Audio®

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY AUGUST 1978 $1.25
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Don Davis - Sabine Equation

Confessions of a Loudspeaker Designer

Speaker Wizard Neville Thiele on Crossover Networks

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measuring equipment.

A totally unique tuning system.

Deep inside the SX1980 there's a quartz crystal generating the perfect frequencies of every FM station in the United States and Canada.

As you rotate the tuning dial, a special Pioneer integrated circuit compares the station you're trying to tune to its perfect frequency. When the station is tuned exactly right (all this

takes about half a second), a "fine tuned" light comes on; the receiver then senses when you've let go of the tuning dial and automatically "locks" onto that broadcast.

Luckily, the benefit of all this is far easier to explain than the technology: FM drift is eliminated. A fact that's easily appreciated by anybody who's ever tried to record a long concert off a less formidable receiver.

In addition, the SX1980 features a five gang variable capacitor that helps pull distant FM stations into weak areas. And there's also a multipath button for adjusting your antenna to eliminate multipath distortion. So even tall buildings won't stand between you and better sound. (FM sensitivity is an incredible 1.5 microvolts; the signal to noise ratio is an equally superb 83 decibels. Both better than most separate tuners.)

Still other innovations.

When we designed the SX1980, we knew it would represent a remarkable engineering achievement. But it also represents the kind of thinking and value you get in every high fidelity component we make.

That's why besides everything else, the SX1980 features a suggested price of less than $1250.**

Which only sounds expensive until you hear what our competition is asking for other high powered receivers that lack this kind of sophistication.

The SX1980 is currently inspiring awe at your local Pioneer dealer.

But before you go listen be forewarned: it'll spoil you for anything ordinary.

High Fidelity Components

PIONEER®

We bring it back alive.

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**Suggested retail price. The actual price will be set by the dealer.

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Most companies would consider a receiver with any one of these innovations remarkable.

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But Pioneer isn't just any company. And our 270*watt SX 1980 is somewhat better than remarkable.

Every month, somebody introduces something called "the world's most incredible hi fi receiver."

Yet when you compare their features and technology to Pioneer's SX1980, these "miracles of modern science" begin to look, and sound rather pedestrian.

The greatest DC power story ever told.

It's a simple fact of life that the more pure power

a receiver possesses, the easier it can reproduce music without straining.

And at 270 watts per channel, even the most demanding piece of music will hardly cause the SX1980 to flex its considerable muscle.

But when we built the SX1980, we did more than just create an incredibly powerful receiver. We created a whole new high powered technology.

Each channel, for example, has a separate DC power configuration that helps to provide richer and more accurate bass.

Where some high powered receivers try to get by with ordinary transformers, Pioneer has developed a 22 pound toroidal core transformer that's far less susceptible to minor voltage variations. So you get cleaner, clearer sound.

And instead of pushing conventional power transistors to their limits (the way some manufacturers do), we've actually invented new transistors that last longer and eliminate the need for fans that can cause electrical interference.

All told, these innovations give the SX1980 a total harmonic distortion level of less than 0.03% from 20 to 20,000 hertz. A figure that not only taxes the imagination, but also the abilities of most scientific

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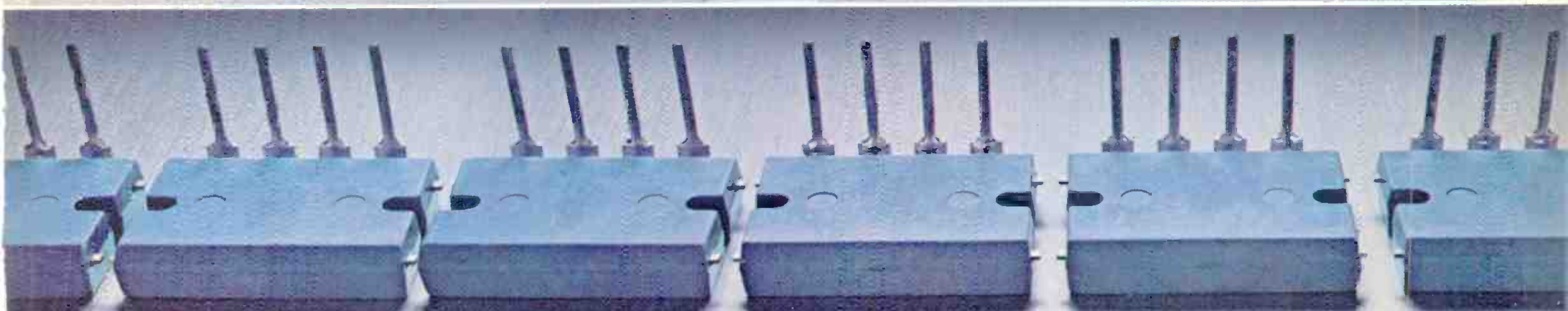
Wattage meters that let you see what you're hearing.


High powered transistors that don't need fans.

Impedance switches that let you get the most out of your cartridge.

3,000 different combinations of tone.

Quartz sampled tuning for near perfect FM reception.

*A power section that puts out a continuous power output of 270 watts per channel from 20 to 20,000 hertz with less than 0.03% total harmonic distortion.

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August 1978 "Successor to RADIO Est. 1917" Vol. 62, No. 8

Feature Articles

Equipment Profiles

Record Reviews

Audio in General

About the Cover: Speaker "wizard" Neville Thiele, who's not on the cover, has an article on speaker crossovers appearing on page 38. Model, Jim Lambrenos. Photo by Photographic Illustrations.

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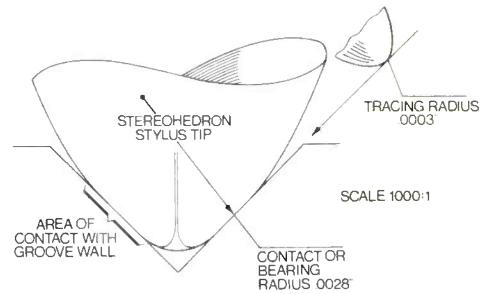
The XSV/3000 is the source of perfection in stereo sound!

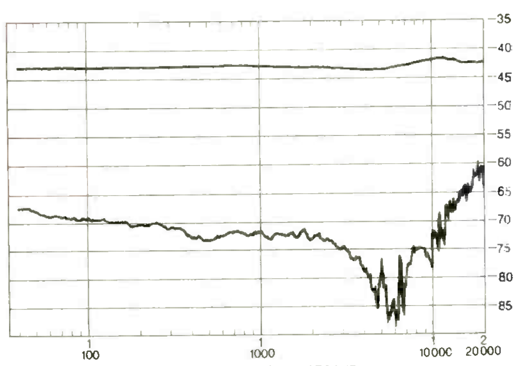
Three big features . . . all Pickering innovations over the past 10 years . . . have made it happen.

1976: Stereohedron® This patented Stylus tip assures super traceAbility™, and its larger bearing radius offers the least record wear and longest stylus life so far achievable.



1. Technical drawing of the Stereohedron shape

1975: High Energy Rare Earth Magnet
Another Pickering innovation, enabling complete miniaturization of the stylus assembly and tip mass through utilization of this type of magnet.



2. Frequency response curve of the XSV/3000

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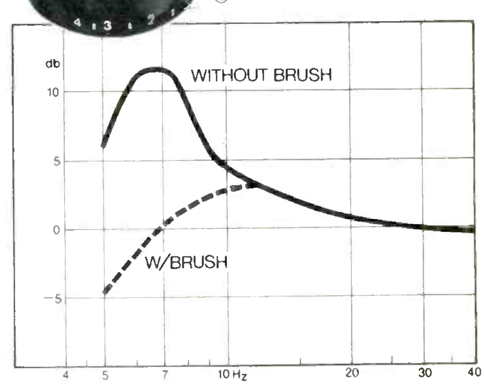

3. Damping effect on tonearm resonance

1968: Dustamatic® Brush
This Pickering patented invention dynamically stabilizes the cartridge-arm system by damping low frequency resonance. It improves low frequency tracking while playing irregular or warped records. Best of all, it provides record protection by cleaning in front of the stylus.

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The super fidelity receiver that someone paid a million for.

A lot of money? You bet it is. But that's what it cost Sansui to develop the world's most advanced receiver. The Sansui G-9000 super fidelity DC receiver. Never before has music reproduction been so clean, brilliant and true. When you listen to a G-9000 you'll actually hear a difference. When you look at the specifications, you will understand why.

The amplifier section is DC and direct coupled to achieve a frequency response of zero Hz to 200 kHz (from main-in, – 3dB). A slew rate of 80V/μsec., achieved through the unique Sansui amplifier circuitry (patent pending), ensures ultra-fast transient response. And we've virtually eliminated distortion. THD is all the way down to 0.02% at full rated power, 160 watts per channel min. RMS, both channels driven into 8 ohms from 20-20,000Hz.

The FM section offers selectable IF bandwidth, for greatest selectivity in crowded signal areas and lowest distortion (0.08% stereo) under normal listening conditions. Sensitivity is 1.5μV (8.7dBf), and capture ratio is a very low 0.9dB.

More advanced than nearly every separate amplifier and tuner available today, the Sansui G-9000, with simulated woodgrain cabinet, is certainly more convenient, especially when you look at and handle its full complement of "human engineered" controls. They are beautifully positioned, superbly smooth and outstandingly accurate. We've even placed all the input, output and speaker terminals at the sides with rails for hiding the cables.

Interested? Then visit your nearest Sansui dealer today. You'll be surprised to learn that our suggested retail price is only $1,050. And that we also offer the G-8000 pure power DC receiver, with nearly all the advantages of the G-9000 but with slightly less power, at a suggested retail price of only $900. Which isn't a lot when you consider that these super fidelity components are easily worth a million.

The Sansui G-9000 pure power DC receiver.

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It can accurately reproduce the 120+ dB peaks that are found in some live music. That's more than just being able to play music loud. It can accurately reproduce the music bandwidth – from below 25Hz to 20kHz. And the Interface:D's *vented midrange* speaker reproduces midrange sounds with the clarity and purity that allows precise localization of sound sources – both lateral and front-to-back.

The Interface:D is the only commercially available speaker we know of that can meet these criteria. Audition them at your Interface dealer.

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Audioclinic

Joseph Giovanelli

Tracking Force Measurements

Q. When setting up a turntable, does one measure the tracking force with or without the anti-skating force system connected?—D. Henderson, Palmetto, Fla.

A. In some instances, it makes no difference at all whether the anti-skating force is activated or not. There are some approaches to anti-skating compensation which involve a weight attached by a thread to a portion of the tonearm, and these will have some affect upon the tracking force. So, to be on the safe side, attach the anti-skating system—or activate it if it is permanently attached.

Maximum vs. Rated Power

Q. The instruction manual for my receiver states "Maximum consumption, 650 watts; rated consumption, 435 watts." What is the meaning of these two ratings?—Sam Notaro, Verona, N.J.

A. The power consumed by your receiver will vary because of the nature of the output stages. When no signal is applied, these stages draw less current than when they are driven, therefore the amount of power consumed varies depending upon whether the equipment is idling or being driven. Also, the amount of power drawn varies with the instantaneous power required.

Car Radio Noises

Q. I have a problem with my car FM radio. I get static through my speakers, and no matter how I try to eliminate it, I have no success. I just bought a noise suppressor kit but have not installed it since I still hear the noise when the engine is turned off. I would like to know what you think the problem may be, and how can I correct it?—Dennis Hennessy, Bradley Beach, N.J.

A. There can be a number of causes for noises in your automobile radio. It may be simply a matter that you are located quite far from most FM stations. This would mean that they are received at too low a signal strength, and this would prevent the limiters in your radio from working to suppress the noise. This is most likely if your receiver is stereophonic. Assuming that your equipment is functioning normally, there is nothing you can do about this kind of noise.

Another cause may be that your car antenna is shorted so that some of the signal is grounding out on the car frame. Perhaps the front end of your radio is misaligned or otherwise defective, leading to reduced signal strength.

It is possible that the noise is actually the result of some defect in the audio portion of your receiver and has nothing to do with the signals being received. A constant background noise, especially when receiving a strong local signal, means that something is definitely wrong with some portion of the equipment, and it should be serviced.

Album/Cartridge Replacement

Q. I would like to know if it is necessary to buy new albums when purchasing a new phonograph cartridge. Does the needle cut its own groove in the album? I've heard so many opinions on the subject that I'm really confused.—Anthony Lingelbach, Fresno, Cal.

A. There is no need to buy new albums just because you've changed cartridges. A playback stylus in good condition doesn't cut any added grooves or change the existing ones in any way that would cause the old album to play better with a new cartridge than the existing one.

However, there are some extreme cases where a given disc has been played so many times that it will now sound either "broken up" or noisy, and here using a stylus of a different shape will sometimes improve the playback of such discs dramatically.

Slew Rate

Q. What is meant by "slew rate" in a power amplifier?—Gil Hampton, Dallas, Tex.

A. After a signal has been applied to the input of a transistor, some time must pass before the output voltage rises to its proper value. The time required for a transistor to arrive at some arbitrary output is generally measured in microseconds and the quicker the response at the output of the amplifier as compared to its input voltage, the more faithful the reproduction will be, or so the argument goes. A

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To get a superb performance, you need a precision machine.

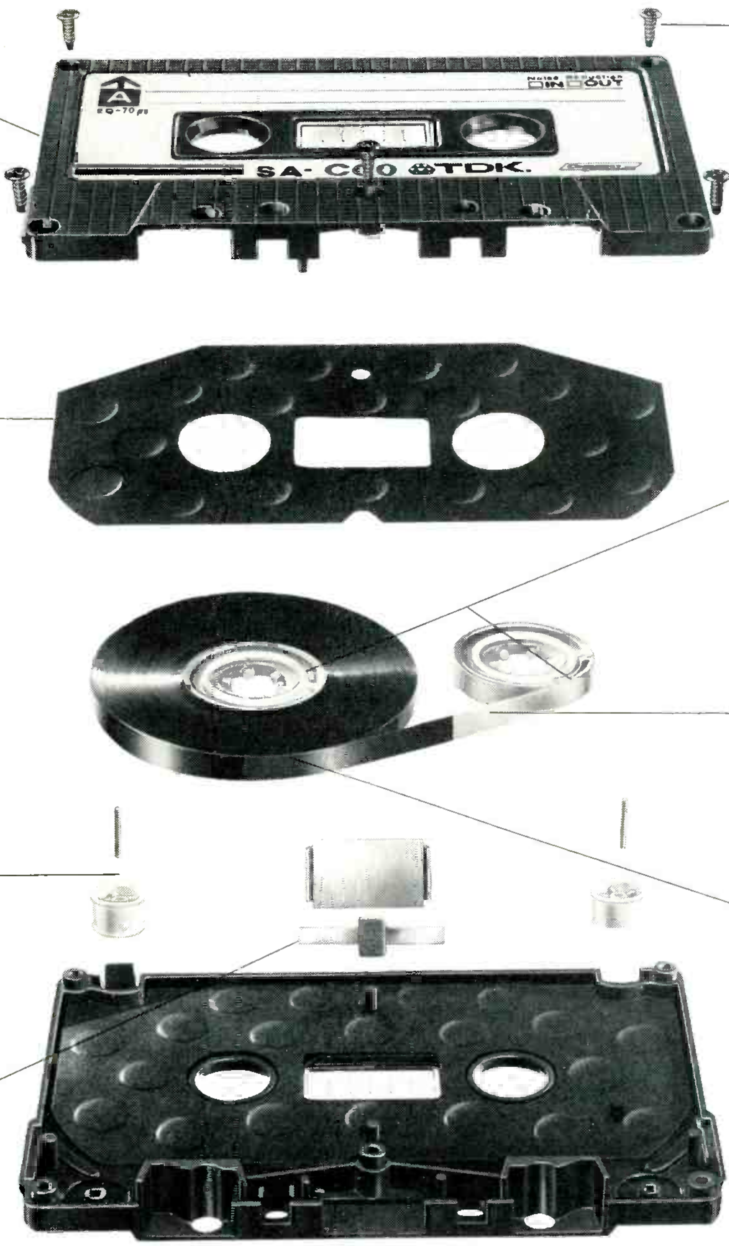
To command a great performance, a cassette shell and cassette tape must be engineered to the most rigorous standards. Which explains why we get so finicky about details. Consider:

Precision Molded Cassette Shells—are made by continuously monitored injection molding that virtually assures a mirror-image parallel match. That's insurance against signal overlap or channel loss in record or playback from A to B sides. Further insurance: high impact styrene that resists temperature extremes and sudden stress.

An Ingenious Bubble Surface Liner Sheet—commands the tape to follow a consistent running angle with gentle, fingertip-embossed cushions. Costly lubricants forestall drag, shedding, friction, edgewear, and annoying squeal. Checks channel loss and dropouts.

Tapered, Flanged Rollers—direct the tape from the hubs and program it against any up and down movement on its path towards the heads. Stainless steel pins minimize friction and avert wow and flutter, channel loss.

Resilient Pressure Pad and Holding System—spring-mounted felt helps maintain tape contact at dead center on the head gap. Elegant interlocking pins moor the spring to the shell, and resist lateral slipping.



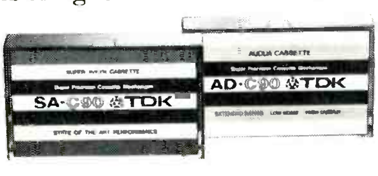
Five-Screw Assembly—for practically guaranteed warp-free mating of the cassette halves. Then nothing—no dust or tape snags—can come between the tape and a perfect performance.

Perfectly Circular Hubs and Double Clamp System—insures there is no deviation from circularity that could result in tape tension variation producing wow and flutter and dropouts. The clamp weds the tape to the hub with a curvature impeccably matched to the hub's perimeter.

Head Cleaning Leader Tape—knocks off foreign matter that might interfere with superior tape performance, and prepares the heads for. . .

Our famous SA and AD Tape Performance—two of the finest tapes money can procure are securely housed inside our cassette shells. SA (Super Avilyn) is the tape most deck manufacturers use as their reference for the High (CrO_2) bias position. And the new Normal bias AD, the tape with a hot high end, is perfect for any type of music, in any deck. And that extra lift is perfect for noise reduction tracking.

TDK Cassettes—despite all we put into them, we don't ask you to put out a lot for them. Visit your TDK dealer and discover how inexpensive it is to fight dropouts, level variation, channel loss, jamming, and other problems that interfere with musical enjoyment. Our full lifetime warranty* is your assurance that our machine is the machine for your machine. TDK Electronics Corp., Garden City, N.Y. 11530. Canada: Superior Electronics Ind., Ltd.



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THE AMERICAN CARTRIDGE THAT'S A STAR ABROAD

When we introduced the Sonus Blue cartridge, we were amazed at the speed with which discriminating audiophiles responded to its astounding ability to improve the quality of record reproduction. And we must admit that we've gotten some pretty good reviews in America.

But what really surprised us were the enthusiastic reviews of European audiophile publications.

Hi-Fi Choice (England): "A best buy... must be the Sonus Blue... overall balance of sound quality and laboratory performance is first rate... On listening tests, the Blue ranked number one."

Banc D'Essais—Nouveautes (France): "Listen to the Sonus cartridge... it reproduces even the most complex musical passages with superlative clarity."

Stereolab—Test (Germany): "...The Sonus showed up as very balanced and clean... compared to other outstanding cartridges, it stands up effortlessly! ...Quality level: Without question top class."

We feel more strongly than ever before that the addition of a Sonus cartridge to any fine quality stereo system will result in noticeable sonic improvements. Write for copies of these reviews, further information, plus the name of your local Sonus dealer.

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SONUS

High Definition Phono Cartridges

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Tape guide

Herman Burstein

Line Length

Q. I would be interested in information concerning the maximum length of microphone cable I can safely use with my tape deck.—Herman DeVries, Union, Iowa.

A. if you are using high impedance microphones—over 10 kilohms output impedance—don't use more than about 15 ft. or 20 ft. at the very most. However, a low impedance mike of about 1 kilohm or less allows you to use upwards of 100 ft. of cable.

Deck Decision

Q. I've been having a problem trying to choose between two tape decks. One is rated at a ±3 dB frequency response, while the other is at ± 2 dB. Is there a substantial difference between them?—Allan Mandeville, APO N.Y.

A. A tape deck with a flat frequency response within 2 dB will give slightly better audible performance than one flat within 3 dB, assuming both cover the same range, say 30 Hz to 15 kHz and both conform to specifications. Keep in mind that the deck rated flat within 2 dB has a total swing of 4 dB, while the other has a swing of 6 dB.

Mono Mishap

Q. I have a Sony tape deck with which I'm not too familiar. I recently received some four-track mono tapes and I find that when I play these, two tracks play through two speakers at the same time, therefore, I must turn off one of the speakers in order to hear the other clearly. Is it at all possible to have one track playing through both speakers?—George Marashian, Milford, Mass.

A. Whether or not you can play four mono tracks one at a time depends upon the switching facilities of your particular tape deck or audio amplifier. Some decks allow you to play one track at a time, while others force you to play two at a time (stereo mode). However, many audio amplifiers allow you to feed one incoming signal (left or right) into both channels. Therefore, I suggest that you consult the tape deck and audio amplifier instruction manuals to see if one or the other permits you to switch one signal into both channels. If the manuals aren't clear on this point, consult your audio dealer or equipment manufacturer.

Dolby Economics

Q. I am confused over the various Dolby noise reduction units on the market, with prices varying over a wide range. Are the cheaper units only for playback of Dolby recordings?—D.D. Woodruff, San Rafael, Cal.

The less expensive Dolby units employ the same electronics for recording and playback; this means that you cannot simultaneously record and monitor a tape with the Dolby frequency characteristics. Instead, you must first record the tape with the Dolby unit, then play it back with the Dolby unit at a later time. The more expensive units enable you to simultaneously record and play a tape with the Dolby characteristics. Also, the more expensive units may incorporate additional features such as microphone mixing, VU metering, etc.

Quality Quandry

Q. Does erasing and recording over previously recorded material affect the quality of the recording?—David Hunt, Rockland, Mass.

A. Tape that is *completely* erased is suitable for repeated use in recording. If the tape machine's erase head cannot achieve complete erasure, use a bulk eraser. Otherwise, though this takes much longer, put the tape through the recording process with no signal input to "pre-erase" the tape. Then the tape is erased a second time when you use it for recording.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 401 North Broad Street, Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.

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Music you never knew was there.

There are probably beautiful musical passages on many of your records that you've never heard. And you never will, unless your cartridge is sensitive enough to clearly reveal all the subtle harmonics within the audio spectrum.

Today's sophisticated direct to disc technology has raised the quality of disc recording to a new state of the art. You need a cartridge that does justice to these fine recordings: an ADC cartridge. With an ADC cartridge you will find the state of the art has been brought almost to the state of perfection.

Long known by audiophiles for incredibly pure sound reproduction, ADC cartridges have also proven their amazingly low record wear. This year, they have even surpassed themselves.

First, there's the remarkable new ZLM with the unique ALIPTIC™ stylus. It combines the better stereo reproduction of the elliptical stylus shape with the longer, lower wearing, vertical bearing radius of the Shibata shape. As a result, sound reproduction is completely transparent and clean. Individual instrument placement is more easily identifiable. And frequency response is ruler flat ±1dB to 20kHz and ±1½dB to 26kHz. It tracks at ½ to 1¼ grams.

Then there's the new XLM MK III with the same reduced mass, tapered cantilever but with a true elliptical shaped nude diamond tip. It has 50% lower mass than our previously lowest mass XLM MK II. It tracks at ¾ – 1½ grams.

The QLM 36 MK III with the innovative Diasa elliptical nude tip also has excellent frequency response, wide separation, and an incredibly clean sound. It also tracks at ¾ – 1½ grams.

The QLM 34 MK III offers elliptical shape and tracks as low as 1 gram with flat response out to 20kHz ±2dB.

The QLM 32 MK III is a 2–4 gram elliptical with great sound. It's one of the best budget ellipticals around.

And ideal for automatic changers, the QLM 30 MK III is a 3–5 gram conical stylus that's compatible with a wide range of stereo equipment.

The ADC cartridges. Think about it. You probably don't even know what you're missing.

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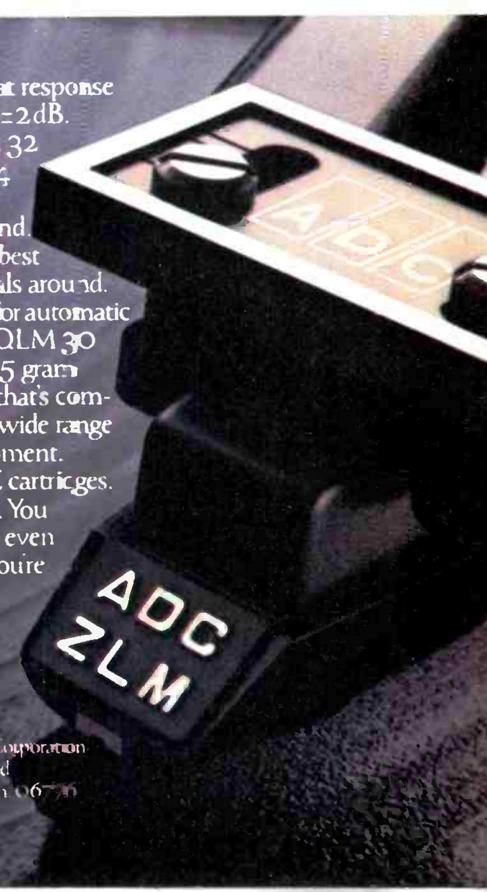

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Audio etc.

Edward Tatnall Canby

We do a lot of talking these days about bringing the concert hall into the living room—how about bringing it into the concert hall? If that sounds redundant, I mean of course via recordings. They do it all the time in Great Britain.

Recently a well-known pair of British record/hi-fi people decided to try the idea over here, in the name of their two organizations. They were Joan Coulson of EMI, the huge British record company, and Raymond Cooke, once of Wharfedale, now heading his own British company, KEF. It happened right in New York and I was there, the whole time. I can report to you first-hand, then, that the operation was successful but the patients nearly died. You never saw such a bewildered batch of press and dealer people in your life. This was not like any hi-fi demo—it was a *concert.* And I mean a concert.

Joan Coulson, who has been EMI chief all-around public relations manager for years and who herself has presented recordings in public for much of her career, was a most winning hostess and commentator on the music—that wasn't the problem. Graceful, enthusiastic as well as knowledgeable, she made a pretty picture up on the small stage of Cami Hall, in the crook of a flower-laden (and silent) grand piano. But this time she was up against more than even she could manage. I had to admire the professional ease with which for almost two hours she tried to reassure her New York audience that all this classical music really was very good listening, even at this considerable length—phew! They were trapped. The leaden weight of the Unaccustomed was just too much, at least for this audience.

To be sure, some of those present were charmed, knowing perhaps both the music and the English tradition that it represented. There's usually a happy soul in the gloomiest audience, a silver lining to every cloud, and this was in fact a beautifully organized presentation of its kind. But unfamiliar—so unfamiliar! It wasn't Coulson's fault, nor that of Ramond Cooke, at the controls—he also had been in the same thing before he teamed up with Coulson. It was simply the nature of the presentation itself. A gramophone concert.

Musical Samples

Now in America we have a very keen sense for new media of every sort, and we quickly develop ways of usage for each, depending. When the press and/or public here is invited to a playing of recordings in public we know what to expect. It happens often, and there's nothing very new about it—the technique is by now sure and effective, if hard on the music. Whether the sponsor is a hi-fi firm or a record outfit, whether the intent is to show speakers, pickups, artists, or new systems via numerous channels or even something positively digital, the format is generally predictable. Superb audio equipment, of course. With plenty of power.

Not only loud music but short. Our musical excerpts by custom virtually never run their proper musical course, i.e. until the music itself allows for a natural break. Instead, time being of considerable essence, we use the merciful fade-out. Or the merciless grab-off, complete with stylus squawk. One minute? Maybe two? That's about it, either way. Necessary because busy press people, the general public, avid for other surrounding sensations, as at a hi-fi show, expect the proceedings to be concise and to the point, with music in its proper place, strictly on a sampling basis.

To put it another way, our public hi-fi is very seldom a concert, nor is it so intended. We play our music at leisure when we are at home, or we listen to it on the air.

The only semi-public occasion when a whole musical work, or at least a whole segment, gets played straight through is as background while conversation rises up. This we enjoy (and I often do myself) because we feel it is a natural thing for recorded music. But even so, most straight-through playings are by accident; nobody got up to turn the machine off, or suddenly substitute a different recording. A *very* few are deliberate, and as a musician I must quietly bless the perpetrators thereof. But I have long since recognized that, with us, that sort of musical sensitivity just isn't in the nature of public recorded-music presentations, which have their own virtues in their own way. I am merely describing, then, rather than criticizing; this is the way we work, over here, and any exceptions to the above procedures merely prove the rule by being exceptions. I

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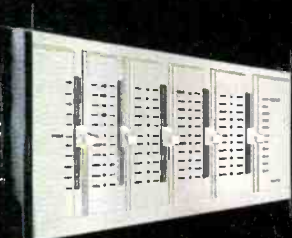
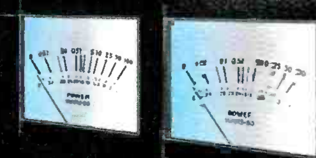
THE JVC SEPARATES.

Sensitive tuners, plus DC amplifiers that help eliminate sonic backlash.



If you've ever listened to a JVC music system with a separate tuner and amplifier, and thought, "One of these days..."

Well that day is here. The new JA-S44 DC integrated stereo amplifier, with its exclusive built-in SEA graphic equalizer and dual power meters, provides clean, uncannily-accurate music reproduction, with all the power you're ever likely to need.* And it has dual power supplies—not one for each channel, as in conventional designs—but one for its Class A-operated preamp/tone control section, and a second which performs even heavier duty for its Class B-operated DC power amplifier section. This unique design practically eliminates both inter- and intra-channel crosstalk and distortion, or what we call "sonic backlash." The results: increased tonal definition and brilliance, especially with high-level transient signals.



Our "Tri-DC" design in the JVC JA-S55 and JA-S77 further eliminates distortion-causing capacitors within the DC phono equalizer, DC tone control and DC power amplifier sections, providing frequency response from 5Hz to 100kHz (+0, −1, 0dB).

The new JVC JT-V22 AM/FM stereo tuner is a standout in its class. With an FM front end that uses an FET RF amplifier, combined with a 3-gang tuning capacitor, the JT-V22 brings in the most timid FM stations and makes them sound as though they're just around the corner. Or, if you're in an area where FM stations are a hairline away from each other on the dial, it delivers clear, interference-free reception. Then, to help you make sure you're on target, it has both signal strength and center-channel tuning meters.

Probably the most significant advance in recent FM tuner technology is JVC's Phase Tracking Loop circuitry in our new top model—JT-V77. This advanced circuit provides high signal-to-noise ratio as well as excellent interference rejection and freedom from multipath effects and adjacent channel interference. It's still another example of JVC's innovative engineering. But sounds speak louder than words. See and hear these magnificently-designed separates at your JVC dealer soon.

JVC High Fidelity Division, US JVC Corp., 58-75 Queens Midtown Expressway, Maspeth, N.Y. 11378. Canada: JVC Electronics of Canada, Ltd., Ont.

Top: JA-S22 Bottom: JA-S55 Top: JT-V77 Bottom: JA-S77

JVC

We build in what the others leave out.

JT-V22, JA-S44

*45 watts/channel, min. RMS, 8 ohms, from 20Hz-20kHz, with no more than 0.02% THD. Rack-mount handles and wood-grain cabinets optional.

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enjoy hi-fi demos of any kind when they are well done, even though now and then I wince at the awful musical mayhem. By common consent, musical meaning is just not a part of *this* picture. And though I do think minor improvement is easy with half an ear, I go along with the general idea. It's us.

Gramophone Concerts

In England, things are more conservative. They have their hi-fi demos, too, but on the whole they take their recorded music—much more literally than we do—*as music*. To them, curiously, it does not too much matter whether music is recorded or live—they feel the same about it. So why not listen in the old reliable ways? Like a concert. Coulson and Cooke were brave souls to come over here with a show that is, you might say, the ultimate product of that British way of thinking. If recorded music is *music*, then why not a concert of that music? "A musical experience," they called it, and it is indeed out of an old and established tradition in their country.

True, the hi-fi itself was not unlike that which we also use, though all of it was British made. But it was not the fi that mattered. Not even Joan Coulson's first-hand EMI commentary, drawn direct from her long experience inside that big company—she knows all the artists and engineers and seems to have been at every recording session—not even all that could disguise the solid fact that what we heard in New York was a *true concert*, just like a concert of live music. We were there to listen, like any other concert audience, and at length. Can you imagine it?

In the U.K., you must understand, there are some 300 "gramophone societies" which meet regularly to discuss and "to learn about musical matters related to the gramophone." And, of course, to play recorded music to the membership. On an American scale this would involve thousands of such groups, if we had them. We have a handful, I have heard. On the other hand, we do have in the hundreds, at least, our hi-fi and audio clubs, which in the American manner also meet to discuss and to play a vast range of musical recordings. In these the music can be extremely well served and surely often is. But, as I have reason to know, it also can be subjected to all the mayhem and indignity customary in professional demos and with a lot less justification. How often, for instance, are musical works played straight through and in respectful near-silence? If I am right, very seldom are these American meetings actual musical concerts. And yet—our informal approach is perhaps better for us if the music is given half a chance to say what it has to say. I only wish it were more often.

Moreover, in England there is a larger scene, a positively awesome tradition, in fact, of actual gramophone lecture-concerts on a scale hardly believable to Americans. Which is where the New York "musical experience" comes in. There have been monster affairs such as the concerts put on by Gilbert A. Briggs, long-time genius of Wharfedale, in, of all places, the Royal Festival Hall. (Imagine a sold-out phonograph concert in Carnegie Hall.) Others, an astonishing number, run as regular concert series, very much like the "live" sort and often in similar halls. Still more go out "on tour," recordings, equipment and all, throughout the U.K. and Eire. The whole movement is a most unusual aspect of what we used to call "live vs. recorded"—played out on a grand scale before large numbers of people. So, as you can understand, the idea of

"The most musical loudspeaker in my experience"

"Exciting to hear... outperformed its specifications...not a hint of shudder or overload ...the most musical loudspeaker in my experience. I have no higher praise for any speaker than that. It out-performs anything of its size at any price in my experience."

PULSE England

"Precise"

"Martin engineers have made a success of an attractive, brilliant and precise loudspeaker, without any fatiguing, colorations or distortions."

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Gamma 310

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What makes this speaker better is what isn't there.

When we created our new 3-way LS-408B, we discovered that *less* is better.

By carefully designing the weight of the voice coil with the cone assembly in the woofer, we discovered that we could eliminate the crossover coil. And eliminate one of the major causes of speaker distortion.

The result is better sound throughout the entire frequency range. A solid, tight bass. Accurate midrange. And crystal clear highs.

But, what we put into a speaker is as important as what we leave out. So for the tweeter and midrange, we used a computer to design light-weight, extra rigid cones for superb transient response.

Then we mounted the speakers on a lumber-core baffle board that reduces internal resonances. And designed the enclosure to assure an acoustic match between speaker and cabinet.

At Kenwood, we make every part of every speaker for one reason: To deliver a crisp, clean sound that accurately reproduces the original music.

If you're serious about your system, you shouldn't settle for anything less.

Your speakers' reputation should be as good as your receiver's.

KENWOOD®

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an actual concert of recorded music is a thing the British take for granted.

Two Masters

Joan Coulson has long been a leader in these. In fact, she came to EMI's notice through the public gramophone recitals she was giving as a sales promo for records. (How often do we try that?) She was primarily music-minded, a pianist, but at EMI she founded not only a lecture service, about recordings, but even an EMI Advisory Service with useful info on how to present gramophone music in public situations. On that basis she still travels widely with her own presentations of this popular sort—popular, that is, in England. She has earned all sorts of public honors for it, and she is even an active member of the AES often seen around the conventions.

As for Raymond Cooke, he was a child violinist, then an industrial chemist, into radar and, finally, an audio man working for Gilbert Briggs himself at Wharfedale where he assisted Briggs at the giant Festival Hall affairs and others as well. Eventually he founded his own KEF Electronics, specializing in speaker manufacture, but he has not lost his keenness for the musical concert via recordings, and it was in this fashion that he joined up with EMI and Joan Coulson for the New York venture.

So there's the background. What was the New York "musical experience" like? In a purely technical way, it was a masterful solution to the problems of playing recordings intended for the home into a concert-hall space. I have never heard a more professional job, and I was astonished at how easily every sort of music came across in the Cami Hall set-up, from solo harpsichord to full orchestra and chorus. I bow to two masters of the art! As for the fi, it was plenty good in the British manner, four Quad 405 amplifiers in pairs feeding a total of 800 watts into the two KEF Model 105 speaker systems on the stage in stereo. Up in the back balcony were two Ferrograph Series 7 tape machines.

What bothered the New York audience was basically the music. These were people for the most part not particularly musical but very familiar with the normal American approach to hi-fi demonstrations. What got them was first of all, the sheer quantity of material. Hours of it! A whole evening, no less. (Well, what else do you expect in a concert?) More specifically, the 16 musical numbers on the program, plus one dividend, were each played straight through to the music's normal end, except in a few very long movements—Bruckner—where there was a discreet fade-out at a good spot. During these very long (relatively) sequences we all sat rigidly in total silence in our concert hall seats—precisely as at a live concert.

Now this was very unsettling, as it is usually for all who go to live concerts for the first time. For *recorded* music, it is just not a thing we Americans are prepared to do in public. At home is another story. There we listen in peace and relaxation. Imagine, then, a very faint slow movement from a Scarlatti harpsichord sonata, a baryton Trio (a sort of cello with extra plucked strings) by Haydn, and so on, complete movements—played from start to finish.

Quiet Quads

I think that perhaps the most unnerving aspect—for this audience—was the volume levels. Again, a matter of

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INTRODUCING THE TEAC C-1.

We took a data recorder made for computers and built a cassette deck made for connoisseurs.

If you're critical about what you listen to, you should see the new TEAC C-1.

The C-1 has a transport directly derived from recorders built by our Instrumentation Division for the world's major computer manufacturers.

Its motors are rated for thousands of hours of continuous use. Servo controls have a reliability factor of 10^8 and function switches are built to withstand repeated use in excess of 100,000 times.

WHY THE TRANSPORT IS SO IMPORTANT

For the C-1 to deliver the kind of virtuoso performance we promise, it has to meter—not pull—tape with the utmost reliability. And that's a matter of mechanics, not electronics.

The sad fact is, many tape recorders are built by electronics companies with a short history of transport design. And transport mechanics is where most tape recorders break down.

Transport design—using materials that move and interact—is no simple science. It's an art that takes a long time to learn.

The art of mechanical design is one we've been practicing for more than 25 years. And it reaches a high point with the C-1.

THE TRANSPORT

The C-1 transport is a 3-motor/3-head dual capstan system. The closed loop dual capstans are linked with twin belts to produce a wow and flutter spec of just 0.04%. The capstan motor is phase-locked loop, so it's free from voltage and frequency fluctuations.

C-1 pinch rollers are self-adjusting to get optimum tape pressure onto the capstans. Transport controls are LSI logic-operated and positive. Separate right and left input controls are cross-geared with friction coupling for one-hand control of channels.

A pitch control lets you vary tape speed up to ±4% (because tapes you get from others may not be as accurately recorded as those you give).

THE ELECTRONICS

There isn't a cassette deck made that can beat this combination of specs: overall frequency response with CrO_2—20-20kHz, other—20-18kHz; Wow and Flutter—0.04% NAB, weighted; and Signal-to-Noise ratio—−70dB with Dolby at 5kHz and up to −90dB with optional dbx interface module (Rx-8).

Another unique feature to the C-1, are plug-in bias EQ/cards that let you optimize the electronics to a specific brand of tape. Additional cards are available for various brands of tape. For distortion-free recording, peak program meters respond to signals with an attack time of 10 milliseconds in all audio frequencies and give you an accurate display of peak level up to +5dB.

Other C-1 features include an input selector switch for Mic/Mic-with-attenuation (20dB pad)/Line; a timer control for automatic record/playback start; a memory function for Auto-Stop/Repeat; and a folding stand for vertical or angled use. Naturally, the C-1 can also be rack mounted.

HOW MUCH

The TEAC C-1* has a suggested list price of $1300, a lot of money by some standards. But when you consider its computer/instrumentation heritage—and what that means in terms of how long and how well it will run—it could be the most inexpensive tape recorder you can buy.

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ADS 810
AR 11
ESS amt 10b
INFINITY QUANTUM 5
YAMAHA NS 690 II

There's only one way to decide which of these fine speaker systems you'd prefer. Compare them with the Ditton 44.

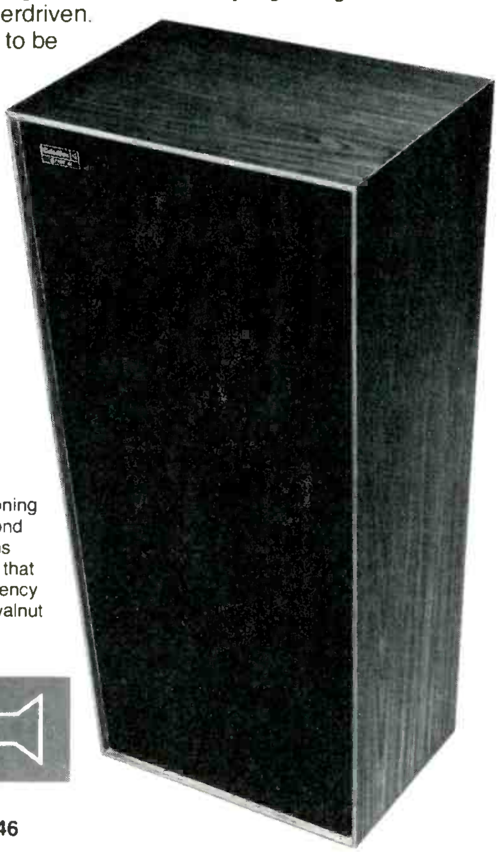
This array of speaker systems should give you an interesting experience in evaluation and selection. Except for their price range (about $300), they have little in common. That is, with respect to size, shape, speaker complement and—to some extent—engineering approach.

Of course, all speakers should pursue the same goal: to be accurate, precise and faithful to the program material. And for a goodly number of music lovers, each of these speakers has come acceptably close to that goal. Which makes each of them a worthy challenger to the Ditton 44.

One fact about the Ditton 44 we can give you right now. It combines both high efficiency and unusually high power-handling capacity. As little as five watts brings it to realistic listening levels. As much as fifty watts are easily handled. And you'll find the listening level uncomfortably high long before the Ditton 44 is in danger of being overdriven.

The specialists we've selected to be Celestion dealers have critically-designed listening rooms that allow all components to be evaluated accurately and fairly. This, of course, is especially important when it comes to speakers.

These conditions make it very likely that you will be highly satisfied when you listen to the speaker of your choice in your own listening environment. Even more so, we believe, if it should be the Ditton 44.



The Ditton 44 by Celestion
An hermetically sealed three-way system employing a 1" dome super tweeter functioning from the 5 kHz crossover point to well beyond audibility, a 6" cone midrange that functions down to 500 Hz and a 12" bass transducer that is operational down to 30 Hz. Overall frequency response is 30 Hz to 40 kHz. Available in walnut or teak finish. 30" h x 14½" w x 10" d.

Celestion
Loudspeakers for the perfectionist

Celestion Industries, Inc.
Kuniholm Drive, Holliston, MA 01746
In Canada: ROCELCO Inc., Downsview M3J2J7

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literalness. We like our recorded music loud, especially in public. Our highly developed sense for the medium tells us, I think rightly, that this is a different form of musical propagation and it *needs* solid volume, perhaps to make up for the missing live performers. But the English levels, even with 800 Quad horses, were never really loud and often quite low. These, indeed, were literal concert levels—as an audience hears them in the flesh—and far from the 110 dB at the mikes up on stage. As I say, it *was* a concert, even in this special sense, meticulously and admirably so. I think that its very power to make our audience acutely uneasy proved how consistent it was with the British viewpoint. I might add that Coulson and Cooke got warm applause when the end finally came. I think we all understood that this was a noble venture, impeccably carried through.

Now I am no believer in non-education, and I deplore our general lack of listening courage in respect to classical music of many kinds. We should be less fearful. It doesn't bite. It can be pleasing even at length. We should listen longer. But *a gramophone concert in a concert hall?*

In the end, I think that a less literal format, under some new name, might provide an easier musical experience for the American listener and with more attention to the demands of this different medium. Surely, there are ways to graft the British idea onto American practice with benefit both to music and fi. I've always thought so. It should be tried, and often. But I would want Joan Coulson and Raymond Cooke on hand to do the producing.

P.S. One technical aspect you may have guessed—no discs. Instead, we heard something of a rarity, at least among large recording companies, two-track Dolby A copies in stereo made direct from the EMI masters of each recording, de-Dolby A in the playback. Hence the Ferrographs—two, to avoid waits for rewind. Not too many members of our audience realized how beautifully this eliminated the amplified rumble, hiss, and gunfire popping of a disc record, even the best, as blown up in a large space. We heard only velvet silence as a background—except for one item. That was *Scheherezade* with Sir Thomas Beecham, EMI's very first stereo release. In those days there was neither Dolby nor dbx. On this one we heard a faint hi-fi hiss. Now if we just had master tape copies for ALL our hi-fi demos. . . .

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A NEW PREAMP FOR THAT DISCERNING PERFECTIONIST WHO CAN APPRECIATE THE DIFFERENCE.

The new Phase 3000 Series Two was designed for that discerning music-lover who has a passion for accurate sound, an eye for elegant, yet functional design, a feel for craftsmanship, and an unfailing determination to maximize return on investment.

The Phase 3000 incorporates the latest technological advancements in preamp design. Transient overloading that plagues preamps has been virtually eliminated, whether amplitude, frequency, or slew induced. Now you can enjoy the flexibility, performance and features that are priced substantially higher in other equipment.

CMOS LOGIC MEMORY SYSTEM

Most preamps use dated mechanical switching devices that force signals to travel long, noisy, circuitous routes from the inputs to the front panel, then back to the outputs. *Ours doesn't.* The Phase 3000 uses CMOS-digital logic to energize switching relays located where they belong, at the input jacks. This shortens critical signal paths. Noise, hum, and the "crosstalk" that's characteristic of mechanical switching is virtually eliminated.

