was nearly perfect—off by no more than about 1.5 dB at −100 dB below maximum recorded level—while right-channel output exhibited a maximum deviation from linearity of only slightly more than 2.0 dB at −100 dB. The fade-to-noise test was conducted for the left channel only (Fig. 10), and the results fully confirm

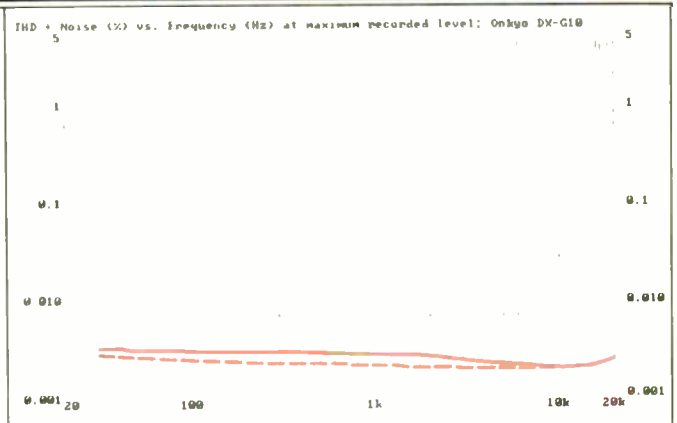


Fig. 5—THD + N vs. frequency, for signal level of 0 dB. The rise at 20 kHz, common in CD players, is minuscule.

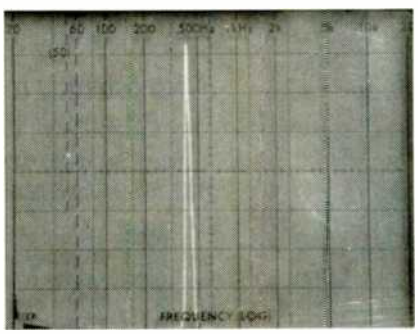


Fig. 6—Spectrum analysis of 20-kHz signal; note the absence of "beat" components. Sweep is linear, from 0 Hz to 50 kHz.

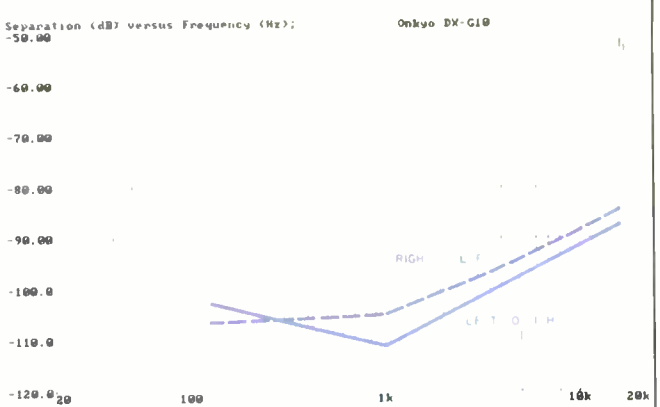


Fig. 7—Interchannel separation.

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It has always been true that placement in the listening room has a profound effect on the sound of any loudspeaker, regardless of its inherent qualities. Cambridge SoundWorks has confronted this fact and created Ensemble,™ a speaker system that can provide in your home, the superb sound once reserved for the best conventional speakers under laboratory conditions. And because we market it directly, Ensemble costs far less than previous all-out designs. Perhaps best of all, it virtually disappears in your listening room.

Henry Kloss, creator of the dominant speaker models of the '50s (Acoustic Research), '60s (KLH) and '70s (Advent), brings you Ensemble, a genuinely new kind of speaker system for the '90s, available factory direct from Cambridge SoundWorks.

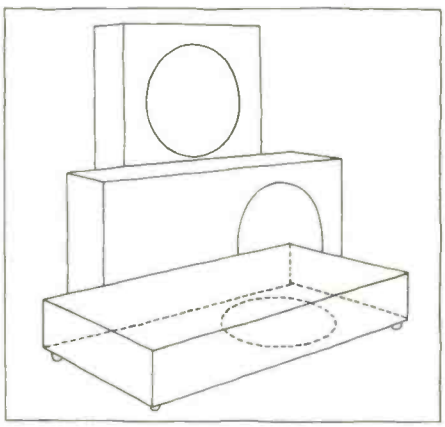
The best sound comes in four small packages.

Ensemble consists of four speaker units. Two compact low-frequency speakers reproduce the deep bass, while two small satellite units reproduce the rest of the music. Separating the low bass on both channels from the rest of the range makes it possible to reproduce just the right energy in each part of the musical spectrum without turning your listening room into a stereo showroom. With clumsy conventional systems, you can either strive for that balance by letting loudspeakers dominate your room, or sacrifice it for less conspicuous speaker placement.

Your listening room works *with* Ensemble, not against it.

Room acoustics emphasize and de-emphasize various parts of the musical range, depending upon where the speaker is placed in the room. If you put a conventional speaker where the room can help the low bass, it may hinder the upper ranges, or vice-versa.

Ensemble, on the other hand, *takes advantage* of your room's acoustics. You put the low-frequency units where they provide the best bass, whether or not that location is good for the high frequencies (and it usually



Because low frequencies are non-directional, Ensemble's bass units can be installed horizontally, vertically, facing upwards, or facing downwards.

Unlike satellite systems which use a single large subwoofer, Ensemble features separate compact bass units for each stereo channel. They fit more gracefully into your living environment, and help minimize the effects of the listening room's standing waves.

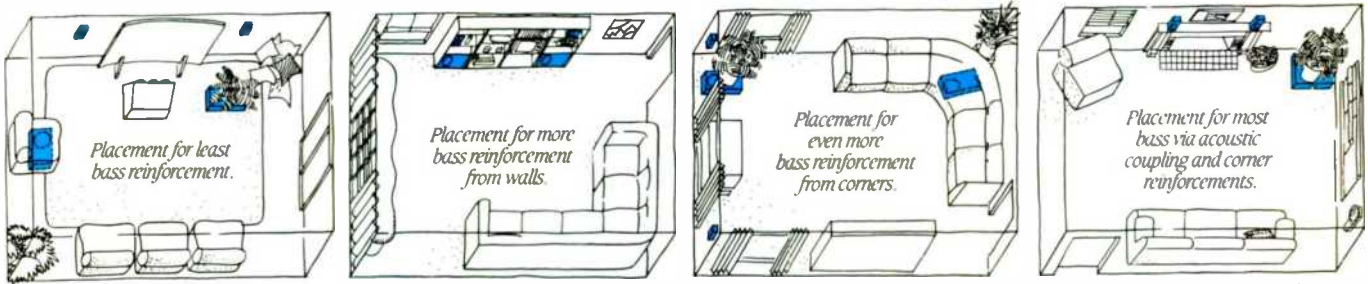
Ensemble is a Trade mark of Cambridge SoundWorks, Inc.

–And Make It Sound Like Music. A Most Unobtrusive Way, gine Going Wrong With Ensemble."

Julian Hirsch
Stereo Review, Sept. '88

isn't for any speaker). Then you put the satellites where they provide a well-defined stereo "stage."

The ear can't tell where bass sounds come from, which is why Ensemble's bass units can be tucked out of the way—on the floor, atop bookshelves, or under furniture. The satellites can be hung directly on the wall, or placed unobtrusively on windowsills or shelves (among other possibilities). The result is extraordinary. There are no bulky speaker boxes to dominate your living space, yet Ensemble reproduces the satisfying deep bass that *no* mini speakers can.



You can put Ensemble's low-frequency units exactly where they should go for superb bass. You can't do this with conventional speakers because you have to be concerned about the upper frequencies coming from the same enclosures as the low ones.

Not all the differences between Ensemble and other speaker systems are as obvious as our *two* subwoofers.

Unlike three-piece satellite systems that may appear similar, Ensemble's four-piece design doesn't cut any corners. We use premium quality components for maximum power handling, individual crossovers that allow several wiring options and cabinets ruggedly constructed for proper acoustical performance. The low-frequency units use the classic acoustic suspension design, and are finished in black laminate. The satellites are finished in gunmetal gray Nextel, a suede-like finish highly resistant to scratching. We even gold-plate all connectors to prevent corrosion. But perhaps an even bigger difference between Ensemble and other speakers is how we sell it...

The best showroom of all: your living room.

Choosing a loudspeaker after a brief listen at a dealer's showroom is like deciding on a car after one quick trip around the block. Therefore we make it possible to audition Ensemble right in your own home. In fact, Ensemble is sold *only* by Cambridge SoundWorks directly from the factory.

That only makes sense. You get to match Ensemble specifically to your listening room in a way no other system permits. You get to listen for hours without a salesman hovering nearby. And if after 30 days of all that you're not happy, you can return Ensemble for a full refund (we'll even reimburse the original UPS shipping charges in the continental U.S.).

You also get to save.

At only $499—complete with all hardware, 100' of speaker cable, and free ongoing assistance—Ensemble costs hundreds of dollars less than it would in a retail store.

What Henry Kloss tells his friends:

Every time I came out with a new speaker at AR, KLH, or Advent, my friends would ask me, "Henry, is it worth the extra money for me to trade up?" And every time I would answer, "No, what you've already got is still good enough."

But today, with the introduction of Ensemble, I tell them, "Perhaps now is the time to give your old speakers to the children."

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Our toll-free number will connect you to a Cambridge SoundWorks audio expert. He or she will answer all your questions from why (or why not) to buy Ensemble to those you may have about related equipment. Your audio expert will take your order (you can use Visa, MasterCard or American Express), and arrange surface shipment via UPS ($7 to $25 anywhere in the continental U.S.). You should have Ensemble within one week. And your Cambridge SoundWorks audio expert will continue as your personal contact with us, to answer questions which might come up after you've begun to enjoy Ensemble at home. We think you'll like this new way of doing business.

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Rare is the CD player that does not show a marked rise in THD at 20 kHz, but this Onkyo unit is one of those rare exceptions.

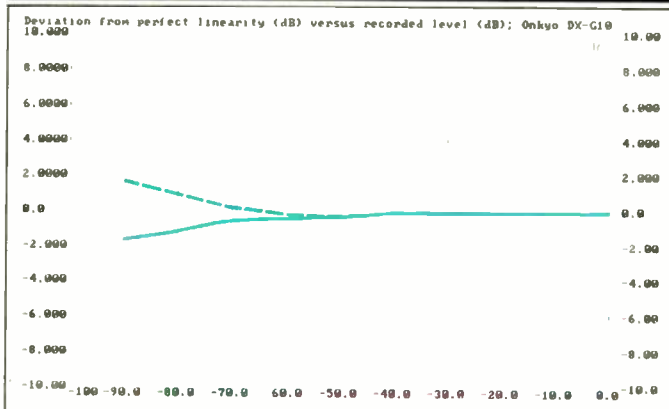

Fig. 8—Deviation from perfect linearity for an undithered, 1-kHz signal at levels from 0 to −90 dB. Linearity was nearly perfect, with maximum deviation not exceeding 2.0 dB in either channel, even at −90 dB.

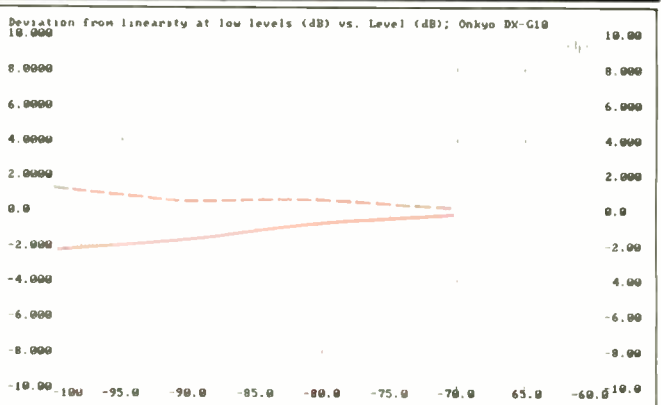

Fig. 9—Linearity deviation for a dithered, 1-kHz signal at levels from −70 to −100 dB.

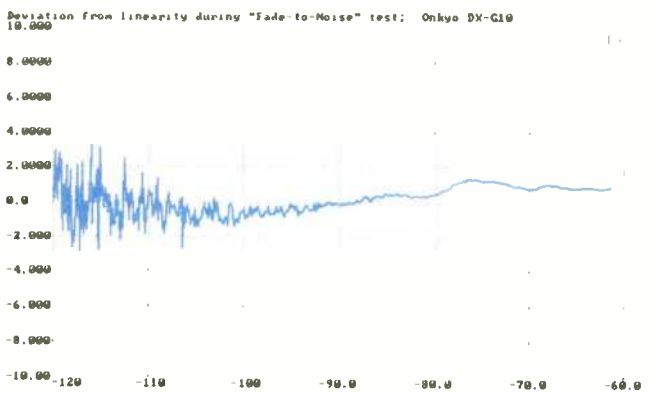

Fig. 10—Linearity deviation for "fade-to-noise" test of dynamic range, using a dithered signal. The DX-G10 tracked the level changes in this test extremely well.

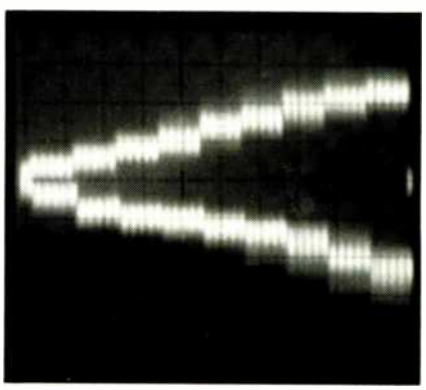

Fig. 11—The monotonicity test also shows this player's excellent low-level linearity.

the earlier conclusion concerning the excellent linearity exhibited by this player. Discrete signals could easily be distinguished from noise, even at levels as low as 110 dB below maximum output.

EIAJ dynamic range measured 93.8 dB for the left channel and 89.7 dB for the right. The monotonicity test signals on the CD-1 disc further verified the DX-G10's excellent low-level linearity (Fig. 11).

I made a few other spot performance measurements before I began my listening tests. SMPTE-IM distortion, at maximum signal level, was 0.00528% on the left channel and 0.00975% for the opposite channel. Frequency accuracy, a measure of the player's master-clock accuracy, was within 0.0159% of perfect. Figure 12 shows how the Onkyo reproduced a 1-kHz square wave, and Fig. 13 depicts a unit pulse as reproduced by the player. It confirms that this unit introduces no signal polarity inversion, unless one chooses to invert polarity by activating the button provided for this.

Use and Listening Tests

For my listening tests, I hooked up the DX-G10 directly to a Hafler XL600 power amplifier (reviewed last month) that had been adjusted for minimum distortion while it was connected to my reference Infinity RS 9 Kappa speakers. In this arrangement, since no preamp was used, I had to connect the CD player's variable outputs to the amplifier. At the time I tested the Onkyo unit, I did not have on hand an amp or preamp with an optical or coaxial digital input, so I was not able to use this player's digital output terminals. Had I been able to do so, however, I would really have been judging only a portion of the Onkyo along with the D/A converter circuit of some other piece of equipment.

The Onkyo DX-G10's low-level linearity proved superb in test after test, including the "fade-to-noise" and monotonicity checks.

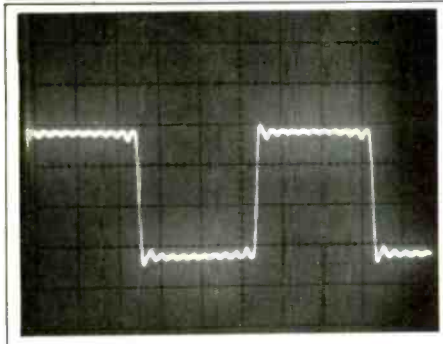

Fig. 12—Reproduction of 1-kHz square wave.

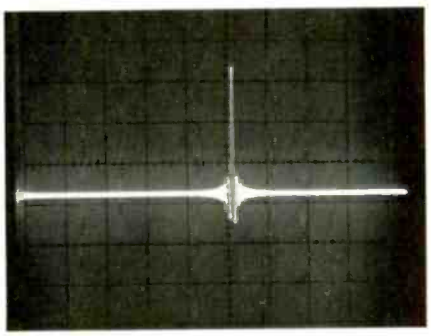

Fig. 13—Single-pulse test.

Among the CDs I listened to were a pair that I had used in evaluating the Hafler amp, namely a disc containing very dynamic classical overtures (Pro Arte's *Light Cavalry*, CDD 402) and a clarinet and piano recording (Delos' *Brahms/Schumann Soiree*, D/CD 3025). Both discs were digitally mastered and recorded and bear the now-familiar SPARS DDD designation. I was very pleased with the sound delivered by this player/amplifier/speaker combination as a whole.

Mechanically, the DX-G10 was a delight to use. Its "Shuttle Search" knob should appeal to those who like to "skip around" in their music, listening to short passages which they are particularly fond of. Access to a given track was so rapid, it was difficult for me to time with a stopwatch. Programming was easy and straightforward. On discs that included index points, I liked being able to move from one to another, even while a track was playing. I also appreciated being able to specify start of play from a given time into a track. In short, I liked everything about this CD player, with the possible exception of its price. At a weight of about 60 pounds, that works out to nearly $42 per pound—or about $93 per kilogram for audio enthusiasts who are into the metric system! Be that as it may, if Onkyo's intent was to show the very best they could do in a high-end CD player, with the DX-G10 they have come very close to succeeding.

Leonard Feldman

Die reine Musik, Pure Music, La musica pura, La pure musique.

If you are looking for loudspeakers with the sound, the fit, the finish of German precision technology, Canton is your clear choice.

For fifteen years Canton has been dedicated to the notion that the best sound color is no sound color. So whether it's Brahms or Berry, Miles or Mozart, you can count on Canton to provide the music, the whole music and nothing but the music.

To achieve this our German craftspeople build every component that goes into a Canton loudspeaker. Our engineers investigate every possible technological improvement, but don't innovate merely for innovation's sake. Our designers and cabinet-makers assure that Canton loudspeakers have a look of unparalleled sophistication and timelessness.

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Time and again critics have agreed: "The absolute hit of the entire test... is the small Canton GL 260. Everyone who hears it... shakes his head with astonishment..." "(The CA 30) was the sure winner in the newly introduced premium class... (It) stands in the reference class as no super-speaker before it." "With its Pullman Set 400... Canton has scored a smash hit."

For a brochure on Canton home and automotive loudspeakers, please contact: Canton North America, Inc., 915 Washington Avenue South, Minneapolis MN 55415-1245, telephone (612) 333-1150.

CANTON

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2

a/d/s/ CC4 TUNER/ PREAMP

The CC4 tuner/preamplifier is part of the a/d/s/ Atelier series of interactive audio components. Having explored its many features and control functions, I can state that it is by far one of the most sophisticated control centers I have yet come across. The CC4's operating system is based on an internal computer that controls a wide variety of functions, such as input-sensitivity programming, 30-station AM and FM memory, all-electronic volume and balance controls, and much more.

All other Atelier components, when connected to the CC4, can be integrated into a remotely operable multi-room system. The control diversity afforded if you purchase an optional a/d/s/ RC1 wireless remote ($150) has several unusual aspects. Two cassette decks are fully controlled, and an automatic video input can turn the CC4 on when audio signals from a TV are present at the video input jacks.

In my own tests, I used the CC4 only with the a/d/s/ PA4 power amplifier. These two components are so closely linked in function and so well matched in design that they form, in effect, an integrated amp. I did not have an RC1 remote, but judging by the excellent design of the CC4 and its matching amp, I have no reason to doubt the effectiveness of any of the more sophisticated control features described in the well-written owner's manual.

Continued on page 74

Manufacturer's Specifications

FM Tuner Section

Usable Sensitivity: 14.8 dBf.
50-dB Quieting Sensitivity: Mono, 27 dBf; stereo, 40 dBf.
S/N: Mono, 70 dB; stereo, 65 dB.
THD at 1 kHz: Mono, 0.1%; stereo, 0.15%.
Frequency Response: 20 Hz to 15 kHz, +0, −1.0 dB.
Separation: 47 dB at 1 kHz; greater than 30 dB, 30 Hz to 15 kHz.
Capture Ratio: 2.0 dB.
Alternate-Channel Selectivity: 65 dB.
Muting and Stereo Threshold: 27 dBf.
I.f. Rejection: 100 dB.
Image Rejection: 95 dB.
Spurious-Response Rejection: 100 dB.
AM Rejection: 50 dB.
Subcarrier Rejection: 65 dB.

AM Tuner Section

Sensitivity for S/N of 6 dB: 8 μV.
Image Rejection: 35 dB.

Preamplifier Section

Rated Output Level: More than 3 V rms at no more than 0.07% THD.
Frequency Response: Phono, RIAA, 20 Hz to 20 kHz, ±0.5 dB; high level, 20 Hz to 20 kHz, +0, −0.5 dB.
IHF Input Sensitivity: MM phono, 1.3 mV; MC phono, 130 μV; high level, 90 mV.
IHF S/N: MM phono, 70 dB; MC phono, 65 dB; high level, 80 dB.
IHF Maximum Input Level: MM phono, 150 mV; MC phono, 15 mV; high level, 5 V.
Rise-Time: High-level inputs, 1.5 μS.

Treble Control Range: ±10 dB at 20 kHz in 2-dB steps.
Bass Control Range: ±10 dB at 20 Hz in 2-dB steps.
Low Bass Control Range: +6 dB at 20 Hz in 1-dB steps.
20-Hz Control (Subsonic Filter): −12 dB per octave below 20 Hz.
Input/Output Polarity: Noninverting.

General Specifications

Power Requirements: 120 V a.c., 60 Hz, 50 watts.
Dimensions: 17½ in. W × 2¾ in. H × 14⅞ in. D (44.5 cm × 7 cm × 37.8 cm).
Weight: 15 lbs. (7 kg).
Price: $1,000.
Company Address: One Progress Way, Wilmington, Mass. 01887.
For literature, circle No. 91

a/d/s/ PA4 POWER AMPLIFIER

Manufacturer's Specifications

Power Output: 150 watts per channel, 20 Hz to 20 kHz, into 4 or 8 ohms; 250 watts in bridged mode (mono), 20 Hz to 20 kHz, into 4 or 8 ohms.
THD: Less than 0.05%.
Frequency Response: 20 Hz to 20 kHz, +0, −0.2 dB.
IHF Dynamic Headroom: 1.5 dB into 4 or 8 ohms.
Input Sensitivity for 1 Watt Output: 100 mV.
S/N Referred to Rated Output into 8 Ohms: 110 dBA.
Damping Factor: Greater than 100.
Slew Rate: Greater than 30 V/μS.
Rise Time: Less than 1.5 μS.
Phase: Noninverting.
Power Requirements: 120 V a.c., 60 Hz, 800 watts maximum.
Dimensions: 17½ in. W × 2¾ in. H × 14⅞ in. D (44.5 cm × 7 cm × 37.8 cm).
Weight: 27 lbs. (12.3 kg).
Price: $1,200.
Company Address: One Progress Way, Wilmington, Mass. 01887.
For literature, circle No. 92

Like the CC4 tuner/preamp, the PA4 power amplifier is contained in a standard a/d/s/ Atelier module. This power amp is designed to deliver 150 watts per channel into either 8- or 4-ohm loads. It can also be used in bridged mono mode, in which case it delivers 250 watts into a single speaker load. The amplifier features switching for two pairs of speakers, or for two speakers when it is used in bridged mode. Its power and speaker switching can be controlled from a companion component, the a/d/s/ Model CC4 combination tuner/preamp.

The circuitry of the PA4 is extremely wideband, with extensive local current feedback in each stage. (Feedback in the main loop is kept moderate, to ensure stability.) Overall bandwidth is controlled by a passive roll-off of 6 dB per octave at the inputs. This all-discrete, bipolar-transistor amp uses 10 heavy-duty output devices in each channel to deliver high current output. A massive toroidal transformer is used in the well-regulated power supply.

