

Audio

NOVEMBER 1985 • \$2.00

INTERVIEW
MITCH MILLER

PIONEER F-99X TUNER

**YOU CAN HEAR
THE DIFFERENCE**



TE
TH **SPEAKER**
GO **AN SOUND**
AN **LENT IMAGING**

BR **B AMP**
CL **ER, SPEED,**
TR **US TRANSIENTS**



THIS CHRISTMAS, WOULDN'T IT BE GREAT TO RECEIVE THE BEST FM RECEPTION YOU EVER HEARD?

PRESENTING THE TERK OMNIDIRECTIONAL FM STEREO ANTENNA™

The Terk 8403 Omnidirectional FM Stereo Antenna™ is the best way to beat the cost of living high, low, or in outlying areas—places that are plagued with poor FM reception.

It gives more power to you in the computer-designed form of a built-in amplifier that boosts incoming signals up to 24dB. Weak signals can be increased up to 1800% with no background noise. And multipathing is totally eliminated, because the Terk 8403 picks up and amplifies only the main signal, ignoring those exasperating echoes.

THE ONLY THING YOU HAVE TO ADJUST IS YOUR ATTITUDE ABOUT FM STEREO ANTENNAS.

Because this hand-built antenna is omnidirectional, it accepts signals from all sides—with equal strength.

So after the simple installation—just attach it to your tuner and plug it in—you'll never have to adjust it to receive different stations.

And with its handsome Italian design, you won't sacrifice looks for listening pleasure.

After all, your superb tuner is just a glorified paperweight unless it can pull in the signals. With the Terk 8403 Omnidirectional it can. Loud and clear.

The monumental result of this mere 16¾" high antenna is an impressive increase in the number of FM stations you'll receive. As well as the quality of that reception.

IT NOT ONLY PULLS IN SIGNALS BETTER. IT'S PULLED IN MARVELOUS REVIEWS, TOO.

From the flatlands of Dallas to the grand canyons of Manhattan, reception has never been better. Sound editor Hans Fantel in The New York Times writes:

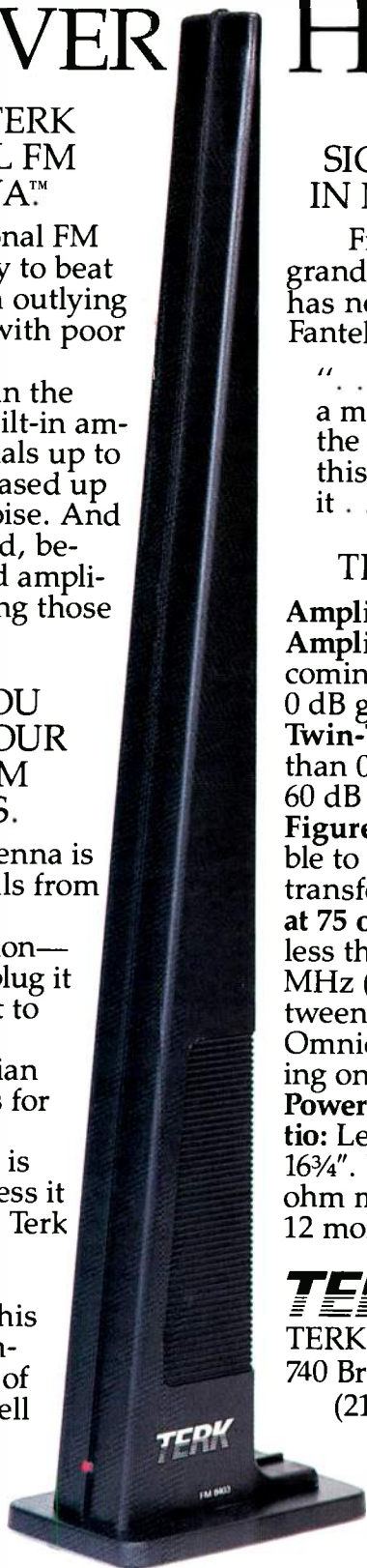
“ . . . effectiveness comparable to that of a much larger antenna . . . considering the improvement it is likely to bring . . . this ingenious gadget seems well worth it . . . ”

TECHNICAL INFORMATION

Amplifier Gain: Adjustable 0 to 24dB. **Amplification:** Capable of amplifying incoming signal up to 18 times. **Selectivity:** 0 dB gain at 50 MHz and at 150 MHz. **Twin-Tone Modulation Distortion:** Less than 0.1% at 100mV. **Distortion:** Less than 60 dB with an output of 100 mV. **Noise Figure:** 3dB. **Impedance:** 75 ohm adaptable to 300 ohm input with matching transformer. **Output Matching Accuracy at 75 ohms:** SWR (Standing Wave Ratio) less than 1.2:1 **Operating Band:** 5 to 150 MHz (with optimal amplification between 88 and 108 MHz.) **Pickup Pattern:** Omnidirectional, or directional (depending on physical orientation). **Range:** 360°. **Power Supply:** 110V. **Stationary Wave Ratio:** Less than 1.2:1 **Dimensions:** Height, 16¾". Base, 2¼" x 3½". Includes 75/300 ohm matching transformer. **Warranty:** 12 months.

TERK™

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**NEC's digital
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When you put a satellite in orbit, you want every possible assurance that it will perform. That's why corporations and governments all over the world ask NEC to build their satellites.

Even if you don't launch objects into outer space, it's comforting to know that NEC puts much of our satellite PCM digital technology into our Compact Disc players for the home.

While most high fidelity companies have only two or three years of experience with PCM digital audio, NEC has been at it since 1965. So it comes as no surprise that other manufacturers are now imitating the digital filtration and high-speed switching our CD players have had from the beginning. And it's no surprise that independent critics in America, Europe and Japan have awarded NEC's players top ratings.

You see, building satellites is not enough for NEC. We feel obligated to take the world's most advanced technology one step further. Into your home.

NEC

Audio

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See page 94

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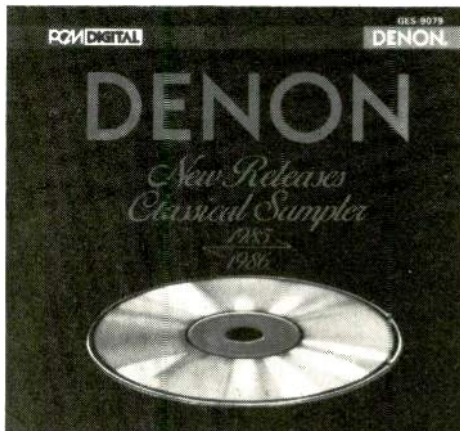
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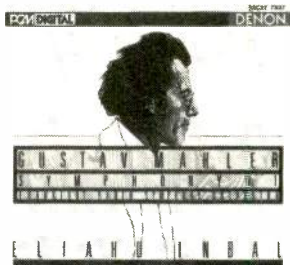
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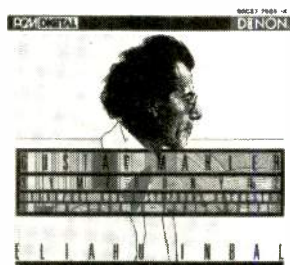
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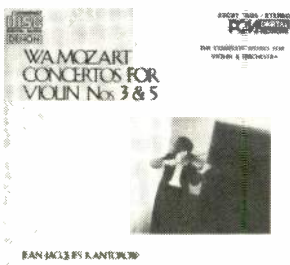
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#C37-7537 Mahler, *Symphony No. 1*; Elisha Inbal, Frankfurt Radio Symphony Orchestra.



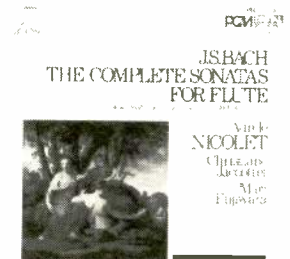
#C37-7604 Mahler, *Symphony No. 2*; Elisha Inbal, Helen Donath, Doris Soffel, Frankfurt Radio Symphony Orchestra.



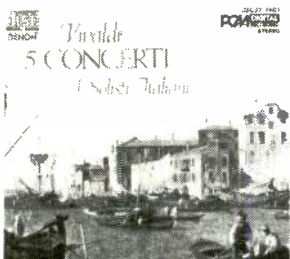
#C37-7504 Mozart, *Concertos for Violin Nos. 3 & 5*; Jean-Jacques Kantorow, violin; Leopold Hager, Neth. Chamb. Orch.



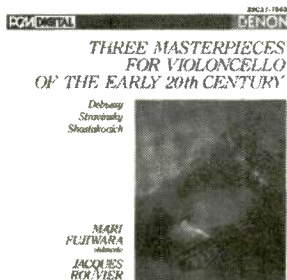
#C37-7334 J. S. Bach, *Six Partitas*; Huguette Dreyfus, harpsichord.



#C37-7331 J. S. Bach, *Complete Sonatas for Flute*; Aurele Nicolet, flute; Christiane Jaccottet; Mari Fujiwara.



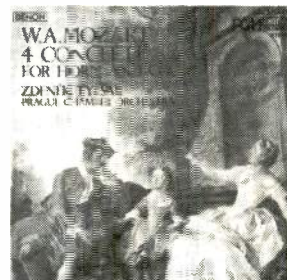
#C37-7401 Vivaldi; *Five Concertos*; I Solisti Italiani.



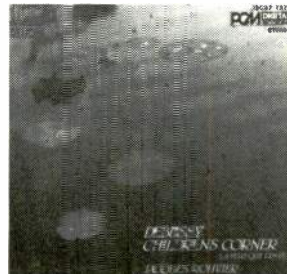
#C37-7563 20th Century Cello Masterpieces; Debussy, Stravinsky, Shostakovich; Mari Fujiwara, cello; Jacques Rouvier.



#C37-7371 Schubert, "Great" C Major Symphony; Otmar Suitner, Staatskapelle Berlin.



#C37-7432 Mozart, *Complete Horn Concertos*; Zdenek Tylsar, Prague Chamber Orchestra.



#C37-7372 Debussy, *Children's Corner*; Jacques Rouvier, piano.



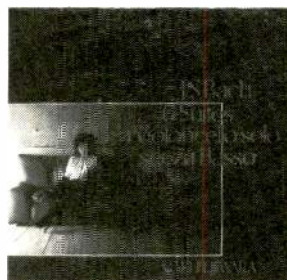
#C37-7433 Weber, *Der Freischütz*; Recorded live at the gala reopening of Dresden's Semper Opera House.



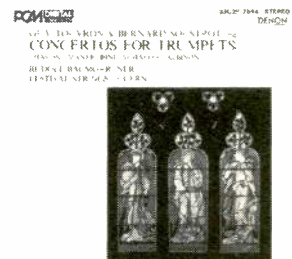
#C37-7482 R. Strauss, *Der Rosenkavalier*; Recorded live at the gala reopening of Dresden's Semper Opera House.



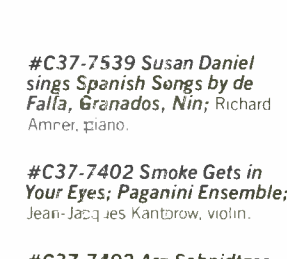
#C37-7407 J. S. Bach, *Sonatas and Partitas for Solo Violin*; Jean-Jacques Kantorow



#C37-7375 J. S. Bach, *Six Suites for Unaccompanied Cello*; Mari Fujiwara.



#C37-7544 *Concertos for Trumpets*; Guy Touvron and Bernard Soustrot; Rudolf Baumgartner, Fest Strings Lucern.



#C37-7539 Susan Daniel sings *Spanish Songs by de Falla, Granados, Nin*; Richard Ammer, piano.

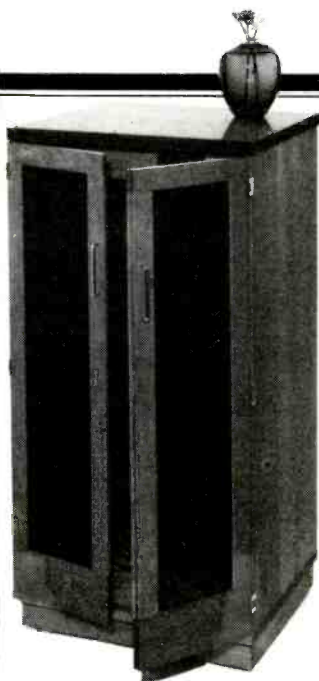


#C37-7492 Arp Schnidiger *Concertos for Organ, recorded on location*; Jacques van Oortmerssen, organist.

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Talwar Cabinets

Talwar cabinets are made of solid wood, with wood door frames holding tempered glass. Internal features include a full-extension accessory or tape drawer, air columns for ventilation, a six-receptacle outlet strip with surge protection and circuit breaker, dual-wheel

casters, and hardwood shelves. A wire-management system handles equipment cables, and the back is removable without tools for access to system connections.

Options include static or dynamic vibration control for the turntable, a grounding bus, forced-air ventilation, solid wood doors, rack-mounting angles, slide-out shelving, and additional shelves or drawers. Power-line filters may be ordered for the entire strip or for each power outlet, and a 3-S amplifier-on delay is available, as is a master controller turning on all devices when one selected unit is switched on.

The cabinets come in heights of 30, 36 and 48 inches, and in oak, cherry, mahogany or walnut. Lacquer or satin finishes are available at extra cost. Price: \$1,200 and up, depending on size, finish and options chosen.

For literature, circle No. 100

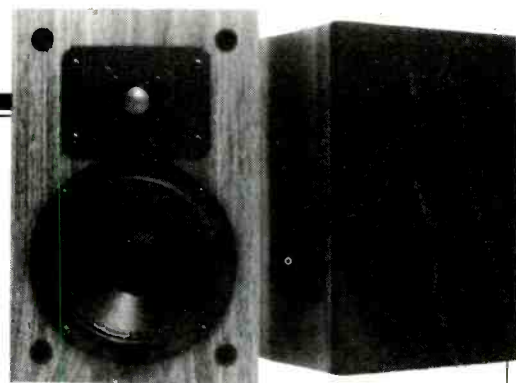
ADS Car-Stereo Amplifier

Thanks to an input level control with a 25-dB range, the P40 Power Plate can accept either preamp-level or speaker-level signals from the front-end unit of a car stereo. Power is rated at 20 watts per channel into 4 ohms at 0.05% THD, and 25 watts per channel into 2 ohms at 0.1% THD.

When bridged for mono operation, the P40 delivers 50 watts into 4 ohms at 0.1% THD. Dynamic headroom (rarely specified for car amps) is 2.3 dB into

4 ohms, 2.0 dB into 2 ohms or bridged into 4 ohms. Power consumption is 0.44 amperes at idle, 10 amperes at maximum output. Price: \$169.

For literature, circle No. 101



Vibe Acoustics Speaker

The M-1 Mini Monitor is a two-way system using a 6½-inch woofer and 1-inch dome tweeter. Sensitivity is rated at 87 dE SPL for 1 watt input, measured at 1 meter. Maximum output is 105 dB SPL, and amps with an output of 15 to 100

watts are recommended. Frequency response is rated as 70 Hz to 20 kHz, ±3 dB. The sealed cabinet is finished in walnut veneer, and the black, double-knit grille is removable. Price: \$175 each.

For literature, circle No. 103

D.G. Industries CD Rack

Compact Disc racks with separators between each disc can't hold multi-disc albums. The CD Caddy can. It holds a total of 29 discs, with the titles conveniently angled upwards. Racks can be stacked with the use of double-sided tape or acrylic cement (not supplied). Price: \$29.95, plus \$3 per order for postage and handling.

For literature, circle No. 102





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See dealer listing on page 116.

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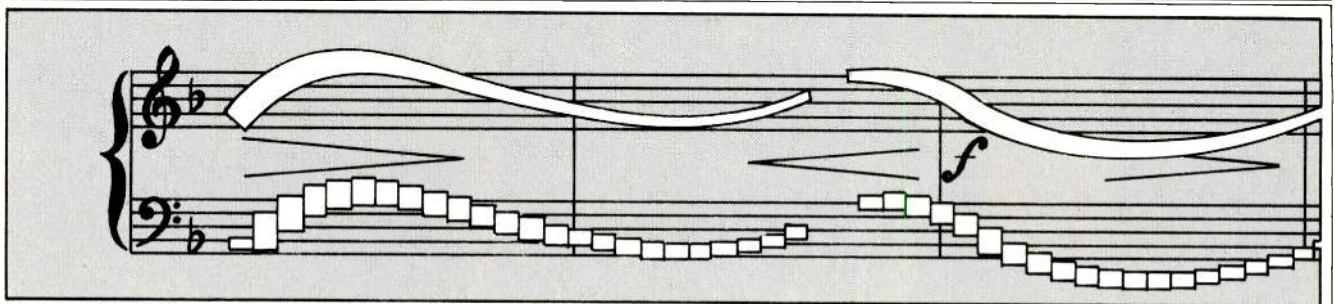
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PHILOSOPHIES TO COUNT ON



Graphic Contrasts

Some audiophiles find digital sound offensive to their ears; others, I suspect, find it offensive to their philosophies. For the philosophical bases of analog and digital are very different.

Analog builds models, or analogs, of the desired information, on the optimistic assumption that our modeling technology is infinitely perfectible. (That also means it's never quite perfected, which leaves lots of room for us to have fun in tinkering with it.)

Digital starts from the cheerful admission that total perfection is impossible, then goes on to assume that we can, by choosing the specific degree of perfection we can live with, achieve it—not approximating perfection but perfecting our approximations.

Analog's history has borne out its premise. Today's LPs are still based, rather obviously, on Edison's century-old—but vastly improved—technology. We now have wider frequency response, lower noise and less distortion, all in a medium that holds more hours of music in less space and costs less to manufacture than Edison's cylinders.

But the more we progress, the harder it gets to improve. The lower the distortion, the harder it is to reduce, whether we mean cutting it by a fixed numerical ratio (such as half) or making an audibly significant improvement. Cut distortion from 10% to 1% and you're a hero—cut it from 0.001% to 0.0001% (which is a great deal harder) and who cares?

Analog and digital philosophies, unlike most others, can be graphed. The analog approach to perfection may be described, without hyperbole, as a hyperbola—a curve which

swings up in an ever-steepening arc. Label the vertical scale as effort needed and the horizontal scale as the quality that effort yields, and you'll find perfection is an asymptote, a point that curve grows ever nearer to without quite touching. Mathematically, perfection can be reached—but by that point, the curve's upward slope, the effort involved, has become infinite. Perfection cannot be attained in finite time, or with finite resources.

In practice, though, we eventually reach a point of "good enough." Once frequency and phase response are flat to 15 kHz, further improvement is unnecessary for most listeners; once flat to 20 kHz, then very few listeners will be able to recognize further progress. Flatten the system out to 100 kHz, and even the most optimistic view of human perception would concede that no further increase would be distinguishable. So we draw up ideal specifications (such as "1% THD" or "20 to 20,000 Hz"), creep up on them and then, once they're attained, reset our sights a little higher.

Digital takes the idea of "good enough" as its foundation, setting its limits with one eye cocked on what is ideally desirable and the other on what's practical. Digital naysayers maintain that those limits have been set too low. That's a pity, if true, since digital systems must jump, not creep, to progress; a diagram of digital philosophy would show stepwise progress between flat plateaus. In other words, the only way to raise our current technology's limits would be to come up with an entirely new digital system, using faster sampling and more bits. Such a system could be implemented now, but only at forbidding cost and with the

elimination of the Compact Disc's compactness.

Even digital enthusiasts concede that today's systems only reach their built-in limits in the digital domain. There's still a trace of slippage during analog-to-digital and digital-to-analog conversion, and there's still some imperfection in the analog stages of the digital hardware. (By definition, remember, analog is never perfect, just perfectible.) These latter imperfections can and will be ironed out, but only by the time-honored analog process of creeping up on the ideal.

Audiophilia grew up in analog surroundings. So many audiophiles feel uncomfortable—consciously or unconsciously—with a system which, however good, admits no further improvement, let alone ultimate perfection. "The sky's the limit" seems rather confining, once you've reached the sky.

Audio hobbyists have a more concrete reason for discomfort: The closed nature of digital systems seems to prohibit the tinkering and finicky adjustment which make analog such involving fun.

For the phonograph, you can buy an infinite variety of mats, cartridges, styli, levels, arms, clamps, isolating stands, de-isolating stands, dampers, cables, separate lubricants for records and for styli, and separate cleaners ditto. You can change tracking force, anti-skating, cartridge alignment, and vertical tracking angle. And so on.

For the Compact Disc, the options are far fewer. Some audiophiles claim that a disc will sound better if you put another disc on top of it . . . if your player accepts double discs without jamming. And you can now buy special cables, phase-correction

Because You Can't Tell The Players Without a Scorecard

AN AUDIO SPECIAL ISSUE...

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to State-of-the-Art

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*Please add your applicable sales tax.
Please allow approximately 6-10 weeks for delivery.

Assembling a phono system's arm, cartridge, table and accessories is a kind of fun that digital systems may never offer.

boxes, isolating feet (or players with them) to reduce the chance of microphonics, and enough CD cleaners to make you forget you're supposed to be able to clean the discs with a damp cloth. (In fairness, the best CD cleaners do ensure that all strokes are radial, across the signal paths, rather than circular, following these paths around the disc; that *is* important.)

What about the thrill of custom-tailoring your system, buying and assembling the digital equivalent of tonearm, turntable and cartridge? The day *could* come when, instead of buying separate turntables, tonearms, headshells, cartridges and mats, the audiophile will purchase separate CD transports, lasers, error-correction ICs, D/A converters, etc. It could—but I don't consider it too likely. The price of such custom complexity would be far higher than the phono equivalent and far less audible.



Coda: Norman Eisenberg

Norman Eisenberg of Stockbridge, Mass., audio critic and writer, died on July 12th at the age of 63. Though he had written only irregularly for *Audio*, Norman had a long and distinguished career in the field. At one time he was the audio columnist for *Saturday Review*. In 1960 he joined *High Fidelity* as Technical Editor, later

becoming Audio-Video Editor and Executive Editor during the 15 years he spent with that magazine. He also edited *Stereo Quarterly* and several *High Fidelity* annual publications. At the time of his death, he was a syndicated audio columnist for the *Washington Post*, the *Newark Star Ledger* and the *Detroit Free Press* newspapers, and for *Playboy* and *Ovation* magazines.

It was a pleasure editing the articles Norman wrote for us—not just because he was a good writer, but because he'd done the same for me, many times, in years past. He was a good editor to work with—not uncritical, but clear and constructive in his criticisms, and able to understand an author's point of view. He was also good company on the many trips we shared to audio labs and factories overseas. He loved not only audio but music. He will be missed.



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A hand holding a black remote control in the foreground. In the background, three black speakers are positioned in a room: one on the left wall, one on a shelf in the center, and a large one on the right wall. The scene is lit with dramatic, low-key lighting.

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DO THE CONTINENTAL

The Big Three auto makers didn't grow so big by ignoring one another's good ideas. So, ever since GM's introduction of a super-premium sound system, the GM/Delco/Bose (*Audio*, December 1982), similar systems have been expected from the other two.

Now Ford's is here. Like GM's, it was done in conjunction with a major home-speaker maker (JBL) and will appear first on the company's highest priced cars (the '86 Lincoln Continentals). Beyond that, there are as many differences as similarities.

The Ford/JBL system is a lot less radical. Where the competition uses vented enclosures requiring special spaces in the doors, and small amplifiers in each enclosure, Ford uses flush-mounted speakers and a single amplifier (four 35-watt channels at 0.07% THD) in the trunk.

Instead of four full-range single drivers, Ford uses four three-way systems, with JBL ½-inch dome tweeters and 3½-inch midrange drivers front and rear, plus 5¼-inch woofers in the front and 6 by 9-inch woofers in the rear. The speakers are mounted conventionally, with all rear speakers on the parcel shelf above the trunk, the front woofers in the doors, and the front tweeters and midranges atop the dash. As JBL's senior R&D Director,



Head end, Ford/JBL sound system.

John Eargle, puts it: "Nothing revolutionary. It's all conventional, the best we know, tweaked."

Though the trunk-mounted, 6 × 9 woofers naturally produce more bass than the door-mounted, 5¼-inch ones, you don't lose bass when you fade out the rear sound. The front/rear fader affects only the midrange and treble drivers; both pairs of woofers operate continuously, regardless of the fader setting. With a total woofer area of 93 square inches, equivalent to a pair of 7.7-inch drivers, Ford and JBL claim response down to 25 Hz—and that's what it sounded like to me.

Several of the JBL-built amplifier's

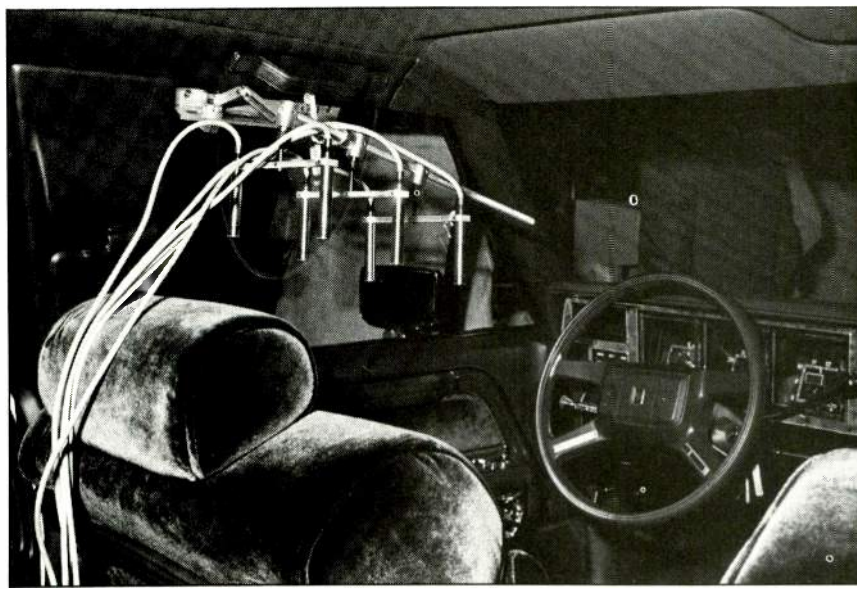
circuit features are designed specifically to meet in-car requirements. Differential inputs are used, to reduce noise pickup from the car's other electrical systems. A fixed, parametric equalization circuit matches the amplifier's frequency response to the particular car model (Fig. 1), so that the sound at the listener's position will be flat within ±3 dB from 200 Hz to 16 kHz (Fig. 2). Below 200 Hz audible response rises, peaking at about +23 dB at about 40 Hz, to overcome road noise. The rear speakers get more boost than the front because they can deliver sound at the lower frequencies, but the electronic EQ curve is, Eargle says, "less than that used on the audience speakers at most rock concerts." This bass EQ is needed even in the comparative hush of a Continental. "Quiet" cars are only quieter at mid and high frequencies," says Eargle. As a result, with the tone controls flat, bass sounds heavy when the car is standing still, but just about right on the road. This is common in good mobile systems, and you can always use the bass controls to flatten out the sound when you're stationary (or to boost it unnaturally, if that happens to be your preference).

Presumably because of the amplifier's bass boost and because of wind noise, the loudness compensation circuit raises the treble more than the bass at low volume settings. The degree of compensation for each volume setting can't be adjusted, but there's no need to, since the sound level each volume setting will produce was known by the designers in advance.

What with bass equalization, loudness compensation and the possibility that the user will add still more boost with the bass control, the speakers could easily be fed enough bass to cause audible distortion. To prevent this, the amp contains a dynamic woofer-cone excursion limiter, which begins rolling-off the bass at progressively higher frequencies as volume is increased beyond a certain point (Fig. 3). So even if you're listening at maximum level (about 105 dB SPL—louder than road noise, but quiet enough to let emergency road sounds reach you), the sound should be clean (Fig. 4).

To cut down on second-harmonic distortion at high power levels, the driv-

Six-microphone array used to test Ford/JBL sound system response.



ers use JBL's SFG (Symmetrical Field Geometry) magnet, whose flux is symmetrical at each end of the coil's travel. The rear woofers have polypropylene cones, while the front woofer cones (and both midranges) are of a paper/polyvinyl laminate. Each material was chosen for its roll-off characteristics in its particular application.

Don't get the idea from all the above that JBL did everything. Ford's commitment to audio goes a lot deeper than most audiophiles might think. Ford began experimenting with car radio in 1929, and offered sets in the V-8 back in '32—so long ago that the radio had to include a motor-generator system to provide high voltage for the tubes. Back in the mid-'70s I put a Philco-Ford AM/FM stereo radio into my Fiat, at the recommendation of one of the designers of the Dynatuner. And Ford's premium sound systems have had separate amps since 1978.

The front-end unit Ford is providing for the system has a digital tuner with bidirectional seek and one-directional scan tuning, but with only four station-preset buttons, the number Detroit favors. (Yeah, I know that research shows most people don't use more than four AM and four FM presets. But judging from the way the aftermarket companies are pushing systems with anywhere from five to eight buttons—and sometimes multiple FM stations for each—I suspect I'm not alone in wanting more.) On the tape side, there's auto reverse, automatic music search, Dolby B NR, and automatic tape-equalization switching. General controls include DNR noise reduction, separate bass and treble controls, balance, and fader. The panel design lacks the fancy look I'm used to on aftermarket systems, but Ford's pictures don't do it justice—it looks pretty good in the Lincoln's dash.

Sound is big business at Ford: They sold 3 million radios in 1984 and expect about 4 million for '85, which makes them probably the second biggest car-audio maker (after GM Delco). The electrical and electronics division (which also makes ignitions and other systems for the car) would be big enough to be on *Fortune's* "500" list if it were independent.

Ford spends \$18.4 million annually on research and development of auto-

Fig. 1—Electrical equalization curve.

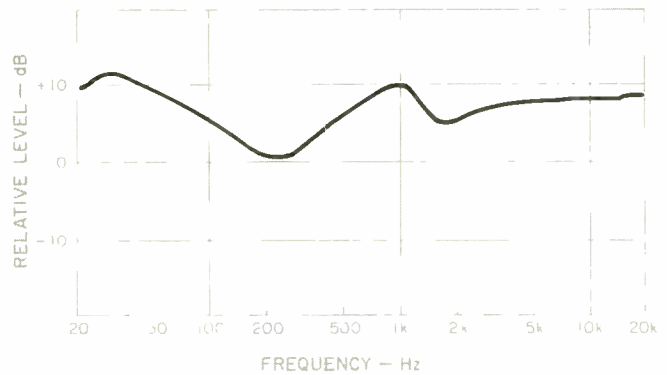


Fig. 2—One-third-octave system response, measured at the listener's position.

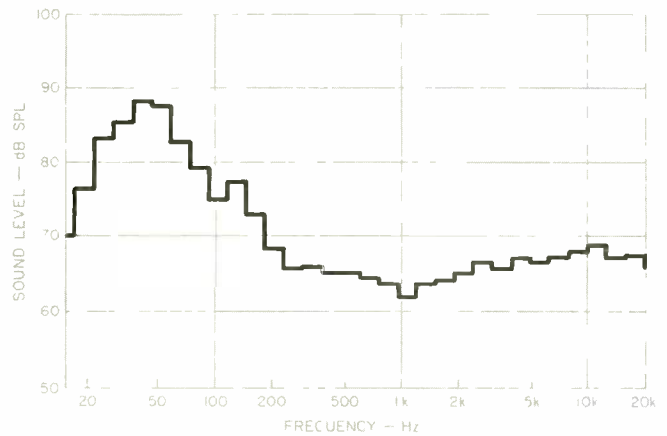


Fig. 3—Low-frequency limiting (rear woofers) vs. drive voltage (0 dB = 10 V).

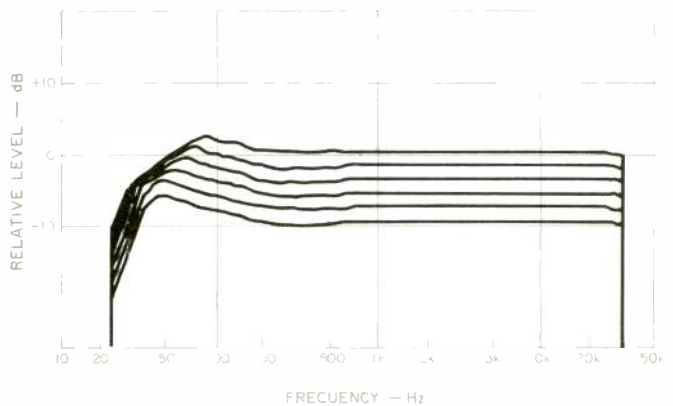
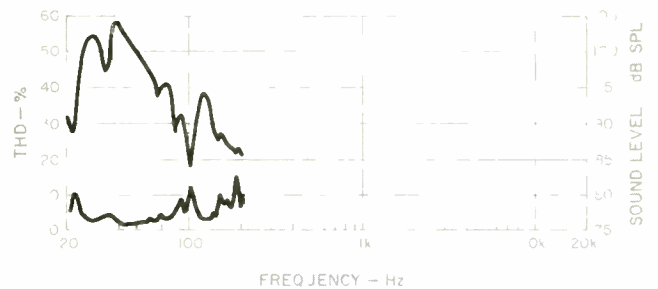


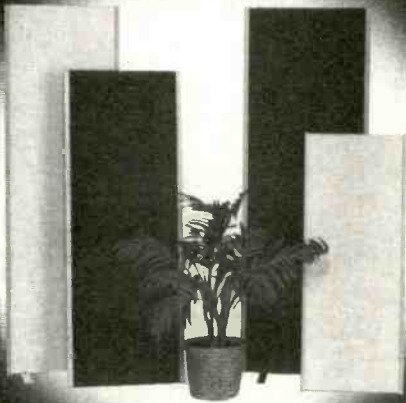
Fig. 4—Bass acoustical THD at 100 dB SPL (lower curve); this rarely goes much over 10% and is mostly well below that. (Upper curve shows acoustical output.)



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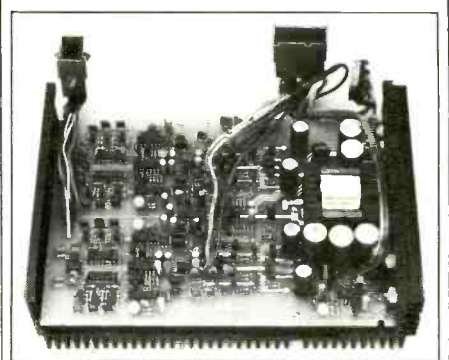
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motive sound systems *alone*. I suspect that few independent car-stereo companies have lab facilities like Ford's, which include drive-in acoustical and r.f.i. anechoic testing rooms. Ford uses the r.f.i. room to test the radio's reception of weak and strong signals, to check the car's and the system's resistance to r.f. interference from outside the car, and to isolate sources of interference within it.

Sometimes the sound system itself can cause interference. For example, an early prototype of the Ford/JBL system suffered AM interference from the amplifier's switching power supplies—a problem Ford had already experienced from digital instrument panels. They cured it with filters and careful wiring layout. Other problems were solved with shielded, twisted-pair connections to the rear amp and differential inputs on the amp itself. Even noise from the electric rear-view mirrors was taken care of, by putting varistors across the motor leads.

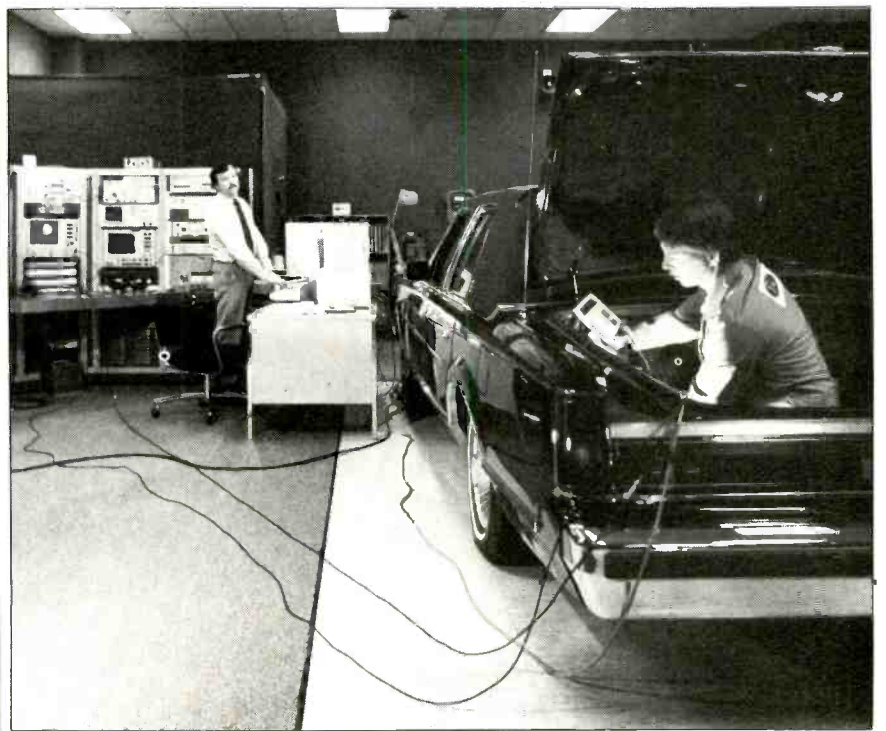
Though Ford's radio division gets a crack at Ford's cars well before out-



Inside the JBL-built amplifier.

side radio companies can, that's not soon enough to suit Ford's engineers. "We don't have physical cars to experiment on 'til very late in the game," says Earl Geddes, Ford's acoustic technical specialist. "So we model the audio system, from the antenna to the speaker drivers, on a computer." (So far, he adds, they don't have the ability to model the acoustics of the car.) "We can iterate any of 17 variables on the computer," says Geddes. Incidentally,

Main instrument bank at Ford's Vehicle Sound Laboratory in Dearborn, Mich. Ford has a second such lab at Dearborn, and others in England and Brazil.



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he adds, "this is *not* a Thiele-Small approach. That approach implies omnidirectionality at all frequencies, which is not actually the case."

Once the car is physically available, Ford's engineers measure system response with a six-microphone array, mounted in an area where 99% of all drivers' ears will be. Measurements made in the car's small space with fewer than six microphones will not give an accurate picture of overall response within the car.

As it happened, I found a copy of an AES paper on this subject waiting at the office when I got back from my visit to Ford, together with a note from a Ford audio engineer, Henry Blind (who coauthored the paper with Mr. Geddes). Mr. Blind suggested that the imprecision of single-mike measurements might account for the need for the kind of "selective fudging" that Lewis Athanas wrote about in the August "Roadsigns."