WANT MORE?

A listening session with a pair of headphones will convince you just how much of a difference a true headphone amp makes. Turn the 3000 around, and see how easy it is to patch in your noise reduction unit.

Two complete taping circuits allow you to copy between decks while listening to another source.

But we've done enough talking. If you're serious about state-of-the-art performance it's time for you to do some listening. See your Phase dealer.

SPECIFICATIONS:

Distortion: less than 0.04% (20Hz-20kHz). Typically 0.005% @ 1kHz.

Signal/Noise (IHF "A"): Phono 1—Moving Magnet: greater than 90dB re: 10mV input. Phono 2—Moving Coil: greater than 78dB re: 1mV input

Frequency Response: Phono-1, Phono-2 deviation: ±0.3dB

Tone Controls: High & Low Frequency controls with switchable turnover points.

Volume Control: 22-position precision attenuator with plus or minus 0.5dB tracking.

Low Filter: 18dB/octave below 15Hz.

Phase Linear Corporation
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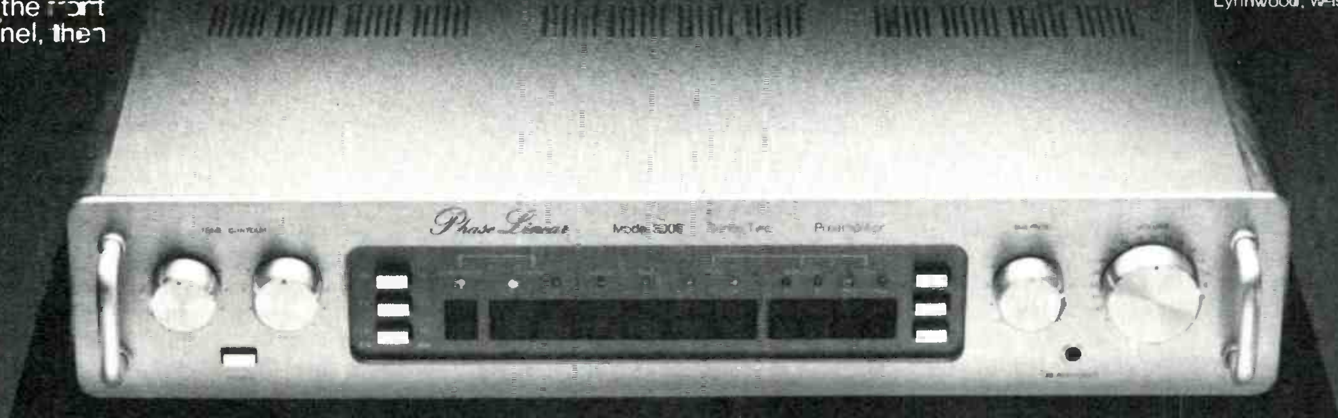
Lynnwood, Washington
98036



PHONO CARTRIDGE FLEXIBILITY

The two independent RIAA Phono Stages eliminate all low-level switching. As a result, noise is reduced to theoretical limits.

Phono 1 is designed for moving-magnet cartridges and has three selectable capacitance values.

Phono 2 is used with moving-coil cartridges and has three selectable resistance values. The expensive outboard head amp usually required for a moving-coil cartridge is already built into the 3000.

Phase Linear®

THE POWERFUL DIFFERENCE

MADE IN USA. DISTRIBUTED IN CANADA BY H. ROY GRAY LTD. AND IN AUSTRALIA BY MEGASOUND PTY. LTD.

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Behind the scenes

Bert Whyte

As I have said many times before (I hope not *ad nauseum*), the audio industry is one of the most dynamic, fastest-growing segments of our scientific community. The fact that the Audio Engineering Society sponsors three conventions every year is a convincing indication of its vitality. Every year, each succeeding American convention becomes ever bigger and more comprehensive. So it was with the 60th AES convention, held in Los Angeles May 2-5th of this year. It has become almost a cliché to state that "attendance was up, more papers were presented, there were more exhibitors than at any previous convention." Needless to say, this "high-water mark" is sure to be topped by the New York convention in the fall . . . and so it goes.

If the entrants in the "digital derby" got out of the starting gate at the 58th AES convention at the Waldorf, at this convention it was obvious they had reached the first turn and were jostling for position, but with the homestretch not yet in sight. There were nine papers presented on various aspects of digital recording, as well as demonstrations of digital recorders from Soundstream, JVC, 3M, Technics, Mitsubishi, and a non-official demonstration of the Sony PCM unit by that bearded savant of Cerwin-Vega, Gene Czerwinski.

Painfully aware of the debacle caused by non-compatibility and non-standardization of quadraphonic sound, the AES has wisely set up a "Digital Audio Standards Committee." There have now been five meetings of this group, and while there seems to be general agreement that a 16-bit system is desirable for digital recorders, the matter of sampling rates seems to have created a stumbling block. On the one hand is a group who advocate a single-standard sampling rate for digital recording whether the units employ fixed heads or rotary-scanning heads. On the other hand, there are proposals for a certain sampling rate to be used with consumer-type PCM units for rotary heads and another sampling rate for fixed head units. As you might expect, since the Japanese are the principal manufacturers of the rotary-head, video-cassette recorders, which they want to mate with PCM recording adaptors, they want to adopt a sam-

pling rate which would not make these adaptors prohibitively expensive. The Japanese consider a 20-kHz bandwidth adequate to prevent deterioration of sound quality, including the effects of the anti-aliasing filter. It is this filter that costs so much, for the wider the bandwidth and the higher the sampling rate, the more complex and costly is the filter. There are other considerations involved in their early potential choice of the comparatively low sampling rate of 44.05594 kHz, such as length of recording time and easy conversion of the digitized audio signals into NTSC video signals. In fixed-head digital recorders, the Soundstream unit uses a sampling rate of 48 kHz, while the 3M/BBC recorder has a sampling rate of 50 kHz. Some who advocate an audio bandwidth beyond 20 kHz, are suggesting sampling rates as high as 100 kHz. The idea here is that the effects of the anti-aliasing filters at this rate would be above the audible range. However, it is doubtful that either the Ampex or 3M digital mastering tape would be able to cope with the high sampling rate. Thus for a variety of reasons, the fixed head "professional" digital recorders seem to be leaning towards a sampling rate around 50 to 54 kHz. Well, enough said on this point. Here is a round-up of digital recorder activity at the 60th AES convention.

Digital Developments

The 3M people held a press conference just prior to the opening of the convention, and Dr. Marshall Hatfield, general manager of their Mincom Division stated that the 3M/BBC digital audio mastering system was "on schedule" and three systems would be in selected studios before the end of 1978. He also stated that continuous production of the digital recorders would begin early in 1979, at their Camarillo, California plant. The rather surprising news from 3M was that the 32-channel pre-mix digital recorder and its companion 2/4 track mastering recorder, which were to be sold at a projected price of "under $150,000," would initially be available only through a lease-rental arrangement. This is because 3M feels that the recorders represent a new technology, that further refinements are sure to evolve, and 3M must be responsible for their incorporation into the recorders. The financial arrangements are said to be $10,000.00 reservation/installation fee, monthly rental of $4,000.00, and a usage fee of $4.00 per hour. One assumes that on a three-year basis, this is equivalent to the original $150,000.00 purchase price. Dr. Hatfield is very bullish about digital audio in general, and reiterated that 3M is doing developmental work which it is hoped will lead eventually to consumer-type digital playback equipment.

The Soundstream digital recorder is currently not available on an outright sales basis. Instead, the recorder is part of a complete recording service wherein the unit and Soundstream personnel are in on the recording sessions, then offer editing services at their Salt Lake City headquarters, then ultimately take the recorder and the edited tape to the JVC Cutting Center in Los Angeles, where Stan Ricker can produce half-speed master lacquers. The digital recording service of Soundstream works on a royalty basis per record sold, with an advance against this royalty covering initial set-up,

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Empire's Blueprint for Better Listening...

No matter what system you own, a new Empire phono cartridge is certain to improve its performance.

The advantages of Empire are threefold.

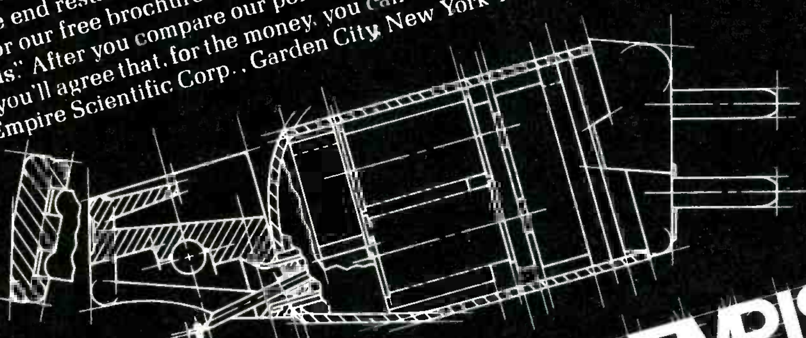
One, your records will last longer. Unlike other magnetic cartridges, Empire's moving iron design allows our diamond stylus to float free of its magnets and coils. This imposes much less weight on the record surface and insures longer record life.

Two, you get better separation. The small, hollow iron armature we use allows for a tighter fit in its positioning among the poles. So, even the most minute movement is accurately reproduced to give you the space and depth of the original recording.

Three, Empire uses 4 poles, 4 coils, and 3 magnets (more than any other cartridge) for better balance and hum rejection.

The end result is great listening. Audition one for yourself or write for our free brochure. "How To Get The Most Out Of Your Records." After you compare our performance specifications we think you'll agree that, for the money, you can't do better than Empire.

Empire Scientific Corp., Garden City, New York 11530



EMPIRE

MODEL	4000 D/III	4000 D/I	2000Z	2000T	2000 E/III	2000 E/II	2000 E/I	2000 E	2000
FREQUENCY RESPONSE	10Hz-50kHz ± 3 dB	15Hz-45kHz ± 3 dB	20Hz-20kHz ± 2 dB	20Hz-20kHz ± 1½ dB	20Hz-20kHz ± 2 dB	20Hz-20kHz ± 2 dB	20Hz-20kHz ± 3 dB	20Hz-20kHz ± 3 dB	20Hz-20kHz ± 3 dB
TRACKING FORCE RANGE	¾-1¼ gm	1-1¾ gm	¾-1¼ gm	¾-1¼ gm	¾-1½ gm	¾-1½ gm	1-2 gm	1¼-2½ gm	1½-3 gm
SEPARATION:									
15Hz to 1kHz	28 dB	24 dB							
1kHz to 20kHz	23 dB	20 dB							
20kHz to 50kHz	15 dB	15 dB							
20Hz to 500Hz			20 dB	18 dB	20 dB	20 dB	18 dB	18 dB	16 dB
500Hz to 15kHz			30 dB	27 dB	28 dB	25 dB	23 dB	23 dB	21 dB
15kHz to 20 kHz			25 dB	22 dB	20 dB	18 dB	15 dB	15 dB	13 dB
I.M. DISTORTION @ 3.54 cm/sec	.2% 2kHz-20kHz	.2% 2kHz-20kHz	.08% 2kHz-20kHz	.08% 2kHz-20kHz	.1% 2kHz-20kHz	.15% 2kHz-20kHz	.2% 2kHz-20kHz	.2% 2kHz-20kHz	.2% 2kHz-20kHz
STYLUS	.2 mil bi-radial	.2 mil bi-radial	.2 x .7 mil elliptical	.2 x .7 mil elliptical	.2 x .7 mil elliptical	.2 x .7 mil elliptical	.2 x .7 mil elliptical	.3 x .7 mil elliptical	.7 mil spherical
EFFECTIVE TIP MASS	.4 milligram	.4 milligram	.2 milligram	.2 milligram	.6 milligram	.6 milligram	.6 milligram	.9 milligram	1 milligram
COMPLIANCE	30×10^{-6} cm/dyne	30×10^{-6} cm/dyne	30×10^{-6} cm/dyne	30×10^{-6} cm/dyne	20×10^{-6} cm/dyne	18×10^{-6} cm/dyne	17×10^{-6} cm/dyne	16×10^{-6} cm/dyne	14×10^{-6} cm/dyne
TRACKING ABILITY	32 cm/sec @ 1kHz @ 1 gm	30 cm/sec @ 1kHz @ 1½ gm	38 cm/sec @ 1kHz @ .9 gm	38 cm/sec @ 1kHz @ 1 gm	32 cm/sec @ 1kHz @ 1 gm	28 cm/sec @ 1kHz @ 1¼ gm	28 cm/sec @ 1kHz @ 1½ gm	28 cm/sec @ 1kHz @ 1¾ gm	32 cm/sec @ 1kHz @ 2 gm
CHANNEL BALANCE	within 1 dB @ 1kHz	within 1½ dB @ 1kHz	within ¾ dB @ 1kHz	within 1 dB @ 1kHz	within 1 dB @ 1kHz	within 1¼ dB @ 1kHz	within 1½ dB @ 1kHz	within 1½ dB @ 1kHz	within 1½ dB @ 1kHz
INPUT LOAD	100k Ohms/ channel	100k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel	47k Ohms/ channel
TOTAL CAPACITANCE	under 100 pF/channel	under 100 pF/channel	300 pF/channel	300 pF/channel	400-500 pF/channel	400-500 pF/channel	400-500 pF/channel	400-500 pF/channel	400-500 pF/channel
OUTPUT @ 3.54 cm/sec	3 mV/channel	3 mV/channel	3 mV/channel	3 mV/channel	4.5 mV/channel	4.5 mV/channel	7 mV/channel	7 mV/channel	7 mV/channel

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recording, and editing costs. Thus far, the Soundstream digital/half-speed disc master process has been used by Orinda Records for a recording of Diahann Carroll and the Duke Ellington Orchestra, and by Telarc Records for a recording of the Cleveland Wind Ensemble. The Telarc recording was being demonstrated on the Soundstream digital recorder at the AES and made a generally favorable impression. Incidentally, Dr. Tom Stockham, the head of Soundstream, was elected a Fellow of the AES at this 60th convention for his work in digital recording.

At the Mitsubishi exhibit room, they were showing their neatly packaged quarter-inch, fixed-head PCM recorder, which now is said to be priced at around $16,000.00, with availability by the fall of this year. Rumors continue to persist that they will have a PCM/Video-Cassette recorder combined unit for about $1800.00, which if true, would certainly be an incentive for the production of prerecorded PCM cassettes. Their unique laser/PCM disc system was again being demonstrated, but unfortunately at the time of my visit, a few gremlins in the system prevented another audition. The pop-type music they were demonstrating was nice and clean, but did little to show the dynamic range/signal-to-noise capabilities of their PCM system.

More Organ Than You've Ever Heard On Disc Before.

Michael Murray playing The Great Organ in the Methuen Memorial Music Hall.

Recorded Direct-To-Disc by Telarc Records.

This could well be the definitive organ record. The instrument is one of the finest in the world. With 84 stops, 115 ranks, and 6,065 individual pipes beginning with the 32′ Principal. All controlled from four manuals and the pedal. The organ was originally constructed as the first concert organ in the United States in 1857. Since rebuilt several times, the last revision was in 1971. It is housed in the Methuen Memorial Music Hall, the only building of such proportions and impressive design ever constructed solely to house a concert organ.

Michael Murray's credentials are also truly impressive. He studied with the late Marcel Dupré, has concertized throughout the U.S., Europe, and the Middle East, has appeared on radio and TV and has performed with leading symphony orchestras.

Capturing this talent, and the sound of this team of musician and instrument, was the result of painstaking work by the Telarc team of engineers. Using direct-to-disc recording preserved a measured range from 16Hz to beyond 20kHz on the final masters. No audio processing or tricks were used...just precise microphone placement and lavish attention to detail from original recording session, through plating, to the final pressings in Europe.

If your stereo system is capable of outstanding performance, this recording should find a treasured spot in your library. It's currently available at all Audio-Technica dealers featuring StandarDisc International Reference Series™ recordings. Because (like all direct-to-disc issues) quantities are limited, we suggest you act quickly.

Telarc 5036 Direct-To-Disc $14.95

Michael Murray playing The Great Organ in the Methuen Memorial Music Hall

SIDE 1

Charles-Marie Widor: Toccata in F Major (from the 5th Organ Symphony)

Louis Vierne: Méditation, from 24 Pieces in Free Style, Final from the 1st Organ Symphony

SIDE 2

Benedetto Marcello: Psalm XIX

Sigfrid Karg-Elert: Clair de Lune

Marcel Dupré: Final, Op. 27, No. 7

Louis Vierne: Prélude, from 24 Pieces in Free Style

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Digital Miking

Genial Jim Kawada was presiding over the JVC demonstration suite, and was showing their ever-fascinating Q-biphonic sound system, and their spanking-new PCM adapter for their Vidstar video cassette recorder. The PCM unit is very attractively packaged, easy to operate with a minimum of controls. Jim was demonstrating a PCM recording of a solo piano, and while the piano was very clean with superb transient response, it was recorded far too closely with the mikes too far apart. The result was a clangorous sound with phase-shift causing some image jumping between speakers. Moral . . . balances are just as important in digital recording as they are in analog! Also demonstrated was a big band recording, and while this too was a very clean sound, it just isn't the right material for showing off the important PCM attributes of dynamic range and signal-to-noise ratio.

The Technics room was loaded with digital surprises. Here too was a PCM adapter for their VHS rotary-head, video cassette recorder, and again we found a very compact, easy to operate unit, with the usual snappy Technics styling. But the real stunner was a PCM fixed-head, open-reel recorder based on their RS1500 isolated loop recorder, using quarter-inch tape at a speed of 15 ips. However, the recorder has very special heads indeed. The record head is a common bias, thin-film magnetic head, made using photo-exposure techniques. There are a total of 60 tracks—30 for the left and 30 for the right channel—on the head, and the special fabrication permits a common bias to be used, with less than a fifth of the recording current necessary for conventional thin-film heads, making it possible to drive all tracks simultaneously.

The playback heads are magneto-resistive effect heads. According to Technics, "the electric resistance of the nickel-iron ferromagnetic thin film components changes according to the strength of the magnetic field so that a high playback output voltage can be obtained even without a coil structure." Of course, with 60 tracks available, dropout countermeasures are emphasized with complete parallel

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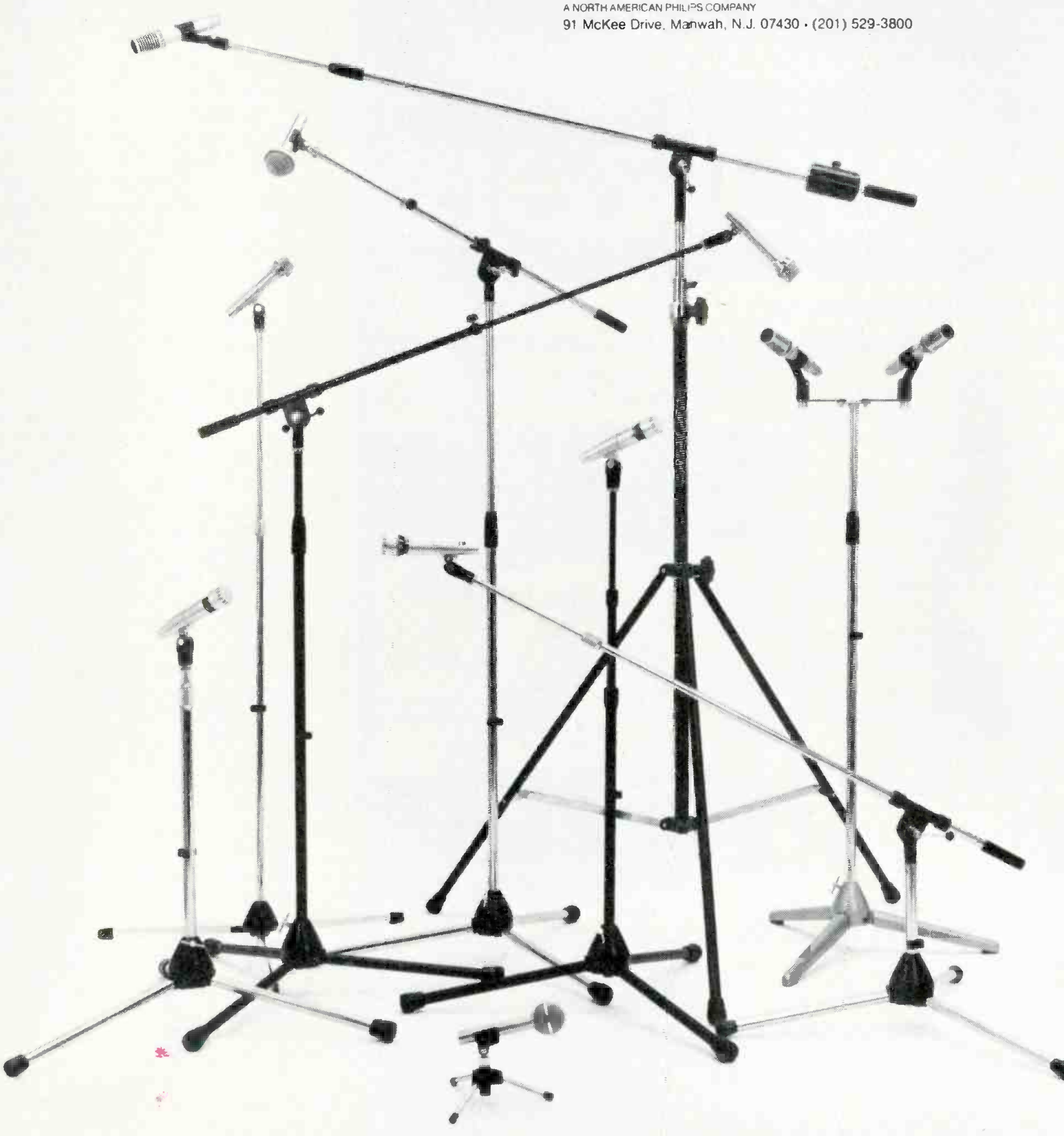

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processing. As stated by Technics, "based on recording the same signal on two different tracks (double writing) and other methods, even if a section of the signal is missing, it will automatically be checked, corrected or compensated for, so that the reproduced sound will still be a precise replica of the original." Editing on this PCM unit will be possible, which is to be expected, but more importantly, record/playback monitoring is said to be possible. John Woram recorded some big band music at the old RCA studios in Hollywood using this new fixed-head PCM unit, and as played back in the Technics room under somewhat less than ideal listening conditions, the sound was strikingly "live" sounding, exceptionally clean, and singularly free of modulation noise. Technics expects to announce price and availability of this PCM open-reel recorder at the Chicago CES.

Automatic Adjustment

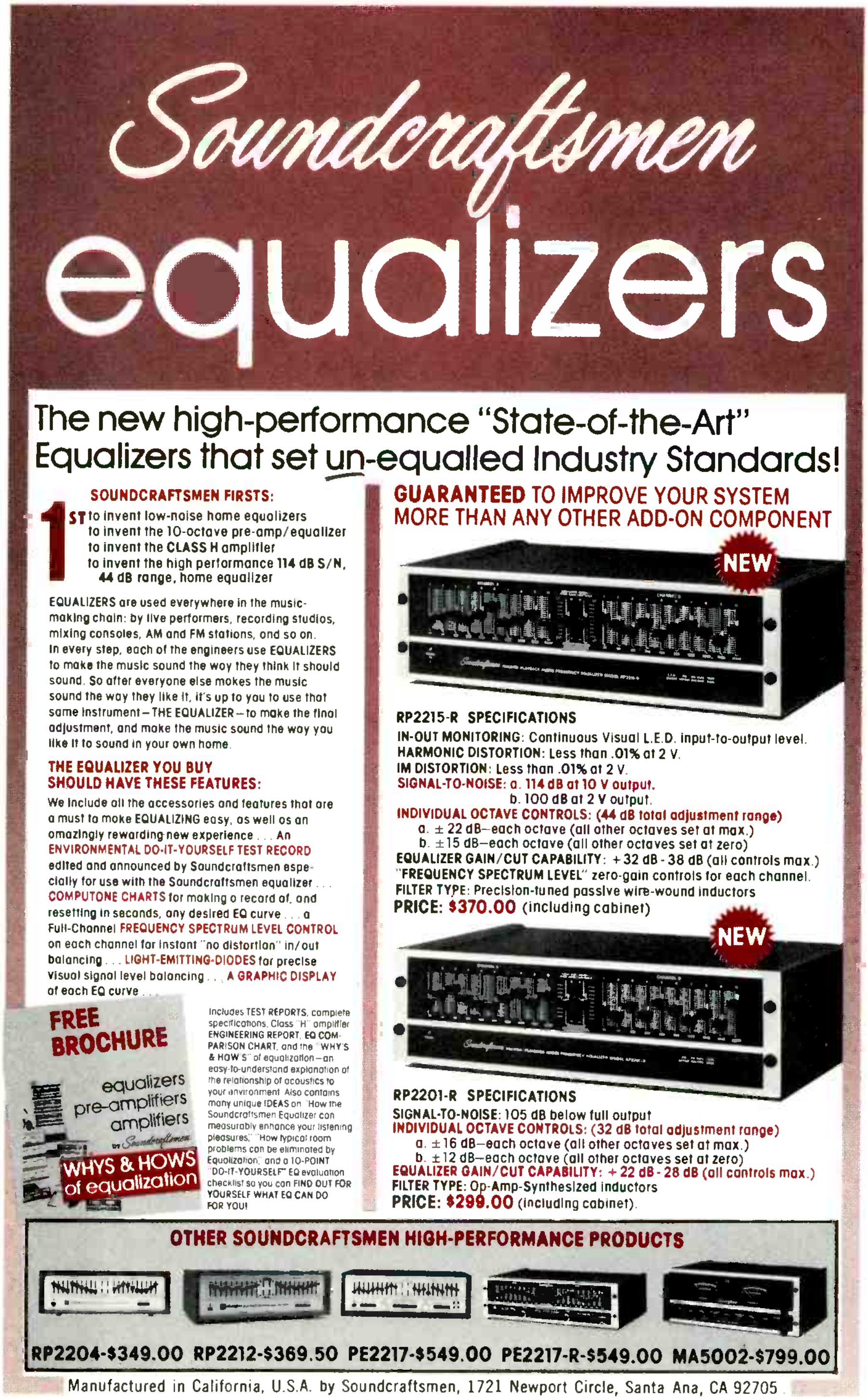
While we are at the Technics room, there were several other interesting developments in their isolated-loop analog tape recorders. There is now a model RS1520, which is essentially the same as the RS1500 introduced last year, but completely fitted with Cannon XLR connectors for input and output, plus front panel accessible bias and equalization adjustments. Then there is the RS1800, using the same isolated-loop transport, but with a larger record/playback amplifier section, which has a feature which is somewhat mind-boggling. How about a tape recorder on which you thread a reel of tape and then press the Record button? There is a red indicator light, and if you watch the VU meters, you'll see the needles hunt back and forth a bit, before settling on the highest reading, at which point, a green light comes on. What you have just seen is a recorder which has *automatically* adjusted for optimum bias for that particular tape!

Finally, from the digital tape recorder front, was the aforementioned demonstration of the Sony PCM unit by Gene Czerwinski. Gene acquired a Sony PCM privately and a new Model 8300 Betamax and proceeded to make some jazz/rock type recordings in L.A. and Toronto. In all honesty they were of really excellent quality . . . a solid bass end, very clean, and very quiet with a lot of presence. As played back by Gene at his usual robust levels, it was an impressive sound.

As usual these days, in reporting on AES conventions, it is undeniable that digital doings take the lion's share of space, but as the fine cutting edge of the art, I feel this is justified. As has been evident during the last few conventions, automated mixing continues to advance in console construction, and at the 60th, the trend continued. As for digital delay units, more and more companies are getting into the act. One of the pioneers in this field, Lexicon had one of the more interesting units in their Model 224 Reverberation Synthesizer. In its "Concert Hall Mode," two independent inputs are used to create the depth and space of three different sizes and shapes of halls. The user can control the reflectivity of the "walls" of the halls in three frequency bands with a digital parametric equalizer. With the "Depth Control," up to 200 milliseconds of apparent delay before the onset of reverberation can be programmed into the unit. Sonically, this was one of the best simulations of concert hall space I have heard thus far.

Recording Lathes

With all the talk of direct-to-disc recording these days, new disc recording lathes are welcome indeed. A new



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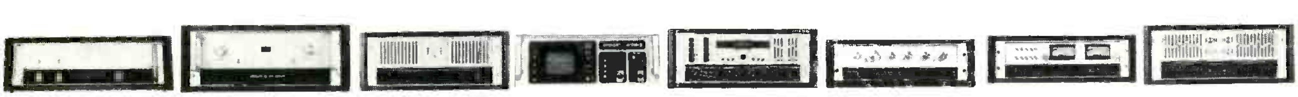
Visit a Crown dealer soon for a complete demonstration. Drop us a postcard if you need help in finding the nearest dealer.



D-150A (IOC) Power Amp | DC-300A (IOC) Power Amp | SA-2 Power Amp | RTA-2 Real Time Analyzer | DL-2 Controller | IC-150A Pre-Amp | OC-150 Output Control | EQ-2 Equalizer

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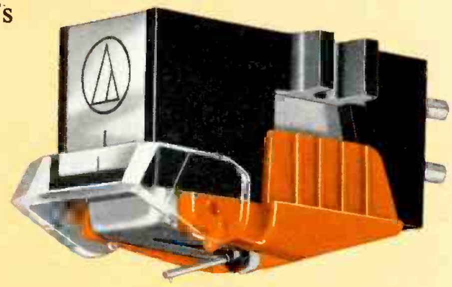
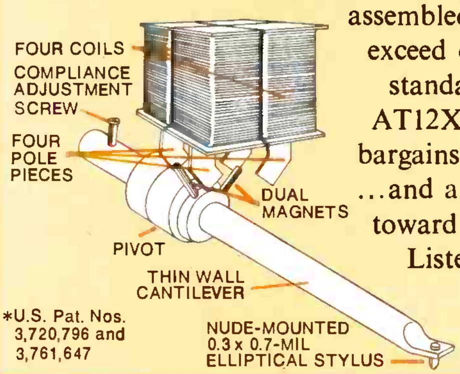
Our AT12XE, for instance. Tracking smoothly at 1 to 1-3/4 grams, depending on your record player. Delivers smooth, peak-free response from 15 Hz to 28,000 Hz (better than most speakers available). With a minimum 24 dB of honest stereo separation at important mid frequencies, and 18 dB minimum separation even at the standard high-frequency 10 kHz test point. At just $65 suggested list price, it's an outstanding value in these days of inflated prices.



Audio-Technica cartridges have been widely-acclaimed for their great sound, and for good reason. Our unique, patented* Dual Magnet construction provides a *separate* magnetic system for *each* stereo channel. A concept that insures excellent stereo separation, while lowering magnet mass. And the AT12XE features a tiny 0.3 x 0.7-mil nude-mounted elliptical diamond stylus on a thin-wall cantilever to further reduce moving mass where it counts. Each cartridge is individually assembled and tested to meet or exceed our rigid performance standards. As a result, the AT12XE is one of the great bargains of modern technology ...and a significant head start toward more beautiful sound. Listen carefully at your Audio-Technica dealer's today.



*U.S. Pat. Nos. 3,720,796 and 3,761,647

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company called Cybersonics was showing a radical departure from the usual Scully and Neumann lathes. Very shallow in depth, utilizing a direct-drive, servo-control turntable, with a hollow shaft for vacuum chip removal and lacquer disc hold-down, the lathe uses a shaft encoder to provide necessary information to what they call their Compu-Drive system for automatic-mode functions such as head drop, lead-in spiral, auto-tape start, lead-in termination, lock-out concentric groove diameter, head lift, and auto retract to rest position. Input to the Compu-Drive is from the preview head and provides updates of two to 18 times per turntable revolution for adjustment of pitch and depth. The whole lathe weighs in at just over 250 pounds, which makes it eminently transportable, and therefore a natural for direct-disc location recording. A micro-processor is said to be in the works, which will enable multiple units of the DM 2002 lathe to be electronically coupled for the generation of multiple lacquers. The DM 2002 can mount either a Neumann or Ortofon cutting head. The unit displayed used an Ortofon 732, but was not operational. It would be interesting to see some test cuts from this lathe, as it seems an interesting concept. The old pros at Neumann have come up with a new model disc cutting lathe, the VMS 80, which incorporates some of the ultra-refinements that have been derived from Neumann's research on videodisc cutting. Direct servo-loop drive for both turntable and lead screw, presentation of groove geometry by video screen as well as by microscope, built-in automatic banding unit, safety interlock command functions, and aircushion shock mounts are some of the niceties. All add up to new ease and precision in disc cutting in general and the cutting of long sides in particular. Importer of the new lathe, Gotham Audio, also showed their latest Magnetophon analog-tape recorder, the Model 15A, with up to 32 tracks on 2-inch tape, optionally equipped with their Telcom C4 noise reduction system.

Willi Studer made a big splash with the introduction of his new A 800 multi-track recorder, with up to 24 channels, built-in autolocator and varispeed and his TLS2000 tape lock system. Otari came up with an 8-channel recorder using half-inch tape, and this will undoubtedly hold interest for the semi-pro market. As always, there were scads of interesting new equipment at the AES convention, but, I have had to trim much, in order to present the items of major import.

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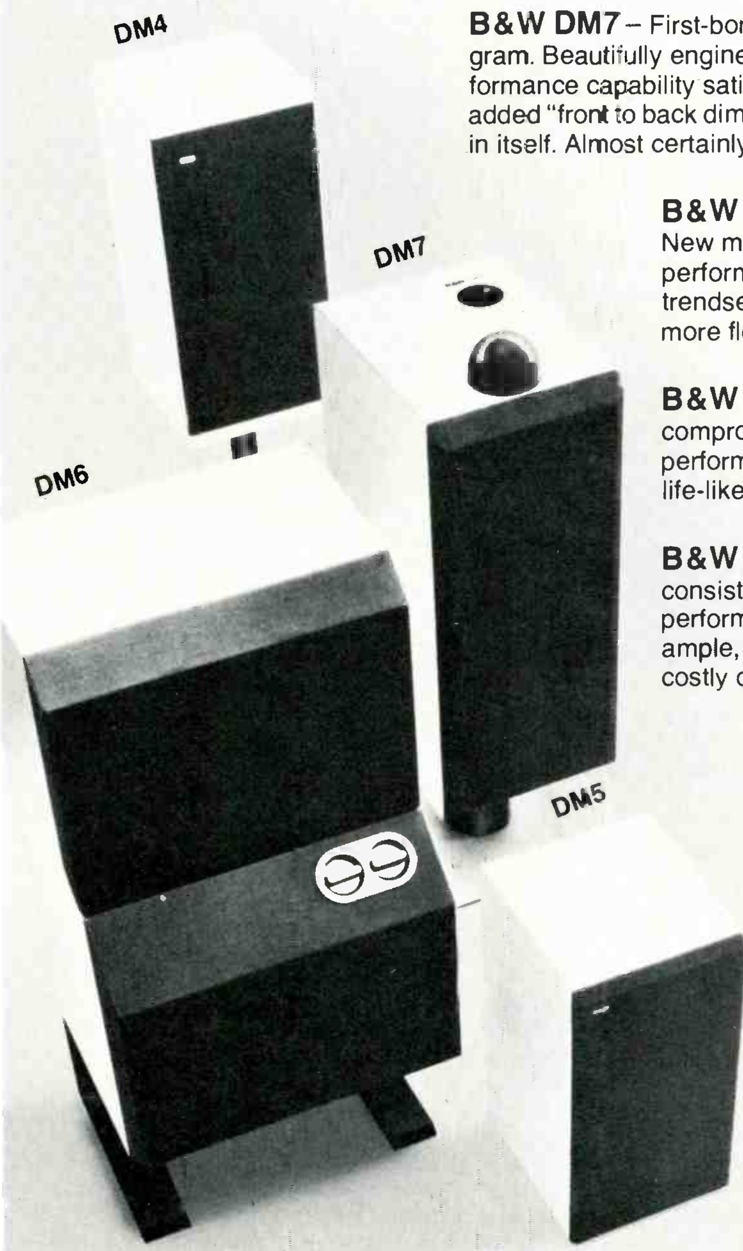
Ideas on perfection differ. Critics, professionals – and discriminating listeners generally – tend to agree however that each B&W Loudspeaker is quite outstanding in its own class. Even so, only individual taste and practical considerations can determine the final choice of model.



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What's New

TEAC Mixer

The Model 2A Mixer is designed for multi-channel recording and offers treble and bass controls, color-coded push/push-type channel-assignment buttons, a straight-line fader as level control for the input channel, a master

fader as level control for the output, a ¼-in. phone plug for the microphone in, and a standard phono plug for the line in. Any signal from an input channel can be assigned to all output channels, and the mixer fits either just ahead of the tape recorder or at the output of a multi-channel tape recorder. Price: $400.00.

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Burhoe Loudspeaker Book

The 48-page, illustrated *Loudspeaker Handbook and Lexicon* by Winslow N. Burhoe is a vest-pocket-sized loudspeaker book containing sections on speaker design; basic concepts such as frequency response, efficiency and Q; an alphabetical listing and description of 50 of the most commonly used speaker terms; negative feedback; dispersion; human hearing, and cabinet design. The author is a well-known speaker designer and the inventor of the inverted dome tweeter. Price: $1.00 from Dept. A, Burhoe Acoustics, 78 Stone Pl., Melrose, MA 02176.

Akai Cassette Deck

The Model GXC-750D cassette deck has GX glass and crystal ferrite record and playback heads mounted in a single head assembly, Dolby noise reduction, an automatic distortion-reduction system to adjust recording equalization at high frequencies and suppress intermodulation distortion, and a dual-capstan drive system to reduce wow and flutter and ensure stable tape tension and speed. Frequency response is 30 Hz-19,000 Hz (FeCr tape), with distortion less than 0.01 per cent. Also featured is a memory rewind, index counter, VU meters, tape selector control, calibration tone button, and a headphone and two microphone jacks on the front panel. Price: $695.00.

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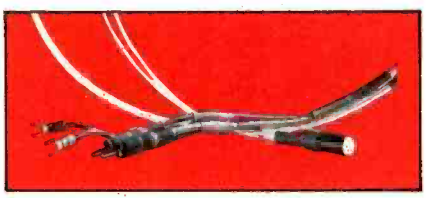
Verion Tonearm Cables

Verion Triaxial cables for replacement of original cables on tonearms are claimed to eliminate both internally and externally generated r.f. noise from power-line to radar frequencies. The construction features silver-plated wire in the shields and the return side and potted termination construction for extreme durability.



Type MDA has phono plugs to female DIN plug for Formula 4, Stax, and similar arms, while type MDD phono plugs to male plug are for Grace 707, etc. Other types and special lengths are available. Prices: 1 meter, $30.00; 1.5 meter, $35.00; 2 meter, $40.00; 3 meter, $50.00.

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Robins Microphone

The Model 48-020 dynamic mike is engineered for uni-directional cardioid polar response with dual high/low impedance facility. It features a ball-type head with heavy chrome plate, wire mesh grill with built-in wind screen, threaded microphone head and base, and a 16-ft. cord with a standard ¼ in. molded phone plug. Frequency range is 100 Hz to 12 kHz, sensitivity @ 600 ohms is −64 dB; @ 20 kilohms, −50 dB ±3 dB. Price: $32.95.

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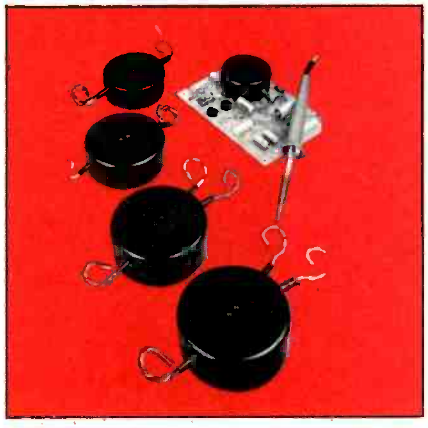
Avel-Lindberg Toroidal Power Transformers

These toroidal power transformers have 50 secondary voltages from 6 to 40 V in 11 steps, with series, parallel, or independent connection options. Five nominal load ratings from 15 to 130 VA



are available, with dual standard 115 or 230 V primary windings for parallel or series operation. They have an 8:1 lower radiated interference field than standard transformers, and can be supplied with PCB mounting or flexible lead terminations. Price: $12.60 ea. small or $23.00 ea. large.

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Osawa/Satin Phono Cartridge

The M-18BX moving-coil phono cartridge has a rated output of 2.5 mV, which is equivalent to that of conventional moving-magnet cartridges, and therefore can be plugged into regular phono inputs. Any input impedance from 30 ohms to infinite, including the normal 47 kilohms, can be used. Previous moving-coil phono pick-ups have all required either a step-up transformer or a "pre-preamplifier" to raise their output level to the point where they could be connected to standard phono input jacks. Other features include: user-replaceable stylus, fixed-pivot berryllium cantilever, and magnetic fluid damping, a 0.1 x 2.5 mil Shibata diamond stylus for both stereo and 4-channel operation. The frequency response is from 10Hz to 40kHz, and recommended tracking force is from 0.5 to 1.5 gram. Price: $325.00.

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Finally. Someone to fill you in on the blanks.

People tell us blank tape has their heads reeling.

We know why. Blank tape is a jumble, presenting as many confusing options as a Chinese menu. Written in Chinese.

Sony is prepared to make order out of the chaos. And no one is more equipped. We've been making tape for 30 years. It's how Sony got started. So we know it backwards and forwards. Forward and rewind.

Right now, Sony makes 4 different blank tapes. Each has a distinct purpose. We're going to slam through the jargon, telling you clearly and specifically, which tape fills which need.

Others try to make their customers into engineers. We'd rather make our engineers talk like our customers.

Basic Blank.

The workhorse tape, technically called Low Noise—don't trouble yourself why. It's for those times when you just want to get it down.

In school, a boring lecture on "The history of the thank-you note through the ages."

In the office, yet another budget meeting. In the car, for your cassette player.

At home, for your Uncle Iggie practicing the oboe.

Better Blank.

While Basic Blank is primarily for speech recording, Better Blank is primarily for music. (Its technical name is Hi Fidelity, one of the few technical names to explain anything.)

Better Blank is sensitive to a wide dynamic range—which means the lows and the highs. It's particularly valid in the bass register—and it won't hurt too much at the cash register.

Better Blank is not Ultimate Blank, but you can still use it in a living room, concert hall, or off a record.

Beautiful Music Blank.

If you want to sound knowledgeable, call it Chromium Dioxide. A thin coating of that substance makes this tape loyal and faithful in the high frequency range.

So piccolos will sound perfect. Lead singers, sublime.

Use this tape when quality—particularly in the high range—is the highest priority.

Best Blank.

When the object is the ultimate, and money is no object. Officially called Ferri-Chrome, this tape offers low distortion and a wide, flat frequency response.

It combines Chromium Dioxide, to pick up the highs, with Ferric Oxide—so the lows reach new heights. There is no better tape to reproduce music.

But do you need Ferri-Chrome? Some say that only the Verri-Crazy can tell the difference. But it's nice to know that the difference is there—if you have the ears to hear it.

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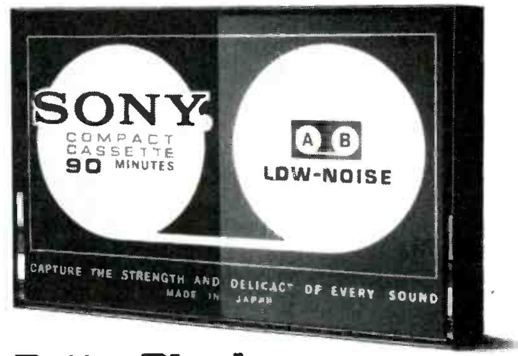
Basic Blank.



Better Blank.

Beautiful Music Blank.

Best Blank.

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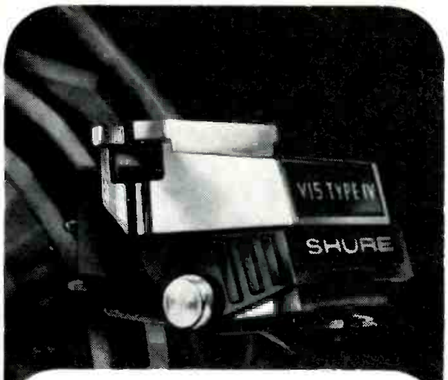

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- Demonstrably improved trackability across the entire audible spectrum.
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- Electrostatic neutralization of the record surface minimizes clicks and pops due to static discharge, electrostatic attraction of the cartridge to the record, and attraction of dust to the record.
- An effective dust and lint removal system.
- A Hyperelliptical stylus tip configuration dramatically reduces both harmonic and intermodulation distortion.
- Ultra-flat response — individually tested.

V15 Type IV
SUPER TRACK IV™
Stereo Dynetic® Phono Cartridge

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RNS Turntable

The EST6 turntable features a 3½-lb. platter, with the underside ringed with stroboscope dots to be viewed in a mirror located on the base of the turntable; a d.c.-controlled, direct-drive, two-speed motor; a bubble level built into the top of the turntable base to monitor turntable levelling, and feet

resistant to moisture and temperature change so as to minimize turntable level changes due to weather. The DIN-weighted rumble is −66 dB, wow and flutter are 0.04 per cent. Two mounting discs are enclosed, one precut for Infinity or SME tonearms; the other for use with any tonearm. Price: $349.95.

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Beyer Dynamic Condensor Microphone

The 48V Phantom powered condensor series consists of one preamp/shaft, and four interchangeable head capsules, which include two omnidirectional and two cardioid patterns, with one of each pattern incorporating a windscreen. External power supplies for balanced and unbalanced operation are provided. Price: $99.95 to $349.00.

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Philips Connectors, Modules and Kits

The Neutrik line of XLR-type audio connectors, modules, and kits, for use in three-pin configurations, have zinc, molybdenum, copper, and aluminum alloy connector housings, and inserts of fiberglass-reinforced, high-temperature plastic. Two innovations are a one-piece, three-pronged collet clamp of heat-treated polyolefin plastic which accepts cables from 4.5 mm to 7.0 mm in diameter, and the interchangeability of components, so as to assemble connector combinations for in-line pads or filters, balanced-low to unbalanced-high impedance conversion, etc. Price range: $2.90 to $4.65.