The PA4 uses no current- or voltage-limiting protection in its output stages. Instead, the amplifier has a detector that opens the speaker relay in the event of gross current overload or large d.c. offset faults. The PA4 uses premium-quality components throughout, from its externally visible gold-plated input jacks to its extensive use of

Continued on page 81

The CC4 can be integrated with other Atelier-series components into a system which features multi-room control and operation.

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Internally, all preamp circuits are fully shielded, and all inputs are buffered by filtered amplifiers for good r.f.i. suppression and uniform input impedance. All of the tone, filter, and level controls are electronically operated by internal computer commands. Results are therefore very precise and repeatable. The alphanumeric display provides complete operational status information. Among the items shown are: Source selected for listening and recording, station frequency and program memory number (during use of FM or AM), and volume, balance, and tone control settings (in dB).

The FM tuner section of the CC4 uses a temperature-compensated, varactor-tuned front-end. The stereo decoder circuitry employs both pilot subcarrier cancellation and analog tuned filters for subcarrier product rejection. A high-blend circuit can be selected in FM mode to improve S/N ratios of weak FM stereo signals. If this setting is stored along with the station frequency, the high-blend function will automatically turn on when the station is selected by memory recall. Since the CC4 can be manually tuned in frequency increments of as little as 25 kHz, it is possible to improve reception of some stations when interference from other signals, close in frequency to the desired signal, occur. This feature may also be useful when receiving FM stations via cable, since many cable companies that carry FM shift the stations to nonstandard broadcast frequencies.

The two sets of preamp outputs can feed one or more amplifiers and can be independently switched on and off from the CC4's front panel, while speaker switching for the connected PA4 power amplifiers can be controlled from the optional RC1 remote.

Control Layout

The CC4 front panel has, in effect, two tiers of controls. The major tier, visible at all times, starts at the far left with buttons for power-on/standby and "TV," a "Program" rocker switch that moves forward or backward through the 30 programmable AM or FM station memories, and selector buttons for FM, AM, two tape monitors, phono, and CD. At the far right are a volume up/down rocker and a mute button. Beneath the mute button is a stereo headphone jack. The "TV" button selects both listening and recording of TV sound if a TV monitor's audio outputs are connected to the system. Holding this button down for more than 3 S puts the CC4 in the TV "auto" mode. In this mode, the CC4 turns on automatically whenever it senses the presence of audio signals at the TV input jacks. Volume is automatically set to "65" (15 dB below maximum), and all tone controls and filters are turned off, yielding further control to the TV monitor itself. This mode is disabled by holding down the "TV" button for another 3 S.

The multi-functional display, near the right end of the front panel, has lighted labels that show when various functions are active, such as tone control and speaker selection. There are two sets of alphanumeric displays. In general, the upper display shows the selected signal source, while the lower one shows information concerning that source. When the tuner section is in use, the upper display shows selected frequency, while the lower shows the program memory number, if any. (Incidentally, the 30 program memories can be used to randomly store both AM and FM stations.) Additional illuminated words in the display area show which of the two output pairs is in use, whether a stereo signal is being received, if the CC4 has been switched to mono or high blend, whether the "low bass" boost mode has been selected, and the status of the bass and treble controls.

The second tier of controls is accessed by pushing a tilt-down panel that smoothly emerges from the unit's front and comes to rest at an angle that makes for easy viewing and use. It contains buttons for up and down manual or automatic tuning of the FM and AM sections, "+" and "–" bass and treble controls, "Left" and "Right" buttons for adjusting channel balance, preamp "Out 1" and "Out 2" selectors, and buttons for loudness, high blend, low bass boost, 20-Hz filter, mono, and "Copy," as well as a "Memo" button for memorizing favorite AM and FM station frequencies. "Memo" performs an important additional function: It can be used to adjust the input sensitivity for all program sources so that they will all have the same apparent sound level when selected. This adjustment can be made over a range of 10 dB in steps of 1 dB. The "Copy" button, if pressed once, sets up tape dubbing from "Tape 1" to "Tape 2." Pressing "Copy" a second time reverses the direction of the dubbing process. While you're in copy mode, you can listen

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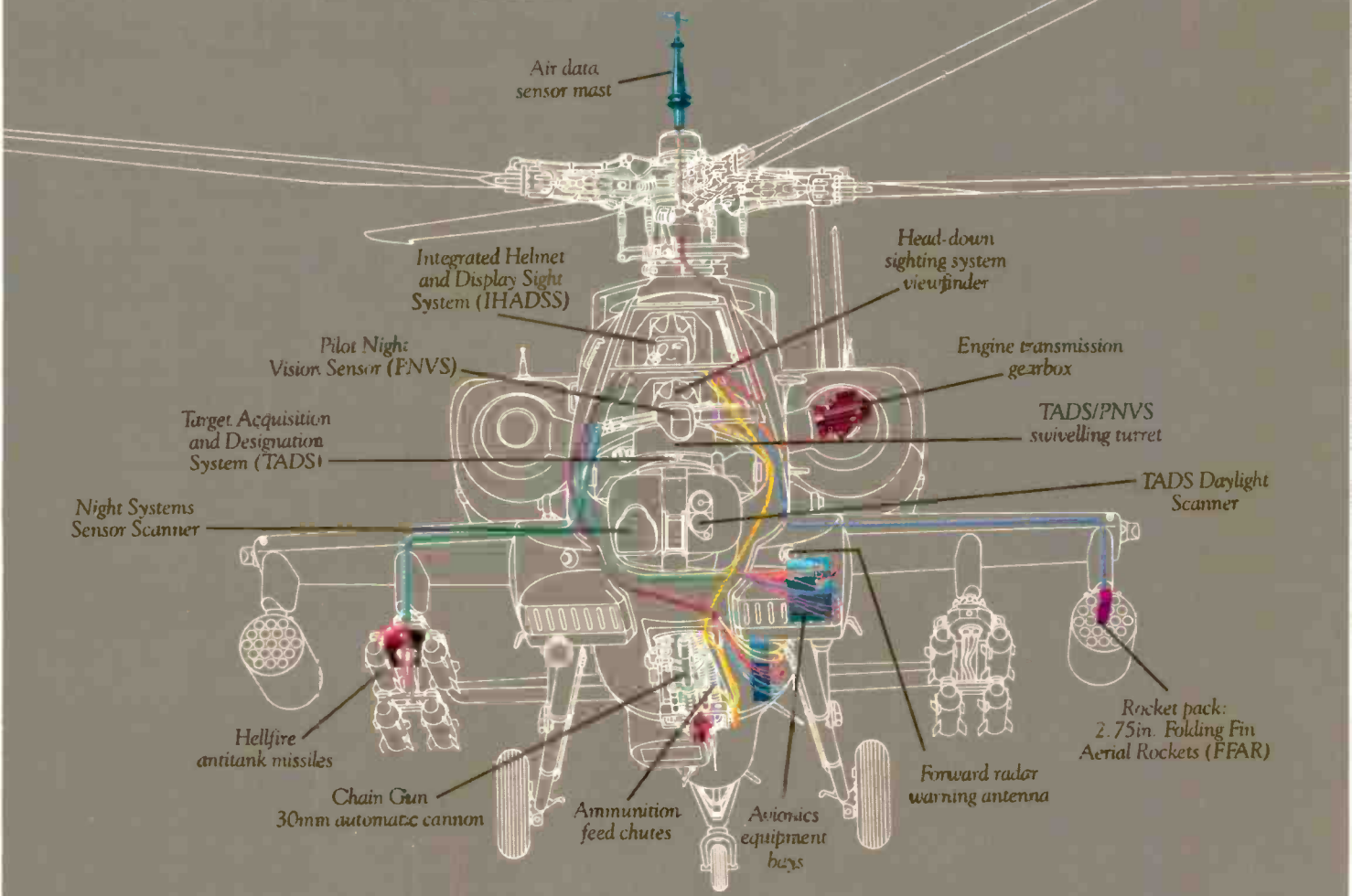
HERE'S WHAT'S IN IT FOR YOU.



It can see in the dark. And attack without being seen. Rain or shine, it can strike like lightning. It's fast, mean, and smart.

But the Apache attack helicopter doesn't fly by itself. It needs trained experts to keep it at its most ferocious.

You can be one of those experts.

If you're interested in electronics, there's a lot inside an Apache to challenge you: Infrared night vision sensors. Laser tracking and targeting technology. Avionics systems unequalled anywhere in the world.

The Army can train you to repair and maintain those systems—important skills that can help you get an edge on life.

So talk to your Army recruiter. Or call 1-800-USA-ARMY. And find out how you can get under the skin of an Apache.

Once you've seen what's inside, you'll be glad it's on your side.

ARMY. BE ALL YOU CAN BE.

Tuning in 25-kHz increments lets you evade interfering signals or zero in on the FM signals cable companies transmit off-frequency.

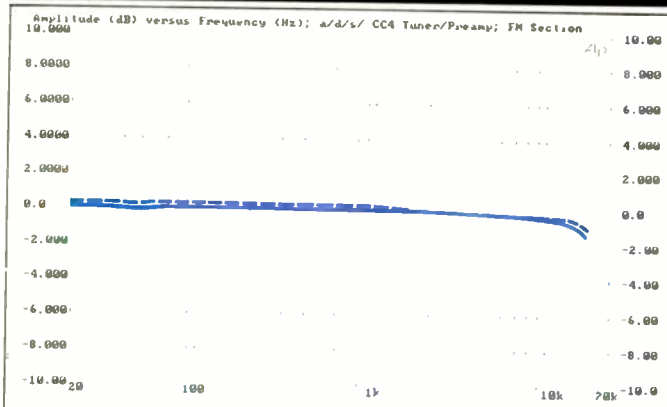


Fig. 1—Frequency response, FM tuner section.

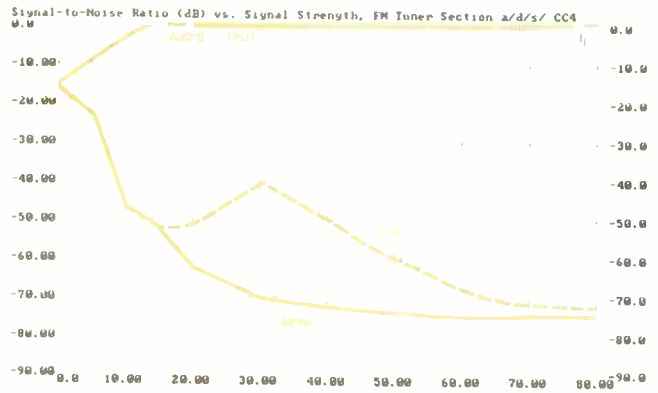


Fig. 2—FM quieting characteristics for mono (solid curve) and stereo (dashed curve).

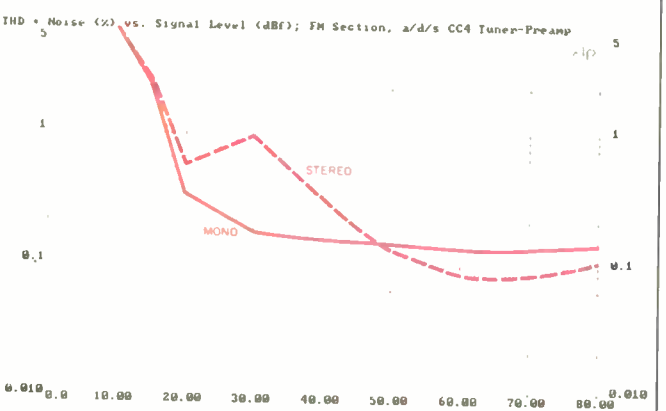


Fig. 3—THD + N vs. r.f. input level for mono signals (solid curve) and stereo signals (dashed curve).

to any one of seven program sources, including the decks being used for dubbing. Pressing "Copy" a third time turns off the copy mode and restores the original condition; the recording source is then the same as the listening source. During use of the "Copy" control, the upper display shows the listening source first, followed by the recording source—for example, "FM" "T1" (for tape 1). Finally, this subpanel contains what a/d/s/ refers to as a "direct" switch. When this button is pressed, bass, treble, loudness, "Low Bass," and "20 Hz" controls turn off to produce flat response once again, and the balance control is restored to its center setting. Pressing the "direct" button a second time restores all previous settings of the above-named controls. I found that this made for a very convenient way of comparing electrically "flat" reproduction with my settings of the various controls.

In addition to the usual assortment of stereo input and output jacks, 75- and 300-ohm FM antenna input terminals, AM antenna terminals, and a slide switch that selects moving-magnet or moving-coil phono inputs, the rear panel is equipped with six multiple-pin DIN connectors. The ones labelled "Phono " "Tape 1," and "Tape 2" send translated remote-control signals to the appropriate a/d/s/ Atelier remote-ready components. The "Master 1" DIN connector accepts remote-control signals from a separate infrared receiver unit, thereby extending remote operation of an Atelier audio system to rooms other than the one where the components are located. This jack also enables connection to a personal computer, using RS-232 signal protocol. The "Master 2" DIN connector parallels "Master 1," for looping through transmissions to an a/d/s/ Compact Disc player or other unit. The sixth DIN connector, labelled "Speaker Remote," sends power on/off and speaker-selector signals to a/d/s/ Atelier power amplifiers such as the PA4, which I used with the CC4 in my listening tests. Finally, there are a total of six a.c. convenience outlets, four switched and two unswitched. These can provide up to 800 watts of power to other audio components whose line cords are connected to the CC4.

Tuner Measurements

Frequency response of the FM tuner section is plotted for both channels in Fig. 1. Response was down by slightly more than 1.0 dB at 15 kHz. Figure 2 shows the quieting characteristics of the FM tuner section. In mono, 50-dB quieting required a signal input of 13 dBf; in stereo, a signal strength of 39 dBf produced the same degree of quieting. Note that at signal levels below 30 dBf, reception begins reverting to mono. In fact, this transition occurred at precisely 27 dBf, as claimed by a/d/s/. However, because the plotted points were done at 30 and 20 dBf, with no automatically plotted points in between, it appears as though the transition occurred at 30 dBf. Maximum quieting for mono at high signal levels measured 75 dB, while maximum stereo quieting was 72.5 dB. Both of these figures are well above the S/N figures specified by a/d/s/.

Figure 3 shows how THD + N varied as a function of signal strength. This graph also pinpoints the usable sensitivity in mono. It is the point at which THD + N amounts to no more than 3%, and for this sample, that occurred at an

There are connections on the back for everything, including MC and MM phono, distant-room remotes, and operation by computers.

input signal level of 13 dBf. Lowest mono THD + N fell a bit short of the claimed 0.1%, measuring 0.125% at 65 dBf. In stereo, however, THD + N was actually lower than claimed by a/d/s/ and, at strong signal levels, was even lower than the mono THD + N figure. At 65 dBf, stereo THD + N was only 0.076%, as against 0.15% specified by a/d/s/.

Figure 4 is a plot of THD + N versus audio modulating frequency from 50 Hz to 15 kHz, for mono and stereo, using a constant 100% modulating signal. There is good correlation between the data recorded in Figs. 3 and 4 for mono, but the stereo THD + N appears to be a bit higher at 1 kHz than the figure I obtained earlier. This is because Fig. 4 is plotted automatically, giving me no opportunity to retune manually between the mono and stereo sweeps. As a result, the tuning was optimized for mono reception but was not quite as precise for the stereo readings. Even a slight amount of detuning can change an FM tuner's THD readings by significant amounts. In this case, the difference was actually very slight; in fact, the THD + N readings at 1 kHz were almost identical for mono and stereo, or slightly higher than 0.1%.

Figure 5 depicts results of a spectrum analysis sweep of the outputs of the CC4 when the FM section was reproducing a 5-kHz signal, modulating just one channel while in the stereo mode. Two sweeps were made. The first produced the tall spike at the left, representing the desired output from the modulated channel. The second sweep was made while measuring the output of the unmodulated channel. Since vertical calibration was 10 dB per division, this sweep shows that separation at 5 kHz was about 45 dB (the short spike within the tall spike). The sweep extended linearly to 50 kHz, and you can see that crossover components in the unmodulated channel's outputs consisted of some harmonic distortion, some spurious components produced by "beats," and some output at the subcarrier frequency of 19 kHz. This subcarrier component was about −60 dB compared with the 100% modulation level.

Figure 6 shows how FM stereo separation varied as a function of audio frequency. The upper solid curve shows response at the output of the modulated channel, and the lower dashed curve shows separation under normal operating conditions, without the use of the high-blend feature. Under these conditions, separation measured 48 dB at 1 kHz, 42.7 dB at 50 Hz, and about 42 dB at 15 kHz. The results at the frequency extremes are far better than the minimum separation values claimed by the manufacturer. At 100 Hz and 10 kHz (the frequencies at which separation is supposed to be stated if specs are to conform with the IHF/EIA Measurement Standard), separation was 45.5 and 46 dB, respectively.

The upper dashed curve in Fig. 6 shows what happens when the high-blend circuit is activated to improve weak-signal stereo reception. Under these conditions, separation at low frequencies remained relatively high. At 1 kHz, however, separation decreased to just over 18 dB with respect to the lower solid curve, which represents the output at the desired channel during this second test sweep. At 10 kHz, separation was only around 7 dB.

Several additional measurements of FM performance that didn't require graphic plots were also made during my

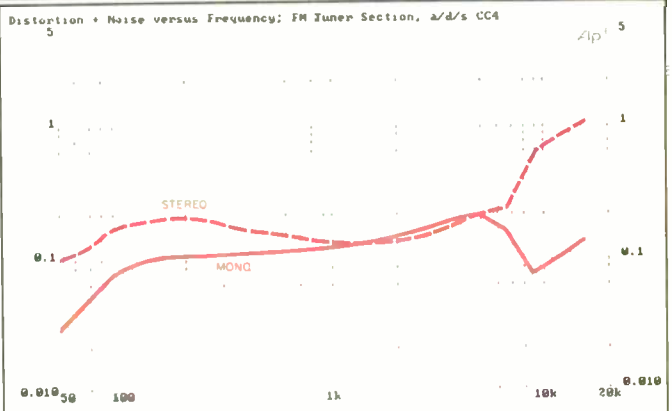


Fig. 4—THD + N vs. modulating frequency for mono (solid curve) and stereo (dashed curve).

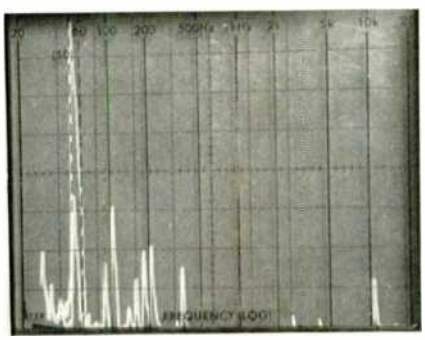


Fig. 5—Separation and crosstalk components for a 5-kHz modulating signal.

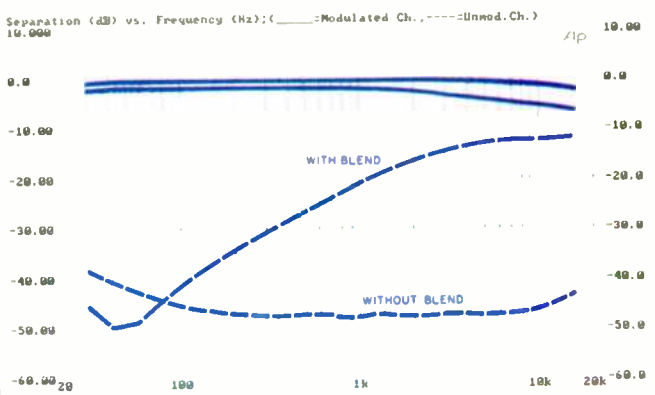


Fig. 6—Frequency response (solid curves) and separation (dashed curves), with and without high blend. The lower of the two solid curves shows response with high blend activated.

The loudness compensation circuit has gradual action and affects only the bass, which is just what such circuits always *should* do.

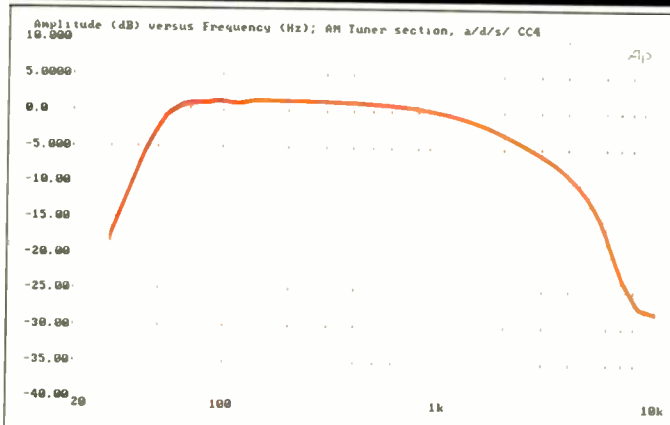


Fig. 7—AM frequency response for signal with NRSC pre-emphasis.

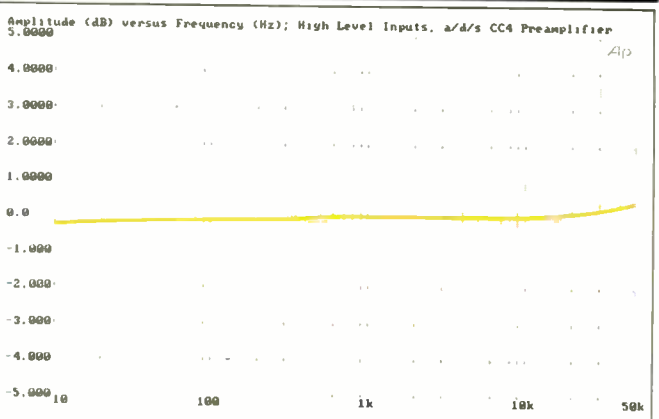


Fig. 8—Frequency response, preamplifier section.

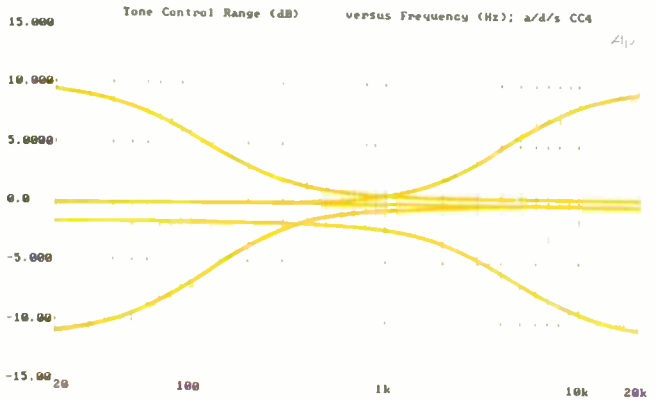


Fig. 9—Bass and treble control range. Note the drop in low-frequency level with full treble cut.

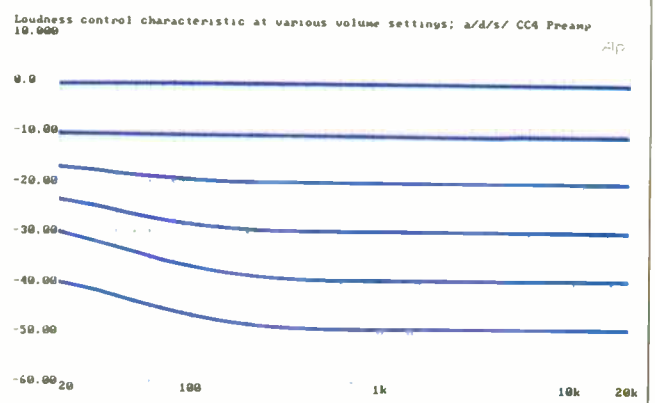


Fig. 10—Loudness compensation at volume-control settings from maximum volume (top curve) to −50 dB (bottom curve), in 10-dB increments.

evaluation of the CC4's tuner section. Capture ratio was 1.8 dB, a bit better than the claimed 2.0 dB. AM rejection was 52 dB, while i.f., image, and spurious-response rejection were all in excess of 100 dB, the limits of my measuring capability for these tests. Alternate-channel selectivity ranged from a low of 65 dB to a high of 70 dB, depending on the radio frequencies used.