Sound has become especially important to Ford's marketers lately. "The car used to be a young person's first big purchase," says Don Duncan, Ford's Audio Planning, Marketing and Sales Manager. "For the baby boomers, that purchase is now a stereo, and the car comes second."

That being the case, you might expect the Ford/JBL system to appear first on lower priced models that would appeal to the sound-oriented younger audience, instead of on the 1986 Continentals. Combining Ford's explanations with a few guesses of my own, I can come up with several reasons for this. First, the Continental is Ford's biggest car, which leaves more room for speakers and electronics. (Time enough to face the challenge of a smaller car once Ford has more experience with the system.) Second, the higher the car's price, the easier the system's price will be to swallow. (Ford estimated that it would be "competitive" with the Delco/Bose system, but exact prices weren't available at press time.) The Continental is also Ford's quietest car, which makes the sound system's advantages more audible. Further, Ford wants to entice younger buyers to the car. Continental's small run makes it good for production and consumer testing. And, Ford says, "We had to start somewhere." 

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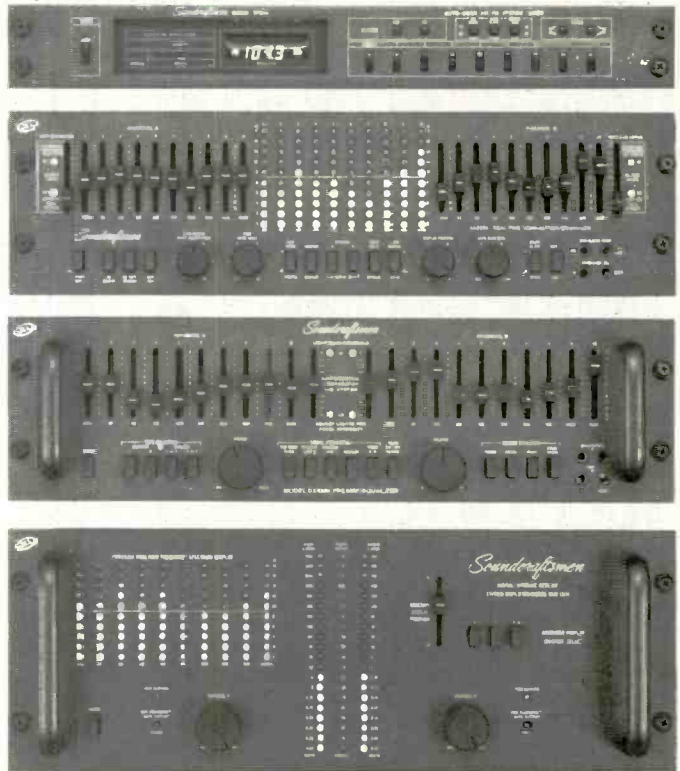
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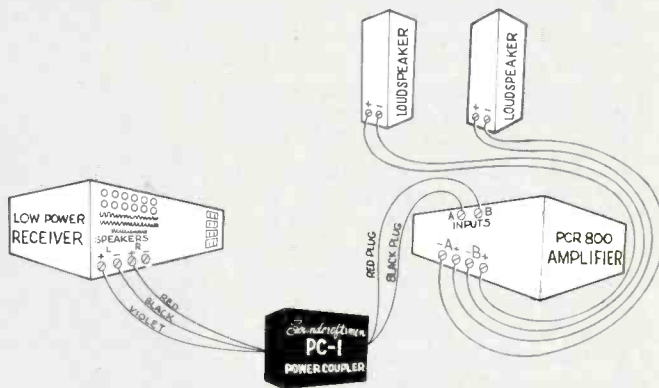
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DANCING AROUND THE MESSAGE

Ivan Berger's August 1985 "Spectrum" column has given me a fine handle for more thinking on a subject that has been on my mind for a couple of generations of *Audio* readers, since hi-fi began: Audio listening. What else? It's what we do. More specifically, how does one listen for the two big preoccupations that our interest involves, the music and the fi?

Aren't they one? Yes indeed, and quite inseparable. And yet, for good reasons and bad, we often act as if they weren't. On the one side we ignore the audio. We have ears only for the message, which is maybe 98% music these days. On the other, and quite as determinedly, we bypass the music as though it were not there. Crazy. But to an extent this is both necessary and useful. It all depends.

I'm going to reverse the Berger argument after a fashion, though it doesn't make much difference. He says that somehow you must hear a system's audio characteristics (or, for that matter, a recording or broadcast) *through* and *past* a foreground of content—the message. That means music, for the most part, if of many kinds. (I think we would agree that "classical" in all its variety is the best test music, the most revealing.) A curious thing. You hear music—and you judge audio.

"Even being just a music lover, as I am, can dull your critical listening faculties," says Ivan. (He means, of course, his audio judgments.) "Listening to music is fun; by the same token, listening past the music, to hear the system's sonic subtleties, is *work*."

You bet. Especially for a man who is professionally into such listening, and particularly if he doesn't like the music and/or the way it is being treated. Also vice versa. If one enjoys the music and thinks that it is being well served, then one is apt to overlook, or condone, a number of li'l failings in the audio department. This is reprehensible, I admit, on the part of one who purports to be able to judge *by ear* the audio qualities of a given reproduction.

I long ago concluded on this basis that I am not an audio critic, even though I have some strong ideas on the subject now and then. After all, I started as a musician before audio had a name. I have never even hoped to be more than a somewhat addled music



Illustration: Karen Barbour

critic, who has perversely made the musical sound of audio a life's work.

Plenty of musicians, says Ivan, have very presentable hi-fi systems, which is also my observation. Why not? They too are citizens, and almost anybody who is into some sort of music likes to own the going sort of musical decor in home or car. Musicians listen to music too—via these systems. But, says Ivan, many "would be just as satisfied with lesser systems. Musicians, you see, know the sounds of music so well that many can re-create that sonic splendor mentally, from even the tinny cues of a pocket AM radio. No matter what the sound system puts out, it's always hi-fi in their heads."

A gracious statement, Ivan! But it also goes for thousands, maybe millions, of plain music lovers who are experienced in listening to their own preferred kind of music. That surely includes Ivan, at least in his off-duty moments. And myself. I can turn my audio judgments off, privately speaking. A compelling musical message can override anything but sheer incomprehensibility. Then, and only then, do I and others like me begin to get annoyed at the audio obfuscation! It spoils the music.

All of which thinking, I'd guess, should drive a dedicated audio man to despair. If so few give a darn about audio quality, then why bother? I truly sympathize. I understand.

But take heart—it isn't really that bad. Good audio, by which I mean technically accurate, faithful, responsible audio, very much including the final listening acoustic, does decidedly make for better musical enjoyment across the board. (Some pop music benefits from *lousy* audio. That's the intent.) Audio sound gets better, richer, smoother, etc. every year. You think that doesn't impinge on our lives, which practically depend on audio all the time?

What we have to consider is the marvelous flexibility of the pair of human ears and the receiving mind in between, a biological system that easily grasps the thinnest of clues for usable sense. Even the dopes have it. People indulge themselves in this extraordinary ability. They are happy with what they have, crude though it may be from the measurement viewpoint. Remember "Home, Sweet Home," that mainstay song of the outing and picnic repertory in days long past? *Be it ever so humble, there's no place like—yes, we*



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**Make no mistake about it:
Most people are primarily
drawn to the sound of music,
not the sound of audio.**

do attach ourselves to things that are easy and comfortable and familiar, including a staggering amount of bad audio.

It is unwise, then, to criticize the Unwashed Public for its lack of audio finesse. Bad taste? That "taste" is more on account of the ear's ability than any slothfulness. The people are right. They don't need the fi.

But a really good first experience of higher things in audio can once in a while work wonders, and lead somebody onward to constructive change. It doesn't even take advertising. What really matters is a personal experience. Nobody is going to pass up a good thing, once it becomes real in a really personal way. How often do hi-fi demos do that job? Not often enough.

"Unconscious musical enjoyment is one of my clues to a sound system's quality," says Ivan Berger. In his rather thorough professional experience, what sounds to be good *music* is often good audio. Now there's your trained and analytic mind! "At a show, if I find myself drawn into a booth to ask what record is being played [italics mine], it's a good sign that the sound was so good that I became unconscious of it. I then shake myself and . . ." Mustn't let that music run away with you, Ivan! So he chastises himself by listening on the same system to music he doesn't like, deliberately. That is indeed work. But it is the honorable way. The business of audio is music, as I said years and years ago, and that's why Ivan has to work so hard.

Make no mistake, most people (trade shows aside) are primarily drawn to the sound of music, not the sound of audio. When you come down to it, even the hi-fi bug, the audio aficionado, listens first of all to music even when he pretends it isn't there.

I think we fool ourselves with too much knowledge, or at least a lot of knowledge we want to show off to the next guy. I've strolled, in my day, through dozens of hi-fi shows, audio fairs, conventions, expos, press demos, always eavesdropping on the endless enthusiastic confabs that go on at such events while the audio bellows at full blast. Virtually all of these excited get-togethers, I have found, are *exclusively* technical. Very informed, yes, and often quite remarkable—but mu-

sic, the business of audio, is not mentioned. The sound is discussed virtually 100% as sheer sound, as though what we were hearing—and that's plenty—were some sort of abstraction, totally removed from the messages, the music which is actually being reproduced. We audio people seem to try hard to blot out and eradicate the very stuff that gives audio its voice.

Now, this argues us into a corner. Logically, then, the person who can best separate the music—any message—from the audio itself would produce the best audio judgment. Maybe that's the truth. But go further. The person who can *entirely ignore the music*, and there are plenty of these, should make a *very* high-order audio critic. A sort of human measuring system! But how useful can this be? All our audio involves *some* sort of message which has its own claim to importance; in fact, added together, these messages are the very reason for audio's existence. Minus attention to the sense of the audio signal, audio is indeed an abstraction.

Well, why not? Abstractions, whole abstract systems, are enormously useful if kept within their bounds. Algebra, calculus, trig, all mathematics—entirely abstract, and deliberately so. Of course audio is also abstract, as is electricity in terms of its rules and regulations. The audio man can certainly be proud that the abstract principles he learns to apply, and to extend in new directions, are the basis for working audio in the sonic flesh.

Nevertheless, for those on the receiving end, it is the audio message that counts. Who needs fancy hi-fi for radio news broadcasts? Who needs it for all sorts of music? And when we do have it, the audio had better do its job, which is to *get over the message*—the music—in ever more superior fashion.

In the audio field, with this sharp dichotomy in our aims and preoccupations, we have to be terribly careful not to let the abstraction become concrete—pure audio minus the sense of its message. The message is *always* there, except in a few test tones and visible readouts. It always counts. But we don't always hear it.

For me, then, it is the foreground that is audio, not the background, and it is all too often dizzily meaningless, like

the television screen when the TV breaks down, all senseless flashes and zigzags. This is most evident at audio shows, and at the beach, with hi-fi and lo-fi. Multiple conflicting signals intermesh in both places for a hash and jargon of nonsense. Hi or lo, it is all the same! To my ear it is noise, and nasty noise at that.

Until . . . Until suddenly I hear a sensible message. The tiniest wisp of Mozart or The Beatles, at the beach, lost, almost, in the roar of the surf, and I am entranced. I strain to catch every note. I fill in, in my head, the parts I can't hear at all. This sound says something. At an audio show, if the fi is good and the music is treated right, I bless the audio fraternity. It is doing its job! The same would also apply to any other kind of music than mine. I do follow Ivan Berger's reasoning, though it's the audio I have to hear past. After all, the best audio people know a lot about music and how it should be presented on their equipment. Pure audio in design, but in execution the message is always important.

If the musical sense is impeded, disrupted, manhandled, then I assume not poor audio but a lousy audio viewpoint. Millions of dollars in faultless design have been negated by such callousness.

I am absolutely furious when I hear good music at a demo suddenly cut off in the middle of a note. A gut reaction. The message, the beautiful expression that is the reason for it all, has been *shot dead*. Murdered in front of my eyes! Crumpled on the floor. I can practically see it. Frankly, I think this is biting the hand that feeds.

So here I stand, maybe side by side with you, hearing the same sounds from the same audio. And while you may hear speakers, amps, equalizers, peaks, phasing, TIM and S/N, I blithely choose to hear Mozart, courtesy of good audio, perhaps on a memorable evening in 1785 Vienna and in Studio A or Symphony Hall two centuries later, 1985. Musical composing, musical performance. Audio recording, audio playback! Our four ears, combined, make a single whole.

A nice idea. For that is the way audio listening should be. But it can also be done with two ears. Ivan Berger's? Yours? A

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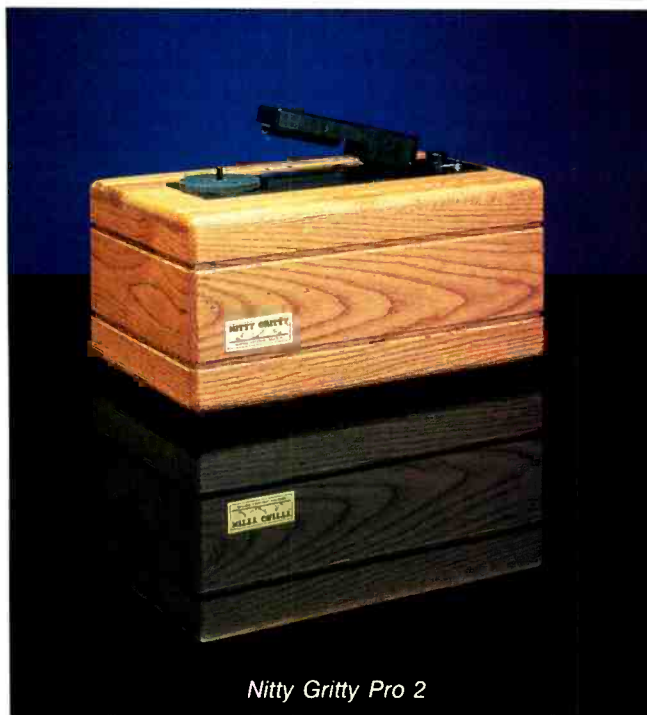
GIVE IT A SPIN

Since the introduction of the Compact Disc, I have accumulated a fairly sizable library of good-quality CDs. I also have many digital tape recordings, an extensive collection of analog master tapes, and even a large number of four-channel masters on half-inch tape. In addition, I have a huge collection of phonograph records. I assure you that I treasure a great many of these recordings, and quite frequently play and enjoy them.

With all my superior sound sources, I continue to play my phonograph records for the most basic of reasons: The music. As I noted some months ago, classical music on CD is at this point heavily oriented to the standard repertoire and the best-selling warhorses. Even though more and more classics are being issued as CDs, it will be years before CD can hope to approach the vast diversity and broad scope of the music available on phonograph records.

Listening to CDs, one becomes quickly conditioned to their superior playback qualities. Thus, when you return to phonograph records, you become acutely aware of the technical shortcomings of many of them. However, a number of the newer phono discs—ones whose lacquers were cut with modern Neumann and Ortofon cutting heads, then processed by advanced electroplating methods, and pressed on the best low-noise vinyl—can provide remarkably high-quality sound. If the recording was made using the DMM process, sound quality can be even better.

Everyone is well aware that the quality of the playback system has a profound effect on the reproduction of music from phonograph recordings, whether they are old or new. Many high-end audiophiles are ardent champions of the vinyl phonograph record, and they often spend an inordinately large amount of money on very elaborate phonograph playback systems.



Nitty Gritty Pro 2

These are the people who buy expensive, belt-driven turntables, exotic pivoted and lateral-tracking arms, and even more exotic and expensive phonograph cartridges, usually of the moving-coil variety. These audiophiles are masters in the arcane art of "tweaking" turntable systems to extract the last iota of performance. For instance, some of these tweekers try to find what they consider the correct vertical tracking angle for each recording they play. This is often a tedious process, but once they've determined the VTA, they mark the setting on the record label so that it may be used in subsequent playings.

Some people consider it a subversion of music to technology, but the tweekers are vitally concerned with the suppression of all extraneous noises and resonances that might be superimposed on the music. These include rumble and other low-frequency vibrations, and various resonant colorations. It is enough of a problem to contend with the hiss, pop, and crackle of record-surface noises without being forced to deal with such vibratory and resonant problems as acoustic feedback, too. This can arise as structure-borne and airborne feedback, both emanating from the loudspeakers

and both interacting with the stylus/groove interface.

In recent years, various spring-loaded isolation platforms for turntables have appeared on the market; they are supposed to suppress acoustic feedback as well as attenuate resonant problems. None of these platforms have been entirely satisfactory. The main problem is that frequencies below 50 Hz, including subsonic frequencies, are attenuated only about 1%. A simpler and more basic problem is that most of these platforms will not accommodate such larger turntables as the Sota Sapphire, VPI, or Technics SP-10MK2. So some tweekers have gone to such elaborate lengths as pouring concrete pillars to serve as decidedly non-

resonant bases for their turntables!

Recently a much more practical solution to these acoustic-feedback and resonant problems has become available, in the form of a dedicated turntable stand and isolation platform rather amusingly called the Lead Balloon. This consists of a 33-inch-high, delta-shaped stand, an extremely strong, very rigid structure made of heavy angle iron. On top of this so-called Delta Tower is a steel turntable platform, 20 inches wide and 16 inches deep. On either side of the turntable platform are lead bars 1 in. H x 1½ in. W x 20 in. L. These bars have a total weight of 25 pounds, and are adjustable so that they can fit underneath the base of almost any turntable currently available. The bottom of the Delta Tower rests either on cushioned pods or the preferred, sharply pointed steel spikes which are intended to mass-couple the entire assembly to wooden or concrete floors for optimum performance. The turntable platform is equipped with leveling bolts.

The Lead Balloon provides a simple but elegant solution to the problems of feedback and resonance. The resonant frequency of the lead is so low—less than 1 Hz—and the density of the lead is so high that it will not transmit

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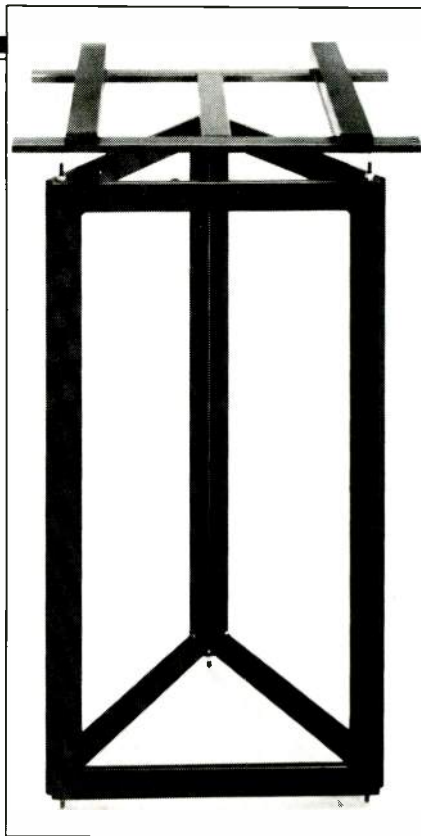
Using the Lead Balloon, I heard just about the cleanest reproduction of phono records I have ever encountered.

any feedback or vibrations to the turntable. It is especially effective in the subsonic and low-frequency regions, which include such things as footfalls and compressor rumble from air conditioners. Needless to say, this also includes low-frequency elements of music, such as large bass drums and pipe organ pedals, which give rise to structure-borne feedback.

I set up my Lead Balloon turntable stand with its steel spikes coupled to the concrete floor of my listening room. In this mode, I used it with a Technics SP-10MK2 turntable (with its 37-pound lava rock/epoxy base) and the new VPI HW-19 MKII belt-driven turntable. The VPI, with its clever suspension system, was combined with Souther's latest lateral-tracking arm, equipped with the new Clearaudio moving-coil cartridge from Peter Suchy, a German designer; I also tried the VPI with Eminent Technology's new air-bearing Tonearm Two, equipped with Shure Brothers' new Ultra 500 cartridge.

The results in both cases were exemplary. I heard just about the cleanest reproduction of phonograph records I have ever encountered. There was a singular lack of resonant coloration, and no veil of low-frequency feedback overlaid the music. Image, focus, and localization were very precise and stable. With the VPI dust cover in place during playback, and a brand-new DMM recording (which was virtually free of any steady-state or impulse surface noise), I was amazed that a vinyl record could quite honestly bear comparison with a Compact Disc. Of course, I must note that ultimately the ravages of stylus/groove friction and contamination from dirt will inevitably produce more and more noise, while the CD will be as fresh and vital on playback 1,000 as it was on the very first play. Nonetheless, the high playback quality achieved with this combination of phonograph equipment and the Lead Balloon was quite remarkable. Even when I played the thunderous, low-frequency pedals in the direct-to-disc recording I made with Virgil Fox, the Lead Balloon did not transmit any of this very high-energy, structure-borne feedback to the turntable.

The turntable platform of the Lead Balloon is available separately, sold as



Arcici Lead Balloon

the Lead Belly. This is intended for use with CD players. As such, the Lead Belly can be placed on an appropriate shelf or table. It is equipped with sharpened spikes for mass coupling, but, to protect shelves and table tops, three Lincoln pennies are furnished to accept the spikes. Here, too, there are leveling bolts, and of course the platform has the two lead bars on which the CD player is positioned.

The same company that makes the Lead Balloon also makes a clever little trestle called the Treble/Base .T-1. These units can be used as speaker stands, but I found them more useful as supports for heavy amplifiers. Equipped with casters, the T-1s make such amps easy to roll around and afford quick access to the amps' inputs and speaker output terminals.

I consider my collection of phonograph records a most valuable asset because many of the musical works may not appear on CD for a very long time. Anything I can do to extend their usefulness and maximize the quality of their playback is a worthwhile endeavor. I have no doubt that the Lead Bal-

loon is a significant aid in achieving this optimum playback quality.

The Lead Balloon has a list price of \$225. The Lead Belly is \$120, and the Treble/Base sells for \$20 each or two for \$35. The Lead Balloon products are sold in many audio shops, or you can contact the manufacturer: Arcici Inc., 2067 Broadway, Suite 41, New York, N.Y. 10023.

While acknowledging the salutary effects of the Lead Balloon on turntable performance, some attention must be directed to certain problems inherent in phonograph records. It hardly needs saying that the main problem with phonograph records is one that has annoyed and frustrated people ever since phonograph records were invented; this is, of course, record-surface noise. The "Rice Krispies Syndrome," as the snap, crackle and pop of impulse noise is popularly known, and the steady-state hiss as the stylus traverses the record grooves, have always been gross intrusions on the music recorded on vinyl discs. In addition, there is the ever-present problem of electrostatic noise.

The noise level of vinyl pressing compounds has steadily improved over the past few years. The best of today's audiophile-quality pressings are remarkably quiet. However, as most record enthusiasts are painfully aware, the buildup of dirt and grime is the mortal enemy of records and the root cause of most record-surface noises.

Microscopic examination of dirt on a record reveals that it is gritty, particulate matter that looks like rocks and boulders lying on the record grooves. Surprisingly, even a brand-new record has a lot of dirt and debris, such as tiny cardboard shreds. The obvious solution to all this is that records must be cleaned.

Countless methods and devices for cleaning records are on the market, and most of them are highly ineffective, simply rearranging the dirt. Some years ago I reported favorably on a record-cleaning machine, and there were several others on the market which worked quite well. However, these machines were rather cumbersome and a bit sloppy to use. Most of them required individual cleaning of each record side.

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For some time now, I have been using the Nitty Gritty Pro 2 record-cleaning machine. To me, it is the first of these devices that works effectively and efficiently, with due regard to human engineering. Housed in a handsome oak cabinet, with a reservoir for Nitty Gritty's Pure 2 record-cleaning

fluid, this machine is very simple to operate. The record is placed on a spindle, and the edge of the record engages a slotted-rim drive wheel. A record-cleaning brush and vacuum chamber contact the underside of the record. A hinged arm, also equipped with record brush and vacuum cham-

ber, is placed over the top of the record. Depressing a rocker switch starts the record revolving. A brief touch on a pushbutton dispenses the cleaning fluid onto both sides of the record. Three or four revolutions of the record are usually sufficient, with the scrubbing action of the brush and the cleaning fluid, to thoroughly clean the record. Depressing the rocker switch to its other position activates an extremely powerful vacuum which gives you a bone-dry record within two revolutions. Examination of the record grooves with an illuminating microscope reveals that the grooves are pristine clean, no longer strewn with the "rocks and boulders" of dirt.

Older records which have had dirt ground into them and are noisy, especially in respect to ticks and pops, can be improved to a limited extent with the Nitty Gritty machine. Using the machine on less heavily soiled records affords lower noise levels, and using it on new recordings is quite rewarding, too. Even before the first play, running a record through the machine removes mold-release compounds and assorted debris. On really high-quality pressings, this can provide a virtually noise-free playback.

The cleaning fluid was formulated by Warren Weingrad (importer of Duntech speakers), who is a chemist and an expert in surfactants and detergents. The fluid's chief virtue is that it leaves no significant residue on the record surfaces. It also acts as an effective anti-static agent. I have found that the use of this fluid in the Nitty Gritty Pro 2 record-cleaning machine is the closest one can come to a program of preventive maintenance in the care of vinyl phonograph records.

At \$699 the Nitty Gritty machine is not inexpensive. Those who have a big investment in a large record collection will benefit the most from it. Obviously, this is a device whose cost could be shared by groups of phonograph-record enthusiasts or by members of audiophile societies. One thing is certain: The Nitty Gritty Pro 2 record-cleaning machine is the best of its type, and provides the best possibilities for low-noise playback of records. For more information, the manufacturer can be contacted at 4650 Arrow Hwy., #F4, Montclair, Cal. 91763.

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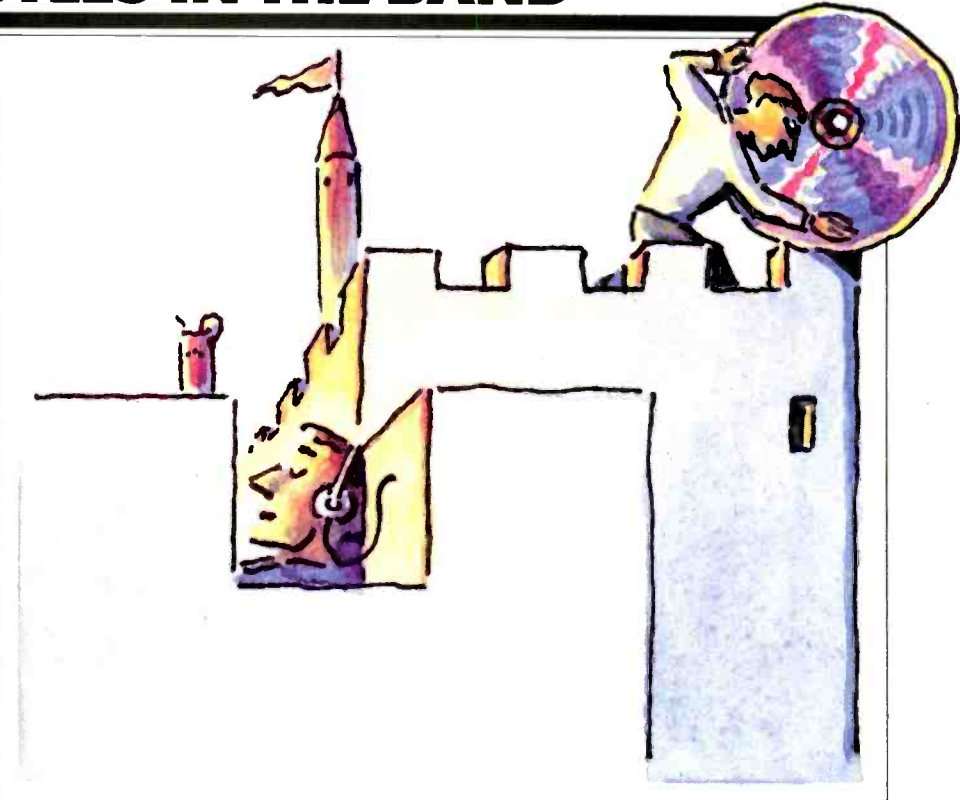
BUILDING CASTLES IN THE BAND

Ever notice how a castle is built? There's usually a lot of wall, then at the top are the square wave-shaped formations so you can pour boiling oil or drop rocks on annoying people outside your castle. That architecture is referred to as crenellated battlements; the lower part where you pour the oil through is called the crenel, and the upper part protecting you is the merlon. If you think about it, it's definitely a digital design.

What does all this have to do with audio? Frankly, not much. But let's try to find the connection, however slim. Last month we examined the nature of pulse code modulation (PCM) and concluded that it was a particularly slick kind of modulation, specifically well suited to audio digitization. The code that is an inherent part of PCM requires relatively little bandwidth to preserve the binary values of a waveform's amplitude at sample time.

And yet, lengthy deliberation might lead one to dark brooding. Why must the entire amplitude of the waveform be preserved when it is really only the *changes* from moment to moment which constitute musical information? Furthermore, when it comes to music, just how much will the amplitude change from moment to moment, especially when you're taking thousands of measurements each second? The idea dawns that perhaps only the *difference* from one sample to the next has to be stored to completely characterize the original waveform.

Differential pulse code modulation (DPCM) accomplishes exactly that. To reduce redundancy and thus the bandwidth required to store data, only the difference between adjacent pulse amplitude modulation (PAM) samples is recorded, forming a differential pulse amplitude modulation (DPAM) signal. On the decoding side, the present sample value is regenerated by using the past value plus the received difference value. To increase efficiency, the present value may be estimated by using a prediction filter: A tapped delay line can examine many past samples and arrive at a safe guess for the value of the present sample. Such a device is called a transversal filter (the same design used in oversampling CD players) and is shown in Fig. 1.



The upshot is that when the difference from one DPAM value to the next is relatively small, a small number of quantizing steps are required to encode the DPCM signal. The bandwidth of the DPCM is thus much smaller than that of the equivalent PCM signal. Of course, the success of the technique hinges on the supposition that the differences from sample to sample will be small. To ensure this, a higher sampling rate is used, because the faster you sample, the smaller the difference from sample to sample.

Given a fast enough sampling rate, DPCM successfully reduces the number of quantizing steps needed to encode an audio waveform. And given a good thing, the natural urge is to take it all the way. Delta modulation (DM) is the limiting case of DPCM, in which the quantized DPAM signal is binary. In other words, only one bit is used to quantize the waveform. That leads to interesting consequences; for example, A/D and D/A conversion are not needed, since the data word is only one bit long.

A complete delta-modulation system is shown in Fig. 2. The encoder compares its past approximation to the

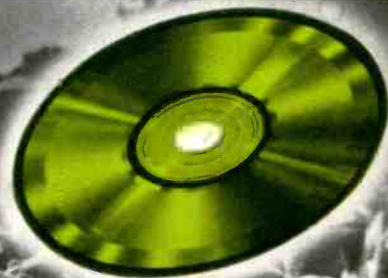
present input DPAM value and generates a one-bit correcting word at sample time; in other words, the system determines if its error is positive or negative, and correspondingly moves its next value up or down one increment, always closer to the present value. That one bit is all that is needed to record the signal; it simply documents whether the signal amplitude went up or down during the last sample interval. As shown in Fig. 3, that one bit tracks the signal, riding along the top of the analog waveform. At the decoder, the DM data is converted back into an analog signal. The only element needed is an integrator to smooth the correction data.

As you might expect, delta modulation is a fairly inexpensive way to encode data. In addition, it offers excellent error-correction performance. In a linear PCM system, an incorrect most-significant bit (MSB) would result in a massive glitch. However, in delta modulation there is no MSB, so the effect of a bad bit is limited to the amplitude difference of one increment.

Only one flaw limits widespread application of delta modulation. Take a close look at Fig 3. See the part of the

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THIS MONTH'S BIG EVENTS ON CBS COMPACT DISCS.



NOVEMBER

with **Marion Hofmann Calvela**

Wagner
Die Walküre, Act I

New York Philharmonic
Zubin Mehta

6

LOVERBOY
Love... Every Minute Of It

8

12

STEVIE RAY VAUGHAN
A WHOLE LOTTA LOVE

SOUL TO SOUL

RICHARD CLAYDERMAN
From Paris With Love

15

Puccini Heroines

TURANDOT
TOSCA
BOHÈME

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Delta modulation has one fatal flaw, slope overload. There are ways to rescue the technique, but a price must be paid in increased hardware complexity.

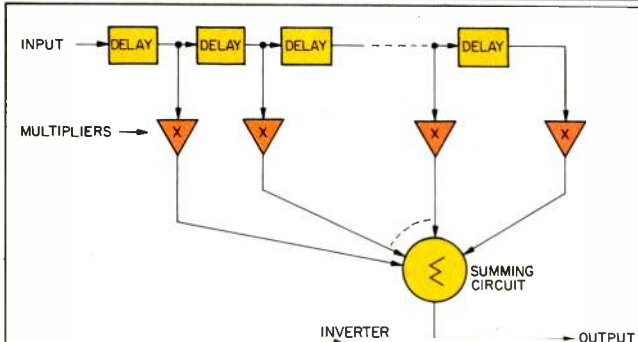


Fig. 1—
Transversal filter.

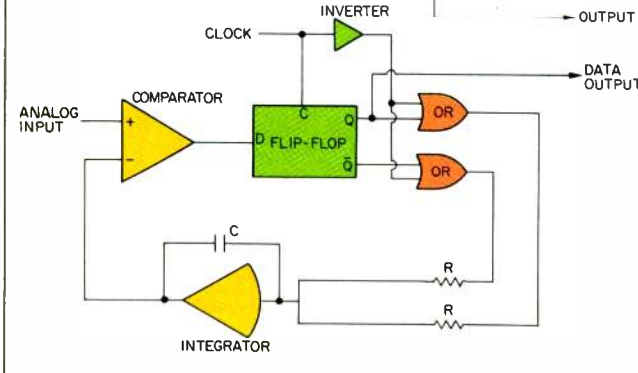


Fig. 2—
Delta-modulation
encoder (A)
and decoder (B).

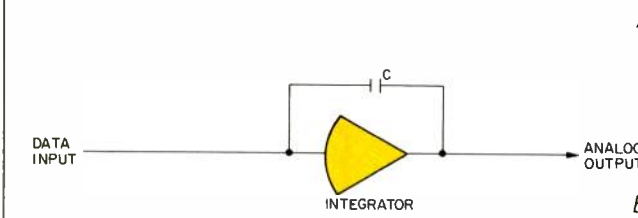


Fig. 3—Delta-modulation tracking;
note slope overload from first to
fifth step.

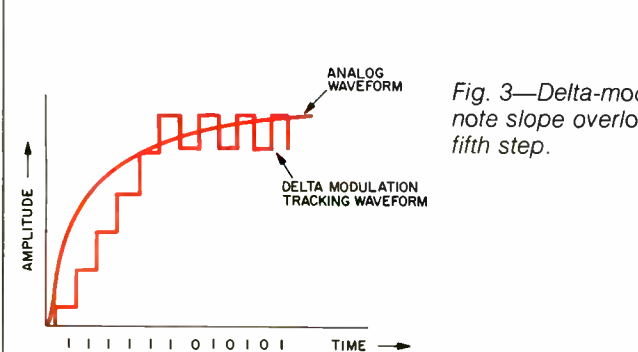


Fig. 4—Adaptive delta-modulation
tracking; note variable step sizes,
used to avoid slope overload.

curve where the waveform takes off while the delta modulation signal lags behind? That is the fatal flaw—slope overload. Delta modulation is successful only when it can track the input waveform. An audio signal is filled with fast-moving transients; thus only a very fast sampling rate would permit the DM data to keep up, given a quantizing step size small enough to yield useful resolution. Linear PCM balances word length and sampling rate for a successful result; DM attempts to do it all with sampling rate alone.

A single sign-changing bit simply cannot track a complex waveform; slew-rate limitations yield transient distortion. Therefore, DM's applications are limited. For example, one DM system used for speech transmission must sample at 17 MHz to maintain even lo-fi quality. From an informational standpoint, we can see that things are indeed out of whack; specifically, the bandwidth of the system is being wasted in an audio application. The Nyquist Theorem tells us that a sampling frequency of 17 MHz would permit encoding of extremely high frequencies, but even the most golden of ears has little use for a frequency response of 0 Hz to 8.5 MHz . . .

However, DM is too nifty to discard. For instance, because of the high sampling rate, no brick-wall filters are required; a gentle filter with low phase shift can roll off the input well before the half-sampling frequency. To rescue the technique, designers have developed various schemes for solving the basic limitation of slope overload. The goal is to form a system with a reasonable sampling rate capable of handling audio waveforms.

Adaptive delta modulation (ADM) tackles the problem head-on. The quantization step size is made variable (Fig. 4): Large steps are used for fast-changing waveforms, so the system can keep on track, while small steps are used for slowly changing waveforms, to maintain resolution. Various algorithms may be used to select proper step size. In general, alternating ones and zeroes at the encoder's output indicate proper tracking, so small quantizing increments are selected. When continuous ones or zeroes are present, the waveform is clearly on the move, and larger steps are selected.

THE PERFECT BALANCE BETWEEN ARTISTIC INTERPRETATION AND TECHNICAL ACCURACY

The gymnast, poised on the balance beam, knows that in order to achieve a perfect score, there has to be total attention given to detail in artistic interpretation as well as the mastering of technical accuracy.

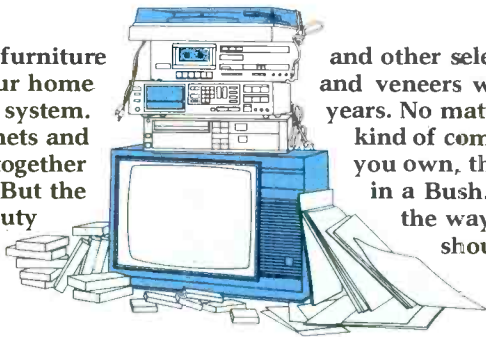
While all gymnasts aspire to perform the most intricate of routines, not all have the ability. The same is true of compact disc players. The digital sections of most CD players are similar to compulsory exercises: They're all basically the same and all basically adequate. The analog sections are where the quality of the performance and the differences between competitors are determined. The analog section of the Harman Kardon HD500 compact disc player has been designed with attention to subtle details, using only the most sophisticated circuitry and highest quality discrete components. The result is breathtaking dynamic range, startling realism and a world class performance every time.