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ESS Loudspeaker System

The Transar/atd, the first full-range Heil air-motion loudspeaker system, has a specified frequency response of 30 Hz-22 kHz, ±3 dB. Midrange and high frequencies are handled by a Heil air-motion transformer, while the bass unit consists of a 32-in. vertical stack of five Lexan (R) diaphragms, interconnected by four vertical carbon-fiber drive rods, and using a series of "reflector plates" set at 45-degree angles to redirect the sound to the front and rear. A current-source amplifier with integral cross-over is included with each system to drive the bass unit with constant power regardless of impedance loading. Within the amp's operating range of 20 Hz-1 kHz, it is rated at 200 watts into 8 ohms. Distortion is 0.1 per cent at rated output. Price: $3250.00.

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Pearlcorder Microcassette Recorder

The Pearlcorder S301 microcassette tape recorder features two hours of recording or playback time, a dual speed function, pause control, built-in electret condenser microphone, and comes with transcriber, remote speakers, carrying strap, batteries and one microcassette. Price: $199.95.

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Tektronix Oscilloscopes

The dual-trace T932A features a 35-MHz bandwidth at 2 mV/div sensitivity, and the T935A, identical in all other respects to the T932A, has delayed sweep. Each model combines a differential display mode; full sensitivity

X-Y (ch 1 vs. ch 2); a.c. or d.c. trigger coupling; variable trigger holdoff; ch 1, ch 2 or composite triggering, and selectable chop/alternate display modes. All critical active components are pretested, and modular circuitry simplifies calibration and repair, cutting costly downtime. A pair of 10X attenuation probes are included with the instruments. Price: T932A, $1155.00; T935A, $1435.00.

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ALLISON

ALLISON ACOUSTICS INC

Allison Acoustics has consolidated, in a new publication, information on all Allison loudspeaker systems with a description of the room-matching principle.

An introductory section explains why loudspeakers designed for flat response in anechoic chambers (the usual procedure) cannot be flat in a listening room, and how the design of Allison Room-Matched™ speaker systems enables them to generate flat power output in a real room.

An entirely new class of direct-radiator drivers has been developed for use as mid-range and tweeter units in Allison systems. They employ convex diaphragms driven centrally. In the case of the tweeter, the diaphragm is forced to flex in a manner simulating the motion of a pulsating hemisphere. This yields high acoustic output combined with almost perfectly uniform dispersion up to 20 kHz. The operative principle is described in the catalog for the first time.

The rest of the catalog is devoted to descriptions of the four Allison models, a statement of Full Warranty for Five Years, and what we believe to be the most comprehensive set of mechanical, electrical, and performance specifications ever published on loudspeaker systems for consumer use.

A free copy of the catalog, review reprints, and a list of Allison dealers are available on request.

ALLISON ACOUSTICS

7 Tech Circle, Natick, Massachusetts 01760

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Wrightwood Engineering Speakers & Tables

Speakers and tables matched in Mediterranean, Provincial, Campaign, Modern styles and finishes are offered in three sizes for the speakers, which will handle the output of most receivers. The tables are available in the 30- and 60-in. sizes. Prices: Speakers from $180.00 to $360.00, and the tables, $130.00 and $185.00.

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Pyramid Amp/Equalizer

The X-700 integrated amplifier/graphic equalizer for automobiles accepts signals from AM/FM stereo, cassette, and 8-track players. The seven-band equalizer controls are center-detented at 60, 150, 400, 1000, 2400, 6000, and 15,000 Hz and cover a 24-dB range; a front-to-rear fader allows balancing of front and rear speaker outputs, and the *On-Off* LED readout indicates selection of the stereo bypass mode. Price: $124.95.

Enter No. 114 on Reader Service Card

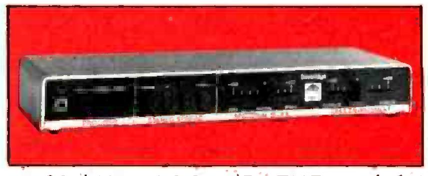
Hitachi Turntable

The PS/58 two-motor, two-speed, direct-drive system features a new unitorque, d.c.-servo, direct-drive motor whose shaft is coupled directly to the heavy, die-cast aluminum platter. A fine tuning system allows of speed and pitch ± 2.5 per cent. A second 16-pole synchronous motor powers the operations of the S-shaped tonearm, which features stylus force control through a counterpoint, anti-skating, viscous-damped cue control, and standard head shell allowing for a choice of cartridge. Wow and flutter is specified at 0.025 per cent, S/N ratio 74 dB. Price: $299.95.

Enter No. 115 on Reader Service Card

Beveridge Control Module

The Model CM-1 control center can be inserted between the preamp and amplifier or in the tape monitor loop, and features tonal compensation in the top and bottom octaves through use of a "spectrum slope" and a multistep "lateral control." The frequency response is specified to be from 10 Hz to 30 kHz, ±0.25 dB; THD and IM distortion are 0.002 per cent; input impedance is 240 k; spectrum slope control "soft" is +2 dB at 40 Hz and −2 dB at 10 kHz; spectrum slope control "bright" is −2 dB at 40 Hz and +2 dB at 10 kHz, and the bass environment control permits the gain at 40 Hz to be ±4 dB. Price: $300.00.



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Phasor Phono Spec Booster

The Phono Spec Booster uses three integrated circuits, equivalent to 42 transistors and 12 diodes in a separate high quality phono stage for use with middle and low level receivers. Depending upon the receiver, the S/N ratio can be improved as much as 20 dB. THD is 0.09 per cent at 1000 Hz reference, S/N ratio is 86 dB "A" weighted, output clipping voltage is 26 V p-p, RIAA accuracy is ±0.5 dB. Price: $75.00.

Enter No. 117 on Reader Service Card

Elite Systems Loudspeaker

The Magnum Opus loudspeaker system features a dual cabinet design. The upper frequency section consists of a mid-range driver with a 30-in., cast-aluminum re-entrant exponential horn, complemented by a 20-watt sonophase diffraction-horn tweeter. The bass section is made up of a 15-in. driver front-loaded into a 48-in. horn which terminates at a 6 sq.-ft. mouth. The crossover network is a three-way, constant-K design, with crossover points at 450 and 3500 Hz. Power handling capacity is from 10 to 130 watts. Price: $690.00.

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IMF Electronics Monitor TLS-80 MK 11

This transmission line loudspeaker system incorporates acoustic foam, such as is used in anechoic chambers, to produce a "wedge effect" where the maximum surface area is exposed to damp the line yet provide a minimum of restriction. The separate midrange line is similarly terminated. The four-way system uses a flat polystyrene bass unit, 11¾ by 8¼ in., a 6-in. plastic cone midrange, a 1¾ in. tweeter, and ¾ in. super tweeter, with crossovers at 350 Hz, 3 kHz, and 13 kHz. Forty watts of pink noise produce 98 dB SPL at 1 meter. Price: $850.00.

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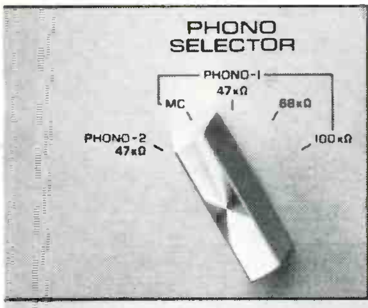
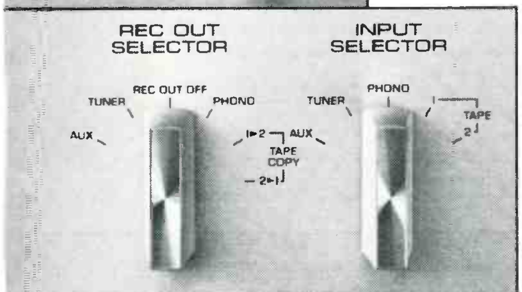
The one alternative to separates: The Yamaha CA-2010 Integrated Amplifier.



The Head Amplifier. Discerning music lovers all over the world are discovering the transparent highs and extended frequency response of the moving coil phono cartridge. While other manufacturers require the addition of an expensive preamp or step-up transformer to boost the low output signal, Yamaha included a special head amplifier in the CA-2010. It's available with the flip of a switch on the front panel. And to help you get the most out of moving magnet cartridges, there's a 3-position phono impedance selector.

The Preamplifier. To assure exact, repeatable bass and treble settings, the controls are precision calibrated in ½dB steps. Dual turnover frequencies for both ranges double the versatility of these accurate tone controls. Completely independent Input and Output Selectors let you record one source while listening to another. And the power meters are easily switched to REC OUT readings in millivolts, so you can monitor the actual output level to your tape deck for cleaner, distortion-free recordings.



The Power Amplifier. 120 watts RMS, with no more than 0.03% THD 20Hz to 20,000Hz into eight ohms.

For tighter, cleaner bass response, the amplifier can be switched to DC operation.

Class A operation is switchable on the front panel, delivering 30 watts RMS, with no more than 0.005% THD 20Hz to 20,000Hz into eight ohms.

The twin power meters are fast-rise, peak delay—they can track even the briefest of transient bursts. Plus they can respond to levels from 1mW to 316W (into eight ohms).

Real Life Rated.™ The specifications of the individual components of the CA-2010 are superior to many separates. Individual specifications alone, however, can't possibly reflect actual in-system performance. That's why Yamaha measures overall performance from phono in to speaker out, rather than at designated points along the signal path. Furthermore, we measure noise and distortion together over a broad output range, rather than individually at the optimum output.

Our Real Life Rated measurement is called Noise-Distortion Clearance Range (NDCR). On the CA-2010, NDCR assures no more than 0.1% combined noise and distortion from 20Hz to 20kHz at any power output from 1/10th watt to full-rated power.

Superb tonality from a musical tradition of technical excellence. The tonal accuracy of our audio components is referenced to the same standards used to evaluate the tonal accuracy of our world-renowned musical instruments. The result is a rich, clear tonality that is unknown elsewhere. You really must hear it.

You really must hear the same resolutely accurate music reproduction available from all four Yamaha Integrated Amplifiers and four superb tuners. All are made to a single standard of excellence—a standard rooted in a 90-year tradition of musical perfection.

For a personal audition of the new Yamaha CA-2010, as well as the rest of our complete line of components, just visit your nearest Yamaha Audio Specialty Dealer. If he's not listed in your Yellow Pages, drop us a line.

.03%
-96dB S/N

Real Life Rated™

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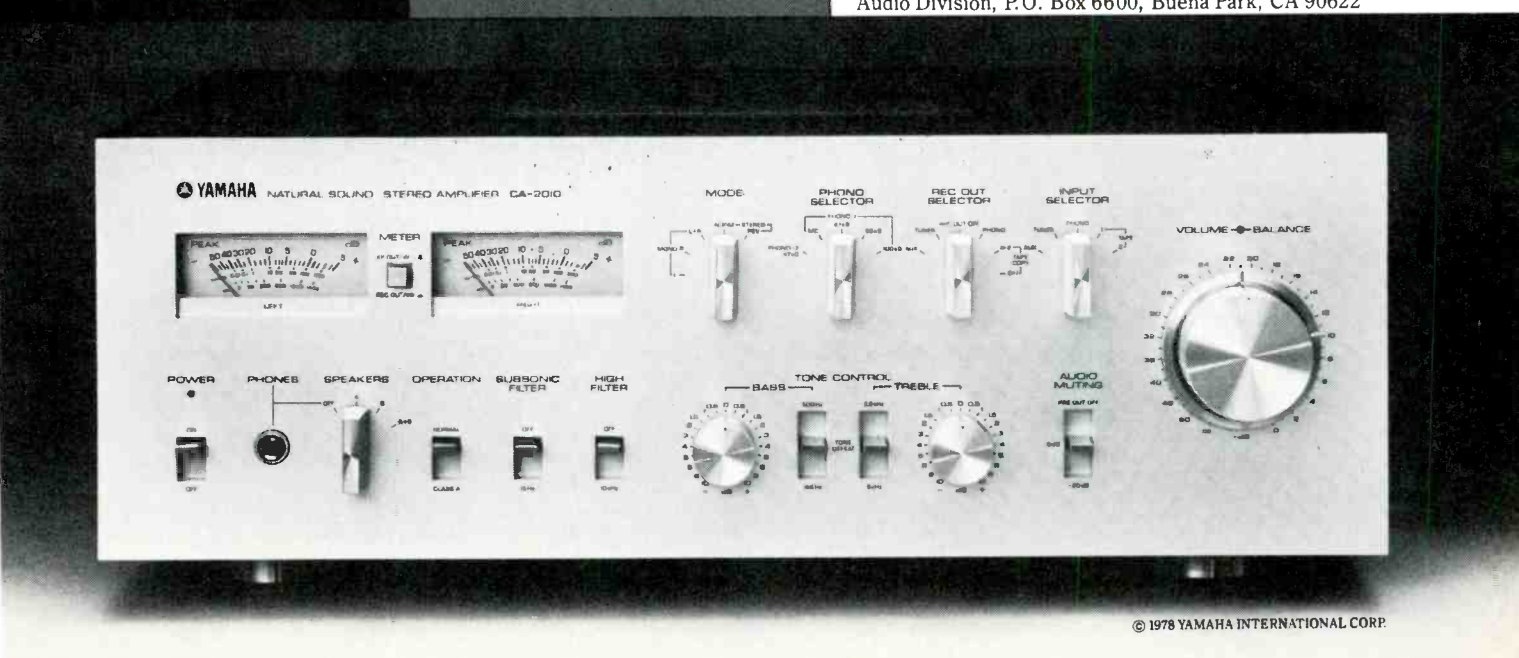

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Now, enjoy freedom from acoustic feedback with the new AT605 Audio Insulator System from Audio-Technica.

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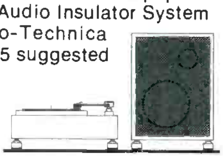
Solve problems of outside vibration like subways, heavy trucks, or jarring footsteps. Or reduce transmission of annoying sound to adjacent apartments with the AT605 System under your loudspeakers. Gain new freedom of speaker placement, and improve performance especially of high-energy, low-frequency transients.

The slightly-curved bottom surface of each AT605 flattens as weight increases so that only the right number and size of resilient rubber projections support your equipment. Four insulators support up to 36 lbs. (9 lbs. each). The felt-covered upper support is easily adjusted for accurate leveling. A precision bubble level is included. And each unit is enclosed in an attractive brushed chrome housing.

If feedback limits the quality of your system, or restricts your choice of equipment location, the AT605 Audio Insulator System can help. At all Audio-Technica dealers for just $24.95 suggested retail. Win the fight against feedback today!



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Dear editor

OSHA Beware

Dear kindly editor:

I was fortunate enough to have one of the prototypes of the Lirpa "VDRS" Vehicular Disc Reproduction System for a short trial period earlier this year. It is a very impressive system. The only real problem was with the rather high level of microwave energy radiated by the unit. However, if the precautions outlined in the "Consumer Safety Notice" section of the review are taken, then no great health problems should result.

However, this was not sufficient for the "feds." Both the OSHA and the EPA offices in our area moved in on our laboratory shortly after we turned on the VDRS. OSHA wanted us to put special guards around the VDRS to protect the workers in the lab, and also to require that all personnel wear protective clothing. Then the EPA folks informed us that, while the emissions from the VDRS do not, at first glance, seem to be covered under the federal vehicle pollution control laws, they would try to find some way to regulate the VDRS.

I believe that the actions of both of these groups are wrong, and encourage all loyal "Lirpa-philes" to write to their elected officials in protest. Don't let the same thing happen to the VDRS that happened to those fine old 427-, 440-, and 454-cubic-inch engines.

R.M.S. Watts, B.S.
Nashville Audible Group
Nashville, Ind.

Abraham B. Cohen

Abraham B. Cohen, recently made a Fellow of the Audio Engineering Society for his contributions to loudspeaker technology, passed away on March 21, 1978. Mr. Cohen, born in Boston, Mass. in 1910, began his involvement with music as Concert Master of the Boston Civic Symphony Orchestra. He received a BSEE degree *cum laude* from Northeastern University, did graduate work at the University of Pennsylvania, and became a Professional Engineer (Eminence basis) in New York State.

During his career, Cohen was Concert Broadcast Engineer for WCAU and KYW in Philadelphia, handled construction and operation of New York FM station W75NY (now WBAI), and spent nearly 25 years at University Loudspeakers as lab supervisor, chief engineer, engineering manager, and vice-president of engineering. He was also manager of the Acoustic Department of Instrument Systems Corp., and served as European liason, director of engineering, customer application consultant, and in new product design for Polydax Speaker Corp. His interests included both creative and administrative work in music and the musical theater and engineering instruction. He was AES convention chairman twice, contributed papers to the AES Journal and served on IEEE and Electronic Industries Assoc. standards committees.

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Have you noticed that *news* has largely been replaced by the staged Media Event, the Official Handout and the Public Relations Campaign? If so, it's time you discovered the missing link between what's going on in the world and what's being printed in the press: NEW TIMES, America's first feature news magazine.

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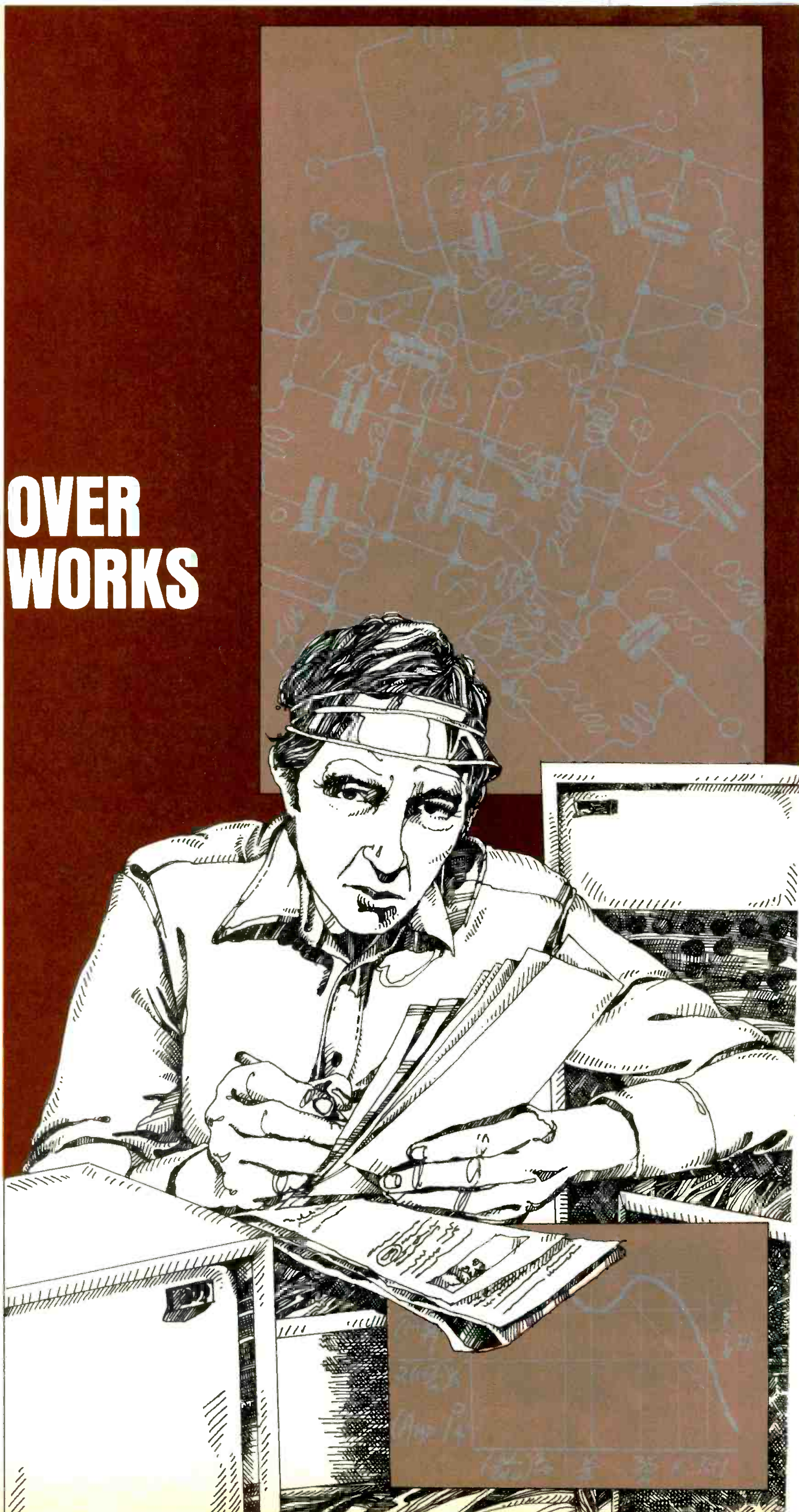
ANOTHER LOOK AT CROSSOVER NETWORKS



Neville Thiele

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The use of crossover networks is based on the idea that two loudspeaker drivers *must* be better than one. Although a great number of listeners achieve "acceptable" sound using only one loudspeaker driver, the advantages of sharing the spectrum between two or more specialized drivers seem obvious. The response should be flatter, since each loudspeaker is required to perform well over a comparatively limited range, and the cross-modulation distortion should be lower, whether it is caused by Doppler effect or simple amplitude limitation. Yet, the more one goes into the problems of multiple speakers and the networks crossing over the signals between them, the more remarkable it seems that they so often produce worthwhile results, using the rough design methods most generally applied.

We propose below to approach the general problem of crossover networks from first principles, questioning the comfortable assumptions that are usually, and often unjustifiably made, hoping to reach a better understanding of the problems and through it, a more reliable method of design.

We will discuss the problem in its simplest form, crossing over between two loudspeakers, as in Fig. 1 (a). Three-way, four-, or five-way systems are best handled as trees which divide into only two limbs at any one time. Thus, the four-way system of Fig. 1 (b) divides, initially, into two paths for high frequencies and low frequencies. Then the high region is split once again into the mid highs and the upper highs, while the lows divide into the bottom lows and the mid lows. Thus, the problem is split into designing three separate two-way crossover networks.

Although we are discussing crossovers in general, I must here and now declare my preference in favor of passive crossover networks. The purpose of crossovers, either active or passive, is to shape the spectra of the signals to the two outputs or speaker drivers, and the same shaping responses will often be used with active and passive crossovers.

The active crossover has the advantage in that it can be changed with comparative ease. This is most useful when different driver systems must be handled, and particularly in experimental work. Besides, the same advantages of handling different parts of the spectrum in different devices apply to amplifiers, as well as to loudspeaker drivers, though with less force. Nevertheless, a high-quality amplifier is expensive, and with the cost nearly doubled for stereo and doubled again for quadraphonic, this makes one hesitant about doubling it yet again for bi-amping, even though I know that some will not agree with this. Perhaps, one day I will be satisfied that a bi-amp pair using a common power supply can be made at a price similar to a single amplifier with equal ease. Then I may retract, but in the meantime. . . .

Even when a passive crossover uses large capacitors and inductors with large quantities of copper, it will always be lighter and less expensive than a second high-quality amplifier, and unless one is careless with the inductor core material, its linearity is beyond question. Besides, it is easily mounted out of sight in the loudspeaker cabinet.

With that opinion declared, we will now concentrate on the Butterworth-type responses invariably used in almost all passive crossover networks. Even so, Butterworth responses are the most widely used in active crossovers also, though by no means the only ones possible.

The response of a filter or any device in fact whose response varies with frequency, such as an amplifier, can be described by the ratio of its output voltage to its input voltage, in terms of a polynominal in ω, the angular frequency, i.e. $2\pi f$,

$$\frac{e_{out}}{e_{in}} = \frac{b_0}{b_0 + b_1\left(\frac{s}{\omega_0}\right) + b_2\left(\frac{2}{\omega_0}\right)^2 + \ldots + b_n\left(\frac{s}{\omega_0}\right)^n} \qquad (1)$$

Any reader who feels threatened at this stage by such a long algebraic expression is begged for a little patience. If such algebra seems quite impenetrable, remember that there are many to whom Indian music, Haydn, Britten, or Prokofiev are equally unapproachable, and many more to whom they are a joy.

The above equation is at its most formidable because we have made it as general as possible. In fact, the b coefficients are simply numbers and they determine the shape of the frequency response. We vary the shape of the frequency response by varying the b coefficients.

Again, b_0 is often unity; if it is not we can divide through numerator and denominator to make it so. We then have a new set of b coefficients (b_1/b_0), (b_2/b_0), etc. The parameter ω_0 is the angular form of the characteristic frequency f_0 such that

$$\omega_0 = 2\pi f_0 \qquad (2)$$

and it sets the position of the response in the frequency spectrum. For many purposes we would prefer the last term of the denominator in the form $(s/\omega_{01})^n$, particularly when b_0 is unity, so we could rewrite the expression again in terms of a new characteristic frequency with

$$\left(\frac{1}{\omega_{01}}\right)^n = \frac{b_n}{(\omega_0)^n} \quad \text{or} \quad \frac{b_n}{b_0}\left(\frac{1}{\omega_0}\right)^n \qquad (3)$$

and readjust the other terms accordingly. This apparently trivial arithmetic manipulation can be a great help in getting the polynomial into a recognizeable shape, and recognition of response shapes from the pattern of coefficients comes fairly readily once one is familiar with some of the basic polynomials.

Such manipulation is quite straightforward. Not long ago it was also very tedious, time consuming, and subject to human error, but nowadays it has become magically simple with the advent of electronic calculators, particularly the programmable ones. With s in the denominator, the expression is in the operational form that can be manipulated using the Laplace transform to give the transient response, the shape of the output waveform to any given input waveform. This is especially useful to engineers working in television or radar. But in audio, where we are mainly interested in amplitude

Michael McNelly

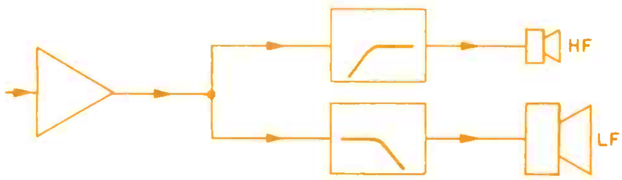

Fig. 1a—Dividing networks for a two-way system.

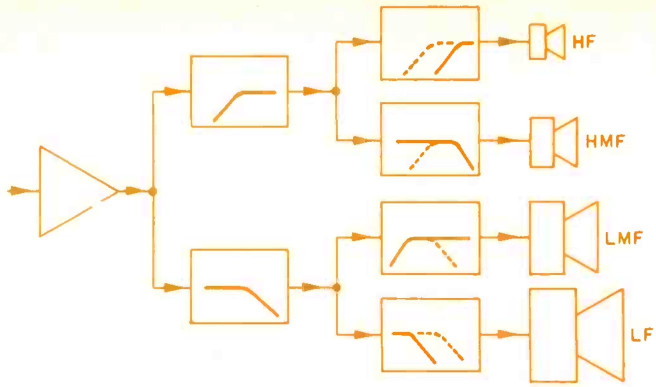

Fig. 1b—Dividing networks for a four-way system.

and phase response, we write $j\omega$ for each s and equation 1 takes the form:

$$\frac{e_{out}}{e_{in}} = \frac{b_0}{b_0 + b_1\left(j\frac{\omega}{\omega_0}\right) + b_2\left(\frac{j\omega}{\omega_0}\right)^2 + \ldots + b_n\left(\frac{j\omega}{\omega_0}\right)^n} \qquad (4)$$

First because the expression (ω/ω_0) appears so often and is a ratio, a pure number that is called normalized frequency, we allot it a symbol of its own

$$(\omega/\omega_0) = a \qquad (5)$$

This makes things easier for the reader once he is used to it. It is also a boon for long suffering typists and typesetters! [*Editor's Note:* And editiors and proofreaders!]

Now, j is the mathematical abstraction $\sqrt{-1}$. It was used by Steinmetz in a.c. theory to define quadrature or "imaginary" components, though their contribution is just as palpable as the in-phase, so-called "real" components. Then substituting in equation 5 and using the properties of j that j^2 is -1, j^3 is $-j$, j^4 is $+1$, and j^5 is $+j$, and so on, and finally grouping "real" and "unreal" components, we can easily derive an expression for the phase angle β between input and output:

$$\tan\beta = \frac{b_1 a - b_3 a^3 + b_1 a^5 - \ldots}{b_0 - b_2 a^2 + b_4 a^4 - \ldots} \qquad (6)$$

and also the amplitude response in terms of the modulus squared:

$$\left|\frac{e_{out}}{e_{in}}\right|^2 = \frac{c_0}{c_0 + c_1 a^2 + c_2 a^4 + \ldots c_n a^{2n}} \qquad (7)$$

where c_0 is obviously b_0^2; c_1 is seen to be $b_1^2 - 2b_0b_2$, c_4 is $b_2^2 - 2b_1b_3 + 2b_0b_4$ and so on, with c_n equal to b_n^2.

Taking stock, we now have an expression for the amplitude vs. frequency response. This contains only even powers of a which we nominated in equation 5 as the frequency f "normalized" to a characteristic frequency f_0, i.e. a pure number. The expression also contains the coefficients c_0 c_2 . . . c_n which again are pure numbers.

The highest power of s, and thus of a^2, is n which is the "order" of the filter and also is the minimum number of reactances needed to make a filter in practice. Thus, one cannot build a third-order filter with fewer than three reactors, either two inductors and one capacitor or two capacitors and one inductor, or in the case of an active filter, three capacitors, along with suitable resistors.

The reader may have noticed that the response in equation 1 is unity at a low frequency when a is very small. It could denote either a passive or an active filter. Again, the response becomes smaller and smaller as a increases, obviously a low-pass filter.

For a high-pass filter, (s/ω_0) in equation 1 is replaced by (ω_0/s). Then in equation 2, $(j\omega/\omega_0)$ would become $(\omega_0/j\omega)$, and when equations 4 and 5 are applied to a high-pass filter, a becomes $(1/a)$ in every term.

We have by now established the form of the amplitude response consisting of a single number numerator with a denominator that is an algebraic expression, a polynomial in powers of a^2. A response can, of course, have polynomials in both the numerator and the denominator, and these are sometimes used in active crossovers, but we again limit our field of inquiry by ignoring such responses, for the moment at least.

In 1930, Butterworth (1) realized that if all coefficients in equation 7 are properly chosen, then the resulting amplitude response, now associated with his name,

$$\left|\frac{e_{out}}{e_{in}}\right|^2 = \frac{1}{1 + a^{2n}} \qquad (8)$$

has some rather special properties. First and most important,

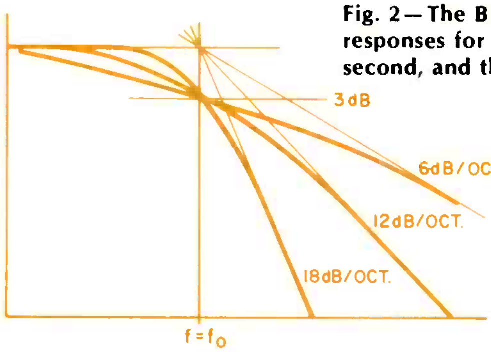

Fig. 2—The Butterworth responses for the first, second, and third order.

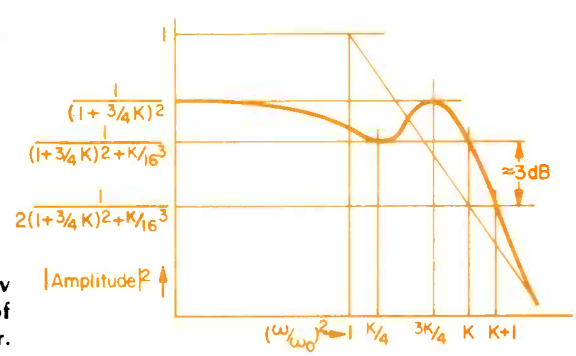

Fig. 3—Chebychev responses of the third order.

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If you are a typical reader of this magazine, you already own a good stereo system and your next component will be a time delay ambience-reproduction system.

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You'll discover the ADS 10 Acoustic Dimension Synthesizer is the system for which you've been waiting.

ADS

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it is "maximally flat." In other words, the response in the pass band stays flatter longer than any other smooth, monotonic response of order n before it finally starts to attenuate. The squared modulus of the response passes through ½, i.e. is 3dB down, at f_0 and falls after that at a rate which tends more rapidly than any other to the utlimate, asymptotic, slope of 6n dB per octave, or if you prefer, 20n dB per decade.

While the Butterworth (maximally flat amplitude) response is the sharpest *monotonic* response of order n, it does not afford the fastest cut off around the transition frequency or the steepest slope in the region just beyond. Filters based on polynomials first described by Chebychev, or Tschebyscheff, or other spellings depending on how you prefer to transliterate Russian cyrillic script, produce a response which ripples at first, extends further out, and then attenuates more rapidly before finally taking up the same ultimate slope. The denominators include expressions which go to zero at some frequencies making the response ripple back to its d.c. value.

The manner in which the use of a Chebychev filter produces ripple, plus a widening of bandwidth plus a more rapid initial slope, is shown schematically in Fig. 2. But again Cheybchev filters are not used in crossover networks and we leave them too by the wayside. Interested readers are referred to ref. 2. The important point is that Butterworth-shaped filters do not cut off as sharply as some other filter shapes of the same order, Chebychev filters, or even better Cauer filters, using elliptical functions. But they have the fastest cut-off of any monotonic, i.e. smooth, curve of that order.

However, the Butterworth filter has another advantage. Suppose we divide the spectrum into two parts using a pair of Butterworth filters, one high pass and one low pass, but both with the same cut-off frequency, f_0. Then we can write the two responses, again using a as the normalized frequency, the ratio between f and f_0, as

$$|e_{out}/e_{in}|^2_{\text{low pass}} = 1/[1 + a^{2n}] \qquad (9)$$

$$|e_{out}/e_{in}|^2_{\text{high pass}} = 1/[1 + (1/a^{2n})] \qquad (10)$$

$$= a^{2n} / [1 = a^{2n}]$$

Then summing the output powers from the two filters

$$|e_{out}/e_{in}|^2_{\text{low pass}} + |e_{out}/e_{in}|^2_{\text{high pass}} = 1 \qquad (11)$$

Thus, a properly designed pair of Butterworth filters can divide the power from the amplifier into two bands without loss and also present to the amplifier a constant load impedance across the whole band. This can be seen graphically in Fig. 4. The familiar view (a) has both scales, for amplitude and frequency, plotted logarithmically. This shows well how each filter goes rapidly from the pass-band with flat response, to the stop band where the attenuation soon reaches a constant rate of increase of 6n dB per octave.

But with the same curves plotted in (b) on linear scales of power (i.e. of amplitude squared into a constant resistance), it is easier to see how the two power spectra are complementary and add to a constant sum at all frequencies.

This use of the whole power from the amplifier and the constancy of load impedance presented to the amplifier output makes the Butterworth filter ideal for crossover networks in general, especially passive ones. Again, the Butterworth shape is not the only one possible for a crossover network absorbing constant power. The Cauer or elliptical function filter allows a much more rapid transition from the pass band to the stop band, with a null response (given ideal components) not far into the stop band. However, it needs more reactive components. Thus, realistically, one must compare a Cauer filter with a Butterworth filter containing an equal number of reactances, capacitors and inductors.

Then, in general terms, with filters of the orders likely to be used, or afforded in loudspeaker systems, both Cauer and Butterworth filters give similar attenuations in the region of the following maximum, e.g. f_4 for the low-pass filter in Fig. 1 (c) and f_2 for the high-pass filter. The attenuations of the Cauer filters are greater nearer the crossover, hence they are more tolerant of drivers with dubious response a little out of band. But, beyond f_4 (or f_2) their attenuation is not so great, hence they are less effective, for example, in keeping down the excursions of the tweeter with lower frequency signals. Besides their phase disturbance is greater. Thus, while one hesitates to rule out Cauer networks altogether, they seem to confer little advantage and have not been used, to my knowledge, in the past.

Butterworth-type crossover networks are shown in Fig. 5 in a form suitable for design. Cauer-type networks are shown in Fig. 6 for a comparison. Networks of orders up to three, as in Fig. 5, are likely to be most useful. However, fifth-order networks have been described (3) and are used by at least one manufacturer.

Fig. 4a — Responses of a Butterworth pair of filters with conventional scales — logarithmic in amplitude and frequency.

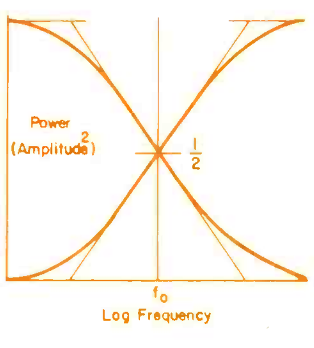


Fig. 4b — Responses of a Butterworth pair of filters with a linear scale (i.e. amplitude squared) and logarithmic for frequency.

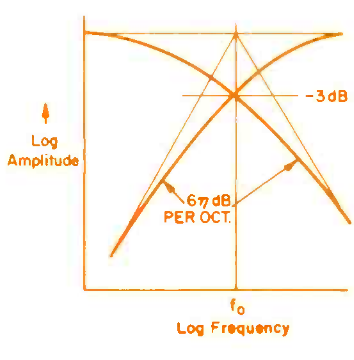
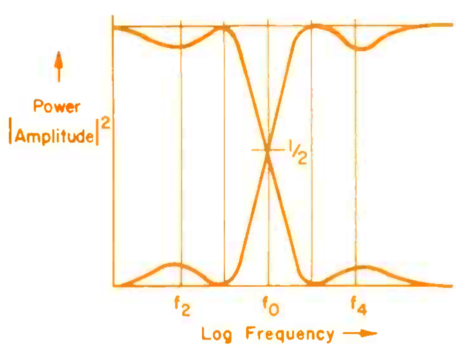


Fig. 4c — Responses of a pair of Cauer filters for comparison with linear scales for power and logarithmic for frequency.



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Amplitude Response of Summed Signal

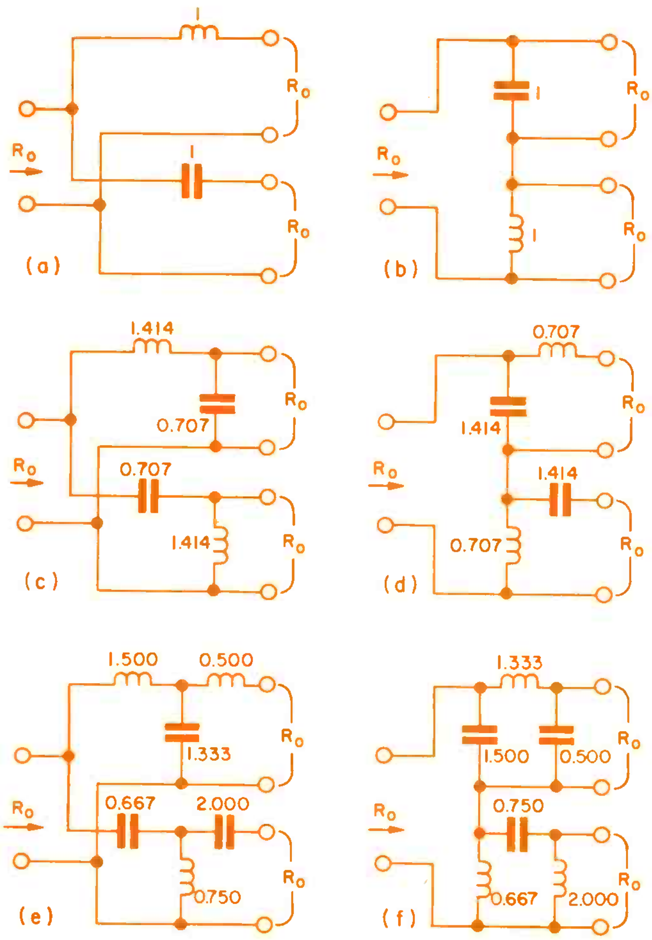
We have seen that the sum of the powers out of a pair of Butterworth filters with the same cut-off frequency is constant. But it does not follow from this that the sum of their *amplitudes,* which depends on phase relationships as well, is constant also. When two signals of equal amplitude are added together, the amplitude of their sum will be twice, e.g. 6 dB higher, if they are in phase, only 3 dB higher if they are 90° apart, and will be zero, a null, if they are 180° apart.

So let us see what happens when we add the outputs of two Butterworth filters, high pass plus low pass. Consider first the very simplest filter order pair in which

$$(e_{out}/e_{in})_{low\ pass} = 1/(1 + sT) \tag{12}$$

$$(e_{out}/e_{in})_{high\ pass} = sT/(1 + sT) \tag{13}$$

Fig. 5 — Butterworth-type dividing networks. First order (a) parallel, (b) series; second order (c) parallel, (d) series, and third order (e) parallel, and (f) series. Component values are normalized for R_0 = 1 ohm and ω_0 = 1 radian/second. For actual component values, multiply inductances by R_0/ω_0 for Henries and capacitances by $1/\omega_0 R_0$ for Farads. Thus, when f_0 is 1 kHz (hence $1/\omega_0$ is 160 micro-seconds) and R_0 is 8 ohms, multiply inductances by 1280 μH and capacitances by 20 μF.



then the sum is

$$\left[\frac{e_{out}}{e_{in}}\right]_{sum} = \frac{1}{1 + sT} + \frac{sT}{1 + sT} = \frac{1 + sT}{1 + sT} = 1 \tag{14}$$

In other words, the response of the summed signal is completely flat across the whole band. Unfortunately, this is the only case in which the response *is* completely flat. Now consider what happens when we *subtract* two first order responses, i.e. we add them out of phase by reversing the connections to one driver. Then

$$\left[\frac{e_{out}}{e_{in}}\right]_{sum} = \frac{1}{1 + sT} - \frac{sT}{1 + sT} = \frac{1 - sT}{1 + sT} \tag{15}$$

This is an all-pass response, i.e. its amplitude response

$$\left|\frac{e_{out}}{e_{in}}\right|^2_{sum} = \frac{1 + (\omega T)^2}{1 + (\omega T)^2} = 1 \tag{16}$$

is still quite flat, but now the phase angle between its output and its input

$$\beta = 2 \arctan \omega T \tag{17}$$

swings from zero at low frequencies to 180° at high frequencies. This can be considered alternatively as a time delay

$$T\ group = d\beta/d\omega = 2T/(1 + \omega^2 T^2) \tag{18}$$

which varies from 2T (T being equal to $1/(2\pi f_0)$, e.g. 160 μS when f_0 is 1 kHz) at low frequencies to zero at high frequencies. This involves us of course in the whole vexed question of time delay. Is it important? It has been pointed out before that a delay differential obviously does matter if it is large enough, if the highs arrive today and the lows arrive tomorrow. What then is the smallest delay difference than can be perceived? Is 320 μS, the time sound takes to travel 10 cm in air, important? Or half that? Or twice that? Again, if the delay is constant across the whole audio band and only reduces outside it, e.g. above 20 kHz, it obviously will not be heard. But what when the center of the phase change moves down towards 10 kHz, or 5 kHz, or 2 kHz?

Tests undertaken by authorities as diverse as the Bell Telephone Laboratories many years ago, and more recently the German Post Office and Prof. Ashley seem to indicate that a delay variation of several milliseconds across the band cannot be heard in a monophonic signal. In stereo, on the other hand, delay differences of less than a millisecond *between the two channels* are quite significant because they move the position of the sound image.

But while delay differences of several milliseconds are most likely unimportant in an audio signal fed to a speaker system, they *are* important if they occur between two drivers in a two-way system over the frequency range of the crossover.

In this region, the two sound sources act together as a column which is comparatively directional, and any delay difference between them can easily swing the axis of the column response away from the listener. So, referring back to equations 14 and 15, we can say that while a pair of first-order crossover networks will produce a flat response across the band, it is only when the two drivers are connected in-phase that their combined response will be truly flat. When the drivers are connected out of phase, the amplitude response will be flat, but the overall signal will suffer more delay at the low frequency end of the band, 320 μS for a 1-kHz crossover

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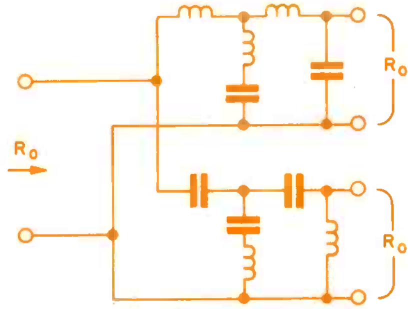

**Fig. 6—
A Cauer-type
dividing network.**

and in inverse proportion for other crossover frequences. The delay drops to half at the crossover frequency itself and zero at very high frequencies. Such a difference between the two connections is almost certainly inaudible. But one must remember that this is true only on the assumption that the two transducers are ideal. This is particularly hard to achieve with a first-order crossover because:

a) The amplitude and phase response of both drivers must be flat over a wide frequency range either side of the crossover frequency or the overall response will be affected. Thus, if the responses of the two drivers had a 90° phase difference at the crossover frequency before the crossover network was connected, the overall result using the crossover network would be a 6 dB peak or a very deep notch depending on whether the phase shift was ±90°. Even four octaves, i.e. 16 times, away from the crossover frequency, e.g. with a 1-kHz crossover frequency, at 62.5 Hz or 16 kHz a phase difference of 90° between the two driver responses would produce an amplitude disturbance of ±0.5 dB in the sum signal.

b) The woofer and tweeter should be physically close together, and the line joining their voice coils should be at right angles to the line between them and the listener, otherwise the column that they form at frequencies around the crossover may not "illuminate" the listener.

Of course, a steeper crossover slope reduces the out-of-band performance of the drivers. If we apply the summed signal test to a second-order filter (or any other even-order filter), we will find that there is no way to connect the drivers for flat response. However, third-order filters can provide flat response with some delay error, but in this case we find (again, assuming ideal drivers) that we should reverse the polarity of one of the drivers. (3)

Thus, we see that loudspeaker crossover networks should usually consist of complementary pairs of high-pass and low-pass Butterworth filters of the odd-order. The first-order response is the only one in which an ideal total response is achieveable. The third-order response seems necessary when excursion of the upper driver limits power handling because of distortion or damage.

References

(1) S. Butterworth, "On The Theory of Filter Amplifiers," *Wireless Engr.*, (October, 1930).
(2) A.N. Thiele, "Filters With Variable Cut-Off Frequencies," *Proc. IREE Australia*, (September, 1965; pp. 284-301).
(3) A.N. Thiele, "Optimum Passive Loudspeaker Dividing Networks," *Proc. IREE Australia*, (July, 1975; pp. 220-224).