I spent only a short time evaluating the AM tuner section, but I did plot frequency response (Fig. 7). As is traditional in AM response measurements, I looked for the −6 dB roll-off points rather than the −3 dB or even −1 dB points normally used to describe the bandwidths of high-fidelity equipment. Even for this more relaxed response measurement, I found that the CC4's AM bandwidth extended only from 42 Hz to 3 kHz. It was pretty clear from this result that most of the a/d/s/ tuner design effort was concentrated on the component's FM section!

Preamplifier Measurements

Frequency response for the high-level inputs of the CC4's preamplifier section was flat within +0.1 dB and −0.2 dB from 20 Hz to 20 kHz. The response was plotted for one channel only (Fig. 8), since both channels exhibited identical response curves. Multiple sweeps were made to create the curves of Fig. 9. I simply adjusted bass and treble controls to minimum and maximum settings, plotting a new response curve after each adjustment was made. The typical "bow tie" pattern of Fig. 9 is about what I would expect

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If you're looking for great bass, we suggest you look behind your speakers.

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Because a speaker that's tuned and "ported" to, say, 30 Hertz, is a full 3 decibels louder in the low frequency range. Which may not sound like much. On paper.

But an increase of 3 decibels is equal to doubling the amplifier power at the tuning frequency (30 Hertz).

And reduces what's known as "cone excursion." Because with the added sensitivity, the woofer requires less cone movement to generate low frequency sounds.

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Premium-quality components are used throughout, from the gold-plated input jacks outside to the low-noise film resistors inside.

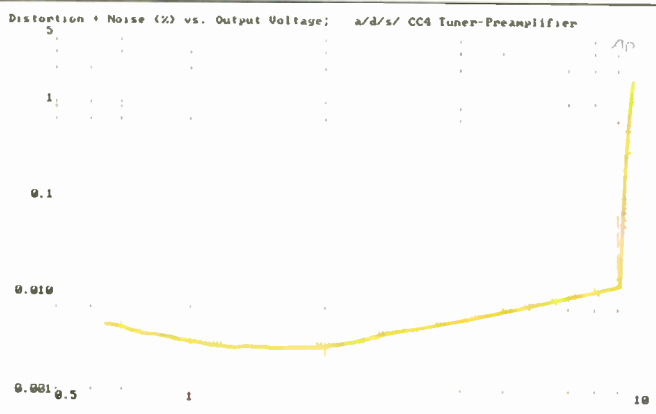

Fig. 11—THD + N vs. output voltage, using high-level inputs, for a 1-kHz signal.

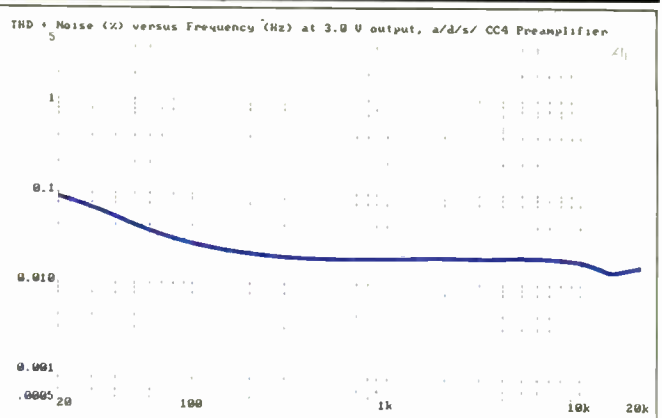

Fig. 12—THD + N vs. frequency, using high-level inputs, at 3 V rms output.

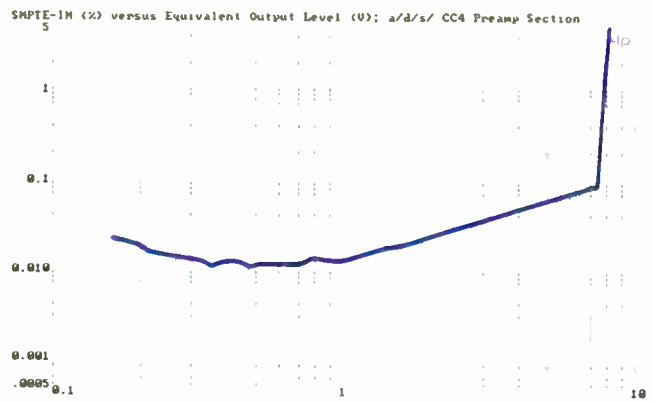

Fig. 13—SMPTE IM vs. output voltage, using high-level inputs.

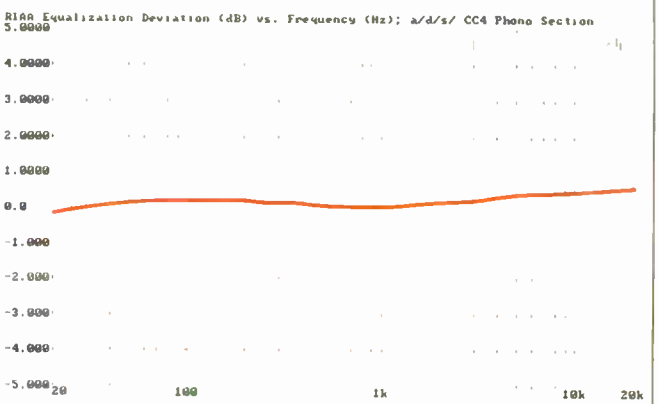

Fig. 14—Deviation from RIAA equalization.

from any well-designed tone control circuitry. What did surprise me just a bit was the shift in level at low frequencies when the treble control was set to its maximum cut position. This shift, noticeable from around 600 Hz downward, amounted to nearly 2 dB. By contrast, hardly any shift of level for nonequalized segments of the spectrum was observed at maximum treble boost or at maximum cut or boost of the bass control.

I was very pleased to note that the loudness compensation built into this unit affected only the bass frequencies. That's all a loudness control *should* do, as I've pointed out more than once. Furthermore, the action was gradual, increasing the amount of boost as the master volume was adjusted to lower and lower settings. Response sweeps at maximum volume, −10, −20, −30, −40, and −50 dB settings are shown in Fig. 10.

Figure 11 shows how THD + N varied as a function of output voltage for the high-level inputs, using a 1-kHz input signal. At 3 V out (the output level specified by a/d/s/), THD + N was only 0.004%. Maximum output before serious distortion occurred was 9 V rms. With my test equipment adjusting input level to produce a constant 3 V output from the CC4, I next plotted THD + N as a function of input frequency (Fig. 12). The higher distortion at 1 kHz observed this time (0.019%) resulted from my using a higher input voltage and lowering the volume control to keep the output at 3 V. In any case, for all but the lowest frequencies, THD + N was still under 0.02% and reached a level of 0.08% at

Power output at 4 ohms is rated by a/d/s/ as 150 watts per channel, but I measured 220 watts at the rated 0.05% distortion level.

20 Hz. Using these same volume-control and input-level settings, I plotted SMPTE-IM distortion versus output level, using the standard 4:1 ratio of 60-Hz and 7-kHz signals as my input (Fig. 13). At an equivalent output of 3 V rms, SMPTE IM was only 0.033%, while maximum output before serious overload occurred was equivalent to about 7.3 V.

Sensitivity for the high-level inputs, measured in accordance with IHF/EIA Standards, was 77.8 mV—less than specified. For the high-level inputs, S/N, using a 0.5-V input and adjusting the output to 0.5 V, was a very high 92.*8 dBA for the left channel and 92.37 dBA for the right.

Turning to the phono preamplifier section, I measured sensitivity for the MM inputs of 1.08 mV for an output of 0.5 V, while S/N for these inputs measured 78.71 dB for both channels. Figure 14 shows deviation from perfect RIAA playback equalization. At 20 Hz, this deviation was only −0.2 dB, while at 15 kHz, deviation amounted to approximately +0.4 dB. MM phono overload was 170 mV.

Switching to the MC phono mode, I measured an input sensitivity of 179 μV for 0.5 V output. S/N ratio was 69.25 dBA for the left channel and 68.64 dBA for the right. Input overload occurred at signal levels above 16 mV.

Use and Listening Tests

As I have already mentioned, listening tests were conducted on the CC4 together with the PA4 amp, using primarily CD source material. In order to evaluate the phono section of the CC4, I had to dig out some of my old favorite LPs. Most remain in excellent condition, because it's been a long time since I have played any of them. The reference turntable in my lab remains the Thorens TD 126 MKIII, equipped as it has been for several years now with the Shure V15 Type V-MR cartridge. Reproduction of these vinyl discs was excellent, and it was nice to be able to adjust input sensitivities to match the levels of the tuner section, my CD player, and my DAT recorder. The front panel of the CC4 is truly a remarkable achievement; its layout is sensible and easy to follow, and the multitude of informative displays let you know just what you are doing.

The combined asking price for the PA4 and CC4 is a rather high $2,200, but in my opinion, if you become the owner of this system, you'll be the proud possessor of much more than just another tuner/preamp and power amplifier. You'll be the owner of two perfectly matched components whose utility can be expanded and augmented by adding other superb, matching a/d/s/ Atelier components—not to mention that optional RC1 remote. Futhermore, if you then couple that remote with the RR1 remote receiver, system control will be able to move with you to any room in your home. It's this concept, added to excellent performance, which makes these Atelier components from a/d/s/ so appealing, despite the price. *Leonard Feldman*

Continued from page 73

low-noise, metal-film resistors and polypropylene capacitors throughout its signal paths. Despite the PA4's relatively small size, the intelligent internal layout of its power-supply parts, heat-sinks, and circuit boards enable the amplifier to transfer away internally generated heat—even under the stressful conditions of my bench tests, many of which involved long-term delivery of rated or near-rated power output. I found that the top of the module became quite hot to the touch under these high power output conditions. At no time did the speaker relays open up during my tests, however, nor did the change in temperature alter the power output capabilities or low distortion readings I obtained for this beautifully designed amp.

Control Layout

A power button is at the left end of the front panel, and an indicator light above it glows amber when the power cord is connected to an a.c. source. When the power is actually turned on, the indicator color changes to green. At the extreme right are a pair of "Clip" indicators that flash when the distortion of the amplifier exceeds 0.5% for any reason. Below these lights are a pair of speaker selector buttons.

The rear panel is equipped with color-coded pairs of speaker terminals, with appropriate terminals of each set marked for bridged connection. Gold plated phono-tip input jacks are nearby; the left one carries the additional notation, "Bridge." A slide switch selects dual-channel or bridged mode, while another switch selects 4- or 8-ohm load optimization. Two additional multi-pin DIN connectors on the rear

can be used to receive power on/off and speaker-selector signals from the CC4 tuner/preamp and from future Atelier control centers. These connectors are in parallel, for loop-through signals to more than one PA4 amp. All Atelier components are supplied with a back cover which conceals the connections and channels all cables out one end, so the units look uncluttered even with their backs exposed.

Measurements

Frequency response of the PA4 was within 0.1 dB from 13 Hz to 38 kHz, as can be seen in Fig. 1. Above 50 kHz, the

Besides its open, unveiled sound, the a/d/s/ PA4 amp has intelligent ergonomics, superb engineering, and good styling.

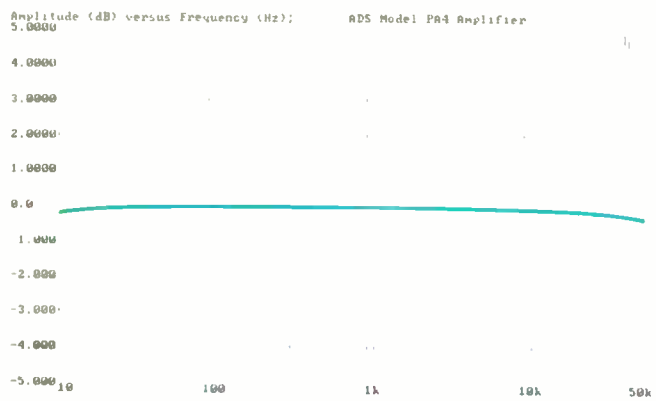

Fig. 1—Frequency response.

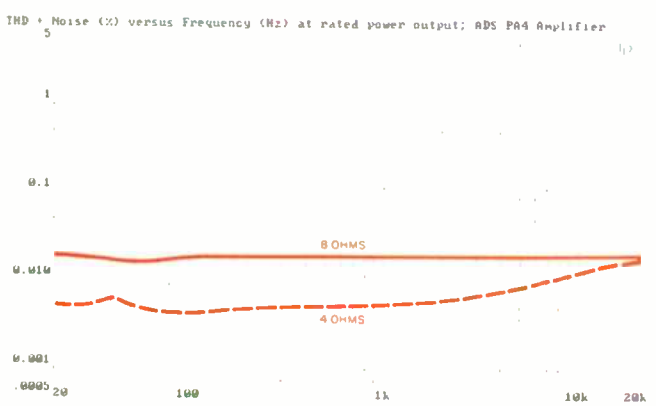

Fig. 2—THD + N vs. frequency.

upper limit of this graph, the roll-off was very gentle, reaching the −3 dB point at 300 kHz. Figure 2 shows how THD + N varied as a function of frequency for the constant rated output of 150 watts into 4 and 8 ohms, with both channels driven. In fact, for 8-ohm loads, THD + N hardly varied at all over the entire audio spectrum; it remained at about 0.017%, far lower than the 0.05% specified. The same test was repeated for 4-ohm loads, and since a/d/s/ specifies the same rated power at that lower impedance, I set the Audio Precision test generator to maintain the amp's output at a constant 150 watts per channel at all frequencies plotted. While this time there was a slight rise in THD as the higher test frequencies were approached, THD + N was still well below 0.02% at 20 kHz.

Figure 3A shows THD + N versus power output into 8-ohm loads for signals of 1 kHz, 20 Hz, and 20 kHz. The rated distortion of 0.05% was reached at an output of 158 watts, so a/d/s/ could have specified this as the rated power output for an 8-ohm load. At the published rating of 150 watts per channel, THD for the worst-case (20-kHz) signal was only 0.007%. Similar plots were made for 4-ohm loads (Fig. 3B). Although a/d/s/ conservatively rated the 4-ohm power output as 150 watts per channel, the curves reveal that the amplifier was able to deliver 220 watts per channel at mid-frequencies and 210 watts per channel at 20 kHz before the rated THD of 0.05% was reached. A 20-Hz input signal resulted in an output of 215 watts per channel for the same rated THD value. If I were to accept the published rating of 150 watts, even for a 4-ohm load, I would have to report the worst-case THD + N figure as only 0.014% (for a 20-kHz signal) as opposed to the rated maximum THD figure of 0.05%. In the bridged mode, I was able to drive the amp to nearly 295 watts using a 4-ohm load for the rated THD of 0.05%. All in all, the PA4 turned out to be one of the most conservatively rated amplifiers I have measured in a long time.

To complete the distortion analysis of this amp, I applied a standard SMPTE-IM signal to the inputs, varying the level to produce equivalent power output levels ranging from around 250 mV to clipping. Results for 8- and 4-ohm loads are shown in Fig. 4. At rated output, SMPTE IM measured 0.006% with 8-ohm loads and 0.016% with 4-ohm loads. Similar plots were made using two high-frequency signals, 18 and 19 kHz, as the input. The resulting "beat" frequency of 1 kHz, usually referred to as CCIF-IM distortion, measured 0.00022% at rated power for 8 ohms and 0.00032% for 4 ohms (Fig. 5).

Input sensitivity for 1 watt output into 8-ohm loads was 97 mV. A-weighted S/N ratio, referred to 1 watt output, was 94.47 dB. Adding another 21.76 dB, to reference the S/N to the rated output of 150 watts per channel, yielded an A-weighted S/N rat o of 116.23 dB, considerably better than the 110 dB claimed by a/d/s/. Damping factor, using a 50-Hz signal into 8 ohms, was 96, while dynamic headroom measured 1.6 dB slightly more than the 1.5 dB specified by the manufacturer.

Use and Listening Tests

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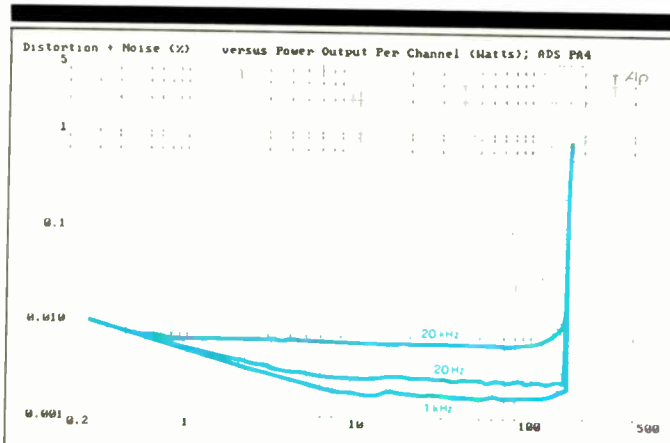

Fig. 3A—THD + N vs. power output for 8-ohm loads.

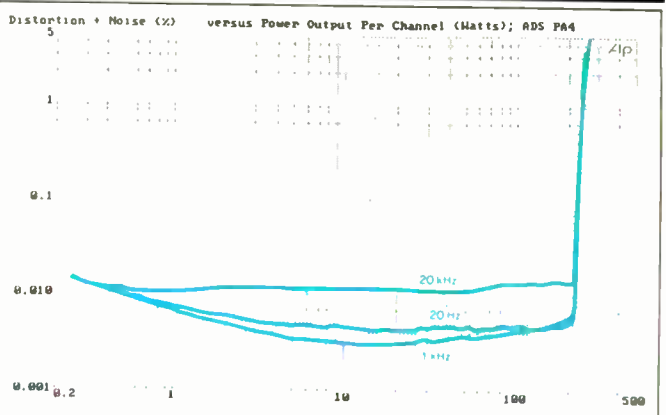

Fig. 3B—Same as Fig. 3A but for 4-ohm loads.

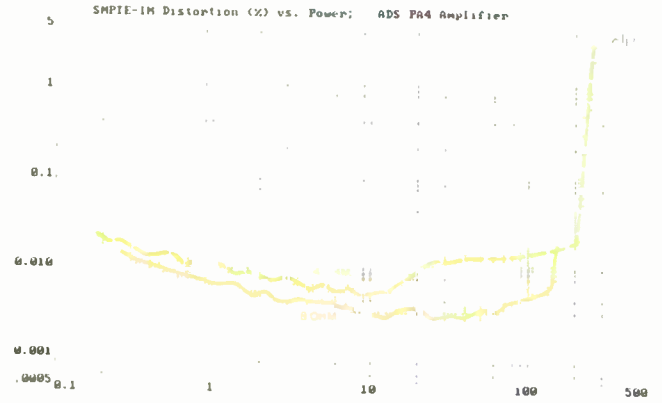

Fig. 4—SMPTE-IM distortion vs. power output.

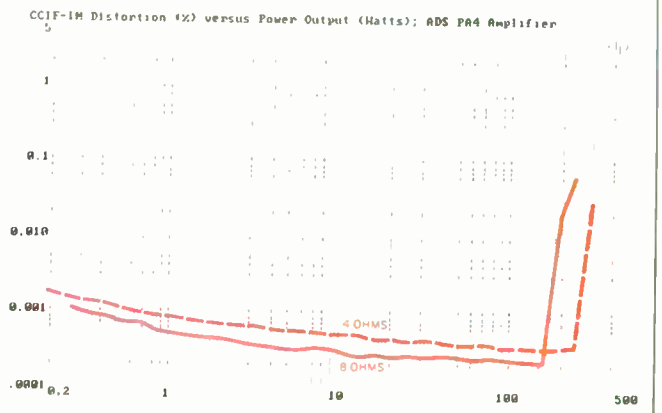

Fig. 5—CCIF-IM (twin-tone) distortion vs. power output.

one's judgment when listening to, and trying to evaluate, the sonic qualities of audio equipment. If this is true, then I must confess that I was predisposed to think very well of the a/d/s/ PA4. I am favorably impressed by superb engineering, good product styling, and intelligent ergonomics. The PA4 boasts all of these attributes. That having been said, you can guess that I thought the sound quality of this compact and neat-looking amplifier was superb. My listening tests involved using the PA4 together with the a/d/s/ CC4 tuner/preamplifier, which arrived at my lab along with the amp. To eliminate the possibility of too many variables, I also played CDs by connecting the variable outputs of my reference CD player to the inputs of the PA4. Not only could I detect no difference in sound balance or quality between these two setups (which speaks well of the "straight wire" qualities of the CC4 tuner/preamp), but the overall sound quality in both cases was particularly open and devoid of any veiled quality.

Two of the several CDs I used especially illustrate this sense of open, unveiled, and smooth sound: A new Telarc release called *Big Band Hit Parade* (CD-80177), featuring digitally recorded arrangements of some of the greatest hits of the '30s and '40s, and a Bainbridge Records remastering of a 1964 recording of Virgil Fox playing the giant John Wanamaker Organ in Philadelphia (BCD-2501). The Bainbridge disc was archived with the Colossus system of digital recording developed by my old friend Lou Dorren, who is now with a company called By The Numbers.

The accurate reproduction afforded by these a/d/s/ components makes it easy to pick out other good software from my growing collection. With electronics this good, it's a lot easier, and more fun, to differentiate between excellent and not-so-great program material. And that's one of the hallmarks of first-rate electronics—that it enables you to easily distinguish between good and not-so-good software.