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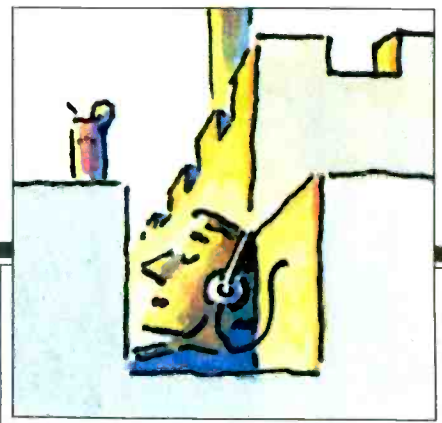


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With this approach, a price is paid in increased hardware complexity. The decoder must constantly figure out what step size the encoder has selected. The two must be synchronized, using the data itself as the common denominator. Also, it is difficult to change step size quickly enough to keep track of audio transients. Moreover, certain conditions such as simultaneous high frequencies and high amplitudes can produce modulation noise, in which the noise floor becomes a function of the signal itself. This artifact is difficult to remedy because a fixed level of dither is ineffective with varying increment sizes.

Another approach is companded predictive delta modulation (CPDM). Rather than vary step size, the signal's amplitude itself is varied to fit a fixed step size. A compander is used to control the amplitude of the audio signal (lowering its slew rate) so that the fixed-step-size delta modulator will not be overloaded. In some designs, to ensure tracking accuracy, a special transient detector is used to provide extreme compression of fast-changing audio transients.

With a little help, either from adapting step sizes or from companding, delta modulation can be used for audio digitization applications. In one current incarnation, a CPDM system samples at 640 kHz, a much more reasonable frequency than the 17 MHz discussed earlier, and yields full fidelity.

When it's all boiled down, the principal specification, data rate, is surprisingly similar for audio PCM and DM systems. A 16-bit, fixed, linear PCM system sampling at 44 kHz requires a data rate of 704 kilobits/S per channel, while CDPM produces 640 kilobits/S—about the same amount of information either way, despite their radically different methods.

Castle walls? Crenels and merlons? It's obvious—PCM is like the entire height of the wall itself, while delta modulation is just the crenellations themselves. I told you the connection was pretty slim. **A**

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LOUDSPEAKERS FOR
OVER A DECADE

Cogging

Q. What is meant by "cogging," with reference to turntables?—Robert C. Watson, Dover, Del.

A. The armatures in some electric motors rotate in a series of stepped movements rather than one smooth, continuous motion. This resembles the jerky transitions created as some gear cogs mesh, disengage and mesh again, and is therefore referred to as "cogging."

If such a motor is used in a turntable or tape machine, it can cause jerky motion. Most or all of this jerkiness will be filtered out by the flywheel action of a turntable's platter or a tape recorder's flywheel. Cogging is most noticeable while a motor is coming up to its full speed.

Broadcast Dynamics

Q. It sounds as though many radio stations are using dbx encoding in their broadcasts. The dynamic range is low. Would a dbx decoder expand the range to what it should be?—Steve Herrick, Swartz Creek, Mich.

A. I understand where you have gotten the feeling that radio stations are using dbx encoding—soft passages are elevated and you hear cymbals being "sucked down" every time a bass note is heard. What is really happening is that the broadcasters are employing very heavy limiting, which does indeed remove dynamic range. (They do it so they can cover a greater area without background noise being audible.)

A range expander might help, but only in those instances where the limiting is not so complete as to remove all traces of dynamics. These expanders require at least some variations in audio level on which to build. Thus, if dynamics are lost completely, the expander will be rendered ineffective.

Broken Anti-Skating Mechanism

Q. The anti-skating mechanism on my turntable is broken, and the "fix" would be to replace the complete tone-arm assembly at a cost of \$63. Simply put, how important is the anti-skating compensation?—L. C. Davis, Jr., Corona, N.Y.

A. The need for anti-skating on a given turntable system depends on the cartridge and its compliance, as well

as the amount of drift that is present without compensation.

I suggest you place the blank side of an Eva-Tone Soundsheet (one of those thin sheet-plastic discs sometimes bound into magazines) on your turntable. With the table rotating, place the tonearm on this disc and observe the amount of drift. If the drift is rapid, you may well need anti-skating compensation. If the drift is very slow, you may be able to get away without such compensation—especially if the stylus is a medium- to low-compliance type. (*Editor's Note: An Eva-Tone Soundsheet was bound into our August 1984 issue.*)

Multi-Speaker Impedance Formula

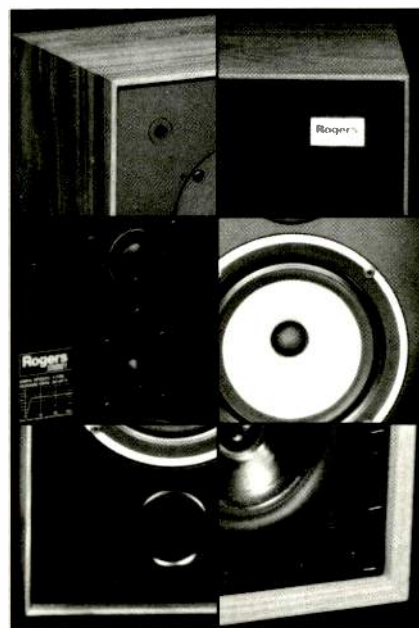
Q. What is the mathematical formula for calculating the impedance of a number of loudspeakers connected together? What information is needed other than the impedance rating of the individual loudspeakers?—Jim Hajeski, Bricktown, N.J.

A. To determine the combined impedance "seen" by a power amplifier, you need to know the nominal impedance of the various loudspeaker systems with which you are concerned. In the case of woofers whose minimum impedance differs markedly from their nominal impedance, you should know the minimum impedance and perhaps use this value rather than the nominal impedance. Even here, if the minimum impedance occurs at a frequency above 100 or 200 Hz, then you can neglect it and simply use the nominal impedance of the woofer.

The total impedance of speakers wired in series is the sum of their combined impedances. For example, the impedance of an 8-ohm and a 4-ohm speaker in series would be 12 ohms.

The total impedance of speakers wired in parallel is found by adding the reciprocals of their impedances (to make a reciprocal, divide 1 by the value of the impedance), then inverting the result. Thus, two 8-ohm speakers in parallel would have a total impedance of 4 ohms ($\frac{1}{8}$ plus $\frac{1}{8}$ equals $\frac{1}{4}$; inverted, that is 4).

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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To prevent a computer from interfering with FM and TV reception, move antennas away from the computer—far away.

Computers and FM Interference

Q. Help! My son's IBM-PC is hashing up my FM listening, sometimes with a continuous varying level (more like white noise), occasionally with crackles and pops and some heterodyning. The interference is worst when I'm listening to distant stations.

I have tried a power-line filter. I have tried an isolation transformer. I have tried a high-pass interference filter (in the antenna input). None of these devices helped reduce the interference.

My FM antenna is the twin-lead type supplied with my tuner. I have it mounted on a beam which I can manually rotate, and the beam is mounted on the ceiling. Without the computer being on, the antenna provides fine reception. If you can solve my problem, I am your friend for life!—L. J. D'Antonio, Londonderry, N.H.

A. Your problem cannot be solved by any of the devices you have tried. I suppose that, if the power cord is neatly wound to as short a length as practi-

cal, and one or another of your power-line filters is placed at the computer, some improvement is possible.

The problem is that computers generate high-frequency digital pulses which, being square rather than sine waves, are rich in harmonics throughout the FM and TV broadcast bands. The FCC recognizes this problem, and has set radiation limits which computers must adhere to. Manufacturers do shield the innards of their computers, but even so, they are certainly not completely "clean."

The cables which connect the computer to such peripheral equipment as disk drives, printers and so on can also act as transmitting antennas whose resonant frequencies may be within the FM band. Shielded cables are available, at least for some applications, though they are very hard to find. If you can't find them, it might be possible to wrap copper screen around the cables and ground it, as a shield.

The interference enters your tuner

via its antenna input terminals, just as the desired stations do. Because the interfering signal is composed of components which have the same frequencies as your favorite stations, the tuner, antenna and high-pass filter do not know the difference between what you want to hear and what you don't. If you filter out the interference, you filter out your favorite stations as well.

Now for the cure (though it may not make you my friend for life): *Get that antenna away from the computer, the farther away the better.* Put an outdoor unit on the roof where it belongs. Use coaxial cable to connect the antenna to the tuner. If you are not permitted to install an outdoor antenna, put your antenna in the attic. Use coaxial cable and appropriate balun transformers to connect to the tuner. If you do not have an attic, place the antenna in the room farthest from the computer and its radiating cables. Again, use coaxial cable to feed the tuner.

What I have told you comes from



What other audio tapes fail to hear.

Insulating a speaker's enclosure is necessary to avoid reflections between the enclosure walls and cone drivers.

experience. My Apple (which I am using to write this) generates a lot of "hash," but with a good outdoor antenna, my FM radio reception is totally unaffected by it.

Resistors in Loudspeakers

Q. I recently opened my two-way loudspeaker enclosures and was surprised to see perhaps a half-dozen resistors. What role do these resistors play in sound reproduction?—Dan Welton, Shelton, Conn.

A. The resistors you have noticed are probably in the crossover network. They may be used to attenuate the signal feeding the tweeter, or they may be there as a part of a treble-boost network. In this regard, some tweeters are not absolutely flat; it is therefore necessary to trim the high-frequency response with a resistance/capacitance network.

Along these same lines, I have seen some circuits where resistors and capacitors are used to boost the extreme

top end of the audio spectrum in order to compensate for high-frequency losses due to room acoustics or to accommodate personal taste.

Insulation in Speaker Systems

Q. I am building a speaker cabinet. Why is foam needed?—Richard Hamilton, Mt. Vernon, N.Y.

A. There is no hard and fast rule about using foam or any other insulation material inside a loudspeaker enclosure. Generally speaking, insulation is installed in order to prevent reflections between the walls of the enclosure and the speaker cones. Sound bouncing off the walls and hitting the cone will force the cone to vibrate. This cone vibration will be heard along with the signal, and will color the sound that you hear.


If you have ever sung in the shower, you know how your voice is reinforced because of the hard, reflective surfaces of the walls. The voice tends to be colored in a pleasant way. It makes

the poorest of voices seem better than they really are.

In high-fidelity applications, however, we do not want any added sound. (If we are reproducing a poor voice, then so be it; the sound system is not there to make it better.) So the reflections within a loudspeaker enclosure must be suppressed. This is done by producing "soft" walls, lining them with sound-absorbing materials which do not retransmit the sound to the air within the box.

Phase-Inverting Preamplifiers

Q. Some preamps are phase-inverting. To compensate, does one reverse the leads of both loudspeaker systems or of just one?—Eugene L. Bershad, Freehold, N.J.

A. When using phase-inverting preamplifiers, there is no need to compensate by changing the phase of the loudspeaker systems from what would be used with a preamplifier whose input/output signals are in phase. 

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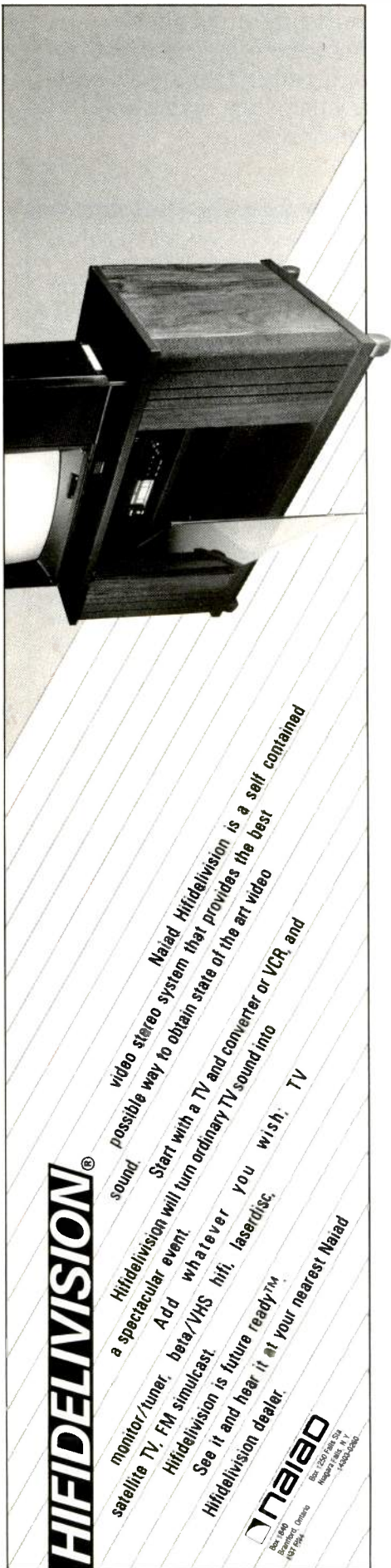
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TAPE GUIDE

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Meter Discrepancy

Q. When I record at +6 dB for peaks (which is what I'm supposed to do, according to the manual for my cassette deck), on playback the level is considerably higher, easily reaching +8 dB or more. Why is this? It doesn't matter at what level I record; the deck will always boost the levels in playback. When recording, should I concentrate on the record or the playback levels?—Richard C. Reyes, Tacoma, Wash.

A. Some tapes have greater sensitivity—the amount of signal output for a given signal input—than do others. You may be using such a tape, which would account for the elevated meter reading in playback. That is, the tape you are using may have greater sensitivity than the tape used by the deck manufacturer to calibrate the meter's playback reading. Or it could be that the meter is miscalibrated. Concentrate on the record levels unless the high playback levels correspond to noticeable distortion; if that's the case, adjust the record levels accordingly, reducing them, say, 2 or 3 dB.

Digital Readiness

Q. I have heard that there are cassette decks and tapes which claim they can faithfully record CDs. Can they faithfully reproduce the high energy levels of Compact Discs without overload? That is, can they achieve as great a signal-to-noise ratio and frequency response?—William Scaramazza, Swedesboro, N.J.

A. On an absolute basis, without regard to audio signal, there is no analog cassette deck and tape combination today which can match the S/N of a Compact Disc and player. CDs achieve over 100 dB S/N on a weighted basis, while cassette decks achieve weighted S/N in the mid-70s with Dolby C NR and in the mid-80s with dbx NR.

However, the dynamic range of the original audio material seldom reaches or exceeds about 70 dB; usually it is no more than 65 dB and often is a good deal less. Hence, a quality cassette system can ordinarily encompass all that is on a musical CD with some margin of safety to spare. If you play the program material at extremely loud levels, during quiet passages you may hear some faint noise with Dolby C NR and perhaps even with dbx NR, but in

most listening situations noise is an insignificant factor with modern noise-reduction systems.

Compact Discs have frequency response extending to 20 kHz and dropping very sharply beyond that. High-quality cassette systems achieve response to 20 kHz and sometimes somewhat higher, perhaps to as much as 24 kHz or so, thanks to such developments as metal tape, Dolby C NR (with its anti-saturation treble-boost curve), and Dolby HX Pro (which reduces bias when there is substantial high-frequency program content that acts in the same manner as bias). Such response is more likely with separate record and playback heads.

Print-Through

Q. I record FM broadcasts onto cassettes. When I stop recording, the signal on the tape doesn't stop immediately. It lingers for a second or so, as if someone turned down the volume. This is annoying when I want a blank space between songs.—John Turner, Greensboro, N.C.

A. The faint sound you hear after stopping your deck is probably due to print-through, a transfer of the signal on one tape layer to the adjacent layer caused by the magnetic flux emanating from the tape. A lower recording level helps reduce print-through, but of course at the cost of a lower signal-to-noise ratio; if you are using Dolby C NR or dbx NR, you may well be able to afford such a reduction in S/N. Also of help is the use of a tape that is not as thin as the type you may be using—for example, C-60 instead of C-90. (Are you by any chance using C-120, which is usually advised against?) You might also be able to reduce the print-through by putting the cassette through fast-wind and rewind before playing it; however, the print-through will likely return with storage.

Perhaps you can erase the offending sound by backing up the tape and putting it through momentary erasure; that is, recording the desired blank space with no signal input. Consider-

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.

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able care will be needed to erase only the section you want erased. It would be wise to practice with a cassette that you don't care to preserve.

Disturbing Playback Readings

Q. When I use a TDK SA tape, the meter is in the red during playback even though it wasn't when recording. With a Maxell UD tape, the playback reading is the same as in recording. And with a BASF CR11, the playback reading is lower than the recording one. Does this mean that I should use only the Maxell tape? Or could I also use the TDK tape, provided that I use a lower recording level so as not to be in the red during playback? If so, won't I then have a reduced S/N ratio? In the case of the BASF tape, should I raise the recording level, thereby improving the S/N ratio? Or should I altogether disregard the playback readings?

This leads to a related question: Just what does a record-level meter indicate?—Marc Claessens, Toronto, Ont., Canada

A. The varying playback readings of the three tapes you mention reflect their different sensitivities. Sensitivity is the level of tape output for a given signal input to the tape. It appears that

your deck's meters have been calibrated by its maker on the basis of the Maxell UD tape or one very much like it. There is a pretty good chance—although not a guarantee—that you will get the best Dolby tracking with this tape or a similar one. Dolby tracking signifies that internally the input and output levels are matched. Thus the variable treble boost in recording will be exactly complemented by the variable treble cut in playback, and accurate high-frequency response will be achieved. However, Dolby tracking can vary about ± 2 dB without grave consequences. Therefore it may be quite all right to use tapes other than Maxell, provided that playback readings do not differ greatly.

Your choice of recording level should not be guided by playback readings. For each kind of tape, you should experimentally determine maximum recording level; that is, ascertain how high you can go before distortion and/or treble loss become evident, and then back down 2 or 3 dB for a safety margin.

The record-level meter indicates how much signal is being applied to the tape. For a peak-reading meter, 0 dB record level typically corre-

sponds to a signal level that, at 315 Hz, results in a recorded level of 250 nanowebers per meter on the tape. Sometimes 0 dB corresponds to 200 nWb/m in the case of a peak-reading meter. In the case of average-reading meters—true or nearly true VU ones—0 VU tends to denote a level approximately 8 dB or so lower, providing a safety margin to cover the meter's tendency to lag behind transients; here 0 VU would denote a recorded level of about 100 nWb/m.

Reluctant Cassette

Q. I have a cassette of Itzhak Perlman performing the Brahms Violin Concerto. The first time I played it, the tape was excellent in all respects. However, the next time it presented problems. The sound was of very wavering pitch, and I could not rewind the tape or make it run in fast-forward. I would appreciate your advice.—Julius L. Levin, Glencoe, Ill.

A. It seems that you have a defective cassette, which should be returned to the dealer for exchange or refund. Before doing so, you might try rapping the cassette smartly against a table top or similar surface, but not so hard as to damage either one; perhaps

my Lucky.”



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you could use a few intervening layers of cloth or newspaper. It may be that the tape has "static cling" and that rapping the cassette will loosen the layers of tape.

Y-Connectors for Duplication

Q. I was recently asked to make several copies of a sales-training cassette. I dubbed it onto open reel, and then connected the output of the open-reel deck to three cassette decks via Y-connectors. Since the recordings are of voice, frequency response is not critical. Does Y-connecting degrade the signal? How many recording decks can one Y-connect? What is used in a commercial duplicating system to connect the slave recording decks to the master playing deck?—Paul Lee Hargitt, Jr., Indianapolis, Ind.

A. When you connect the inputs of two or more tape decks directly to the output of another deck using Y-connectors, the input impedances of the copying decks load each other and the source deck. The result may be distortion and/or loss of treble response, depending on the various output and input impedances involved. The extent to which this occurs depends on the particular decks in question, and its

audibility depends on the program material. Degradation of the copies' signal is probably a good deal less serious for voice than for music.

If the results you've gotten are acceptable, stay with your procedure. I don't know how many more "slaves" you can add before the results become objectionable; you will have to determine this by adding one slave at a time. Some slaves may interfere more with the system than others will.

In professional duplication, the copying decks are fed through buffer electronics that isolate the inputs of the slaves from each other and prevent the slaves from heavily loading the master playing deck.

Din on DIN

One of the items in the June 1985 "Tape Guide" dealt with the meaning of 0 VU on record level (and playback level) meters. W. J. Newell of Richardson, Tex., presents interesting and useful information in this context:

"The reference Dolby level is based on the ANSI standards, while DIN levels are based on (surprise!) DIN standards. They do not have the same basis. DIN specifies that magnetic fluxes on tapes be measured directly with a

magnetometer, while ANSI specifies that flux be determined by playing the tape with a 'high-efficiency' head. The practical effect of this is that the same piece of tape will play about 1 dB higher on a DIN-calibrated meter than it will on an ANSI-calibrated meter, assuming the 0-dB reference is the same nominal flux level for both. Looking at it another way, given a meter with its 0-dB reference at 200 nWb/m ANSI (Dolby 0 dB), a Dolby reference tape should read 0 dB while a DIN 0-dB tape (250 nWb/m to the DIN standards) will read about +1 dB, not +2 dB as most of the cassette-deck testers in the world continue to state.

"I think that the older 160-nWb/m standard for 0 dB refers to the DIN standard. Thus, a Dolby-level tape should read about +3 dB on a meter with its zero set to this level.

"Are these differences significant? Yes. Many errors may occur in the record/playback chain for Dolby tapes, and there is no need for any more. Even if this were the only error, it might be audible on Dolby B to a critical listener, especially in a comparison situation; for Dolby C it certainly would be heard. If Dolby types are mixed, the effects can even be more bizarre."

Mitch Miller:

A Hidden Classic

PART I

YEAH, THAT'S RIGHT, MITCH MILLER. If you thought Mitch was just the cornball king of sing-along, this interview ought to enlighten you, as it did me. Plainly stated, Mitch Miller is one of the most important figures in the history of the record industry. He has really done it all. Recognized as one of the country's top classical oboists, he played for Stokowski and other important maestros. He also made some of the earliest chamber jazz recordings with Alec Wilder.

As musical director at Mercury Records in the late '40s, he nurtured the careers of middle-of-the-road singers such as Vic Damone, Patti Page and Frankie Laine, and developed a reputation as a hit-maker with Laine's "Mule Train." He played on and supervised the famous "Charlie Parker with Strings" sessions at Mercury; in addition, he was a technical innovator in the studio, and created the first overdubbing.

When Miller switched to Columbia in 1950, he really took off on a hit-making streak. In two years he turned Columbia from the fourth-place company into the first, and throughout the '50s he developed new singers like Tony Bennett, Rosemary Clooney, and Johnny Mathis. It is unlikely that anyone will ever produce as many hit records as did Mitch Miller in his career. Even though he will always be known for his mainstream hits, he was hip enough to sign Mahalia Jackson to her first major-company contract, recognize the genius of Hank Williams, and work with top jazz musicians like Erroll Garner. In the late '50s, Miller took a vocal, controversial (and, he claims, misunderstood) stand against the rise of rock 'n' roll. When he criticized disc jockeys in 1958 for "abandoning adults" and favoring rock, his own records were subsequently banned from airplay.

Despite his track record as a hit A&R [Artists & Repertoire] man and producer of other people's records, Miller is surely best known for his own hits, like "The Yellow Rose of Texas," and the *Sing Along* records and television show. Still spry, energetic and outspoken at age 74, he continues to be involved in music as a guest conductor of orchestras around the country. At an October 2 luncheon sponsored by the National Academy of Recording Arts and Sciences, Miller was honored with a Governor's Award from the organization's New York chapter.

T.F.

Why don't we begin by discussing your career as an oboist. You made your professional debut at 15, and went on to become one of the finest classical oboists in the country. How did you approach your career when that was your main endeavor?

I never worked with a great oboe teacher. I had some lessons with Marcel Tabuteau, who was a fantastic oboist in the Philadelphia Orchestra. Whenever he fixed a reed, he turned away so I couldn't see what he was doing. So I said that's enough of that. I just went off on my own. I didn't want to model myself after the oboe players that I heard. There were qualities that I liked in many of them, but no one was the guy I tried to emulate.

This was in Rochester, where you grew up?

Yes. Also on records and on radio, and the various orchestras that would come through. I tried to get a sort of vocal sound combined with the seamless playing and phrasing of Pablo Casals. I had his Bach suites, and I would listen to them all the time. I can recommend that any young musician who wants to get the best lessons in phrasing and musicianship listen to these Casals suites, and any Casals recordings. Don't listen to the performances per se, but try to have a microscopic ear and listen to what he does with every note. Pretty soon it becomes a revelation.

How did you happen to choose oboe, or was it chosen for you?

The Rochester public schools had the first public-school music system in America. George Eastman gave them the instruments, provided they would give the instruction. My father bought a grand piano, a square piano, when I was six years of age. He paid \$15 for it,





Leopold Stokowski; Miller played oboe on the maestro's historic 1947 recording of "Swan of Tuonela," and regards him, along with Fritz Reiner, as the conductor he has most enjoyed playing for.

for the moving of it. It was a giant Chickering, took up half the front room. My two older sisters and myself were the only ones old enough to take lessons. He paid a buck a week each on a \$42-a-week salary to give us lessons. I was going along pretty well, except I didn't like the teacher. She smelled like she was eating paste. I was playing Bach and Mozart, but I sort of quit. Then when I was 11, I heard about the instruments in the public schools. So I applied for one. All my friends had shiny brass instruments, and all they had left was the oboe [laughter]. So I said, "I'll take it." I didn't even know you needed a reed for it. Then I found out. As fate would have it, my father was a toolmaker and wrought-iron worker, so he made all the tools for me to make the reeds. You could buy a reed, but that didn't guarantee anything. Everyone has to make a reed that is specially suited for them.

When you were playing classical music, who were some of your favorite orchestras and conductors to work with?

I played with many conductors, and also fine chamber music with the Budapest, Paganini and Lener quartets. I started with Albert Coates, Eugene Goossens, Fritz Reiner, Molinari, Stokowski, Sir Thomas Beecham, Alexander Smallens, Leon Barzin.

And your favorite?

My favorite—I would have to say there's two, for different reasons. Fritz Reiner and Stokowski. Fritz Reiner, one, because he liked me [laughter]. I didn't realize then that he was a very tough cookie. I found out later that if Fritz Reiner liked your playing at first, you were in forever. When I met him years later, when he was conducting at CBS, he remembered my name and everything. And if he didn't like your playing, even though you were a good musician, you had a tough row to hoe with him.

Where did you play with him?

He was in Rochester. He came from Cincinnati. Eugene Goossens went to Cincinnati and Reiner came to Roches-

ter. Then, of course, the most magical experience I've ever had with a conductor was with Stokowski. I had never met him, and I got a call on a cold Monday morning in 1947. This voice comes over the phone and [with an accent] says, "Michel Millair?" I thought it was one of my friends putting me on. He says, "This is Leopold Stokowski," and I let go with a scatological remark [laughter]. I said, "Seventy-three in the morning, what are you doing to me?" You know? Without missing a beat he said, "This is Leopold Stokowski and I have been listening to you on the CBS Symphony, and would like for you to record for me." He had a whole bunch of mixed-up accents. He was British, I guess, originally. The "Swan of Tuonela" of Sibelius. It's a big English horn solo piece. This was going to be the following Wednesday. So I said, "Fine, I'll be there."

I went to the Manhattan Center on 34th Street, and in walks the cream of New York. I'm talking the cream of the New York Philharmonic. The cream of the NBC Symphony, all the old concertmasters. On the first stand of cello were Leonard Rose and Frank Miller. The first stand of the violas was Carlton Cooley and Bill Linzer. The trumpet section was Harry Glantz, Benny Baker, and Bill Vacchiano. It was amazing. There will never be an orchestra put together like that again. The setup—mind you, this is long before tape; we were doing it on acetate then. The first piece he did was "Swan of Tuonela." He stayed away until he was ready to start. Then he comes up and says, "Gentlemen, 'Swan of Tuonela.'" He started to conduct, and within two minutes it was like the Philadelphia Orchestra at its best. We just went through the piece twice. I never heard a playback. He didn't allow us in to hear the playback, but he went in and listened. In those two or three days we recorded the "Swan," some Albéniz, the New World Symphony—I played the English horn solo on that—and the "Escapes" of Ibert. As it turned out, these are some of the historic recordings of all time. The "Swan" got tremendous reviews. Even when you listen to it now, with all the technique, and all the tape and all the tools we have, here you get perspective, you get the right sound. You may not get

Photographs: Frank Driggs Collection

KOSTELANETZ AND STOKOWSKI KNEW MORE *about sound and microphone technique than almost anyone else, and I was able to learn plenty from them.*

the super hi-fi qualities that you do on present-day records, but as a performance it's super, and as for balance it still holds up tremendously. This man had a kind of magic. I can't explain it. It was one of the most exciting experiences, when I look back. It was like meeting a strange, beautiful woman, and you knew all about her and she knew all about you. The phrasing came—I did what he wanted without him saying anything. The orchestra did the same. He also gave you parameters within which you were free; in fact, he encouraged it, to phrase freely within a certain frame. It was one of those experiences that you can never duplicate.

Didn't you turn down a job offer to become first oboist with the New York Philharmonic?

Well, they turned *me* down [laughter]. They asked me to join and I was playing with the CBS Symphony. The Philharmonic was then a 30-week season, and the manager, Van Prague, said they would like to have me as solo oboe. All I wanted then . . . See, the CBS Symphony was 52 weeks, no vacation, no nothing, but we made about \$10,000 or \$11,000 a year. This was in 1935, '36. And Labate was retiring from the Philharmonic. So I said, "Just equal my salary." They said no. There were only two people who got \$300 a week for the 30 weeks, and that was Harry Glantz and Bruno Jaenicke, a French horn player, a wonderful player, as was Harry Glantz. So they got Harold Gomberg from the Washington National Symphony then, and he's been with them for all these years. He only retired four or five years ago.

Do you regret it at all?

No, I don't regret anything that's happened. Many times I have missed jobs, and it turned out to be the best thing I could have done.

If you had gone to the New York Philharmonic, do you think you would have gone on to a pop recording career at Mercury and Columbia as an A&R man and producer?

That I don't know.

Tell me what the CBS Swing Club was all about.

That was a jazz program every Saturday night [on CBS radio]. They would have jazz musicians on and play all kinds of jazz.



Pablo Casals (above), an early model for Miller; André Kostelanetz (right), conductor of the CBS Symphony Orchestra, for whom Miller played for nearly two decades.

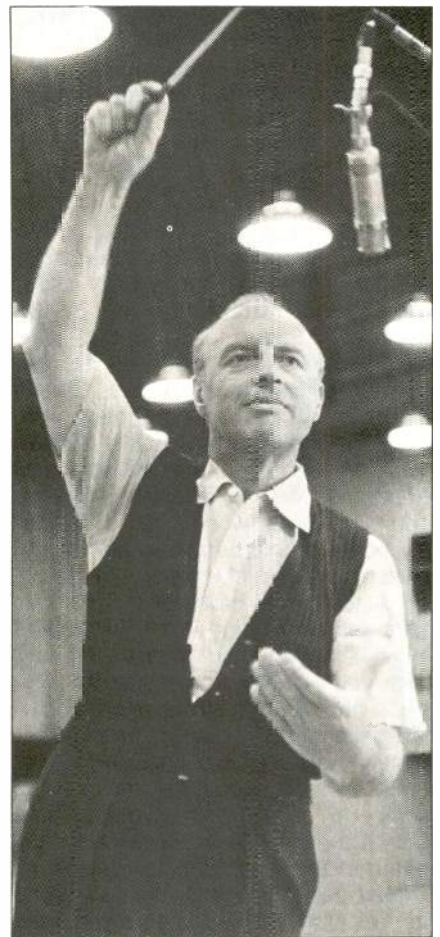
Wasn't this something you were involved with?

I played in some of them, yes. See, the staff musicians at CBS had to play everything. I played every Kostelanetz session from 1935 to 1953. André would call up and make sure I was free before booking the recording session. He did that with two or three other key players. He, along with Stokowski, knew more about sound and microphones than anyone. I learned plenty from them. He was very meticulous in the way he balanced. For a half-hour program, which is about 22 minutes of music when you take the commercials out and everything, we would spend about five or six hours rehearsing. Not for the playing, but for the balance. So I'd play Kosty, I'd play the jazz, we had to play everything. Then we'd play the Symphony, too. We would play Studio One. I played Orson Welles' "Mercury Theatre." I played in the orchestra that did the Martian invasion broadcast.

Really?

Yes. We thought it was a dull show [laughter].

He let you in on what was going to happen?





Patti Page: among many other songs, she collaborated with Miller on "Money, Marbles and Chalk," a recording that pioneered the technique of studio dubbing.

Of course we knew. It never occurred to us that the population, the people in America, were so subliminally upset about what was going on in the world—with Hitler and all that—that they were ready for anything. The reason the panic came on was, Charlie McCarthy was on at the same time—the "Chase & Sanborn Hour"—and we were what's called a sustaining program; the "Mercury Theatre" was non-commercial. So when Charlie McCarthy would go off, people would tend to switch to other channels. We had a simulated news broadcast about this strange ship landing in the swamps of New Jersey—including the "We will take you now for some standby music"—and we did 30 seconds of potted-palm music [laughter]. Then immediately there was a correspondent out there. Now, if people had stopped to think, no correspondent could have gotten there in 30 seconds. But they heard it, and it was done so realistically they began to get in their cars and run out of town. Policemen came up to

the studio. But we kept on with the broadcast.

Alec Wilder was a friend of yours whom you worked with. Did you know him in Rochester?

Yes, we were at the Eastman School together. He was a fantastically talented composer, as people are finding out now. His only problem was he would write only for those he liked. That included publishers as well as musicians. I got Alec to come to New York and play some of his songs, some of which are standards now. "While We're Young," "It's So Peaceful in the Country," "Who Can I Turn To?" I was playing with Yella Pessi, the harpsichordist; I was playing Bach concerts and Baroque music in 1937, '38. I said to Alec, "Why don't we use these instruments with the harpsichord, and make a kind of jazz chamber music?" So Alec immediately wrote for us. I got Harold Golzer on bassoon, Toots Mondello on clarinet, Eddie Powell on flute and piccolo, Jimmy Carroll played clarinet. We made these records. They had to be three minutes to three minutes and fifteen seconds long because that was the length of a shellac record. These records are the wellspring that all of the jazz chamber music came from, you know, whether it was Chico

Hamilton or Raymond Scott or the Modern Jazz Quartet. You listen to those and you'll hear it. It was the first use of the harpsichord in jazz. Since we were all classical musicians except Toots Mondello and Jimmy Carroll, Alec would write everything out. It's remarkable how it holds up.

Did you produce these sessions?

No. Morty Palitz produced them, I played. Morty Palitz was then head of Brunswick A&R. Brunswick Records was then owned by Republic Pictures. Soon after that Bill Paley bought it. Republic had the old Columbia label, too, long before there was a Columbia Broadcasting. Republic Pictures then sold it to Bill Paley, around '38. It was along then that we did the first octet records—the Alec Wilder chamber jazz. Then we did a whole series of them. There were two or three albums out. We did some later on for Vox.

Let's get into how you went from this high-powered classical career into a career in pop music. You didn't find that an unusual move to make?

No, because while we were at school, along with Alec Wilder and a couple of other chums, we were listening to Louis Armstrong, Duke Ellington, Jimmie Lunceford. When we were students we loved the jazz. I remember the first time I heard the Hot Club of France. These were some classically trained musicians who were playing great jazz. There was Ella Fitzgerald, and Crosby in his relaxed way. The bands came out and we'd buy these three-for-a-dollar Decca Blue Label records. So we were constantly listening to great jazz and popular music.

How did you begin to get a reputation as someone who could be an A&R man or producer of pop recordings?

Well, I played a lot of sessions as a sideman. And in those days, of course, there was no tape; many times, trying to get a balance, they'd say, "Take one to see how it sounds." I would say, "Why not take it for a recording?" Because we had been rehearsing all the time. I'd say, "Why won't you guys listen while we're rehearsing so when we're ready to go, the first take is it." You must remember that if the balance wasn't quite right, or if there was one little wrong note, you had to do the whole side over. It was an exercise in exhaustion as well as frustration. But at

I USED THE SAME APPROACH IN PRODUCING *classical and pop music*, because the same rules of taste, musicianship and balance apply to both.

the same time the excitement had to be right, and everybody had to do their jobs. That lent a dimension to the record that you don't feel now because everything is safe and cool. If you want to put a note in, you put it in. So I would complain.

As a session man?

As a session man. Because many times you'd have a big solo and it was wasted. You played five, six, seven times, then they'd say, "Now we'll go for a take." I said, "Where were you guys before?" I made a general pest of myself. But on the other hand they wanted me because I played pretty well. That didn't fall on deaf ears, I guess, because when John Hammond went over to Keynote, which later became Mercury, he asked me to come and produce some classical records, remembering when I had bitched as a studio musician. I came and I did. The first thing I did was the Fine Arts Quartet with "Death and the Maiden." He was so delighted with what I did with the musicians. When I'd ask for something they'd look at me quizzically as if to say, "What does this guy know?" I'd say, "Look, do it both ways just for a few bars and come in and listen, and if you don't like what I've told you to do then I'll just take what you're doing." So then they came in and listened and they looked at each other and said, "You can tell us anything you want." [Laughter.] And the record won a prize that year.

When was this?

In '48. So John, after that, said, "Come on and do some popular records." So I went in and did Frankie Laine, Vic Damone, and Patti Page.

Now that was a real switch, to go from classical or even some of the chamber jazz you were doing to Frankie Laine or Vic Damone.

Not really, Ted. I'm always surprised when people say it's a switch. I never compartmentalized it in my own mind. And the same rules apply. You know—taste, musicianship, balance, get the best out of the artist. Many times the artist doesn't know what his best char-

acteristics are, and you're there to remind them. You can't put in what isn't there, but you can remind them of what they have and they're not using.

But I think the thing that people wonder about is, was this music you really appreciated yourself?

Oh yes. Oh gosh, yes. See, there's an art to everything. A great mystery writer is a great writer. It's like saying that Richard Rodgers is not Beethoven or Bach. And that's right, but there's room for both. These great popular composers. . . . You know, the term classical just means something that lasts. So I saw no difference. I used the same approach as I did on classical records and classical playing. In fact, with some of the artists I would even tell them how to breathe because many of them did not study technique. If they wanted a long phrase I would show them what to do. I did this with Johnny

Mathis a lot. He was a very fast learner. In fact, I would stay with Mathis in the studio, and when I wanted that special choirboy quality I'd have a signal. I'd shake my hand in a certain way and stay right with him while he was recording, and he'd soar. You listen to those records and you can hear it.

You really helped make Frankie Laine, Vic Damone, and Patti Page stars.

You have to put down the fact that my father used to have a saying: You can't make bullets out of shit. These people just had it, and you'd uncover it. You can't put in what they don't have. So that was the joy and that was the fun. It's like discovering something. Then they would come in and hear themselves and they would know what they did and they would build on that. I would look for those qualities that made them unique. I would have an image in my mind. Nobody sees a re-



Johnny Mathis in 1957, whom Miller characterizes as "a very fast learner" when it came to vocal technique.