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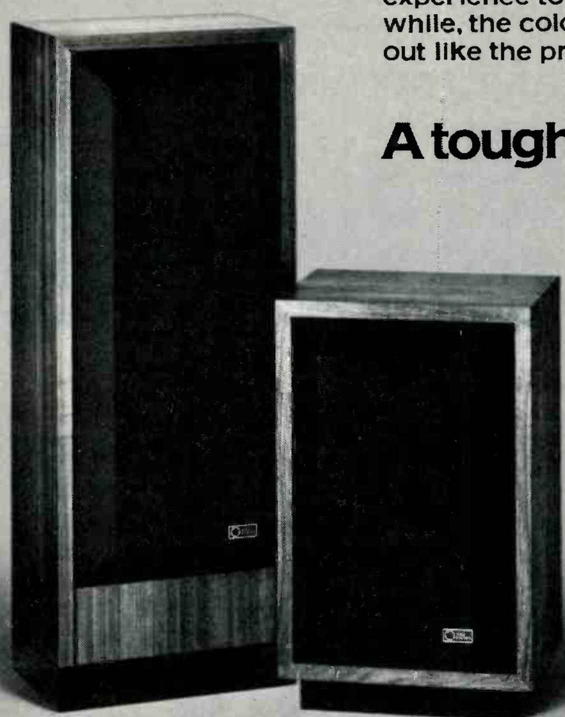

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The AUDIO ADVISOR

AUDIOGRAM

VOLUME I, NUMBER 7

This is the full text of the review of the Polk 10's which appeared in the AUDIOGRAM, a discerning and independent audiophile journal which is entirely supported by its readers and accepts no manufacturers' advertisements. Subscriptions are available for $15.00 per year.

POLK MODEL 10 LOUDSPEAKER

POLK AUDIO
1205 South Carey Street
Baltimore, MD 21230

When we heard the Polk speakers at Summer CES we knew we had to test them. We were so impressed that we could not believe the prices. But first let us say that there are a few factors that might make us prejudiced in their favor. The Polk people use the Spendor as a reference. They like the sound of ARC tubes. They are the East coast distributors of the Formula 4 tone arm. We, at AUDIOGRAM, share so many likes with the folks at Polk that it is hard for us not to like their speakers. And the company is a local one that has made good — the pride of Baltimore and Washington.

Nonetheless, the sound coming forth from the Model 10 "monitors" is something really special. It is a sound that is open, well defined and very low in coloration. One does not generally expect such low coloration in a modestly priced box speaker, and certainly not anything like the definition exhibited by these speakers. How does Polk do it? We think it is mostly execution. They hear very well and they care.

The Model 10 uses a 1-inch soft dome tweeter, two 6 1/2-inch plasticized midrange drivers and one 10-inch sub-bass radiator (which is really a passive radiator). Polk calls the crossover between the bass and midrange drivers "fluid-coupling". It occurs at 60 Hz and provides fourth order Butterworth loading for the energizing cones.

We auditioned the speaker on the optional stand which Polk sells. The stand, or one like it, is highly recommended. It tilts the front of the speaker slightly back from the listener, providing better phasing between drivers and reducing undesirable floor-coupled resonant effects. We would say that the sound of most bookshelf speakers currently placed on the floor would certainly be improved by such a stand.

Inasmuch as Polk had indicated that they use the Spendor as a reference and inasmuch as we had one on hand, we compared the Model 10 to this speaker. In fact, we have compared many speakers to the Spendor and most of them have sounded extremely colored by comparison. (The only speaker systems that have been able to make the Spendor sound colored have been a well-tuned Fulton J and the Rogers LS3/5A's.) Although the Spendor did manage to make the Model 10 sound a trifle nasal, we were amazed at the similarity of sound — and that's good.!

But the Spendors cost upwards from $700 a pair (if one can find them), will not handle much power and cannot reproduce the bass of the Polks. It really isn't fair to compare the Model 10 to a reference monitor. It should be compared with other modestly priced speakers. However such a comparison is no fairer than the Spendor comparison. Other $200 speakers simply do not come close to the standards set by the Model 10. In fact the Polks compare very favorably with the Magnepan and Dahlquist DQ 10's. Bass response of the Model 10 surpasses that of the DQ 10. Definition is almost on the par with the Magnepan (stereo imaging is better). Driver blending is excellent, the midrange is open and exceptionally clear, and there is much less hint of boxiness than that which is found in most box speakers.

If we had to fault the Model 10's, we would say that they are slightly bright and just a little fat in the low end. However, they are extremely neutral throughout most of their range. Only in comparison with some of the world's best speaker systems do they sound the least bit colored. They are a high definition speaker system deserving the very best associated electronics. And at their price, they are simply a steal.

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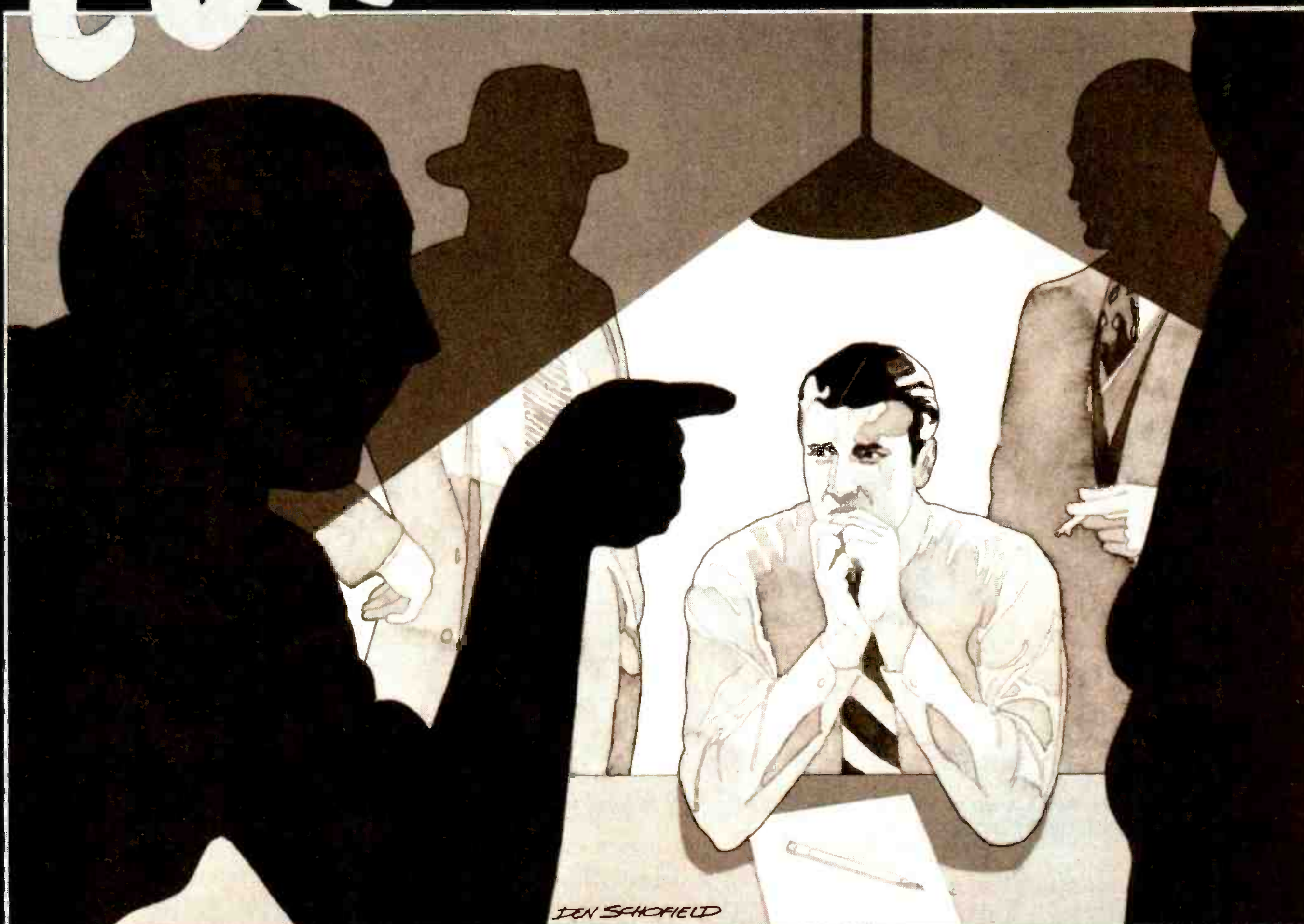

Den Schofield

*W.J.J. Hoge

Two years ago the kindly editor talked me into writing a construction article about a subwoofer (1). Because a system with 1-per cent efficiency and a low-frequency cutoff of 20 Hz must be rather large (600 liters or about 21 ft.^{3}), I didn't expect too much reaction from the gentle readers. Boy, was I wrong! To date, I've gotten hundreds of letters and hundreds of phone calls about how to subwoof. So, at the end of this article I'll present a list of corrections and updated information to the original article. Also, an improved electronic crossover (with foil patterns for a set of PC boards) will be given. Meanwhile, I'll try to answer some of the most common questions provoked by the original article.

*Kustom Electronics, Inc.
Chanute, Kans 66720

Several folks have written to ask if there isn't some way to miniaturize the subwoofer. One letter from Germany put it this way: "After I explained to my wife what 21 cubic feet meant, she explained to me what divorce meant." The answer to this question is "No, not if we wish to have both a low cutoff frequency and low distortion." Remember, cabinet volume, V_B, is probably the single most important specification of a loudspeaker system. To put this in mathematical terms

$$\eta_0 = k_\eta f_3^3 V_B \quad (1)$$

where η_0 is the system reference efficiency, f_3 is the system low frequency cutoff (−3 dB), and k_η is the fudge factor based on the type of system. In the real world, efficiency and distortion are inversely related in well-designed systems.

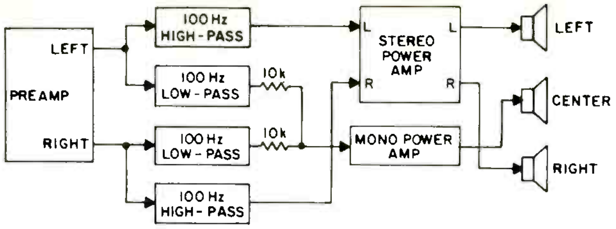

Fig. 5—Crossover method used when the preamp has no mono output for a center channel.

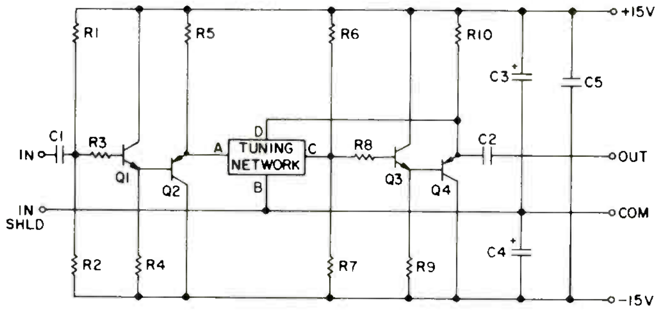

Fig. 6—Basic filter schematic used in the crossover.

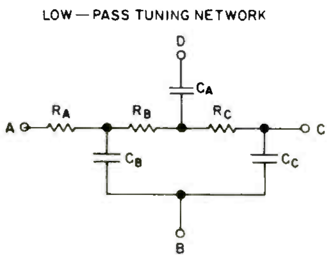

Fig. 7—Low-pass tuning network used in Fig. 6.

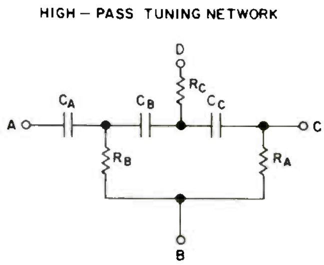

Fig. 8—High-pass tuning network used in Fig. 6.

a living, you can call up one of the companies that builds loudspeaker drivers for original equipment manufacturers, give them a set of specifications, and have a driver developed for your particular application. Any of these companies will be happy to give you samples—if they think they have a chance to sell you several thousand more. If you are a hobbyist, you are stuck with using a readily available driver. Given a few bits of information about a driver, you can tell if it's useful for your proposed application. Since quite a few gentle readers have written in to ask me if I could design them a box to use a Brand X Model Y driver (yes, I can; I do it for a living and expect to get PAID for it), I will describe one method I use for vented-box woofer design. It was originally developed by Keele (2) and represents an approximation of the charts given by Small (3, 4) for systems with an enclosure loss factor of $Q_L = 7$. In order to use this method, we must have the following information about the driver: f_S, the driver resonance frequency; Q_{TS}, the total Q of the driver, and V_{AS}, the compliance equivalent volume of the driver. I won't attempt to define these terms in this article, but references 1,3, and 4 can provide background information. Armed with these data and the design flow chart in Fig. 2, we can check to see if a driver is useful. Let's try a couple of worked examples . . . .

Suppose we want a system which is useful down to around 40 Hz and reasonably small, say, around 100-liters net volume. The two drivers available to us are a 38-cm unit designed for use in horns and a 25-cm (10-in.) high-compliance unit designed for use in closed-box systems. The parameters of the larger unit are $f_S = 18$ Hz, $Q_{TS} = 0.17$, and $V_{AS} = 1300$ liters. Plugging this data into the flow chart, we find that

$$V_B = (15) \times (1300) \times (0.17)^{2.87} \quad (4$$

$$= 120 \text{ liters} \quad (5$$

which is reasonably close to our goal. This is the enclosure volume which will come close to giving maximally-flat response. Continuing along, we find that

TABLE I Typical Driver Parameters.

Mfgr.	Model	Adv. Dia (in)	f_s (Hz)	Q_{TS}	Vas (liter)	η_0 (%)
KEF	B110	5	31	0.39	27	0.18
CTS	6W10C	6	54	0.32	25	0.97
KEF	B200	8	24	0.62	110	0.21
Magnavox (Australia)	8-30	8	54	0.41	31	0.86
CTS	10W18C	10	22	0.30	230	0.75
Eminence	EM40	10	30	0.64	110	0.33
CTS	12W32C	12	21	0.25	470	1.2
JBL	2125	12	63	0.53	110	3.0
CTS	15W54C	15	18	0.17	1300	2.9
Eminence	EM-15-RR	15	20	0.60	750	0.68
JBL	LE-15A	15	17	0.24	1200	1.9
Hartley	CN2262-D	18	37	1.2	320	0.77
Altec	604-E	15 coax	29	0.27	500	3.2
RCA	LC-1A	15 coax	34	0.40	300	2.0

Note: The two coaxial loudspeakers have leaks around the treble drivers. This increases the effective enclosure losses and lowers the Q_L to about 3. The method outlined in this article will not yield good results with these drivers. Try using the $Q_L = 3$ design chart given by Small (4). The Q_{TS} of the 18-in. driver is too high for use in most vented-box alignments. Try a very large closed-box design.

These parameters are typical values as measured by Prof. J. Robert Ashley of the University of Colorado. Individual drivers vary according to manufacturing tolerances.

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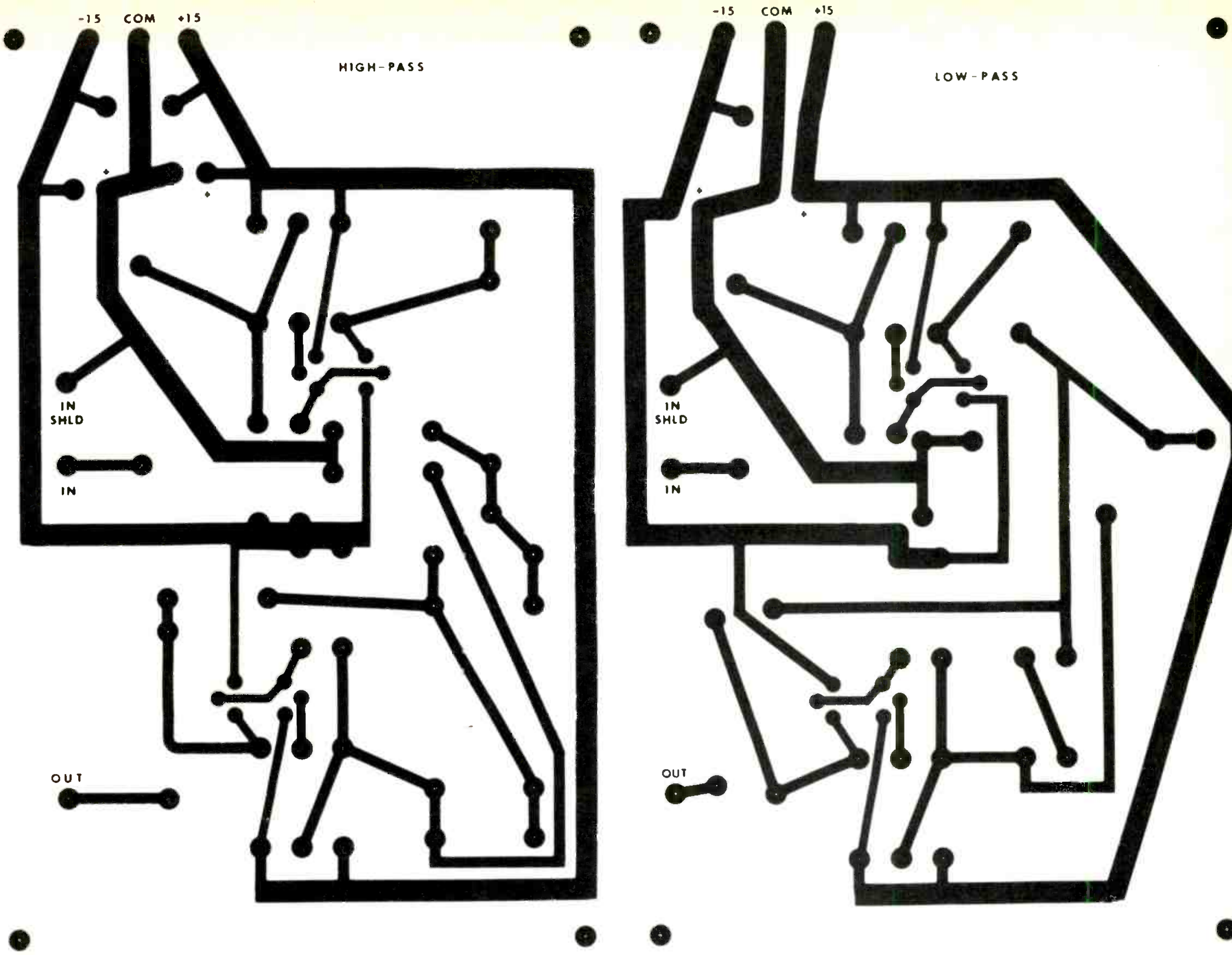

Fig. 9 — Foil patterns for the low- and high-pass filters.

$$f_3 = \frac{(0.26)(18)}{(0.17)^{1.4}} \quad (6$$

$$= 56\,Hz \quad (7$$

which is too high. To lower the f_3, we would have to increase V_B. Thus, we must discard this driver.

Now let's try the 25-cm driver. Its parameters are f_s = 22Hz, Q_{TS} = 0.30, and V_{AS} = 230 liters. Running this through our Texas-Packard calculator gives us

$$V_B = (15) \times (230) \times (0.30)^{2.87} \quad (8$$

$$= 110 \text{ liters} \quad (9$$

$$f_3 = \frac{(0.26)(22)}{(0.30)^{1.4}} \quad (10$$

$$= 31\,Hz \quad (11$$

Thus f_3 is lower than we desire. Let's try a smaller box. For a 60-liter enclosure

$$f_3 = (22) \times (230/60)^{1/2} \quad (12$$

$$= 43\,Hz, \quad (13$$

which is close to what we were looking for.

To find the frequency to which we tune the enclosure's Helmholtz resonance, we continue with

$$f_B = (22)(230/60)^{0.32} \quad (14$$

$$= 34\,Hz \quad (15$$

Since we are not using the 110-liter box, which approximates maximally-flat response, we will have either a peak or sag in the frequency response. To determine the amount, we use

$$R = 20 \log_{10} [(2.6)(0.30)(230/60)^{0.35}] \quad (16$$

$$= +1.9\,dB \quad (17$$

If this amount of peaking is tolerable, then we can use this driver. We can reduce the peaking and lower the f_3 by using a larger enclosure.

Our next step is to calculate the dimensions of the vent required to resonate the enclosure at 34 Hz. Figure 3 shows two forms which a vent may take. The first is a simple hole in the front panel of the enclosure; the second is a pipe or tube. To calculate the required area of the first type of vent we use the formula:

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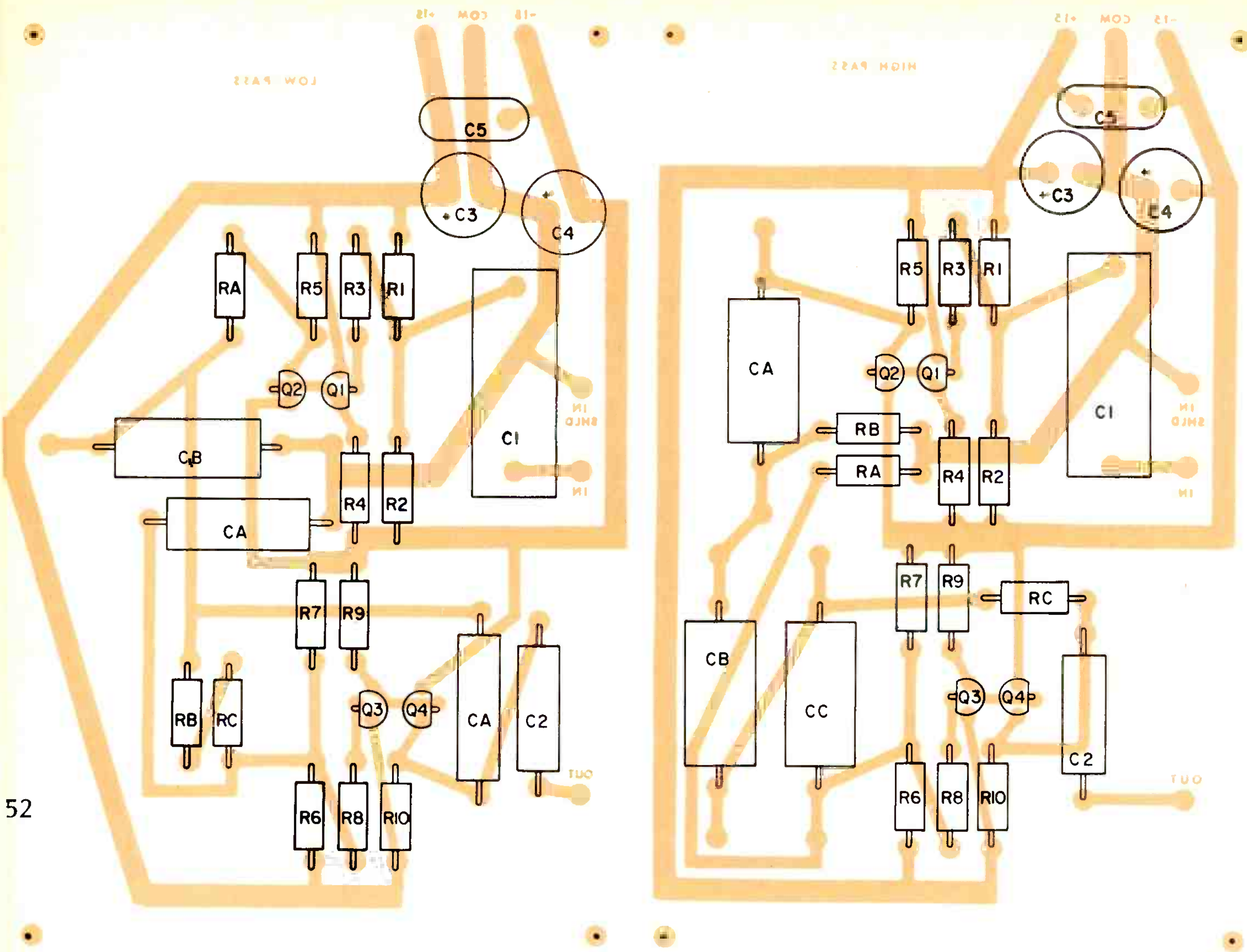

Fig. 10—Component locations on the filters. Note that parts are inserted on the side OPPOSITE from the foil pattern.

$$d_v = 1.80\times10^{-5} f_B^2 V_B + (3.25\times10^{-10} f_B^4 V_B^2 + 4.23\times10^{-5} f_B^2 V_B l_v)^{1/2} \quad (18$$

Where d_v is the diameter of the vent in cm, l_v is the thickness of the front panel in cm, and V_B is the enclosure volume in liters. For our 60-liter enclosure with a 1.9-cm (0.75 in.) thick front panel, we would have a 3.9-cm (1.5-in.) hole for an enclosure resonance of 34 Hz. High power output at low frequencies might cause a vent of such small diameter to whistle. This happens when the particle velocity in the vent becomes so great that the air flow is turbulent. We can solve this problem by making the vent larger in diameter, but simply increasing the vent diameter will mistune the enclosure. If we increase the diameter of the vent, we must also increase its length. Thus, we have the second type of vent. We may find the required length with

$$l_v = \frac{2.36\times10^{-4} d_v^2}{f_B^2 V_B} - 0.740 d_v \quad (19$$

A vent 7.6 cm (3.0 in.) in diameter is probably adequately large for a 60-liter enclosure tuned to 34 Hz. In this case the required tube is 19.7 cm (7.75 in.) long. A vent of larger diameter would require a longer tube.

To use the driver in the proposed 60-liter system, all we now need to do is select a set of dimensions which will give us the appropriate net volume and allow the driver and vent to mechanically fit into the system.

Of course, in order to use this method, the designer must know the required driver parameters. Any manufacturer *should* be able to provide you with this data. If you can't get it that way, you will have to measure it yourself. Ashley and Swan (5) and Hoge (6) describe methods for making these measurements. (Author's Note: My AES pre-print is available from the Audio Engineering Society, 60 East 42nd Street, New York, N.Y. 10017. It costs $2.00.)

Another question asked by many of the gentle readers concerned the design of a passive crossover for the subwoofer. Neville Thiele has eloquently covered crossover design in another article in this issue, so there is little need for me to comment on this subject, except to say that I feel 18- dB/octave crossovers should be used with subwoofers and that I agree with Ashley (7) that in high-power systems such crossovers are better realized with active crossovers.

The original crossover schematic published with the article contained two errors. First, the 0.01-μF capacitors should be 0.1 μF. Second, the 0.33 μF capacitors should be 0.033 μF. I built my original crossover on perforated board using push-in

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Luxman R-1120 tuner/amplifier

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Table II — Filter Values

Low-Pass Filter				
f(Hz)	C_A(nF)	C_B(nF)	C_C(nF)	$R_A = R_B = R_C$ (kilohm)
100	390	150	22	14.3
250	390	150	22	5.76
300	390	150	22	4.87
400	390	150	22	3.65
500	390	150	22	2.87
2500	39	15	2.2	5.76
3000	39	15	2.2	4.87
3500	39	15	2.2	4.12
4000	39	15	2.2	3.65
5000	39	15	2.2	2.87

High-Pass Filter				
f(Hz)	R_A (kilohm)	R_B (kilohm)	R_C (kilohm)	$C_A = C_B = C_C$(nF)
100	22.1	2.94	1.15	390
250	23.2	3.01	1.21	150
300	24.3	3.16	1.24	120
400	22.1	2.94	1.15	100
500	23.2	3.01	1.21	75
2500	23.2	3.01	1.21	15
3000	24.3	3.16	1.24	12
3500	24.3	3.16	1.24	10
4000	22.1	2.94	1.15	10
5000	23.2	3.01	1.21	7.5

terminals and had no problem with it. However, some folks did. They got oscillators instead of filters. Oscillations in the filter can usually be solved by installing a 1000-ohm resistor in series with the base of the first transistor in each of the Darlington pairs. If the power supply oscillates, try installing a 47-ohm resistor in series with the base of the regulator transistor. In the past two years I have worked up a better set of crossover filters. Each filter section is on a separate card. This allows some versatility in their use. For example, I own a preamp with a center-channel (mono) output. By connecting the filters as shown in Fig. 4, I save having to use a second low-pass filter as in Fig. 5. These newer circuits are really the same filter type as the older one but with improvements. Complementary devices are used in the emitter-follower amplifiers. This tends to reduce distortion. Also, the transistors used are quieter and allow for higher output voltage and current swings. The new filters have input impedances of over 200 kilohms and will drive a 10-kilohm load. To answer another specific question: Both the old and new crossovers will work very well with the amplifier circuit published in *Audio* by Leach (8,9). Both the old and new crossovers are low distortion devices. On the new unit the distortion is typically below the residual reading on most distortion analyzers. Using the DIM 30 (10) test for transient intermodulation distortion, no distortion products were visible on the analyzer above the 0.01 per cent level.

When building the new crossover, use 1-per cent metal-film resistors in the tuning network and in the bias networks of the amplifier stages. This will improve the stability of the unit. Otherwise, 10-per cent composition resistors may be used. The capacitors in the tuning network should be 5-per cent (or better) polycarbonate or polystyrene. Parts values for the tuning network for several different frequencies are given in Table II. Because the physical dimensions of the capacitors

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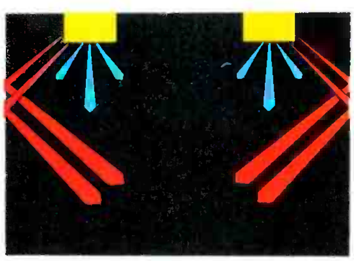
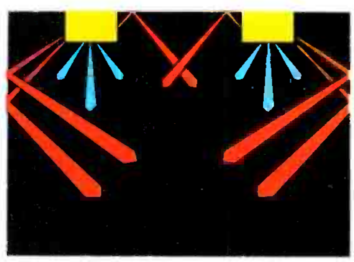
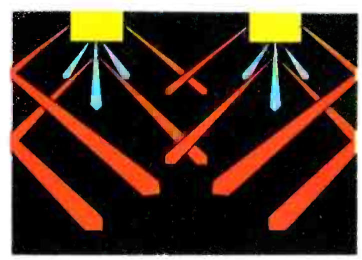

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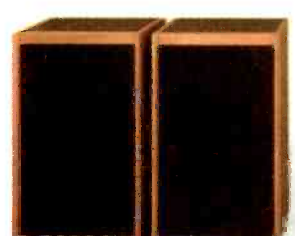

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required vary, some of the installation points for tuning capacitors on the circuit boards have two sets of solder holes. For best results use the transistors specified; however, if the MPSA18 is not available, the 2N5210 can be used to replace it with some degradation in performance.

The filters require a ± 15 V power supply. Each board draws slightly less than 25 mA. No power supply details are given here — I'm not sure how many circuit boards any given home project might use. The National Semiconductor *Audio Handbook* (11) contains a good section on power supplies. I recommend that it be consulted. Also, read the comments on ground loops and how to avoid them.

Finally, some comments on drivers for the subwoofer. The correct driver for the 20-Hz version is the CTS 15W38C. For a while this driver was out of production, but it is now being produced again by CTS of Brownsville, Inc., in Brownsville, Texas. The driver for the 12-Hz version is no longer in production. This is no great loss. There is no musical reason to build such a subwoofer anyway as 20 Hz is low enough.

(Editor's Note: Mr. Hoge is ordinarily quite free with helpful advice, but understandably tends to be annoyed by having to pay postage when gentle readers forget to send him self-addressed, stamped envelopes with their questions. Specific information on complete kits or the PC boards for the crossover filters is available from W.J.J. Hoge, P.O. Box 127, Chanute, Kansas 66720.) *A*

References

1) W.J.J. Hoge, "Switched on Bass," *Audio*, Vol. 60, No. 8, August, 1976, pg. 34.
2) D.B. Keele Jr., private communication.
3) R.H. Small, *Direct-Radiator Electrodynamic Loudspeaker Systems*, Ph.D. thesis, Univ. of Sydney, 1972.
4) R.H. Small, "Vented-Box Loudspeaker Systems, Part III: Synthesis," *J. Audio Eng. Soc.*, Vol. 21, September, 1973.
5) J.R. Ashley & M.D. Swan, "Improved Measurement of Loudspeaker Parameters," AES pre-print No. 803.
6) W.J.J. Hoge, "The Measurement of Loudspeaker Driver Parameters," AES pre-print No. 1287.
7) J.R. Ashley, private communication.
8) W.M. Leach, "Build a Low TIM Amplifier," *Audio*, Vol. 60, No. 2, February, 1976, pg. 30.
9) W.M. Leach, "Construct a Wide-Band Preamp," *Audio*, Vol. 61, No. 2, February, 1977, pg. 38.
10) E. Leinonen, et al., "A Method for Measuring Transient Intermodulation Distortion," *J. Audio Eng. Soc.*, Vol. 25, April, 1977.
11) D. Bohn, ed., *Audio Handbook*, National Semiconductor, Santa Clara, California, 1976.

Parts List — Author's Crossover

Resistors

R1, 6	499 kilohms, 1%, RN60D
R2, 7	562 kilohms, 1%, RN60D
R3, 8	1 kilohm, ½ W, 10%, composition
R4, 9	10 kilohms, ½ W, 10%, composition
R5, 10	1.5 kilohms, ½ W, 10%, composition

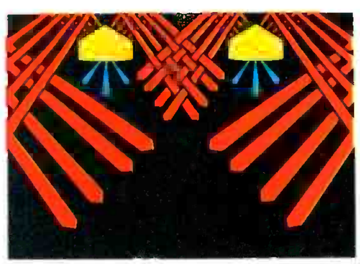
Capacitors

C1	330 nF, 100V, polyester (Cornell-Dubilier DMT1P33)
C2	10 μF, 15 V, nonpolar electrolytic (Sprague TAVN-1155)
C3, 4	150 μF, 25V, electrolytic (Sprague 503D157G025DG)
C5	100 nF, 50V, ceramic

Transistors

Q1, 3	MPSA18, Motorola
Q2, 4	PN4249, Fairchild

Live.



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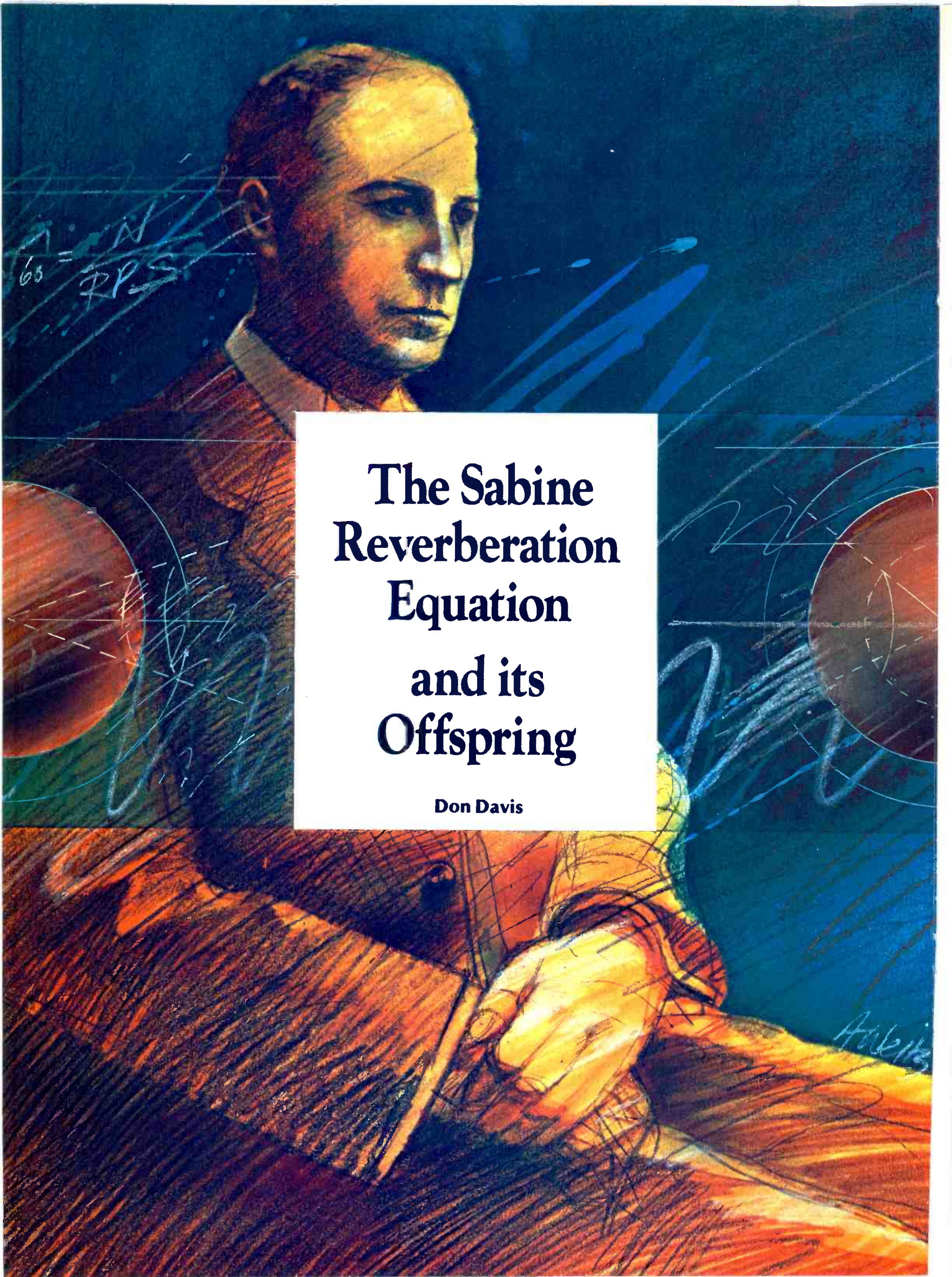

The Sabine Reverberation Equation and its Offspring

Don Davis

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Harvard University found in 1895 that its newly completed Fogg Art Museum had severe acoustical difficulties. President Eliot, head of the university, turned to a young physics professor named Wallace Clement Sabine with the request to "do something" about the problem.

Sabine didn't follow the practices of past generations and hang draperies, place carpets, etc., to "deaden" such a "live" room. Instead he turned from qualitative approaches in finding the solution to a study of the problem on a quantitative basis.

Sabine had at his disposal a number of useful tools to aid in the investigation of the problem. First, there was the troubled lecture room in the Fogg museum. Second, there was nearby Saunders Theater which was considered to have excellent acoustics. Third, the constant-temperature room in the sub-basement of the Jefferson Physical Laboratory turned out to be a reverberation chamber. Finally, he had a middle-of-the-road room considered acoustically tolerable, but not much more, in the large lecture room, also in the Jefferson Physical Laboratory building.

With these environments as laboratories, Sabine used the seat cushions from Saunders Theater as his portable absorption, organ pipes and a portable windchest as his sound source, and a stopwatch and his own remarkable hearing as his acoustic test instruments.

After more than two years of intensive research (he often taught classes during the day and did research all night, existing on just a few hours of sleep), Sabine not only had corrected the troubled room by adding the correct amount of acoustical absorption, but as it turned out, he had gathered the raw data for the first important breakthrough in the science of architectural acoustics.

One Saturday evening on the 29th of October, 1898, staring at some of his curves, Sabine called out to his mother (who was living with him at the time),"Mother, it's a hyperbola!" This simple, but inspired observation, took architectural acoustics out of the dark ages of cut-and-try into the sunlight of calculation and measurement.

The insight that came to Sabine, revealing the fundamental relationship between the size of a room and the absorption needed, resulted from his unbelievably precise measurements coupled with his intuitive genius. Thereafter, the reverberation time of a room was calculable prior to construction.

In September, 1975, some 77 years later, W. B. Joyce, in an article entitled, *Sabine's Reverberation Time and Ergodic Auditoriums* in the Journal of the Acoustical Society of America, showed the relationship between the second law of thermodynamics and Sabine's equation. This talented Bell Laboratories scientist derived Sabine's equation from a literature search that could have been done at Sabine's time since the necessary thermodynamic concepts were extant by 1895. (For those with a desire to experience the original material on this subject, there is no substitute for obtaining and reading the first two references in the bibliography.)

Tony Weitz

In 1929, M.J.O. Strutt considered reverberation by regarding it as a case of free damped vibration of the volume of the air enclosed in a room (this was before computers, mind you). The analysis involves the general wave equations, with suitable boundary conditions imposed. Strutt regarded as unsatisfactory the theories which dealt with the paths of separate sound rays (geometric acoustics). The various *eigentones* or modes of the resonant vibration of the air columns in the room appear in the analysis. This analysis revealed Sabine's law as an asymptotic property toward which the reverberation tends, as the frequency of the (forcing) sound becomes infinitely great compared with the lowest free frequency of the air itself—in other words, when the dimensions of the room become infinitely great compared with the wavelength of the sounds.

Later work at MIT by Philip Morse and Richard Bolt led to the honest but humorous conclusion that "The practical role of wave acoustics is that it can indicate how to design an enclosure for which geometrical acoustics and statistical acoustics are valid, and in which there is no need of wave acoustics."

In any enclosed space, either rooms that people can live in or boxes that house loudspeakers, there is a finite length of time required for any steady state sound-field, developed by a sound source, to die once the sound source is turned off. All of us have experienced the duration of sound after a handclap in a concrete structure, such as an underground parking garage, compared to the same handclap in an open field.

The sound heard during the length of time it takes the initial sound (e.g. handclap) to die out is called reverberation. The reverberation time is the length of time, in seconds, that reverberation can be heard. In precise measurements, the reverberation time is measured for at least 20 dB of decay and then extrapolated to give the time it would have taken to decay 60 dB. This time in seconds is called the RT_{60}.

Figure 1 illustrates the typical measurement setup. A band of pink noise (typically either octave or ⅓ octave) is emitted by the loudspeaker until a steady state level is produced in the enclosure (i.e. the rate of acoustic power being emitted is all being absorbed at the same rate). Then the amplifier output switch is opened and the microphone signal is fed to another band-pass filter identical to the send filter, and the decay rate is observed on the display unit (which may be a digital meter, a graphic level recorder, or an oscilloscope screen). When a graphic level recorder is used, Fig. 2 shows how the trace produced is analyzed.

The Law of Conservation of Energy

The basic law of the conservation of energy states that "energy can be transformed but it is never created or destroyed." Thus, the rate of increase of reverberant energy ($W_{aR}\uparrow$) in a room must equal the rate of emission of energy

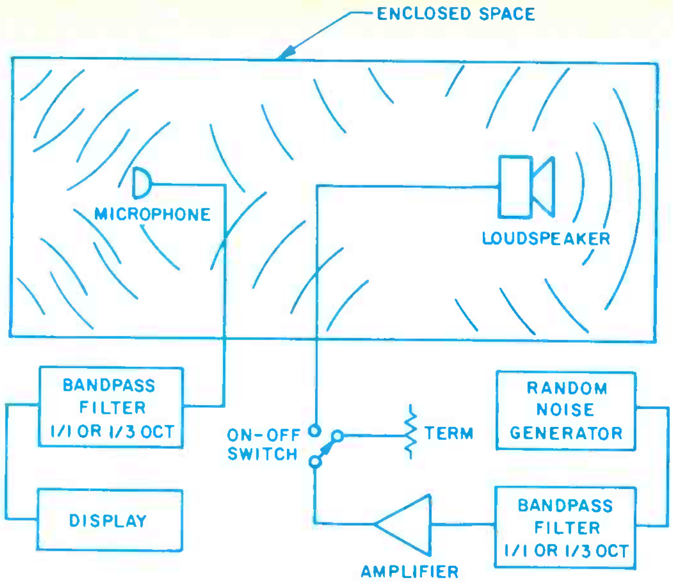


Fig. 1 — Measuring the RT_{60} of an enclosure.

from the source into the reverberant sound field ($W_{a_T}\uparrow$) minus the rate of absorption of the reverberant energy, $Sa\downarrow$.

$$W_{a_T}\uparrow - Sa\downarrow = W_{a_R}\uparrow$$

This means that all of the energy a sound source puts into an enclosure must be accounted for by either absorption (turning into heat), by transmission (passing through the enclosure to another space), or by reflection (adding to the sound level).

Sound Levels Emitted By Sound Sources

Looking at how the sound power is calculated, we find that if we were to place at the center of an imaginary sphere with a radius of 0.282 M an omnidirectional sound source of negligible size which emitted one acoustic watt, we could by internationally agreed upon definition write:

$$dB_{W_a} = 10 \log \left(\frac{1W}{10^{-12}W}\right) = 120\,dB$$

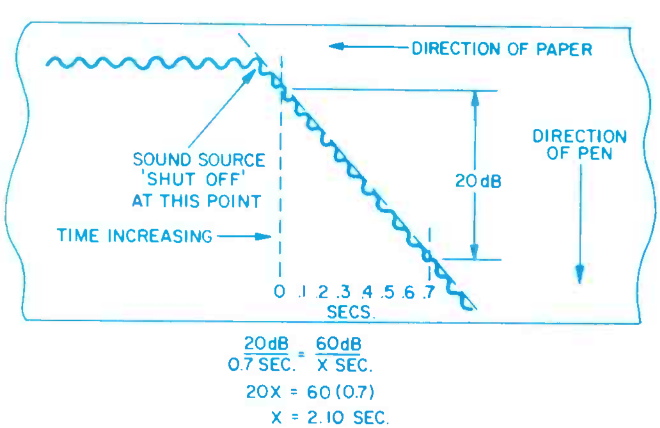
Where: dB_{W_a} is the acoustic power expressed in dB referenced to one pico-watt.

If we were to examine the situation carefully, we find that for a sphere with a radius of 0.282 M, the surface area would be 1 M^2. ($4\pi r^2 = A$). Therefore, our acoustic intensity is 1 W/M^2.

The intensity may also be expressed as a level in dB. We can write:

$$dB_I = 10 \log \left(\frac{1W/M^2}{10^{-12}W/M^2}\right) = 120\,dB$$

Fig. 2 — The chart recorder method of measuring RT_{60}.



Since dB_p also has an internationally agreed upon reference value (0.00002 Pascals or 20μPA), the sound pressure is

$$10^{\left(\frac{120}{20}\right)} \times 0.00002 = 20\text{ PA}$$

Another way of approaching the sound pressure value is to observe that the average pressure is

$$P_{aver.} = \sqrt{\frac{W_a P_c}{4\pi r^2}}$$

which is a form of acoustic Ohm's law,

Where W_a is the acoustic power in watts;

P_c is the acoustic impedance in Rayls. (N-Sec/M^3) and is 406 MKS Rayls—when T = 22°C(71.6°F), atmos. press. = 29.6 inches Hg or 0.75/M Hg;

p is the density of air in Kg/M^3 and c is the velocity of sound in M/Sec, and

$4\pi r^2$ = area of a spherical surface and acts as a form of acoustic power factor.