Leonard Feldman

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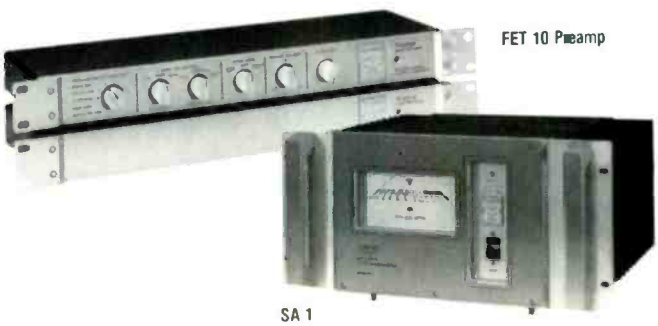

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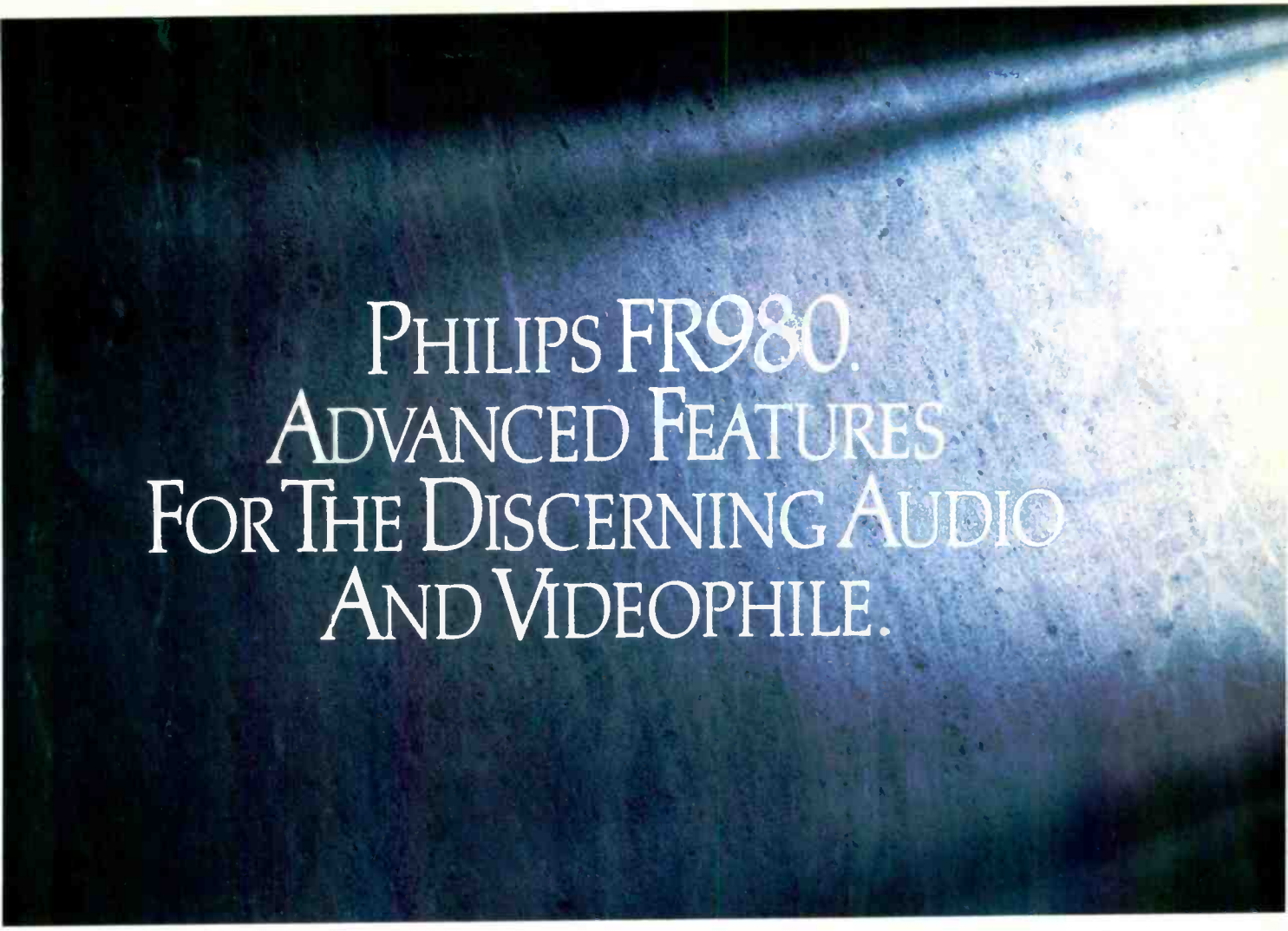

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3

FOSGATE DSM-3610 PRO-PLUS SURROUND PROCESSOR

Manufacturer's Specifications

Static Separation: Better than 35 dB side to side, center to surround, and surround to front. Typically better than 50 dB from center to surround and surround to center.

Dynamic Separation: Sufficient for instantaneous localization in all directions simultaneously.

Main-Channel Distortion: 0.05% at 2 V output.

Frequency Response: 5 Hz to 35 kHz, ±1 dB.

S/N Ratio: 90 dBA, re: 1.5 V.

Surround-Channel Distortion: 0.3% or less.

Dolby Surround Frequency Response: To Dolby Laboratories specifications.

Surround-Channel S/N: 85 dBA, re: 1 V.

Subwoofer Frequency Response: 5 to 80 Hz, with roll-off at 12 dB/octave above 80 Hz.

Bass EQ: Up to 18 dB boost.

Input: 100 mV to 3.5 V, 75 kilohms.

Output: Up to 4 V, 1.5 kilohms nominal.

Dimensions: 17¼ in. W × 2¾ in. H × 11 in. D (43.8 cm × 7 cm × 27.9 cm).

Weight: 9.8 lbs. (4.5 kg).

Price: $1,429.

Company Address: P.O. Box 70, Heber City, Utah 84032.

For literature, circle No. 93

Jim Fosgate and Peter Scheiber have been involved for many years in creating designs and products for various forms of surround sound. The result of their latest collaboration, the Fosgate 360° Digital Space Matrix DSM-3610 Pro-Plus, is an advanced separation-enhancement system.

Sophisticated digital control technology allows the time constants of the logic steering circuitry to change constantly with the dynamics of the source. This is true whether the material is encoded with Dolby Surround or is regular stereo. The attack and release times of the logic-control signals are automatically adjusted in response to complex material, thereby preventing IM distortion, pumping, or breathing effects. These times can be very short when called for.

An analog time delay is used, which the makers feel has a more natural sound than digital delays. The Pro-Plus system includes a modified Dolby B NR circuit, to encode 10 dB of noise reduction in addition to Dolby Surround's standard 5 dB. Fosgate states that the combination "results in a time-delay system with the quietness of digital and the natural sound of analogue."

The DSM-3610 offers four operating modes: "Mono," for synthesized stereo surround from monaural sources, plus "Regular," "Medium," and "Wide" surround modes, all of which are compatible with Dolby Surround. It has input switching for four audio/video sources, plus A/V tape-monitor connections. Controls for input level and balance, surround level and delay, and bass EQ (adjustable from 0 to +18 dB) are on the front panel. The supplied infrared remote control can change overall volume and main/surround balance, mute system output when needed, and restore all factory-set adjustments with the touch of a button. (Adjustments for more exact level matching to external amplifiers, should that be necessary, are available inside the DSM-3610.)

The unit has outputs for main stereo, center front, and subwoofer channels as well as for the left and right side and left and right rear surround channels. The surround delay is continuously adjustable from 15 to 30 mS.

Control Layout

Along the left side of the front panel are 11 pushbuttons, each with a large LED indicator, in groups of five, two, and four. These buttons require a firm push to ensure latching. Light-touch switches may be in vogue these days, but I have seen such switches fail with time and not work no matter how much pressure was applied. The switches used by Fosgate have contacts that wipe across each other in operation, which promotes long-term reliability.

The first group of five pushbuttons is for "AV Source." The buttons labelled "One" through "Four" have green LEDs and are mechanically interlocked. "Tape Monitor," the last of the five, is not interlocked with the others and should not be. When it is on, its yellow LED cautions the user that the DSM-3610 is in monitor mode. When activated, all of these "AV Source" buttons switch both video and stereo audio.

The next two buttons to the right are "Logic" (red LED) and "Center Ch" (yellow LED). "Logic" engages the Fosgate Pro-Plus steering logic. "Center Ch" activates the center-front channel to feed a center amplifier and speaker.

The next group of switches is for "Sound Stage Width." These buttons, each with a green indicator, offer choices of "Mono Enh," "Regular," "Medium," and "Wide." "Mono Enh" is used with monaural sources and enhances them by synthesizing a surround effect. "Regular" provides better-than-theater Dolby Surround effects from encoded sources and provides a distant perspective for stereo listening. "Medium" yields a mid-hall perspective with stereo or surround-encoded material. It omits the normal Dolby Surround delay and response-restricting, 7-kHz filter from the side (but not the rear) channels. "Wide" is used to get an up-close, "you are there" perspective from a variety of sources.

In the center of the front panel, just to the right of the pushbuttons, are a number of LEDs and the remote sensor. From left to right are: "Dialog" (red LED), "Surround" (red LED), "IR Sensor," "IR Receiver" (red LED), and "Input Level" (three green, one yellow, and one red LED, side by side). When processing stereo material, the "Dialog" and "Surround" LEDs flash on and off in accordance with the relative center and surround content of the program material. The small, round infrared sensor is inset into the panel to protect it from possible damage. Its LED flashes rapidly whenever the remote control is used, confirming that transmission is being received. The "Input Level" LEDs form a simple, left-to-right level meter. The leftmost green LED is always on when the unit is powered, the yellow LED indicates caution against higher levels, and the red LED calls for level reduction.

Further to the right are five rotary controls: "Input Level," "Input Balance," "Bass EQ," "Surround Level," and "Surround Delay." Below each are guiding labels at the counterclockwise and clockwise ends of rotation. The labels are, respectively, "Min/Max," "Left/Right," "Bypass/+18 dB," "Min/Max," and "15 mS/30 mS." Each of the medium-sized knobs has good knurling and an obvious white index line, both of which are very helpful. It would be even better if each index line extended onto the face of the knob: When a knob is at either extreme position, its index line cannot be seen from above. At the far right is the power on/off switch. The panel's gold legends are hard to see on the black background if the light is somewhat dim.

On the back panel are four groups of gold-plated phono jacks. From right to left, the first six are the "Video Switch" group, labelled "1," "2," "3," "4," "Tape," and "Out." The "Tape" jack allows connecting the video output from a VCR, so its output is looped through when the tape-monitor switch on the front panel is used. The "Out" jack will feed the selected source to a video monitor. The second group consists of "1" through "4" stereo pairs for the "Audio Inputs." Next is the "Tape Recorder" group, which has audio "Tape Out" and "Tape In" stereo pairs. The "To External Power Amplifiers" group has stereo pairs for "LF/RF" (main), "LS/RS" (side), and "LB/RB" (back surround), and single mono outputs for "CF" (center front) and "Sub" (subwoofer). To the right of the unit's power cord are two unswitched a.c. outlets. The fuse-holder below the cord has a flat cap with a screwdriver slot. This good design makes it possible to check a fuse externally but does not make it that easy to diddle. A label calls attention to the fact that this Fosgate unit has been treated with Tweek, to prevent corrosion and to maintain good contacts at connections.

Removing the top cover revealed a chassis-size p.c. board having an open and very neat layout. Some parts numbers are shown, and many components and sections are identified by function. The eight user-adjustable trim pots are very clearly marked, and an accompanying statement warns the user about changing any other controls. I noticed that the other, factory-adjusted trim pots were marked and staked in place by small dabs of red lacquer. Three fairly large black boxes (literally) are the "Pro-Plus D-3 Digital Control Voltage Generator," "Pro-Plus MX High Separation Matrix," and "V-1 Electronic Volume Control." Many parts of the highest quality were in evidence. The soldering on a small vertical board was excellent; I did not remove the bottom cover to look at the soldering on the main board. The power transformer mounted on the side rail and the board, was fairly hot to the touch after hours of operation. The chassis was good and rigid without the top cover—more so, of course, with it back in place.

The remote control is very simple in comparison with many others, and its functions are easy to understand. This

The DSM-3610 was successful in placing voices with the on-screen characters while maintaining spread in the music and effects.

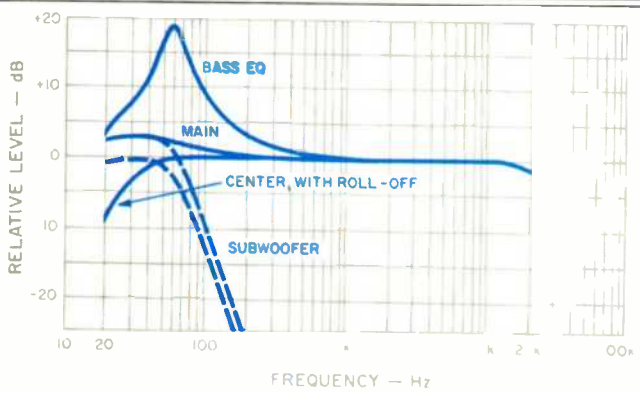

Fig. 1—Swept-frequency response curves for various channels and settings of the DSM-3610; see text.

simplicity could be a considerable advantage for many users, although others will miss being able to switch modes from the listening position. The remote's two "Vol" buttons increase or decrease overall level, while the two "Bal" buttons shift the front/back balance. A push of "Ref" returns volume and balance settings of the DSM-3610's voltage-controlled amplifiers to factory-set references. "Cue" drops the volume to a low level when desired, such as when answering the telephone. A second push, or a touch of either volume button, restores the set volume.

Measurements

I should first note that all measurements were made after I had completed the listening tests that are discussed later.

The main-channel frequency response (Fig. 1) rose slowly as the frequency decreased below 1 kHz, reaching +1 dB at 100 Hz and close to +3 dB from 40 down to 20 Hz. It then rolled off to reach 0 dB at 4.3 Hz and −3 dB at 2.7 Hz. Above 1 kHz, response was flat to nearly 20 kHz, then rolled off to −0.8 dB at 20 kHz. The −3 dB point was reached at 45.9 kHz.

The center channel's response was basically the same as the main channel's, including the low-end boost. Figure 1 also shows the low-frequency response of the center channel with its internal roll-off switch on. This roll-off would be recommended for center speakers having poor bass capability or for a better overall balance when a subwoofer is used. The subwoofer output rolled off above 50 Hz, reaching a slope of 18 dB/octave at about 80 Hz. The subwoofer internal trim pot had a range of 25 dB. Figure 1 shows the subwoofer channel's response with this pot adjusted to match the main channel's level at 40 Hz (+3 dB) and with the pot adjusted to match the main channel's 1-kHz output (0 dB). The bass EQ's boost peaked at 58.5 Hz, with a maximum rise of 17.2 dB; this is in addition to the main channel's normal response boost of 2 dB or so at that frequency. The side channels were −3 dB at 30 Hz and 7.7 kHz, and −10 dB at 9.7 kHz in "Regular." In the "Wide" operating mode, the −3 dB point moved out slightly, and −10 dB was reached at 12.6 kHz. The back surround-channel responses for all modes were close to the "Regular" side-channel response.

Harmonic distortion for 1 V at 1 kHz was 0.03% in the main channels, falling to 0.028% at 20 Hz and rising to 0.3% at 20 kHz. At 0.5 V, a much more likely voltage, the distortion at 20 kHz was 0.12%, which is much better. The surround channels had 0.05% distortion for 1 V at 1 kHz. The 20-Hz figure was 0.15%, and the high-frequency distortion was 0.3% just before the roll-off point.

With "Ref" volume and balance, the S/N ratio of the main channel was 93.3 dBA referred to 1 V, and this would be close to typical over a range of adjustments. With volume at maximum and balance all the way to the front, the ratio decreased to 80 dBA, which is a worst-case figure. The side channel's S/N was 91.7 dBA with reference volume and balance. The back surround channel's S/N varied from 80 to 90 dBA, depending on particular settings. This ratio was typically 85 dBA with reference volume and balance and with the surround-level pot at 1 o'clock.

The maximum input level for a 1-kHz test signal was greater than 31 V. With the input-level pot wide open, 0.196 V would just turn on the level meter's red LED; actual waveform distortion appeared 4 dB above that. I fed in a 5-kHz tone burst to check the response of the LED meter and set the continuous level 1 dB above where the red LED turned on. I was quite impressed to see that the LED was still flashing brightly with a burst as short as 10 mS. In fact, it was still flashing, albeit faintly, with bursts as short as 0.4 mS. The decay time was about 250 mS, somewhat faster than a VU meter. The DSM-3610's little meter may not look like much, but it is an important and well-implemented feature.

Maximum output, defined by the onset of clipping, was 6.7 V with the internal level-adjustment trim pot turned up. This voltage is much higher than is called for by the sensitivity of any power amplifiers I know of. There was, therefore, no need to keep the trim this high, so I returned it to the factory setting. The input impedance was a satisfactory 22 kilohms with the input pot at maximum and a good 39 kilohms with it at midpoint, a more likely position. The output impedance was 675 ohms, which is a very good figure. The surround delay time could easily be set anywhere from 10.8 to 30.0 mS.

Using a monaural source, I adjusted "Input Balance" to get a minimum level in the surround channels. With this setting, the left main-channel output was just 0.3 dB higher than the right. The left and right sections of the input-level pot tracked within 1 dB from 0 to 40 dB of attenuation, which is fairly good. Remote-control volume and balance tracked within 1 dB for about 25 dB over their total 40-dB range. From maximum volume and balance all the way front, "Ref" reduced the main channel's volume by 18 dB, including a

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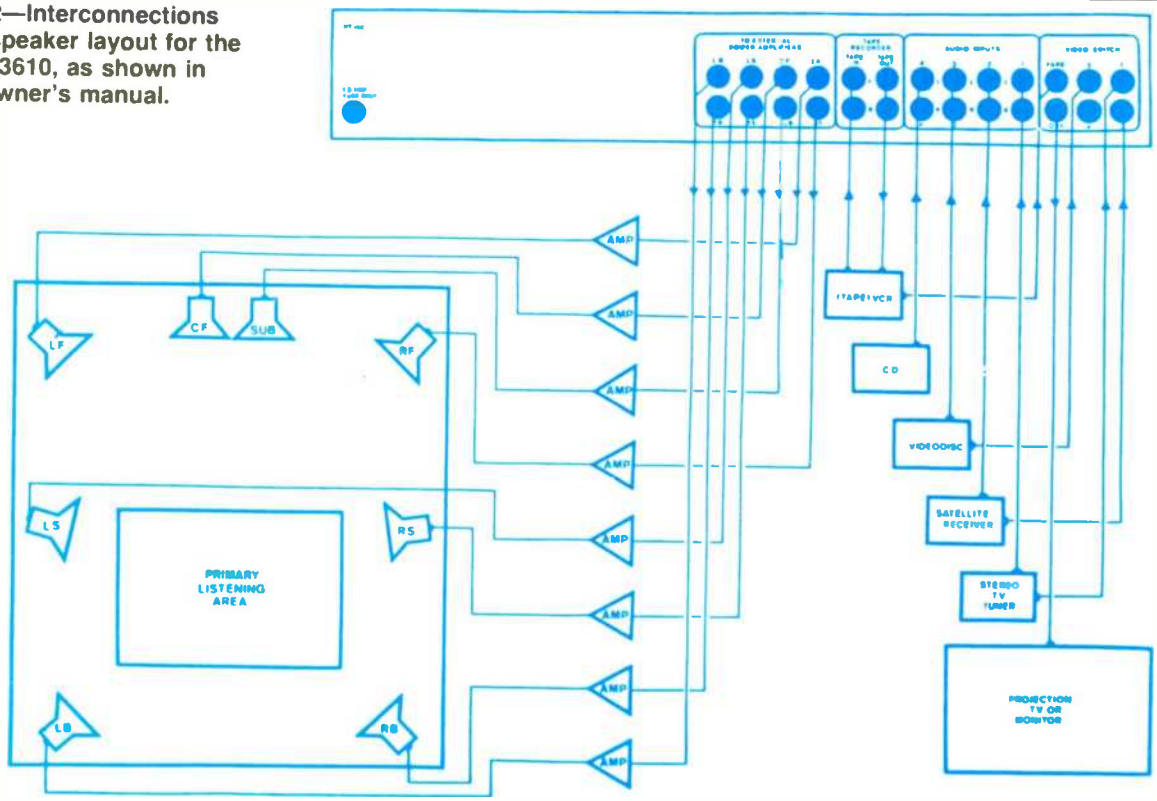
I was pleasantly surprised at how well the combination of music and announcements sounded. Some processors can't manage both at once.

Fig. 2—Interconnections and speaker layout for the DSM-3610, as shown in the owner's manual.



14-dB level drop plus a 4-dB balance shift from front to back. "Cue" reduced the maximum volume by 37 dB.

Use and Listening Tests

The DSM-3610 owner's manual starts with a quick hookup guide for those who can't wait to hear something. The final step recommends reading the entire manual, which I feel is a must for the best use of this Fosgate processor. There is good discussion on front-panel controls, rear-panel connections, and the possible sources of audio and video, plus some suggestions on which modes to try. The installation instructions are quite good, but they would be improved if references to the illustrations at the back of the manual were included. It's good to instruct the user on checking loudspeaker connections for consistent polarity relative to amplifier outputs. Missing, however, is the caution that some power amplifiers invert polarity, and some do not. The section on making internal adjustments is well written and includes the steps needed to get personalized reference-level settings for future use of "Ref"; here, though, users should have been referred to the back-of-the-manual illustration of these pots. The sections on "Optimizing System Performance" and "In the Event of Difficulty" are succinct, lucid, and pertinent.

My reference processor for the listening/viewing tests was the Yamaha DSP-1. Other equipment included a Yamaha AVC-50U for input switching and main-channel amplification, a Yamaha TX-900U AM/FM tuner, a Magnavox FD1041BK CD player, an Akai VS-M930U-B VHS Hi-Fi VCR, a Sanyo VCR-7200 Beta VCR, a Yamaha LV-X1 videodisc player, a Soundcraftsmen DC2214 octave-band equalizer, a Yamaha M-35B four-channel amplifier for the side and surround speakers, a Lafayette amp for the center channel, a QSC amp for trying other speaker locations, and speakers from JBL, Dynaco, and Ramsa. The Akai VHS Hi-Fi VCR was used as the MTS stereo-TV decoder. I used a patchbay that facilitated making fairly fast changes between the Fosgate DSM-3610 and the reference Yamaha DSP-1.

Figure 2 is a reproduction of one of the illustrations in the DSM-3610 owner's manual. I did not use the tested unit for switching inputs, but the outputs, amplifiers, speakers, and arrangement in Fig. 2 match what I did.

For my first listening/viewing test, I watched a VHS Hi-Fi version of Paramount's *Planes, Trains and Automobiles*, with Steve Martin and John Candy. Some of the balances weren't quite what they should have been, but I hadn't taken the time to adjust them according to the manual. I did, however, set the surround delay to correspond to the listening area and came to a number of conclusions fairly quickly: The results were best with "Logic" and "Center Ch" on; the sound effects and background music were well integrated into the overall sound; "Medium" was the preferred mode; I couldn't sit close to a back surround speaker, and the character of the dialog was very good.

....remarkable!

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The DSM-3610's quality and performance should interest those who want high-quality home-theater sound together with enhanced stereo music.

Even though I had more setup adjustments to do, I made a fast comparison with the Yamaha DSP-1 and confirmed my judgment that the DSM-3610 delivered superior dialog from this movie. The improvement in the sound of the dialog led me to re-aim the center speaker so that my preferred listening position would be more on its axis. Then I followed the procedures in the manual to get better level balances among all the speakers. The next source was the NBC movie, *A Stoning in Fulham County*, with Ken Olin, Jill Eikenberry, and Ron Perlman. The results were very good with both "Logic" and the center channel on, and were not as good with either or both off. I was able to set the center channel's level exactly where I wanted for good, centered dialog without losing a good spread in music and effects. Because I had matched levels well, particularly between the side and back speakers, it was much more difficult to localize the rear surround speakers than it had been before. I determined that the remote control was effective up to at least 25 feet and over 30° off axis.

Aliens, with Sigourney Weaver, on Showtime, had good dialog centering even when the center channel was off, but I preferred it on. There were good, pertinent alterations in the sound field with changes in the scene. Poor surround systems can produce changes that are interesting but wrong for what appears on the screen. One scene was particularly exciting. A warning beep was sounding, and I suddenly realized that I was getting tense from the action and from being surrounded by this persistent tone—very effective. A rented VHS tape, *From Beyond*, with Jeffrey Combs and Barbara Crampton, required the monaural setting and "Logic" off. The results were fairly good—better than I expected.

The Warner Home Video *Ladyhawke* videodisc, with Rutger Hauer, Matthew Broderick, and Michelle Pfeiffer, produced the best sound I'd yet heard from this setup, to say nothing about the best picture. "Logic" and the center channel were both on, and "Medium" was the preferred mode—especially for the music, which I really like. There was one short section where there was some soft popping, but it disappeared with the steering logic off. The popping did not occur at any other point, so I suspect the disc itself was responsible. This conclusion was reinforced when I played Paramount Home Video's *Rustlers' Rhapsody* videodisc, with Tom Berenger. The results were similarly excellent and without any popping. I have commented in the past about other systems that spread stage-center voices out in space until they seem disembodied. These two discs helped to emphasize the DSM-3610's success in placing voices *with* the characters, while maintaining spread in the music and effects.