Mary Martin and son Larry Hagman during a 1950s studio session. Martin's recording (with Arthur Godfrey) of "Go to Sleep," the first disc Miller produced for Columbia, was banned from airplay.

cord. You can hear it for nothing on the air. What makes you buy a record? It must be something you want to play over and over again. And remember, in those days every record shop closed at 6:00. There were no all-night record shops. There was none of the super-market feeling. So you looked for qualities that would make the person buy it. To this day there are some great records that I would call performance records that you'll never tune out if they're on the radio, but you'll never buy them, either. We call those turntable hits.

So were you looking for a vocal quality, or personality?

Vocal quality combined with the song. Oh, the song has to have it. The song has to be the vehicle for the artist to show this quality. It also has to have the characteristics so that in four bars you know who the singer is. If you listen, you know immediately who Ma-tis is, who Tony Bennett is, who Vic Damone is, who Frankie Laine is.

Mitch, what did you hear in a song like

"Mule Train" so that you said, "This is going to make Frankie Laine a star"?

Well, remember Frankie Laine had a hit that made everybody think he was black. It was called "That's My Desire." Some lady in Cleveland wrote it, I think. He was working in an airplane plant, in a Lockheed plant out in California. He was on Mercury. When I came in, I chose "Mule Train" because the image I had of Frankie Laine was the Blue Collar Singer. The guy who works for a living, who understands what it means to sweat and to make a living, and who pounds his pillow with frustration. That's the image I had of Frankie and I would look for songs with qualities of that. There are lots of areas where that could apply, even to this day. [He sings:] "Up in the morning, out on the job, work like the devil for my pay . . . but the lucky old. . . ." And you know, the guy worships: "I Believe." "Jezebel"—anger at this woman who's got him all turned on, and he can't tie her down. Frustration. Lyrical content combined with the music.

Talking about lyrical content, your first disc at Columbia, Arthur Godfrey and Mary Martin's "Go to Sleep," was banned.

It was a joke that they should ban it.

"Go to Sleep" was brought to me by Fred Rayfield, who worked for Disney. It's about a salty couple in their '40s, a stream of consciousness, lying down and asking each other questions. When no one wants to answer the question, they say, "Oh go to sleep, go to sleep." I got Arthur Godfrey and Mary Martin, who was in *South Pacific*, and Arthur was at the top of his popularity. It's a marvelous record.

Why did they ban it?

Because they were in bed! But the funny part is that Larry Parks and his wife recorded the song, too, and they allowed that one.

And because Godfrey and Mary Martin were not married, that was taboo?

That was taboo. It was banned by my own company, CBS. How times have changed, huh?

I want to talk about the Charlie Parker and Strings session you did at Mercury. Tell me how that came about. I know you played oboe and English horn on it as well as producing it.

Norman Granz was releasing his "Jazz at the Philharmonics" through Mercury then. Norman, as you know, did wonders with recording live jazz concerts. He didn't go into the studio until much later. He wanted to do Charlie Parker with strings, that was his idea. But he knew nothing about strings. He said, "Mitch, will you produce it for me?" I said sure. We went to the Reeves studio and Bob Fine was the engineer. We had the best string players. We had Ray Brown on bass, Buddy Rich on drums, Stan Freeman on the piano, all the concertmasters in New York. Jimmy Carroll did the arrangement. I had never met Parker. We were going to do the whole album, three sessions in one day. And that was not unusual. The producers in my day, if we didn't make four sides in three hours we thought ourselves failures [laughter]. So it was 10:00 to 1:00, 2:00 to 5:00 and 7:00 to 10:00, all the same day. Get the whole album done. That was three sessions at \$38 or \$40 apiece. You know, that was a lot of money. We were rehearsing and Bob Fine was the engineer. About an hour and a half later, Parker walks in and looks around and hears this beautiful sound and he turns around and walks out. Everybody thought he was going to the bathroom. I was saying, "We're ready, Charlie."

IT WAS MY JOB TO THINK OF UNUSUAL THINGS. *But you never depend on a novelty record for basic sales. If it hits, it's whipped cream on the sundae.*

And Norman Granz comes around, "Where's Charlie?" He's running up and back, and I could just see, you know, all this money had to be paid to musicians and no Charlie Parker. We kept rehearsing, getting all the sides balanced for the background. Of course, all the arrangements were done. For about four or five hours, Norman was running all over town trying to find Parker. We tried to salvage the session and do "Claire de Lune" or something like that [laughter]. We gave up on it and thought it was over.

A few days later Norman calls me. He found Parker and Parker said he was so overwhelmed by that beautiful sound, he couldn't do it alone. So out of the clear sky Norman says, "Why don't you play with him?" I say, "Are you kidding, Norman? I don't improvise." He says, "But you can play something." All desperation. I said, "Look, if Jimmy Carroll will write a sketch for me I'll play around that sketch." Norman told Parker that I would play with him. He came in and we had the musicians there. And, Ted, we made *twelve sides in four hours*. See, the balance was set from before. Everything but one or two tunes was a first take and that was it. I don't think Charlie has ever played better on any record than he did on that. I didn't think we were making history. This record now is legendary.

Of course you knew about Parker and his reputation.

Oh, of course. I listened to him on great nights and on bad nights, too. He was taking another step further in jazz.

And that was all right with you?

Of course! As long as it's related to the subject. See, what drives me mad, especially today, is the pedal point [a bass ostinato] going for 2½ hours and the guy's noodling above it. Improvisation, to me, is to take the tune and do variations on it. And Parker was a master at that. No matter how far out, it had a relation to the tune.

You were known for creating rather unusual pairings, like Parker with strings, Burl Ives with a Dixieland

Frankie Laine and Jo Stafford. Laine's "Mule Train," which Miller chose for Laine to record, sold 1½ million copies for Mercury at a time when 250,000 was considered to be good.

band, Dinah Shore with bagpipes. Was this something that became a signature of yours?

That was my job, to think of unusual things that worked. Some didn't. The Dinah Shore with bagpipes, it's funny. You see, since there was no tape we had to get the bagpipes going outside the studio, then open the door while the needle went down to cut the record. And I didn't realize that bagpipes had to be outdoors. They drive a lot of people crazy.

What do you mean, they had to be outdoors?

Bagpipes sound better in the open air. Evidently on records—a lot of disc jockeys started to play it, then said they couldn't stand this song, and they broke the disc on the air [laughter]. Of course, Dinah soon left Columbia for RCA, I think. No risk, no success, Ted. The whole business of the great jazz players. . . . What makes them great is they risk at the moment of the performance. They try for something. It may not come off, but they're going to try.

There's another element to this, though. You did a number of novelty songs like "Stinky Cheese Polka" by Two Ton Baker, and let's not forget "I Saw Mommy Kissing Santa Claus." Wasn't this another aspect of these unusual pairings?

Not really. You must remember, I was

giver complete freedom. Goddard Lieberson and Jimmy Conkling both said, "Look, you're running it, you shoot for the moon. We're not going to second-guess you. Just stay within the budget." And what else could you ask for? So I did Rosemary Clooney and Marlene Dietrich with "Too Old to Cut the Mustard." It was a country song and I had the lyrics rewritten to suit them. The idea of these crazy pairings, or unusual pairings, was what I call "sweet surprise." People don't expect it and say, "Hey, what's that?" Then if they like it, they want it. It's as simple as that. It's a hook. You never depend on a novelty record for your basic sales. If a novelty record hits, it's whipped cream on the sundae. If you look at the body of my work, they are all quality songs regardless of what some may say. It's all there for the record; as Casey Stengel said, "You could look it up. . . ." Even Tony Bennett sang "In the Middle of an Island." See, I liked for these artists to be presented in an unpredictable way every once in a while, just to change the menu for them. I did gospel with Johnny Ray even before gospel was played on white stations. "I'm gonna walk, walk, walk and talk with my Lord," it didn't sell that big, but it stopped the show on the floor. It gave the people another aspect of what he was able to do.





Charlie Parker (center) at a 1949 recording session at Mercury, said to be his first with strings. With him were Buddy Rich on drums, Ray Brown on bass, Miller on oboe, and two unidentified violinists.

Frankie Laine's "This Old House" was gospel written by a country singer that became a number-one hit.

Well, I guess the word novelty itself explains the attraction; it's new.

Yes. And "Mule Train" was a novelty. Believe me, they were standing in line outside the stores on Broadway to buy that record. There must have been 20 covers within one week. I put Mercury into hock because they had to get them pressed, so we went to the MGM plant and they wouldn't press without the money in advance. So Mercury found the money and we were sending the record out with station wagons running up and back like crazy. It was fun! It sold about a million and a half then, which is like seven million today.

In those days a hit was, what, about 200,000?

There were some million-sellers, but yeah, about 200,000 or 250,000. Because there were only about one-fifth as many stereo sets as there are in the country today.

You covered a lot of country music. How did that come about?

You know, when I had a hot record, I'd want to get it to *Billboard* Thursday night so they'd review it in the next issue. I used to go over myself with an acetate. I got to know all the guys—Jerry Wexler, Paul Ackerman, and Bob Rolontz. As I got to know Jerry well, he said to me, "Mitch, why don't you listen to Hank Williams? He's a country singer and he writes great, great songs." I went and listened. The first one I heard was "Cold Cold Heart." I played it for Tony Bennett, Hank with his scratchy fiddle and all that. Tony said, "You want me to do that? Cowboy songs?" I said, "Tony, don't listen to the background, and don't listen to that interpretation, listen to the words. 'Free my doubtful mind, and melt my cold, cold heart.'" And he said, "Well, all right." Percy Faith made an arrangement, and whoa, a smash hit. With Tony. After that I got Fred and Wesley Rose and I said, "Look, I promise you that if you let me know in advance the Hank Williams songs, I will give you top artists if I decide to do them, and I will respect Hank's release in the country field, and not until his song is out and established will I come." They agreed. So out of that we got "Your Cheatin'

Heart," "Jambalaya," "Setting the Woods on Fire," "Hey, Good Lookin'," "Kaw-Liga," we did them all. That opened up the whole field of country coming to pop. Then I did the reverse. I had Marty Robbins come up North and we did "A White Sport Coat and a Pink Carnation." That was my session. In fact, what happened then—and the Roses told me this—was that suddenly a lot of these country writers started to write with pop stars in mind, and they lost their touch. This went on for about a year or two in the '50s. The Roses said these writers had to get back to the idea of writing the songs that they felt from the gut, and what crossed over would cross over. But if you start to think in terms of pop artists, they weren't writing their kinds of songs. But Jerry Wexler is the one who put me on to this. I did "Singin' the Blues" with Guy Mitchell. "Just Walking in the Rain" with Johnny Ray, dozens of them. They all became hits. Hank Williams would come over to thank me every once in a while. Hank Williams was really a very taciturn guy. Very few words.

When you went to Columbia from Mercury—I understand Goddard Lieberson tried to lure you away from Mercury a number of times.

SOMETHING HAPPENS IN THE STUDIO; *the adrenalin stops, there's less interaction. How can an artist work with just a background and a headset?*

Not really. The first time they lured me away I went [laughter]. The circumstances were that Manny Saks was the head of Columbia A&R and had gone over to RCA. The position was open, and Goddard Lieberson called me up. I had gone to school with him. He and Alec Wilder and I were in the same class. Then, for the munificent sum of \$25,000 a year. . . . I don't know what I was getting at Mercury, but it wasn't anything near that. And Mercury had promised me a piece of the business. When I got to Chicago and I asked Mercury, "How many hits do I have to have before you give me a piece?" they said, "Well, we'll give you 5%, but you'll have to pay for it." Well, that's all I had to hear. So I was ready to go. I still worked hard, because my ego wouldn't allow me not to, but I wasn't about to buy stock in that company. They worked hard but one thing they did scared the hell out of me. They went into the television business, and made a set that was damn good. They bought Raytheon chassis and had a cabinetmaker make the set. Instead of scratching for the payroll—which they did when I first arrived—here they had a couple million bucks in the bank. I said, "What are you going into the television business for?" You know, sets were in short supply and everybody was selling. But I said, "These giants like RCA and Philco, overnight they'll cut their price in half and they'll destroy you." And it happened six months later. So that also put a sour side on it. But I had a wonderful time working there. They gave me complete freedom. I'd stop in and they'd say, "Kid, you got any hits today?" [Laughter.]

You were at the height of your power as a producer and A&R man when recording tape was introduced. Did you pick up on it right away?

Oh yes. Mind you, it was only monaural, but you could use just part of a record, which was a great advantage in the sense that if the whole record was marvelous except for two edit points, you could do that part over. That was 1951, I would say, a year after I came

to Columbia. I used the same technique as before, because with monaural tape you could not remix; even with stereo tape there was no remixing. It wasn't until they had multiple tracks that you could remix.

The technique when tape first came in was that you could use a big chunk of something, and you could save some good performances. Say you had a perfect take, except the ending was no good. You could use the first part and make a new ending, splice on an ending. It was just a tool to save a good performance. It wasn't the tool that became a crutch. By that I mean you can now sit there coolly and say, "Well, if this note isn't right I can always do it on another track and insert it." To me that is. . . . Something happens in the studio, the adrenalin stops pumping. How can an artist work with a background, and the headset in his ear? To me music is interaction. And interaction means it has to happen at the same time.

John Hammond would agree with you, I think.

You can't define it, but you know when it isn't there. It's the extra adrenalin, the urgency, the interaction. Rosemary Clooney put it to me one time: The

rhythm track was made and then she put her voice on it. Then they added strings. The record came out and she said it sounded good enough, but "If I had known what the strings were doing, I would have phrased differently." It's the people, too. I was very lucky. I tried to hire the best guys. Percy Faith, there's no better arranger in the world than Percy was, and a wonderful guy. Then I gave Ray Conniff a shot. He had low periods when the booze got to him, and he fought it off and no one would give him a job. He tells this story himself. I gave him a chance to back up Johnny Mathis, and he was marvelous. Then he wanted to do something on his own and I said, "Ray, why don't we take your old Artie Shaw arrangements and just put different colors in them?" He says, "What do you mean?" I said, "We'll use voices as instruments. Double the men's voices with the brass and the women's voices with the reeds." So we did two sides, "S Wonderful" and "Begin the Beguine." We put it out as a single and it got tremendous reaction. So we made an album and that's how he got started. And Ray Conniff has sold more records than God!

Getting back to studio technique, you



Marlene Dietrich and Rosemary Clooney in 1952 while recording "Too Old to Cut the Mustard," one of the "unusual pairings" Miller was noted for. He had the song's lyrics rewritten just for them.



Tony Bennett in early 1951, one of the unknowns Miller helped discover after joining Columbia. Other Miller "finds" were Johnny Ray and Guy Mitchell.

helped pioneer the technique of dubbing, right?

Patti Page, Jack Rail and I did the first dubbing, before Les Paul and Mary Ford. It was a record called "Money, Marbles and Chalk." [He sings:] "I've got money to spend, marbles to roll, but my chalk won't write any more." It's a country song where Patti sang with herself. This was before tape. We did it from acetate to acetate. The problem, then, was you'd lose the bass and rhythm sound as you went from one generation to the next. With "Money, Marbles and Chalk" it was easy because there were only two voices. Then we did "With My Eyes Wide Open," which was four voices. Now, you get to a third and you lose the bass and rhythm completely and we had to throw it all out and start all over again. Then you had the problem of the needle cutting the bass—if you put too much on there would be distortion. We would try to find ways to do it with primitive compression. We managed. It took us a whole morning. The first

take we had, and we had to go back and back, and finally it came out. That was the first tremendous hit with multiple recording.

Let's talk about Monday afternoons with Mitch at Columbia. This was the day when any song publisher could come in and audition songs for you. Were you really inundated with song publishers?

Every A&R man was, but I was quite successful so they wanted me. When I came to Columbia we had Dinah Shore and Frank Sinatra. Frank was then at the bottom of his career. Dinah Shore, people don't realize, has had only two hits in her whole life. She's a wonderful performer, but as a record artist she had only "Sweet Violets" and "Dear Hearts and Gentle People." Lieberson and Conkling said, "Go out and recruit. Don't buy artists from another company." So first I listened to artists and that's how I found Rosie Clooney, Tony Bennett, Johnny Ray, Guy Mitchell, The Four Lads, Jerry Vale, Johnny Mathis. They were all unknown. I preferred that because everybody thinks a record producer could force somebody to make a record. You can't. All a singer has to do is do it badly and it won't come out. You cannot take somebody

by the ear and tell them to do a three-minute piece against their will. The only weapon I would have if an artist didn't want to do a certain piece would be to give it to somebody else. If that artist made a hit of it, next time they would listen. That worked. I did that a few times. But that didn't make any ill will from the artist. They just, next time around, got their share. You must remember you only have a certain number of bullets a year to shoot. Especially in those days, you couldn't come out with one release on top of another. The pipeline was full, the promotion. If everyone had worked a record and it was a failure, you can't just get them excited immediately, and then three weeks later come out with another record. It's impossible. The pipeline won't take it.

But this stable of talent you built up meant you needed lots of songs, lots of material.

Yes. Also, these Monday sessions were to appease a lot of guys. They wanted to come over and play a song. I couldn't stop what I was doing. Remember, I was working with arrangers, artists, producing all the stuff, flying back and forth to the West Coast. So I set aside this time when anyone could come in with songs. Other people would leave stuff with me and I'd come in at 7:00 or 7:30 in the morning and listen to it. I'd prefer that, because when a song is bad you know it immediately. If a song is good, you want to hear it two or three times to see if it wears well. But if they're there in person, and the writer's there, you can't destroy them. So you have to spend 10 or 15 minutes saying, "Oh, I can't do it." And they ask why. If they left it with me, they would always get an answer. A lot of publishers and writers hated my guts, but they'll agree on one thing and that's that they always got an honest answer. I always kept my word. I'd say, "If you give this to Frankie Laine as an exclusive, I promise it'll be his next release." And I would honor it. See, before, publishers would get all these people to make a record, and they'd say, "The release date is such and such." I'd say, "I don't want that. I'm going to make a hit for your song, I want to be the first one out." I would never honor a release date. If they brought me a song, they knew that if I

EVERYONE THINKS A RECORD PRODUCER *can force artists to make a record. You can't. Because all they have to do is do it badly, and it won't come out.*

liked it and made the record, I'd put it out. In fact, they tried to stop me from releasing a couple of records, but when the records turned out to be hits they ceased trying to stop them from coming out early [laughter].

I must admit that I've never really understood the concept behind music publishing. What is the role of a music publisher?

In those days the role of the publisher was to plug his songs. They would go to the radio remotes, to Abe Lyman and Benny Goodman and Les Brown, and get their songs played on the networks.

Why didn't a record company or an artist just publish the material?

I tried to do that with Columbia. In fact, I set up a publishing company for them, April Music. See, writers would come to me with unpublished songs. I would act as their editor and say, "Do this and this and change the song this way." If I liked it and the artist liked it, I'd say, "Give us an exclusive." Now, the writer would run to a publisher after talking to me and tell the publisher, "I have a Johnny Mathis record on this, give me a good advance." The publisher would call me and I'd say yes, they do. So I thought, if I'm doing this, doing the publisher's job, why doesn't Columbia set up its own publishing firm? I mentioned this. But in the early '50s they were so afraid of antitrust that they were sort of gun-shy. They said no. It started with Frankie Laine's "I Believe." These four guys came in after hours and they played this song. [He sings very slowly:] "I believe for every drop of rain that falls, a flower grows," six, seven, eight. The song was damn good, and it sounded like Frankie Laine. I said, "Why don't you compress it?" They said, "What do you mean?" I said [he sings it faster]. They said, "Yes, but that's a three-bar phrase." I said, "So who's counting?" [Laughter.] It sounded right. We did the song and that is one of the hottest copyrights to this day. I prevailed upon them to put it in April Music. They did, and they gave me a quarter of the mechanicals—a

quarter of the record royalties. The publisher got a penny for every record sold, and the writer got a penny. So they gave me a quarter of a penny on record royalties.

What I'm getting at is this: Isn't music publishing a holdover, a vestige from the days when sheet music was an important source of income?

Yes, but publishing songs is still an important source of income. That's why the old catalogs are worth so many millions. Every time a performance is done, that cash register rings. Every time a record is made of a Gershwin song, the income is tremendous. And boy, the writers deserve it. Without the writers there's nobody.

But couldn't the writer just be given an additional cut out of the record, rather than having a separate publishing entity? It seems like a vestige to me.

Well, it is a vestige. That's why most rock musicians have their own publishing companies, and most artists who write their own songs have their own publishing companies. But the publishing companies that have large catalogs [of songs they have published over the years] are worth literally hundreds of millions. Like Frank Loesser who had his own company. Even when

he had stuff published by somebody else, he had in mind to get it back 28 years later [upon expiration of the original copyright], and he did. When the renewal came, he put it in his own publishing company.

I guess that's the real story behind the rise and fall of Tin Pan Alley: The rise in the days when artists did not usually write their own material and sheet music was a big source of income, and the fall when more artists started to write and publish their own material.

That was the decline of the all-powerful publisher. But they're still powerful because they have all these great old copyrights. They're all good till 50 years after the death of the writer.

But in terms of new songs, they're not a factor?

Yeah. But on the other hand, that goes back to the record companies. They ask, "Where are the Gershwins, Berlins and Rodgers?" I know some marvelous writers who go to a record company today and they say, "You're not for the market," when the whole success of any artistic enterprise is being *different* from the market. **A**

This is the first section of a two-part interview.

Frank Sinatra (center) with Miller (right) at Columbia in 1951; man at left is unidentified. Sinatra was "at the bottom of his career" at Columbia when Miller joined the label in 1950.



1

PIONEER F-99X TUNER

Manufacturer's Specifications

FM Tuner Section

Usable Sensitivity, Narrow-Band: Mono, 10.8 dBf.

50-dB Quieting Sensitivity, Narrow-Band: Mono, 12.8 dBf; stereo, 34.8 dBf.

S/N Ratio: Mono, 94 dB at 80 dBf; stereo, 87 dB at 80 dBf.

Alternate-Channel Selectivity, Narrow-Band: 85 dB.

Capture Ratio, Wide-Band: 0.8 dB.

THD, Wide-Band: Mono, 0.0095% at 1 kHz, 0.015% at 100 Hz, and 0.02% at 6 kHz; stereo, 0.02% at 1 kHz, 0.02% at 100 Hz, and 0.07% at 6 kHz.

THD, Narrow-Band: Mono, 0.09% at 1 kHz; stereo, 0.5% at 1 kHz.

Stereo Separation, Wide-Band: 65 dB at 1 kHz, 55 dB from 20 Hz to 10 kHz.

Frequency Response: 20 Hz to 15 kHz, +0.2 dB, -0.8 dB.

I.f. Rejection: 100 dB.

Image Rejection: 70 dB.

Spurious Response Rejection: 80 dB.

Subcarrier Rejection: 60 dB.

Muting Threshold: 25.2 dBf.

Output Level: 650 mV at 100% modulation.

AM Tuner Section

Sensitivity: 150 μ V/m (with loop antenna).

Selectivity: 18 dB.

S/N Ratio: 50 dB.

Image Rejection: 40 dB.

I.f. Rejection: 60 dB.

Output Level: 150 mV at 30% modulation.

General Specifications

Power Consumption: 120 V a.c., 20 watts.

Dimensions: 18 in. W x 2½ in. H x 12-5/16 in. D (45.7 cm x 6.4 cm x 31.3 cm).

Weight: 9 lbs., 15 oz. (4.5 kg).

Price: \$324.95.

Company Address: P.O. Box 1760, Long Beach, Cal. 90801.
For literature, circle No. 90



Pioneer tuners have always enjoyed a good reputation among devotees of good FM radio. Witness the series of "Super Tuners" that Pioneer pioneered (sorry!) several years ago for car sound systems. The current "Super Tuners" are still considered by many to be the standard by which other car-stereo tuners should be judged. It stands to reason that a company that can do such a good job of designing a tuner for the hostile electrical and physical environment of an automobile should be able to do an equally fine job in designing one for home use. Pioneer has done just that with their F-99X.

One of the chief virtues of the F-99X is its dual i.f. bandwidth, which is switchable from wide to narrow. Many other manufacturers have employed this scheme of trading off selectivity for lower distortion and better separation, but the bandwidths Pioneer has chosen make the most of this idea. The unit, like most recent AM/FM tuners, employs frequency-synthesized tuning, which has also been designed to near perfection. Unlike designs of the earliest synthesized models, the F-99X's use of this crystal-accurate method of tuning has not in any way degraded its signal-to-noise ratio or distortion capabilities. My only quarrel with Pioneer's description of the F-99X is in their use of the word "digital"; I'm not sure what's digital about this fine product, other than the legible frequency display which does, indeed, show tuned-to AM or FM frequencies in numbers—or "digits."

To keep the front panel slim and uncluttered, and yet provide an adequate number of station presets, Pioneer makes use of the now-familiar "shift key" approach. The eight preset buttons, with the aid of a "Station Call" mode key, allow you to program or memorize a total of 16 AM or FM stations. What's more, when you want to recall these stations, it's not necessary to specify whether they are on the AM or FM band. Of course, you can preset AM and FM stations in any order you wish, but if you program the first eight on the FM band with "Station Call" in its out position, and then program the next eight as AM stations with "Station Call" in its depressed position, this key then serves the purpose of switching bands as well as stations. The F-99X will remember the station to which you are tuned when you turn off the power, and will access that frequency when power is turned on again. Even if the power cord is disconnected or there is a power outage (up to three days or so), a charged capacitor inside the tuner will power the memory function so station presets will not be lost.

Control Layout

The "Power" on/off pushbutton, together with its indicator light, is at the upper left corner of the tuner's slim front panel. "FM" and "AM" selector buttons are located below the power switch, and to the right is an LED display area that shows tuned-to frequencies, the selected band (AM or FM), signal strength (by means of three small LEDs), selection of the "Narrow" i.f. mode, and stereo reception.

The "Tuning" rocker bar, to the right of the display, raises or lowers the tuned frequency till the F-99X intercepts the next acceptably strong signal. The same bar can also tune the F-99X up or down the dial in increments of 0.1 MHz (FM) or 10 kHz (AM), if the "Manual Search" button is pressed. Memorizing a station's frequency is accomplished by press-

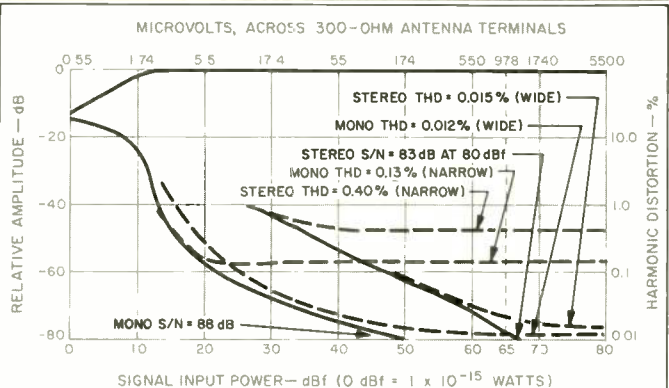


Fig. 1—FM mono and stereo distortion in wide and narrow i.f. modes, and quieting in wide mode only.

ing the "Memory" button, adjacent to the "Tuning" bar, and then pressing one of the numbered preset buttons at the panel's far right. The i.f. mode-selector and "Station Call" buttons are to the right of "Memory" and "Manual Search." An LED above each of these four controls shows when it is activated.

The "Manual Search" button has a second function: Switching to manual tuning also turns the FM muting off. You're more likely to use the manual tuning mode to seek out weak stations, which automatic tuning might skip and muting might make inaudible. So Pioneer's arrangement makes more sense than the more common one of yoking the mono/stereo switch to the muting. The latter practice has, more than once, kept me from listening to a fairly weak station in stereo, even though I was willing to tolerate the extra noise. I dislike having to switch into mono to defeat a muting circuit, especially when its threshold is set too high, as often happens.

I'd like to credit Pioneer with having carefully thought out the most desirable location for the mute defeat switch, but I should note that it may have been the only place they could put it, since this tuner does not have a mono/stereo switch. The omission is not really much of a problem. If you encounter a very noisy stereo station (one strong enough to overcome the stereo threshold of the tuner but not strong enough to be noise-free), you can always switch to mono on your preamplifier or amplifier. Doing so cancels out most of the objectionable noise that is normally out of phase in the left and right channels.

The F-99X's rear panel is equipped with the usual left and right output jacks; a 75-ohm, coaxial FM-antenna connector, and a pair of spring-clip terminals for the separate AM loop antenna, supplied, or an outdoor AM antenna. If you want to use a 300-ohm, flat twin-lead for connecting your FM anten-

Muting and stereo thresholds are set at ideal points, so the auto tuning mode delivers only those stereo signals quiet enough to be enjoyed.

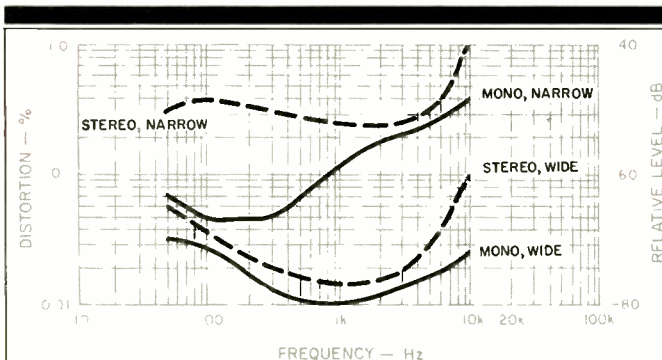


Fig. 2—THD vs. frequency, FM section.

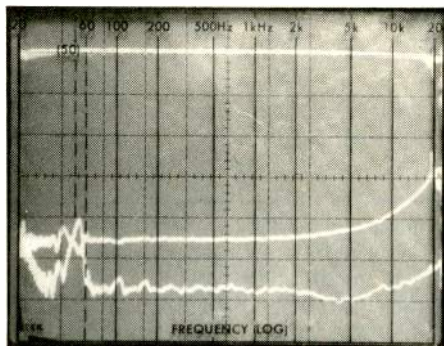


Fig. 3—FM frequency response (top trace) and separation vs. frequency for narrow i.f. mode (middle trace) and wide i.f. mode (bottom trace).

na, you will have to connect it to the 300-ohm/75-ohm transformer that is provided. The version of the F-99X supplied to the United States is also equipped with an output jack labelled "AM Stereo," but no details are given regarding its "tap-in" point. Since I do not have an AM stereo decoder (either for the Kahn-Hazeltine or the Motorola system), I can't say whether this jack serves its purpose.

Measurements

Figure 1 shows the tuner's FM quieting and 1-kHz distortion characteristics and, by implication, its sensitivity. Usable sensitivity was 10.8 dBf in the narrow mode, exactly as claimed, but in the wide i.f. mode, as might be expected, usable sensitivity was slightly poorer, 14 dBf. The 50-dB quieting sensitivity in mono, in the narrow mode, was 13 dBf, actually better than claimed. In stereo, I measured 36 dBf for the 50-dB quieting point, regardless of the i.f. mode. Since quieting characteristics were very nearly the same in either i.f. mode, once signal strengths exceeded the low usable-sensitivity figures, I saw no point in showing quieting for both modes.

In the wide i.f. mode, I measured a maximum signal-to-noise ratio of 88 dB in mono, but I suspect that this result was limited by my test equipment. The same holds true for the wide-mode measurement of THD at 1 kHz in mono, where I obtained a reading of 0.012%. The fact is that the accuracy of my signal generator, as good as it is, is guaranteed only to 0.01% distortion and to a residual-noise figure of around 90 dB. I would therefore not dispute Pioneer's claimed S/N of 94 dB, in mono, or THD of 0.0095%, also in mono. (I just wish I knew how they measured these low figures!)

My tests showed, dramatically, the trade-offs that occur when a tuner has a well-designed wide/narrow i.f. choice. Switching to the narrow mode resulted in a very substantial improvement in selectivity; it measured just over 83 dB in this mode, compared to less than 50 dB in the wide mode. But as you can see in Fig. 1, distortion increased in the narrow mode by more than a whole order of magnitude, measuring 0.13% in mono and 0.4% in stereo for a 1-kHz test signal.

The differences in distortion produced by the tuner in its two i.f. modes are further illustrated by the curves of Fig. 2. Here, I have plotted distortion as a function of frequency, from 50 Hz to 10 kHz, for both mono and stereo operation of each of the two i.f. modes. Stereo separation, shown in Fig. 3, is also affected by the choice of i.f. modes. While in the wide mode, I measured separation of 60 dB (the highest I can measure reliably) at 1 kHz. Separation was very nearly as good at the frequency extremes, with readings of 59 dB at 100 Hz and an incredibly high 53 dB at 10 kHz. Switching to the narrow i.f. mode resulted in separation figures which, although still more than adequate, clearly illustrate what a narrower i.f. bandwidth does to even the most carefully designed and well-aligned multiplex decoder circuitry. Now, separation measured 46 dB at mid-frequencies, decreasing to 44 dB at 100 Hz and 40 dB at 10 kHz.

There are also differences, between the wide and narrow i.f. modes, in separation and crosstalk components created when a 5-kHz signal is used to modulate one channel 100%; this is evident from the spectrum analysis photos of Figs. 4A and 4B. Notice the higher amplitude crosstalk and distortion products that show up to the right of the desired 5-kHz (large) spike in Fig. 4B, compared with those appearing in Fig. 4A.

Overall frequency response was flat within 0.2 dB from 50 Hz to 10 kHz and was down 0.8 dB at 15 kHz, as claimed. Frequency response (in stereo), as well as channel separation for both i.f. operating modes, is shown in the spectrum analysis sweeps of Fig. 3. The frequency sweep is logarithmic from 20 Hz to 20 kHz, and the vertical scale is 10 dB per division.

The muting threshold was set to just under 30 dBf—an ideal point for this tuner, in my opinion. At 30 dBf, the F-99X's stereo signal-to-noise ratio has reached an acceptable level of 44 dB. The stereo switching threshold was set almost to the same point, 27 dBf—again an ideal choice. Therefore, when you are in the automatic tuning mode, the frequency-synthesized tuner will deliver only incoming stereo signals that are quiet enough to be enjoyed. If you want to listen to weaker stereo (or mono) stations, you'll simply

Your Eyes Have Ears

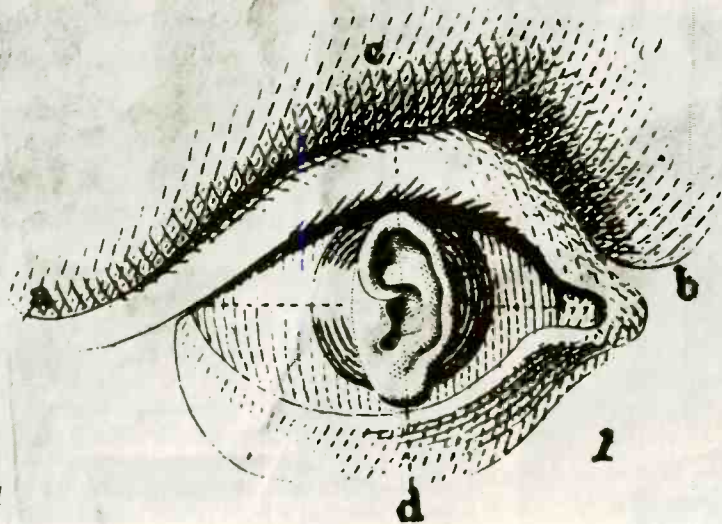


Figure 1

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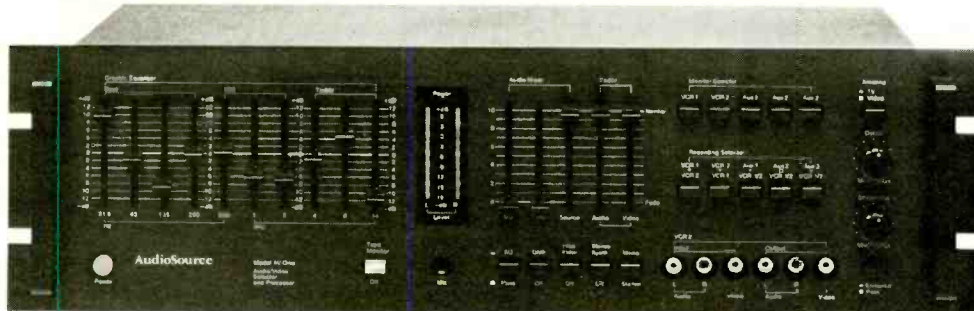
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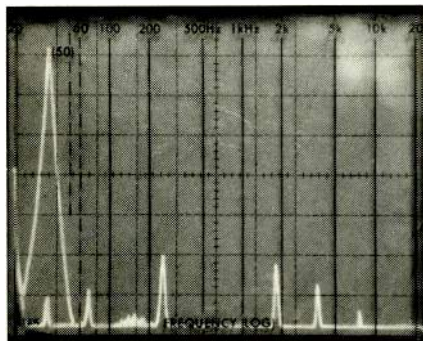
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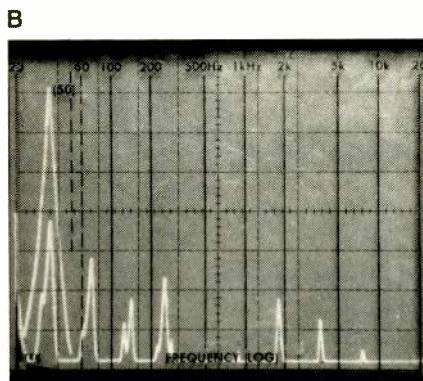


Fig. 4—Separation, crosstalk, and distortion components for 5-kHz left-only modulating signal in wide (A) and narrow (B) i.f. modes, FM section.

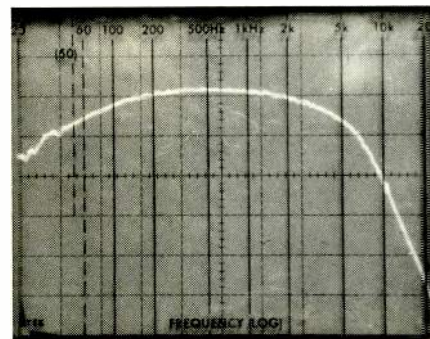


Fig. 5—AM frequency response.

have to tune to those stations manually and thereby defeat the muting circuitry.