Thus

$$\text{Power} = \sqrt{\frac{1\text{ W} \times 1.17886\text{ Kg/M}^3 \times 344.4\text{ M/Sec}}{4\pi(0.282)^2}} = 20.1\text{ PA}$$

To summarize these calculations, we can construct the following relationships for our 1 acoustic watt radiating omnidirectionally and measured at 0.282 M:

$$\frac{\text{Level in dB}}{120} \text{ is the same as } \frac{\text{Acoustic Power } W_a}{1W} = \frac{\text{Acoustic Intensity}}{1W/M^2} = \frac{\text{Acoustic Pressure}}{20\text{ PA}}$$

The inner sphere of Fig. 3 represents these values.

Now let's change only a single parameter and *double* the radius of our sphere. First of all, we can, by inspection, detect that our spherical surface area quadruples when the radius is doubled because the radius in the area formula is squared. We then have four square meters of surface area. This means that we have only ¼ of a watt per square meter, even though adding the 4 areas together still leaves us with 1 acoustic watt of total power.

$$10 \log \frac{1}{4} = -6.02\,dB$$

Therefore, our acoustic intensity level and our sound pressure level have lowered from 120 dB to

$$120 + (-6.02) = 113.98\,dB$$

Our sound power level, however, remains 120 dB, while the acoustic power = 1W = 120 dB, the acoustic intensity = ¼ W/M^2 = 113.98 dB, and the acoustic sound pressure = 10.08 PA = 113.98 dB. This effect is called the inverse square law rate of level change.

From this example, it can be seen that, neglecting true attentuation factors (such as absorption), sound level decreases as the square of the distance from the sound source and would in a free field finally spread out sufficiently to become inaudible. Figure 4A illustrates the area change per doubling of distance. This effect is dependent upon *two* angles both diverging (see Fig. 4B). When only one of the two angles diverges, then the area changes are directly related to the radius change and only −3dB/doubling occurs (see Fig. 4C).

The Effect of Directivity on the Data

If we were to go back to our original sphere with a radius of 0.282 M, and this time change another single parameter such

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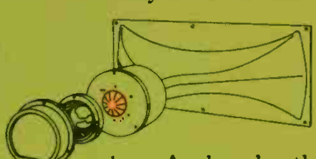
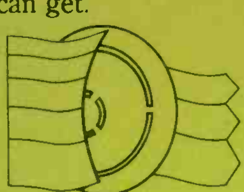


It may not look like much, but this simple, innocent-looking disk brings you closer to the fullest possible sound in the high frequencies. Called the "Tangerine™," it's a brand new patented radial phase plug. And we're the only one who has it.

We build it into our high-frequency compression drivers on our Model 15 and 19 speakers. That's why they sound more natural and as close to live sound as you can get.



Circumferential Phase Plug

Tangerine Radial Phase Plug

Until now, the old circumferential phase plugs put up obstacles to high frequencies. By forcing sound through evenly spaced slots, the plug developed its own undesirable acoustic characteristics. Because the distances between slots were even, certain high frequencies never made it through.

That's why we came up with a better idea. Instead of circumferential slots, we have radials. The prime number of the slots and the tapered distances between them provide a clear path to high frequencies. As a result, you get super-high efficiency and greatly extended high-frequency response. A much wider band of clear and natural highs, unbroken by any artificial barrier.

After filling in the highs, we created a unique dividing network for our Models 15 and 19. It has a built-in dual-range equalizer so you can achieve variable equalization of mid and high frequencies. The combination of a dual-box design and tuned vent offers precise internal volume and enclosure tuning. The outcome is an unheard-of low frequency response: the best ratio of lower limit vs. sensitivity yet.

It's not surprising that all these improvements in sound technology were made by Altec Lansing. The name that's been the number one choice of professional recording studios and artists for over forty years.

For a full-line catalog and the name of your local Altec Lansing dealer, just write us. Altec Lansing International, 1515 S. Manchester Avenue, Anaheim, California 92803.

ALTEC LANSING

ALTEC LANSING. THE NUMBER ONE NAME IN PROFESSIONAL SPEAKERS IS COMING HOME.

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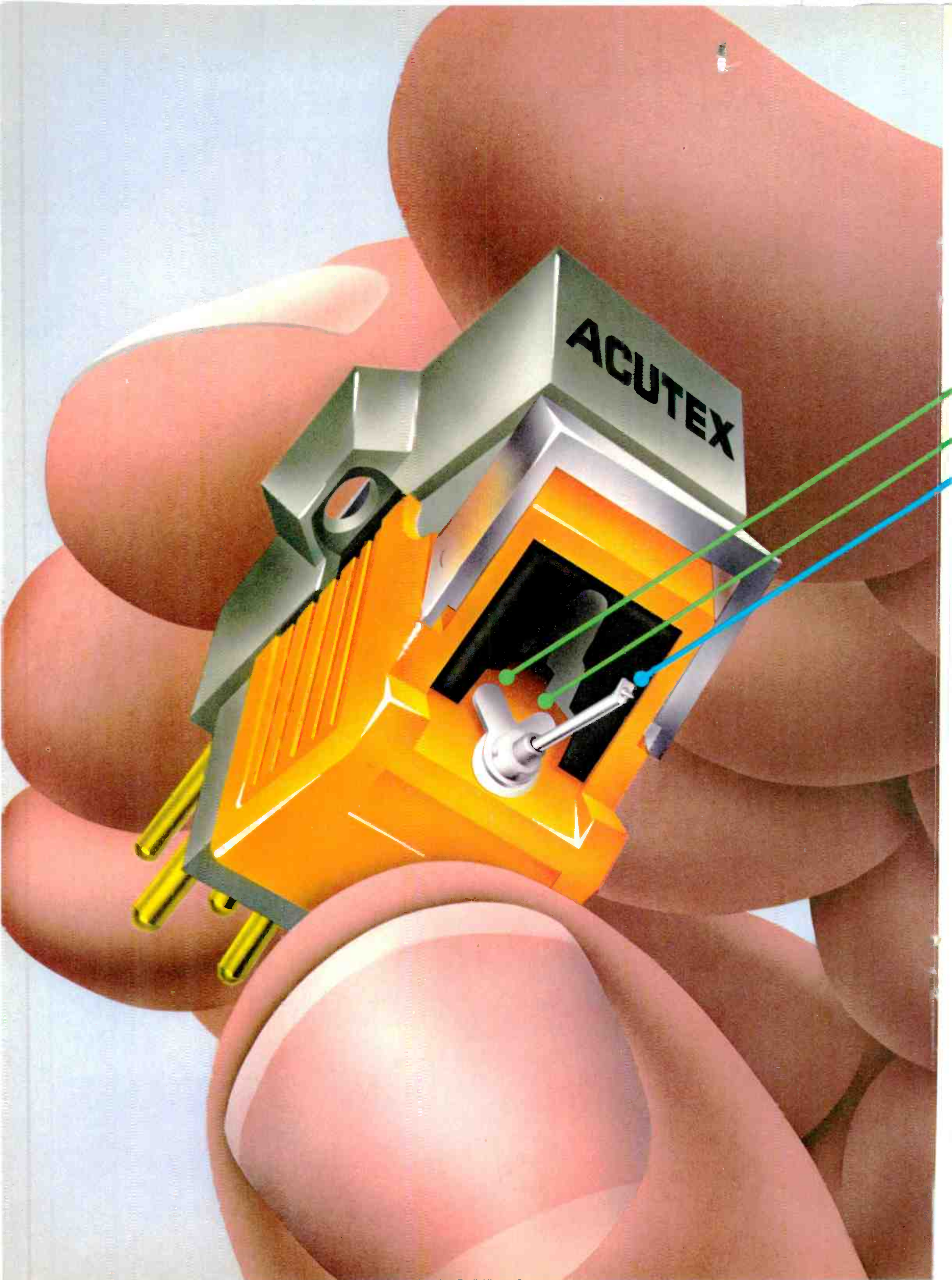

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CREATING THE WORLD'S BEST STEREO SEPARATION WAS AS EASY AS X,Y,Z.

If you were asked to describe the performance of your stereo system, you'd rattle off the typical statistics.

Watts per channel. Woofer size. And of course, frequency response.

But chances are, you'd be hard pressed to say how much your cartridge separates the left channel from the right. Yet, of all stereo specifications, none is a better judge of how well your system reproduces music than stereo separation. Because the greater its separation, the more three dimensional your music sounds.

Unfortunately, while other components have improved dramatically every year, cartridges have remained basically the same for twenty. Until now.

AN ACUTEX CARTRIDGE DOESN'T GET ITS SIGNALS CROSSED.

To understand how unique an ACUTEX cartridge is, you have to know something about the common cartridge.

There are two major principles used to convert a record's grooves into electricity. Moving Iron and Moving Magnet.

With the first, the stylus arm, or "cantilever," is made of iron and wiggles near a coil and magnet inside the cartridge. In the second, a tiny magnet attached to the cantilever wiggles near those coils.

Both have drawbacks. A moving iron is a much weaker generator of electricity than a moving magnet. But a moving magnet is much heavier. Its increased weight can wear out your records faster, and might destroy certain high frequency passages at first playing.

Even worse, stereo separation is only fair in either case. Because one iron or one magnet is the source for two channels. But five years ago, some inventor had a brainstorm.

Instead of a single magnet attached to the cantilever, he used two. One for the left (X) and one for the right (Y).

Instantly, the cartridge's output rose and stereo separation improved.

It was good, but not good enough. Since it was heavier. And when (X) wiggled it also caused (Y) to wiggle slightly; causing some left channel signals in the right channel.

There was no barrier to stop that cross talk, and stereo separation suffered.

ACUTEX created the barrier. With basic geometry.

OUR BOTTOM-OF-THE-LINE BEATS THEIR TOP-OF-THE-LINE.

First, we increased output even further by making the cantilever itself magnetic (Z). Thus we had three moving magnets at 90-degree angles to each other; each in a separate plane in relation to the coils.

So when a record played, (Z) canceled out any spurious signals created in the left channel by the right.

And vice versa.

Finally, because we placed one powerful magnet inside the cartridge—*inducing* the magnetism into our three lightweight armatures—the weight was sharply reduced.

The result was stereo separation so great that our $35 model rivals many of our competitors' $135 models.

And the two best ACUTEX cartridges *surpass* the separation specs all record companies use when cutting an album!

DIAMONDS, GOLD, AND PRECIOUS RECORDS.

Not only will ACUTEX deliver outstanding separation of your music, you'll hear more music to begin with.

Because ACUTEX's three armatures decrease record surface noise at the same moment they increase record signals. Soft notes especially sound clearer, with minimal snap, crackle, and pop.

Each ACUTEX cartridge was designed with a diamond stylus best suited for its purpose.

Our 315 model has a solid (nude) elliptical diamond with a frequency response through 31,000 Hertz.

And the 320 provides a ruler-flat response up to 45,000 Hertz, using a recently developed STR (Symmetrical Tri-Radial) diamond.

On all ACUTEX models, the terminal pins are gold-plated. This allows for maximum electrical contact to your other stereo components.

Since we applied the principle of induced magnetism, ACUTEX has a very low Effective Tip Mass. Which means our cartridges are extremely gentle on groove walls, so you can play your oldest and most precious albums without permanent damage.

But frankly, all our words and pictures won't convince you half as much as your ears. One listen, and you'll be convinced that until now, stereo sound this good was truly unheard of.

ACUTEX will be coming soon to selected hi-fi stores in your area.

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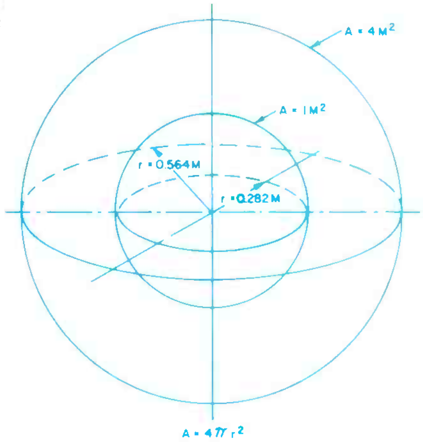
Fig. 3—
The relationship of
the spherical surface
area to radius.



as the surface area of the sphere from a sphere to a hemisphere, we could then reinspect our data as follows:

Acoustic power = 1W = 120 dB, the Acoustic intensity = $2W/M^2$ = 123.01 dB, and the Acoustic sound pressure = 40PA = 123.01 dB. All of this because our 1 acoustic watt now passes through 0.5 M^2 of surface at the distance of 0.282 M.

The parameter name for this effect is Q or directivity factor

$$Q = 10^{\left(\frac{dB_p\,\text{on axis} - dB_p}{10}\right)}$$

Where dB_p is found by

$$10\,\text{Log}\,\frac{10^{\left(\frac{123.01}{10}\right)^{*}} - 10^{\left(\frac{0}{10}\right)^{**}}}{2} = 120\text{ dB}$$

* relative power for hemisphere surface,
** relative power for rear of hemisphere.
Therefore

$$Q = 10^{\left(\frac{123.01 - 120}{10}\right)} = 2$$

Confining the Acoustic Energy

Next let's confine this source emitting 1 acoustic watt in an enclosed space having and internal volume of V = 500,000 ft^3 (14,160 M^3), a boundary surface area of S = 42,500 ft^2 (3948.25 M^2), and with each surface reflecting 85 per cent of the energy and absorbing 15 per cent. Therefore, our absorption coefficient is 15/100 = 0.15.

We now have direct sound—that sound energy which has been emitted but has not yet encountered a boundary, and reverberant sound—that sound which has encountered a boundary and reflected and is now mixed with all other sounds that have reflected one or more times.

The Hopkins-Stryker Equation

The level present as direct sound at any given distance can be found by

$$dB_{p_D} = dB_{W_a} + 10\log\left(\frac{Q}{4\pi r^2}\right) + 10.5^{*}$$

*if r is in ft.

And the level present as reverberant sound becomes

$$dB_{p_R} = dB_{W_a} + 10\log\left(\frac{4}{S\bar{a}}\right) + 10.5^{*}$$

*if $S\bar{a}$ is in ft^2.

Combined, these two equations become the equation that allows the total dB_{p_T} to be calculated

$$dB_{p_T} = dB_{W_a} + 10\,\text{Log}\left(\frac{Q}{4\pi r^2} + \frac{4}{Sa}\right)$$

when r is in meters, and

$$dB_{p_T} = dB_{W_a} + 10\,\text{Log}\left(\frac{Q}{4\pi r^2} + \frac{4}{Sa}\right) + 10.5$$

when r is in ft.

Now, let's again gather our data; the Acoustic power = 1W = 120 dB, the acoustic intensity has become complex as a result of many reflections combining, and the reverberant sound field acoustic pressure = 1.68 PA = 98.5 dB.

One acoustic watt is a powerful level, as can be seen in Fig. 5. We now have a reverberant sound field at a level of 98.5 dB. If we were to turn the sound source off at this point and time the decay to 98.5 − 60 = 38.5 dB, we would be able to measure the RT_{60}. Let's instead calculate it from a completely theoretical basis.

Derivation of the Sabine Equation

It is easily understood that the larger the internal volume possessed by an enclosure, the more energy it can hold without the walls bulging (much as a larger bucket can hold more water than a small bucket). Therefore, RT is proportional to V. Looked at from another viewpoint, if we cut an "open window" in our large enclosure, energy can flow out. The rate at which it flows out (the RT) is proportional to $1/\bar{a}$ where $\bar{a}$ is the average absorption of the opening.

As the sound waves are emitted and encounter boundary surfaces, there will, after sufficient encounters, develop a mean distance between encounters. This distance, called the mean free path, M.F.P., is found by

$$\text{M.F.P.} = \frac{4V}{S}$$

Fig. 4A—The area increases as the square of the radius.

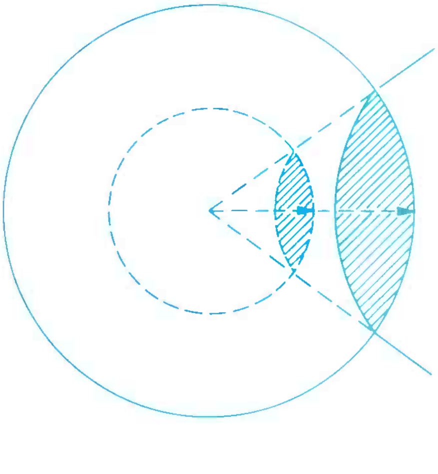


Fig. 4B—The area increases as the square of the radius when both angles diverge.

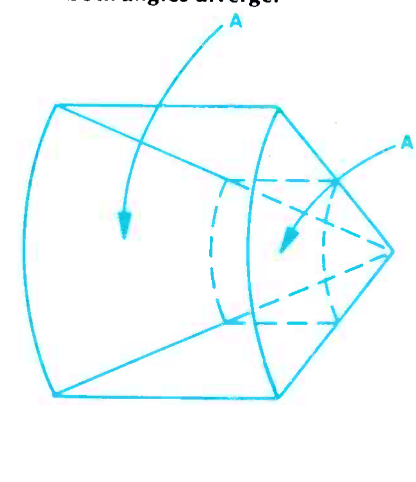
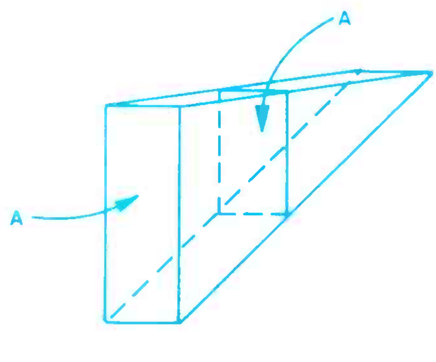


Fig. 4C—The area increases as the radius increases when only one angle diverges.



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"The Dual 939 cassette deck at $550 is best described as 'beautiful.' It performs well, is notably easy to use ...and it has features most of us thought were impossible to get."

This quote, from a test report in *HiFi/Stereo Buyers' Guide*, is hardly alone in its appreciation of the 939. For example, *Radio-Electronics* reported:

"Superlatively low distortion, high signal-to-noise ratios, smooth tape transport action ... fit in nicely with the very best high-fidelity component systems."

High Fidelity's measurements for flutter "suggest that the performance level may be beyond not only your ability to perceive any flutter, but the lab's ability to measure it."

And this from *Stereo:* "Obviously loaded for bear the 939 is one of the most feature-laden cassette decks we've encountered."

When they say "loaded for bear" here's what they mean:

The 939 reverses automatically in playback. (C-90 cassettes will play 90 uninterrupted minutes.) There's continuous play too. And recording is bi-directional. You never have to flip the cassette at the end of the tape.

Instead of slow-moving meter needles, there are instantaneous-reacting LED record-level indicators—twelve of them per channel. They're switchable from VU to peak reading and are visible from across the room.

Fade/edit control is another Dual exclusive. Unwanted sounds on a tape can be faded out gradually and smoothly, and the music faded back in. *While you're listening*, because it's all done during playback.

Still more operating features.

The list of features goes on and on. Line/microphone mixing; Dolby NR plus calibrated Dolby FM decoding; memory stop; separate output and headphone level controls; and an overload limiter that doesn't compress dynamic range.

Unique drive system and tapeheads.

The 939's drive system contains Dual's powerful Continuous-Pole/synchronous motor, two capstans, and special gear drives for fast wind in both directions. (C-90 cassettes fast-wind in just over a minute, the time other decks need for C-60's.)

Hard permalloy tapeheads provide extended life and superior magnetic linearity. The four-track record/playback head switches electronically when the tape changes direction; it never shifts position. Result: perfect tape alignment in both directions at all times.

Six ways to install.

You can install the 939 for front load or top load, plus three other angles. And you can also hang it on a wall.

One last quote.

Now you can appreciate why *High Fidelity* ended its report with: "We can think of no cassette deck that even approaches the 939's unique personality and range of features."

Actual resale prices are determined individually by and at the sole discretion of authorized Dual dealers.

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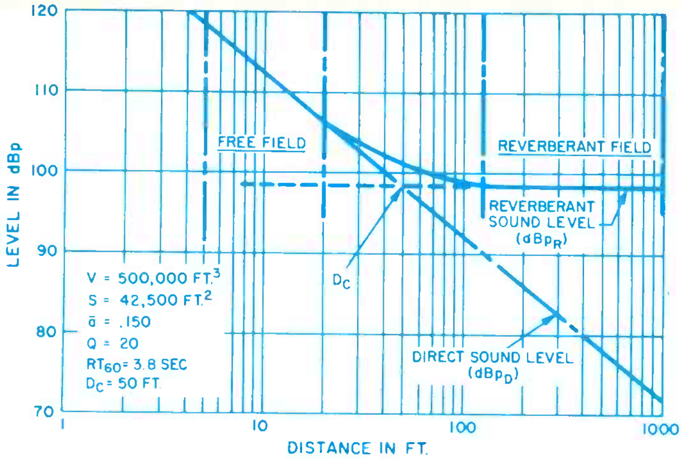


Fig. 5 — The near field, free field, far field, and reverberant field represented graphically.

The M.F.P. concept has been rigorously demonstrated both mathematically and empirically. If we assume the speed of sound to be 1130 Ft/Sec., then it is possible to say that the number of reflections per second, R.P.S., is

$$\text{R.P.S.} = \frac{\text{Velocity of sound}}{\text{M.F.P.}} = \frac{1130}{\text{M.F.P.}}.$$

Further, if we are concerned with 60 dB of decay, where $e^{(6 \ln 10)} = 1{,}000{,}000$ (as -60 dB is 1/1,000,000), then $6 \ln 10\,(1/\bar{a})$ has to be the total number of reflections, N, during 60 dB of decay (See Fig. 6).

It can be intuitively seen that

$$RT_{60} = \frac{N}{\text{R.P.S.}}$$

Writing the components in the form given just above

$$\frac{6 \ln 10 \dfrac{1}{\bar{a}}}{\dfrac{1130}{4V/S}}$$

can be collected into

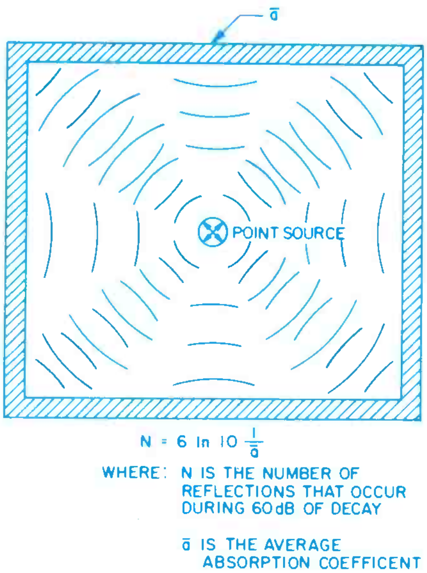
$$RT_{60} = \frac{0.049V}{S\bar{a}}$$

$$\text{Where } 0.049 \text{ is } \frac{4(6 \ln 10)}{1130}$$

$$\frac{4(6 \ln 10)}{343.24^{*}} + 0.161^{**}$$

*speed of sound in Meters/Sec, **metric constant.

Fig. 6 — The absorption of a steady-state sound field.



How fascinating it is to find out that the constant Sabine worked out from his plotted data was 0.049.

Around 1930 efforts were expended to "improve" the Sabine equation for the limiting case of very high absorption, and it was rewritten as the Norris-Eyring equation

$$RT_{60} = \frac{0.049V}{-S \ln(1-\bar{a})}$$

$-\ln(1-\bar{a})$ converts any $\bar{a}$ found by measuring the RT_{60} of a real room and obtaining $\bar{a}$ by

$$\bar{a} = 1 - e^{-\left(\frac{0.049V}{S \times RT_{60}}\right)}$$

back into $\bar{a}_{sab}$

That is,

$$-\ln(1-\bar{a}_{n.e.}) = \bar{a}_{sab}$$

Joyce's paper is so thorough on the invalidity of the Norris-Eyring equation (where it is shown that the high Absorptitivity case is such a grossly underspecified problem that none of the geometric equations can be solved correctly) that we suggest that those readers with questions in this direction start with Joyce's paper.

The Fitzroy Equation

Dariel Fitzroy, a quiet, competent thinker, recognized during the late 1950s that in enclosures where the absorption was not uniform, the RT_{60} measured was greater than the RT_{60} calculated. He reasoned that there could be three typical axes for reverberation—floor-ceiling reflections, end-wall-to-end-wall reflections, and side-wall-to-side-wall reflections, and he wrote his equation to account for such a case:

$$RT_{60} = \frac{0.049V}{S^2}\left(\frac{2(xy)}{\bar{a}_{xy}} + \frac{2(xz)}{\bar{a}_{xz}} + \frac{2(yz)}{\bar{a}_{yz}}\right)$$

The Fitzroy equation has proven to have remarkable applicability in the real case of, say, a carpeted floor, acoustic tile ceiling, and with all other surfaces highly reflective.

Having used this equation to predict an RT_{60}, then the $\bar{a}$ for treatment purposes can be looked at by

$$\bar{a}_{sab} = \frac{0.049V}{SRT_{60}}$$

Limitations To All Acoustic Equations Based On Geometry and Statistics

It should always be considered that, insofar as the reverberation formulas depend upon statistical averages, they presuppose a complete mixing of sound in the room. In very absorptive rooms, the sound dies away in a few reflections, and the statistical basis of the formulae is weakened. In recent studies done by me with time delay spectrometry, typical meeting rooms in hotels have been found in some cases ($RT_{60} < 0.5$ Sec) to develop no reverberant sound field, whereas in others $RT_{60} > 0.7$ Sec a field appears.

My experience with time delay spectrometry causes me to state *unequivocally that recording studio control rooms are not proper subjects for use of classic statistical equations.*

In very large rooms, such as the Astrodome and the Superdome, because the sound cannot cross the room many times during a measured reverberation period of a few seconds, the validity of the formula is affected. I hope to have much fundamental work to report in the not too distant future on the guidelines TDS has illuminated with regard to reverberation in such spaces.

Absorption Units

All materials, whether intended for acoustical use or not, have absorption coefficients that have to be accounted for in

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Tape recording will never be the same.

In Fisher's 41 years of audio leadership, we've introduced many important high fidelity "firsts." But we honestly think the new CR4025 tape deck is one of our most exciting and practical innovations.

Remote electronic editing is as important an advance in tape recording as the cassette.

Now for the first time, you *can really enjoy* creating your own personal music library from FM broadcasts or record albums. The editing is done electronically while recording. A great leap forward from the old way of recording... without jumping up and down every 3 minutes to edit.

Fisher's wireless remote electronic editor makes tape recording a pleasure. The CR4025 tape deck has a built-in wireless receiver that operates the deck's solenoid-actuated Pause mechanism. The remote control transmitter operates the Pause control instantly from up to 20 feet away. Relax, listen, and capture the selections you want to keep at the push of a button.

New guide to buying high fidelity equipment. Send $2 for Fisher Handbook with your name, address to Fisher Corp., 21314 Lassen St., Chatsworth, CA. 91311.

Zap! You eliminate any commercial or announcer's voice from your off-the-air FM broadcast recording . . . or skip any unwanted track on an album you're taping from.

Of course, this fantastic convenience wouldn't be worth much if you had to sacrifice performance. Fortunately, you don't — the CR4025 has the excellent frequency response and extremely low wow & flutter that you expect from Fisher, plus Dolby noise reduction for clean, noise-free recordings.

The Fisher CR4025 is priced at $250* and is available at selected audio stores or the audio department of your favorite department store. For the name of the nearest Fisher dealer, please call toll-free 1-800-528-6050 ext. 871 from anywhere in the U.S. (in Arizona, 1-955-9710, ext.871).

*Manufacturer's suggested retail value. Actual selling price is at the sole discretion of the individual Fisher dealer.

FISHER

The first name in high fidelity.

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Table I — Sound-Absorption Coefficients of General Building Materials and Furnishings

Materials	Coefficients 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Brick, unglazed	0.03	0.03	0.03	0.04	0.05	0.07
Brick, unglazed, painted	0.01	0.01	0.02	0.02	0.02	0.03
Carpet, heavy, on concrete	0.02	0.06	0.14	0.37	0.60	0.65
Same, on 40-oz hairfelt or foam rubber	0.08	0.24	0.57	0.69	0.71	0.73
Same, with impermeable latex backing on 40-oz hairfelt or foam rubber	0.08	0.27	0.39	0.34	0.48	0.63
Concrete block, coarse	0.36	0.44	0.31	0.29	0.39	0.25
Concrete block, painted	0.10	0.05	0.06	0.07	0.09	0.08
Fabrics						
Light velour, 10 oz per sq yd, hung straight, in contact with wall	0.03	0.04	0.11	0.17	0.24	0.35
Medium velour, 10 oz per sq yd, draped to half area	0.07	0.31	0.49	0.75	0.70	0.60
Heavy velour, 18 oz per sq yd, draped to half area	0.14	0.35	0.55	0.72	0.70	0.65
Floors						
Concrete or terrazzo	0.01	0.01	0.015	0.02	0.02	0.02
Linoleum, asphalt, rubber, or cork tile on concrete	0.02	0.03	0.03	0.03	0.03	0.02
Wood	0.15	0.11	0.10	0.07	0.06	0.07
Wood parquet in asphalt on concrete	0.04	0.04	0.07	0.06	0.06	0.07
Glass						
Large panes of heavy plate glass	0.18	0.06	0.04	0.03	0.02	0.02
Ordinary window glass	0.35	0.25	0.18	0.12	0.07	0.04
Gypsum board, ½ in nailed to 2 x 4's 16 in oc	0.29	0.10	0.05	0.04	0.07	0.09
Marble or glazed tile	0.01	0.01	0.01	0.01	0.02	0.02
Openings						
Stage, depending on furnishings			0.25—0.75			
Deep balcony, upholstered seats			0.50—1.00			
Grills, ventilating			0.15—0.50			
Plaster, gypsum or lime, smooth finish on tile or brick	0.013	0.015	0.02	0.03	0.04	0.05
Plaster, gypsum or lime, rough finish on lath	0.02	0.03	0.04	0.05	0.04	0.03
Same, with smooth finish	0.02	0.02	0.03	0.04	0.04	0.03
Plywood paneling, 3/8 in thick	0.28	0.22	0.17	0.09	0.10	0.11
Water surface, as in a swimming pool	0.008	0.008	0.013	0.015	0.020	0.025
Air, sabins per 1000 cubic feet					2.3	7.2

RT_{60} calculations. Just a few of these are shown in Table 1. The unit of absorption in the United States is the sabin (named in honor of W. C. Sabine). One sabin is 1 ft^2 of open window. In Europe the absorption unit is also called a sabin, but it is 1 M^2 of open window. To find the number of sabins of absorption in an enclosure, each area of boundary surface is subdivided into as many parts as there are differing absorptive materials. The average absorption coefficient, $\bar{a}$, is found by

$$\bar{a} = \frac{s_1 a_1 + s_2 a_2 + \ldots s_n a_n + sa_{obj}}{S}$$

Sa_{obj} is the number of objects in the space times the $S\bar{a}$ rating. See Table II for examples.

Reams of paper have been expended in advocating various methods of measurement. Broadly classified, the major techniques are:

Where *sources* are 1) interrupted warble tone, 2) interrupted random noise, 3) the Schroeder-Kuttruff method (the ringing of a pulsed filter is employed as a signal source), and 4) gunshots, bursting balloons, and other impulse sources.

Readout devices are 1) high speed graphic level records, 2) digital direct-reading meters, 3) oscilloscopes with logarithmic vertical scales and either long persistence screens or memory, and 4) well-trained ears and a stopwatch.

Today, with the advent of digital real-time analyzers and readily available, powerful, table-top computer-calculators, it is possible to fully automate these measurements. Again, thanks to the increasing power of computers, the wave acoustics solutions may become realistic in small, readily available devices within the coming decade. The important point is that the correct philosophy be attached to the automation, as the rule GIGO (*garbage in—garbage out*) still applies.

No effort has been made in this article to discuss the acceptable criteria for reverberation developed during the past 70 years nor of the basic approaches to using the equations in the planning for the application of acoustic absorption to spaces as correctional measures.

Conclusion

The work of W.C. Sabine founded the entire field of architectural acoustics and is fundamental to the successful interface of any electro-acoustic system to the acoustic environment. A partial list of present day equations directly based on Sabine's work are 1) critical distance, 2) reverberation, 3) reverberant sound field, 4) transmission loss, 5) Hopkins-Stryker and its many variations, 6) articulation loss of consonants, and 7) Q relative to the adjustment of direct-to-reverberant ratios.

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An inside look at Jensen's Total Energy Response.

You're looking at the heart of one of the most uniformly accurate sound reproducers made today. A Jensen Lifestyle Speaker.

Unlike many speakers that require special on-axis listening positions—or others that bounce the sound all over your room—Lifestyle is engineered to deliver a wide spectrum of musical information throughout the listening area. In proper perspective. With all the depth and imaging your source material is capable of. And at real-life volume levels. That's what Total Energy Response is all about.

In fact, for perfectly integrated speaker systems and total quality control, we make every element that goes into the manufacture of our Lifestyle speakers. From the heavy duty magnets to our handwound, high power voice coils. Even the computer-designed crossover network. And of course, all of our precision woofers, midrange drivers and 170° dispersion dome tweeters.

But please, give a critical listen to these speakers in person. We think you'll agree, a notably superior design concept has resulted in audibly superior sound reproduction.

JENSEN
LIFESTYLE SPEAKER SYSTEMS
Division of Pemcor, Inc.
Schiller Park, Illinois 60176

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Table II — Absorption of Seats and Audience

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Audience, seated, depending on spacing and upholstery of seats	2.5-4.0	3.5-5.0	4.0-5.5	4.5-6.5	5.0-7.0	4.5-7.0
Seats, heavily upholstered with fabric	1.5-3.5	3.5-4.5	4.0-5.0	4.0-5.5	3.5-5.5	3.5-4.5
Seats, heavily upholstered with leather, plastic, etc.	2.5-3.5	3.0-4.5	3.0-4.0	2.0-4.0	1.5-3.5	1.0-3.0
Seats, lightly upholstered with leather, plastic, etc.			1.5-2.0			
Seats, wood veneer, no upholstery	0.15	0.20	0.25	0.30	0.50	0.50
Wood pews, no cushions, per 18-in length			0.40			
Wood pews, cushioned, per 18-in length			1.8-2.3			

Values given are in sabins per person or unit of seating

The genius of the man is apparent, important, and yet relatively unheralded. Encyclopedias rarely mention him. Outside of the field of architectural acoustics, students fail to recognize his name. Wallace Clement Sabine deserves our honored respect and acknowledgement.

Note on Symbols Used

The author is familiar with the symbols proposed for international use in the S.I. (called Systems International d'Unites by some and Systeme Idiotic by others) but prefers not to use them where their use is not mandatory.

$$10\,\mathrm{Log}\left(\frac{W_a}{10^{-12}}\right) \equiv L_p \equiv \text{dB-PWL}$$

$$\mathrm{dB}_p \equiv L_p \equiv \text{dB-SPL}$$

$$Q \equiv R_\theta, \lambda, D_f$$

(S.I. has no definitive symbol for Q as yet)

$$PA \equiv Pa \equiv N/M^2$$

Definition of Terms

V is the total internal volume of an enclosed space in ft^3 or M^3.

S is the total boundary surface area of an enclosed space in ft^2 or M^2.

$\bar{a}$ is the average absorption coefficient of an enclosed space (dimensionless),

$$\bar{a} = \frac{s_1 a_1 + s_2 a_2 + \ldots s_n a_n + sa_{obj.}}{S}.$$

$s_{1,2,n}$ is the individual surface areas in the ft^2 or M^2 of the differing absorptive materials.

sa_{obj} is the total absorption figure for objects in the space that are not part of the boundary surface area.

RT_{60} is the time in seconds that it takes the steady state sound level in an enclosed space to drop 60 dB in level *after* the sound source is turned off.

D is the decay rate in dB/Sec of the steady state sound level after the sound source is shut off,

$$D = \frac{60}{RT_{60}}.$$

MFP is the mean free path in feet or M (i.e., the average distance the sound wave travels between encounters with boundaries,

$$M.F.P. = \frac{4V}{S}.$$

N is the total number of reflections during a given decay. For 60 dB of decay,

$$N = 6\ln 10\,(1/\bar{a}).$$

R.P.S. is the number of reflections per second,

$$R.P.S. = \frac{\text{Velocity of sound}}{M.F.P.}$$

W_a is the acoustic power in watts emitted by the sound source.

dB-PWL is the acoustic power in dB referred to 10^{-12}W.

Q is the directivity factor of the sound source.

PA is the sound pressure in Pascals,

$$PA = 10\ \text{dyne/cm}^2 = 0.9806650\ N/M^2.$$

$a_{1,2,n}$ is the absorption coefficient associated with each $S_{1,2,n}$.

dB-SPL is the sound pressure level in dB referred to 20 μPA,

$$\text{dB-SPL} = \text{dB-PWL} + 10\,\mathrm{Log}\left(\frac{Q}{4\pi r^2} + \frac{4}{S\bar{a}}\right) + 10.5\ \mathrm{dB}\ (r\ \text{in ft}).$$

D_c is the critical distance in ft. or M at which the direct sound field level is equal to the reverberant sound field level,

$$D_c = 0.141\sqrt{QS\bar{a}} = 0.03121\sqrt{\frac{QV}{RT_{60}}}$$

dB_{P_R} is the reverberant sound field level in dB,

$$dB_{P_R} = 10\,\mathrm{Log}\left(\frac{W}{Sa}\right) + 136\ (Sa\ \text{in ft}^2).$$

dB_{P_D} is the direct sound field level in dB,

$$dB_{P_D} = 10\,\mathrm{Log}\left(\frac{Q}{4\pi r^2}\right) + 130\ (r\ \text{in ft}).$$

dB_{P_T} is the total sound field level in dB,

$$dB_{P_T} = dB_{W_a} + 10\,\mathrm{Log}\left(\frac{Q}{4\pi r^2} + \frac{4}{Sa}\right) + 10.5\ (r\ \text{in ft}).$$

References

1) *COLLECTED PAPERS ON ACOUSTICS* by Wallace Clement Sabine, published by Dover publications, Inc., New York, 1964.

I like this edition in preference to my original copy of the work because the Dover edition has a new introduction by Frederick V. Hunt, an inspired worker in acoustics in his own right and an unusually talented historical investigator as well.

2) *SABINE'S REVERBERATION TIME AND ERGODIC AUDITORIUMS* by W. B. Joyce, published in the J-ASA, Vol. 58, No. 3; September, 1975; pp. 643-655.

The bibliography attached to this paper contains one of the more exhaustive lists of revelant historical articles on the subject.

3) *THE NOTEBOOKS OF WALLACE C. SABINE* by Leo L. Beranek, published in the J-ASA, Vol. 61, No. 3; March, 1977; pp. 629-639.

These previously "lost" notebooks were unearthed at Riverbank Laboratories by Ralph Huntley and were subsequently reported on by Beranek.

4) *WALLACE CLEMENT SABINE* by William Dana Orcutt, published by Plimpton, Norwood, MA, 1933 (out of print).

A few remaining copies are available from Leo Beranek at the cost of the binding and are considered by many to be priceless.

5) *SOUND SYSTEM ENGINEERING* by Don and Carolyn Davis, published by Howard W. Sams Co., Indianapolis, 3rd Printing, 1977.

A thorough development of a full set of Sabine-based equations for use in sound system design work.

6) *REFERENCE DATA FOR RADIO ENGINEERS* Published by Howard W. Sams, Inc. Indianapolis, Sixth edition, 1975, pages 37-11 to 37-17.

This article contains useful measurement details.

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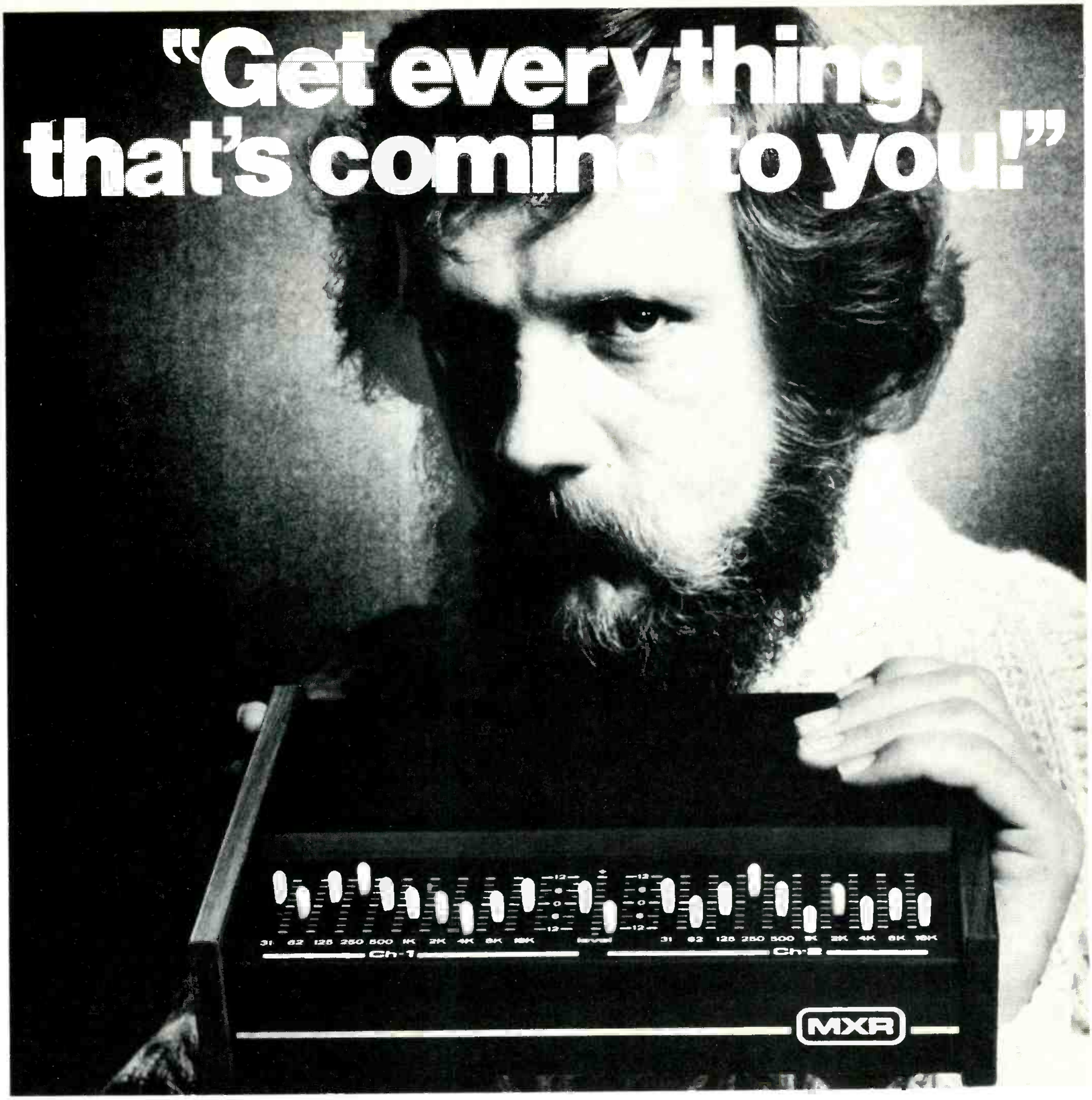

69

Everything but the effects of poor room acoustics, poor speakers or poor program quality with the MXR Stereo Graphic Equalizer.

You've got a room that's a lot like a sponge . . . rugs, drapes, overstuffed chairs. And every time you turn on your system, most of the aural glory gets soaked up. Or, you've bought a sound system that has an impressive price but alas, a depressing sound. Your records, tapes and radio sources may sound good to some, but to you, the high fidelity just isn't high enough. And you'd lose if you made a trade.

Get into control with the MXR Stereo Graphic Equalizer. It lets you tailor frequency responses and adjust acoustics to your desires. Control 10 frequencies plus level on each of two channels. Play with the lows, boost the mid-ranges, and soar with the highs. Bring each speaker closer, or move it farther away at the touch of a slide control. The MXR Equalizer's frequency controls not only adjust for the interior of your room, but also for the interior of your system, making a small system sound big . . . a big system sound mammoth.

Built with the same ingenuity are our Compander which enhances sound for home recording, and our new Dynamic Processor, which brings recorded dynamics to life and removes impulse noise. Hear the entire MXR line at fine audio dealers. Or write MXR Innovations, Inc., 247 N. Goodman St., Rochester, N.Y. 14607. Or call 716-442-5320. Also distributed in Canada by White Electronic Development Corporation, 6300 Northam Drive, Mississauga, Ontario.

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Equipment profiles

Luxman Model R-1120 Stereo AM/FM Receiver

MANUFACTURER'S SPECIFICATIONS
FM Tuner Section
Usable Sensitivity: Mono, 10.3 dBf (1.8 µV); Stereo, 17.2 dBf (4.0 µV).
50-dB Quieting: Mono, 14.1 dBf (2.8 µV); Stereo, 36.8 dBf (38 µV).
S/N: Mono, 74 dB; Stereo, 70 dB.
Selectivity: 80 dB.
THD: Mono, 0.1 per cent @ 100 Hz & 1 kHz, 0.2 per cent @ 6 kHz; Stereo, 0.2 per cent @ 100 Hz & 1 kHz, 0.4 per cent @ 6 kHz.
Frequency Response: 20 Hz to 15 kHz, +0.2 dB, −1.5 dB.
Capture Ratio: 1.3 dB.
Image Rejection: 80 dB.
I.f. Rejection: 85 dB.
AM Suppression: 55 dB.

When Lux Audio of America Ltd. first introduced the products of their parent company, Lux Corporation of Japan some three years ago they chose to do so with a line of high-end amplifiers, tuners, and preamplifiers which were designed for what was then deemed the ultimate in performance and quality. Lux Corporation, a 53-year old company by now, had for some time previously been marketing integrated receivers in other parts of the world in various price categories. It was only when they developed their latest receivers, about a year ago, that the company decided to sell them in the U.S., to complement the rest of their well-accepted line of audiophile products. Indeed, in an effort to get across the idea that these receivers are not just "me too" products, they have elected to call them tuner-amplifiers to convey the idea that their performance is as good as might be obtained from separate components.