When listening to my favorite FM station, I preferred "Medium" or "Wide" mode, depending on the music. I left "Logic" in and the center channel on most of the time and was pleasantly surprised at how well the combination of spoken announcements and played music sounded. Previously tested surround processors offered the choice of good voice quality or good music sound—not both.

I used CDs for most of the music-source listening. The well-known Pachelbel Canon in D Major, performed by the Jean-Francois Paillard Chamber Orchestra, was best using "Medium," with center and logic off. The sound had good, smooth quality, but, overall, it was not a match for what was possible with the Yamaha DSP-1. I came to similar conclusions for other pieces on this Erato CD, entitled *Pachelbel: Canon/Albinoni:Adagio* (ECD-55018).

For Mozart's Symphony No. 39, played by the Bamberg Symphony Orchestra with Eugen Jochum (Orfeo C045901A), the "Regular" and "Medium" modes were both good. *Music of Wagner* (Minnesota Symphony Orchestra with Neville Marriner, Telarc CD-80083), Schubert's *Death and the Maiden* (Amadeus Quartet, Deutsche Grammophon 410024-2 GH), and some Charpentier motets (Concerto Vocale, Harmonia Mundi HMC-901149) were all best with "Medium" selected. Dire Straits' *Brothers in Arms* (Warner Bros. 25264-2) was especially good with "Wide." The center speaker was very good for pointing up vocals on this and other pop/rock CDs. "The Atlantic Records 40th Anniversary Show" on HBO featured, among others, Phil Collins, Sam Moore, The Bee Gees, The Rascals, and Dan Aykroyd. The center channel was definitely needed for good vocal centering and presence. I thought "Wide" mode was best for both music and a "being there" audience sound.

Although I had wished for more features on the remote control during setup and early testing, I did not feel so limited after some use. I suspect that many audiophiles would have a similar experience: After learning what modes and control and switch settings are best for particular sources, those choices will be made when selecting the source while at the equipment. That's also the time to check input level and change bass EQ, if necessary.

In my own listening, I thought that the sound was good and full with bass EQ at zero. I did not judge the bass to be excessive and was a bit surprised at the response boost revealed in the later measurements. If a turntable is used with this system, a subsonic filter may be needed to reduce possible rumble. There is a slight lag when changing volume or balance with the remote, but the shifts are desirably smooth. "Cue" requires a short hold on the button—a quick tap is not long enough for response, even though the front panel's "IR Receiver" light goes on. I liked the way the muting went on and off because the level changed very quickly but smoothly—not abruptly, as is typical.

I do feel that Fosgate's combination of the 360° Digital Space Matrix and the Pro-Plus steering logic is successful. This is particularly true for movies—whether broadcast, on videocassette, or on videodisc. Music performances on TV, including music videos, also benefited from the performance of the DSM-3610. In comparison to the reference processor, however, the Fosgate was audibly less successful with classical music—although it did provide a better compromise for some broadcast music programs with spoken commentary.

One of the tested unit's strong points is its provision for side speakers, which secure a general improvement in the smoothness of the sound field. The side speakers also enlarge the possible listening area and make the back surround speakers less likely to be localized.

The Fosgate DSM-3610 has a high price, but its quality and performance make this sound processor of interest to those who want really high-quality home-theater sound and better-than-stereo music reproduction. *Howard A. Roberson*

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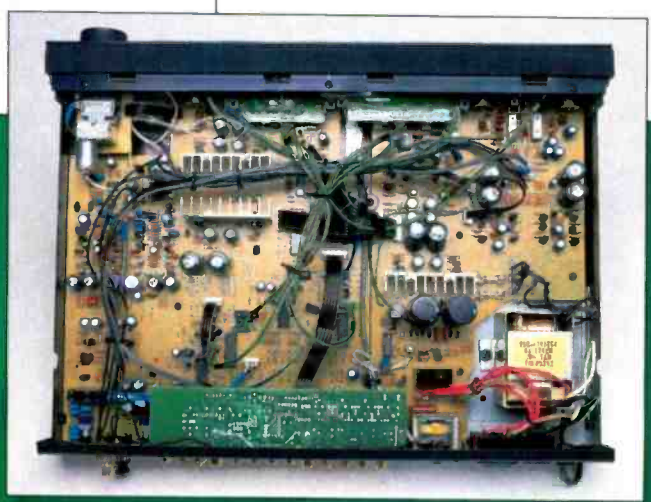
4

HARMAN/ KARDON CITATION TWENTY-FIVE PREAMP

Manufacturer's Specifications

Frequency Response: Phono, RIAA, 20 Hz to 20 kHz, ±0.2 dB; high level, 0.25 Hz to 250 kHz, +0, −3 dB.
THD: 0.002%, AUX input, 1 V output.
Slew Rate: 120 V/μS, measured without input anti-slewing and output-isolation networks.
Rise-Time: 1.4 μS.
S/N: MM phono, 83 dB; MC phono, 78 dB; high level, 91 dB.
Input Sensitivity (re: 0.5 V Output): MM phono, 1.1 mV; MC phono, 65 μV; high level, 65 mV.
Phono Overload: MM, 180 mV; MC, 10 mV.
Subsonic Filter: −3 dB at 15 Hz, 6 dB per octave.
High-Cut Filter: −3 dB at 6 kHz, 6 dB per octave.
Loudness Characteristic: +10 dB at 50 Hz; +3 dB at 250 Hz.
Nominal Output Level: 1 V.
Maximum Output Level: 10 V.
Output Impedance: 600 ohms.
Bass/Treble Control Range: ±10 dB.
Muting Attenuation: −20 dB.
Dimensions: 17⅜ in. W × 3⅜ in. H × 14⅝ in. D (44.3 cm × 8.5 cm × 37.1 cm).
Weight: 20 lbs. (9.1 kg).
Price: $849.
Company Address: 240 Crossways Park West, Woodbury, N.Y. 11797.
For literature, circle No. 94



The Citation name has been associated for several decades with some of Harman/Kardon's most impressive audio components. While each generation of components introduces new circuit concepts and approaches to circuit design, some of the fundamental principles associated with the Citation line since its beginnings remain intact. Harman/Kardon designers favor low gain, very wide open-loop bandwidth before feedback, and minimal use of negative feedback for lowering THD. Fast amplifier reaction time is another attribute of this and other Citation designs.

The Twenty-Five preamp incorporates a loudness control that I will have more to say about presently. The tone controls have two turnover points which can be selected by the user. The unit is extremely flexible; it not only accepts inputs from up to four video and three audio sources but also allows you to use each as a recording source. You can record almost any combination of video to video, audio to cassette deck, or audio to Hi-Fi VCR without having to change connections to your components. You can even dub from one source to several others while listening to a different program source.

Control Layout

Primary controls for the Citation Twenty-Five are always visible on the front panel, and secondary controls are hidden behind a flip-down panel. Primary controls include a power on/off switch with a built-in LED indicator, a standby indicator light, four tape-selector buttons plus a tape/source selector, five input-selector buttons, a small rotary balance control, a mute button, and a carefully calibrated master volume control. Flipping down the hinged panel that runs along the lower left of the front panel reveals the bass and treble controls and their turnover switches. Bass turnover can be set to either 200 or 400 Hz, while the available treble turnover frequencies are 2 or 6 kHz. Loudness compensation, subsonic and high-cut filters, mono/stereo, and an MM/MC selector comprise a lower row of pushbuttons. Above these, another row of pushbuttons and five more buttons further to the right handle selection of the program source that you want to direct to the record outputs. The remote control supplied with the Twenty-Five duplicates all functions found on the unit's front, except for balance and those whose controls are under the concealed flip-down panel.

The rear panel sports no fewer than 37 input and output jacks, a ground terminal, five a.c. convenience receptacles (three switched and two unswitched), a "Remote Power On" jack (to turn on a Citation Twenty-Two power amp), and cartridge-loading switches for the MM and MC inputs. The switch for the MM inputs adds 300, 200, or 100 pF of capacitance to the 125 pF the preamp normally places in parallel with your cartridge. The MC inputs are equipped with an input-resistance selector (adjustable for 10, 30, 56, or 100 ohms) plus shorting plugs to minimize noise when these inputs are not in use.

Because so many components can be connected to and controlled by the Citation Twenty-Five, the authors of the owner's manual have taken pains to provide five easily understood hookup diagrams. Each diagram illustrates specific groups of components that might be used with this preamplifier.

Measurements

Because of Harman/Kardon's emphasis on wide bandwidth, I deliberately measured frequency response for the high-level inputs of the Citation Twenty-Five using the entire range of frequencies provided by my Audio Precision System One test gear. Results are shown in Fig. 1. Response was essentially flat from 10 Hz to 10 kHz, down 1 dB at 75 kHz, and down 3 dB at 135 kHz. Input sensitivity for the high-level inputs measured 66 mV for 0.5 V output.

To measure the action of the subsonic and high-cut filters, I ran a second sweep, this time from 10 Hz to 20 kHz. Results are shown in Fig. 2. The −3 dB cutoff point for the subsonic filter occurred at precisely 15 Hz, as specified by the manufacturer, while the −3 dB point for the high-cut filter fell at 7 kHz. For reference purposes, a response curve with both filters turned off is also shown in Fig. 2. The range of the bass and treble controls, as well as the effect of the selectable turnover frequencies for each of these, is shown in the multiple sweeps of Fig. 3. As long as Harman/Kardon was offering selectable turnover frequencies for this preamp's tone controls, I would have preferred to see the bass turnover frequencies shifted to a somewhat lower point in the spectrum so they would have less influence on the critical midrange. On the other hand, the treble turnover points, in my opinion, are ideally set.

This brings me to the measurement of the loudness control's contours. All I can do is applaud loudly. Harman/Kardon realized that the Fletcher-Munson curves for equal loudness do not require treble emphasis at low listening levels. The fact that those curves exhibit a rising characteristic at high frequencies does not mean that loudness con-

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Harman/Kardon understood that the Fletcher-Munson equal-loudness curves don't require treble emphasis at low listening levels.

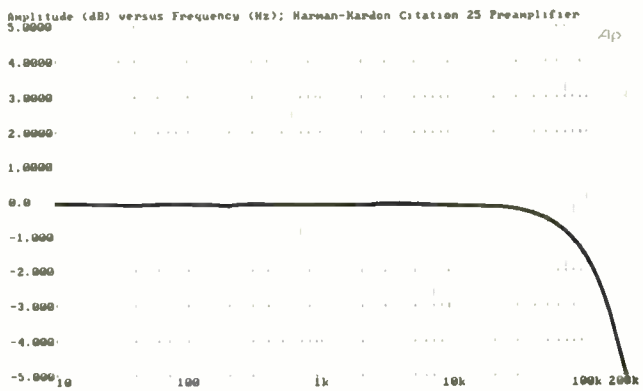

Fig. 1—Frequency response. Note that the frequency scale extends to 200 kHz.

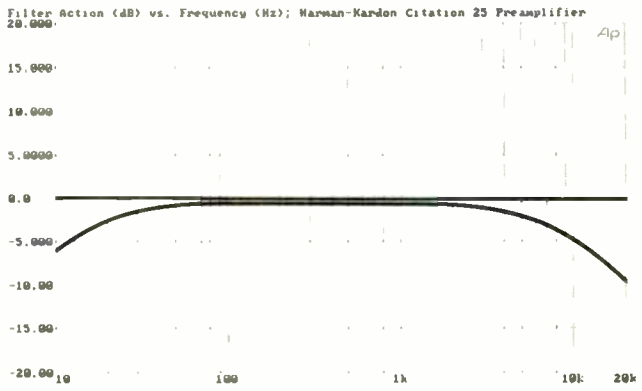

Fig. 2—Frequency response with and without low-cut (subsonic) and high-cut filters. Note scale changes from Fig. 1.

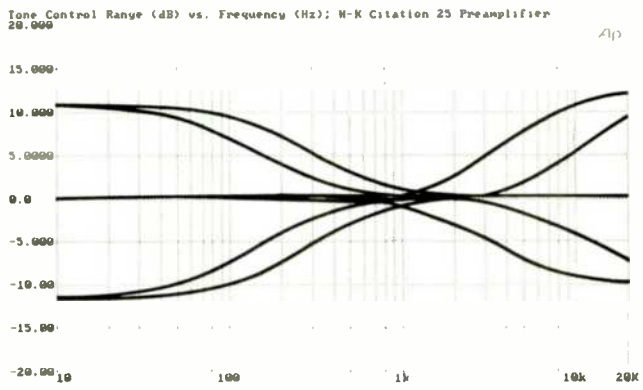

Fig. 3—Bass and treble control range, showing effects of switchable turnover frequencies.

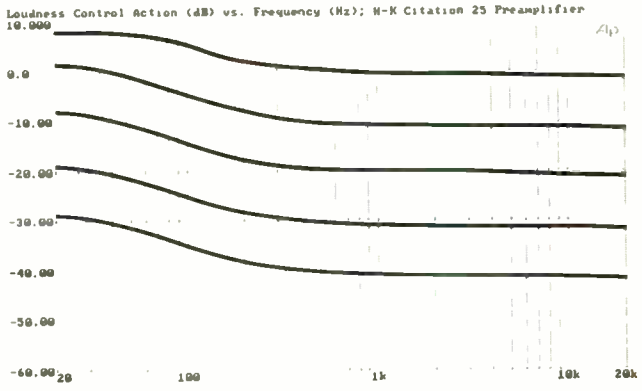

Fig. 4—Loudness compensation contours for volume settings from 0 dB (top curve) to −40 dB (bottom curve); see text.

trols must do likewise. If you were to examine the Fletcher-Munson curves, you'd see that the amount of rise at high frequencies is almost constant at all listening levels. This means that our hearing is less sensitive to high frequencies than to mid-frequencies, regardless of the level at wh ch we listen. By contrast, our sensitivity to bass frequencies decreases as the listening level is lowered; that's why loudness controls make some sense in the first place. It's the change in sensitivity to bass frequencies with changing levels which makes us think that music reproduced at lower than performance levels is deficient in bass. Harman/Kardon understands this; very few other manufacturers do. So much for the good news. On the negative side, if you examine the curves shown in Fig. 4, you will notice that once the volume control is set at −10 dB or lower, the amount of bass boost remains virtually constant. This is *not* in accordance with the requirements of the Fletcher-Munson curves. Less boost should have been provided at, say, −20 dB than at −40 dB. Overall, however, this loudness control sounded better to my ears—and to other listeners who auditioned this preamplifier—than the more usual design, which boosts both bass and treble frequencies at lower listening levels.

Figure 5 shows how THD + N varied with frequency for a fixed output level of 3 V. Distortion remained at around 0.0021% throughout the bass region, rising to 0.0028% at 1

I could detect no difference in sound quality when I fed my CD player directly to my amp and when I placed the Twenty-Five between them.

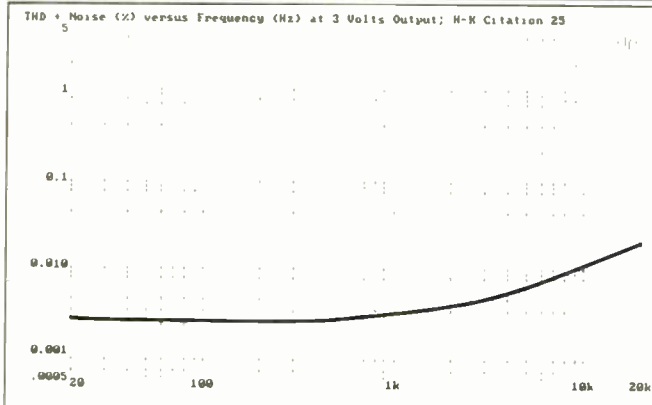

Fig. 5—THD + N vs. frequency, at 3.0 V output.

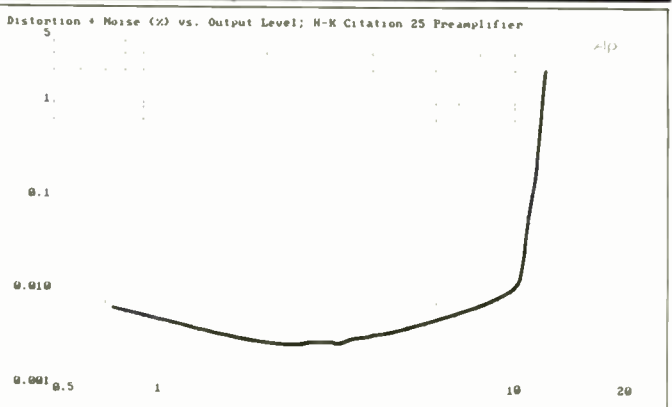

Fig. 6—THD + N vs. output voltage, at 1 kHz.

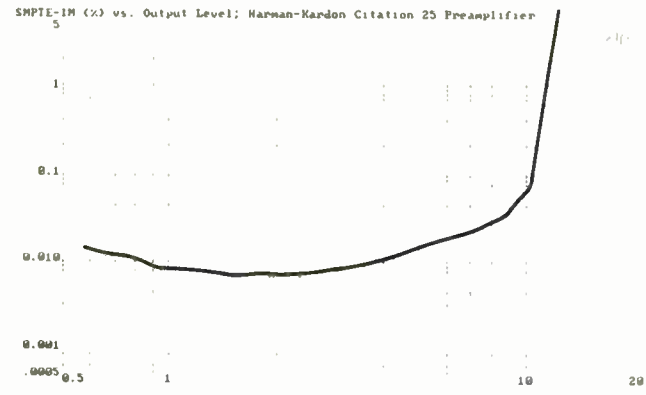

Fig. 7—SMPTE-IM distortion vs. output voltage.

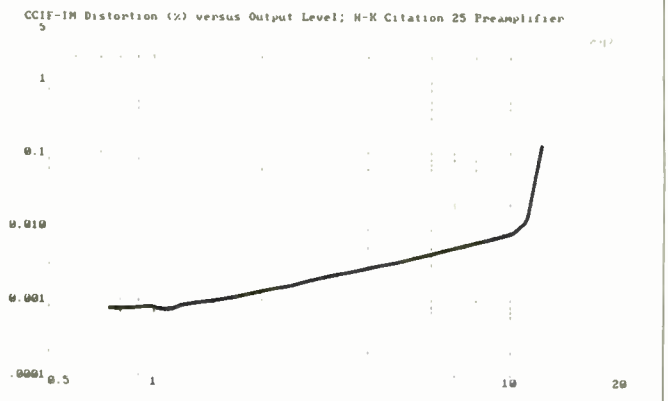

Fig. 8—CCIF-IM (twin-tone) distortion vs. output voltage.

kHz and to 0.02% at 20 kHz. Figure 6 shows how THD + N varied with increasing input and output levels for a 1-kHz test signal. The unit's THD + N remained under 0.01% up to about 10 V, the maximum output specified by Harman/Kardon. Figures 7 and 8 show how SMPTE-IM and CCIF-IM (twin-tone) distortion varied with output level. In both instances, equivalent output exceeded 10 V before a steep rise in IM was noted.

The A-weighted S/N ratio for the high-level inputs, referred to 0.5 V input and 0.5 V output, measured an impressively high 91.62 dB for the left channel and 91.4 dB for the right—a fraction of a dB higher than claimed by Harman/Kardon. Input sensitivity for the MM phono inputs was 1.1 mV for 0.5 V output, while S/N, referred to 0.5 V output with 5 mV applied, was a very high 84.5 dB. The MC inputs performed well, too, with a measured S/N ratio of 77 dB referred to 500 μV input and 0.5 V output. Input sensitivity for the MC inputs was 90 μV for 0.5 V output. Overload for the MM phono inputs was a very high 185 mV, while the MC inputs were able to handle 15 mV before there was audible evidence of input overload.

I was puzzled by one aspect of the phono inputs. Inasmuch as there is a front-panel switch that selects either MC or MM phono, why was it necessary to incorporate separate pairs of inputs for MM and MC cartridges on the unit's rear panel? Did the designers believe that, in this age of digital Compact Discs, audio enthusiasts owning the Citation Twenty-Five are likely to have two turntables, one with an MC pickup and the other with an MM cartridge? Oh, well, no harm in providing for that arrangement, I suppose. In any event, RIAA equalization was excellent, as evidenced by Fig. 9, which shows that deviation from perfect RIAA equalization did not exceed 0.2 dB at any point.

Use and Listening Tests

Rather than simply listen to a single program source through the Harman/Kardon Citation Twenty-Five, I decided to hook up as many audio sources as I could assemble. My

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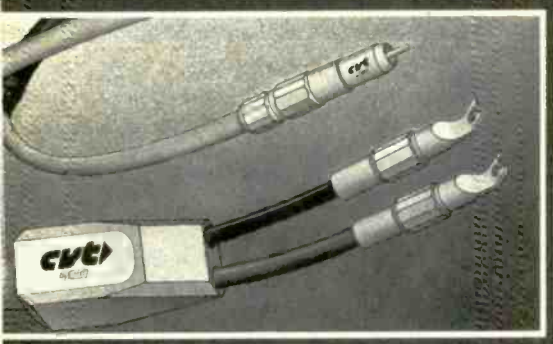

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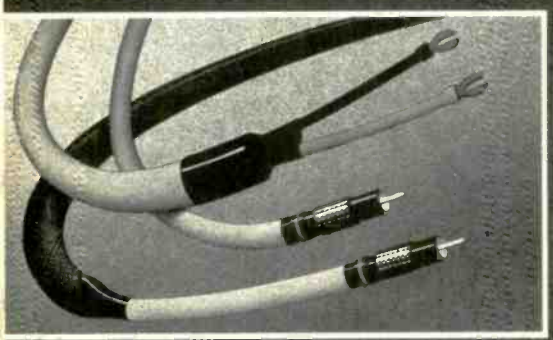

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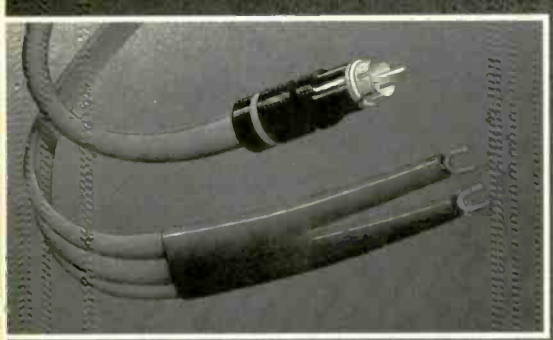

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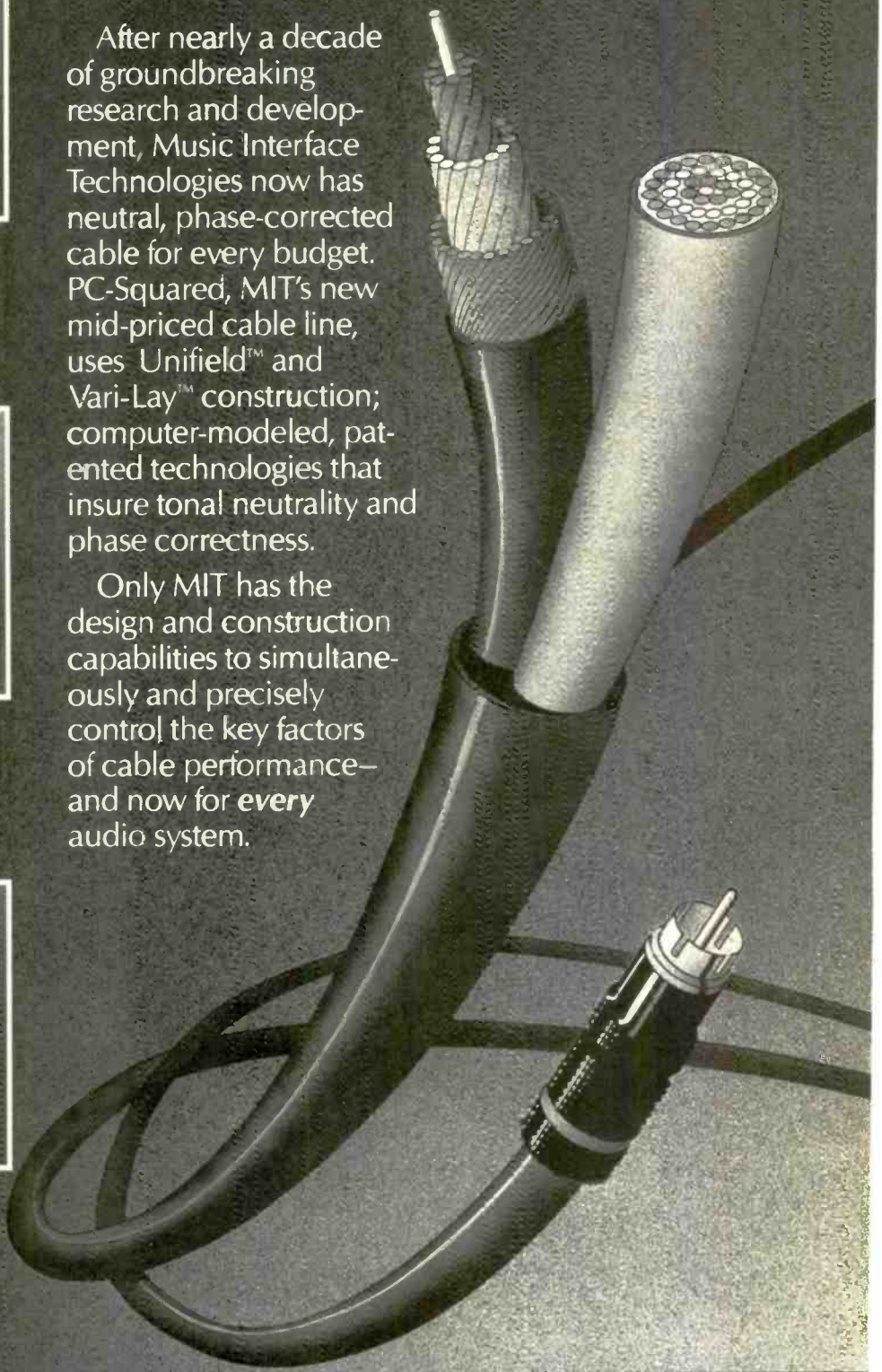

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As I'd expect from a good preamplifier, the Citation neither diminishes nor attempts to "enhance" the natural sound.