Capture ratio, measured in the wide i.f. mode, was 1.0 dB. Subcarrier rejection was 61.5 dB on one channel and 65 dB on the other. SCA rejection was greater than 75 dB, and image rejection measured 71 dB. Spurious response rejection, measured in the wide mode, was greater than 85 dB, and AM suppression measured 67 dB—one of the highest readings I have ever been able to obtain for this important parameter. I.f. rejection was 100 dB or greater (my test setup would have difficulty reading anything over 100 dB).

After plotting AM frequency response (Fig. 5), I didn't spend too much time measuring other characteristics of the AM section. I suppose if you wanted to apply the very liberal tolerance of ± 6.0 dB to the frequency response, you could say that it extended from around 50 Hz to 6 kHz. On the other hand, if you arbitrarily call the 1-kHz output "0 dB," then the -6 dB points would have to be stated as occurring at around 60 Hz and 4 kHz. In either case, the narrow bandwidth of the AM section makes me doubt whether any type of AM stereo adaptor would work successfully when connected to the rear panel's "AM Stereo" jack. I suspect that owners of this excellent tuner won't care one way or the other about AM stereo in any case.

Use and Listening Tests

When connected to my outdoor rotatable antenna, the Pioneer F-99X tuner successfully picked up every FM station that I have ever logged in my listening area. This added up to some 60 usable signals, plus a marginally unacceptable few that were 100 miles or more away. You couldn't ask for much more by way of FM sensitivity in an FM tuner. Even more impressive was the ultra-low distortion. Yes, you *can* hear the difference, especially when you tune to stations that habitually overmodulate and sound terrible on tuners of lesser quality.

There were a few stations far enough away from the broadcasters in my area to have been assigned adjacent channel frequencies, and these were nicely locked in by switching to the narrow mode. Equally sensitive tuners I have tested were unable to zero in on those stations: Even in their narrow i.f. settings, they just didn't have enough adjacent-channel rejection. Pioneer, as I suspected during the bench tests, has set the narrow and wide i.f. bandwidths where they will do the most good.

I found that I hardly needed to refer to the owner's manual when testing or listening to this tuner. The control layout is very logical and easy to understand. I could argue that the "Memory" pushbutton, required for entering a frequency into one of the preset locations, might have been better positioned near the preset buttons instead of near the "Tuning" rocker, but that's really a minor point.

After I had finished my listening tests, I mounted the two wood-grain side panels that came with the tuner. These panels did indeed dress up what is otherwise a rather stark and plain-looking housing. For the kind of FM reception I was able to get from the F-99X, and considering its very reasonable price, I wouldn't have been too upset even if Pioneer had chosen *not* to throw in those wood side panels.

Leonard Feldman

KING: 17 mg. "tar", 1.3 mg. nicotine, 100's: 17 mg. "tar",
1.4 mg. nicotine, av. per cigarette by FTC method.

You've got what it takes.

Salem Spirit

*Share the spirit.
Share the refreshment.*

SURGEON GENERAL'S WARNING: Quitting Smoking
Now Greatly Reduces Serious Risks to Your Health.



The modestly-priced amplifier that delivers price-no-object sonic performance.

ADCOM® GFA-555.

This high-power, high-current amplifier easily and accurately interfaces with virtually any speaker system available today—including some troublesome exotic types whose impedance falls as low as 1 ohm.



ADCOM®

11 Elkins Road, East Brunswick, NJ 08816 U.S.A.

Why high current is important.

The standard 8-ohm impedance at which an amplifier's output power is normally referenced may not even be close to the actual moment-by-moment impedance presented by a given speaker under typical operating conditions. That is, with a music signal feeding a speaker.

A speaker with a nominal rating of 8 ohms can actually present the amplifier with a load anywhere from about 40 ohms to less than 2 ohms, depending on the frequencies it is handling at any given moment.

As speaker impedance falls, increased current is drawn from the amplifier output stage. In fact, many amplifiers, when pushed to very high levels and very low impedances, reach a point where their protection circuitry had better shut them off...or their output transistors will self-destruct.

Why the 555 sounds as good as (or better than) far more expensive amplifiers.

Despite its modest price, the 555 was conceived and designed to be compared with "esoteric" price-no-object amplifiers. Throughout its development, we subjected the 555 to comparative listening tests against highly-regarded amplifiers priced up to three times higher.

Although some listeners reported hearing subtle differences among all the amplifiers, none heard anything to suggest that any was priced much lower than the others. In that very select company, we were highly pleased not to stand out.

High current output stage.

Each channel is provided with 8 high-current output transistors, and is capable of delivering more than 20 amperes into low impedance loads.

As a result, transient capability—which virtually defines the demands of music—is greater than 800 watts into 2-ohm loads and 400 watts into 1 ohm. And the amplifier remains stable, without glitches or oscillation, under all operating conditions.

Simple gain path throughout.

The minimum of components used from input to output means less wave-

form distortion and less phase shift. Further, the use of discrete circuit elements rather than integrated circuits allowed for total flexibility in selecting and tweaking individual elements for optimum performance at every stage.

Both active elements in the input stage are class-A biased, using very sophisticated double-regulated active current sources. This current supply is unaffected by variations in the power supply or signal.

Transformer with double secondaries.

The 700-watt toroidal power transformer, specially designed for the 555, has many of the technical advantages of two separate transformers, but is far more cost effective. It provides especially tight regulation and a minimum of inter-channel crosstalk, vibration, hum, or noise.

Well-regulated, high-current power supply.

The two secondary windings feed separate rectifier bridges and filter/storage capacitors—also specially designed—with a total capacitance of 60,000 microfarads. This high capacity provides excellent reserves for transient high-output peak current demands.

This rugged, efficient and stable power supply is extremely important, and helps maintain low distortion down to very low frequencies. Also, performance remains relatively unaffected by low or high AC line voltages.

Ultra-stable bias circuitry.

A significant new current-feedback double-regulation technique, developed especially for the 555, is used in the bias circuitry for the drive and output transistors. This assures exceptional bias stability under widely varying thermal, line-voltage and signal conditions.

No current-limiting protective circuitry.

The only protection needed against large, short-term overloads is power-supply fusing. To protect against long-term overloads that can cause overheating, a thermal circuit breaker shuts down the amplifier when the heat sink temperature reaches 75 degrees C. When the

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temperature drops, normal operation resumes automatically.

Advantages of direct coupling.

Coupling capacitors can be responsible for a variety of subtle signal distortions. By direct coupling of the input and output of the circuitry, Adcom eliminates the need for such capacitors, and thus eliminates the problem at the source.

No output coil.

Most amplifier designs have protective coils in their output circuits to prevent spurious oscillations under typical load/signal conditions. But these coils are responsible for most amplifier/speaker interface problems.

And when the amplifier is connected to high-capacitance loads, such as electrostatic speakers and some esoteric cables, the coil can introduce resonance and ringing. Adcom solved this problem by the direct coupling of the output. The damping factor remains high at all frequencies, phase shift is kept low, and bandwidth into difficult loads—particularly electrostatics—is improved.

Final word.

If you are looking for a new power amplifier, appreciate the need for considerable power, understand the importance of high-current capability—and know great value when you hear it—you'll certainly want to compare the Adcom 555 to any other amplifier at any price!

When you do, you'll hear for yourself that higher cost does not necessarily mean better performance. And like many others, you're likely to prefer the 555 purely on its own sonic terms—sight unseen and price unknown.

Power output:

200 watts per channel continuous, both channels driven into 8 ohms, 20 Hz – 20 kHz, 0.09% THD.

325 watts per channel continuous, both channels driven into 4 ohms, 20 Hz – 20 kHz, 0.25% THD.

Bridged:

500 watts continuous, driven into 8 ohms, 20 Hz – 20 kHz, 0.25% THD.

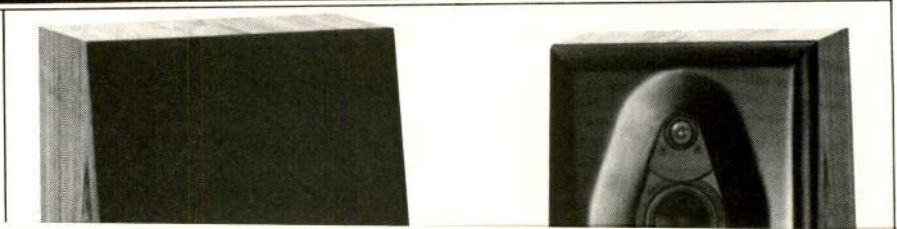
dB at 25 Hz. Caution should be exercised in driving this system to higher sound levels with program content containing high levels of low bass. A 30-watt drive level in mid-range, well within this system's capability, can escalate to 120 watts at 25 Hz, with possible damage to the woofer. The equalizer does drop back down to reasonable levels at the normal flutter-modulation range around 5 Hz; thus, record warp and general surface irregularities on analog discs should not cause audible modulation effects due to substantial excursions of the bass driver.

Figure 5 shows the measured difference in gain between the left and right equalizer channels. These are exceptionally well balanced over the whole range, with a worst-case offset of about 0.3 dB at the resonance peak of 25 Hz.

Figures 6 and 7 show the axial, anechoic frequency

length. Measurement was made with the electronic equalizer in place. I could not verify either the high- or low-frequency claims made by Thiel; however, the differences between my measurements and the specifications are not large. I measured the response extremes at 29 Hz and 16 kHz as being 3 dB down from the mean mid-band average. Through the majority of the audio range, the CS3 is quite smooth in its response.

The phase response of Fig. 7 is corrected for two air-path length delays. At a physical path length of 1.6 meters, the bass response is corrected for a time delay of 4,660 μ S, while the air-path delay required to bring the 15-kHz range up to 0° is 4,697 μ S. The tweeter arrival is within 37 μ S of the midrange arrival. The corrected phase shift is near 0° over the majority of the audio range, which means that a positive-



The boost provided by the bass equalizer is quite substantial, so one should be cautious in driving this system to high sound levels.

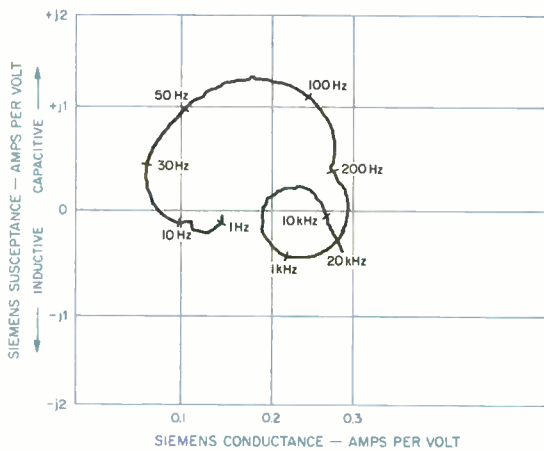


Fig. 3—Complex admittance for 2 V rms drive.

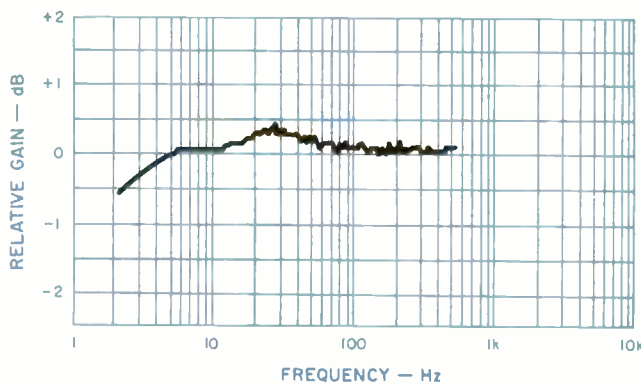


Fig. 5—Difference in gain between left and right equalizer channels.

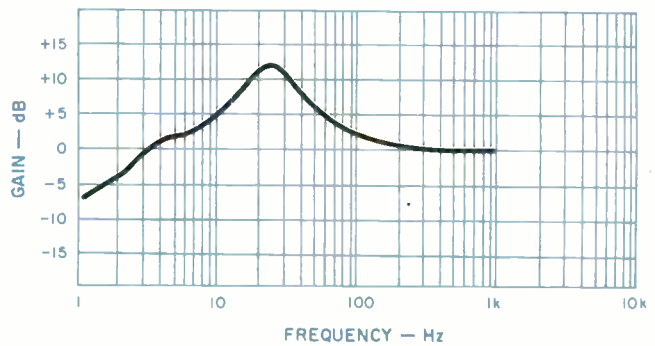


Fig. 4—Transfer gain of bass equalizer, which was measured as flat to 31 kHz.

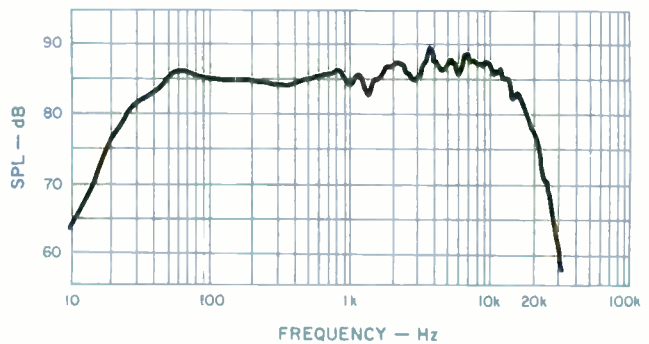


Fig. 6—On-axis sound output level with a constant drive of 2 V rms, measured at 1.6 meters and corrected for 1-meter path length.

going voltage drive produces an in-polarity, positive pressure increase at the listening location.

It was clear right from the beginning that the grille is a source of problems. Figures 8 and 9 show the *change* in sound (relative to Figs. 6 and 7) which is produced when the grille is removed. A peak-to-peak amplitude variation of 4 dB in mid-band and a mid-band phase variation of 25° is enough to make me suggest that a musically sensitive owner should remove the grille in order to achieve better sonic accuracy.

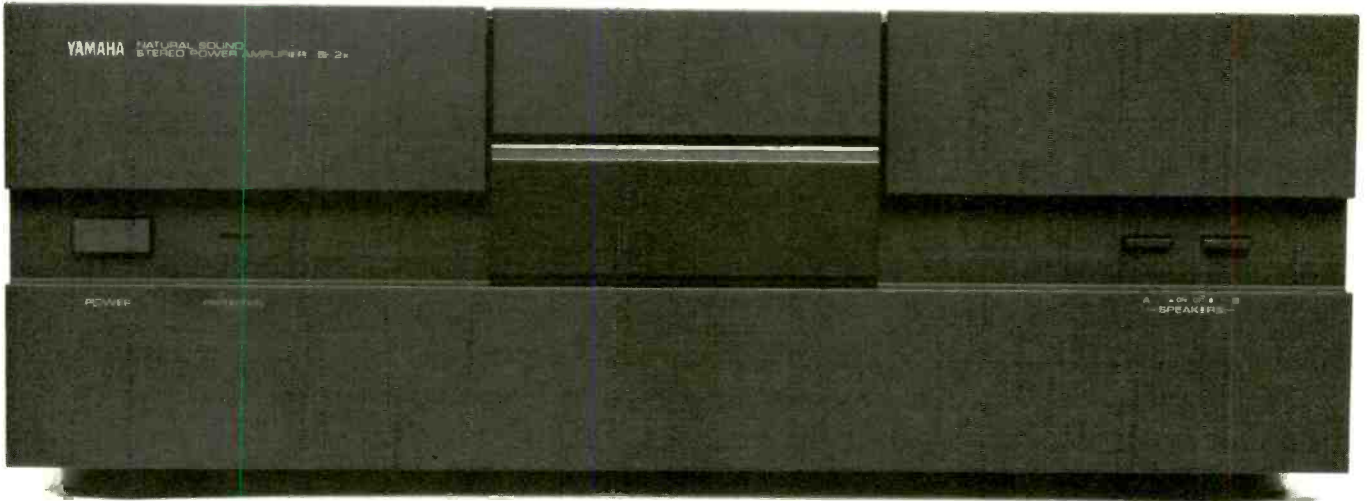
The 3-meter room test is shown in Fig. 10. Although the speaker's anechoic frequency response (shown in Fig. 6) is quite smooth, the room measurement is quite unsmooth. This measurement was made with the speaker placed 30 cm in front of a wall. The microphone was in a nominal listening location, 3 meters from the speaker and 1 meter above a carpeted floor. The frequency spectrum of the first

13 ms of sound which arrived at the listening location was measured, and no article of furniture was placed where a substantial sound reflection could occur within this time window. The top measurement was made directly on-axis. The lower one was made with the microphone positioned so that the speaker was in a normal left-channel stereo position, 30° off the center line of the speaker. Because of the substantial variation, the two curves are displaced 15 dB for clarity of presentation; normally, I use a 10-dB offset without overlap.

Energy-time curve (ETC) measurements verified that the substantial ripples in response above about 1 kHz are due to ceiling reflections which arrive about 3.5 ms after the direct sound. The culprit, if that be the word, is the very large vertical dispersion pattern of the midrange and tweeter. Figure 11 is the ETC of the first 4.5 ms of sound, where

Continued on page 66

Price is no object.



One look at these exquisite audio components will tell you we spared no expense building them. But one look at their price tags will confirm the fact that these audiophile-quality components are realistically priced.

Consider the B-2X Power Amplifier, the accurate and musically powerful foundation of this trio. You get 170 watts of Class A power RMS per channel, both channels driven into 8 ohms, from 20-20,000 Hz at no more than 0.002% total harmonic distortion. But without the size and heat problems conventionally

designed Class A amps give you.

Internally, the B-2X shows engineering taken to extremes. Massive power supply capacitors (488,000uF total) handle a wide current output range. So low impedance loads, whether resistive or capacitive, are handled with ease (625 watts/ch. dynamic into 2 ohms). And a twin monaural configuration makes the B-2X beautifully transparent and dynamic.

Suggested retail price is \$1,500.



The C-2X Pre-amplifier is a delight to hear. Or, rather, to not hear. The internal components were selected to meet the tightest tolerances. And every section of the circuitry is isolated and specially shielded to virtually eliminate noise, distortion and crosstalk.

A dual-transformer power supply provides com-

pletely independent power for input and output. All this attention to detail results in a preamplifier whose pinpoint image placement, dynamic contrasts and soundstage come alive on a dead silent canvas.

Suggested retail price is \$1,300.



And finally, the T-2X Tuner, with its computer-controlled five-digit servo tuning system. So you can enjoy broadcast reception accuracy to within one hundredth of a MHz (or 1 kHz) to deliver the renowned Yamaha natural sound. Even on stations that were previously unlistenable because of poor sonic performance. And for sheer pleasure and convenience, you'll have 10-station random access tuning with

multi-status station memory operations.

Suggested retail price is \$600.

The Yamaha Audiophile Series™ components are only available at select Yamaha dealers. For more information and the name of your nearest Audiophile Series dealer, write: Yamaha Electronics Corporation, P.O. Box 6660, Buena Park, CA 90622.



RECOG

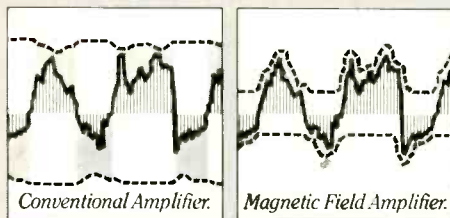
Why the Carver M-500t Magnetic Field Power Amplifier has helped begin an industry trend and how it has stayed ahead of its inspired imitators.



Twice in the last decade, Bob Carver has taught the high fidelity industry how to make amplifiers that give you better performance and value. Both times his bold lead has attracted followers. Still, as evidenced by the current release of the M-500t, Carver sets standards yet unequaled in the audio community.

With its astonishingly high voltage/high output current and exclusive operation features, it is a prime example of why Carver remains the designer to emulate:

- Continuous FTC sine-wave output conservatively rated at 250 watts per channel.
- Produces 600 to 1000 watts per channel of dynamic power for music (depending on impedance).
- Bridging mode delivers 700 watts continuous sine-wave output at 8 ohms.
- High current Magnetic Field power supply provides peak currents up to ± 100 amps for precise control of voice-coil motion.
- Designed to handle unintended 1 ohm speaker loads without shutting down.
- Equipped with infinite resolution VU meters.



Solid line: audio output signal.
Broken line: power supply voltage.
Shaded area: wasted power.
Vertical lines: power to speakers.

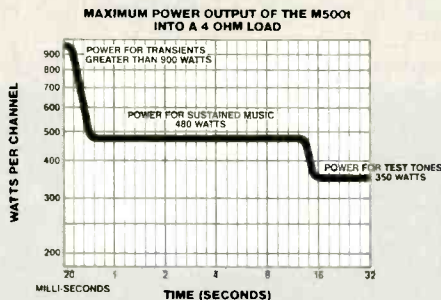
POWER EXPRESSED BY THE DEMANDS OF MUSIC.

The Carver M-500t Power Amplifier responds to musical transients with better than 700 watts per channel of instantaneous peak power through 8 ohm speakers. Well over 900 watts per channel into 4 ohm speakers.

And yet its Federal Trade Commission Continuous Average Power Rating is 250 watts per channel into 8 ohms.

The gulf between the two power ratings represents Bob Carver's insistence that amplifier design should fit the problem at hand. That problem is reproducing music with stunning impact, not simply satisfying a sine-wave test which doesn't even include speakers or sound sources. Hence the seeming gulf between the two ratings.

Bob reasoned that since music is composed of three basic types of power waveforms, those types of waveforms are what an amplifier should be designed to satisfy.



The Carver M-500t delivers massive power at three important output levels.

First there are instantaneous peak transients — the sudden smash of cymbals, drums, or the individual leading edge attack of each musical note. While these waveforms last less than 1/100 of a second, they form the keen edge of musical reality which must be present if you are to realize high fidelity. Though momentary, they also demand a tremendous amount of amplifier power.

Directly following instantaneous transients are combinant musical crests of demand that come from multiple instruments and their harmonics. These long term power demands may last up to several seconds but usually come and go in less than a second. And yet they can tax anything but an exceptionally powerful amplifier.

The third type of power demand is represented by the average power contained in the music, and is approximately one third to one half of the FTC continuous power rating.

At extremely high output current levels, the Carver M-500t not only delivers over 700 watts of instantaneous peak power for instantaneous transients, but can deliver over 600 watts

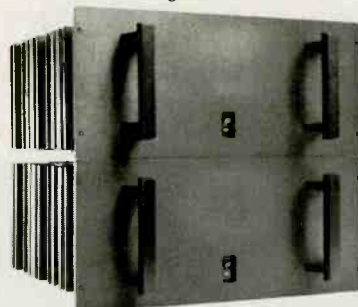
RMS of long term power for demands lasting up to several seconds. The M-500t provides more power, more current and more voltage than any comparably priced amplifier ever offered.

THE MAGNETIC FIELD AMPLIFIER VS. CONVENTION.

Audiophiles, critics and ultimately other manufacturers have each accepted the wisdom of Bob Carver's fresh approach to delivering power in musical terms. Yet only Carver has so elegantly translated theory into practice.

Rather than increase cost, size and heat output with huge storage circuits, Magnetic Field Amplification delivers instantaneous high peak and longterm power from a small but powerful Magnetic Field Coil. The result is an amplifier capable of simultaneous high current and high voltage that can do sonic justice to the dynamics of Compact Discs and audiophile records in a compact, cool-running design. An amplifier costing considerably less than the ultra-esoteric models which figured significantly into the genesis of its circuitry. For a reprint of the full story of its development as well as a catalog of Carver high fidelity audio components please call or write to us.

Figure 1



This \$7,000 pair of esoteric amplifiers figure significantly into the heritage of the M-500 "t" version circuitry.

Figure 1 above shows a \$7,000 pair of ultra-esoteric mono amplifiers. No expense was spared on their admittedly magnificent but still conventional design and construction.

Figure 2 shows the massive toroid output transformers contained in these prestigious audiophile designs. At 10% regulation, their output current is ± 50 amperes.

All conventional amplifiers are condemned to using this type of design.

UTION.

Figure 2 also shows the patented Magnetic Field Coil employed in the Carver M-500t. Its output current is ± 100 amps at 10% regulation!!!!

Figure 2



Over 40 pounds of toroid coils put out half the current of a single ten-ounce Magnetic Field Coil

DISTINGUISHING FEATURES OF THE CARVER M-500t.

Power is mandatory for dynamic impact and musical realism. And yet power requires control and finesse. While the Carver M-500t isn't the only amplifier to deliver adequate output, it is one of the few that tempers force with protection circuits beneficial to both the amplifier and your loudspeaker system.

◆ These include DC offset, short circuit power interrupt as well as two special computer-controlled speaker monitor circuits which protect against excessive high frequency tweeter input and an overall thermal overload.

◆ The Carver M-500t continuously displays power output through dual, lighted infinite resolution VU-ballistic meters. Meters which can react to musical transients as brief as 1 millisecond.

◆ The M-500t is quiet. Inside and out. Its circuitry has the best signal-to-noise ratio of any production amplifier. Better than -120 dB. And, in spite of its massive output capability, the M-500t does not require a noisy fan to dissipate heat. Thanks to the cool running Magnetic Field Amplifier circuitry.

◆ No other amplifier in the M-500t's price or power ranges is capable of handling problematic speaker loads as low as 1 ohm. Whether required by certain brands of speakers or inadvertently derived by pairing too many low impedance speakers at one set of output terminals, all conventional amplifiers simply shut down or blow their fuses when faced with this condition.

◆ In stereo use, both channels of the M-500t can actually borrow from each other during unequal output demands. In addition, Carver amplifiers have pioneered phase inversion circuitry which takes advantage of the in-phase (mono) characteristics of bass to essentially double available power supply current at low frequencies.

◆ Finally, the Carver M-500t can be used in a bridged mode as a 700 watt RMS per channel mono amplifier without any switching or modification.

MUSIC IS THE FINAL PROOF.

Were you to buy a power amplifier solely on features and performance specifications, painstaking comparison would inevitably lead you to the Carver M-500t.

But we are sure that your final judgment will be based on musicality. It is here that the M-500t again distinguishes itself.

Bob Carver has carefully designed the M-500t to have a completely neutral signal path that is utterly transparent in sonic character. The result is more than just musical accuracy. It means a total lack of listener fatigue caused by subtle colorations sometimes exhibited by conventional amplifier designs, regardless of their power rating.

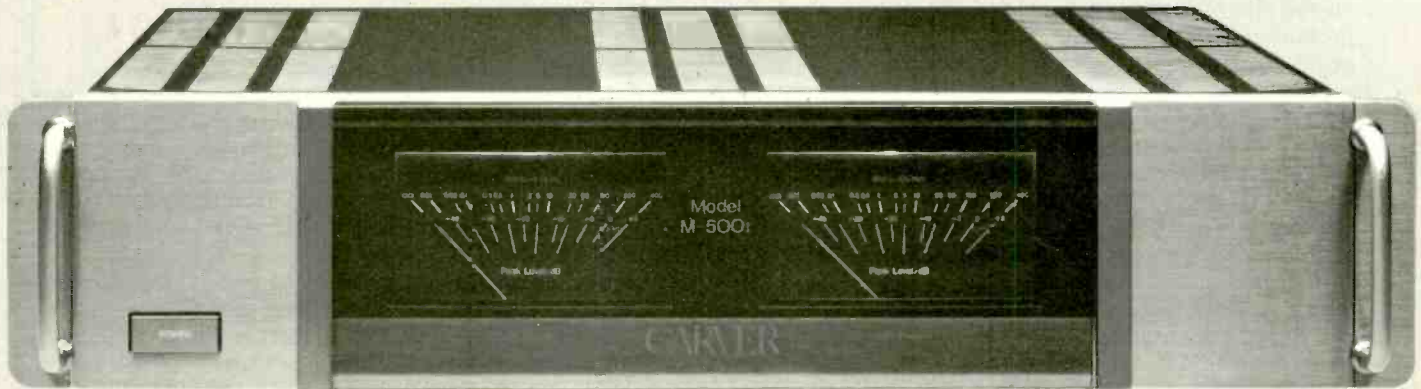
It means a veil is lifted between you and your musical source as the most detailed nuances are revealed with realism, believability and delivered with stunning impact.

VISIT YOUR CARVER DEALER FOR A SURPRISING AUDITION.

We invite you to audition the Carver M-500t soon. Against any and all competition. Including those who are only now embracing the principles which Bob Carver has refined over the last several years.

We doubt that you will be surprised when the M-500t lives up to the claims made in this advertisement. What will surprise you is just how affordable this much power, musicality and accuracy can be.

SPECIFICATIONS: Power, 251 watts per channel into 8 ohms 20Hz to 20kHz, both channels driven with no more than 0.15% THD. Instantaneous Peak Power, 1000 watts into 2 ohms, 950 watts into 4 ohms, 600 watts into 8 ohms. Longterm RMS Power for Music, 500 into 2 ohms, 450 into 4 ohms, 300 into 8 ohms, 1000 watts bridged mono into 4 ohms, 900 watts bridged mono into 8 ohms. Bridged Mono RMS Continuous Power, 700 watts continuous into 8 ohms. Noise -120 dB IHF Weighted. Frequency Response, $\pm 0-3$ dB 1Hz-100kHz. Slew Factor, 200. Weight, 25 lb. Finish, light brushed anthracite, baked enamel, black anodized.



CARVER

POWERFUL

MUSICAL

ACCURATE

Horizontal dispersion of energy is very smooth, indicating exceptionally good stereo lateralization.

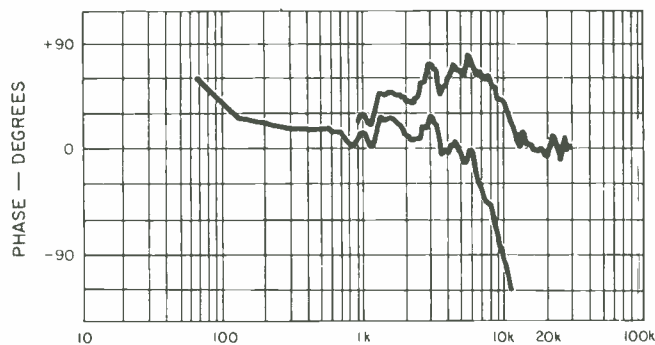


Fig. 7—On-axis phase response, measured at 1.6 meters and corrected for two time delays to correspond to 1-meter

measurements. Time offsets are 4,697 μ S (top curve) and 4,660 μ S (bottom curve).

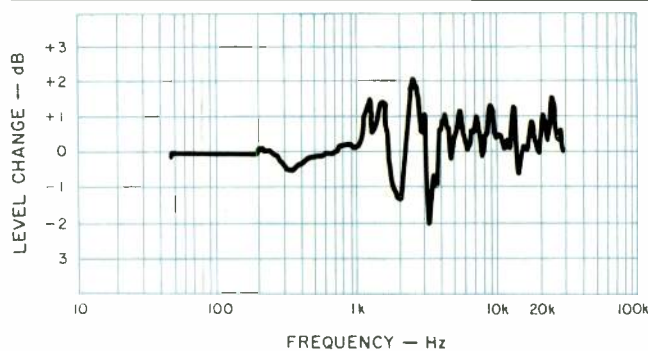


Fig. 8—Change in sound output produced by removing grille.

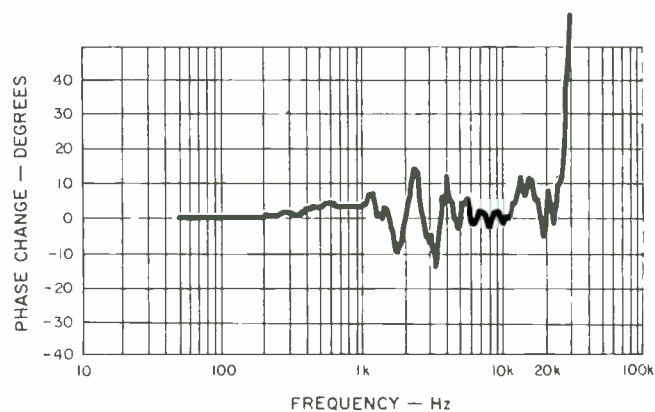


Fig. 9—Change in direct-sound phase response produced by removing grille.

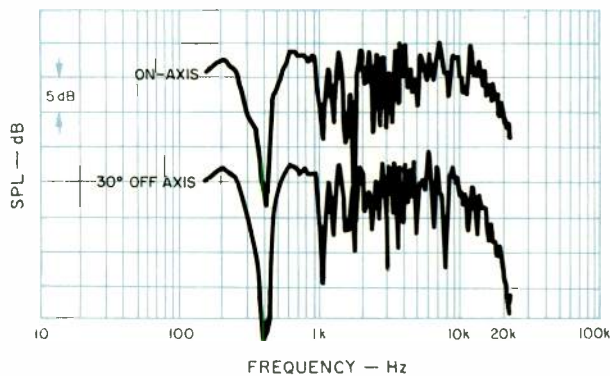


Fig. 10—Three-meter room response.

the principal problem lies. The first peak, at 9.5 mS, is the direct sound. The next peak, at 11.1 mS, is the floor reflection, and the third peak, at 12.8 mS, is the ceiling reflection. The energy level of the ceiling reflection, in the d.c. to 20-kHz band, is only 8 dB less than that of the direct sound.

Figure 12 is a measurement I make on each speaker but normally do not include in my reviews. This is the impulse response which corresponds to the ETC of Fig. 11. The ETC is the true log magnitude of the impulse response, so no new information is provided with regard to signal energy, but the impulse response clearly verifies the CS3's claim of being a coherent-source loudspeaker. The actual sound pressure of the first arrival, the floor arrival, and the damaging ceiling reflection are extremely good pulse shapes. These 3-meter sound measurements, Figs. 11 and 12, show that the CS3 should definitely not be placed directly under any overhanging shelf or near an object which can reflect

sound into the listening area. They also reveal why the CS3 sounds good on transient material, even though the normal 3-meter room measurement is quite irregular: The ear hears three rapid, coherent arrivals occurring at times related to the room geometry, instead of hearing a time-stretched smear of sound.

Figures 13 and 14 show the measured horizontal and vertical polar energy patterns. (These measurements are the normalized integral of the squared magnitude of the power spectral density, integrated over the range from d.c. to 20 kHz.) The horizontal dispersion of energy is exceptionally smooth, and remains within 3 dB over the full stereo stage. This indicates exceptionally good stereo lateralization. The vertical response is also good, showing only a small dip at 5° above the normal listening axis. It is the untamed vertical dispersion that may cause early sound interferences in some rooms. Both dispersion curves indi-

The system can handle power, but it begins to show distress at very high levels, with the bass going first. At normal levels there's no problem.

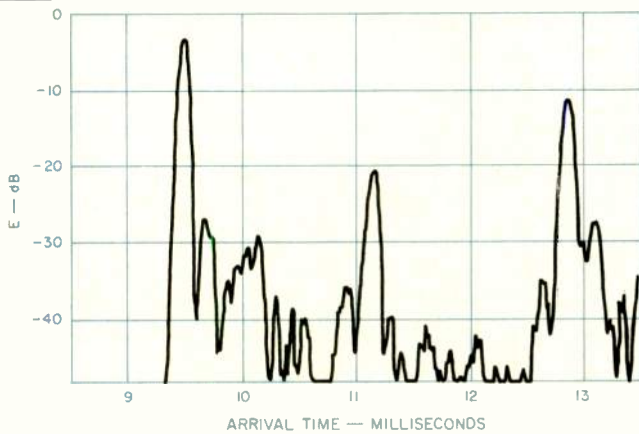


Fig. 11—Energy-time curve for 3-meter room response.

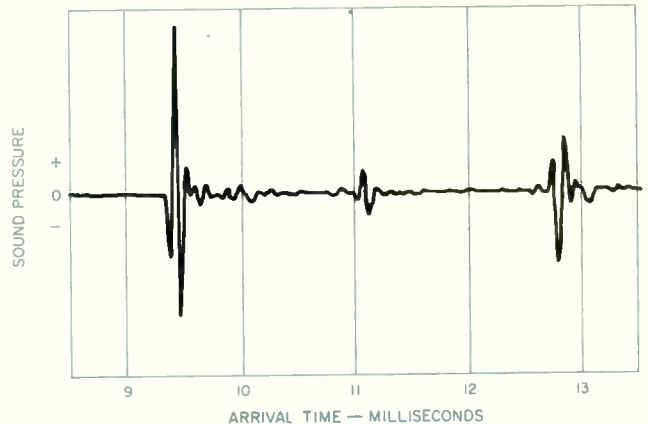


Fig. 12—Impulse response for first-signal arrivals in 3-meter room test.

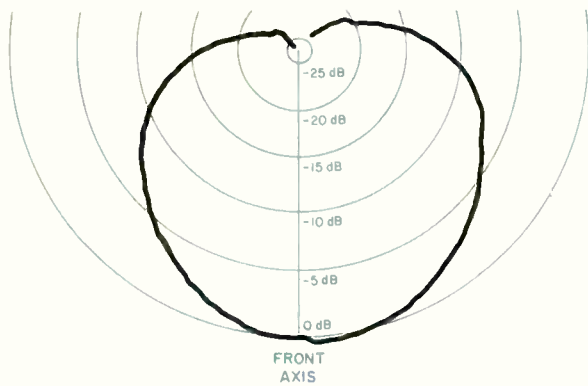


Fig. 13—Horizontal polar-energy response.

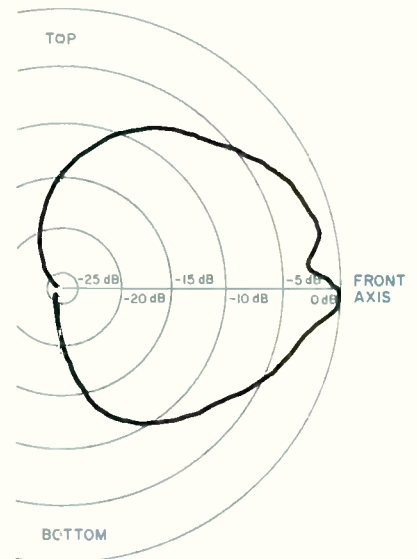


Fig. 14—Vertical polar-energy response.

cate that no acoustically reflecting object, such as a chair or bookcase, should be placed near the CS3.

Harmonic distortion for the tones E_1 , A_2 , and A_4 (41.2, 110, and 440 Hz) are plotted in Fig. 15. Distortion is quite low for A_2 and A_4 , but the low bass has higher distortion than I would like to see in a speaker of this otherwise high quality. As with the frequency measurements, the bass equalizer is incorporated in this distortion measurement. Deep bass is achieved with a penalty in the CS3; the woofer is driven rather hard—some 7.5 dB harder than mid-band, in the case of E_1 (41.2 Hz). The result is that the woofer runs out of steam when the midbass and midrange drivers are still 10 dB below their power-handling limit. In all deference to Thiel's excellent design, I recommend that a subwoofer be considered where the user desires robust sound levels—not for deeper bass, but for cleaner bass.