All of the Lux receivers bear a family resemblance. Front panels are dominated by a large bronze-tinted dial area, the upper section of which is fitted with less often used controls and switches (all neatly camouflaged to avoid a cluttered look), while major controls are positioned on the light-colored lower section of the panel with ample physical separation between them. Upper, secondary controls include a Dolby FM switch (active only if one purchases the optional Dolby decoder board which plugs into an empty multiple-pin connector inside the chassis), a tape monitor switch (for up to two tape decks), tape-dubbing switch, mono/stereo mode switch, loudness switch, subsonic, low- and high-cut filter switches, power switch, and a sensitivity switch which governs the firing points of a series of LED power indicators located in the dial area (6 LEDs per channel, calibrated from −18 dB to 0 dB and responsive to power output peaks of from 120 mW to 120 W in two ranges).

Linear FM and conventional AM frequency scales are positioned below these controls and are softly illuminated when power is applied. Below the dial scales, at the left, are indicator lights for Dolby and stereo FM plus illuminated signal-strength and center-of-channel meters. An additional LED serves as a power-on indicator and, when power is first applied, flashes intermittently until voltages have been stabilized, after which speakers are electrically connected to the output stages. This LED will also become illuminated if

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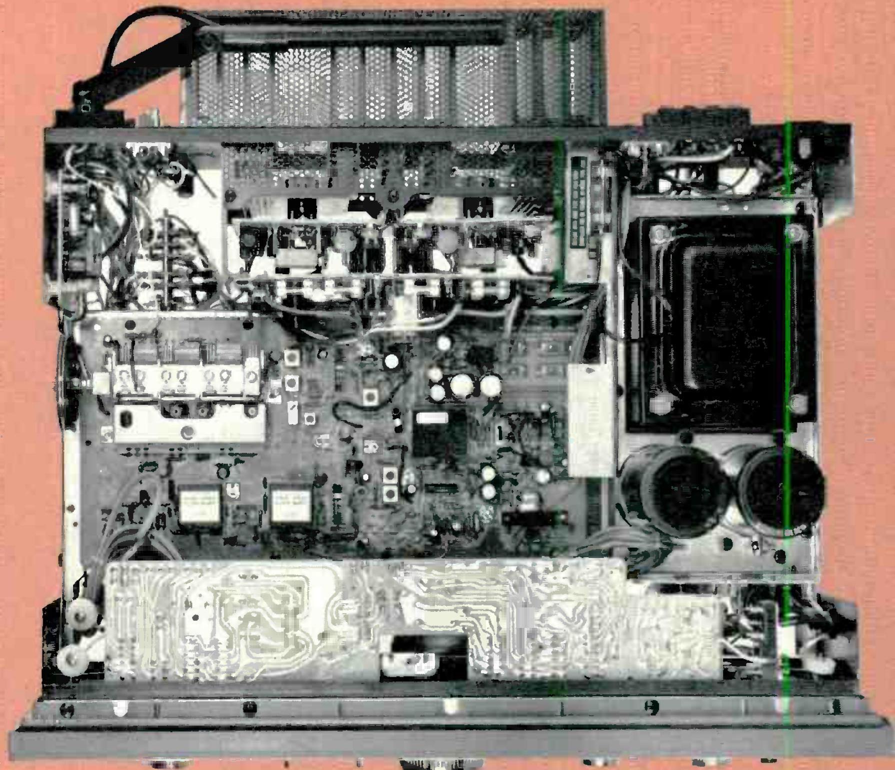
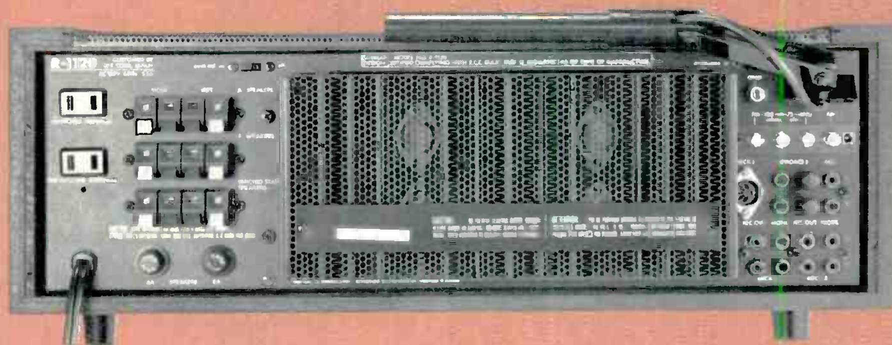
Stereo Separation: 45 dB @ 100 Hz, 48 dB @ 1 kHz, and 42 dB @ 6 kHz.
Sub-Carrier and SCA Rejection: 60 dB.

AM Tuner Section
Usable Sensitivity: Internal antenna, 200 μV/M.
S/N: 52 dB.
Image Rejection: 75 dB.
I.f. Rejection: 80 dB.
Selectivity: 32 dB.
THD: 0.5 per cent.

Amplifier Section
Power Output: 120 W/channel, 8 ohm loads, 20 Hz to 20 kHz.
Rated THD: 0.03 per cent.
Rated IM: 0.03 per cent.
Frequency Response: High level, 15 Hz to 60 kHz, −1 dB.
Input Sensitivity: Phono, 2.6 mV; High Level, 160 mV.
Phono Overload: 160 mV.
S/N: Phono, 72 dB (94 dB "A" weighted re: 10 mV input); High Level, 95 dB "A" weighted.
Treble Control Range: ±13 dB or ±8 dB @ 10 kHz (depending upon turnover setting).
Bass Control Range: ±11 dB or ±6 dB @ 100 Hz (depending upon turnover setting).
Filter Cut-off and Slope: Subsonic, 15 Hz, 12 dB/octave; Low, 70 Hz, 12 dB/octave; High Cut, 7 kHz, 12 dB/octave.

General Specifications
Power Consumption: 500 W @ rated output.
Dimensions: $19\frac{5}{16}$ in. (49 cm) W x $7\frac{3}{32}$ in. (18 cm) H x $16\frac{21}{32}$ in. (40.8 cm) D.
Weight: 37.4 lbs. (17 kg).
Price: $995.00.





the protection circuits of the amplifier section are activated for any reason.

Major controls include an input program selector (with two phono settings, AM, FM and AUX), bass and treble control knobs, which, when pulled outward provide alternate tone-control turnover frequencies, dual-concentric volume and balance controls, a speaker selector switch, headphone jack, and a centrally located, massive flywheel-coupled tuning knob.

The rear panel of the R-1120 is equipped with three sets of spring-loaded speaker terminals, two of which are for the connection of conventional speaker systems, while the third is specifically intended for use with electrostatic-speaker systems. Speaker-line fuses are located below the speaker terminals. To the right of the metal grille (which protects the output transistors mounted directly to protecting heat sinks) are four antenna terminals (for 75-ohm or 300-ohm FM, and external AM-antenna transmission lines), a chassis ground terminal, two sets of phono input jacks, AUX, tape-in and tape-out jacks, and a DIN multiple-pin connector which parallels the Tape-1 in and out jacks. An antenna-attenuator switch is also located in this section of the rear panel (for use when overly strong FM signals are received), as is a large AM ferrite-bar antenna which can be rotated away from the chassis for best reception.

A block diagram of the R-1120 circuit is shown in Fig. 1. The FM tuner section uses a four-gang tuning capacitor and a dual-gate MOS-FET r.f. stage in its front end. Linear-phase ceramic and block filters are used in the i.f. section to achieve sharp skirt selectivity while maintaining adequate bandwidth for low-distortion mono and stereo audio recovery. A quadrature detector/limiter circuit is incorporated in a single IC, and the composite audio signal recovered from this circuit is fed to an IC PLL decoder, followed in turn by an IC low-pass filter which suppresses sub-carrier output. A modified form of AFC circuitry which Lux calls its "Closed Lock Loop Tuning System" locks in received signals but is limited to a locking range of only ±100 kHz to prevent "pulling" of adjacent strong-signal channels.

The AM tuner section of the R-1120 uses a three-gang tuning capacitor and an amplified form of AGC circuitry as well as a ceramic filter in its i.f. section.

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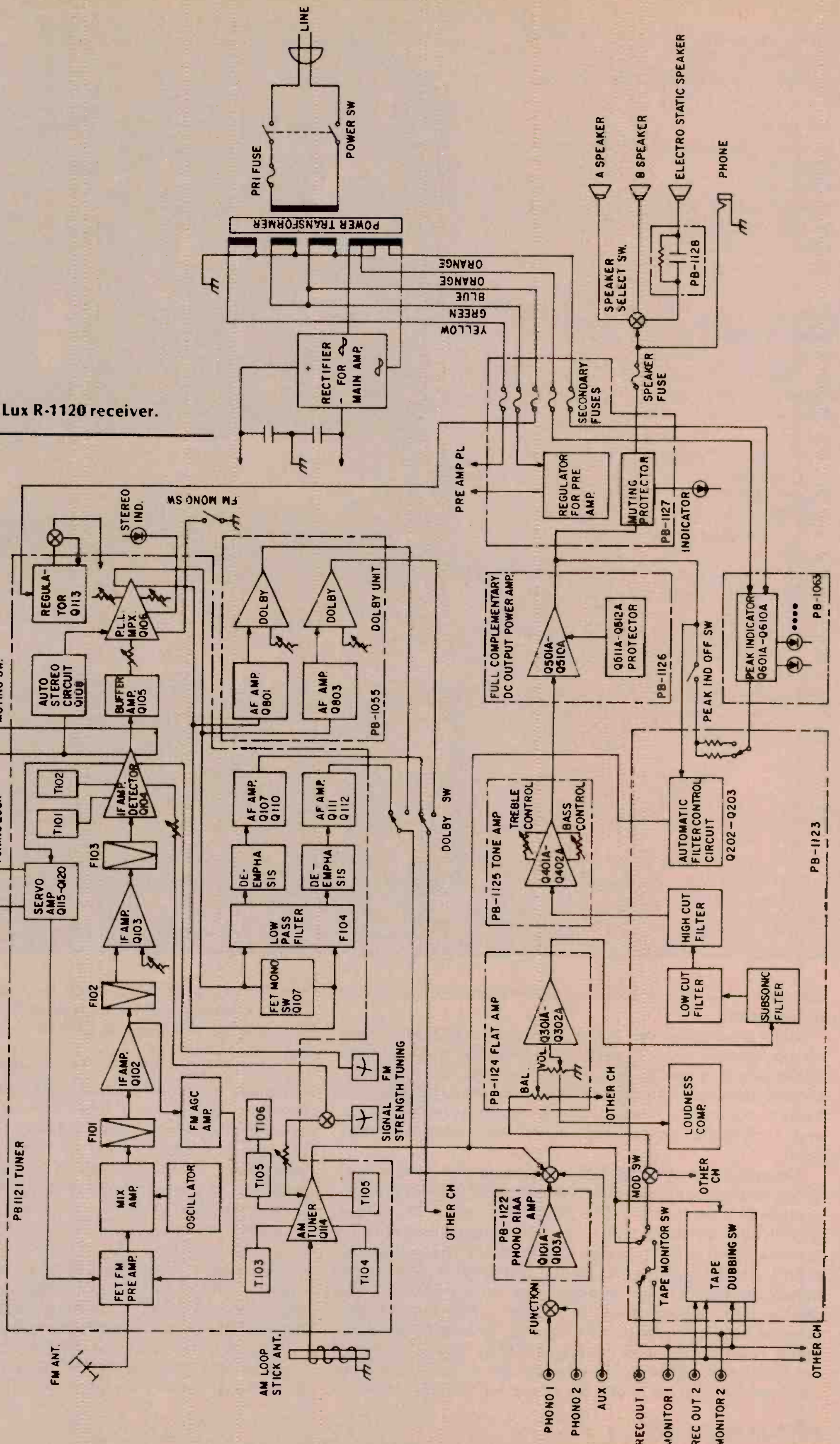

Fig. 1 —
Block diagram of the Lux R-1120 receiver.

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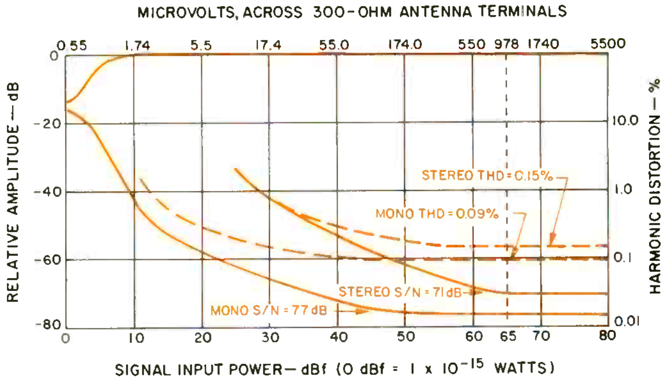

Fig. 2 — Mono and stereo quieting and distortion characteristics of the FM section.

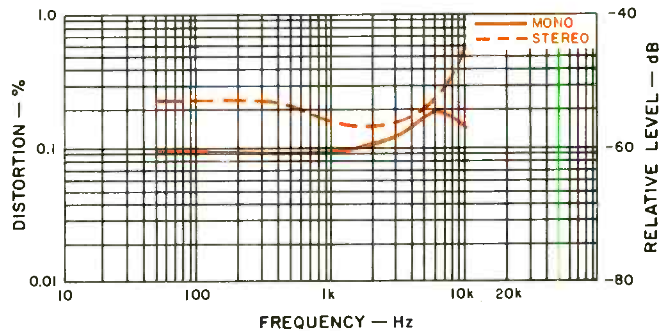

Fig. 3 — Distortion vs. frequency in the FM tuner section.

FM Tuner Section Measurements

Usable sensitivity in mono measured 10.3 dBf, exactly as claimed. In stereo, usable sensitivity was 22.1 dBf, being governed by the stereo switching threshold rather than by actual noise and distortion measurements (THD is down to 1.3 per cent by the time stereo mode is switched in automatically). The 50-dB quieting point required only 12.5 dBf of signal strength in mono and 36 dBf in stereo, both figures better than claimed by Lux. Best S/N in mono measured 77 dB, while for stereo the S/N for 65-dBf signal inputs was a high 71 dB. Harmonic distortion of 1 kHz measured 0.09 per cent in mono and 0.15 per cent in stereo, again exceeding published claims. All of these results are plotted graphically in Fig. 2, while in Fig. 3 we have plotted distortion versus frequency for both the mono and stereo modes.

Capture ratio measured 1.2 dB, while alternate channel selectivity was 83 dB. Image and i.f. rejection both measured 85 dB, and spurious response rejection was in excess of 90 dB. Sub-carrier and SCA rejection both measured in excess of 70 dB, exceeding published claims by far. There would be no need for an MPX filter on a tape deck when recording FM programs from this receiver. Muting threshold is ideally set at a level of 13.5 dBf. Frequency response for FM is plotted (including 75 microsecond de-emphasis) in Fig. 4, along with crosstalk into the undesired opposite stereo channel. Response was flat within −1.2 dB out to 15 kHz, and separation measured a high 51 dB at mid-frequencies, 48 dB at 100 Hz, and 38 dB at 10 kHz.

AM Section Performance

In response to many reader requests, we have begun to measure a few of the AM performance characteristics of stereo receivers. In the case of the Lux R-1120 (and nearly every other receiver we have tested recently), frequency response was not really something to rave about, as illustrated in the sweep-frequency display of Fig. 5. While other performance specifications such as S/N, THD, image, and i.f. rejection all met or exceeded their published ratings, Lux, like so many other receiver makers, chose to limit the bandwidth of the AM section with the results shown in Fig. 5. Perhaps the expected coming of stereo AM will prompt all manufacturers to take another look at their AM design philosophy. In the meanwhile, you'll have to search elsewhere if you want wide-response AM reception.

Amplifier and Control Section Measurements

The power amplifier section of the R-1120 is conservatively rated and delivered 150 watts per channel into 8-ohm loads at 1 kHz before the low rated THD of 0.03 per cent was reached. For a rated IM of 0.03 per cent, power output was even higher, with readings of 167 watts per channel, as shown in Fig. 6. Power bandwidth for rated output (120 watts per channel) extended from 15 Hz to just a bit over 20 kHz (extremes of frequency at which THD did not exceed 0.03 per cent), as illustrated in the graph of Fig. 7. Damping factor for the power amplifier section measured 52 at 50 Hz and referred to 8 ohms.

Phono input sensitivity measured 2.8 mV for rated output, and overload was a very high 250 mV (at 1 kHz), as against the 160 mV claimed by the manufacturer. Signal-to-noise in phono measured 78 dB ("A" weighted) referred to actual input sensitivity, which translates to 86 dB referred to a 10 mV input. RIAA equalization was accurate to within ±0.3 dB, while frequency response measured through the high level in-

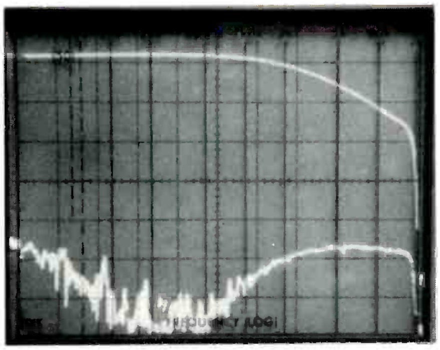

Fig. 4 — Frequency response and separation characteristics (including the 75 μS de-emphasis) of the tuner section. (Each vertical division in all 'scope photos is 10 dB per division.)

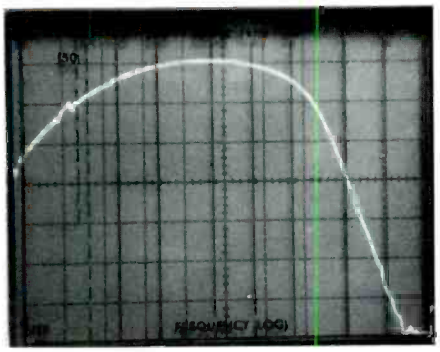

Fig. 5 — AM frequency response.

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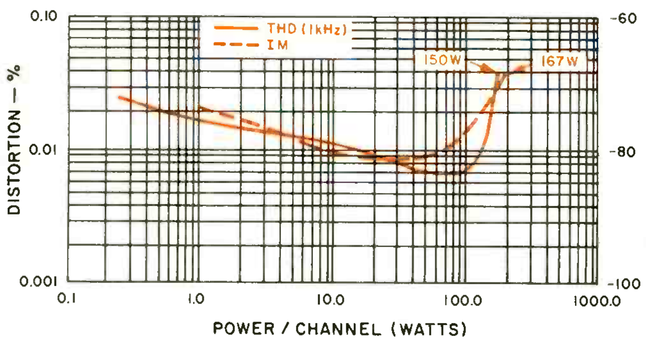

Fig. 6 — Distortion vs. power output.

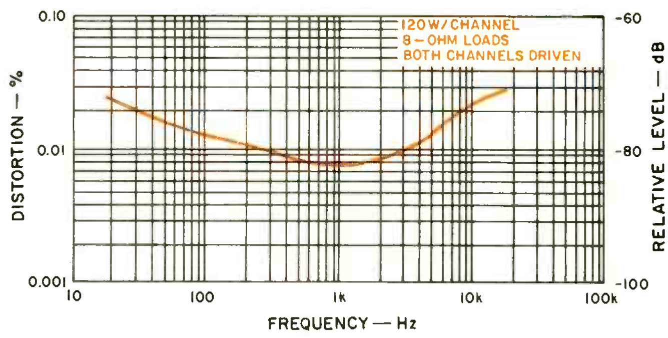

Fig. 7 — Distortion vs. frequency at rated output.

puts was flat from 4 Hz to 170 kHz for the −3 dB roll-off points (10 Hz to 65 kHz for a −1 dB roll-off). Hum and noise in high-level mode was 100 dB below rated output ("A" weighted), while residual noise was a bit lower still, with readings of 103 dB, "A" weighted.

Tone-control range with the bass and treble control knobs depressed (2 kHz and 400 Hz turnover) is plotted in the sweep-frequency 'scope photo of Fig. 8, while the range of control available with the alternate turnover settings (200 Hz and 4 kHz) is plotted in Fig. 9. The subsonic filter response was exactly −3 dB at 15 Hz as claimed but cannot be seen in Fig. 10, since the sweep rang in this presentation is from 20 Hz to 20 kHz. The alternate low-cut filter action as well as the high-cut filter response are clearly illustrated in Fig. 10, however, and exhibit their 12-dB/octave slope rates and specified cut-off points precisely.

Action of the loudness compensation circuitry is depicted in the multiple sweep 'scope photo of Fig. 11, and Lux chose to emphasize both bass and treble response in their loudness circuitry.

Use and Listening Tests

It has been often stated that bench measurements alone do not tell everything about an audio product. This is particularly true when it comes to products made by a few companies such as Lux. Certainly, this is not the most feature-laden receiver we have ever put through our lab, nor is it particularly "bargain priced." Yet, Lux seems to have the ability to produce product after product that just *sounds* better. This was particularly true of phono reproduction which was especially impressive when reproducing program sources having extreme musical transients. There was no hint of stridency at the high end and bass reproduction was tight and true. As for the FM tuner section, again, measured specifications do not tell the entire story. Certainly, there are tuners and receivers today which have lower measured distortion

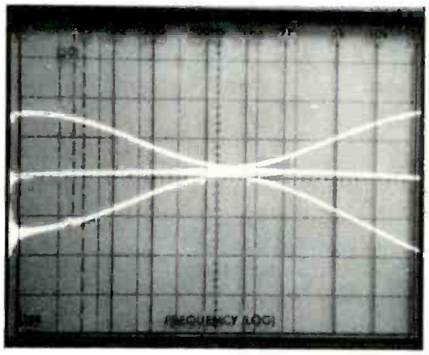

Fig. 8 — Bass and treble control range at the 400-Hz and 2-kHz turnover settings.

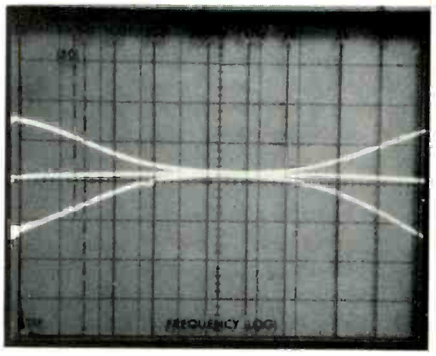

Fig. 9 — Bass and treble control range at the 200-Hz and 4-kHz turnover settings.

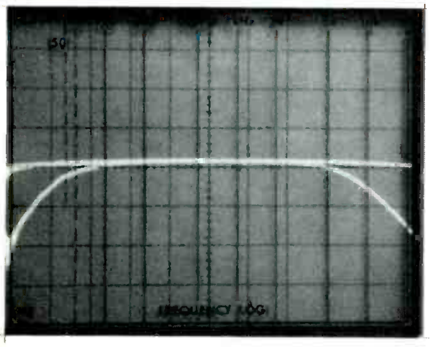

Fig. 10 — Low-cut and high-cut filter response.

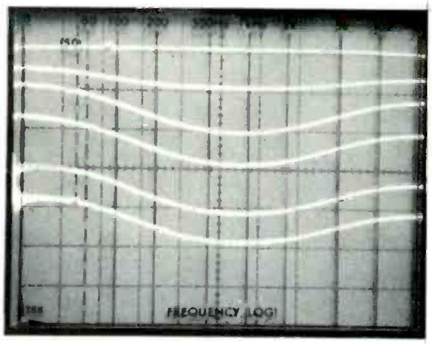

Fig. 11 — Loudness compensation, in 10 dB increments, of the volume control.

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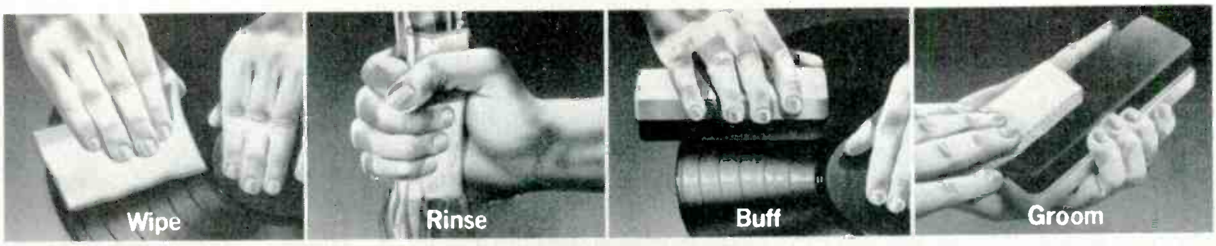
Before this, all leading record cleaners carried a little dirt from one record to the next.



Even though you couldn't see it, the build-up of dirt on your cleaning pad was inevitable. So you were bound to spread it around.

But now Sound Guard™ record cleaner has the solution. Spray it on your record. Wipe it off with our non-abrasive sponge, and rinse the dirt down the drain. And that's only the half of it.

Once you've buffed your record with our cleaning pad, you can clean the pad itself with our grooming pad. So you've made doubly sure that you're not carrying dirt from one record (or side) to the next.

Sound Guard record cleaner is a two-step cleaner, too. It's good for light cleaning each time you play your favorites.

It's ideal for thorough cleaning and before every Sound Guard® record preservative application.

So stop burying dirt in a buffer. Wash it down the drain.

Like every one of our Sound Guard products, Sound Guard record cleaner is sold in audio and record outlets.

Sound Guard® keeps your good sounds sounding good.

Sound Guard preservative—Sound Guard cleaner—Sound Guard™ Total Record Care System

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figures and even somewhat better 50-dB quieting figures, yet, when listening to FM over the Lux R-1120 one senses that the tuner is able to capture and hold signals that other tuners and receivers have trouble with (at least in our listening location) and it is equally obvious that tuner alignment has been carefully performed, so that center-of-channel indications correspond exactly to lowest distortion tuning points. Dial calibration, too, was perfect from 88 MHz to 108 MHz, and the inobtrusive "Closed Lock Loop Tuning" system keeps signals firmly locked yet did not prevent us from tuning to weak-signal stereo stations whose frequency was only 400 kHz away from some of our local "powerhouse" stations.

In short, the Lux R-1120 must not be judged on a simple watts-per-dollars basis but should be auditioned carefully and compared with other receivers in the same price category, regardless of their power output ratings. Its 120-watt plus power output capability should be ample for use with all but a few ultra-low sensitivity speakers and, speaking for ourselves at least, we would rather trade 3 or 4 dB of extra power for the sound quality and elegant design of the Lux R-1120.

Leonard Feldman

Enter No. 90 on Reader Service Card

Sony Model TC-K7II Stereo Cassette Deck

MANUFACTURER'S SPECIFICATIONS

Frequency Response: 30 Hz to 16 kHz with FeCr tape, 30 Hz to 15 kHz with CrO_2 tape.
Harmonic Distortion: 1.3 per cent.
S/N Ratio: 60 dB with FeCr and 56 dB with CrO_2 at peak level.
Input Sensitivity: Mike, 0.2 mV; Line, 60 mV.
Output Level: Line, 775 mV.
Wow & Flutter: 0.045 per cent W rms.
FF & RWD Times: 70 seconds for C-60 cassettes.
Dimensions: 6¾ in. (17 cm) H x 18⅛ in. (46 cm) W x 12¼ in. (31 cm) D.
Weight: 24.3 lbs. (11 kg).
Price: $540.00.

Sony's latest front-loading cassette deck provides many useful features that should be of interest to an audiophile considering the purchase of a deck in this price range. On the left end of the front panel are the power switch, a three-position timer switch, a headphone level pot, and the associated jack. The timer switch will turn the unit on in either *Play* or *Record*, as desired, with a helpful status light for the latter. The cassette is inserted into the guides in the air-damped door, which has a large, clear plastic cover. The eject button is just to the right, below the counter and the memory switch, which can be set to *Off*, or for *Stop* or *Play* upon rewind to "000." The light-touch, logic-controlled tape-motion buttons below all have handy status lights, except for *Stop*. The logic configuration provides the capability for flying-start recording, just by holding in *Play* and touching *Record*, very nice. When the door is closed with a cassette in place, an inside light is turned on. Head accessibility is fairly good with the door in place and is excellent with it removed (a simple task).

The right side of the front panel includes the good-sized, well-illuminated level meters with peak level indicators to the left for 0, +4, and +8 VU. Just below are the Dolby switch, which offers the choice of multiplex filter in or out, the limiter switch, and the tape select switches, which offer three positions each for bias and EQ. The combinations permit matching various low-noise tapes as well as FeCr and CrO_2 types. The large, finely-knurled mike and line level pots are dual-section without friction clutching. As there is a small difference in diameter, however, both sections can be grasped and turned together. The record-mode status light is just above and between the pots. The mike phone jacks are below the associated pot which provides full mixing with the line input. There is a stereo line-in jack below its control pot. A momentary contact push-button allows muting of the record signal to prevent recording any undesired material, such as commercials. Use of this function does not remove the signal from metering or monitoring, facilitating its use. The line-out pot provides control of the level from maximum to 20 dB below that. The output, therefore, cannot be reduced to zero, but finer setting of level for matching is possible. This control has no effect on the level shown on the meters or on the drive to the headphone control, a useful feature that is of value many times.

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The Dahlquist DQ-10. Time...and Time again.

Critics and audiophiles agree — the listening quality of the DQ-10 is unexcelled. What accounts for its superb performance?

Time

Much credit for its smooth coherence must be given to the precisely matched transient characteristics of the five drivers. And, a good deal has been written about the DQ-10 and its extraordinary solution to the problems of time delay or phase distortion. It is not surprising that other high quality speaker designers have followed suit in offering their versions of time delay correction.

...and Time Again

The real "secret" to the unprecedented performance of the DQ-10 lies in Jon Dahlquist's patented method for reducing *diffraction*, a more audible and destructive form of *time* distortion. The separate baffle plate on which each driver is mounted is dimensioned to minimize diffraction in the frequency band in which it operates. Thus, the effect of the sound we hear is that of a driver mounted in free space, without obstructions or surfaces to distort the original sound source.

It can be said that the DQ-10 eliminates inaccurate reproduction caused by time elements — inertial time delay, and diffraction time delay — distortions that limit the performance of conventional speaker systems.

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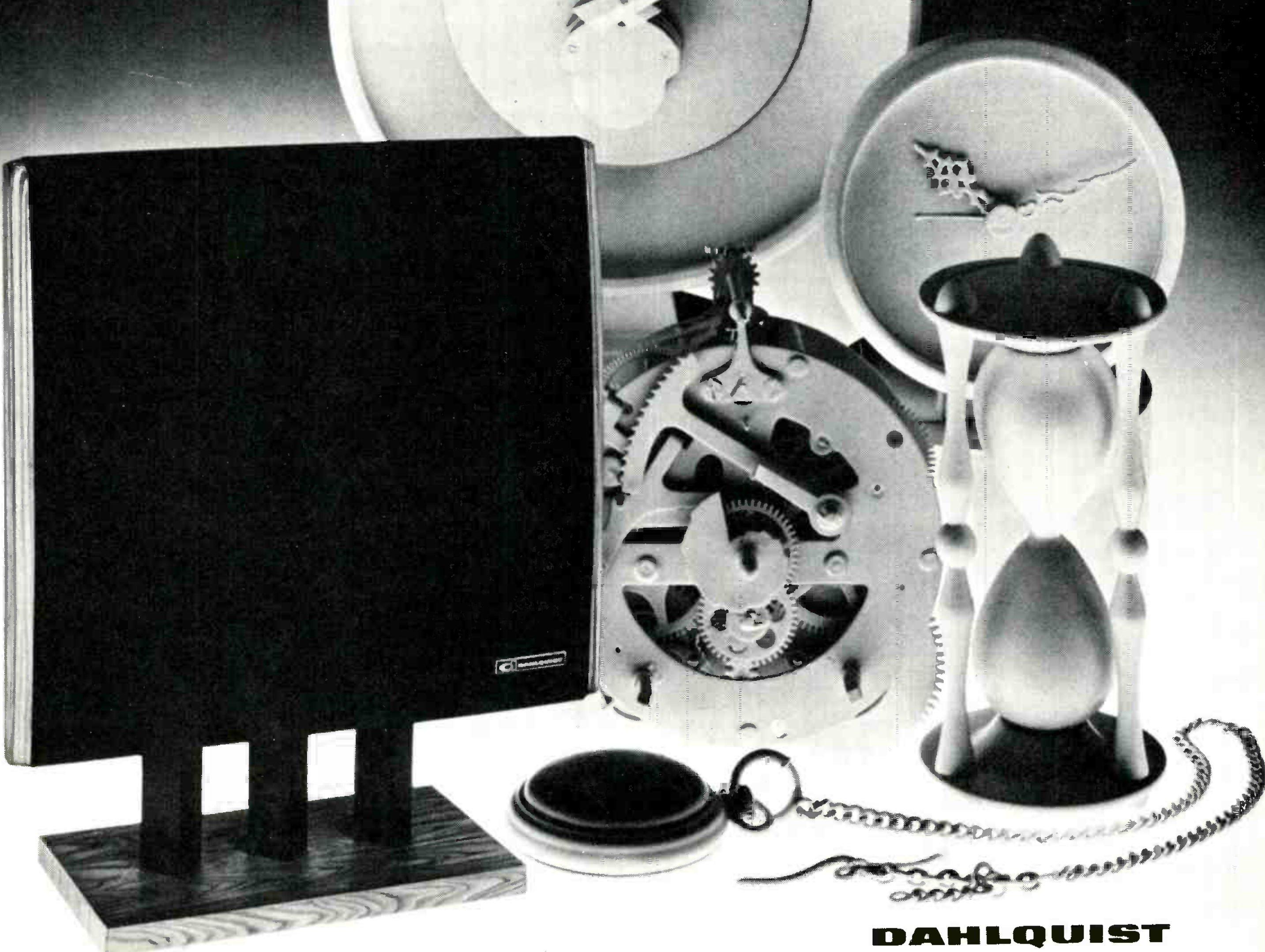

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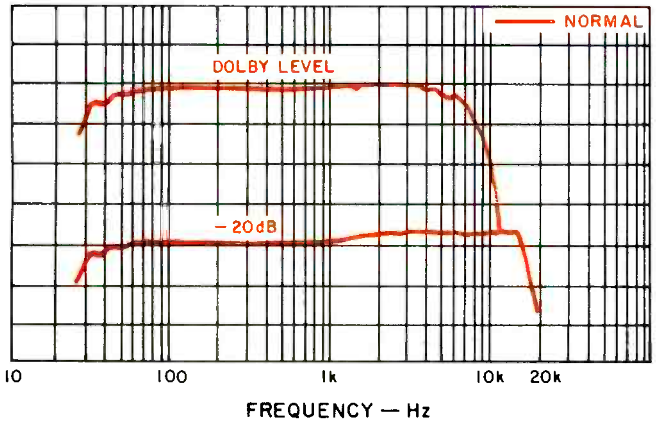


Fig. 1—Frequency response with Maxell LN tape in normal mode.

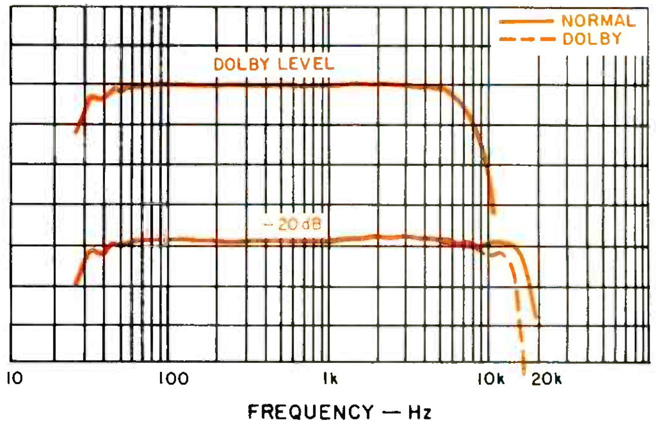


Fig. 2—Frequency response with BASF Studio tape in both normal and Dolby modes.

The back panel has the line-in and line-out phono jacks, a socket for the optional accessory remote control, and an unswitched a.c. outlet. Removal of the wood-grain end pieces permitted removal of the metal cover which has rows of slotted vents to prevent heat entrapment. The great majority of the circuitry is on two large PCBs, one of them for the logic. The soldering was excellent with very little flux residue. Parts identification was good, and there were helpful direction arrows for the adjustment pots. The power transformer is a hefty size, and the wire runs were neatly bundled. The two-motor drive appeared to be of rugged construction, with the FG servo-motor belt drive to the large-flywheel capstan of particular note.

Performance

The *Playback* response of the TC-K7II deck was within a couple dB over the entire range of both the 120- and 70-microsecond test tapes. Level indications on the meters were very close with these tapes and with a Dolby calibration tape. *Playback* speed was approximately 0.7 per cent fast. Using the pink-noise and 1/3-octave RTA combination, the *Record/Playback* response was checked with a number of tapes showing very good results: BASF Performance and Studio, Maxell LN and UD, Sony UHF, FeCr, and CrO_2, Nakamichi EXII, and Scotch Master II and Master III. Maxell LN showed a +2 dB plateau in the higher frequencies, dropping to −3 dB at 17 kHz (see Fig. 1). This data was obtained at a level 20 dB below that to obtain 200 nWb/m at 400 Hz in playback. With a *Record* level to match the Dolby reference (+2.5 dB on the meters), the headroom extended to 7.5 kHz. The response with BASF Studio (Fig. 2) had similar frequency limits, but had superior flatness over the entire range at both levels. There was some rolloff in the highest frequencies with Dolby, but the change was admirably small below 10 kHz. Sony FeCr tape (Fig. 3) obtained greater response at the highest frequencies, out to 20.7 kHz normal, 19.0 kHz with Dolby. The boost of 3 dB at 15 kHz seems just a bit much, but a slight increase in bias or a touch with a tone control could pull it down with substantially no effect on the response limit. The best headroom at the reference level was provided with Sony CrO_2 tape, out to 10.0 kHz (see Fig. 4). The response at the lower level reached 20.7 kHz. These *Record/Playback* responses evidence a flatness that is excellent by any standard. The multiplex filter notch was 3 dB down at 16.5 kHz and had its 32 dB notch at a measured 18.995 kHz, just 5 Hz from 19 kHz. The phase jitter in the playback of a recorded 10-kHz tone was 50 degrees, very good for a cassette deck.

Measurements of HDL_3 (relative level of the third harmonic) were made with a 1-kHz test signal with zero reference as before (see Fig. 5). With that reference, data was taken based upon changes in *Record* level. Some deviations from the expected straight-line functions were shown with

Fig. 3—Frequency response with Sony FeCr tape in both normal and Dolby modes.

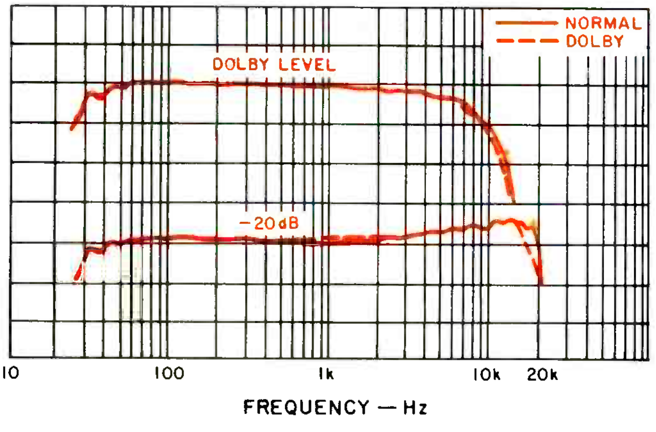
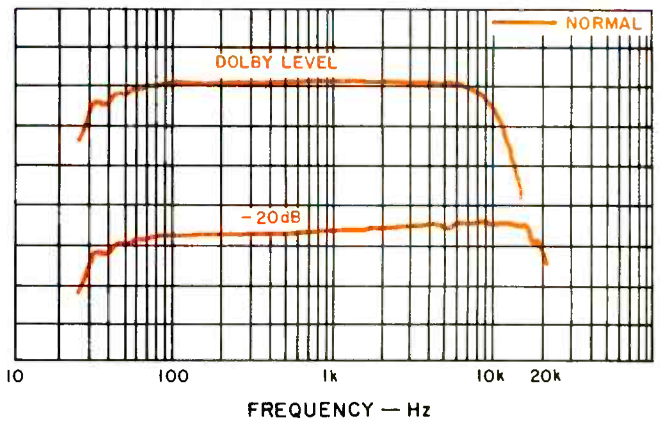


Fig. 4—Frequency response of the Sony CrO_2 tape in normal mode.



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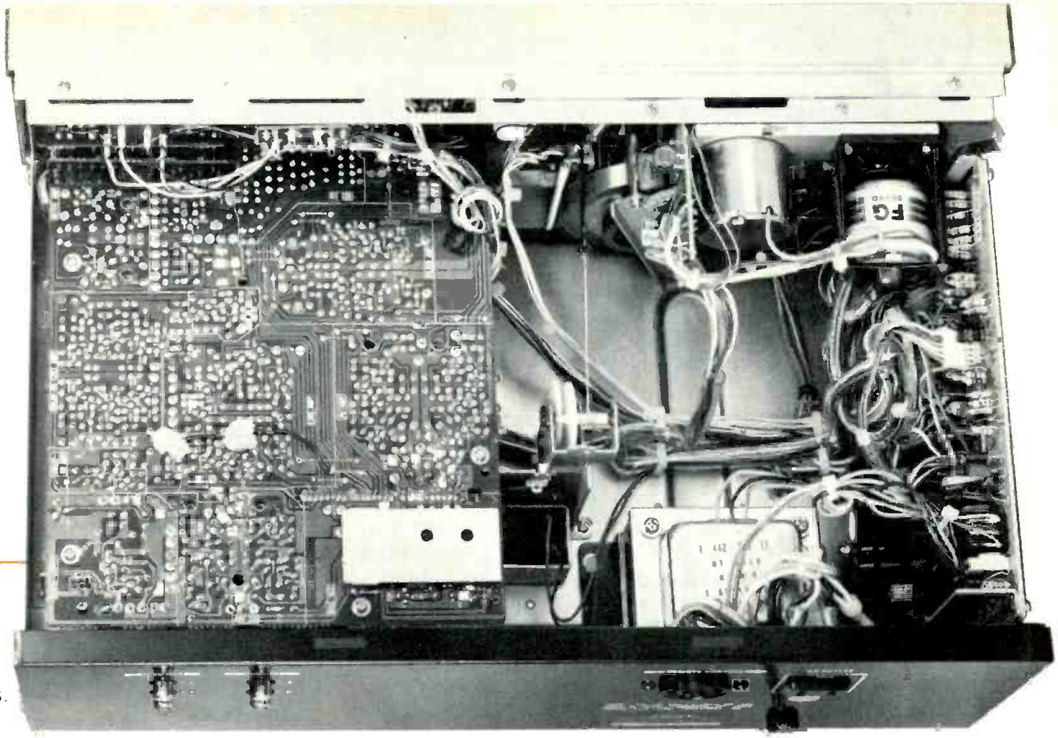


saturation effects at the highest levels and some contributions from distortion in the electronics at the lowest levels. The results for this deck with Sony FeCr were measurably better than with Maxell LN, and both had lower distortion than the CrO_2 tape. In general, HDL_5 was very low, always at least 20 dB lower than HDL_3. HDL_2 was more noticeable, but was never a significant contributor to the total distortion. Use of Dolby mode decreased the level of HDL_3 and HDL_5 at all levels and for all tapes. On the other hand, HDL_2 was increased, but its value was still typically less than 0.2 per cent. The plot of HDL_3 vs. frequency for Sony FeCr at 10 dB below reference level reached a peak of 0.6 per cent at about 5 kHz (Fig. 6). Below 100 Hz, HDL_3 was below the measurement-noise limit and was something less than 0.1 per cent at 30 Hz, excellent results. The distortion level in Dolby mode was always as low or lower than that shown in the figure.

Signal-to-noise tests were conducted using the same reference level, that was used for Dolby level in playback. In normal mode and IEC "A" weighting, the ratios were 51.0 dBA for Maxell LN and 53.2 dBA for Sony FeCr and Sony CrO_2. With Dolby, Maxell LN had a ratio of 58.8 dBA, and Sony FeCr and CrO_2 had 59.0 and 60.3, respectively. To determine the ratios for the 3 per cent HDL_3 point, the increase in the level in *Playback* relative to the reference level was measured. Because there is compression in the *Record/Playback* process at the highest levels, the true signal-to-noise ratio has to be related to the actual, relatively attenuated playback tone. With this criterion, Maxell LN had ratios of 51.8 dBA and 60.6 dBA with Dolby. Sony FeCr had

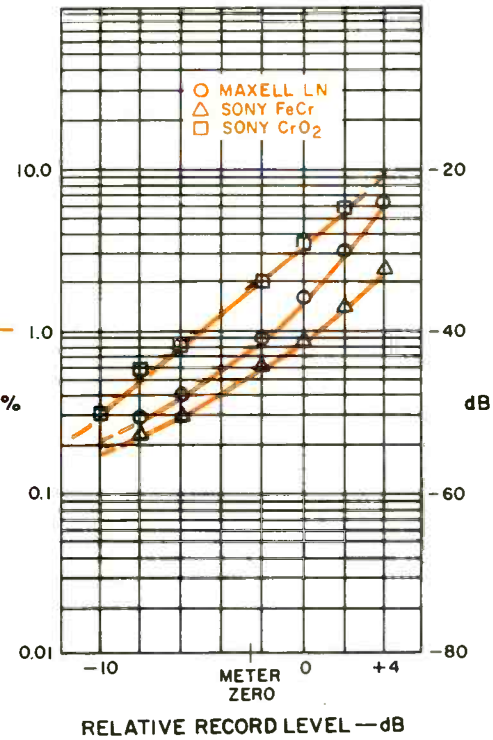
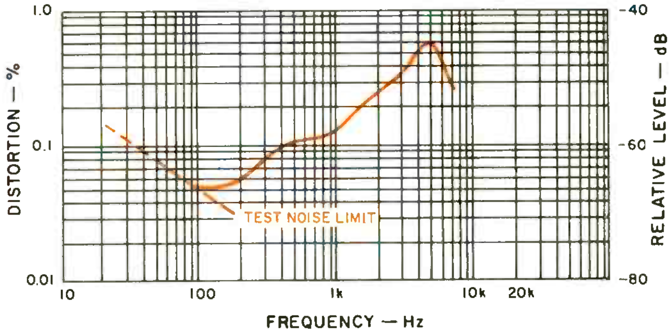
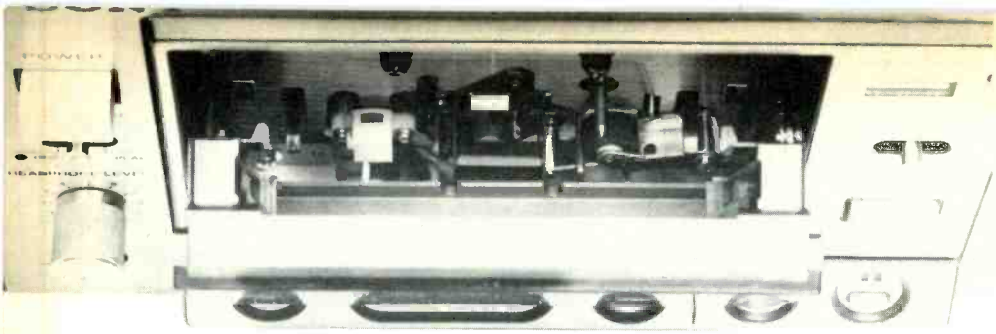


Fig. 5—Relative level of 1-kHz third harmonic distortion with Maxell LN, the Sony FeCr, and the Sony CrO_2 tapes. The 0 reference is Record level for Dolby level in playback.