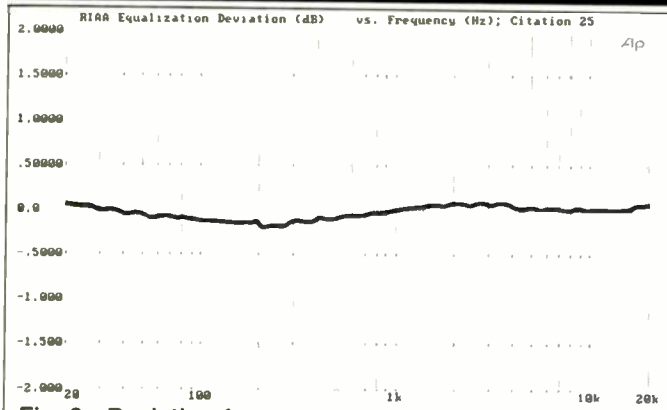


Fig. 9—Deviation from RIAA equalization is 0.2 dB or less at all frequencies. Note expanded scale.

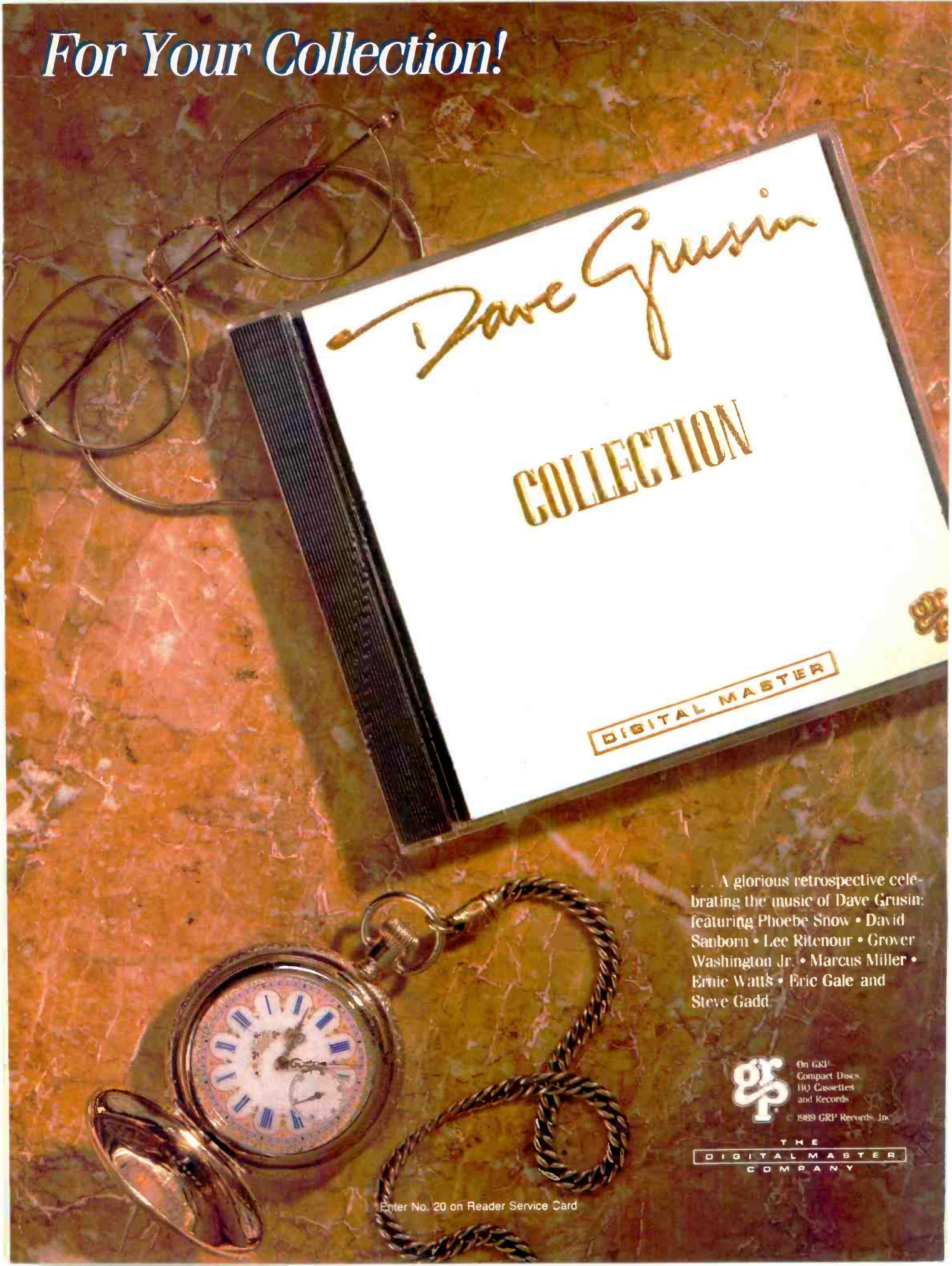
objective was to determine just how simple (or complex) total control of all these components would be using this preamp. After only a few minutes of familiarization with the pushbutton selectors, I was able to accomplish all the interfacing and recording options described in the unit's owner's manual.

As for sound quality, I judged it primarily by listening to CDs—though out of sheer curiosity, I played back some Hi-Fi VCR audio recordings. I also connected an FM tuner and a couple of cassette decks to the preamp and did some listening, as well as some recording and dubbing using the switching capabilities of the Twenty-Five.

Using the better CD material, the sonic results were flawless. Listening to a recently acquired CD of Stravinsky's *Petrouchka*, as played by the Seattle Symphony Orchestra under the direction of Gerard Schwarz (Delos D/CD 3054), I attempted the ultimate A/B test for a preamplifier: Comparing the sound heard when feeding the CD player's output directly to my reference power amp and speakers against the sound heard with the Twenty-Five interposed between the CD player and the reference amp. With gain adjusted carefully to within 0.1 or 0.2 dB, I could detect no difference in sound quality between the two setups.

The same held true when I auditioned another new Delos release which features Carol Rosenberger playing a Schubert Sonata on a Bösendorfer Concert Grand piano (D/CD 3018). The recording engineer for both these Delos CDs, incidentally, was John Eargle, who has a way of making recorded music sound remarkably natural and lifelike. The Citation Twenty-Five neither diminished nor attempted to "enhance" that natural sound, which is what I would expect from a well-designed preamplifier. *Leonard Feldman*

For Your Collection!



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TIRED BUT TRUE

American Dream: Crosby, Stills, Nash & Young
Atlantic 81888-4, LP.

Sound: B Performance: C–

There's nothing wrong with the tried and true. Unfortunately, at times, *American Dream* is simply trying, and is less than true to what we might have hoped for from the group that wrote the soundtrack to an era. Although the formula is the same, with each member serving as lead singer on the songs he's contributed, the particles that are the four personalities rarely coalesce and only occasionally converge to create a few sterling moments. Formerly so finely wrought from four unique voices, the vocal harmonies on *American Dream* are often just hammered out cursorily, and unfortunately, they rarely soar.

Clearly the most artistically visible of late, Young predominates here in terms of quantity—he's written or co-written nearly half the songs, opens and closes the album, and has named it. Still, his work on *American Dream* is not infused with the subterranean energy or eccentric brilliance that usually makes him shine. Instead, it is sentimentality that prevails on the nostalgic "Feel Your Love," the politically exhortative "Name of Love," and the tragic tale of repossessed dreams, "This Old House."

Stills' only solo contribution, "Got It Made," is a gem. Soulful, full of irony, it's a perfect vehicle for a voice that's become *more* buttery and resonant.

It may surprise some that the choicest cuts on the album come from the much-maligned Crosby. The acoustic confessional "Compass" traces his 10-year tailspin with eerie grace and bold poetry ("I have seized death's door handle . . ."). And he brings to the album one of the too few moments of high energy with "Nighttime for the Generals," an unparried jab at the shady side of the CIA. His passionate vocal, suffused with conviction, has only one other counterpart on the album: Stills and Young's banshee duel on "Night Song."

Which brings us to Nash. Three of his four contributions deal with the most serious problems society faces—war and pollution. Despite good intentions, they are so full of glib abstractions and are so weakly delivered that Nash comes across like a straw man struggling to hoist an ineffectual banner. Worse than serving as the chain's weakest link, Nash undermines the power that rock music can bring to bear on world problems.

Looking at progressive survivors such as Robbie Robertson and Steve Winwood, there's no excuse for the creative flabbiness of the reunited CSN&Y. We can only hope that *American Dream* is an exercise aimed at redeveloping some artistic muscle.

Susan Borey

Live and Let Live!: Bobby King and Terry Evans
Rounder 2089, LP.

Sound: B Performance: B+

Bobby King and Terry Evans are best known for the soulful vocals they have contributed to Ry Cooder's albums for 15 years. Now, at last, they're stepping out on their own. And with Cooder producing and playing sizzling lead guitar, plus the likes of drummer Jim Keltner, bassists Darryl Johnson and Jorge Calderon, and keyboardists Jim Dickinson and Spooner Oldham, they are stepping out onto very solid ground indeed.

What these guys are doing here is gutty R&B of the Sam & Dave charm school variety. The set opens with the soul chestnut "Just a Little Bit (of Your Love)" and closes with a gospel-driven read of Oldham's great song, "Dark End of the Street." In between is a nonstop program of songs mostly written by King and Evans and occasionally by Cooder, great playing (especially Cooder's guitar), and thrilling vocals. The boys defy you to lift off the needle.

There are two ways to look at this record. One way is to view it as the long-overdue debut of King and Evans, soul singers extraordinaire. But because it features Ry Cooder's most rocked-out, spine-tingling slide playing in years, you could, if you so wish, call this the best album Ry has made since *Bop Till You Drop* in '79. Either way, *Live and Let Live!* is a winner, an album that makes you feel as good as it plays.

Michael Tearson

Ghost Stories: The Dream Syndicate
Enigma 773341-1, LP.

Sound: C Performance: A–

This is so '60s, it's '80s. And just as the '60s added up to a decade greater than the sum of its years, so too is *Ghost Stories* greater than the sum of its pieces. Steve Wynn's vocals are homely, his lyrics are college-coffeehouse, and his band plays loose, like at a frat party. But, boy, they do it like they really believe that guitars can save the world.

I know this sounds horribly subjective and inferential, and I will say that I could talk of coloration and "warm" strings and all those other components of technique, but that's not the point. As The Dream Syndicate wanders further from its neo-psychedelic L.A. niche, and as the too-hip bombast of former guitarist Karl Precoda fades further into memory, the band has become seemingly less self-conscious and more just-shut-up-and-play. On most of these cuts, on the best ones, they've stopped intellectualizing. The Dream Syndicate is never going to sound like a Pittsburgh bar band, but now, at least, Chuck Berry won't spit on them. (Although he might have a different opinion on the pressing; tiny but bothersome crackles plague a couple of songs.)

The best cuts on *Ghost Stories* ring with unadorned guitars and keyboards, with full, major chords as satisfying as chocolate cake. The worst moments are when the band digs a little too deeply and delivers a horribly kitschy cover of Blind Lemon Jefferson's haunting "See That My Grave Is Kept Clean" and a pretentious and trite electric-blues number called "Weathered and Torn." Countering these lapses are the raw forward vocals and almost folky accompaniment of "The Side I'll Never Show" and "When the Curtain Falls," the confessional late-night musings of "Whatever You Please," and the rollicking "Black."

These are the kind of songs that your iconic kid-with-a-guitar-and-a-dream would sit down, write, and play. Maybe you have to be a sucker for that kind of stuff, but, last I heard, it's what rock 'n' roll is all about. *Frank Lovece*

Tuesday Blue

shibumi: Tuesday Blue
EMI-Manhattan E1-46980, LP.

Sound: B+ Performance: C+

As suave and slick and smooth as the band's name and the album title would suggest, there is nothing here you haven't heard too many times before. It might be a little glib to point out, but the romantic pop/pap of *shibumi* paints Tuesday Blue as an Irish Duran Duran, with the exception of the Todd Rundgrenesque organ-playing by Tom Jones (not *that* Tom Jones, *this* Tom Jones).

The ensemble-written songs allow lead vocalist Michael Ryan the opportunity to be romantically tortured in ways ranging from starvation ("All I know is I'm hungry") to suffocation ("I nearly choked on their extremes/I nearly finished myself off") to psychological trauma ("I suffer these hallucinations"). When he seriously calls himself "a knight in shining armour, a protector of romance," I want to jump in and start torturing him myself.

Somehow, for all the bathos, there's a soullessness here. Everything is so controlled and over-rehearsed that all passion and spontaneity have been programmed out. Someone can say "I love you" all they want, but saying it doesn't prove it's true. When they *mean* it, you can hear it. Just like you can when I say I don't love *shibumi*.

Bobby King and Terry Evans

Randy Newman attains his greatest heights on this new LP, with songs that are neither satirical, pathetic, nor sinister.

Photograph: Melodie Gimple

And what is that, anyway? An homage to The Chords' seminal classic "Sh-Boom"? Just as with George Bush's "thousand points of light," I don't know what that means.

Frank Lovece

Land of Dreams: Randy Newman
Reprise Records 25773-1, LP.

Sound: B Performance: B

Not a few of the tracks on his latest album exemplify the type of song for which Randy Newman is the undisputed master—the ironic dramatic monolog. Newman assumes his victim's identity—be it redneck, rock star, unabashed money-grubber, or dopey poseur—and makes him tell his own story, in the process unwittingly revealing the pretensions and delusions, the sacred cows, the meannesses of spirit that make him tick.

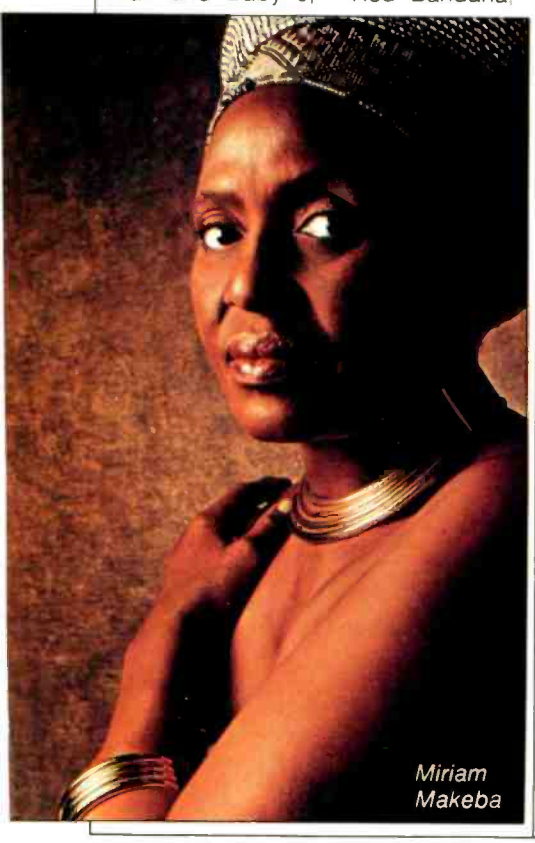
Songs of this type make up the middle ground of *Land of Dreams*—Newman neither at his best nor at his worst, what you might call *average* Newman. In "Roll with the Punches," "Masterman and Baby J," "Red Bandana," "Follow the Flag," "It's Money that Matters," and "I Want You to Hurt Like I Do," he inhabits and humorously deflates, respectively: A complacent conservative with callous, stupid, useless advice for the poor; a typically self-promoting rap singer; a working-class dolt who proudly wears a red bandana symbolic of who knows what; a defiant, misty-eyed patriot; a philosophical mammonist, and a bastard dad. That's side two in a nutshell. In addition to Newman's consistently entertaining and occasionally funny or moving lyrics, there are his droll, expressive singing and his music (ably crafted from strong but conventional Tin Pan Alley, ragtime, movie music, and pop/rock). Especially noteworthy are the arranging and producing, handled variously by Mark Knopfler, Jeff Lynne (of ELO fame), and the team of James Newton Howard and Tony LiPuma.

But the greatest heights Newman attains are on the three songs that open side one. The first two, "Dixie Flyer" and "New Orleans Wins the War," are unlike anything Newman has done before. They're not satirical, sentimental, black, sinister, or pathetic. In fact, they don't rely on any kind of exaggeration or narrow selectivity to produce an artificially intensified emotional effect. In these two songs, Newman, for the first time I can think of, is drawing a self-portrait—of the artist as a boy of 7 or 8. This kind of story—of his mother taking him to New Orleans while his father fought in WWII, and of his father's returning and taking wife and son back to L.A.—could easily turn mawkish in someone else's hands (Jackson Browne's, for instance). But Newman's abiding sense of humor keeps the potential for bathos in check. The result is a more finely balanced, mature work than Newman has ever done before.

The third song on side one, "Four Eyes," surpasses the other two. It is a magical juxtaposition of distorted autobiography about the first day of school. The effect of using a monstrous pentatonic polka transforms a childhood rite of passage into a demented *Sturm und Drang* Wagnerian nightmare.

Knopfler's production, here as elsewhere, features spacious yet deep and detailed sonic landscapes. You'll hear a wonderful variety of sounds, including the most specific, complex, evocative, and living synthetics this side of Joni Mitchell.

Susan Borey



Miriam Makeba

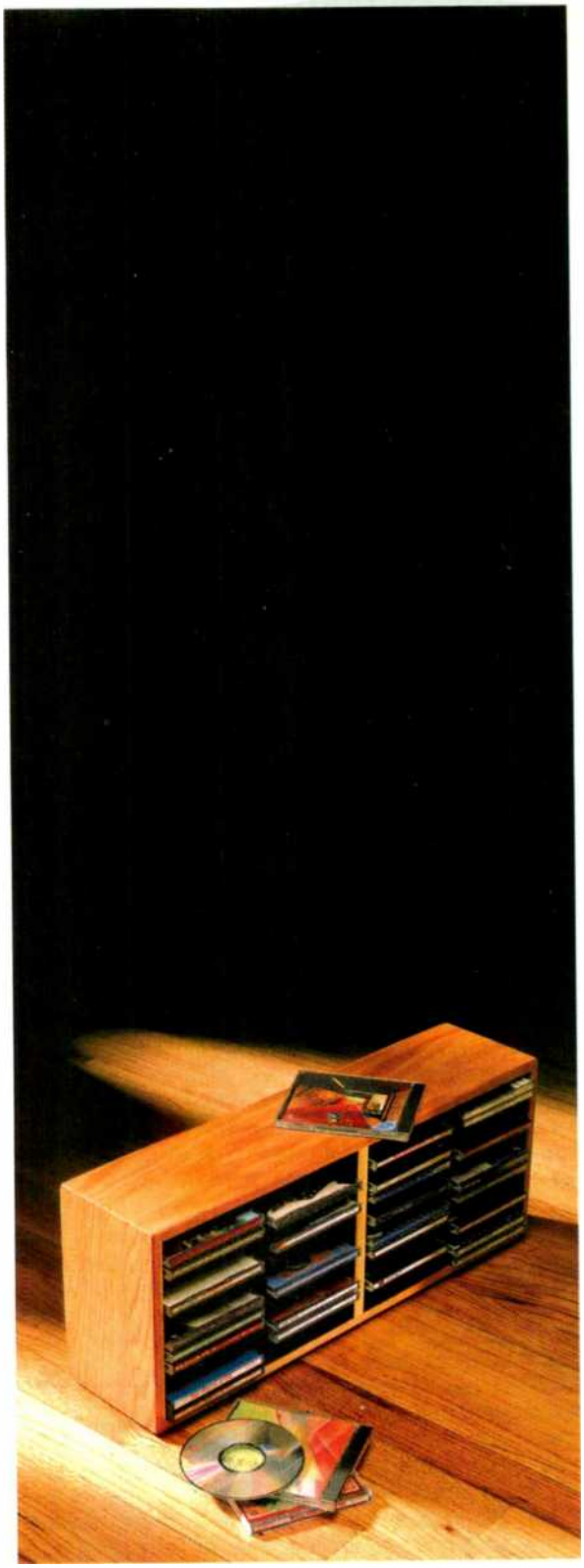
Journey of Dreams: Ladysmith Black Mambazo
Warner Bros. 25753-1, LP.

Sangoma: Miriam Makeba
Warner Bros. 25673-1, LP.

Although they have released 26 records in South Africa since 1970, it wasn't until Paul Simon recruited Ladysmith Black Mambazo for the *Graceland* sessions and tour that this a cappella group was able to win international acclaim (and a Grammy) for their efforts. I suppose any auspicious introduction of ethnic music into the mainstream bodes well for the musicians. It makes me fret, though, about all the undiscovered musical talent that, without a boost, will never reach our ears.

Journey of Dreams conveys a mood that is at the same time supremely earthy and ethereal. It's so subtly compelling that it is immediately attractive, even to those accustomed to the rhythms and melodies of a much younger culture. It certainly tells something about the power of the human voice. Here, unaccompanied, expressing sentiments in a foreign language, the singers convey with luscious 10-part harmonies a wide range of emotions

Photograph: William Coupon



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With luscious harmonies, Ladysmith Black Mambazo conveys emotions that need not be translated to be understood.

that need not be translated to be understood. This type of music is called "Isicathamiya" in Zulu—"to walk lightly on one's toes"—which aptly describes this music's gentle, mellifluous style.