The measured intermodulation of 440 Hz by 41.2 Hz is

shown in Fig. 16. In this measurement, as in the previous one, the electronic equalizer causes the speaker to be driven harder at 41.2 Hz than at 440 Hz. The woofer clearly shows that it is the Achilles' heel with regard to distortion. The IM rises constantly with increasing power level. The nature of this distortion is principally amplitude modulation of 440 Hz by 41.2 Hz. At 1 average watt, the incidental 440-Hz phase modulation is 1° peak-to-peak. At 10 average watts, it is still only 2° peak-to-peak, the remainder of the distortion being amplitude modulation. This measurement indicates that high-level program dynamics may become muddled by bass modulation.

Figure 17 shows the axial ETC with the grille in place, and Fig. 18 shows the ETC with the grille removed. This is an exceptionally fine impulse response in either case, but the grille does contribute to some early scatter of sound arrival. Measurements made off-axis (not presented here) show

I was quite impressed by the overall accuracy of reproduction. The CS3 does a good job with voice and piano, and percussion is sharp and well defined.

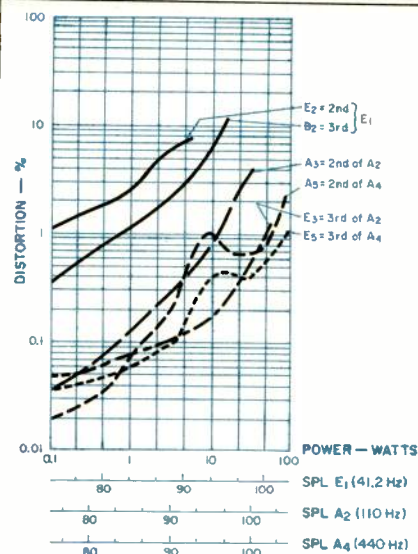


Fig. 15—
Harmonic distortion for the tones E_1 (41.2 Hz), A_2 (110 Hz), and A_4 (440 Hz).

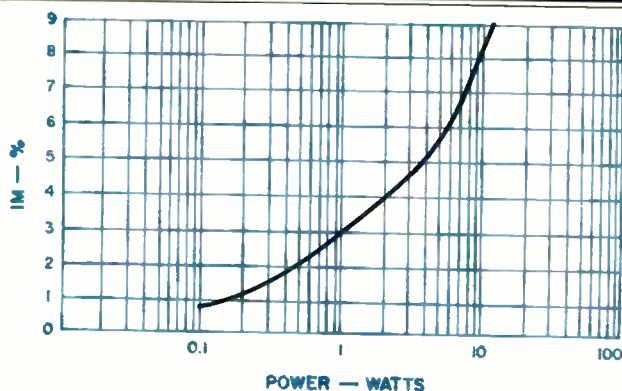


Fig. 16—IM distortion on 440 Hz (A_4) produced by 41.2 Hz (E_1) when mixed in one-to-one proportion.

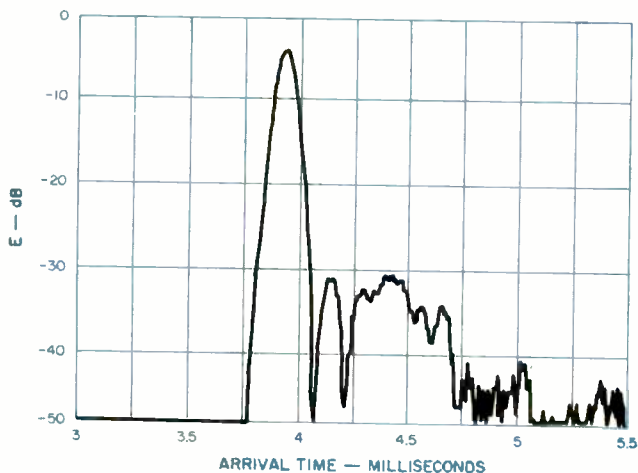


Fig. 17—Energy-time curve with grille in place.

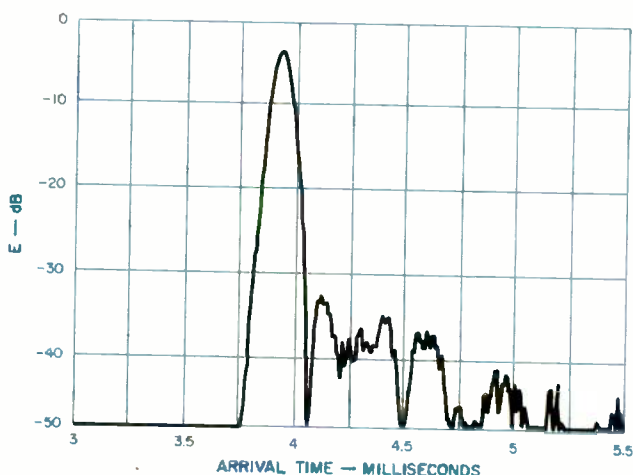


Fig. 18—Energy-time curve with grille removed.

that the effect of the grille is even more dominant at those positions. I recommend removing the grille if this is compatible with listening-room decor.

Use and Listening Tests

I was favorably impressed with the Thiel CS3's overall accuracy of reproduction. Although a bit tizzy on the top, this is one of the very few home systems I have heard which does a good job of reproducing both piano and female vocals.

To my ears, the most accurate reproduction was achieved with these loudspeakers placed about 50 cm in front of an acoustically absorbing wall and subtending a 60° angle at the listening location. I preferred the sound I got when the Thiel CS3 speakers were pointed straight ahead, putting me 30° off the front axis, and with the grille assembly removed.

The entire system is capable of handling relatively high power, but it does begin to show audible distress at very high sound levels. The bass goes first, becoming a bit muddy on really hard-driving beats. The midrange, in the octave above middle C, tends to go harsh at very high drive levels, but the tweeter hangs in there at all levels. All of this occurs at very high levels, and I had no quarrel with cleanliness of reproduction at my normal listening levels.

Low bass is there, but it is not overwhelming. Midrange is smooth, and free of obvious peakiness, to my ears. The extreme top end has a sizzle which can be tamed by pulling down the high treble on bright program material such as brass.

Stereo imaging is excellent, both in depth and lateralization. Percussive sound is sharp and well defined but a bit bright, and tends to pull forward in the stereo image.

As I said, I liked the sound.

Richard C. Heyser

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3

ESOTERIC SOUND RE-EQUALIZER

Manufacturer's Specifications

Frequency Response: 20 Hz to 20 kHz, ± 0.5 dB.

THD: Less than 0.02%.

Gain: Unity.

Maximum Input: 3.5 V rms.

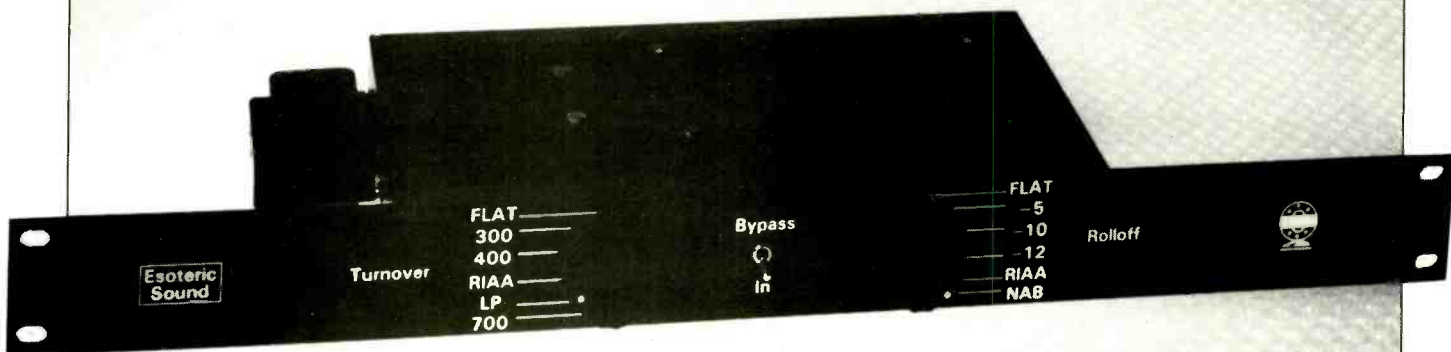
Hum and Noise: 85 dB below rated output.

Bass Turnover Points: Flat, 300 Hz, 400 Hz (AES), RIAA (NAB), LP, 700 Hz.

Treble Roll-Offs: Flat, -5 dB, -10 dB, -12 dB (AES), RIAA, NAB.

Price: \$200; optional walnut case, \$85.

Company Address: 4813 Wallbank Ave., Downers Grove, Ill. 60515.
For literature, circle No. 92



If you are nostalgic about the early days of audio and high fidelity, you will love this little product designed and produced by Mike Stosich of Esoteric Sound. If you are a newcomer to good audio, you may well wonder what a "Re-Equalizer" is, and why anyone would need one. Perhaps a few words about my own history will help to answer those last questions.

Way back in the dark ages (around 1950 and earlier), there was no standard equalization within the recording industry. By then, pretty much everyone realized that it was a good idea to cut master records with bass tones diminished in amplitude (to prevent running one record groove right into the next) and with treble tones accentuated (to get up and over the record-surface noise). The problem was that no two record companies agreed on just how much to cut the bass and boost the treble. The result was pretty chaotic. Of course, if you played records on a cheap, "low-fi" phonograph it really didn't matter much, since most of them were so far off in frequency response to begin with. But if you sought more accurate sound reproduction, it was

important that your phono preamp stages incorporated the reciprocal of the bass and treble recording equalization curves used in making the discs you played.

When I worked as a design engineer at Fisher Radio back in the 1950s, we and such other companies as H. H. Scott and McIntosh tried to provide as many of these playback curves as possible. One of the preamps that I helped to design had a total of 36 possible playback equalization settings, six for the bass end and six for the treble. And that's exactly how many playback curves you can select from with Esoteric Sound's Re-Equalizer.

There are two major differences between the old preamps I worked on and the Esoteric Re-Equalizer. First, the Re-Equalizer is not a phono preamp. It is meant to connect at a high-level point in the signal chain—between your preamp outputs and your main power amplifier inputs or in a tape out/in loop. Second, instead of providing a total playback curve, it provides the *difference* between standard RIAA equalization and those older equalization curves used to make early-vintage records. In other words, if I wanted to

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*Stereo TV sound where available. **70 watts per channel at 8 ohms, 20Hz-20kHz with 0.007% THD. †Stereo VCR required. ††Cable TV converter required.
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Sound Designer/Musician
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and III, Brainstorm,
Ice Pirates*

*Steve Gilbard—
Concert Sound Engineer,
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Credits: Madonna*

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This unit goes beyond what we did in the old days of hi-fi. It even lets you play early acoustic records and cylinders, most of which used no EQ at all!

play a modern record while the Re-Equalizer was in my system, I would set its two selector switches to "RIAA." Thus set, the Re-Equalizer would deliver perfectly flat response from input to output, just as it would if I had thrown its "Bypass" switch. The Re-Equalizer works this way because it is presumed that it will be used with a preamplifier that has RIAA equalization built in.

The Esoteric Re-Equalizer actually goes beyond what we did in the early days of hi-fi. It even allows you to play back early acoustic records and cylinders, most of which used no equalization at all! When you set the two selectors to their "Flat" positions, the unit introduces the exact reciprocal of an RIAA playback curve. Bass frequencies are attenuated while treble is emphasized, so that the *net* response (your preamp stages plus the Re-Equalizer in series with the signal) is *flat*.

Control Layout

The Esoteric Re-Equalizer's front panel fits into a standard 19-inch rack, though the actual chassis behind the panel is barely half that width. The power transformer is mounted on the outside of the chassis housing, for best signal-to-noise ratio and minimum hum pickup. There is no on/off switch; the unit consumes only 2 or 3 watts and can be left on continuously. You can also, of course, connect its power cord to a switched a.c. outlet on your amplifier or receiver. A pair of selector switches—one for the bass "Turnover" frequency settings, the other for the treble "Rolloff" settings—are located on either side of a "Bypass" toggle switch. The six positions of the "Turnover" switch are labelled "Flat," "300," "400," "RIAA," "LP," and "700." The "Rolloff" switch positions are identified as "Flat," "-5," "-10," "-12," "RIAA," and "NAB."

Circuit Description

The Re-Equalizer employs a total of two type NE5532 ICs for its four op-amp stages. Separate bass and treble equalization networks are used, with an isolating stage between them. As shown in the schematic of Fig. 1, total gain of the system is supposed to be unity. (The figures above the diagram indicate level at each stage.) Precision-tolerance components are used throughout the single, neatly laid-out p.c. board that houses all parts with the exception of the power transformer.

Measurements

The manufacturer did not specify what this unit's rated signal input level should be, so I measured distortion and signal-to-noise ratio with respect to 1 V input. Harmonic distortion measured a very low 0.006% at 1 kHz, 0.0055% at 10 kHz, and 0.0065% at 100 Hz; SMPTE-IM distortion was 0.01% for the same input level. For my signal-to-noise ratio measurements (Figs. 2A and 2B), I reduced the input level to 0.5 V in order to conform with the IHF/EIA Amplifier Measurement Standards. Unweighted S/N measured 71.3 dB and A-weighted S/N was 84.8 dB. If the input level were 1.0 V those results would be 6 dB higher.

Having finished these basics, it was time to check out the Re-Equalizer's EQ curves. Before I did that, however, I wanted to check out the accuracy of the device's own

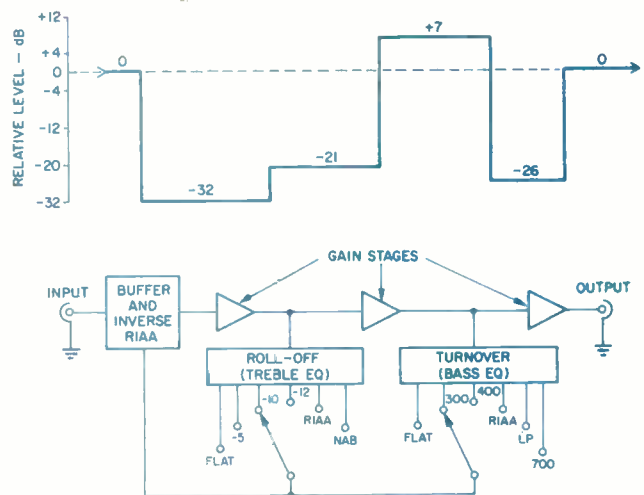


Fig. 1—Graph of signal levels (top), and block diagram (bottom) showing gain structure, stage by stage, of Esoteric Sound Re-Equalizer.

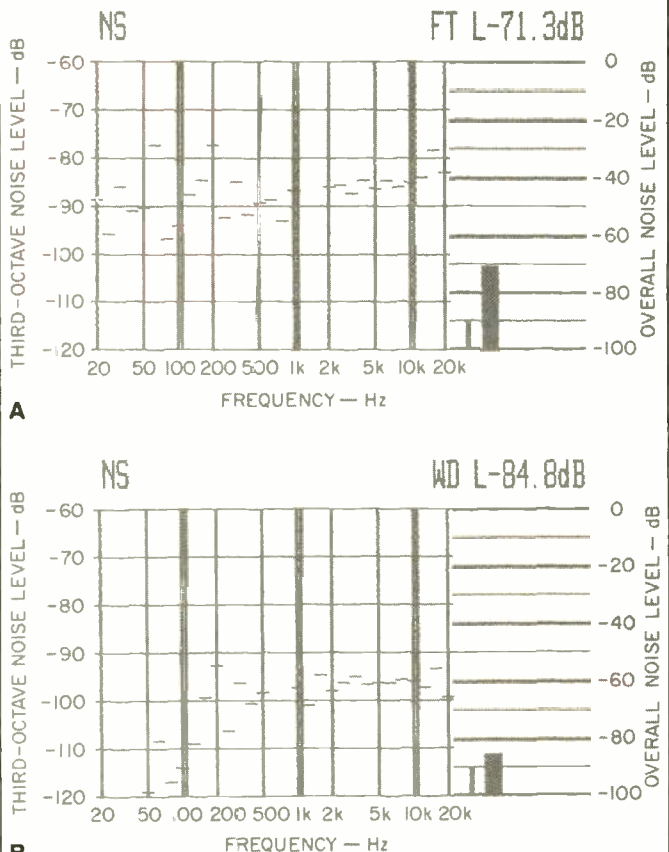


Fig. 2—S/N analysis, unweighted (A) and A-weighted (B), with 0.5 V input.

This may be one of the best investments you could make to further your enjoyment of vintage discs.

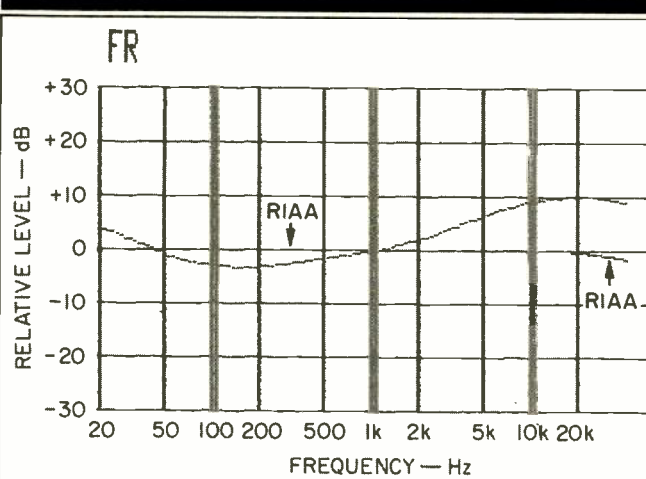


Fig. 3—Two response settings of the Esoteric Sound Re-Equalizer. With controls set to "RIAA" the Re-Equalizer's own response is close to flat (+0.0 dB at 100 Hz, +0.2 dB at 10 kHz), making this curve essentially invisible up to about 20 kHz. The other curve shows the Re-Equalizer's response with bass "Turnover" control set at 300 Hz and treble "Rolloff" control at -5 dB, one of 35 possible EQ modification settings.

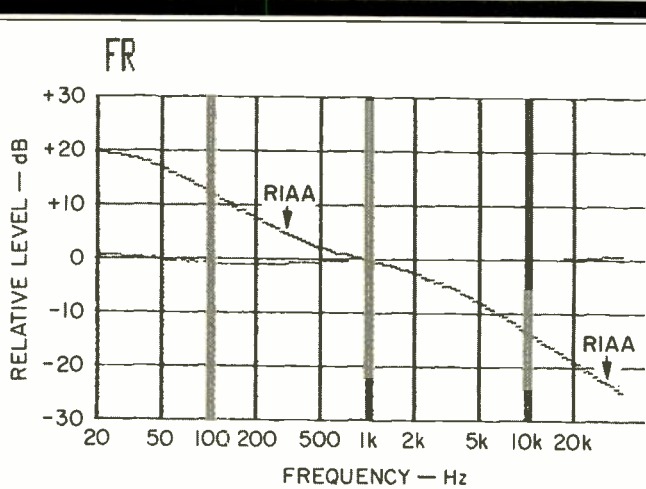


Fig. 5—Same as Fig. 4, with "Turnover" and "Rolloff" set to "Flat," essentially cancelling RIAA equalization.

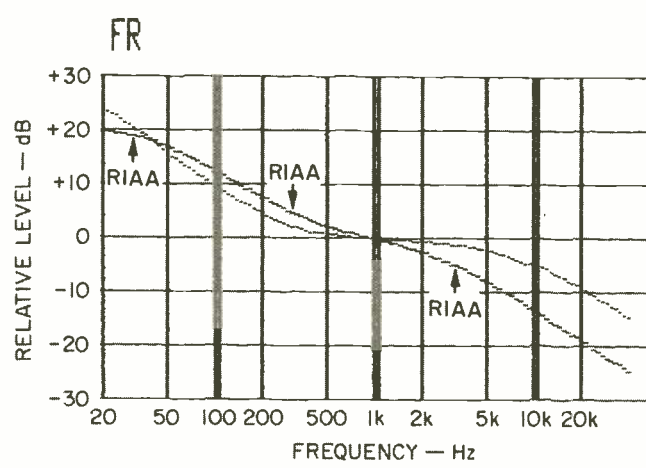


Fig. 4—Same as Fig. 3, but including effects of RIAA equalization network in an external preamp.

"RIAA" settings. As I explained earlier, since this device introduces the *difference* between RIAA equalization and other playback curves, setting both switches to RIAA should result in flat response if I feed my test signals into the Re-Equalizer *without using a phono preamplifier ahead of the device*. This plot, shown in Fig. 3, comes very close to being perfectly flat. It had a 0-dB deviation at 100 Hz and was up +2 dB at 10 kHz. To further illustrate the action of the Re-Equalizer, I superimposed another curve: A "300" turnover (bass) setting and a "-5" roll-off (treble) setting. These produced an attenuation of -2.8 dB at 100 Hz and a boost of 9.2 dB at 10 kHz.

For Fig. 4, I introduced an accurately calibrated phono lab preamplifier into the signal path so that the reference RIAA settings would produce the familiar RIAA playback curve when I fed in signals of constant amplitude. Since the basic principles of phono equalization have always been the same (at least when equalization was used), all the "vintage record" EQ curves obtainable with the Re-Equalizer resemble the RIAA curve—enough so that I had to label it, so you can tell which curve is which. Though I ran similar curve comparisons on other settings of the Esoteric Sound unit, the differences remained similarly subtle to the eye—some closer to RIAA, others showing greater differences—yet easily audible.

The one exception is the curve obtained by setting both of the Re-Equalizer's selector switches to the "Flat" position. These settings would be used for playing old acoustic disc records or even older cylinder recordings (which were made with no equalization) through a modern preamplifier. As you can see from Fig. 5, the resulting curve is almost perfectly flat. That means that the Re-Equalizer effectively cancelled the +17 dB of boost at 50 Hz and the -13.1 dB of cut at 10 kHz that the RIAA characteristic of the preamplifier would normally have supplied.

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The new ADS CD3.



Though the Re-Equalizer's audience is limited, its designers deserve credit for translating an unusual idea into a real product.

Summary

Obviously, the Esoteric Sound Re-Equalizer is not for everyone. If your record collection consists entirely of LPs that were mastered and pressed after about 1960, you won't find any use for this add-on. On the other hand, if you own many records issued from before that date, old 78-rpm records or even older LPs which do not comply with RIAA characteristics, the money you spend for one of these Re-Equalizers may well be one of the best investments you can make to further your enjoyment of those vintage recordings.

Rather than leaving you to guess what settings to use for your archival records, Mike Stosich has gone to a great deal of trouble to research just about every old record label that I know of—plus a great many that I had never heard of. (Have you ever heard of Supraphone Records, for example? Or Hit of the Week?) He has tabulated and listed the correct settings for no fewer than 90 different record labels, in four pages of the carefully prepared owner's pamphlet that's supplied with the unit. (Did you know that the 78-rpm records pressed by RCA around 1935 required a different equalization from those pressed in 1938, which in turn required a still different equalization from those made after 1948?)

In using the product experimentally in my own system, I found that none of the settings materially increased distortion readings. I did note, however, that when using the "Flat"

or "-5" settings of the "Rolloff" switch, the amount of boost introduced by the unit is substantial. (It has to be, to offset the substantial treble roll-off of the standard RIAA playback curve.) If you are playing an old record that really requires that setting, there will be no problem, since there is very little high-frequency content in such records to begin with. If, however, you simply experiment with these settings and use them with records that don't really require them, the added treble boost might well overload the device, which can't deliver much more than 3.5 V output before high distortion levels occur.

Esoteric Sound isn't going to make a fortune marketing this product. The audience is limited, and decreasing with time. But in my opinion, they have provided a very valuable product for those individuals and institutions that have rare and valuable record collections dating back to before RIAA became the world standard. Even if you knew what the differences were between RIAA and the settings you need for certain old records, you would have a hard time arriving at those required curves with any degree of accuracy using typical bass and treble controls or even graphic equalizers. Esoteric Sound's Re-Equalizer performs its task very accurately without the introduction of distortion or other undesired effects. Its designers deserve credit for coming up with an unusual and very original idea and for carefully translating it into a real product.

Leonard Feldman

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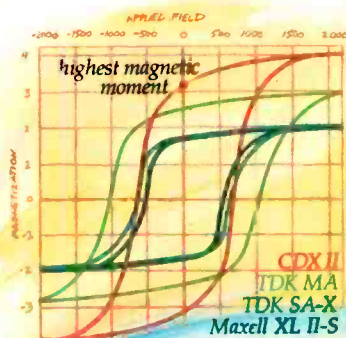
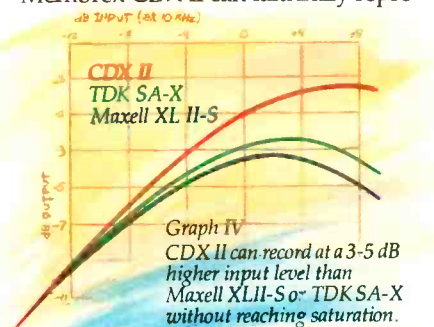
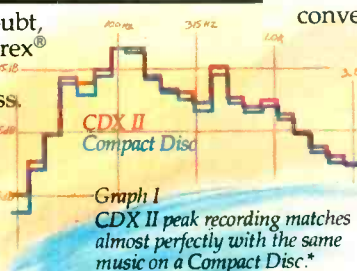
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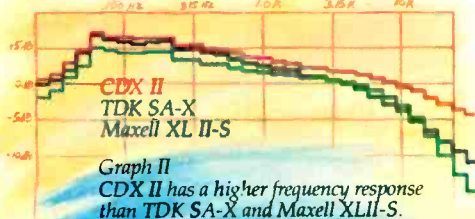
Now you can record at higher levels to minimize hiss, and still capture the loud passages, the peaks, the crescendos—without distortion or loss of high notes. In fact, you can almost capture the fantastic imaging digital discs have become famous for. But you can do it on tape. And do it with ease. Loud and clear. All at the high bias setting.

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4

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Power Output: 250 watts rms per channel continuous, 8 ohms, 20 Hz to 20 kHz; 400 watts rms per channel continuous, 4 ohms; 800 watts continuous into 8 ohms in bridged mode.

Rated THD: Less than 0.01% maximum, 250 watts rated power per channel, 20 Hz to 20 kHz.

Frequency Response: 1 Hz to 100 kHz, +0, -3 dB for 1 watt output.

S/N Ratio: Hum and noise, 100 dB below rated output, 90 dB IHF.

IM Distortion: Less than 0.01%, from 10 mW to rated output, for any combination of frequencies from 20 Hz to 20 kHz.

Damping Factor: Greater than 500 at 20 Hz, referred to 8 ohms.

Input Impedance: 50 kilohms unbalanced.

Input Sensitivity: 1.40 V for 250 watts per channel into 8 ohms.

Dimensions: Chassis, 19 in. W x 5¼ in. H x 13½ in. D (48.2 cm x 13.3 cm x 34.3 cm), including connectors; front panel, 16⅞ in. W x 7⅞ in. H (41.1 cm x 18.1 cm).

Weight: 50 lbs. (22.7 kg).

Price: \$1,450.

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The Canadian-built Bryston 4B is a Class-AB2, solid-state, stereo power amplifier which is rated at 250 watts per channel into 8-ohm loads, 400 watts per channel into 4-ohm loads, and 800 watts, bridged, into 8 ohms. Physically, the unit is rack-mountable and rather small for a Class-AB unit. It has been designed to run cool without an internal fan, which is made possible by using the entire chassis (over 1,500 square inches!) as a finned heat-sink.

The 4B was first produced in 1976. Since then, there have been only a few modifications and a small increase in price, which shows Bryston's product stability. The amplifier's reputation for ruggedness and reliability has resulted in acceptance by recording engineers and touring musicians, while

its reputation for good sonics and an ability to drive difficult speaker loads has made it a hit with audiophiles. Our colleagues in the Audiophile Society (Westchester, N.Y.) favor this amplifier because it sounds good with their Plasmatronics, Jung/Randall Research-modified Dahlquist DQ-10s, and Snell Type A speakers. Recently, Bryston has designed a new output stage for the 4B, which makes it a good time to review the amplifier.

The Bryston's physical appearance adheres to the traditional military-black, "thermal monolith" design, with heat-radiating fins covering the amplifier's sides and part of its back panel. The heat-sink fins are rounded and have no sharp corners or edges. The front panel features dual-color

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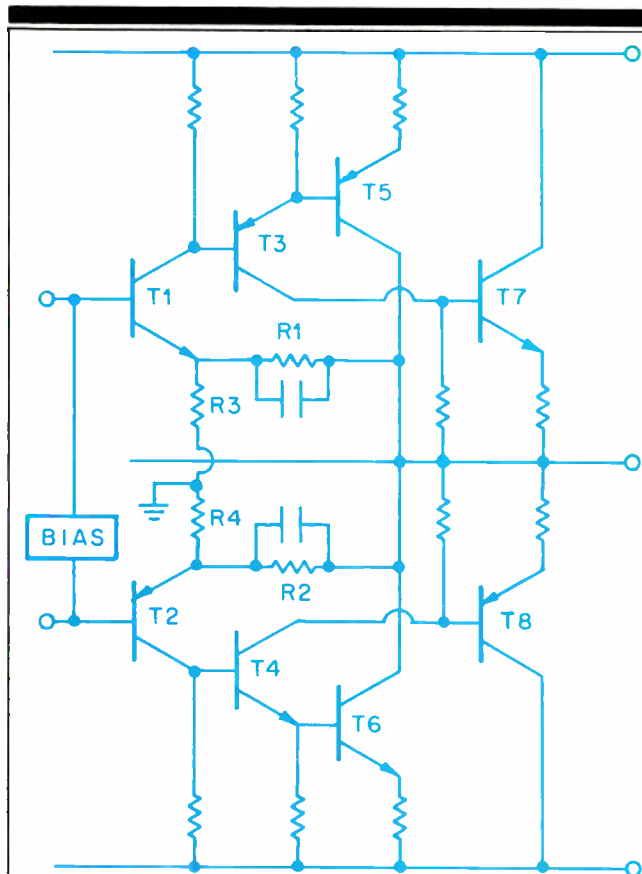


Fig. 1—Circuit diagram, output stage, Bryston 4B amplifier. Note that both polarities of the output transistor are used on each half of the output waveform.

transformers are located inside, near the front panel, where they are best supported in rack mounting. Chassis aluminum is either 0.048 or 0.125 inch thick, depending on structural needs. The quality of finish, machining, and assembly is up to the best instrument standards. We are delighted to see that Bryston uses threaded steel inserts and Robertson machine screws to attach removable panels instead of the more common (and less expensive) sheet-metal screws. All internal screws and fasteners are treated with locking thread-sealer for structural integrity and vibration resistance. Output transistors and drivers are mounted in vertical groups of three to the sides and back of the chassis. Connections are picked up on the inside by sockets soldered to p.c. boards. One p.c. board in each channel spans two vertical groups and contains the amplifier drive circuitry. The other two "socket boards" are hard-wired to this drive board. Lead lengths are short, desirably, but it struck us that replacing a small circuit-board component would entail the removal of six transistors coated with thermal grease—a messy and time-consuming job. Bryston, however, points out that the amplifier's construction allows the entire board assembly for each channel to be removed for replacement (some dealers even stock these modules), or for low-cost shipping to the factory for service. Should field service be necessary, they say, the boards' plated-through holes allow components to be removed in the field from above the board; this is still hard to do, we've found, on the equipment we have tried servicing that way. In any case, these details of construction reflect Bryston's philosophy of performance first, cost second.

The 4B is a dual-mono design, with separate power supplies for each channel, on a single chassis. Its two completely separate amplifiers are arranged symmetrically to either side of an imaginary front-to-back line. Every part is duplicated, with the exception of a single power cord and a single input/output, bridging-circuit board. Two large E-I core transformers fill the front of the chassis. Four 10,000- μ F filter capacitors (two per channel) stand toward the chassis rear, just in front of the back panel.

Each channel uses an open trimpot, presumably for a one-time adjustment of bias. Airborne contaminants are bound to collect on the resistance track, since the trimpot sits in the updraft between the bottom- and top-panel ventilator slots. Should the bias need future adjustment, the technician in our shop suggested that using a good contact cleaner might be necessary to get a reliable second-time setting.

Even though the unit is small compared to other conventional amps that deliver 200 watts per channel, the inside is neat, with adequate room for cooling and repairs. The driver boards and the input board use gold-plated board-edge connectors. In a wise design move, only power wiring uses the 1/4-inch push-on connectors; signal-bearing lines do not. Soldered and "gas tight" mechanical connections, which we prefer, are used for Bryston's signal circuits. Clip-in, 8-ampere a.c. backup fuses are hidden deep in an area that is not user-serviceable, to prevent damage to the amp from audiophiles who install 30-ampere car fuses in the line sockets to "get more current" out of their amplifiers. Point-to-point wiring is neatly dressed. The circuit boards them-

LED pilot lights, one for each channel. These remain green while the unit is powered, and flash red at clipping. The power on-off button is the only front-panel control. The rear panel contains gold-plated signal-input connectors and five-way speaker binding posts, the mono/stereo switch, a ground isolation switch, fuse-holders for two 7-ampere a.c. fuses, and the line cord. The Bryston employs an unusually heavy, nondetachable, coiled line cord.

Construction

The quality of Bryston's chassis construction appeals to us. The front panel is composed of two 1/8-inch sheets of aluminum, sized for a standard rack. Two large power

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The amp's newly designed output stage yields 6 dB less distortion than the previous model, and can drive low-impedance loads with less difficulty.

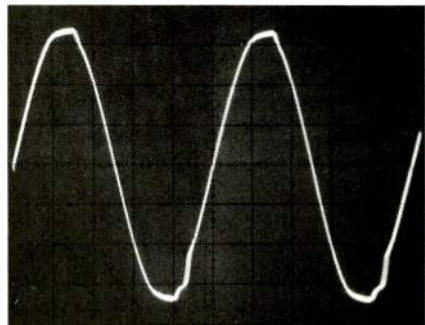


Fig. 2—Response at clipping for large-signal, 20-kHz sine wave and 8-ohm load. Slight "sticking," a source of extra distortion at clipping, can be seen as the trace leaves the flattened peak area. Scales: Horizontal, 10 μ S/div.; vertical, 20 V/div.

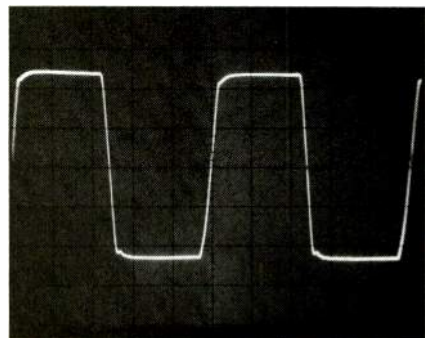


Fig. 3—Response to a 20-kHz square wave, when delivering 250 watts into 8 ohms. Scales same as in Fig. 2.

selves are high-quality epoxy-glass, double-sided with component-designator screening. Parts are well secured and run cool; they are specified for continuous duty, with typical safety margins of 250%. Mean-time-before-failure (MTBF) ratings on the filter capacitors are several times longer than the typical ratings found in home amplifiers, Bryston claims. Factory burn-in consists of a square-wave input signal driving the amplifier into a capacitive load, slightly under clipping, for 100 hours, with a 3-hours-on/1-hour-off cycle. Such procedures "mature" the components inside the amplifier

and uncover any marginal parts that might fail from thermal stress. After these reliability checks, the amplifier is bench-tested, and the results are listed on a sheet packed with the product. These procedures yield an amplifier likely to provide many years of maintenance-free service.

Circuit Description

The circuit of the 4B incorporates much of the design philosophy that Bryston applies in building bipolar, solid-state amplifiers. For example, the double-complementary differential input circuit gives the stage great linearity by negating distortion products with subtractive cancellation. The input stage presents the preamplifier with a high (50-kilohm), linear input impedance. This stage cross-couples the input transistors, which then can supply the bias current for d.c. equilibrium, resulting in a near-zero inherent d.c. offset voltage. This first stage exemplifies Bryston's design goals: To achieve wide-band transient accuracy and open-loop linearity.

Bryston recently introduced a new output-stage configuration which exhibits a number of advantages over the popular complementary bipolar, unity-gain Darlington design. As shown in Fig. 1, the new circuit combines emitter- and collector-output devices for both pull-up and pull-down. It allows the base-drive current from the driver transistors (T3 and T4) to do double duty. Although each pull-up or pull-down pair of output transistors are in parallel insofar as the power-delivery current is concerned, their base terminals are connected in series. This means that the base current supplied to T7 comes from T5 (via T3) and is not merely split between the two bases as it is in the parallel connection. This configuration essentially eliminates any small asymmetry in the zero-crossing region, since both polarities of output transistor are active at all times. Everything else being equal, driver transistors T3 and T4 will be called upon to supply exactly half the base current required in standard configurations, as well as one-fourth the junction-capacitance charging and discharging current. Gain of the output stage is set by the sub-circuit involving resistors R1 through R4. Transistors T5 and T7 comprise the "pull-up" output devices (one of each sex), and T6 and T8 make up the "pull-down" pair.

There are a few easily skirted disadvantages to this new output stage. Placing the base-to-emitter voltage drops of the output transistors in series results in a 1.5-V loss in clipping output voltage; the new 4B has a slightly higher rail voltage to compensate. In addition, this design demands output devices with matched betas, so such parts are hand-selected.

Chris Russell, Bryston's main designer, reports that this new design results in a 6-dB reduction in across-the-band distortion, particularly in the upper harmonics. In addition, the output stage is more tolerant of loading than the previous design, and can drive low-impedance loads with less difficulty. Russell reports that the elimination of all zero-crossing anomalies, particularly notch distortion, means that the new 4B displays a distortion spectrum similar to that obtained with Class-A biasing. Open listening tests, always a part of Bryston's research, reveal for Russell an amp with less veiling than alternative designs.



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Speed, huge transient attack, and powerful bass response were our first subjective impressions. This amp has dynamic range to burn.

Measurements

Each power supply uses an oversized transformer, a 25-ampere bridge rectifier, and two 10,000- μ F electrolytic capacitors having 128 joules of energy storage per channel. Potentially noisy fans have been eliminated from the design. Rail voltages are ± 80 V d.c. The power supply, while not electronically regulated, is a "stiff" design. It makes severe demands from the 167-V peak of the 60-Hz, 120-V a.c. sine wave, rather than drawing current over a more substantial percentage of the cycle. This required that we revise our usual testing technique, to maintain peak (rather than rms) line input voltage. No consumer power line is likely to perform in this manner, but then, the consumer is not likely to need (or want) continuous delivery of this level of power to speakers.