Fig. 6—Third harmonic distortion vs. frequency @ 10 dB below the Dolby level with Sony FeCr tape.





ratios of 56.4 dBA, 64.0 dBA with Dolby; and Sony CrO_2 had 52.7 dBA, 59.8 dBA with Dolby. The ferrichrome tape provided the best performance in this respect and was also the winner with CCIR weighting. Erasure and crosstalk were both greater than 80 dB down, excellent results. Separation from one track to the other was 30 dB down, quite adequate but on the low side, relative to other measurements.

Mike input sensitivity was 0.13 mV, and that for line was 40 mV, both better than specified. Input clipping occurred at what would be +18 on the level meters. The pot sections tracked quite well, with the right one 0.5 dB low at −10 VU. The output levels for 0 VU in *Record* were close to 800 mV, while in *Playback* the average output was about 750 mV. The dynamic response of the meters showed that they truly deserved the VU label. The peak level response indicators were right on the nose with continuous wave (CW) signals, but required a dB or so more drive with a 10-mS burst. The meter scales were generally within a fraction of a dB. The limiter threshold was close to the Dolby level reference, with 1 dB of compression with a CW signal for a normal indication of +4.5 VU. The maximum indication was just above scale with severe overdriving. In a dynamic test, a 25-mS burst about 25 dB above threshold was reduced to +8 VU by the end of the burst. The first part was clipped/limited to about +12 VU. Signal levels lower than this very severe test would be reduced further.

The tape playback speed varied a total of 0.1 per cent at most with line power anywhere from 100 to 130 V. A 3000-Hz test signal was recorded at the beginning, middle, and end of a cassette, and plots were made of tape speed and wow and flutter. There was very little variation in tape speed at any of the three positions. With flutter, however, the results at the ends of the cassette were obviously poorer than in the middle. A second cassette was used (see Fig. 7), and a longer plot was made of flutter at the beginning of that cassette (top trace in the figure). The improvement in the results was indicative of problems associated with the first cassette used. The deck, therefore, appears capable of meeting its rather tight 0.045 per cent W rms specification the great majority of times with good quality cassettes. Fast forward and rewind times for a C-60 cassette were 73 seconds. Logic response time from *Fast Wind* to *Playback* was less than a second.

Listening and Use Tests

Cassette loading and unloading was very easy. Removal of the plastic door was easy and straightforward, making cleaning and demagnetization very convenient. The light-touch tape motion switches were really a joy to use with the logic control a definite benefit. No goofs were detected in trying to find a weakness in the system. The timer switching and record mute button worked as specified. The headphone level control, the memory play function, flying-start recording, and meter indications unaffected by the output pot were continually useful. The nice, open faces of the meters aided in their use, as did the peak indicators. The instruction book was very good with excellent text and illustrations. The discussion of various aspects of the deck flows very well, and there are good ties to the diagrams for specific tasks. There is a short list of recommended tapes, but no schematic.

The playback of various sources was most satisfactory and switching back and forth between Dolby and normal modes did not introduce any detectable shifts in response, even of a subtle nature. The limiter was used with music recording at a purposely high level, switching it in and out. In playback, the improvement it gained was obvious. The limiter would be especially useful for unattended recording, such as with timer start. All *Record, Pause,* and *Stop* clicks were of very low level, well into tape noise. The Sony TC-K711 offers very good performance, excellent in some areas, coupled with the flexibility of many useful features.

Howard A. Roberson

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Fig. 7—Measurements of tape speed and wow & flutter with a 3-kHz test signal at the beginning, middle, and end of a cassette.

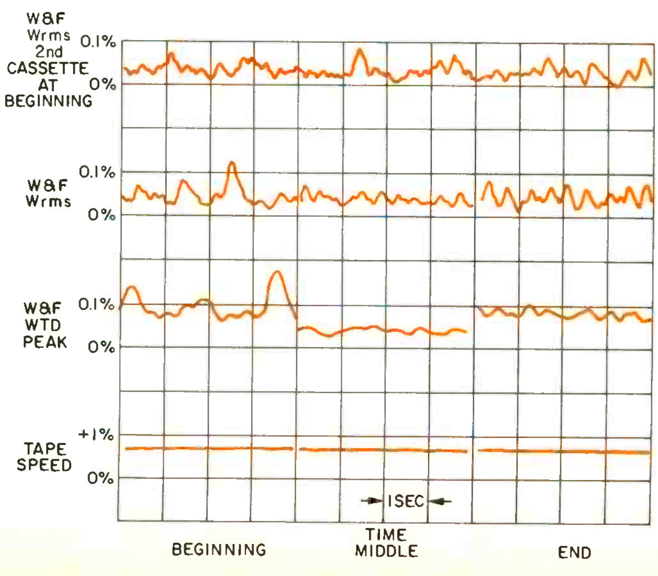
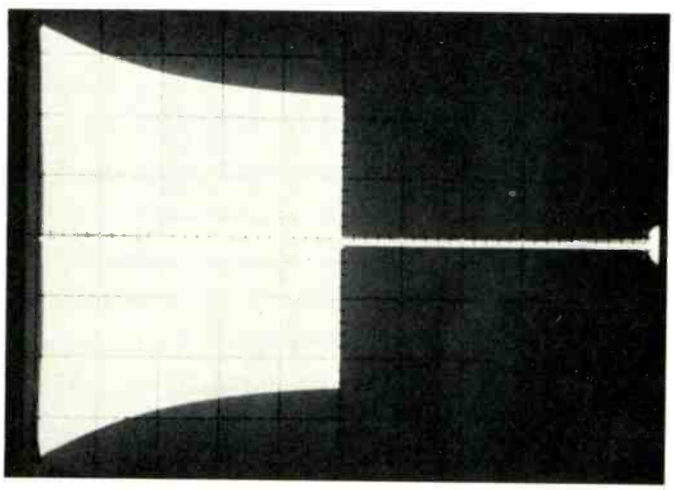
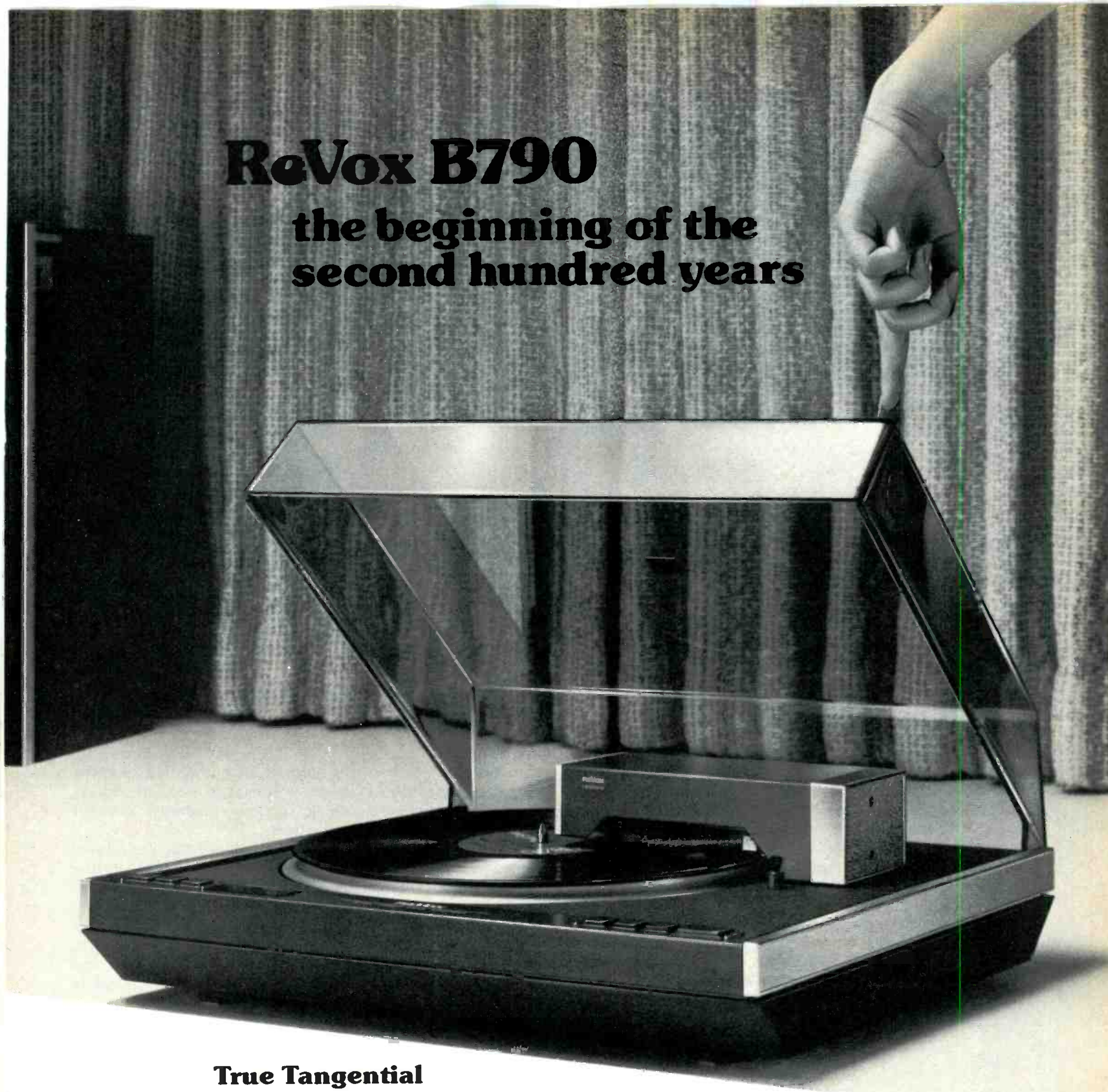


Fig. 8—Limiter action of the Sony TC-K711 cassette deck. (Each division equals 5 mS.)





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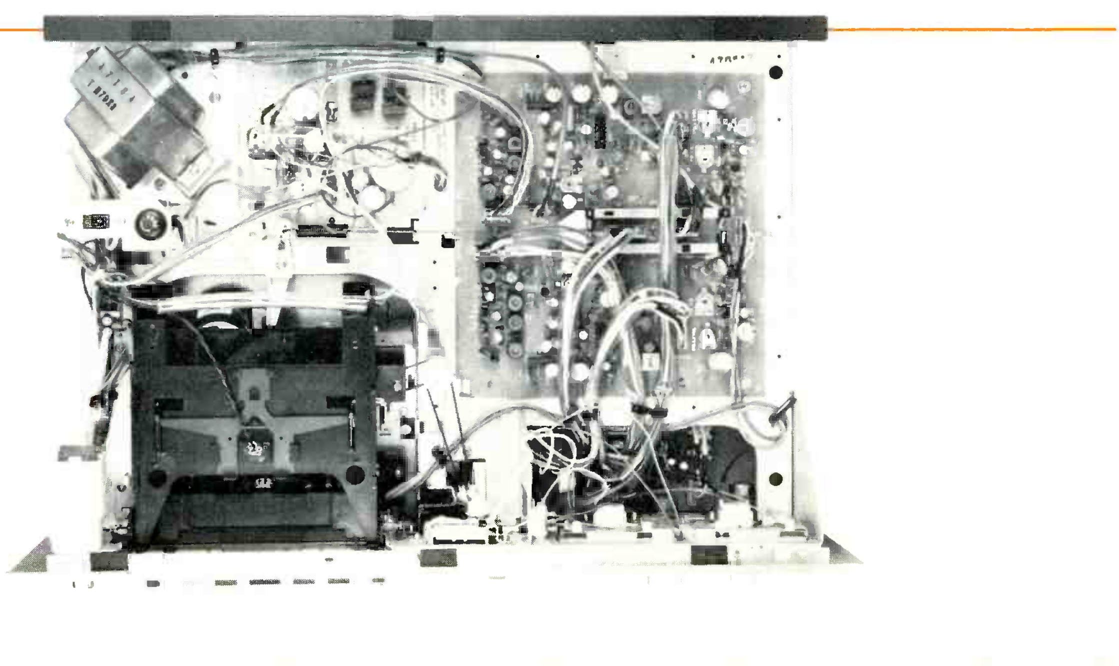
Scott Model CD-87R Stereo Cassette Deck

MANUFACTURER'S SPECIFICATIONS
Frequency Response: 30 Hz to 14 kHz, 30 Hz to 17 kHz with FeCr and CrO_2 tapes.
Harmonic Distortion: 1.5 per cent.
S/N Ratio: 56 dB.
Input Sensitivity: Mike, 0.5 mV, Line 50 mV.
Output Level: Line, 400 mV, Headphone, 1 mW @ 8 ohms.
Wow & Flutter: 0.065 per cent W rms.
Dimensions: 18 ⅜ in. (46.6 cm) W x 13¼ in. (33.5 cm) D x 5¼ in. (13.2 cm) H.
Weight: 18.3 lbs. (8.3 kg).
Price: $349.95.

The Scott CD-87R cassette deck has very good basic performance as well as some features not normally available. As a starter, the unit designated CD-87 is mountable in standard racks. (Don't get confused by the fact that the CD-87*R* is the *non-rack* unit.) Below the counter and its reset and the memory switch is the tape-running indicator which this reviewer found very helpful. Immediately to the right is the *Record* status light. The two level meters are brightly illuminated, but the scales seemed a bit small by current practice. A peak indicator with a +3 threshold is between the meters. In a row below are the two mike phone jacks, a mike-DIN/line switch, a three-position Dolby NR switch to permit having the multiplex filter in or out, separate bias and EQ switches with positions for normal, FeCr, and CrO_2, and the output and record level controls. The latter is a dual-concentric pot with friction clutching. The knob diameters are a bit on the small side for easy adjustment.

The cassette loading scheme is unique and does seem somewhat magical in operation. Placing a tape in the elevated carrier within the door opening and giving it the slightest push, or closing the clear-plastic door, causes the cassette to zip into position. *Eject* swings the carrier back up snappily, but retains the cassette in the load/unload position. The first judgment was that the action was too vigorous, but throughout the testing the cassettes were always properly seated for play and retained in the carrier on ejection. Ac-



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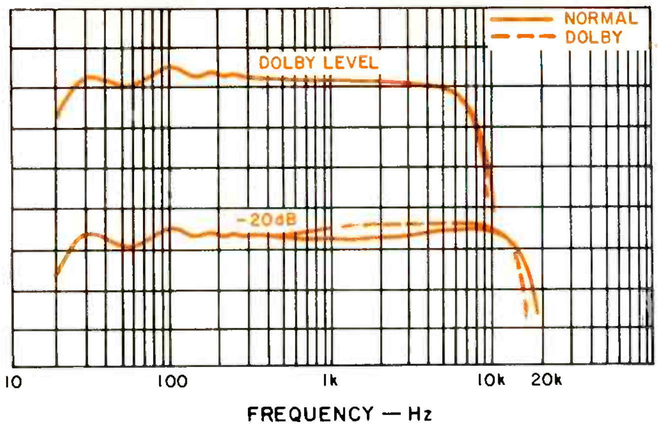


Fig. 1—Frequency response with Scotch Master I tape in normal and Dolby modes.

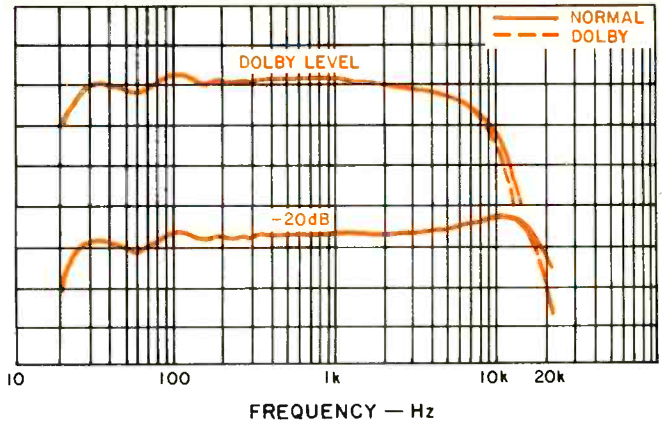


Fig. 2—Frequency response with the Sony FeCr tape in normal and Dolby modes.

cessibility to the heads and capstan drive was adequate with the carrier in the play position and the plastic head cover flipped-up. The lever-action tape motion controls required a firm push, but latched reliably each time. The phone jack is just to the left, with the power switch above.

The line in and out phono jacks are on the back panel, as well as a DIN in/out jack. The flow soldering on the major PCB was excellent, and the hand soldering in other areas was good. Parts identification was good and the adjustments were well labeled. There were three internal fuses, not mentioned in the instruction book.

Performance

The play response of the Scott deck was very good in the middle and high frequencies, but was up to 4 dB down at the lowest frequencies, consistently for three different alignment tapes. Playback of standard reference levels were within 0.5-dB meter indication with the output pot at maximum. BASF Studio, Maxell UDXLI and UDXLII, Scotch Master I, Master II, and Master III, Sony FeCr, and TDK SA all showed good record/playback responses in the pink-noise/RTA checks. Head contour effects were apparent up to about 200 Hz in the swept-sinewave record/playback responses. Scotch Master I had a gently falling response at Dolby level (+3 meter), but headroom still extended to 7.3 kHz (see Fig. 1). With the level 20 dB lower, the upper limit was 16.5 kHz. The response with Dolby was very close at the higher level, but there was a gentle (+1.5 dB) elevation around 2 kHz, and the high end rolled off at 14.5 kHz. The headroom with Sony FeCr was 6.8 kHz, slightly less than that with Dolby (Fig. 2). The response 20 dB lower extended to 20 kHz with a slight peak at 12 kHz. These excellent results were substantially matched in Dolby mode, with minor discrepancies at the very highest frequencies. The responses for TDK SA were close to those for the Scotch tape (Fig. 3). The multiplex filter was 3 dB down at 16.6 kHz, and the 33-dB notch was at 19.040 kHz. The phase jitter in the playback of a recorded 10-kHz tone was 50 degrees, good for a casette deck. (The jitter does vary from one cassette to another.)

The CD-87R deck had a low level of distortion products compared to other recorders in its price range, particularly with the CrO_2-type tape, TDK SA. With a 1-kHz test tone, HDL_3 was 1.3 per cent or less at Dolby level for the three tapes tested. At 8 dB lower record level, HDL_3 for TDK SA was approaching 0.1 per cent (Fig. 4). HDL_2 (2nd harmonic distortion level) and HDL_5 (5th) were admirably low with few exceptions. Use of Dolby obtained a reduction in the levels of all distortion products, in contrast with some decks where there is an increase in HDL_2. The plot of HDL_3 vs. frequency for the TDK tape at 10 dB below Dolby level (−7 meter) shows very low distortion except for the lowest frequencies (Fig. 5). The signal-to-noise ratios were excellent for all tapes. With IEC "A" weighting, the figures were 50.3, 55.4, and 55.2 dBA for Scotch Master I, Sony FeCr, and TDK SA, respectively. With a HDL_3 = 3 per cent reference, the results were 57.7, 59.2, and 57.9 dBA. With Dolby, the values were 59.8, 63.2, and 60.2 dBA for the Scotch, Sony, and TDK tapes. With the 3

Fig. 3—Frequency response with TDK SA CrO_2 tape in normal and Dolby modes.

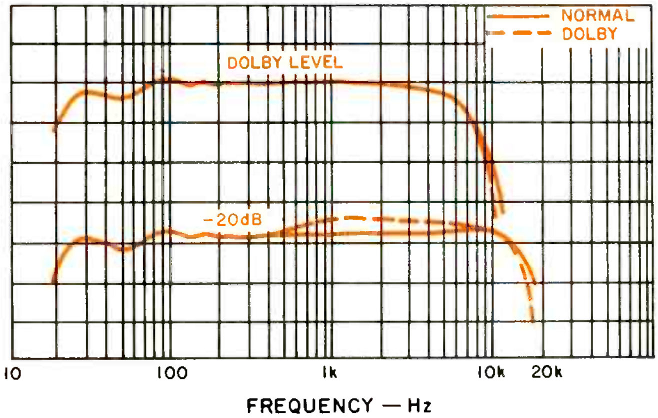
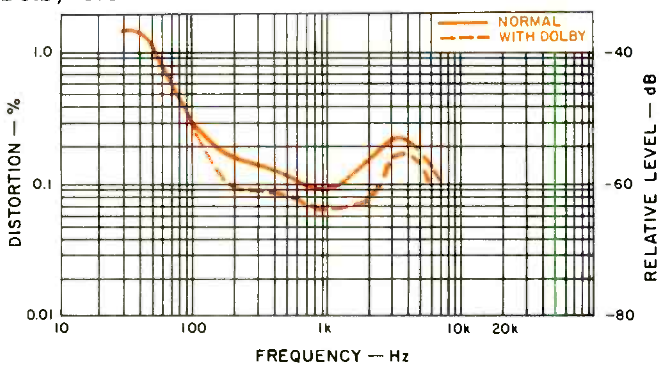


Fig. 4—Third harmonic distortion vs. frequency with TDK SA tape in the normal and Dolby modes at 10 dB below Dolby level.



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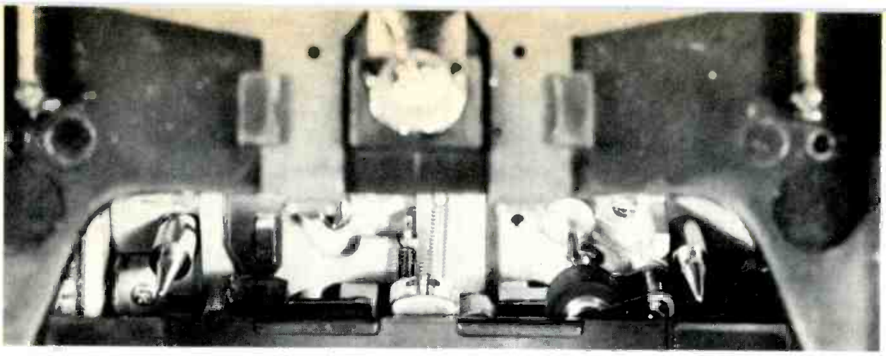

per cent HDL_3 reference, the figures were 67.8, 67.4, and 63.8 dBA, excellent performance. CCIR weighted figures were 8 dB lower for normal mode, about 5 dB lower with Dolby. Erasure and crosstalk were both at least 80 dB down. Separation from one track to the other was an excellent 50 dB, much better than the typical cassette deck.

Mike input sensitivity was 0.3 mV and that for line was 24 mV, both better than the specifications. Clipping of the input signal appeared at a level equivalent to +16 on the meters. The sections of the input level pot tracked very closely. The friction coupling was slightly tight, somewhat aggravated by the small knob diameter. The output pot also had excellent tracking, and the output at its maximum position was equal to the specified 400 mV with a zero meter indication. The output at the headphone jack was less than the specified 1 mW with an 8-ohm load, but it drove most phones satisfactorily. There is no designation on the face of the meters, but the dynamic response was in accordance with VU meter standards. The scales are not as detailed as some, but they matched set-in attenuation exactly. The "+3" peak indicator threshold was at +5 with a CW signal and at +6 with a 10-mS tone burst. The playback of a standard tape was 0.7 per cent fast with 120 V power. With a reduction to 100 V, the play speed was 0.17 per cent higher; at 130 V, the speed was 0.3 per cent lower. The wow and flutter and speed stability were checked at the beginning, middle, and end of a cassette (Fig. 6). The typical flutter of 0.05 per cent W rms is certainly very good, and within the specified 0.065 per cent but there were a number of peak values close to 0.1 per cent W rms. On an IEEE weighted peak basis, the typical value was 0.07 per cent. The wind times were just over 80 seconds for C-60 cassettes.

Listening and Use Tests

Loading and unloading cassettes was very easy, in general, though a little care was needed. Accidentally pushing a tape slightly when unloading could result in its being loaded again. Pushing the tray in without a cassette required shifting up the two guide rollers at each side of the tray, a somewhat fussy task not mentioned in the instruction book. The cleaning and demagnetization were accomplished with care; it would have helped if there had been additional clearance for the Q-tips and the demagnetizer. The tape motion controls worked reliably through all of the testing, including the concerted effort to make something go wrong. The tape-running indicator was useful, particularly when it was desirable to check what was going on from some distance away.

The text of the instruction book was quite adequate, with the exception of the failure to mention the need to lift the roller guides to push the tray in without a cassette. The illustrations were good, although I would have liked to see more information provided on setting record levels. The playback of recorded music left little to be desired. With Sony FeCr, there was a slight increase in ticks from one record. With TDK SA, there was a very slight increase in presence with Dolby, but this change was very subtle. With these tapes, and the Scotch Master I, there was nothing detrimental detected. The Scott CD-87R does not offer all the features found in some of the other decks in its price range, but this cassette deck does deliver very good record/playback response, low distortion, accurate VU meters, excellent signal-to-noise ratio, and its snappy load/unload scheme. And if rack mounting appeals to you, there's the Scott CD-87, complete with front-panel handles. *Howard A. Roberson*

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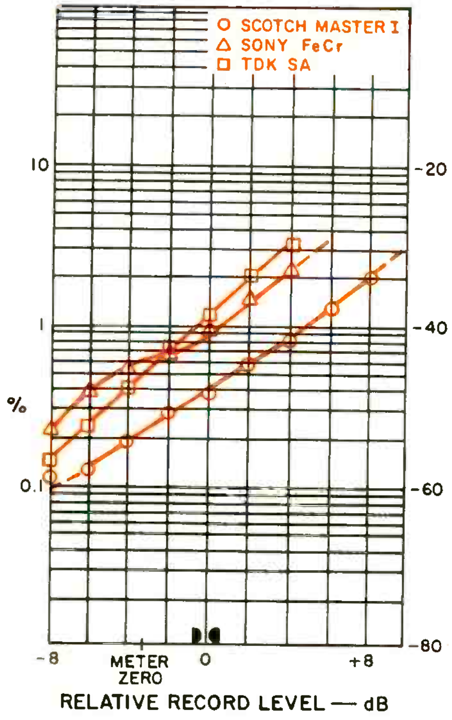
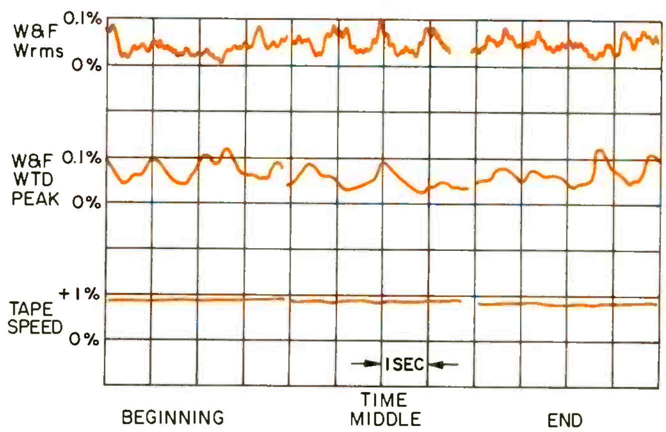


Fig. 5—Third harmonic distortion vs. level @ 1 kHz with Scotch Master I, Sony FeCr, and TDK SA CrO_2 tapes.

Fig. 6—Tape speed variation and wow & flutter measured at the beginning, middle, and end of a cassette.



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The column

This Year's Model: Elvis Costello
Columbia JC 35331, stereo, $7.98.

For the past few weeks I have to admit that I've been listening to the radio a lot more than anything else, keeping my ears perked for something more interesting than the records I've been sent from the record corporations. Most of the LPs that come out these days sound like they were recorded in either an executive cubbyhole or a conference room, rather than the bathroom, living room, or bedroom that spawns creativity. Anyhow, I got **This Year's Model** in the mails and I can predict that the radio will not be in use quite so often for the next few weeks, at the very least. Elvis' second big record is every bit as eccentric as the first, slightly more worldly lyricwise, and promises to grow on yours truly in the times to come.

First, this features the Elvis Band which has been touring extensively since the release of the last album and, thus, the role of producer Nick Lowe is slightly less arrangement-oriented and more reliant upon getting the most out of the least. The album is recorded primarily live with very few overdubs, and is particularly heavy on the bass and drums, utilizing keyboards (mainly Farfisa organ) for melodic lines and Elvis' tremeloed rhythm guitar to punctuate the beat with the chords. Some may see the album as underproduced but for my money it is *very* produced . . . but enough for the sound, let's get to the songs.

The hits are *No Action*, *This Year's Girl* (the latter containing a beautiful combination steal from The Stones *Stupid Girl* and the Beatles *You Won't See Me* in the bridge), the punkesque *You Belong To Me* a delightful but cryptic song called *Hand In Hand*, the acoustic guitar-driven *Lip Service*, a song that sounds so much like The Band it's scary called *Living In Paradise*, a creepy/speedy Music Machine descendant called *Liptick Vogue* formerly entitled *Not Just Another Mouth*, and an indictment of the American waves called *Radio Radio*. Which leaves only three tunes on the whole album which aren't full-fledged winners and even *they're* better than most of the stuff around now.

His attitude is similar to most of the New Wavers—change the world by getting rid of all the old boring institutions and people—but with a musical style which to date has been far more commercially successful, the former Declan Patrick McManus has already reached more people than the Sex Pistols, the Talking Heads, and the Damned have collectively. **This Year's Model** should bring him even closer to all the feeding hands he wishes to bite, and for good reason. *J.T.*

Sound: B+ Performance: A

Kill City: Iggy Pop & James Williamson
Import/Bomp IMR 1018, stereo, $7.98.

Everytime I hear Iggy I can envision the first time I came face to face with the boy, eating scrambled eggs with his hands in the St. Moritz Hotel on New Year's Day, 1974. The night before I observed him onstage diving into the audience, making barely discernible throat noises and turning New York's Academy of Music into a scene that made CBGBs look like a Yale classroom by comparison. But that January 1 morning he was a tamed man-eater; I was later a witness to the other side of the schizophrenic.

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That was his last moment of glory before his second decline . . . he would later come back to New York only to play the suburban dives. Upon returning to Los Angeles he would become heavily drug-dependent, fire managers, and musicians; and eventually hook up with then-journalist Ben Edmonds who supervised the making of **Kill City.** It was a low period for the Ig, for without his longtime fellow stooge Ron Asheton the only close musical companion he had was James Williamson, whose Stones-fixation was just one of the many curses upon Iggy Pop. **Kill City** is a bizarre combination of Iggy's raw power strewn on top of Williamson's Keith Richardisms, Stooges pianist Scotty Thurston trying to add a little musicality, and Soupy's sons Tony and Hunt Sales trying to be the rhythm section on what sounds like a bunch of songs they'd never heard before. It's a mess.

First off, Williamson mixed the album and obviously doesn't know much about the process, as it sounds like nothing really fits together and the drums are barely audible. All the rock tunes rely upon the opening riff from *Saturday Night's Alright For Fighting* (possibly as these tapes were recorded as a demo for Elton's Rocket Records) or any given Stones tune, and the whole album has a flavor not unlike **Exile On Main Street.** I wish that the voice of Ig had been given more prominence in the mix because most of the time it's very difficult to make out anything at all that he's singing, and it's hard to tell which tune is playing as there's not a lyrical clue to be found. Perhaps this wasn't Iggy's finest moment, but let us not forget whose album this really is.

Unfortunately, Williamson did have an amnesia attack as far as that's concerned. Not content to merely take the money for this project (after serving some time working for Chicken Delight, he remixed the tapes and sold them to Bomp) he gave himself equal billing, as if there's a significant James Williamson following to buy **Kill City** on faith alone. If James wishes to be a star, let him do something new and make it on the merits of his music, but riding on the coat tails of past accidents is not exactly fair play. **Kill City** is OK but not astounding, a piece of history representing only a few weeks in the life of someone who would most likely rather see it all forgotten. Then again, Iggy's got a pretty good memory—last time I ran into him he asked me, "Hey—still eating scrambled eggs with a knife and fork?" *J.T.*

Sound: D+ Performance: B−

Cats Under the Stars: The Jerry Garcia Band
Arista AB 4160, stereo, $7.98.

Against all my expectations **Cats Under the Stars** is one of the better albums Jerry Garcia has been associated with. Its best shot comes first with *Ruben and Cherise* which retells the Orpheus legend in modern terms. It sports a vibrant mariachi synthesizer part and an infectious tricky melody reminiscent of the Grateful Dead's *Scarlet Begonias.* Next, *Love in the Afternoon* is a dreamy, lazy, loping song that works handsomely. From there it is hit or miss. Some work, *Gomorrah, Rhapsody in Red;* some don't, Donna Godchaux's *Rain* and the two short filler numbers.

The Dead's famous Bob and Betty engineering team turns in a deft job. **Cats** is Garcia's brightest sounding record. When Maria Muldaur harmonies are added, it takes on a rich luster.

Cats Under the Stars has held up over time much, much better than I anticipated. With a supply of good songs that outpoint the weaker moments, the album is a winner by decision. *M.T.*

Sound: B+ Performance: B

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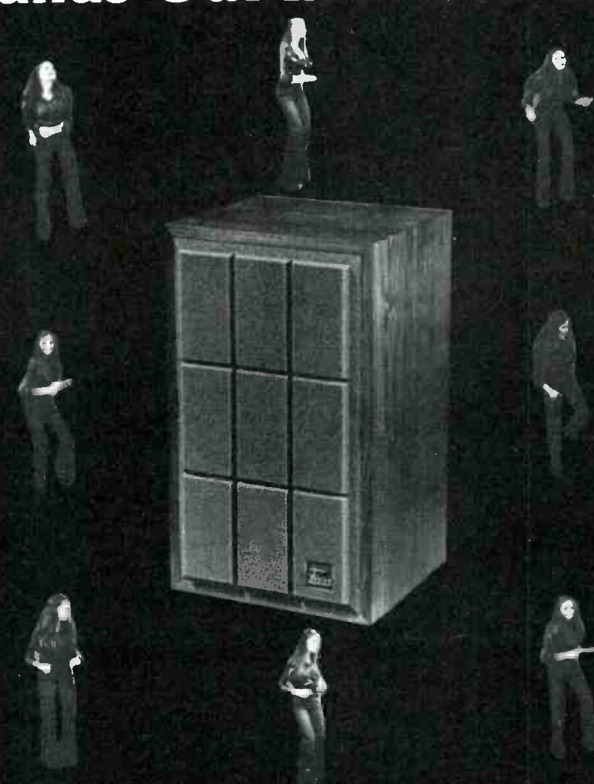

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The Last Waltz: The Band
Warner Brothers 3WS 3146, stereo, $14.98.

The Last Waltz is what The Band called its final concert appearance on Thanksgiving 1976, at Winterland in San Francisco. Martin Scorsese filmed it and the film is glorious, the best rock concert footage ever. His crack camera crew caught an amazing amount of the on-stage interplay.

For the night, The Band gathered together lots of people they've worked with or simply admire, and each guest got a spot in the movie and record with The Band backing everyone. The music is exuberant and exciting, with great performances almost commonplace. Some of the highlights are their first boss Ronnie Hawkins' for *Who Do You Love,* Paul Butterfield and Levon Helm sharing *Mystery Train,* and Muddy Waters at his most playful on *Mannish Boy.* Then there's Joni Mitchell's off-stage human saxaphone part in Neil Young's *Helpless.* The two most scorching guest shots are the inevitable Bob Dylan set (Dylan always unleashes something extra in The Band) and Van Morrison's. Unfortunately, in the movie both are truncated. Only the second half of Dylan is in the film. Also cut was a super Ray Charles-style, gospel-tinged arrangement of *Too-Ra- Loo-Ra-Loo-Ral (That's an Irish Lullaby)* sung as a duet with Richard Manuel.

The Band's performances of their own material sprinkled throughout are uncommonly emotional for stuff they've done and done and done forever. *Stagefright* is magical, the best song Rick Danko has ever had to wrap a vocal around. However, he gives that one a run with his impassioned job on *It Makes No Difference* which, with a new Howard Johnson horn arrangement, is far superior to the original studio version. And Levon Helm sings his butt off on *The Night They Drove Old Dixie Down.* Only one of the film's songs, *Baby, Don't Do It,* their encore placed at the start of the film, is not included in the record.

Spread throughout the film is some incidental, studio-recorded music and some numbers filmed in live performance on the MGM Studio's soundstage. All this, plus a couple of new Band songs, are gathered on side six of the three-record set under the um-

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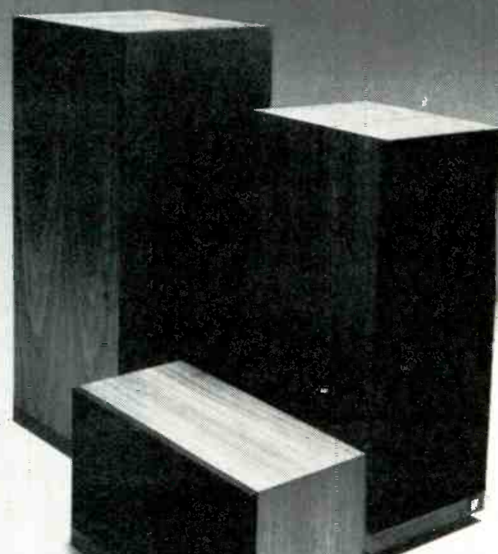

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brella title of *The Last Waltz Suite*. Some notes here: *The Weight*, newly recorded, features the voices of Mavis and Pop Staples and the Staples Singers in a version that is spirited in the film and paradoxically a bit flat on record. On *Evangeline* Emmylou Harris is added in the type of country narrative ballad she does best. Finally the movie's theme music played over the credits sounds suspiciously like *The Third Man Theme* rewritten into 3/4 time. The Band has previously recorded *The Third Man Theme* on their oldies album, the excellent **Moondog Matinee.**

Both as record and film, **The Last Waltz** is a tremendously attractive package. Its recorded sound, better than average for a live record and a breakthrough for movie sound, sets a new standard for rock cinema. The studio work is equally well done.

I must cop to having been emotionally bound up in the music of The Band for a long, long time, nearly as long as I care to easily remember anymore. The end of The Band's road life is a landmark, if not a real event, and one that probably means most to those involved. (Incidentally, there is the inference that The Band will make further studio records though they will not tour. Then again, how many retired artists keep coming back for one more tour? Anything can happen.)

Most important is the emotion bound up in this set of performances, particularly Robbie Robertson's—his guitar work has never been stronger and in the film he is a captivating presence. For one who takes no on-stage lead vocals, he is on screen inordinately much, but then again, he is the producer of both record and film.

The record is excellent, but don't miss the movie. *M.T.*

Sound: A— Performance: A

20 Golden Greats: Buddy Holly/The Crickets
MCA 3040, $7.98.

Over the years Buddy Holly's recorded legacy has been treated really shabbily in America. Virtually all of his albums have dropped out of print here, forcing you to search for imports (usually from England or Germany) if you want to hear him at all. Most recently, only a 24-song, double-pocket reissue has been available here. Of these 24 pieces, 14 appear on **20 Golden Greats.**

I doubt that even this collection would have been released here had it not gone to No. 2 on the English charts for a two-month spell in early '78. The imminent release of a film about Buddy also must have had some effect.

In any case, the collection is exemplary as far as the selection goes. It is likely that any favorite you might have of Holly's music is here. But there is no annotation, no credits, not even any mention of what is mono, stereo, or rechannelled stereo (as most Holly albums have been). Listening indicates that the album may well be mono after all, but I can't be completely sure as the sound really isn't that hot.

Buddy Holly is probably the most loved of the great stars of the '50s. Elvis was the King to be sure, but Holly was something else again. He wrote and sang, played very advanced guitar for his time, and got involved with the arrangements and the production. In short, though he knew it not, Holly was the model for the self-contained stars of today. He was super.

20 Golden Greats may not be perfect, but it is easily the best Buddy Holly collection available in America in years. What counts most is its generous amount of music. *M.T.*

Sound: D Performance: A

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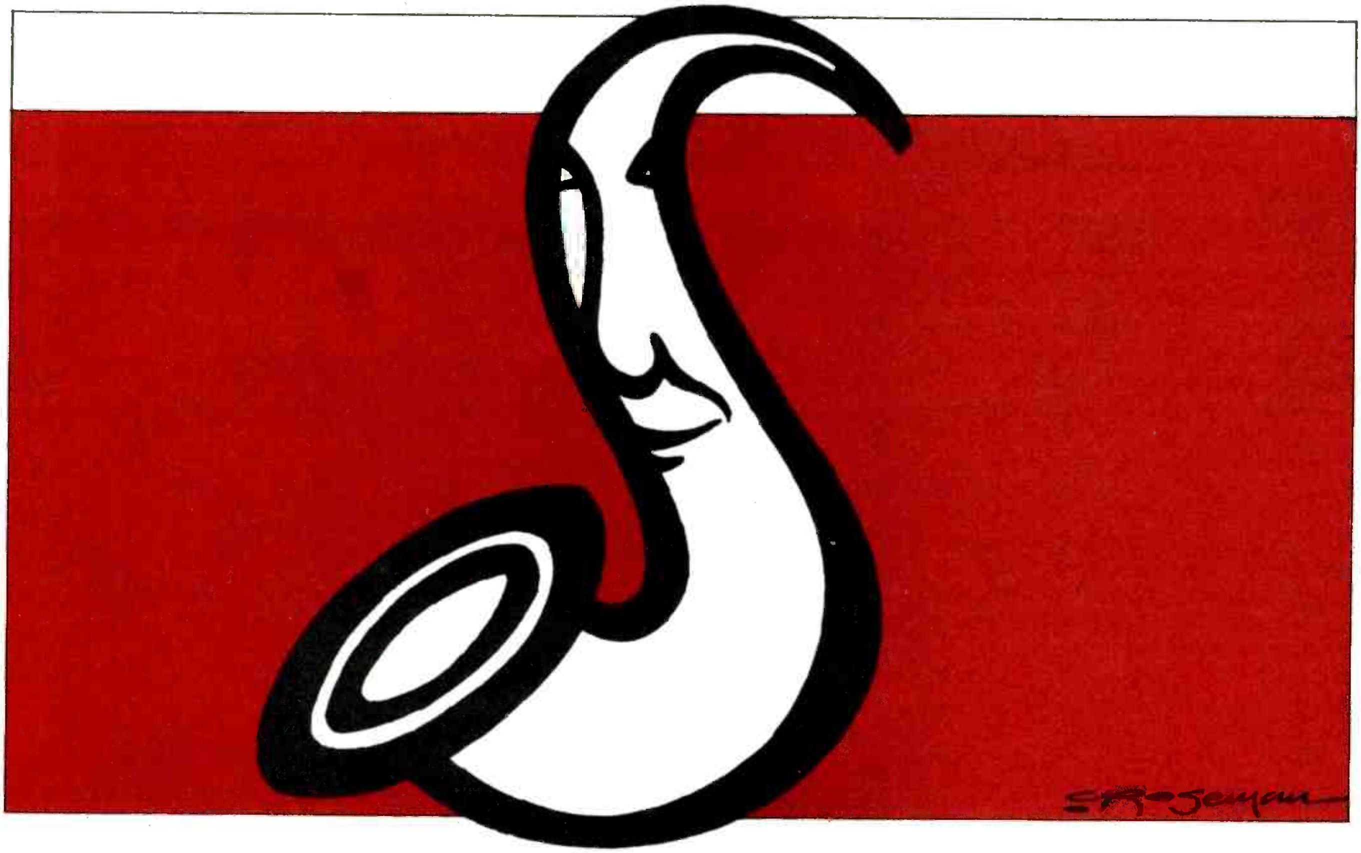
Jazz & blues



The Complete Charlie Barnet; Vol. 1, 1935-37
RCA Bluebird AXM2 5226, mono, $7.98.
Charlie Barnet, Vol. 1
Ajax 104, mono, $5.98.
Charlie Barnet, Vol. 2
Ajax 106, mono, $5.98.
Charlie Barnet & His Orchestra; 1938
Alamac QSR 2435, mono, $2.98.
The Best of Charlie Barnet
MCA 2-4069, mono, $7.98.
Radio Discs of Charlie Barnet
Joyce 2012, mono, $5.98.
Film Tracks of Charlie Barnet
Joyce 3001, mono, $5.98.
Charlie Barnet & His Orchestra
Aircheck 5, mono, $5.98.
Charlie Barnet & His Orchestra; 1945-47
First Heard 1974, mono, $6.98.
One Night Stand Battle of the Bands; Charlie Barnet vs. Woody Herman
Joyce 1012, mono, $5.98.
Charlie Barnet & His Orchestra; 1949
Alamac QSR 2446, mono, $2.98.

Charlie Barnet, handsome as a matinee idol, scion of wealth (American Sugar Refining Company and the New York Central Railroad), was expensively educated and groomed for a career as a corporation lawyer, but a passion for music and particularly jazz consumed him, and, at 16, he turned to the saxophone and eventually developed into one of the band era's foremost reed players.

Barnet led many big bands from 1933 until the late 40s, and the above collection of recordings, most of them available with a little searching in collectors shops, provide an accurate documentation of his lengthy and often remarkable career. By his late teens, Barnet, bankrolled by an indulgent family, was leading pickup bands aboard cruise ships to South America. Later he returned to school to please his mother, doubling at night as a sideman with various night club orchestras. In 1933, he got his first steady job as a bandleader at the Paramount Hotel (partially owned by an uncle) on West 46 Street in New York City, and made his first recordings under his own name for the American Recording Company group of labels—Melotone, Perfect, and Oriole.