English translations of all the songs are included, and it's fun to follow along in Zulu. The songs, penned by founder Joseph Shabalala, reflect traditional religious and political themes and are also briefly explained.

For instance, "Ukhlangami" re-creates a common practice, negotiating a bride's dowry. The members mock and tease each other, and the harried bridegroom bewails his own dwindling resources. Several of the songs pay homage to various people, including Hugh Masekela and Paul Simon, who Shabalala calls "Vulindlela," or "he who opens the gate."

Although Simon is credited with facilitating Ladysmith's material success, the band reserves another level of tribute for persons who provide spiritual inspiration. Foremost among these is Miriam Makeba, exiled from her native South Africa for 27 years.

Makeba's own collection of ethnic songs, *Sangoma*, is nothing short of a classic. Her voice is multi-tracked into a powerful choir and is supported by very sparse percussion accompaniment. Each of the 18 short cuts gives a powerful impression of life in the land Makeba cannot return to. Rooted in images of her childhood, many are sung from the point of view of a *sangoma*, a divinely inspired healer. Others are songs of lament—about lost loved ones, times of travail, and evil spirits about to descend. Makeba's treatment is consistently powerful, consistently superb.

Both albums were produced by Russ Titleman, who presents the voices with a crystal clarity that is, at times, painfully bright. *Susan Borey*

Talk Is Cheap: Keith Richards
Virgin 90973-1, LP; **90973-2,** CD; AAD; 46:48.

Sound: A–/B+ Performance: B

One might call Keith Richards' approach to his long-awaited, post-breakup/pre-reunion album "stoned algebra." *Talk Is Cheap* equals '70s Stones composition, plus their '80s production values, minus Mick's vocals and Woody's second guitar, minus one good rhythm section, plus a different but equally good one—all divided by many of the roots that originally inspired the world's greatest rock 'n' roll band.

No matter how you calculate it, it's very difficult to get beyond comparing Richards' solo work to that as half of the Glimmer Twins'. Dominated by his distinctively thick, distorted, chordal rhythm guitar work, you'll find yourself saying, "Ah, 'Take It So Hard' sounds like *Sticky Fingers*, or. . . ." However, if you *can* listen to Richards' music on its own terms, what you'll find is a pretty decent roots-rock band, for better or worse, in search of a vocalist. Not that Richards' voice is without merits, especially on tunes with simpler melodic demands like the funky "Big Enough" (with Bootsy Collins on bass!), his Memphis Horns meet cabaret jazz duet with Sarah Dash ("Make No Mistake"), the mid-tempo rocker "You Don't Move Me," or the delightful gem of a ballad "Locked Away." But when range or energy needs to be pushed, his limitations become apparent—as on the raucous rocker "Struggle."

As an arranger, Richards has stuck with the familiar pattern of foreground vocals nestled between doubled guitars (often an electric/acoustic combination), with bass and drums near the edges and other rhythmic support mixed slightly in the background. Each song begins with an introductory chordal riff or statement, which becomes fairly monotonous after a while. Sonically, both CD and LP sound full and crisp, with voices well defined; some low-level analog tape hiss is noticeable, especially in the intros on the CD version.

Keith Richards' *Talk Is Cheap* isn't just another Stones record, but it *will* give you a pretty good clue as to who was their main musical inspiration. This album is a must as a Stones artifact. As a roots-rock record, it's good but not remarkable, and probably wouldn't get so much attention without the more famous connection. *Michael Wright*

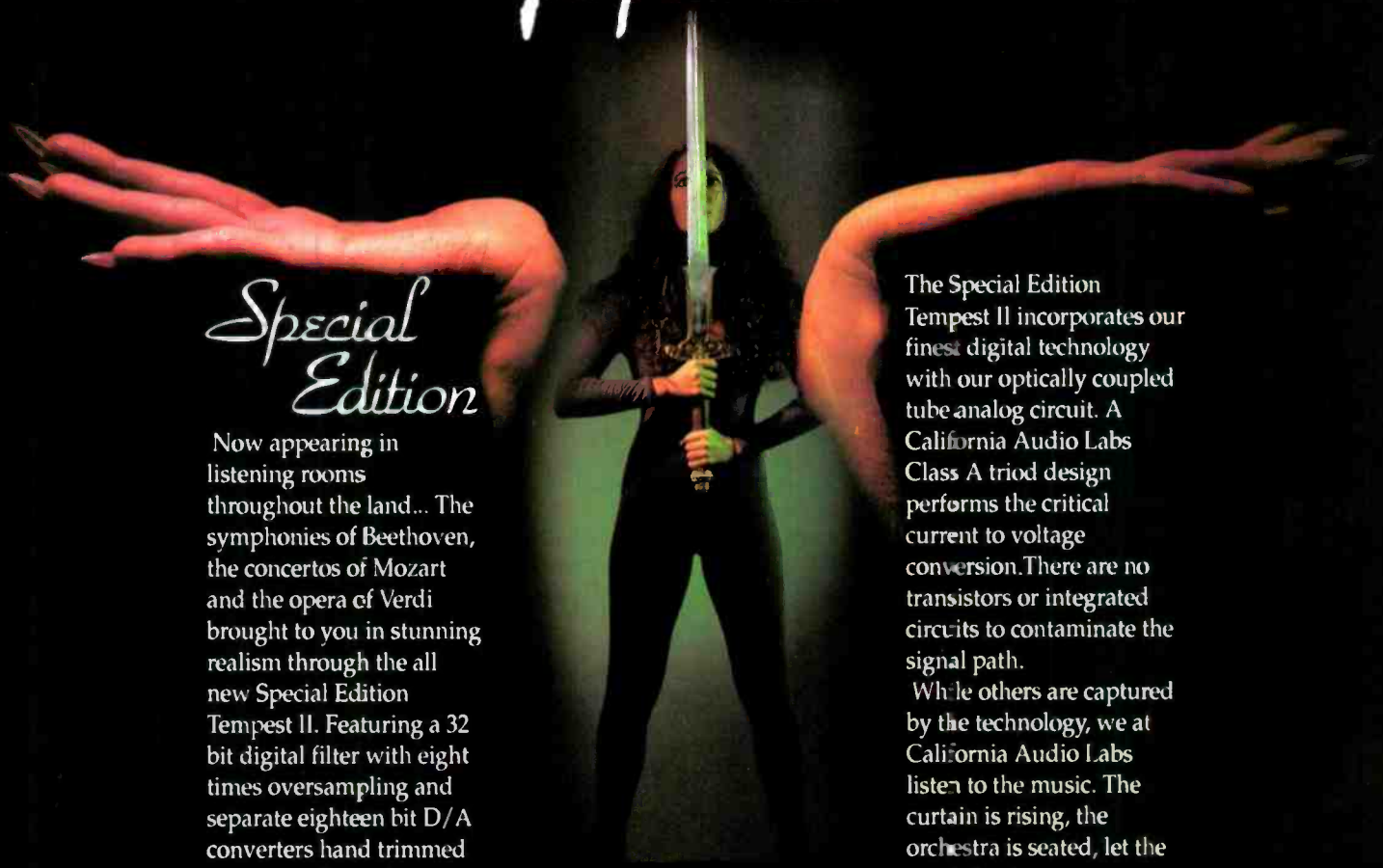
Big Thing: Duran Duran
Capitol C1-90958, LP.

Sound: B Performance: C–

After several years spent on solo albums, splinter groups, and side projects, Duran Duran has returned—albeit with its membership pared down to Simon LeBon, Nick Rhodes, and John Taylor. Their new album is smoothly tailored with an artsy sound, but I don't hear hits here. Nothing jumps out and embeds itself in memory.

In Duran Duran's defense, they remain challenging popsters who shun easy paths and desperately want to be taken seriously. Unfortunately, when it comes down to tunes, *Big Thing* is an empty tank. *Michael Tearson*

Tempest II



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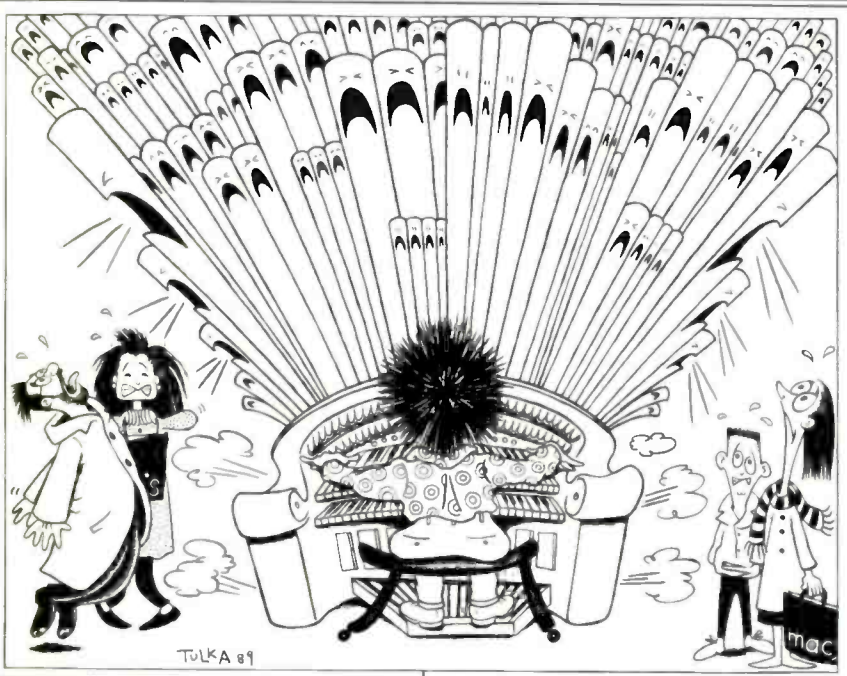

Illustration: Rick Tulka

Virgil Fox Plays the John Wanamaker Organ—Philadelphia. Bainbridge BCD-2501, CD. (Available from Bainbridge, P.O. Box 8248, Van Nuys, Cal. 91409.)

There are Virgil Fox fans all over who will welcome this CD, but what intrigues the most here is a pair of more important factors—first, the most famous of big American organs, second in size only to the Convention Hall monster in Atlantic City (pre-casino), and the "archiving" of this 1964 recording via Colossus, that recent massing of digital bits into an overall digital processing/recording system put together by Lou Dorren.

In all the early years of my life, the Wanamaker organ was one of the wonders of the modern world, along with the Statue of Liberty, the Leviathan, and the Eiffel Tower. This organ was not only huge, with almost 30,000 pipes, but was improbably set up right in the middle of a department store, like Christmas at Macy's. For background music? Decidely not! Play those 30,000 pipes all at once, and you do not hear background music. It was basically a showy monster of a concert organ, not yet a "Mighty Wurlitzer" nor quite Radio City, but aiming in that direction and already well removed in function from the great 19th-century French organs in their churches. My *Cyclopedia of Music* (eighth edition, revised 1958) has the dope: This huge installation was actually an enlargement of an organ at the St. Louis World's Fair in 1904, which makes it considerably a classic.

Was it originally blown by electricity? No doubt. Even in 1904, electricity dominated that big Exposition, and by then, the motive power would have been available, as it was for thousands of trolley cars and interurban trains. But if I am right, many of the huge organs of not long before were still powered by the old monster bellows pumped by sweating slaveys. César Franck began his years at the Ste. Clothilde organ in Paris back around 1858, when serviceable electric motors did not exist—and steam was highly impractical in church. He played that organ until 1890; did he ever, so to speak, find himself electrically driven? The music dictionaries don't say.

All of which is fascinating because this is the sound one hears from the big Wanamaker organ—not at all like the later monsters. You will immediately notice the unusual shiny, almost varnished quality of it—typical, for my ear, of the very best of the great Romantic organs in the last century. A genuine antique! Though not as antique as many "Baroque" organs still existing.

I am not exactly a Fox worshipper, and I did not find much character in the brief classics, light and heavy, from Bach to Wagner by way of the Westminster Chimes, which Fox put down on this recording. No matter—the end result all sounds very Wanamaker and it's good.

As for Colossus, I have no archive data since my copy of the CD arrived in a white paper folder, all unadorned, with not even an indication as to whether it was mono or stereo in 1964. My instant, and perhaps erroneous, impression was that this *was* a mono recording, possibly doctored a bit for a semi-spread. The peculiar acoustics of that department store "court"—or, as we'd say, mall—makes for a very unchurchlike effect, quite dead for the mikes, which tends to minimize the stereo. One-point stereo? Perhaps! To my surprise, I also noted what seemed to be an old trick in this game, a roll-off in bass on one side, and in highs on the other, for a selective directionality. Could it be, in 1988? Hermann Scherchen used that trick (pre-stereo, in the early 1950s) for his curious "Stereophoner," written up in this department a few years ago.

I also noticed a curious sort of fluttering and an occasional "wow—wow" which must be purely in the acoustics—surely not in a professional recorder, even in 1964, nor generated by Colossus in 1988. Interesting.

It is worthwhile to keep an eye and two ears alert for things that the Colossus digital system can do in the total recording domain. Like the burgeoning MIDI system, it can convert almost anything digital to anything else, which is the name of digital audio these days.

Edward Tatnall Canby

An Arthur Berger Retrospective: Duo No. 1 for Violin and Piano; Quartet for Winds; Duo for Cello and Piano; Duo for Oboe and Clarinet; Trio for Guitar, Violin, and Piano. Boehm Quintette; Gilbert Kalish and Christopher Oldfather, piano; Joel Krosnick, cello; Joel Smirnoff, violin; David Starobin, guitar. **New World NW360-2,** CD.

This is a real challenger—I think a lot of audio people with both good equipment and good ears could like it. New

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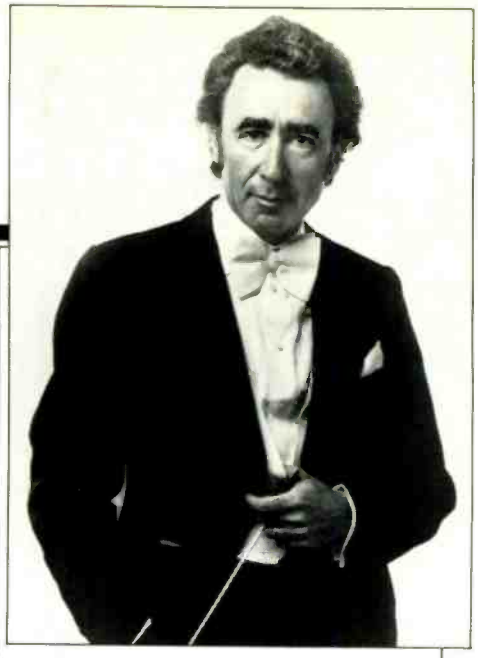
Sergiu Comissiona does not penetrate Schumann; he misses dozens of the real Romantic subtleties of the music.



World is a label of prestige, supported, as is now usual, by various funds and foundations. Why not? This merely corresponds to the aristocratic money that supported a large part of the older "classical" music we hear today.

Arthur Berger I remember vaguely, in the '30s and '40s, as a constant presence in print for several newspapers at the top (i.e., New York)—the *Trib*, the *Sun*—a critic who was spare, academic, precise, and (it seemed) old-fashioned. I also vaguely remember hearing a sample of his music way back and being shocked. Such *dissonance*! Such cacophony from that precise and scholarly soul!

Well, my soul now goes out to him (he being precisely my age) as I listen here. Wow—are his earlier works old-fashioned! The ones I thought so hideously modern, you understand. And how pleasant they sound to my current ears! Really excellent, beautifully crafted music, even if it is mini-modelled on Stravinsky, Aaron Copland (fragments of cowboy folk tunes), and even Schoenberg. Arthur Berger, unlike Stravinsky himself, seems to work in a restricted and specialized area. You will quickly find here, in retrospect, that there is an invisible fence which says, *"This is my territory. It is what I do."* And it all sounds alike in a way, this intimate, beautifully shaped, small-sized chamber music, with a tantalizingly fragmented melody of bits and pieces, a strong, lilting rhythm, plus typically acrid but expressive harmonies. Is it "serial music"? I could not care less, nor will you. The sound is endearingly "neoclassic" in its most winning form, with that steady (but always irregular) beat which was so typical of the period—foot-tapping à la Bach and, of course, straight out of jazz—it can be irresistible to our more tolerant ears. Berger wasn't as dry or as dissonant as we then thought. He's top-notch, if limited in his scope.

Boehm Quintette

The performers here, too numerous to list, are simply excellent. Berger should be happy. (He's still around and well known among musicians.) Nothing at all dry about their performing. It is absolutely first-rate—which means, of course, that they *communicate*. You're the potential receiver. The recording is exemplary, two gorgeously natural pianos/pianists, a violin, winds, a cello, even a guitar—and on CD, the sound is marvelous. If you find yourself thinking that Berger is stuck somewhere back in nostalgia, save your ears for the last piece, 1972, jumping far ahead. It is precisely where all the big, earlier modernists moved—Stravinsky, Schoenberg (to an extent), even Copland and Roger Sessions—straight into the driest, most abstrusely specialized serialism. Yet not altogether! When you have heard the endearing earlier Berger works, so old-fashioned, you will hear their echoes still persisting in this last, to soften and hearten the prevailing austerity. I think you might like Arthur Berger, at this late date in his long career.

Edward Tatnall Canby

Robert Schumann: Symphony No. 1 ("Spring"); Symphony No. 4. Houston Symphony Orchestra, Sergiu Comissiona.
Pro Arte CDD 393, CD.

Robert Schumann: Symphony No. 2; Symphony No. 3 ("Rhenish"). Houston Symphony Orchestra, Sergiu Comissiona.
Pro Arte CDD 394, CD.

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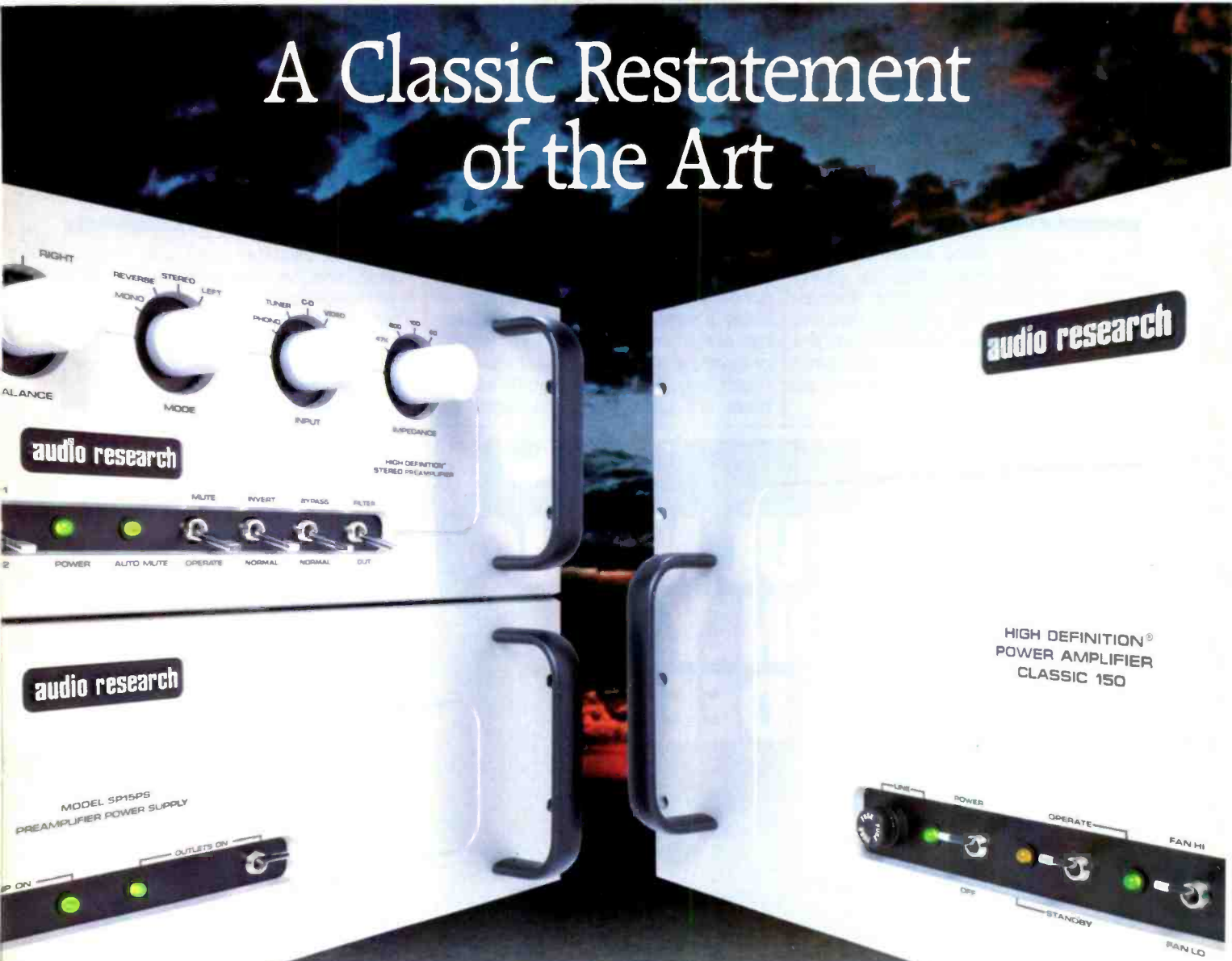

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As one gentleman quipped some time back, Mahler may have sought God, but Anton Bruckner found him.

ronica Jochum piano series of Robert and Clara Schumann plus the young Johannes Brahms ("Classical Recordings," January). It is a worthy thought, to tie these together, but for my ear, the playing of the symphonies just cannot compare with Veronica Jochum's piano interpretations.

Okay—perfectly good. This is no second-rate orchestra, and everything is neatly in place (and more so than in many a top-name recording, too). But the conductor with the odd name—originally out of Romania and now, one might say, an international—simply does not penetrate Schumann. His beat is unbearably rigid and metronomic, and he misses dozens of the real Romantic subtleties of the music. That is, he either does not give his musicians a chance to *do* them or, equally sad, does not teach them how they should play.

I have an uncomfortable feeling that the wise performers in this orchestra could do a better, more expressive job by themselves (even if maybe out of time now and then, minus conductor) than they are allowed to do in these four performances.

No—not inept playing, not bad playing. Far from it! Just too rigid, and not enough understanding. Precise, accurate, but the insides of the music don't show. *Edward Tatnall Canby*

Bruckner: Symphony No. 7. Slovene Philharmonic Orchestra, Lovro von Matačić.
Denon 32CO-2035, CD; ADD; 65:46.

This is the last recording of Yugoslavia's late leading conductor, Lovro von Matačić, taped at a concert in Cankarjev in June of 1984. The analog recording is okay but is not blessed with the richness or cohesion of string tone essential for the best Bruckner listening. It is a listenable document—no more, no less.

Followers of Bruckner approach his nine symphonies with something close to awe. (No, I am not forgetting "die Nullte,"—No. 0—and the 1863 "student symphony.") The Ninth's two-movement torso (credibly completed in this decade by American William Carrigan) may be deeply felt, but the Seventh has always drawn me irresistibly. As one gentleman quipped some time back, Mahler may have sought God, but Anton Bruckner found him. Just so, if this four-movement song to spirituality in music speaks as strongly to you as to me.