The 4B was first run for one hour at 33% of rated power, or about 83 watts per channel into 8-ohm loads with a 1-kHz test signal. The chassis top became warm, but the amplifier didn't thermally shut down.

Voltage gain was found to be 30.1 dB into an 8-ohm load. The IHF sensitivity for 1 watt into 8-ohm loads at 1 kHz was 88.4 mV.

Power output was measured from 20 Hz to 20 kHz into a variety of load conditions, as shown in Table I. At 0.1% THD, minimum continuous power output per channel was 269 watts (46.4 V) into 8 ohms and 286 watts (33.8 V) into 4 ohms. Bridged (mono) operation resulted in a minimum continuous power output of 348 watts (52.8 V).

Bryston does not give distortion or bandwidth limits for power ratings at 4 and 8 ohms in the bridged mode. We arbitrarily selected a very stringent 0.1% distortion limit, and the amplifier came close to its ratings in mid-band. Over the full audio band, and using our distortion limits, the amplifier put out less continuous power at the frequency extremes. Allowing for a little higher distortion, the 4B would have easily met its continuous ratings. The amplifier performed very well at 8 ohms, with ample reserves to handle an occasional impedance dip down to 4 ohms.

As Table II indicates, at rated output power, the maximum total harmonic distortion plus noise (THD + N) was 0.0055% for 8-ohm loads (at 40 V). Measurements at lower levels all indicated lower distortion.

When brought to clipping level at 20 kHz, the waveform flattened on top and bottom, as expected. This happens in all amplifiers when the output transistors have pulled the load up or down to the power-supply voltages or "rails." The Bryston, like most other amplifiers, once brought to the rail voltages, tends to "stick" there for a few microseconds before jumping back to the proper waveform. This effect is shown in Fig. 2, where sticking generates an excess of distortion at clipping. The sticking lasts only a few microseconds per cycle, so its effect is greater at high frequencies, where it occurs for a greater portion of the cycle. A very high current may flow through the output devices during the sticking period. The saturated transistor (the one that pulled the load to its supply rail) does not unsaturate instantly, even though the drive to it is removed. Before it can let go, feedback may tell the opposite transistor to pull the load toward its rail voltage. Thus, for a few microseconds, both output halves can be pulling against each other. At 20 kHz

Table I—Maximum power output (watts) at 0.1% THD + N.

Freq., Hz	8 Ohms		4 Ohms		8 Ohms, Bridged
	Left	Right	Left	Right	
20	284	278	331	359	659
200	294	292	363	402	718
2k	300	298	361	414	707
20k	273	269	210	286	348

Table II—THD + N (%) at rated output, 8 ohms.

Freq., Hz	Left	Right
20	0.0020	0.0025
200	0.0017	0.0019
2k	0.0020	0.0022
20k	0.0048	0.0055

or higher, this simultaneous conduction can suddenly double the current drawn from the power line as the amplifier just begins to clip.

The 4B recovers from clipping very quickly, but traces of sticking can still be seen. Bryston says that a pre-clipper circuit could have been designed into the 4B to prevent output-stage clipping, hence sticking and simultaneous conduction. It was decided, however, that the decreased maximum power output would be a greater sacrifice than the small amount of sticking. After all, if the user operates the amplifier below clipping, there is very little distortion of any kind. The twin clipping indicators on the front panel are most helpful in this regard.

The IHF signal-to-noise ratio (which is A-weighted noise referred to 1 watt output into 8 ohms) measured 87.8 dBA for the right channel and 86.6 dBA for the left channel.

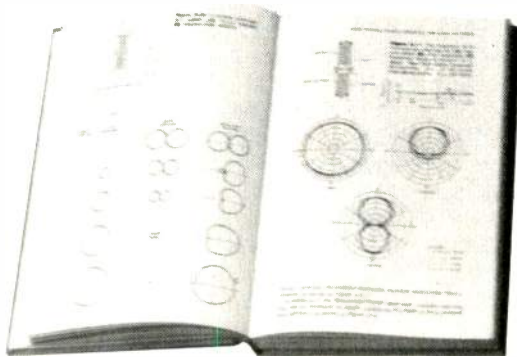
Crosstalk versus frequency was measured by driving one channel and measuring the leakage into the other, with the unused input terminated by a 1-kilohm resistor. Crosstalk was found to be better than -80.5 dB from 20 Hz to 10 kHz, peaking to -73.2 dB at 20 kHz in the left channel. These figures are good, a testimony to the dual-mono design.

Figure 3 illustrates the 4B's square-wave response at rated power, 250 watts per channel into 8 ohms at 20 kHz. The rise-time is 3 μ S. The slew rate measured 24 V/ μ S up, 27 V/ μ S down, asymmetrical. This improved to 30 V/ μ S up, 40 V/ μ S down when the amp was grossly overdriven by a 1-kHz square wave. IHF slew factor into 8 ohms was 3.9 (77.3 kHz). Adding a 1- μ F capacitor caused the expected ringing of the output network, with a 0.2-dB increase in sine-wave output at 20 kHz, but no instability.

Measuring the 1-watt frequency response into 8 ohms showed the amplifier to be within ± 0.1 dB from 20 Hz to 20 kHz. The high-frequency -3 dB point was at 145 kHz, and the low-frequency -3 dB point was at 0.27 Hz. Input impedance for the 4B proved to be somewhat frequency-

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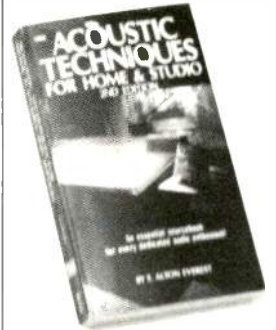
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**We find the Bryston 4B
to represent good quality,
high reliability, and
elegance of engineering.**

dependent, measuring 48 kilohms at 1 kHz and 36 kilohms at 20 kHz.

The low-frequency damping factor was measured at 460 for 8 ohms, and the wide-band damping factor was measured at 27.6 for 8 ohms. Dynamic headroom measured 1.0 dB (42.3 V, 315 watts) at a pulsed clipping from a steady-state level of 250 watts rated power into 8 ohms. The 4-ohm IHF headroom was 0.36 dB (47 V, 435 watts). The bridged 8-ohm IHF pulsed power output reached 0.66 dB (86.3 V, 930 watts). These figures indicate a power supply with voltage regulation that is tighter than usual.

Our standard test of peak output current utilizes a 20-mS pulse (repeated at a 0.5-S rate) driving one channel of the amplifier into a 0.1-ohm load. Under these conditions, the 4B delivered 17.1 amperes rms for the right channel and 16.3 amperes rms for the left channel, before clipping. This places it in the high-average range, among today's high-powered amps, for instantaneous rms current delivery.

If more than one 4B is used in a system, they should be turned on in sequence rather than simultaneously. This is true for most high-power amplifiers that don't contain turn-on surge-limiting circuitry. The amplifier's heavy turn-on surge can trip household circuit breakers, as co-author Clark found when he turned on his home system, which then contained a Dyna 410 as well as the Bryston 4B.

Use and Listening Tests

Equipment used to evaluate the Bryston 4B included a Linn Sondek turntable with a Magnepan Unitrac 1 arm, Accuphase AC-2 moving-coil and Shure V15 Type V-MR cartridges, Philips Compact Disc players, a Mark Levinson ML-7 reference preamp, Mark Levinson ML-9 and Tandberg 3009A solid-state power amps, and Jung/Randall-modified Dahlquist DQ-10A loudspeakers. Clark auditioned the Bryston in his home system and in his dedicated listening room. The amplifier was interfaced with a number of systems, including Fried Studio IV speakers. An ABX Co. double-blind comparator was used to compare the 4B to a pair of mono Tandberg 3009A amplifiers using the Fried speakers. Hitachi oxygen-free speaker wire was used during testing by both authors.

The 4B was auditioned by co-author Greenhill on the Dahlquist speakers. First subjective impressions with this amp were of speed, tremendous transient attack, and powerful bass response. The amplifier has dynamic range to burn. Greenhill could not believe the 105-dB peaks his Dahlquists delivered re-creating the helicopter landing (in the living room!) during the opening of Pink Floyd's "The Happiest Days of Our Lives" (from *The Wall*). Unlike other amps, the Bryston, its clipping lights flashing, produced enough directional cues so Greenhill could track the gunship coming in from the north, hovering over the right speaker, and finally setting down behind the left Dahlquist! We credit this ability to localize sounds precisely, even at high volume levels, to the 4B's excellent channel separation; Greenhill's favorite big amps, the Levinson ML-3 and Krell KMA-200, are also dual-mono systems. The 4B decoded percussion and voice with uncanny accuracy, bringing an eerie clarity to Stevie Nicks' vocals on "Sisters of the Moon," from Fleetwood Mac's *Tusk*.

The reference Levinson ML-9, though very comparable in the midrange and equally detailed in the highs, could not match the Bryston's field depth. We attribute this to the 4B's dual-mono design. On the other hand, the Levinson outstripped the 4B in deep bass, yielding more solidity and impact on CD bass-drum notes. The front-panel indicators flashed frequently as we subjected the Bryston and a number of other amps to the best bass Telarc CDs could deliver, and the 4B produced the bass pulses with little evidence of audible clipping.

Clark too was impressed by the amplifier's clean power in his open evaluation, but the accurate clipping indicators served as a visual reminder that 250 watts per channel is not always enough. Clark uses the Sheffield Drum Record (Sheffield Lab 14) to check large power amplifiers in his dedicated listening room. This record's closely miked drum kit reaches high peak sound pressure levels (115 to 120 dB at 10 feet) if the proper sonic perspective is maintained. Attempting to reproduce these levels through moderately sensitive Fried Studio IV loudspeakers invariably results in amplifier clipping. With the 4B, the onset of clipping was inaudible, signalled only by the blinking of its clipping indicators. Even when the clipping lights flashed often, the only audible difference was a softening of drum attacks.

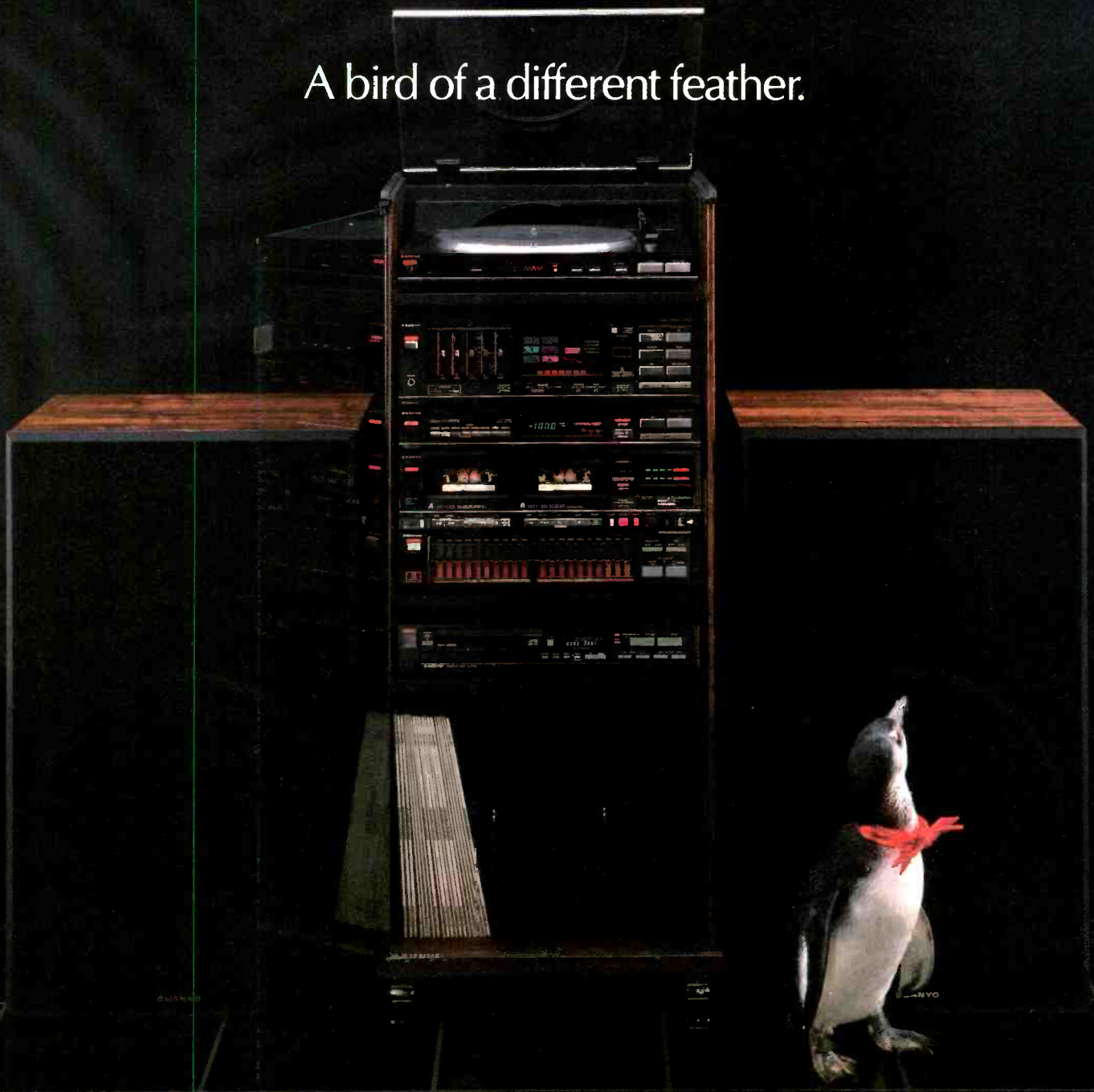
Subjectively, Clark found the Bryston's sound cool and analytic. Later, he wondered if his sonic perceptions might be biased by visual reactions to the 4B's styling. Other than the friendly logo silk-screened on the front panel, he found the black, metallic 4B businesslike and rather featureless. Luckily, he was able to test this potential reviewing bias with a pair of Tandberg 3009A mono amplifiers. These amps have sexy Scandinavian styling (rosewood side panels) and easy, sparkling sound to match. After living with the Bryston and Tandberg amplifiers for more than two months, Clark made 16 identification attempts over a 1½-hour listening session, and was correct in 12 out of 16 tries, which we consider significant. Clark tried to replicate this feat, but achieved only seven correct identifications out of 16 trials during his second attempt. Hooked up for a level-matched, double-blind comparison, Clark did not believe he could tell which amplifier was playing.

The Bryston operated smoothly during all bench and listening tests. No turn-on or turn-off thumps were present. The ABX comparator's switching relays caused no problems with the Bryston's protection circuitry.

In summary, we find the Bryston 4B to represent good quality, high reliability, and elegance of engineering design. The front panel's very desirable clipping indicators are essential for preventing audible distortion and speaker damage from intense clipping by this very powerful amplifier. The controlled tests were unable to demonstrate with high significance a sonic difference (below clipping) between the Bryston and the Tandberg 3009A, confirming Clark's belief that most well-designed amplifiers today differ little sonically. Greenhill's subjective impressions of the 4B continued to be highly positive about the amp's channel separation, superb dynamic range, and outstanding midrange detailing—even when these subjective impressions weren't confirmed by Clark's double-blind, A/B/X-controlled procedures.

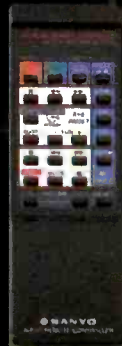
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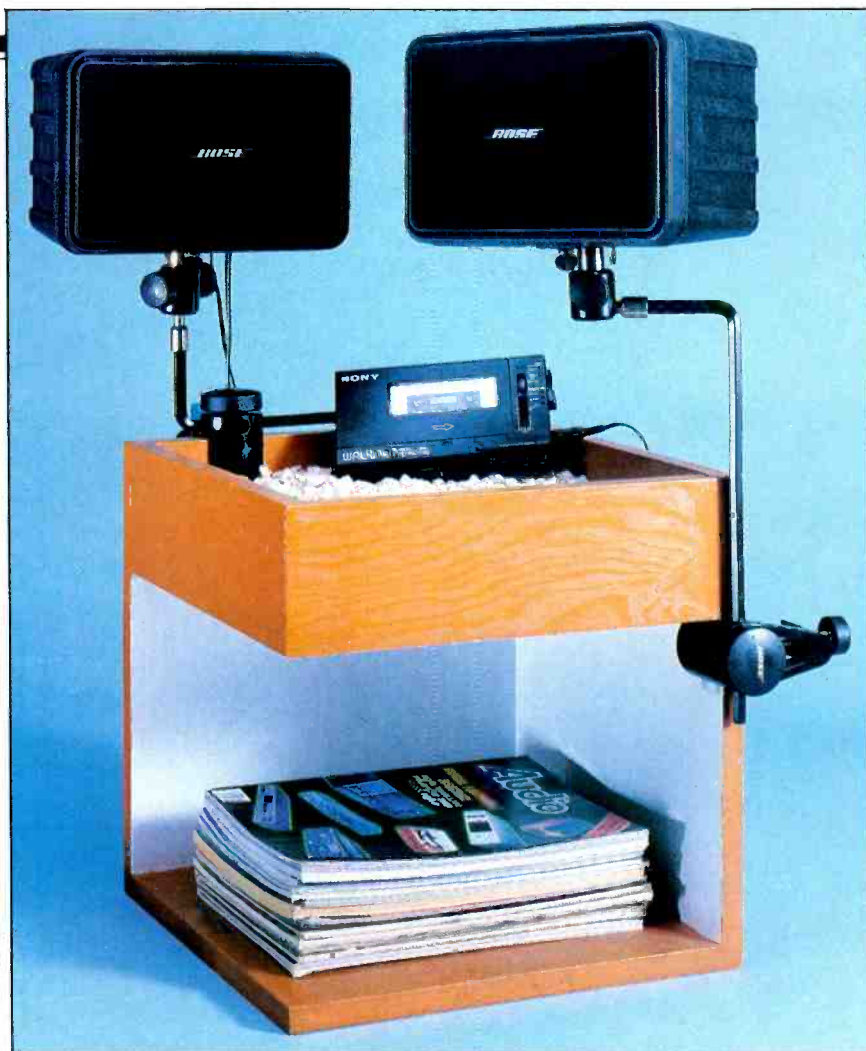
We're not always fortunate enough to be able to choose our own roommates. When I reached the exalted state in the U.S. Army (as a senior NCO) which entitled me to share a two-man room at the end of the barracks, my roommate turned out to be another sergeant, who—in off-duty hours—played trumpet in the outfit's jazz band. He was decent enough not to practice in our room (at least when I was there), but his gigs often lasted well past normal bedtime, and many a night he would return and jolt me awake as he groped around the room and finally hit the sack.

This happily brief interval in my younger days soured me on the whole idea of a roommate unless it was one of the opposite sex, chosen by me. Understandably, then, it was with some misgiving that I contemplated a package recently arrived from the Bose Corp. which displayed, rather prominently, the word "RoomMate." What now? A miniature android who played the trombone?

Then I remembered. At the 1984 Summer CES in Chicago, Bose had demonstrated a new amplified stereo-speaker system called the RoomMate, and this package must be the product reaching the market. A whole new scenario unfolded in quick-time, to wit:

Here is this jogger, or pedestrian, or bicycle rider or skater, moving through the temporal world seeking refreshment for the soul as well as refurbishment for the sinews. He or she achieves the former by listening, via lightweight stereophones, to a personal stereo set of the Walkman type. He or she arrives home, the body tired but the spirit stimulated, seeking more of the musical magic that permeated the peregrinations. But, of course, it is time to doff the stereophones, and so the music is muted.

Except it need not be. Enter the Bose RoomMate, which enables him or



her to continue hearing the music from the personal set by filling the room with clean, wide-range, well-imaged stereo.

The trick is accomplished by a self-amplified speaker system whose input matches the impedance and signal levels provided by the personal stereo rig, or indeed any signal normally intended to drive headphones. (The RoomMate has an input impedance of 33 ohms, and some 90 to 100 mV of signal will drive it to full output.) This makes the RoomMate eminently suited to be run from the headphone outputs of tape decks, receivers, preamps, TV sets, and even CD players. Most of these require a plug adaptor to convert their own standard, 1/4-inch jack to the 3.5-mm mini-jack needed by the RoomMate's signal cable; such adaptors are available from Bose or from audio dealers. The RoomMate does

come with a stereo-to-mono mini-adaptor which is especially useful for jacking into the mono headset output of television sets.

The RoomMate is a two-piece system; one of its speakers also houses the built-in stereo amplifier that drives both units. The amplifier is rated at a nominal 4.5 watts per channel, which translates to sound output of 95 dB SPL, according to the specifications, with 6 dB of amplifier headroom permitting peaks up to 18 watts, or 101 dB SPL. In practice, I got a maximum clean SPL of 100 dB with *steady-state* signals, a bit better than specified. I found response to be linear within ± 3.5 dB from 150 Hz to 16 kHz, sloping off at 12 dB/octave below 150 Hz and with useful output down to about 40 Hz. Above 16 kHz, response rolls off, but energy remains out to 20 kHz.



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Reproduction provided with the more demanding sources was a surprise, giving new meaning to the notion of big sound from small speakers.

Between the volume control on whatever sound source you're using and the sensitivity switch at the back of the powered RoomMate unit, you can achieve any comfortable listening level you want. The drivers used here, by the way, have good genealogy—they use a magnet structure similar to that found in Bose's top speaker system, the 901. Here, this powers a 2-ohm ribbon voice-coil driving a 4½-inch diaphragm.

The units (each is 9 × 6 × 6 inches) can be plunked down wherever convenient and separated by nearly 8 feet via the interconnecting speaker cable. Optional mounting accessories include wall brackets (\$19.95 per pair) and a "universal joint" arm and bracket for positioning the speakers just about anywhere (\$39.95 per pair). A travel bag (\$29.95) is also available. The basic RoomMate system costs \$229 and weighs 12½ pounds.

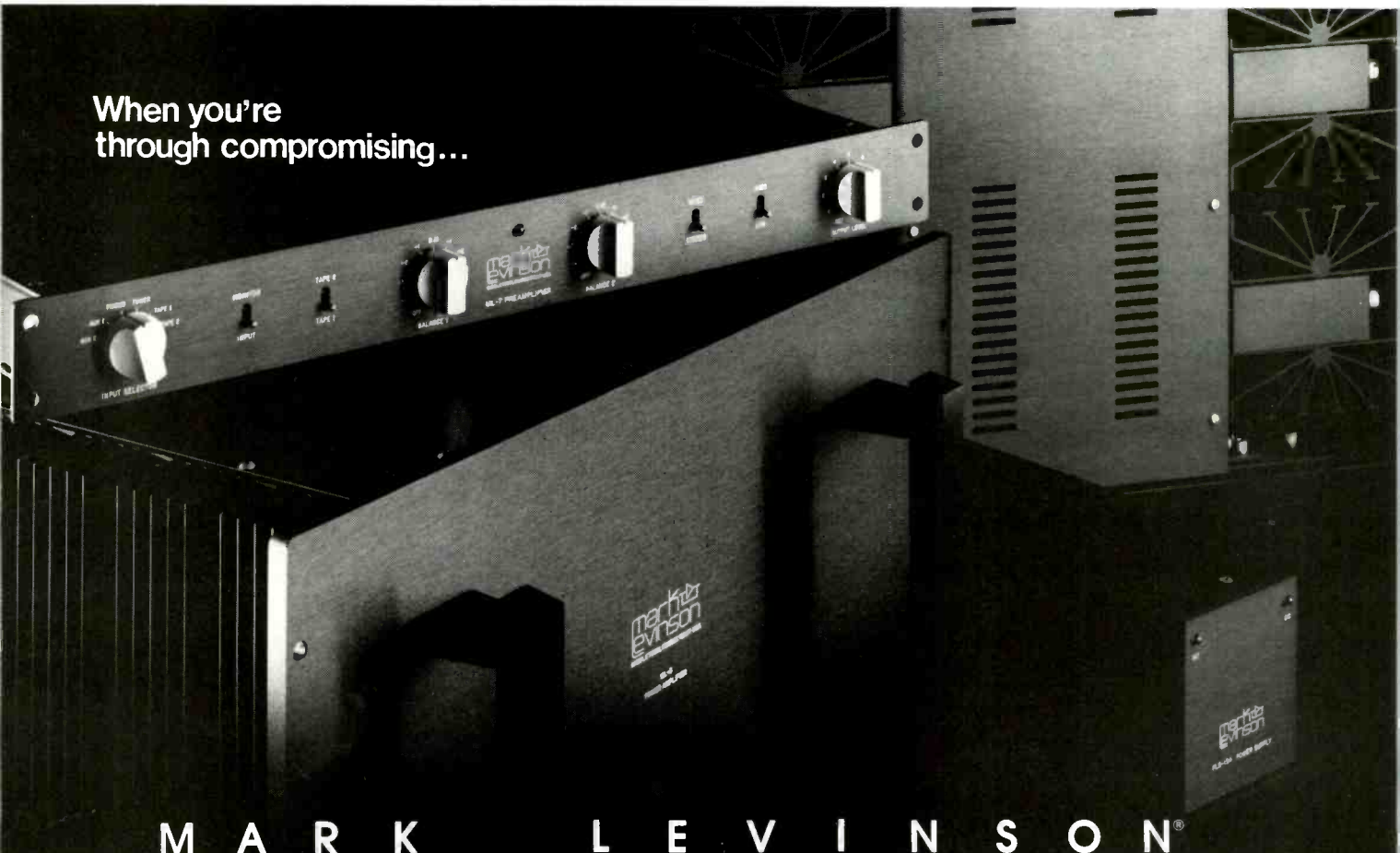
To get acquainted with my new roommate, I ran the stereo pair from

various sources, including a deluxe preamp into which were connected my turntable, CD player, tape deck and FM tuner. In each case, the results clearly demonstrated that the RoomMate need not be limited to sound from TV sets or Walkman-type petites. The reproduction provided on the more demanding sources was a pleasant surprise, giving new meaning and practicality to the notion of big sound from small reproducers. You can, in other words, use this RoomMate not only to enhance sound from a TV or personal portable, but also to set up a decent stereo system in any situation that precludes the use of a separate amplifier and/or larger speakers. And if you are using full-scale amplification and full-size speakers, the RoomMate units, running off your headphone output, can serve as added speakers for center-fill (if your main speakers are fairly far apart) or as side "flankers" (if your main speakers are fairly close to each other).

These possible applications notwithstanding, the new RoomMate has become my new roommate, literally, to enhance the audio portions of TV programs viewed on a color set in my bedroom. Thanks to the broadened sound spread and the cleaner and wider range spectrum provided, a lot of TV sound has become more listenable. Those old *Star Trek* reruns never sounded so good: When Capt. Kirk orders "Warp 1," there's a swelling of low-frequency power that at last sounds like the *Enterprise* (or at least what I always felt a starship *should* sound like), rather than a weak imitation of the Eighth Avenue subway. When Quincy pleads for more time on a case, there's real pathos in his voice instead of a puerile whine. Even the commercials offering Pavarotti recordings sound good enough to listen to.

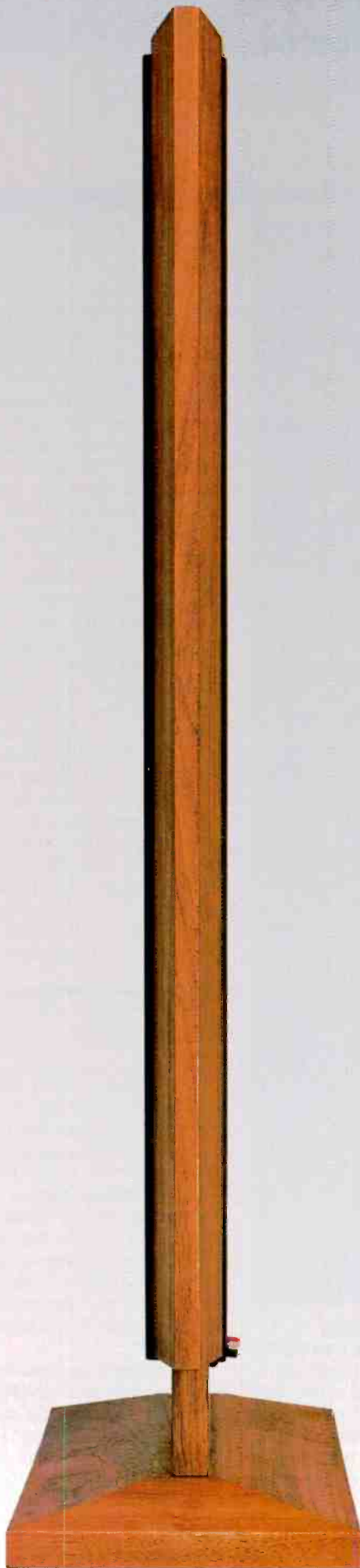
And, wonder of wonders, my distaff roommate does not object to the new RoomMate. Fact is, she's as nuts about it as I am. *Norman Eisenberg*

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ROCK/POP RECORDINGS

MICHAEL TEARSON
JON & SALLY TIVEN

LOWE AT NEW HEIGHTS



Rose of England: Nick Lowe
Columbia AL 39958.

Sound: B Performance: A

Nick Lowe is out of fashion and desperately in need of a hit, and he has finally responded to the pressure. He has gathered his forces and made a record so fine that one is willing to forgive his flops, his misconceived

projects, and his nasty words for ex-partner Dave Edmunds. We can barely believe an album this fine could come from Lowe, whose recent work has seemed uninspired and contrived. When it comes to pure, unadulterated rock 'n' roll albums, laced with simple charm, this is right up there with John Fogerty's *Centerfield*.

"I Knew the Bride" was always a fun

song, but this somewhat souped-up version, with Huey Lewis adding his special touch, betters the Edmunds original. The production on the album is Lowe's strongest ever, with rich drum sounds rather than the thin and grating ones we've heard on previous albums, distinctive guitar textures, and vocals that sound more like people singing than the cartoon-character voices that Lowe is prone to delivering.

Lowe and his band, The Cowboy Outfit, also dispense with the usual routine of writing all the songs themselves, delivering admirable covers of John Hiatt's "She Don't Love Nobody," Elvis Costello's brilliant "Indoor Fireworks," and a handful of other songs by lesser known writers. This approach makes the songs written by Lowe and band sound better, as the sameness that permeated other albums has been eliminated. The arrangements are top-notch, as opposed to standard Nick Lowe one-take jobs; there was considerable thought put into the making of this record, and quite a bit of heart as well. One can only hope that Lowe will be able to record a follow-up as consistent and entertaining as this. Not since *Rockpile* has he sounded so inspired and at ease, and it would be a shame if this spurt of fine artistry lasted for only one album. *Jon & Sally Tiven*

Try Me: Billy Burnette
MCA 5604, \$8.98.

Sound: B Performance: A-

This album comes within a hair's breadth of being too country for our taste, but the handful of tracks that rock easily vindicates this second-generation rock 'n' roller. Father Johnny Burnette (whose Rock 'n' Roll Trio pioneered the classic three-piece rockabilly sound back in the '50s, and who penned such oft-covered gems as "The Train Kept-A-Rollin'") stands his boy in good stead, as the country/rockabilly bedrock under Billy's work is nothing if not authentic.

Billy possesses considerable vocal and compositional abilities as well as savvy in choosing his cover material. "Rock and Roll Lullaby" is a great vocal showcase, and his version of The Boxtops' "The Letter" (also from the Chips Moman repertoire) is an interesting amalgam of pretty country guitar-

Photograph: ©1982 Ebet Roberts



Billy Burnette

picking and pulsing techno-synth. As a matter of fact, the more powerful cuts on *Try Me* are the ones that are the most modernized, not the ones that are purest. Most of side two is closer to musical Americana than it is to blistering rock 'n' roll. The title cut is the standout, graced with great Steve Cropper rhythm-guitar parts, a strong blues/rock vocal and a snakey verse/chorus that's elevated by a poppish bridge. All told, the artist could stand to be more adventurous in his genre-crossing; Billy's credibility, authenticity and sincerity (and we give big points for that) are good, but his rockability is only sporadic. *Jon & Sally Tiven*

Old Ways: Neil Young
Geffen GHS 24068, \$8.98.

Sound: B — Performance: B —

Old Ways is hard to account for. Young, who is reputed to have been found talking to a bolt when he was supposed to be onstage, has produced some of the most menacing, haunting, unnerving, intelligent and sometimes delicate songs in the history of rock 'n' roll. So why is it that this tireless searcher has written and performed almost nothing here but conventional country and western duets, complete with gritty but *normal* C&W singers and players, and slick Nashville production? Two possible explanations come to mind.

The first can uncharitably be called the "brain damage theory." Perhaps, like Muhammad Ali, one of the washed-up characters who traipse through a cut entitled "Misfits," Young has stayed in the ring one round too long, and absorbed one blow to the head too many. Drink and drugs—and even art itself—take a heavy toll. Perhaps Young has defied his own formula, managing to burn out *and* fade away. This is a man who has made it his business to drive back and forth across the border between illusion and reality as often as possible. You can't fault him too heavily for nodding off at the wheel.

My second possible explanation is that this album is not that big a departure for Young. He has always liked his rock heavy on the country. But why such conventionality? What accounts for the lush strings found in songs such as "The Wayward Wind," or the forsaking of Young's plaintive, raw harmonica for Terry McMillan's country-slicker stylings? Why is he, on most of the

tracks, mixing his quavery, skinny wolf's voice with either Willie Nelson's bleating bighorn or Waylon Jennings' tender-hearted bear? Simply because, when they work, these things sound good, and Young has always cleaved to simplicity, even in the face of technocratic pressure. Besides, Waylon and Willie are more naturally Young's peers than are, say, Elvis Costello and David Bowie.

At its best, on songs like "Get Back to the Country," "My Boy" and "Misfits," *Old Ways* is too good to be accounted for by the brain-damage theory. In fact, "Misfits," with its upright bass so far forward in the mix it sounds like a bass drum, and Doana Cooper's background vocal so far back she sounds like she's on the other side of the prairie, is the closest thing to a studio tour de force as Young has ever produced. Since, for him, weird is normal and normal is weird, perhaps trying to come off like a regular hombre is just his way of trying something new.

Susan Borey



Neil Young

Professor Longhair's music is a real part of our heritage; his influence has been more far-reaching than you might have suspected.



Rock 'N' Roll Gumbo: Professor Longhair

Dancing Cat DC-3006, \$9.98.

Sound: B Performance: A-

Professor Longhair, who died in 1980, remains a vitally important figure in the great New Orleans music tradition, with his almost indescribable rhumba/boogie music chock-full of syncopated rhythms, seemingly impossible piano figures, and, most of all, infectious good feelings.

This set, released on George Winston's Dancing Cat label (a subsidiary of Windham Hill), was recorded in '74 for the French Barclay label. This is its first American release. For the occasion, two previously unreleased tracks have been included, and the whole set has been freshly remixed with new horn parts added to the anthemic "Mardi Gras in New Orleans."

For the performance, suffice it to say that this is a particularly engaging set by Longhair. He plays with verve and

mischief aplenty as he runs through a lot of his favorites, songs like "Junco Partner," Huey "Piano" Smith's "Rocking Pneumonia," "Jambalaya," Ray Charles' "Mess Around," "Stag-o-lee," and, of course, Longhair's signature song, "Tipitina." One thing that makes this set a little different for Longhair is the presence of another renowned wild man, Clarence "Gatemouth" Brown, on guitar and, for "Jambalaya," on fiddle.

The sound is as polished as the tapes would allow. Actually, it's quite lively. The pressing is excellent, and the quiet between cuts is *quiet*.

This is music that is a real part of our American heritage. Professor Longhair's influence has been more far-reaching than you might have suspected, something George Winston points out in his liner notes. If you have never had the pleasure of experiencing Longhair, this is an excellent place to begin, and if you already know about Longhair, then you should already want this album. *Michael Tearson*

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Godley & Creme's album is a Steven Spielberg series of homage/re-creations, with pop music replacing movies as the object of the artists' affections.



Lol Creme

Kevin Godley

The History Mix, Volume I: Godley & Creme

Polygram 825981-1, \$8.98.

Sound: B Performance: A -

I'm growing old. We all are, I know, but maybe rock critics notice it more. When I tell people that rock/video di-

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rectors Kevin Godley and Lol Creme were founding members of the popular Brit band 10cc, it's like the old joke about how Paul McCartney, no kidding, really was in a band before Wings.

Nominally a celebration of their 25 years of working together, Godley & Creme's first album since leaving 10cc in 1975 is, as the Brits would say, a fascinating one-off. It's a Steven Spielberg series of homage/re-creations, with pop music replacing movie serials as the object of the artists' affections. The points of call should be familiar to anyone whose cultural touchstones begin somewhere before MTV.

Motown, psychedelia, Atlantic Records doo-wop, Steely Dan—take your pick, and that's just side two. Side one is considerably weirder, a sort of British vaudevillian revue done with synthesizers. Though a tad precious, it has charm and a sentimentality noted by a few wafting moments of 10cc's "I'm Not in Love." Tweaking what's become an almost standard music-industry release pattern, there's also an extended dance-mix version of the single, "Cry," which seems, at least to my feet, to be deliberately undanceable. What fun.

The flip side is more accessible though just as lighthearted, with the tongue-in-cheek, Carnaby Street jauntness of "An Englishman in New York," a Platters pastiche called "Golden Boy," and the lush/raw chain-gang choir of "Save a Mountain." A prominent New York music critic recently voiced his opinion that British pop choruses are inferior to ours because they don't have the same choral tradition; he ought to step out of his village long enough to hear this cut.

I wonder, too, if this prominent critic could appreciate the notion that, knowing Godley & Creme's deliciously warped sensibilities, the "Volume I" in the title is probably a joke.

Frank Lovece

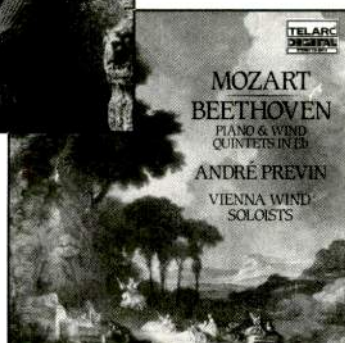


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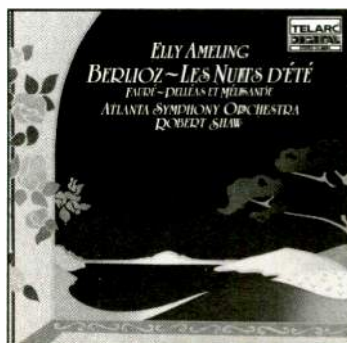
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Above the Tower introduced me to artists I hope to hear more of. The ethereal music of *Magical Strings* can do wonders for frayed nerves.