Von Matačić was 85 and failing when he led the Slovene Philharmonic in his last two concerts, of which this is the first (but the last one to be taped, apparently). The orchestra has a fine feel for the music, and the conductor works the "old man magic" we expect of venerable podium warriors. The long lines of the work emerge glowingly, while "bacteris" (Max Reger's chuckling term for players' and ensembles'

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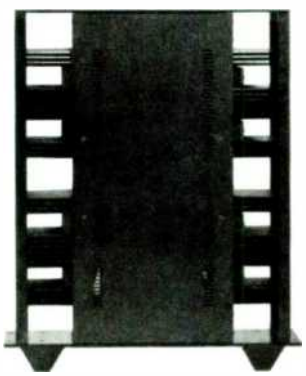

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On Bruckner's Seventh, the orchestra has a fine feel for the Symphony, and the conductor works the old man magic we expect.

smudges) abound. The brass bestow warmth and beauty on the big solos of the religious Adagio but do not play in tune in the massed chords closing the First Movement. Ensemble, in general, is a bit slovenly, and yet this is loving playing for the orchestra's own grand old man. Perhaps one could say that this was von Matačić's ultimate glimpse of God in the temporal state he left shortly afterward.

Many thanks to Denon for this album, but not for the inept translations of the notes: "The Slovene Philharmonics pay with the present record reverence to his memory thus putting a noticeable mile-stone in their work" is not what one wants from a major force in the global Compact Disc repertoire. Most recent releases, though, show excellent notes in three Western languages.

Listeners will encounter slow tempi in the Scherzo and the Finale which do not meet the composer's requirements of very fast for the Third Movement and agitated (or "with motion") for the last. Thus, these final two movements are a little frustrating, although the First and Second are pure heaven. The ending picks up to just the right degree, and the close of the work is bracing.

Christopher Greenleaf

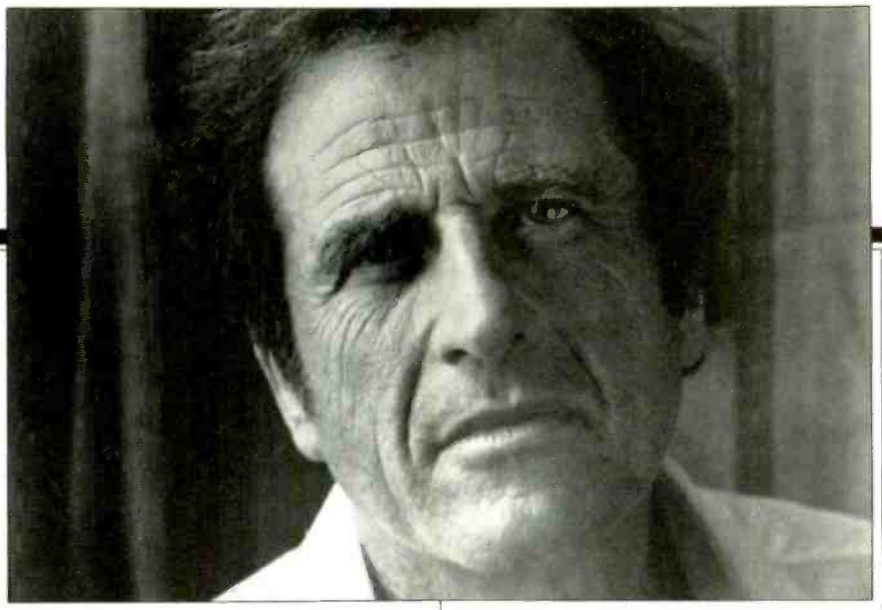
Tobias Picker: Keys to the City. Brooklyn Philharmonic Symphony Orchestra, Lukas Foss; Tobias Picker, piano. **Marc Blitzstein: Piano Concerto.** Brooklyn Philharmonic Symphony Orchestra, Lukas Foss; Michael Barrett, piano.
CRI CD 554, CD.

Both of these works are exciting, accessible additions to the orchestral repertoire. Whether they will come to be recognized as such is, of course, another matter. For though things are improving with regard to the acceptance of American composers by American orchestras, there's still a long way to go.

Case in point: The Marc Blitzstein concerto, written in 1931, did not receive its orchestral première until 1986—by the same forces that perform it here. Tobias Picker fared better with 1983's "Keys to the City," commissioned for and performed at the Brooklyn Bridge centennial celebration.

Blitzstein is a fascinating figure. Killed in 1964 at the age of 59, this seminal American composer/librettist is best known for his English-language adaptation of the Kurt Weill/Bertolt Brecht "Threepenny Opera." Aside from his "The Cradle Will Rock" and "Regina," most of Blitzstein's own catalog has remained in obscurity.

The concerto, like 1934's "Orchestral Variations" (which only received its première in the fall of '88), is an early piece, basically neoclassical in style, that uses the full orchestral palette with craft and wit. Pianistically, it is more demanding than "Keys," which is also a concerto of sorts, and reflects a greater integration of the solo instru-



Conductor Lukas Foss directs a tightly knit interplay between soloist and orchestra on these thoughtful performances.

ment with the orchestra. Michael Barrett, a Blitzstein aficionado who conducted John Houseman's 1983 production of "Cradle," is an effective interpreter of both works.

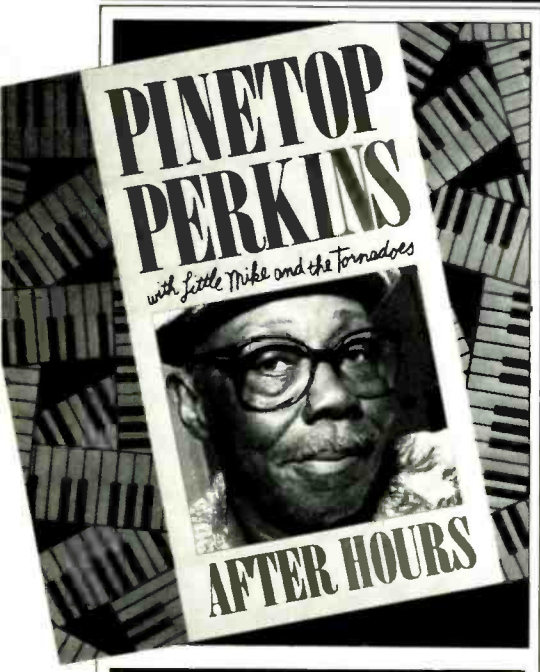
It is not surprising to hear echoes of Weill's instrumentation in the concerto, nor shades of "West Side Story"—Blitzstein was Bernstein's mentor. The second of the three movements is strikingly beautiful, slow, and somewhat sad. It suggests, but never quite comes to rest in, a tonal, hymn-like simplicity. The last movement is a tempestuous, dramatic passacaglia whose extended solo passages showcase Barrett's technical proficiency.

Picker, a 34-year-old composer of deservedly high standing, is currently in residence with the Houston Symphony Orchestra. Like the Blitzstein work, "Keys to the City" is a relatively early piece for the composer. It is in one movement, highly sectional, and moves from one idea or mood to another in linear fashion. The pulse of "City" is easily discernible, recurring in different guises. Sometimes it sounds human, sometimes industrial, sometimes urban.

A kaleidoscopic potpourri of images and atmospheres, "Keys" bows more than occasionally to Gershwin and covers a stylistic gamut from neoclassical to post modern. There's also a wonderfully funky jazz-based section dominated by piano and winds, on which Barrett and his collaborators swing with conviction.

These are indeed well-rehearsed, thoughtful performances, and Lukas Foss directs a tightly knit interplay between orchestra and soloist. CRI's president, David Olan, has remarked that the label is shifting its focus from quantity to quality, and it certainly seems true enough with this recording. Only one complaint: On my copy, the plastic on the CD's rim was shedding, causing the disc to skip unless wiped fairly often. Otherwise, this is a laudable effort. *Susan Elliott*

LONG TIME COMIN'



After Hours: Pinetop Perkins
Blind Pig 3308, LP.

Sound: B+ Performance: A–/B+

Nobody But You: John Hammond
Flying Fish 502, LP.

Sound: B+ Performance: A–

What we have here are two key blues artists who, but for different and separate fortunes, would and should be *a lot* more well known, not to mention well recorded. Instead, listeners must rely on these individuals' sheer doggedness and desire to keep going despite receiving far less financial reward than they're worth. Say thank you to their respective independent labels, Blind Pig and Flying Fish, for issuing platters such as pianist Pinetop Perkins' *After Hours* and John Hammond's *Nobody But You*.

It is indeed hard to believe that after four decades, this entry marks Perkins' debut as a leader. He is easily one of the most important blues pianists ever. He's the man who, after Otis Spann died, served Muddy Waters in good stead for over a decade and then helped to create the initial incarnation of the Legendary Blues Band, a unit comprised of The Man's alumni. Perkins possesses a keen and astute sense of rhythm and drive, which he can deliver at whim in a classic Windy City blues fashion.

The pianist covers the proverbial waterfront here: He lays out haunting, irascible melodies on not only the title track, but also amid compositions such as his own "Sit in the Easy Chair" and fellow Chess recording artist Robert Nighthawk's "Anna Lee."

Above all, Perkins' strongest suit just may be his ability to offer delectable stride and boogie-woogie piano with authority and perhaps unparalleled subtlety.

Throughout, Perkins is accompanied by Little Mike and The Tornadoes, a New York-based unit with reasonably formidable talent that provides the pianist with a quality backdrop logically filled with harmonica (Little Mike), guitar, bass, and drums. Sometimes, Perkins' talent all but overwhelms The Tornadoes (say, in Jimmy Smith's "Chicken Shack" and Jimmy Reed's "You Don't Have to Go"), as it would any of the recently arrived white blues/R&B bands on today's scene. In fact, Perkins' vocals and playing are the best parts of Waters' immortal "Got My Mojo Working," Peter Chapman's "Every Day I Have the Blues" (the late Joe Williams anthem), and Willie Dixon's oft-waxed "I'm Your Hoochie Coochie Man." Despite a few sonic flaws, *After Hours* is a must for anyone's blues collection.

Meanwhile, Hammond (name in tow, as it has been since he was a child and discovered how important his father, John Hammond, Sr., was to the industry) has borne his own sense of the blues. Since beginning his public career in the mid-'60s, Hammond has struggled to establish his own identity and to fit in *somewhere*—to find his own musical niche, particularly after the Village's boon days passed.

Hammond still sings with a genuine sense of urgency, either topically and politically or intimately and personally. A student of John Lee Hooker's stark sense of reality and sometimes bleak outlook, Hammond never sounded stronger than he does on *Nobody But You*, where he also draws from his favorite rock 'n' roller, Bo Diddley, and blues legend Robert Johnson.

Soft-spoken and apparently more relaxed, the New York minstrel is joined in places by various lesser-known musicians, players he uses in spots when touring. Yet with rare exception, the guitarist strives for and maintains a sense of isolation. His desperate tone on "Sail On" fits well; on the acoustic Doc Watson-influenced "Lost Lover Blues," his voice conveys loneliness—same with "If I Get Lucky," a country/blues that smacks of the Delta.

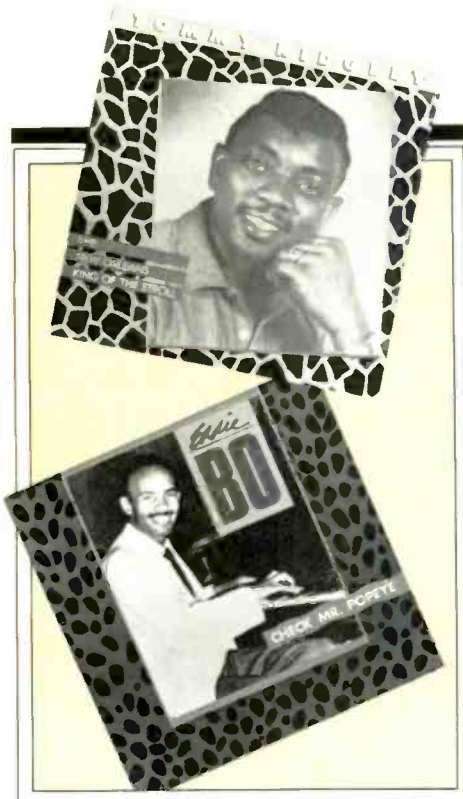
Hammond may not be fashionable or in the limelight these days, but a recent series of openings for Tracy Chapman doubtless earned him new fan appreciation. His skills on six-string, slide, and National steel guitars, as well as his harmonica playing, are more deft than ever. They should not be underestimated or, worse, dismissed. His sense of timing in the classic title track swings. "Cutting Out," reminiscent of "Mellow Down Easy," which he showcased two decades ago, owns a much more sophisticated presentation today.

In a recent appearance, folk-rocker Warren Zevon told the audience, "This is a John Hammond tune. You know, I never could understand why he wasn't as popular as Mick Jagger and Keith Richards." How true! *Jon W. Poses*

1965: Al Jarreau
Bainbridge BCD2037, CD.

Back in 1965, Al Jarreau was just stretching his wings, testing his fledgling repertoire of scatting, soaring, and swirling vocal pyrotechnics. This re-


John Hammond



cording, made in June of the year for which it was named, highlights his sweet, smooth, energetic voice in a straight jazz program of eight mostly top-notch tunes. Behind him is a tight trio of lesser-known musicians on acoustic piano, bass, and drums.

Jarreau, then studying by day at Iowa State University and performing locally by night, must have been a revelation to the patrons of the Tender Trap in Cedar Rapids and the Celebrity Club in nearby Moline. Obviously impressed, the owners of the latter took the young singer into the studio and recorded him monaurally. Jarreau took to the experience like a bird freed to the wide blue skies. He sails through a Coltrane-like arrangement of "My Favorite Things" and glides with ease through the difficult "Sophisticated Lady."

The CD version of that glorious performance has been processed for digital stereo with the fascinating Colossus system. True to its claims, this state-of-the-art digital recording system adds no sound of its own and provides a clean, mirror-image reproduction of the original program. Unfortunately, in this case the process reveals the many flaws of the original mono recording. Irritating tape hiss is most notable in "One Note Samba," while a purely mechanical knocking is heard in "Sophisticated Lady" and "Joey, Joey, Joey." Strangest of all, in compensating for a recording level that was originally set too high on some cuts, the volume of Jarreau's voice is abruptly lowered and he is swiftly pulled further into the background.

The only quibble with this Colossus system recording is a strange quality to the left/right channel separation—something which I found audible only with headphones. In gradually shifting all the way to the right or left channel, the program moves in bumps and starts rather than in a smooth progression, and the remaining "empty" channel produces an inaudible sense of pressure on the eardrum.

Although this treasurable performance did not receive an original recording of the same calibre, the soaring early flight of *1965* is still well worth a listen. *Paulette Weiss*

The New Orleans King of the Stroll: Tommy Ridgley
Rounder 2079, LP.

Sound: B Performance: B+

Check Mr. Popeye: Eddie Bo
Rounder 2077, LP.

Sound: B– Performance: B–

Independent record labels have long formed the bedrock of American popular music. Scattered throughout the country, they add up to a network that discovers artists too far removed geographically or stylistically from the major labels to draw their attention. Success is measured in sales that would rate nary a footnote in the annual corporate report of a major record company. The typical independent lasts no longer than its would-be stars' fleeting fame. When the label folds, its recordings are often consigned to a vault for eternity. Ric and Ron, two New Orleans independent labels operated by Joe Ruffino in the late '50s and early '60s, are now the subject of an admirable reissue program from Rounder.

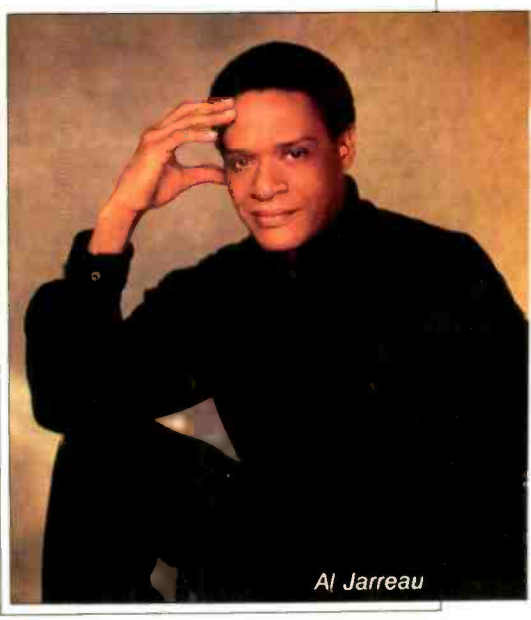
Bandleader/pianist Tommy Ridgley gave Ric Records a string of regional hits. A vocalist with the Dave Bartholomew band before Bartholomew worked with Fats Domino, Ridgley had earned a reputation as a polished ballad singer before signing with Ric. You can easily understand his success. He knew his limitations, and selected material and crisp arrangements that allowed him to do what he did best—sing ballad-like material in a smooth style similar to Chuck Willis'. The singles lose a bit of their impact assembled on an album, but considered individually, they are all memorable.

Many of these tracks boast the sort of professionalism that inspires covers. Fans of Freddie King will recognize that the late blues guitar ace borrowed heavily from Ridgley in recording the latter's "Double Eyed Whammy" and "Girl from Kooka Monga." Also included is an even more obscure single in a Bobby Bland vein, cut for Johen, that suggests that Ridgley was prepared to change with the times.

Except for the omission of the names of the band members in otherwise detailed liner notes, *The New Orleans King of the Stroll* is an excellent example of a well-planned reissue album.

Eddie Bo was a more eclectic musician than Tommy Ridgley. His skill as a songwriter and jack-of-all-trades in the studio kept him employed long after these Ric sides were history. "Check Mr. Popeye" sparked a national dance craze that led to Bo's hit losing sales to similar tracks by Chubby Checker and Huey Smith. While he remains much admired in the Crescent City, this compilation reveals that Bo has a thin voice which won't be to everyone's taste. Purchase the Ridgley set first.

Roy Greenberg



Photograph: Bonnie Schiffman

Al Jarreau

Bringing the blues to a wider pop audience is hard. It's nice to see an artist like Robert Cray succeed in the attempt.

Don't Be Afraid of the Dark: The Robert Cray Band
Hightone/Mercury 834 923-2, CD.

Sound: A Performance: B+

After flirting with a more pop-oriented production on his last album, Robert Cray—the critics' Great Blues Hope—returns to the gutsier, leaner sound of his pre-PolyGram Hightone releases on *Don't Be Afraid of the Dark*.

Actually, with his slinky Fender guitar up front in the mix and backed-off horn treatments, Cray achieves an uptown fusion of blues and R&B. Even though there's only one blues progression (the tasty "Across the Line"), the blues comes through in the vibrato-laden guitar lines which skitter along slightly behind the beat, much like T-Bone Walker's and a lot of the Texas-style players. For guitar grits, check out the leads on "Don't You Even Care?" (with noteworthy keyboard licks by Peter Boe) and especially the off-the-wall solo on the ballad "I Can't Go Home." Cray also cuts some nice, funky rhythm figures on "Acting This Way" (with David Sanborn handling lead sax), "Gotta Change the Rules," and the tremolo-saturated "At Last." As a vocalist, Cray has an expressive—if somewhat throaty—soulful delivery which at times is reminiscent of Stevie Winwood during his days with Traffic. Check out his moves on "Your Secret's Safe with Me" and the title cut.

Yet for all the blues inspiration in Cray's music, there seems to be a fairly formulaic approach to lyrical subject matter. Or to put it another way, how much trouble can you possibly have with women? Other than the seduction scenario of the title number, eight out of 10 cuts are obsessed with variations on the she-done-me-wrong theme. It wears a bit thin over an album's worth of songs, and it's not likely to win over lots of female fans. The only other subject here is on "Night Patrol," a curious vision of street culture that has more the ring of detached, liberal, middle-class observation than of deeply felt emotion rooted in blues experience, whatever that may be.

Producers Bruce Bromberg and Dennis Walker have given Cray a crisp sound, with his voice well defined by close-hugging, prominent rhythm and lead guitar tracks. Otherwise, overdubbing was kept to a minimum, so the parts have a distinct club ambience and are clean and noise-free.

Bringing the blues to a wider pop audience (either new to the genre or forgetful of it) is difficult; it's nice to see an artist like Robert Cray succeed in the attempt. And the bluesier direction of *Don't Be Afraid of the Dark* is a welcome development. Still, the suspicion nags that the blues is being packaged in a stereotypical fashion. Like much other contemporary pop, it's entertaining, but don't confuse it with the real thing. *Michael Wright*

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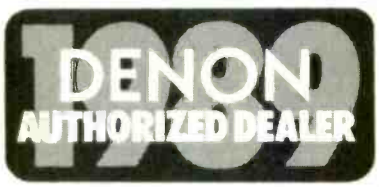

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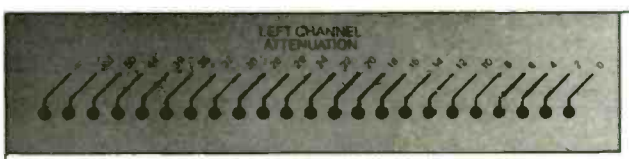

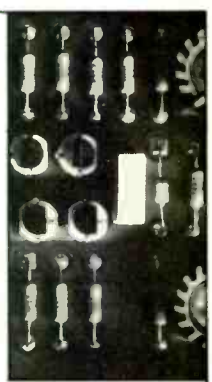

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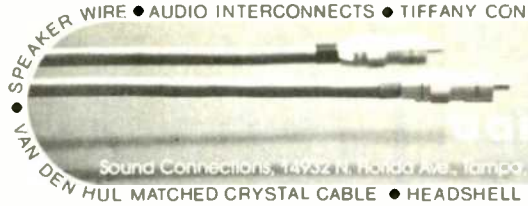

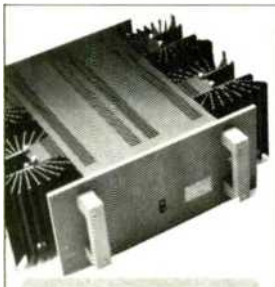

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- More Stereophile readers owned Magneplanars than any other speaker brand.

DEALER SATISFACTION –

1989 Inside Track survey conducted with dealers, Magnepan was rated:

#1 in Distribution Policies
#2 in Prompt Resolution of Problems
#2 in Quality of Sales Reps

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"McIntosh . . . no other transistor amplifier is capable of reproducing as well."

"All the sounds, even those different one from another, remain separated and distinctive. There results a sensation of contrast, precision, and uncommon clarity.

. . . A close analysis of different frequencies reveals an extremely deep bass, very rich in spatial detail . . . The upper bass region is very linear testifying to an extraordinary richness of information. The very structured mid-range contributes enormously to listening pleasure.

The feeling of power is never refuted and instead of stunning the listener, the 7270 recreates an audio environment of a majesty that *no other transistor amplifier is capable of reproducing as well.*" Need we say more?

—REVUE DU SON, foremost French stereo magazine.

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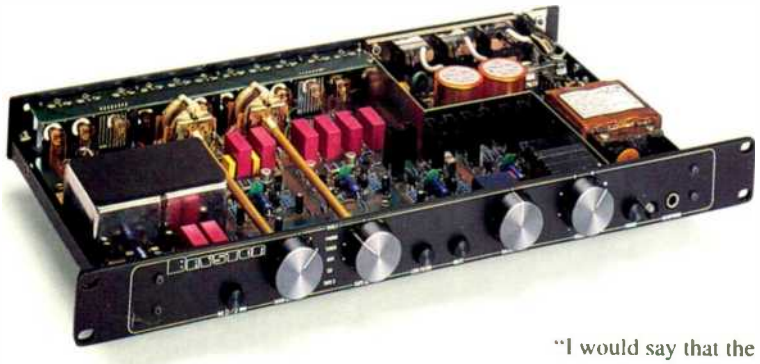
"The way in which orchestral peaks were handled indicated that the Bryston .5B/2B combination's control over dynamics and attack was very impressive indeed."

Paul Miller
The New Hi-Fi Sound, Britain



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"I would say that the LP playback qualities of the 12B with either moving coil or moving magnet cartridges are state of the art. I have not heard better from other more expensive amplifiers."

Andrew Marshall
Audio Ideas Guide, Canada

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Revue De Son
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