Above the Tower: Magical Strings
Flying Fish FF-360, \$8.98.

Sound: B Performance: A

Magical Strings is Philip and Pam Boulding of Seattle, Washington. Using wire- and nylon-strung Celtic harps of their own construction, they make

some of the most beguiling music around. For extra coloring, they also employ whistles and field organ and occasional outside players on cello and fiddle. Their music is mostly original compositions inspired by traditional sources, but they do play some pieces with Welsh and Irish origins.

The Bouldings make ethereal, calm music that can do wonders for frayed nerves. Whether you are a dyed-in-the-wool traditional music aficionado or someone who's interested in the New Age music, as it has come to be called, I think you might really enjoy *Magical Strings*. Producer Mícheál Ó Domhnaill, himself an artist who straddles the traditional and New Age camps, has done a lovely job in shepherding the wonderful sounds of the Bouldings to vinyl for a graceful finished product. The sound is rich and true and wonderfully clear. Even the silences between the selections are uncommonly quiet.

Above the Tower has introduced me to artists I hope to hear a lot more of and about.
Michael Tearson

Reconsider Baby: Elvis Presley
RCA AFL1-5418, \$8.98.

Sound: B Performance: A+

Always on My Mind: Elvis Presley
RCA AFL1-5430, \$8.98.

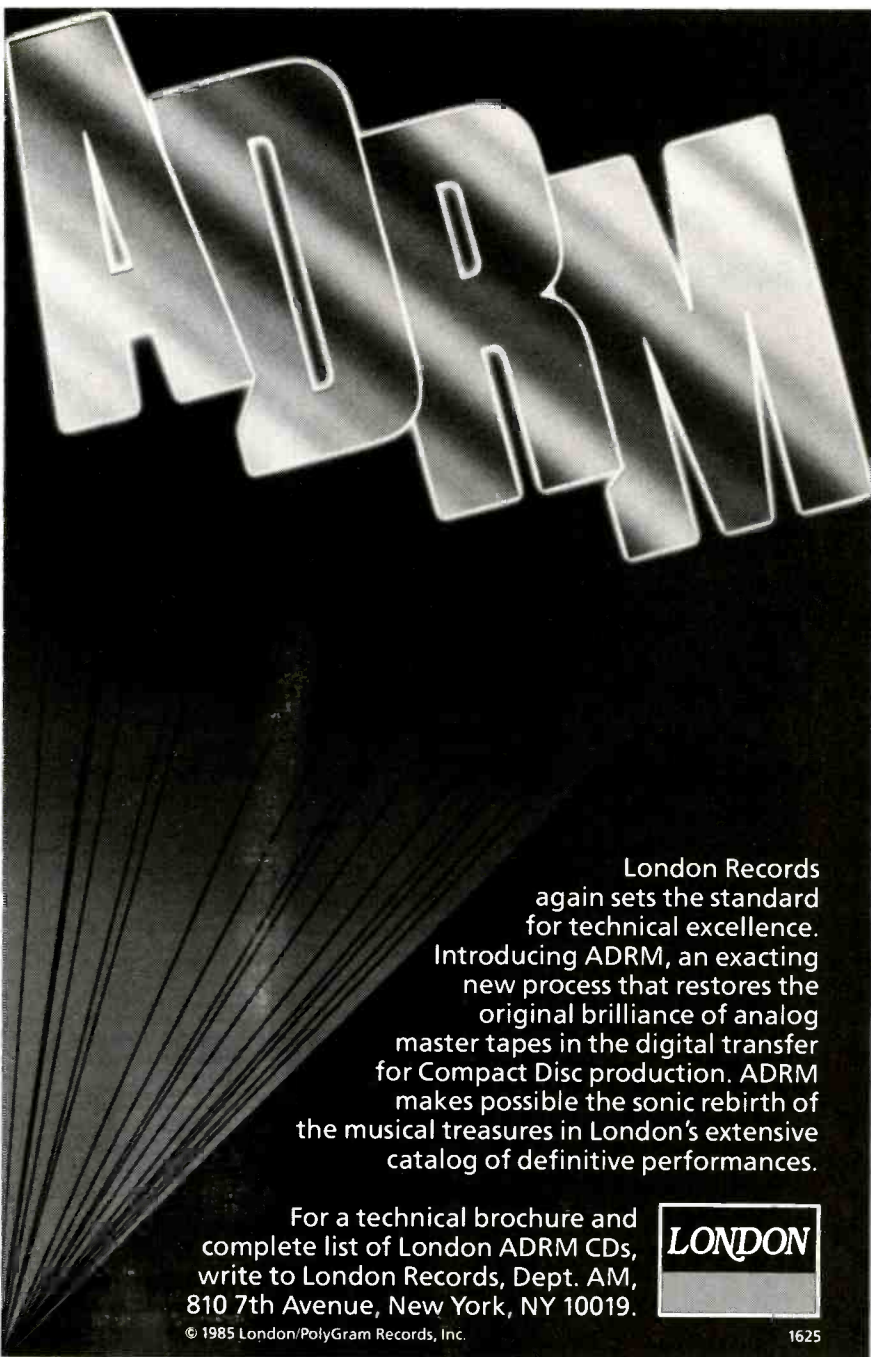
Sound: C- Performance: D

The Elvis Presley 50th-anniversary year continues with two more collections, each tied to a theme.

Reconsider Baby is a collection of Elvis the blues singer. It is an album of impassioned and committed performances of the stuff Elvis evidently loved best.

The album is superbly annotated. Peter Guralnick has delivered some fine liner notes that help put the album into proper historical perspective. With each song is given the name of the original artist and where it previously appeared. It turns out that the album contains one previously unreleased Sun Records master, four alternate versions of previously released songs, a B side that somehow missed being on a Presley album, and five more. Songs range from 1954 to 1971, giving lie to the idea that Elvis lost touch with his blues roots.

The sound of *Reconsider Baby* is lovely. For the reissue the master tapes have obviously been lovingly cleaned up so that the music can shine through. A nice touch is that the album has been pressed in appropriate blue vinyl. *Reconsider Baby* in an instant is an essential Elvis Presley album.



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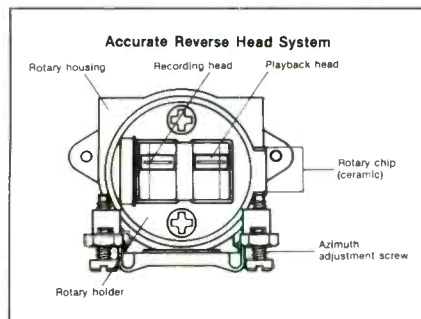


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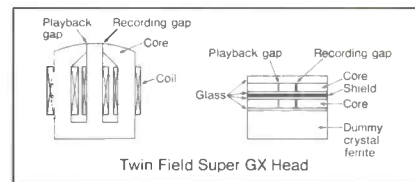
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Eurythmics' latest album has excellent performances but frustratingly less than excellent sound. It's the group's passion that carries the show.

Then there's *Always on My Mind* pressed in passionate purple, a miserable and maudlin collection of songs from late in Presley's career. The theme here is marital breakup and divorce. Over 13 songs the thematics get relentless, especially in an album of Elvis at his most overblown.

This is one album that the people at RCA obviously cared much less about than, say, *Reconsider Baby*. There is no annotation at all, no data about the songs. Just a cheap cover graphic of Las Vegas lights. Fittingly the sound here, especially on the in-concert tracks, is tinny and unconvincing.

Always on My Mind is a perfect album to put on if you want to commit suicide.
Michael Tearson

Be Yourself Tonight: Eurythmics
RCA AJL1-5429, \$9.98.

Sound: C- Performance: B+

Eurythmics evolves their airy electronics into a big, nery sound on their new album, *Be Yourself Tonight*. On the lead track, "Would I Lie to You?," pumping horns add a whole new, previously unhinted-at dimension to their music. Next, the signature harmonica sound of Stevie Wonder lights up "There Must Be an Angel." At the close of side one, Annie Lennox is joined by Aretha Franklin to duet on the anthemic "Sisters Are Doin' It for Themselves," backed by The Charles Williams Singers for gospel choir effects. What a thrill to hear Aretha singing those gospel licks!

David Stewart, mastermind Eurythmic, has opened up the very concept of what Eurythmics are to a whole lot more diversity here. Annie Lennox's singing is brilliant; confidence and inner strength allow her to sing flourishes she has never even hinted at before. She has opened up her stylings here, too. Fortunately the songs, fervently romantic as they are, are strong enough to bear such grandly scaled performances.

The produced sound is disappointing. There is so much going on that it feels crowded, the overall effect clipped and thinner than it should be. I must note that the cassette sound is noticeably better than the record.

Excellent performances with frustratingly less than excellent sound. It is Eurythmics' passion that carries the show.
Michael Tearson

The Dream of the Blue Turtles: Sting
A&M SP-3750, \$9.98.

Sound: B Performance: B

Give him high marks for the taste to make a solo album with the likes of Branford Marsalis, Omar Hakim, Kenny Kirkland and Darryl Jones. Credit him with trying to bridge the gap between popular music and contemporary jazz. And you have to admire him for trying to bring his audience into new forms of musical awareness.

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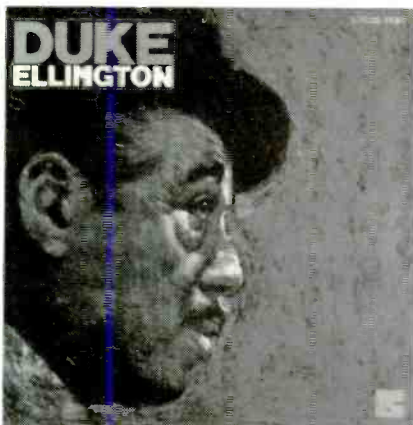
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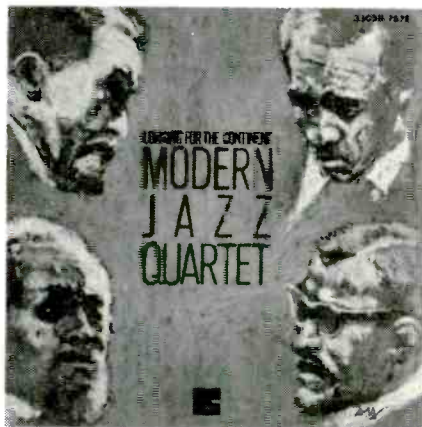
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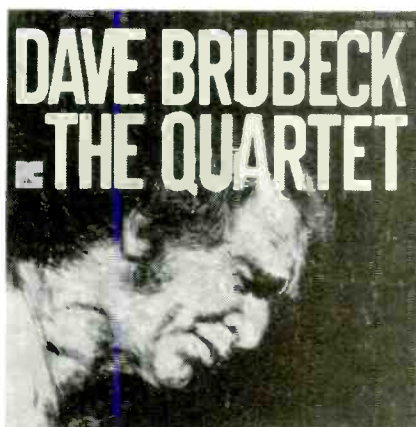
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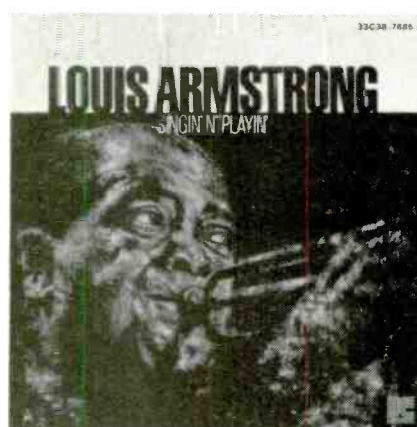
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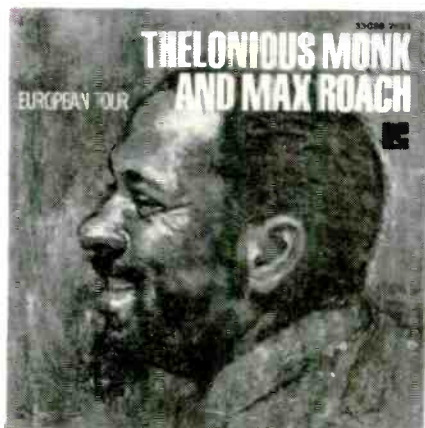
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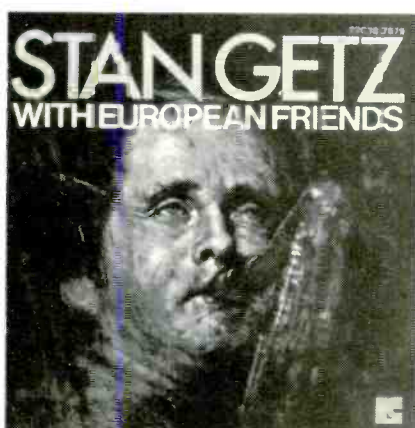
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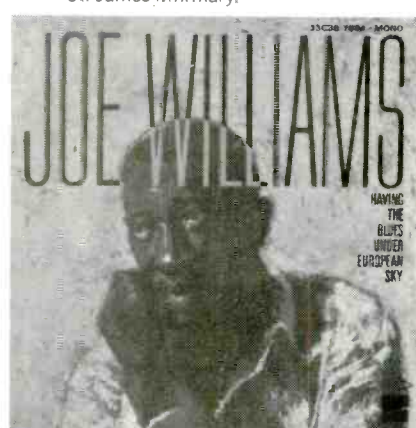
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Although some of the songs on Sting's solo album are above par, most are average, and the playing doesn't help make the tunes any more accessible.



Now let's put The Police back together and make some records with drive and tension, Mister Sting!

This is not a jazz album, first of all—Sade sounds more jazzy than this. It's just another Sting record on which Mr. Sumner is backed by musicians best known for their jazz affiliations. While

contemporary jazz is more or less small combos doing improvisational pieces and/or solos, these are your basic Police-styled pop tunes played in a different groove. Some of them are above par, most of them are about average, and the playing doesn't help to make the tunes any more accessible or original, just slightly busier and less forceful. The first single, "Set Them Free," which most everyone has heard, hardly blazes any new musical paths—the lead instrument is a tambourine swathed in reverb! Sting is obviously getting off because (a) he is unquestionably running the show and (b) he is playing with American jazz artists, the dream of every English musician. But these New York jazzers grew up with Yes and Genesis, so it isn't quite like purist city here.

This is not to say that Sting fans the world over won't appreciate this record, but it doesn't rock like Police records do and the younger audience might not go for it. I'd rather hear him sing duets with Ray Charles, or Bono, or just have him work with people rather than in front of them.

Jon & Sally Tiven

Who's Zoomin' Who?: Aretha Franklin

Arista AL8-8286, \$8.98.

Sound: B Performance: B+

With the success of Tina Turner, there is renewed hope for resuscitating the careers of soul singers from the '60s, and as Aretha was Lady Soul it's only natural that her new album is very much a creation of the post-Tina mentality. The results are mixed—the greatest success is her duet with Eurythmics (also available on *their* album). Narada Michael Walden (who produced most of the record) is only a fair to middling songwriter. "Freeway of Love" and the title cut are the best tracks from his sessions; the remainder of his productions are actually inferior

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Two Hearts didn't score a knockout with me, but I did like it much more than I expected to—thanks to its very real charm.

to the tracks produced by Aretha herself. But the Eurythmics duet is so far superior to anything else on the record it makes even the second-best track look like filler. "Sisters Are Doin' It for Themselves" is simply one of Aretha's best vocals *and* tracks ever, as if she started with the feel of the bridge section from "Chain of Fools" and took off like a rocket from there. Next time, it would be nice if a woman this talented were given songs and tracks as strong as this for an entire album, ideally with a producer like Laurie Latham and songwriters like Don Covay, and then we'd finally see a full resurgence in her career.

Jon & Sally Tiven

rock mix, with lots of flourishes and textures and excellent detail in the percussive effects. I especially like the sound of the electric sitar in "Maria," the marimba in "Man with Two Hearts," and the sneaky sax in "Snakes and Ladders."

Men at Work face a very real and

basic dilemma. Never again are they likely to catch the musical world off guard and equal the impact of their debut album. What they have to do is deliver goods at the level that their debut established, and that was quality stuff. They are doing better than I thought they would. *Michael Tearson*

Two Hearts: Men at Work
Columbia FC 40078.

Sound: B Performance: B-

Two and a half years can be more than a lifetime in the world of pop music. Newcomers can become stars, then oldies-but-goodies, in less time than that. For a band to vanish and then reappear after so much time can be very dangerous.

Australia's Men at Work are returning from just such an absence with their third album, *Two Hearts*. They are down to three original members in Colin Hay, the guitarist and very distinctive vocalist, keyboardist/vocalist Greg Ham, and guitarist Ron Strykert. The rhythm section of Jeremy Alsup and Mark Kennedy on bass and drums, respectively, may not be permanent; they are not included in the album's photography, if that's any clue.

Men at Work are still much more interesting when Colin Hay is singing his songs than when Greg Ham is singing his. Hay's smoky voice, so instantly recognizable and stylish, sounds best here on "Man with Two Hearts," "Everything I Need" and "Maria." Ham's not a bad singer at all. He's just not as distinctive a stylist. His best song is "Stay at Home," which relates a tale of inner-city paranoia.

Two Hearts didn't score a knockout with me but I found myself liking it much more than I expected to. I think I tried to resist the album, but as I listened repeatedly, the very real charm of Men at Work won me over anew. This record sounds bright and lively due to Bob Clearmountain's superb

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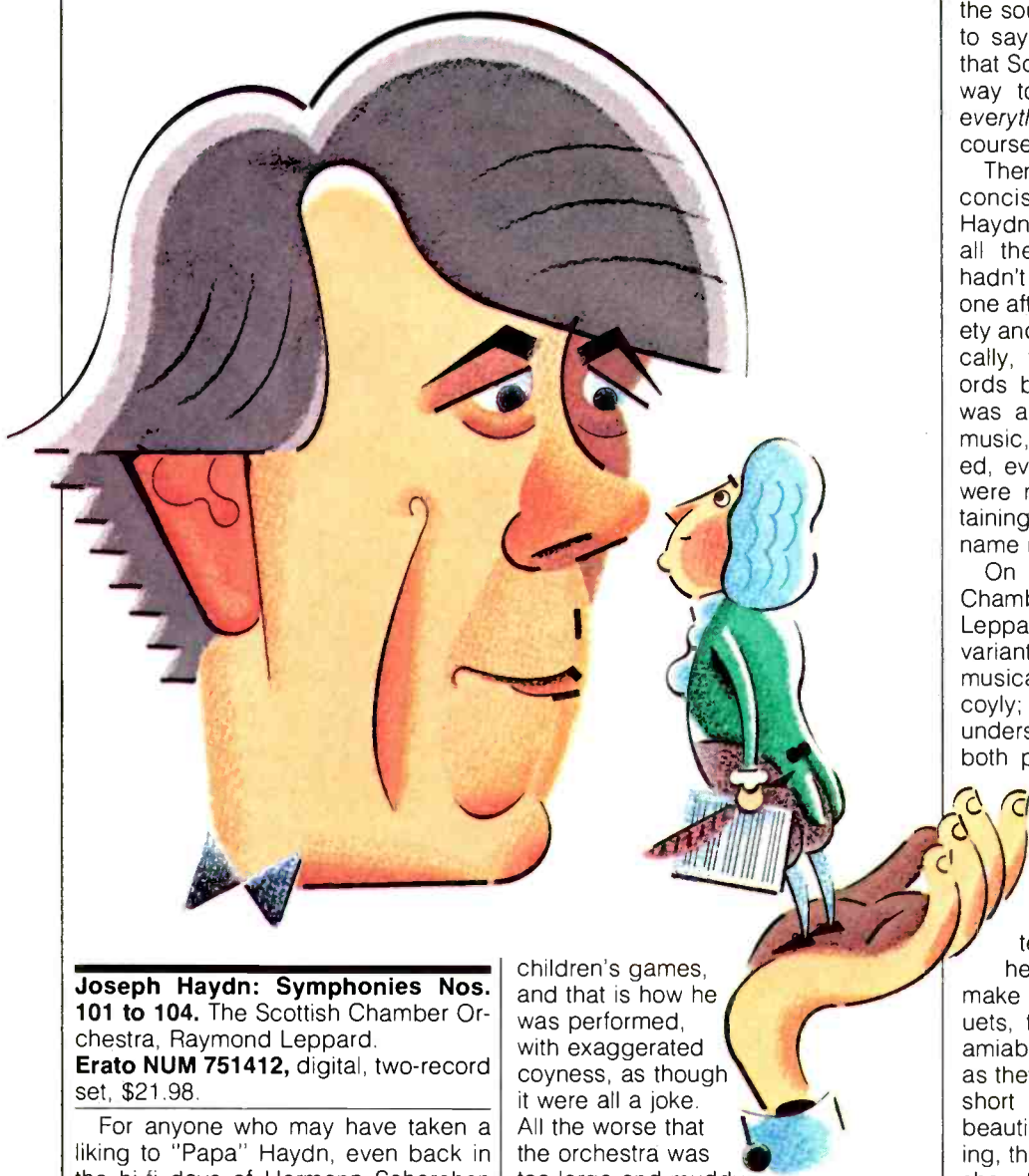
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GROWN-UP PAPA



Joseph Haydn: Symphonies Nos. 101 to 104. The Scottish Chamber Orchestra, Raymond Leppard. Erato NUM 751412, digital, two-record set, \$21.98.

For anyone who may have taken a liking to "Papa" Haydn, even back in the hi-fi days of Hermann Scherchen on Westminster—or, for that matter, on classic 78s with good old Tommie (Sir Thomas Beecham) and his like in England—this recording should be a digital dream. It is the last word; it has everything it should and very little it shouldn't.

There have been successive stylings of Haydn's late symphonies in the lengthening history of recording. At the tail end of Romanticism, Haydn could not find a comfortable place. Alongside the giants such as Tchaikovsky, Sibelius, and Strauss, he seemed superficial and cute, somehow playing

children's games, and that is how he was performed, with exaggerated coyness, as though it were all a joke. All the worse that the orchestra was too large and muddy, the highs and the color were missing on disc, and the bass—those Haydn drums—was only a muffled blur. It was a sort of clown treatment we heard, but not clearly. Yet Haydn survived and his late symphonies never really lost their place. Too much good in them, for those who could hear it.

Then came Scherchen, the darling of the hi-fi buyers and sellers, and suddenly, Haydn was big and portentous and Romantic and the drums were superb. Remember the Haydn "Military"? Every hi-fi show reverberated with it,

the sound sensation of the time. I hate to say so, but I've always suspected that Scherchen didn't really find a new way to play Haydn—he just played *everything* that way as a matter of course. But that could be argued.

Then we had the Restoration—small, concise orchestras like the forces Haydn himself used, and the revival of all the dozens of symphonies that hadn't been heard before, recorded one after the other by The Haydn Society and in many other series. Paradoxically, these sounded bigger on records because the mud was gone. It was a whole new effect for Haydn's music, no longer cute and exaggerated, even if most of the performances were more musicological than entertaining. H. Robbins Landon—does the name ring bells for you?

On these digital LPs, the Scottish Chamber Orchestra under Raymond Leppard sums up the best in all these variant approaches, playing Haydn's musical games humorously but not coyly; they are for adults. Today we understand that a composer can be both playful and deeply serious. The

fast movements go at a playful tempo—not raced at preposterous speeds.

The slow movements are profoundly serious and beautiful, but never portentously weighty, as we used to

hear them done by those trying to make them into Tchaikovsky. The minuets, that used to plod like so many amiable elephants, now move faster, as they should, being only a few years short of Beethoven. Above all, with beautifully clear and balanced recording, the various "choirs" of instruments show their contrasts as Haydn intended, and the contrasts of loud and soft are even better, quite awesome in musical impact. This was no pigtailed ninny, this composer!

Philip Glass: Satyagraha. Columbia Masterworks I3M 39672.

Sound: B Performance: A+

Satyagraha is the Philip Glass opera depicting an early period in the life of Mohandas K. Gandhi in South Africa. It's a monumental work and a new summit for the music known as minimalism. Minimalism was started in the

early 1960s by La Monte Young and brought to unprecedented popularity by Philip Glass, Steve Reich, and Terry Riley. Initially, minimalism was a reaction against serialism as well as against conventional music. It rejected Western ideas of tension and release, crescendos and diminuendos, and embraced an Eastern concept of steady-state music. It was like putting an electron microscope to the sound of one chord, revealing an interior sonic world as rich as the one our normal senses experience.

Most of the original composers now disdain the term minimalism, especially since they've moved beyond their self-contained performance ensembles and begun composing larger scale works. Riley writes for string quartets, Reich's "Tehillim" is for large orchestra and choir, and Philip Glass' 1980 opera, *Satyagraha*, is for orchestra, solo voices, choir and electronic keyboards.

Satyagraha is a mature and moving



Philip Glass

work from a composer who hasn't made a misstep since forsaking the academic tradition 18 years ago. It is also like no opera you've ever heard, sounding more like a time-warped ritual mass. *Satyagraha* uses the charac-

ters of Gandhi and his followers in South Africa to relate a story from India's epic *Bhagavad-Gita* in parallel to the struggle against the Black Act, an early version of apartheid that discriminated against Indians. The text, taken

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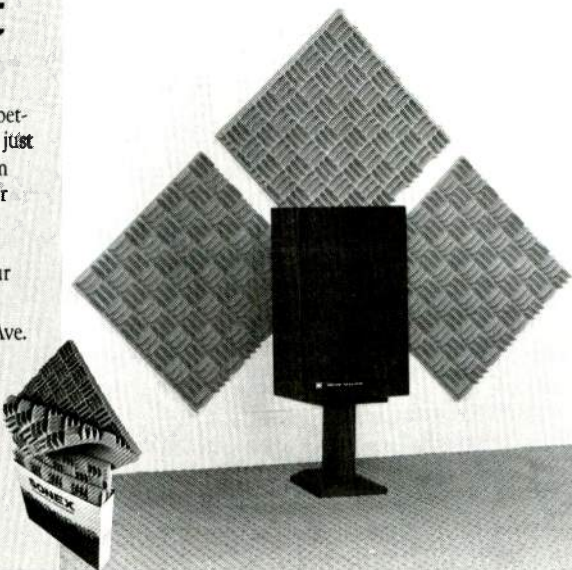
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Satyagraha is a mature and moving work from Philip Glass, a composer who hasn't made a misstep in two decades.

from the *Bhagavad-Gita*, is sung in the original Sanskrit.

The recording of *Satyagraha* was done direct to digital multi-track (a 3M 32-track machine), and it is an opulent and enveloping experience. As Glass once said, "It's as lush a work as you're ever going to get from me." Glass' writing for full orchestra creates a hypnotic web that draws you in, while the chanting choirs and exhorting tenor of Douglas Perry and company propel you through a spiral journey.

The richness of *Satyagraha* is enhanced by the recording process, which differs from the standard practice of using a complete performance or splicing together parts of different takes. Instead, it was done in layers, with each orchestra section and vocal performer recording their complete parts, one at a time, in a seamless, continuous take. The results are an expanded separation of instruments and voices and an attention to detail that is remarkable. The string sections seem to swell above the speakers, and the bottom is almost endless. This latter effect comes from doubling the cellos and double basses with synthesizers played by Glass cohort Michael Riesman. Riesman also engages the flutes in swirling counterpoints, their pure, airy tones contrasting against the reedy, Farfisa-like whine of the synthesizers, a Glass trademark sound.

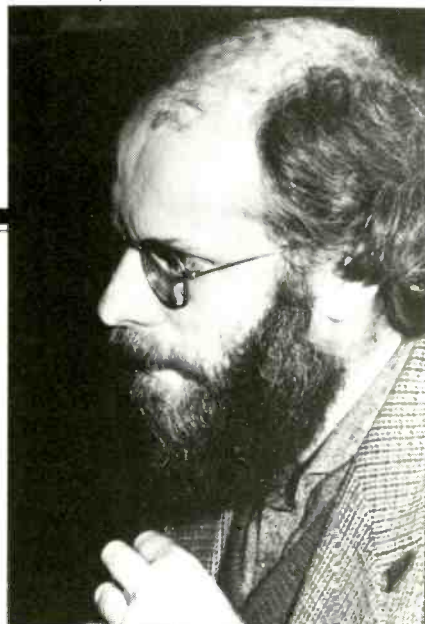
Then there are the voices, rising up out of the web with a compelling clarity: Perry's poignant refrain in the closing act over the ascending orchestra, the overlapping duets and trios with soprano Sheryl Woods, bass Scott Reeve and alto Rhonda Liss in the second scene of Act I. *Satyagraha* sounds more like a Renaissance mass than an opera, with elegant, sinewy lines that resonate in the musical and acoustic space that Glass has provided.

Satyagraha is a spiritual and emotional tour de force by one of the leading composers of the last two decades. Glass has approached this work not as avant-garde theater, like his first opera, *Einstein on the Beach*, but as an adaptation of the conventions of opera to his own methods of composition. It is not only a masterpiece of the new tonality, but one of the most important works of the 20th century.

John Diliberto

John Eliot Gardiner

Ton Koopman



J. S. Bach: Ouvertüren (Orchestral Suites). English Baroque Soloists, John Eliot Gardiner.

RCA Erato 750762, digital, two-record set, \$21.98.

J. S. Bach: Brandenburg Concertos. The Amsterdam Baroque Orchestra, Ton Koopman.

RCA Erato 751342, digital, two-record set, \$21.98.

These two soul-mate albums go naturally together, though one is nominally British and the other Dutch, released on a French label by RCA. They celebrate Bach's 300th birthday, and very well, too, not only in the playing but in the combination of the latest in high-tech recording and, equally, musicology. Both (as far as one can figure) are played on instruments of the Bach period, either old ones or new ones modeled on the old. That is the state of the Baroque art these days. There are small miracles involved in playing these oldie music machines that only a

few decades ago would have seemed utterly impossible for any modern performer. We have indeed restored the performance, the instruments, the tempi, and the ornaments of an age of music that comes down to us, so to speak, only in coded form, and we have ingeniously decoded perhaps 90% (my guess) of the "unwritten"—or previously unheeded—sense of the musical works.

Being typically international, the Dutch and English groups are much alike. Indeed, I spotted at least one player common to both, the resoundingly elegant Crispian Steele-Perkins. He plays trumpet—minus valves, we assume. A superman!

True to contemporary Bach thinking, the tempi in both these recordings are brisk, sometimes a bit too much so for the detail, and there is no Romantic

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These two Bach releases, celebrating his 300th birthday, combine the latest in playing, high-tech recording and musicology.

nonsense at all about those strange chords and poignant moments that were so much revered by an older generation. Just as well—they really do not need, so to speak, pre-emphasis.

The slow opening movements in "French" style, with dotted (or, as we used to say, limping) rhythms—once

done at abysmally slow speed—are now taken with faster short notes and a brisk and easy continuity. What a difference! It is so obvious that this *makes sense*—the music works, it speaks, for any unprejudiced ear. I am happy I have lived long enough to hear Bach thus put on his own feet as a

solid human being, if a notable one, in place of his earlier image as some distant and unapproachable musical god.

Curious French phrase, *numérique digital*. This is on both of these albums, and, as usual in French, is quite correct. It only remains to say that, in the balance of both albums, the brass is not out in front, and in fact is rather modestly miked considering the horrendous difficulties of the music as played without valves (it is accurate—they aren't hiding anything). The "Baroque" strings have that now-familiar and lovely edginess, a silvery sound with very low vibrato, that is quite unlike the standard modern violin sound. It is the very effect that the 19th century wanted to remove, and did. The woodwinds are suavely perfect; next to recorder and harpsichord, they are now the most perfected, in terms of technique, of the old instruments.

Finally, it should be said for the thousandth time in this space that Baroque music, partway between "chamber" and "orchestra," is ideal for recording, particularly with the more colorful older instruments. Indeed, it is certainly possible to say that the renaissance and popularity of Baroque music in this last half-century is *directly* due to its affinity for the audio arts. What else? Without us, it would never have happened. Or if it did, we would still be back in the Bach/Stokowski era, with the entire Philadelphia Orchestra, or equivalent, and a degree of sheer musical mud you would not believe.

I should know. My first-ever Bach record was one movement of the "Brandenburg Concerto No. 2" with the Philadelphia Orchestra, conducted by Stokowski.

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Music for Festive Occasions contains some very golden sounds, and trumpeter Richard Giangiulio plays with excellent verve, rhythm and imagination.

day began in the '20s and flowered in the '30s. That's how he sounds.

If you are versed in even the most standard works of classical music, on the other hand, you will find him abysmally dilute and derivative. The stuff is beautifully written and organized pap, with some of the most skillful orchestrations in the business—that, indeed, was Grofé's principal biz and talent. In terms of music, he shaped his pap as that much superior talent George Gershwin could never learn to do; Grofé's well-lubricated music just rolls along effortlessly, saying nothing that hasn't been said safely and long before, in much more potent terms.

This is an odd disc, not only for including a first recording, the "Aviation Suite" of 1946 (maybe *you* can hear the jet planes), but because it is all Dutch, from the numerous KLM photos of planes and an airport in Holland, to the performers. And the English notations—all have that slightly heavy, hearty Dutch flavor, a bit on the solemn side. The players do well, but some of the diluted Americana, especially the early oompah jazz and the Mississippi folk tunes, sounds like something out of Peter Breughel. Dancing Dutch peasants! Sort of fun, here and there.

Music for Festive Occasions. The Dallas Trumpets; Richard Giangiulio, trumpet; Paul Riedo, organ.
Crystal S232, digital, \$9.98.

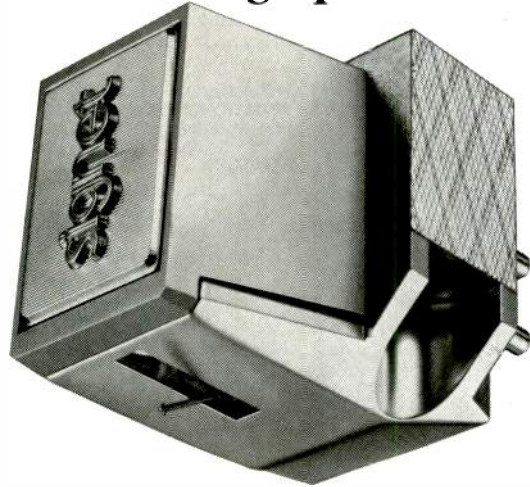
Three trumpets, a set of tympani, and an organ in a church with a big reverb make some impressively golden sounds here, ranging from Baroque brilliance to the early Romantic—both the well-known wedding marches. The motivating force is Richard Giangiulio, an instinctively musical trumpeter. The authenticity of the earlier music is not exactly great, but this trumpeter's verve and rhythm are excellent, and most of his ornaments, the very essence of the older music, are imaginatively correct. Two other trumpets play on and off for variety and a massive effect, with the organ serving as accompaniment and "orchestra" and the tympani adding punch. For anybody who goes for "Baroque" this will make good, festive, background listening.

Curious that the organist and his or-

gan are so uninspiring in sound. It's a good, old-fashioned, all-purpose organ (built in 1978), which Riedo does not use with much subtlety, nor with much feeling for Baroque music. Sorry, but I took an active dislike to this aspect of the ensemble, while growing to like the trumpet in whatever it played,

Baroque or no. Note that all the older music, composed for natural trumpet without valves, shares a certain fanfare quality that is startlingly different from the trumpet music composed for a softer and mellower melodic sound in the 19th century. Mr. Giangiulio is clearly aware of the difference.

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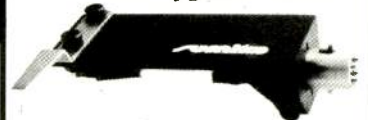
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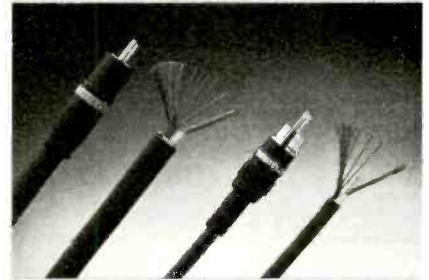
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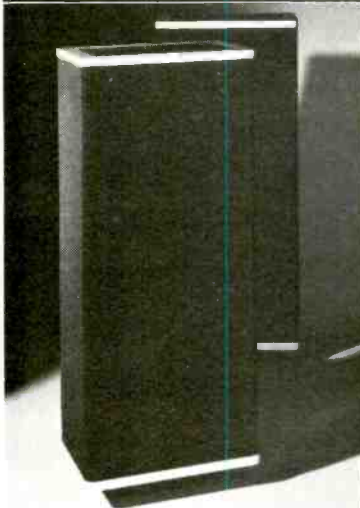
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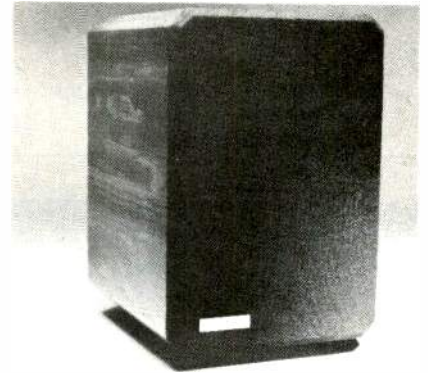


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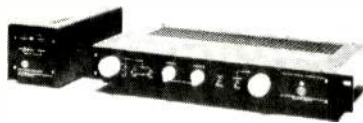
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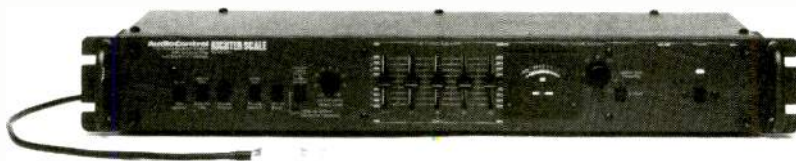
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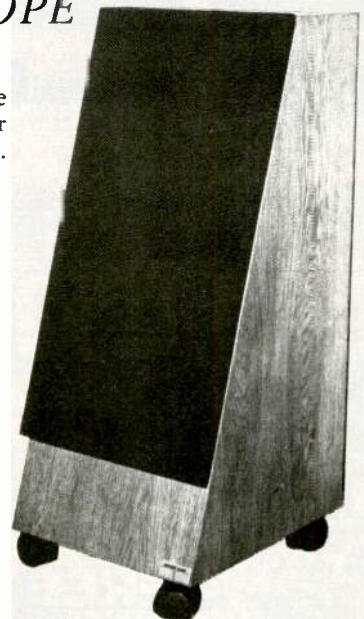
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