Barnet's 1933 band was formed on a shoestring (the family coffers were not bottomless); for $20.00 he bought a library of Jan Garber's businessman bounce arrangements (Garber, "The Idol of the Airwaves," used saccharine, Lombardo-like voicings, but without Guy's klutzy rhythm). Barnet also obtained a few jazz charts by Horace Henderson and Benny Carter. That the Barnet band was slow to develop an original style is evident on the Ajax **Charlie Barnet, Vol. 1** release, consisting of early Melotone and Perfect recordings and on his early Bluebirds. The Ajax Vol. 1 collection focuses on the 1933 Barnet band playing Mickey Mouse Garber arrangements (with Harry Von Zell, who was also announcing the band's CBS broadcasts on vocals!). Only Barnet's highly volatile, jump-phrasing tenor sax adds an explosive jazz touch.

In 1934, Barnet followed Ozzie Nelson into an excellent booking at New York's Park Central Hotel; at the end of the year he had signed with Bluebird. He was still using the Garber charts and still floundering in search of

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a musical identify, but he was buying more arrangements from black jazz musicians he admired such as Benny Carter and Horace and Fletcher Henderson. Some of the hot jazz influence can be heard on early Bluebird sides like the Jan. 21, 1935, recordings of *Nagasaki, Growlin',* and *On a Holiday.* These were cut in New Orleans with a band that included trumpeter Chris Griffin, trumpeter-arranger Eddie Sauter, and vibist Red Norvo. In New Orleans the band, after struggling through the South, snared a splendid gig at the Roosevelt Hotel. After several successful weeks, the engagement was abruptly terminated when the "Kingfish" Huey Long complained to the hotel management that the band was too loud. The jazzy Bluebird New Orleans sides were recorded by RCA A&R recording supervisor Eli Oberstein, who was in town cutting blues and country music artists. The six New Orleans tracks were cut in the rustic setting of a barn, and they hold up today, coming through one's speakers with the crisp, boxy jukebox sonics of the better recorded 78 RPM swing discs of the mid and late 30s.

Most of the remaining 26 Barnet Bluebird sides, collected in **The Complete Charlie Barnet Vol. 1,** keep a lid on the band's jazz kick. Victor exec Leonard Joy appeared to be trying to mold the Barnet orchestra into another Ozzie Nelson aggregation (good- looking, boyish crooner-bandleader playing and singing bouncy ballads). Although jazz talent was present in this early Barnet band, it was never permitted to get up the healthy head of steam it was to develop with such later Bluebird numbers as *Cherokee, The Count's Idea,* and *The Redskin Rhumba.* These swing classics as well as other blazing numbers that captured the jitterbugs fancy and the jazz fans' approval, will hopefully be covered in Bluebird's Vol. 2 Charlie Barnet reissue. (That is, if RCA resumes issuing the Bluebird series; right now the company is using most of its pressing facilities to meet the insatiable demand for posthumous Elvis'. Most of Bluebird Volume One is mainly of interest to Barnet buffs and big band memorabilia freaks. The band recorded any number of novelty and sentimental hits of the day like *I'm an Old Cowhand, Until the Real Thing Comes Along,* and *When Did You Leave Heaven;* also included are two collector's items—theme songs of what were to become the most popular disc jockey shows. Both *Make Believe Ballroom Time* and *The Milkman's Matinee* feature vocals by the Modernaires, a group that was to make it big with Glenn Miller. It is only on the very last track in the Bluebird doubleset, an out and out swinger, *I'm Praying Humble,* recorded in September of 1939 under a new Bluebird contract, that we begin to hear the guts, power, and finesse that characterized the great Charlie Barnet bands. Ajax's **Charlie Barnet, Vol 2,** shows what the maestro might have done earlier, unfettered by commercial restraints. This LP consists of 1937 sessions made for the independent variety label; some of the tracks are outstanding jazz performances that include a rousing reprise of Fletcher Henderson's *Down South Camp Meeting* and punching instrumentals like *Swinging Down to Rio* and *Chris and His Gang;* Barnet's forceful, driving tenor is very much in evidence. Another good cut is the moody *Take My Word,* an exquisitely scored Benny Carter piece that was recorded by Cab Calloway under the title, *Lonesome Nights.* Three interesting items rounding out Ajax's second Barnet collection are *Surrealism, Overheard in a Cocktail Lounge,* and *Merry Widow on a Spree,* performances that owe something to unorthodox arranger-leader Raymond Scott. Two outstanding black musicians, trumpeter Frankie Newton and bassist John Kirby, appear on the Ajax Variety dates. In the following years Barnet regularly ignored racial barriers by employing many black musicians.

By 1938 Barnet and his band, having terminated their first Bluebird contract, were coming nearer and nearer to outright jazz. The band made no commercial recordings that year, but was featured in Martin Block's two mammouth swing carnivals held at Randalls Island in NYC; it also cut some radio transcriptions that have been issued on Alamac's **Charlie Barnet and His Orchestra, 1938.** These have a high quotient of jazz material. On the Alamac LP, one notes the budding, black-influenced big band style that emerged full-blown when Barnet went into the Famous Door on 52nd Street in the fall of 1938 following Count Basie. Barnet's love for the jazz bands of Fletcher Henderson, Chick Webb, Benny Carter, Jimmie Lunceford, Count Basie, and particularly Duke Ellington, is heavily reflected on this album and indeed throughout the remainder of his career. On the poorly dubbed Alamac disc we hear good performances of Lunceford's *Rock It For Me,* Duke's *Prelude to a Kiss, Harmony in Harlem,* and *I Let a Song Go Out of My Heart,* and Basie's *Do You Wanna Jump Children]*

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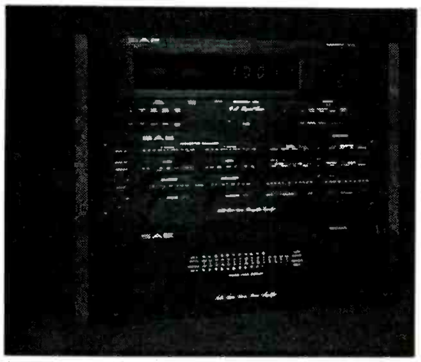

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covered here is 1942-46 when the Barnet band was cresting at its peak, musically and commercially. Included are driving Decca recordings like *Skyliner* and *Smiles* featuring Barnet's expressive, volatile tenor. Numbers like *Things Ain't What They Used to Be, Gulf Coast Blues, Pow Wow,* and *The Moose* showcase the spirit and vivacity of one of Swing's great bands. The pungent voicings on ballads such as *What a Difference a Day Made* and *You'd Be So Nice to Come Home To* (with knockout vocals by a bluesy Kay Starr on the first and a torchy Fran Warren on the latter), complemented by Barnet's fine soprano sax work and growling plunger choruses by trumpeter Peanuts Holland, contribute to the Ellingtonian feel of the orchestrations. (Barnet's band from this period was said to play with Ellington harmony and Basie rhythm.)

This early to mid 40s Barnet band employed a number of emerging modern jazz talents including the melodically sensitive and swinging pianist Dodo Marmarosa (who has a sparkling solo on *The Moose*), guitarist Barney Kessel, and bassist Howard Rumsey. Arranger Andy Gibson was contributing infectious stompers like *I Like To Riff* and *Oh Miss Jaxson* which spotlighted jazz trumpeter Peanuts Holland. My favorite Barnet piece from this period is Gibson's jaunty *Washington Whirligig,* which is not included in the MCA reissue, but can be found on Joyce's **Radio Discs of Charlie Barnet,** a collection of V Disc material which parallels Barnet's Decca output. Eleven of the Radio Discs selections are taken from a "V Disc in the Making" recording session broadcast over NBC on Sept. 11, 1944. Too bad the radio reference recording (if there was one) was not used for this LP instead of someone's home recording of the broadcast—the acoustics are murky, but there are excellent performances which include a sensitive Kay Starr on *Nobody Knows the Trouble I've Seen* and *I Can't Get Started,* the relaxed *Washington Whirligig,* and a high tension reading of Ellington's *Cottontail.*

A great sonic improvement over the Barnet V Disc collection is Joyce's **Film Tracks of Charlie Barnet;** there are rare film excerpts of the Barnet band as it appeared in Hollywood feature films and big band shorts. Kay Starr scores again on a plaintive *Haunted Town* which compares favorably with Lena Horne's fine Barnet recording of the same tune for Bluebird in 1941. There are sprightly renditions of *Skyliner, Washington Whirligig, Pompton Turnpike,* and *The Redskin Rhumba.* The flip side covers a series of film short performances made in 1948. At this point the Barnet band had been infected by the progressive jazz syndrome; the two best 1948 cuts are a richly scored *My Old Flame* with a gorgeous Barnet soprano, and the Claude Williamson piano showcase, *Claude Reigns.*

With the Barnet Aircheck collection, we return to 1945 and 1940. The material here is from Victory Parade of Spotlight band broadcasts. These are all quite excellent sounding airchecks, official radio station reference recordings. The professionalism of the sound is matched by the excellence of the Barnet band performances. The material is a mixture of 1945 pop (Kay Starr on *The Trolley Song,* Ginny Powell on *Dream*), unabashedly Ellingtonian instrumentals (*I Didn't Know About You, Rockin in Rhythm*) and 1940 swing (*Flying Home*). There is also another rollicking version of *Skyliner.*

First Heard's **Charlie Barnet & His Orch. 1945-47** contains Barnet airchecks from big band emporiums like the 400 Restaurant in NYC, and the Casino Garden Ballroom and Mission Beach Ballroom in California. Material like *The Sergeant Was Shy, Cottontail, Bunny, Cherokee,* and *Murder at Peyton Hall* is crisply recorded and briskly performed. By the late 40s, Barnet's brand of big band jazz, like other well known leaders', became increasingly frenetic; the influence of bebop and progressive jazz was very strong. In 1949 Barnet switched to the Capitol label, Stan Kenton had temporarily disbanded, and Barnet was pressed into becoming the label's exponent of progressive jazz. Barnet's Capitol output is hard to find; the Barnet Capitol sides were reissued several years ago on the Dutch Odeon label and the now out-of-print Capitol Jazz Classics series. Several of these same Barnet's be-bop performances can be heard on Joyce's well recorded **One Night Stand Battle of the Bands** in which Stan Kenton pontificates on the future of "modern music" and referees a July, 1949, battle between Barnet and the boppish Woody Herman band at the Rendevous Ballroom in Balboa Beach, California. Barnet plays similiar material on the horribly dubbed (from an Atlantic City Steel Pier broadcast) Alamac **Charlie Barnet & His Orchestra, 1949.** After listening to the Barnet band play frenzied numbers like *Bop City, BeBop Spoken Here,* and *Lemon Drop,* it's no wonder that dancers deserted the big bands en masse. Barnet played the material exceedingly well, but the music never sounds congenial to him. In fact, much

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of the music from this period played by Barnet sounds like an uneasy marriage of his former swing style with a kind of forced progressivism. One last note, the Alamac dubbing of the 1949 Steel Pier broadcast contains Maynard Ferguson's famous rendition of *All the Things You Are,* on which Maynard launches into a breathtakingly beautiful cadenza, playing a clear, ringing melodic line reminiscent of Charlie Spivak at his best; then all hell breaks loose as MF blasts skyward, practically bursting a blood vessel with his brassy pyrotechnics, completely destroying the tune's lovely melodic line. The Jerome Kern estate sued to have Barnet's Capitol version of Maynard's performance withdrawn from the market. *John Lissner*

The Complete Charlie Barnet, Vol. 1

Sound : A– Performance: B+

Charlie Barnet, Vol. 1

Sound: B– Performance: B

Charlie Barnet, Vol. 2

Sound: B– Performance: A–

Charlie Barnet & His Orchestra, 1938

Sound: C+ Performance: B+

The Best of Charlie Barnet

Sound: A Performance: A+

Radio Discs of Charlie Barnet

Sound: C– Performance: A–

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Charlie Barnet & His Orchestra

Sound: A Performance: A

Charlie Barnet & His Orchestra, 1945-47

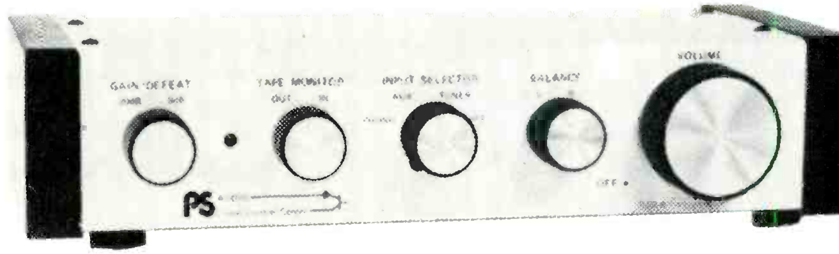
Sound: A– Performance: A

One Night Stand Battle of the Bands

Sound: A– Performance: A–

Charlie Barnet & His Orchestra, 1949

Sound: D Performance: A–



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Vivaldi: Anotimpurile (The Four Seasons). Orchestra de camera a Filarmonicii din Cluj, Mircea Cristescu. Solist, Stefan Ruha. **Electrecord (Romania) ST-ECE 0564** stereo.

A fairly small number of the Romanian records sent us were of standard international works rather than Romanian music; imagine my surprise to play this one and find that *Anotimpurile* is the familiar group of four Vivaldi concertos celebrating the seasons.

Here, as in other Electrecord discs, superb quality is combined with excellent performance. The playing is exemplary; I do not remember a more satisfactory version of the music, including the beautifully accurate and tasteful solo violin, Stefan Ruha. The sound of the small string orchestra and the solo is remarkable for its clarity and lack of the all-too-common edginess of many string recordings. What more can I say? This is another Romanian winner.

For more information write to Electrecord Recording Co., Bucharest VII, Str. Luigi Cazzavillian No. 14-16, Romania.

Documente ale culturii muzicale vocale in muntenia, moldava si transilvania, discul nr. 1, secolele XIV—XVI. Corul de camera "Madrigal," Constantin. **Electrecord STM-ECE 01199** stereo.

Get it? Being a Latin language, Romanian is more or less translatable by the average American in spite of its distance from Spanish, French, and Italian. This series is musicological in intent, "documents" of historical music from the area, as performed by the same excellent chorus (*corul*) that is heard on the other records in the series.

The content here is a bit confusing for the Western ear. It consists of two main elements. The first side is all ancient chant, out of the Eastern church and in Greek, apparently restored by some great Romanian scholar in the 17th century; the sound is lovely but unfamiliar. Nearest musical relative, of course, is Western Gregorian chant from the Catholic church, with which this makes an interesting comparison. The second side is music of the 16th century, from the far Eastern edge of the Western Renaissance, and though there is evidently Eastern methodology involved the sound is that of the West, the far provinces, so to speak, a somewhat oversimplified and naive usage of familiar Western devices of that period. There isn't much that we might label as Moldavian or Transylvanian, etc., and not very much intrinsic interest though the performances are nice. All but one of the works on this side are in Western church Latin.

There is a succeeding disc, carrying the "documentation" on into the 18th century—same idea; most of the music sounds like a provincial version of one or another type of Western music. Pleasant but not of any great musical impact.

For more information write to Electrecord Recording Co., Bucharest VII, Str. Luigi Cazzavillian No. 14-16, Romania.

David Montgomery "The Piano." (Weber, Beethoven, Brahms, Schubert, Godowsky.) **Direkt to Disk 02,** $14.95. Sonic Arts Corp., 665 Harrison, San Francisco, CA 94107.

This companion to the label's **"Piano Fireworks!"** (Russell Stepan) is a single disc, recorded by the same people. Unfortunately, it offers only one type of mike arrangement—the very worst. From start to finish it clangs and whangs and bangs, absolutely undistorted, the genuine sound of a grand piano with your ears practically lying on the strings. This one was apparently done even closer-up than the 12-inch clearance on side one of the Russell Stepan album. Aesthetically it is the ugliest piano sound I ever expect to hear. Though if you enjoy this sound, that surely your privilege!

There is no universal single standard for piano performance and this pianist, David Montgomery, already has a sizable reputation in the classical area, I can only say that I found his playing fussy, mannered, and wholly out of touch with the basic European traditions of playing this European light music, all semi-classic dance, from Beethoven and Schubert through Weber, Brahms, and Leopold Godowsky. I turned the record off on side two after a couple of Schubert Landler. Schubert is one of my favorite composers, too.

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Koto. Rokudan no Shirabe, Hachidan no Shirabe. **RCA Mastering Lab RDC-5,** stereo, (45 rpm) (direct to disc).

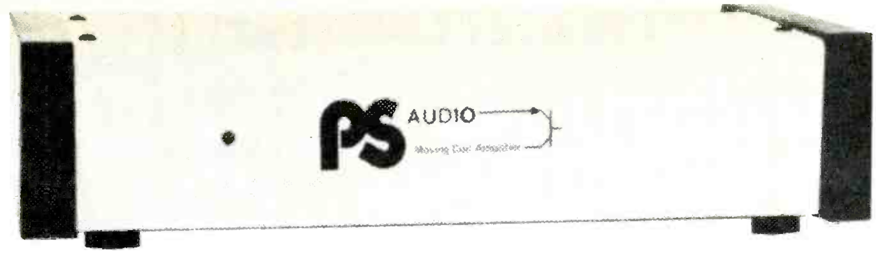
Are these two sisters? They both play that large ancient Japanese classical stringed instrument, the *Koto*. Very twangy. I can tell you no more—the entire jacket and booklet text is in Japanese characters. The sides run about six minutes-plus each, 12-inch at 45. Take it or leave it.

Moussorgsky-Ravel: Pictures. R. Strauss: Till Eulenspiegel. Dvořák: Slavonic Dance No. 8. Orch. Mondial des Jeunesses Musicales, Hétu. **Musicus MS2-45101,** (2 discs stereo 45). *(Artofonic, 6275 2e Ave. Rsmt., Montreal, Que. Can.)*

All is not geld that glysters, as Wilhelm Shakespeare once said. What with the excellent d-to-d now coming out of Canada, this super 45 recording should offer similar values, though differently achieved. Simple two-mike stereo, no mixing, noise reduction, compression, equalizing, limiting, etc., and the discs cut direct from the original tape. All that should indeed, at 45 rpm, give some interesting results.

Not enough. There are, unfortunately, other elements in the totality of a recording. First, this is a live performance, and like many it is adversely affected by too much absorbent audience and perhaps non-optimum mike hanging. (Only two.) The sound is listless in ambience, not well focused, rather undifferentiated, in sum, rather uninteresting, in view of the predominantly colorful music. Second, this is a vast youth orchestra, one of those great get-togethers much beloved by the French all over. The youngsters play well, and come from many a country. But the total result is, professionally speaking, soggy. That is the best word. OK but lacking in crispness and polish. Which is no reflection on the youth congress itself—just on the idea of making this a competitive recording. No amount of mike-to-disc hi fi is going to improve this factor, alas.

Third, the sound—minus limiters, etc.—tends to be rather tubby, with plenty of bass but rather mushy, for the above musical reasons as well as the no-limit pickup. Fourth, there is unfortunate pre-echo, here and there, which does not help a bit. Fifth, the pressing is very so-so, tending towards crackles in the first inch of play and also, my copies, warped and un-flat mechanically. Up and down, up and down. All of which adds up to a minor disaster. Audio life isn't easy these days.



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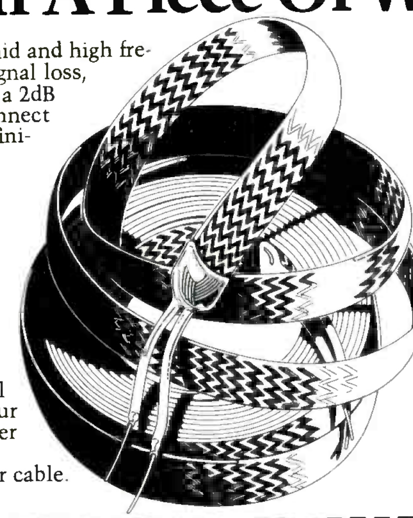

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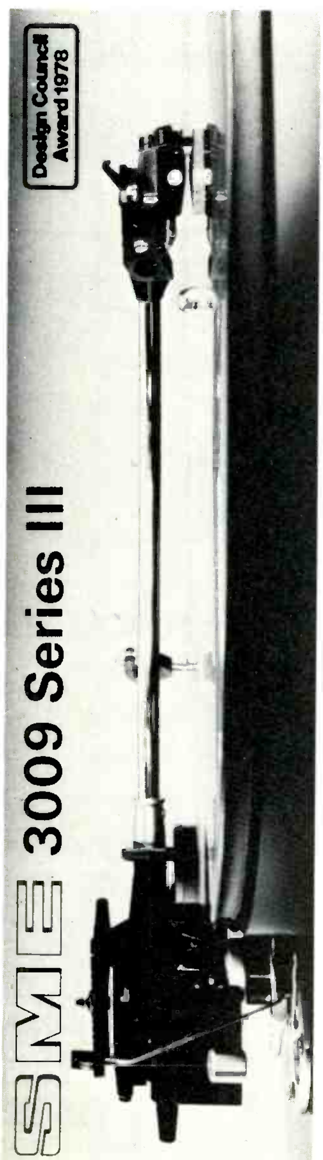

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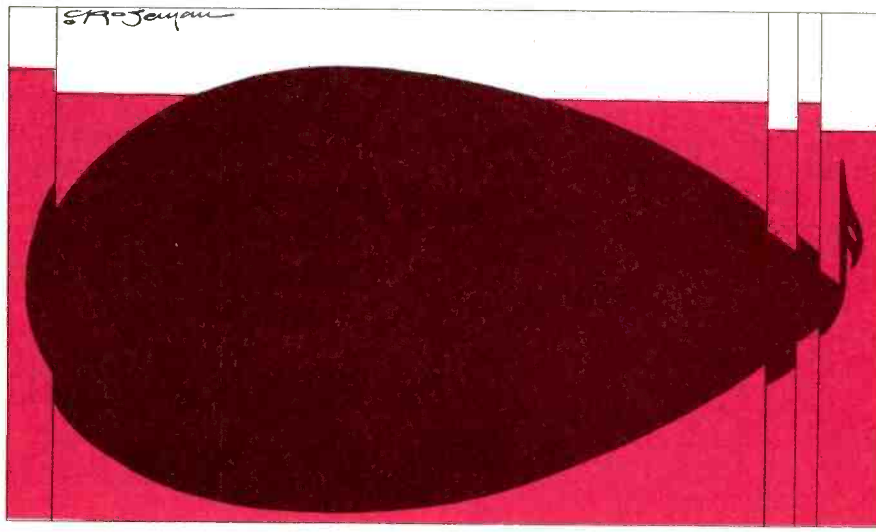
Classical reviews

Edward Tatnall Canby



Ezra Sims: Microtonal Music—"String Quartet No. 2 (1962) Elegy;" Elsa Charlston, sop. Boston Musica Viva, Pittman. **CRI SD** 377, stereo, $7.95.

That word "microtonal" caught my eye here right away. It indicates music with micro-subdivisions of the octave, in and around the ordinary scale, or in addition to same, and many a composer of an adventuresome nature has had a try at such a system, mostly with unbearably seasick results. I remember an ancient 78-rpm disc, Carillo, I think, which was largely a repetitive scale of, say, D minor with numberless micro-intervals going up, down, proving nothing at all to my ear except that D minor was fine just the way it is on the piano, untampered with! And then there is the more trenchant (and even more dissonant!) music for two out-of-tune pianos, a quarter tone apart, by Charles Ives . . . .

Imagine my surprise. This music is hardly to be called old fashioned, but it is a very listenable and easy modern, and after a few minutes the funny noises begin to seem quite simple and natural. They are, I think. Because this man (unlike a lot of composers) is a musician and hears. Indeed, he even calls himself a conservative—that is, he doesn't throw out the works and start all over with the Revolution. The sound, in fact, is, for contemporary, fairly conservative. There is first *The Elegy,* for soprano on a German text by Rilke, part sung, part in the manner of *Sprechstimme,* half spoken, with flute and clarinet, and three strings. (The extremely high ending, due to the soloist's recent illness, was sung by somebody else and edited in. Interesting.) Then there is the *String Quartet*—so-called. The guy has a nice humor; an eminent music dictionary listed him as composer of a *String Quartet No. 2* (1962)—a work that did not exist; so, accommodatingly, Sims went ahead and wrote a new piece, to which he gave that title—though it is a quintet for two winds and three strings and was composed in 1974. Does a title *have* to describe a piece, he asks? Anyhow, the dictionary is now correct.

Note: In some of my reviews there will be new letter ratings for the recording itself. Three separate factors will be rated: a) the sound in terms of fidelity; b) the recording technique . . . acoustics, mike placement, balance, etc., and c) the disc surfaces on my copy.

I rate **B** as honorably average or up to the current standards, **C** is deficient, and **A** is marvelous.

Disc surfaces, being irregular, are averaged out. Many recordings have ticks at the beginning but smooth out later on, and this is taken into account. *E.T.C.*

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The Ezra Sims scale has 18 pitches to the octave, the first and fifth (2:3) harmonically perfect, the others more or less alternatives, a bit higher, or lower, for the rest of the usual tempered pitches. The notation is very simple and easy to follow, small arrows and half-arrows next to a note pointing up or down. What this amounts to, as I hear it, is a viable instrumental alternative to tempered pitch, which is rigid and too fixed in its arbitrary dissonance for our times—we are increasingly finding ways to get out from under it, led by the electronic music capability. A more free scale, in any case, is an old tradition, still extant in choral singing today and in much string music and, unofficially, in plenty of other music as well. Most instruments can, after all, raise or lower the "fixed" pitches of the official scale to suit the moment—as they do here in Ezra Sims.

It takes a musical composer, a real musician, to do anything with a pitch system of this microtonal sort, of course. You might try Sims—he does it.

Sound: B+ Recording: A−
Surfaces: C+

Bach: Eighteen Chorale Preludes of Various Kinds (Leipzig Chorales). Daniel Chorzempa, Organ of Lebuinskerk, Deventer, Holland. **Philips 6700 114**, 2 discs, stereo, $15.90.

Daniel Chorzempa's Handel organ concertos of last year were the finest to be heard—here is the same man in the "big" Bach chorale preludes, those monumental works based on German Lutheran hymns, collected and revised over much of Bach's lifetime. Since Schweitzer—*the* Schweitzer—there has not been as persuasive a recording as this. Not every one of the works is perfection—Chorzempa is, after all, a mere human being and out of the U.S.A., scarcely Bach country! But this man has penetrated into the Bach soul, the real depths of the music, and if you have any acquaintance with these wonderful works or have the time and patience to allow them to penetrate into your existence, then you will hear what I hear, and no two ways about it. For the most part, these are slow, quiet pieces, serenely ornamental, not at all grand; only a handful are fast and lilting. At first try, they may seem unexciting, but just give them awhile.

Fine recording, good surfaces, and a limpidly clear organ sound from one of those superb Dutch organs in the old churches make for optimum conditions.

Sound: A− Recording: A−
Surfaces: B+

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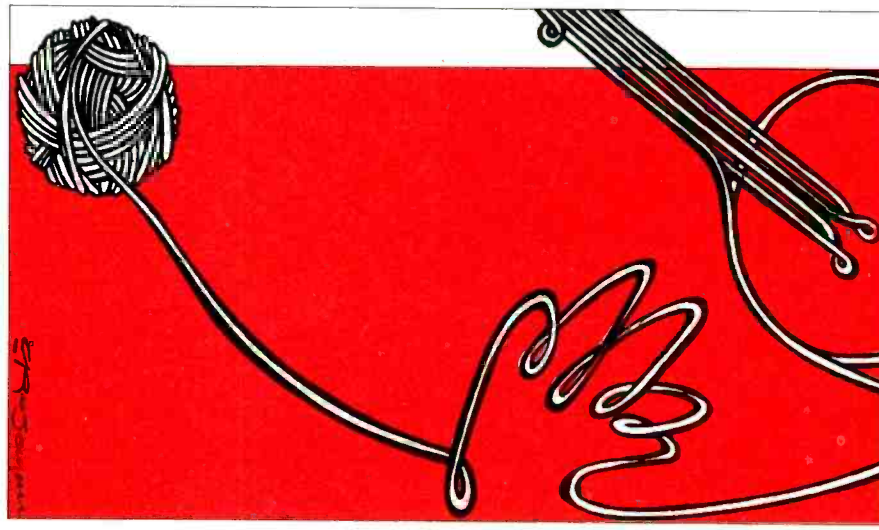

String Band Music: The Delaware Water Gap String Band
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In recent years there has been an upsurge of interest among folkies in American "old timey" string band music, both as accompaniment to square-dancing (itself coming back into favor among folkies) and as an electic mixture of traditions, repertoires, and performing styles that offers young musicians older models which are at once both highly "traditional" and relatively "progressive."

Based upon Appalachian mountain music—which was in turn based largely upon British Isles dance music—and incorporating urban forms such as ragtime, early swing jazz, and even Broadway tunes of the period (1925-35), "old timey" string band music was never what you could call "purist." As a result, the revival of interest in old timey music has meant a loosening of the narrow blinkers which have all too often in the past divided one segment of the potentially broad folkie audience from one another as well as from the general listening audience which isn't particularly into the war between Bluegrassers and Old Timey freaks. Once hymn-singers and shantymen start listening to the old church harmonies in this banjo-pickin' paradise, the war's over.

Thus, both the Highwoods String Band, a raucous twin-fiddler-based square dance outfit from upstate New York, and the Red Clay Ramblers, a smooth singing jazz-influenced quintet from North Carolina, are recognized as drawing upon different wings of the same broadly defined old-timey tradition. Their acceptance, in turn, has meant that other young bands coming along have had a much easier time gaining an audience.

One such young band which has just released its debut album after nearly five years on the road together is The Delaware Water Gap String Band. **String Band Music** (Adelphi Records 2004) combines a number of influences, from the French-Canadian reels of Vermont to the ragtime of Scott Joplin and friends, and including both Irish music and jug band. Delivered in a relaxed, bouncy, and pleasant style, this version of old timey music is sure to please a wider audience than they have managed to reach in the past, now that they are at long last on record, and would form a fine introduction to the genre for people inching their way through Western Swing and *Carolan's Concerto,* back to the hills where it all came together.

Especially noteworthy is the Delaware Water Gap's version of *Moving Day,* a song usually associated with The Jim Kweskin Jug Band and the Holy Modal Rounders. Rather than the manic rendition one might expect—given that lineage—it is given a laid-back, bouncy treatment that is very pleasant and refreshing. The two extended rags on the album, *Mineloa Rag,* from the East Texas Serenaders,

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and *Swipesy Cakewalk,* partially composed by Arthur Marshall and completed by his teacher, Scott Joplin, serve to emphasize the loose, jazzy side of The Delaware Water Gap String Band. For the obligatory virtuoso pieces, there's not only a clawhammer banjo duet on the English country dance tune, *Come Baçk and Sing,* but also a twin-mandolin medley, *Moneymusk/Four Nights Drunk* (and you'll love their explanations of the tune titles, too). Their singing is not as strong as their picking, but they still turn in a creditable version of The Blue Sky Boys' *S-A-V-E-D,* and you might find yourself joining in on the chorus too. One minor point: I prefer other versions of *Carolan's Concerto* to this, but don't let the absence of a concertina from the lineup put you off. Otherwise you will miss out on some fine fiddling from Dave Brody, along with the bass (and banjo) talents of Bob Carlin, Alan Podner's mandolin picking, and the lead work on both banjo and vocals of Hank Sapoznik, the group's founder. The recording is by Chelsea House's Bill Gehman, with his usual clean work on the board. You'd enjoy it. *John McLaughlin*

Sound: A — Performance: A

The Water Lily: Priscilla Herdman
Philo PH 1014, stereo, $6.98.

Taste and warmth are the hallmarks of **The Water Lily,** Priscilla Herdman's debut album. Her rich contralto and graceful guitar are ably supported by Jay Unger alternating on fiddle and mandolin, and Abby Newton on cello. The mix is just beautiful.

Seven of the 11 songs are poems by the Australian Henry Lawson, four with musical settings by Priscilla. These are love songs of uncommon beauty, especially the title song, and tales of Australia's cattle and sheep drovers. The other four selections complement the Lawson legacy. Eric Bogle's *The Band Played Waltzing Matilda* is a chilling song of the experiences of a young Australian conscript in World War I. *Dancing at Whitsun* tells of townswomen in England keeping the Morris dancing tradition alive in the absence of the traditional dancers, their men. *Jock O'Hazeldean* is a popular Child ballad which has appeared in many editions. Finally *Old Wooley* is about the night a former member of Bob Willis' Texas Playboys showed up and was wonderful.

The Water Lily is an album with a grace not unlike fine china.

Michael Tearson

Sound: A — Performance: A −

A Favourite Garland: Shirley Collins
Import Records, IMP 1017, stereo, $6.98.

This is the final album by one of England's finest folk singers. She has recently retired from solo performances and recording, and this one is a fond look back over her lengthy and distinguished recording career. All of the album is traditional save *God Dog* written by Robin Williamson of the Incredible String Band. The album ranges over wide terrain, from simply stated austere settings to modern folk-rock arrangements.

Shirley has always favored ballads, and she sings them with love. Whether her accompaniment is the brilliant, if obscure jazz guitarist Davy Graham on *Nottoman Town* or the original incarnation of the late, lamented Albion Country Band on a piece like the *Staines Morris,* she is always comfortable and convincing. Shirley is not flashy, just very, very real and warm.

A Favourite Garland is a lovely collection of balladry, sure to please any fan of the British tradition. Though diverse, it is never excessive, annoying, or cloying. Carefully chosen and sequenced, it is a labor of no small amount of love. *Michael Tearson*

Sound: B + — Performance: A

Blackberry Blossom: Norman Blake
Flying Fish 047, stereo, $6.98.

Norman Blake could have been a hot-shot guitar superstar by now. Instead, bless him, he has remained staunchly true to his great musical love, folk music. He is a rare specimen of a wonderful, warm human being with a sense of tradition and a stunning command of acoustic guitar, plus fiddle and mandolin as well. He is a genuinely modest man, too.

The first side of **Blackberry Blossom** has three songs and an instrumental, the flip side one song and four instrumentals. Between them, there is a wide range of material. From the chipper vintage novelty number *Are You From Dixie* and the very country *Railroad Blues* to a lovely guitar cello duet with his wife Nancy Blake on *The Rights of Man Hornpipe,* a lively mandolin-guitar duet *Foggy Valley,* and a majestic violin-cello duet simply called *Medley in D,* the album is a homespun delight.

The album was recorded at Chicago's Ajax Studios. It is a lovely job, particularly for the way that it captures the subtleties of the wooden instruments with such brilliant clarity.

Michael Tearson

Sound: A + — Performance: A −

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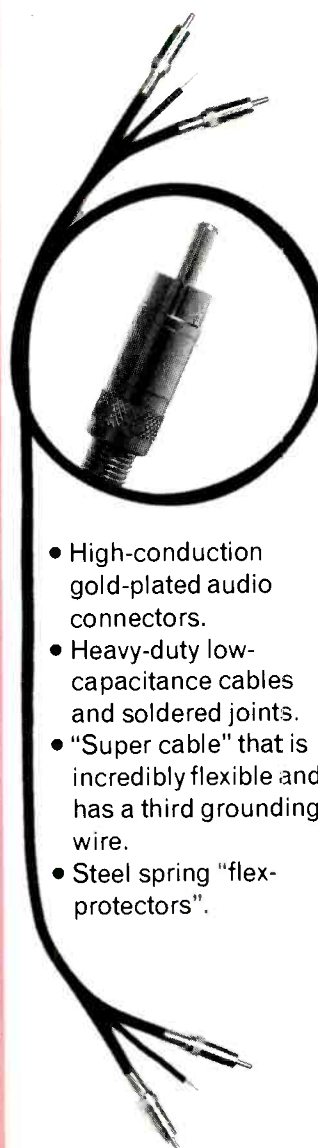

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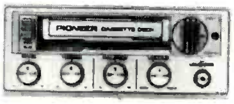

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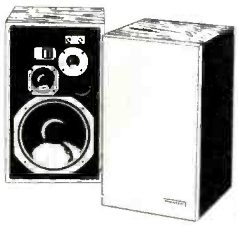

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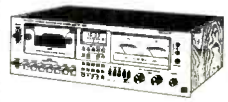

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Know'd Them All: Roy Dunn
Trix 3312, stereo, $6.98.

Roy Dunn is an obscure 55-year-old singer-guitarist from the Atlanta area who ranks as one of the greatest rural-blues discoveries of the 1970s.

Dunn doesn't snugly fit into the Georgia-blues mold, since his most pervasive influence is Texas giant Lightnin' Hopkins. Not only does Dunn refashion Hopkins' grotesque narrative, *Mr. Charlie,* but several of his originals *She Cook Cornbread For Her Husband, Everything I Get Ahold To,* and *You're Worrying Me* are modeled in part on the Hopkins approach. Similarly, his interpretations of Tampa Red's *Stranger's Blues* and Buddy Moss' *Bachelor's Blues* are markedly colored by his exposure to Hopkins.

By no means could Dunn be considered a mere Hopkins imitator, however. His guitar style is eclectic yet personal, with dense chordal splashes on *She Cook Cornbread* and the old standby, *Move to Kansas City,* as well as distinctive stoptime phrases on *Further On Down the Line* (which also incorporates an unusual slapped-bass effect) and *Lost Lover Blues.* When he switches to electric guitar, however, as on *Everything I Get Ahold To* and *Roy's Matchbox Blues,* the Hopkins flavor comes through loud and clear.

Dunn's excellent guitar work is overshadowed by his superlative singing, obviously affected by a decade of experience with gospel quartets. His voice is bristly, with a throaty rasp, yet is capable of conveying such deep personal emotion that it sounds like a universal lament. There are very few "happy blues" here, as Dunn ranges from the quiet pensiveness of *C.C. Rider* to the spiritual intensity of *Pearl Harbor Blues,* though he reaches the apex of his expressiveness with the profoundly mournful *Lost Lover Blues* and *Roy's Matchbox Blues.*

Though recorded in six sessions over a four-year span, the sound quality is fine throughout. The close recording results in a clean, full-bodied, very natural guitar sound, particularly on the cuts where he uses a steel-bodied instrument. The vocals are equally convincing. *Matchbox* is slightly marred by a static buzz from a faulty amp; to re-record it, though, might have meant the sacrifice of a magnificent vocal performance.

In this age of 25-minute albums, Trix remains the home of the 25-minute-plus side. **Know'd Them All** clocks in at a generous 56 minutes. Write to Trix Records, Drawer AB, Rosendale, NY 12472. *Tom Bingham*

Sound: A— Performance: A

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The bookshelf

Silver Ghosts: J. W. F. Puett,
Puett Electronics, P. O. Box 28572, Dallas, Texas 75228. Paperback $7.95.

Silver Ghosts derives its title from the gleaming, chrome-plated chassis—the trademark of Scott's receivers, and the look that influenced the styling of many high-fidelity products through the 60s and can still be detected today in McIntosh equipment.

Puett's book is about E. H. Scott and several of his most popular radio receivers of the 20s, 30s, and 40s. Scott was one of the earliest pioneers of exotic high-fidelity equipment, his products being analogous to today's McIntosh and Crown. (See "Nothing New Under the AM Sun," January 1977, *Audio.*)

The book begins with a brief biography of Scott and his achievements as a manufacturer of high-fidelity radio consoles and radio-phono combinations. The balance consists primarily of reprints of E. H. Scott literature and advertisements, and allows them to tell the history. The types of reprints are generally those Scott Newsletters which were used to introduce a new receiver or product. Approximately 25 separate sets are covered in great detail, including the schematics for each of the sets, which should be of great use to collectors of these sets. The reprints were done with quite a bit of care, so that, visually, they will compare favorably with an original held close. Also included are a few pages of reprint photos of Scott console cabinets, enabling the collector to identify some of the cabinets he may come across.

Silver Ghosts is a bit different from most books we find in that it started out as an IBM photocopy booklet at $9.95. Puett held back on delivery as long as possible until he had enough orders to justify printing the volume. It was a good thing for the customers, since printing the booklet resulted in the fine reproduction detail which makes it so valuable to the collector, which was his intention.

This book is definitely for the serious collector of vintage radio receivers and high fidelity products, and especially for the owners of E. H. Scott receivers, for whom it is a must.

Michael Stosich

1988: The New Wave Punk Rock Explosion, Caroline Coon
Hawthorne Books, 1978, $4.95 (paperback).

Any musical trend with a social presence as strong as Punkrock is guaranteed to spur on authors aplenty to divulge their private loggings on the topic, as there will be enough fans of the genre for the publisher to recoup his initial outlay. Whether the book provides any classic revelations is highly dependent upon (a) the author's ability to write in an interesting manner, (b) the author's degree of closeness to the Punkrock scene, and (c) exactly how much information there is to relay to the public. Caroline Coon seems to have a certain amount of journalistic style, and it is certain that she's privy to enough of the punkers to make her book one of interest to at least the British fans. But there's not all that much interest-worthy information when it comes down to it, unless one takes on both America and Great Britain, and unfortunately the Ramones, Television, Patti Smith, Prix, Rue Morgue, Blondie, and just about all of the American New Wave groups are given an absolutely minimum of space.

Of course, one problem is that of timing; in the time period since this book was written the emergence of Elvis Costello as a major musical force, the dissolution of the Sex Pistols, and the emergence of the thousands of small record labels and punk groups has made a significant impact upon the punk rock scene. As far as it goes, **1988** is not a bad book, but it gives strictly a bird's-eye view of one section of the scene. How Coon can devote a whole chapter to a nonentity like The Slits and then ignore a meaty topic like the roots of punk (an authoritative chapter on this could be most illuminating) is beyond me. In most cases, Coon opts for the point of view, "If I wasn't there, I can't write about it"; which is unfortunate because it limits the scope of an otherwise passable book.

John Tiven

Acoustic Design by Michael Rettinger
Chemical Publishing Co., 1977, $19.50.

Acoustic Design is Volume I of **Acoustic Design and Noise Control,** with the subject of noise control covered in Volume II. The current version is the third edition of this text by the well-known consultant on acoustics, Michael Rettinger. **Acoustic Design** includes three major sections: room acoustics, room design, and sound amplification systems. Having owned and used the two previous one-volume editions, I was particularly interested in what changes had been made in the newest opus. The great majority of the material is the same as before in the corresponding sections, but there have been a number of useful additions that will be mentioned below.

The first section on room acoustics includes 24 pages on absorption, nine pages on reverberation, and 49 pages on sound insulation. The absorption of various materials and constructions are discussed and illustrated with helpful line diagrams, including absorptivity-vs.-frequency curves. Historical background and theory are also covered briefly. Coverage on sound-absorptivity measurements is new in this edition. The part on reverberation is not lengthy, but the Sabine, Eyring, and Fitzroy equations are discussed and compared knowledgeably. There are a number of insightful comments made by the author on measurement techniques and possible variations in the results. The portion on sound insulation presents a broad, in-depth coverage of this significant area. Some parts, such as the discussion of HUD (Department of Housing and Urban Development) requirements, will be of little interest to those most concerned with audio. The great majority, how-

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ever, is quite appropriate for those who would like to gain a solid understanding of the elements of insulation. Of particular interest is "Sound Insulation Design for Buildings," an addition in this latest edition.

The second section on room design has many parts, covering a range of room types from small music rooms to grandstands. There are a total of 17 categories, with some receiving very brief coverage. Depth is provided on concert halls, recording studios, motion-picture studios and sound stages, high-rise buildings, and reverberation chambers. The detailed breakdown of types is helpful in pinpointing particular problems and solutions, but some of the overall understanding is lost in the process. A short part on "Acoustic Methods" appears to be mislabeled as it covers acoustic *models,* and the next part covers methodology and is so entitled. Here there is material on guidelines and design approaches, with additional coverage over the previous edition on ray tracing and room shape effects. Design of auditoria receives the major attention, and some of the information would also aid studio and control-room planning.

The section on sound amplification systems is a total of 32 pages, too brief to cover the subject in depth. Most of this concentrates on specifications, which would be of most use to someone relatively inexperienced in professional sound reinforcement. A three-page bibliography consists primarily of texts on acoustics with additional comments made by Rettinger on each book. The index is only two pages long, which is much too short for this type of book. The lack of detail prevents the finding of needed information without a time-wasting word-correlation game. The order in the room-design section appears to be quite haphazard, aggravating the limitations of the index. May the author/publisher correct this non-acoustic problem in the next edition.

The style of the author is such that assimilation of understanding is greatly facilitated—a definite strong point of the book. Production of the book is very good, with an excellent binding, clear line drawings, and a clear type face. Numbering the tables and listing tables and figures would be helpful additions to the next edition of the book. **Acoustic Design** is not a quickie cookbook to make you an "instant expert," but it will be a valuable addition to the library of those who are serious about gaining fundamental understanding of problems and solutions.

Howard A. Roberson

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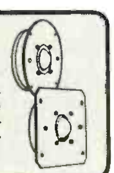

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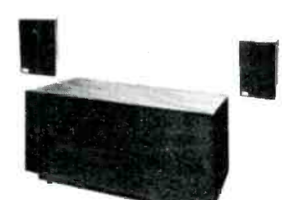

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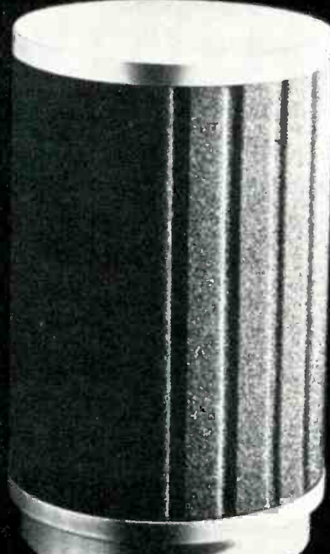

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• All M&K Sub-woofers are aligned 2nd Order Butterworth (B2) maximally flat ($f_c = f_3$). They are designed particularly for "tight" bass, transient detail, and very low overhang and decay time.

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• M&K, THE SUB-WOOFER SPECIALISTS, INTRODUCE DOUBLE VOICE COIL MATRIXING

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• All current stocks of M&K sub-woofers offer this feature. They still have the same superb "tight" low bass detail and absence of coloration of our earlier drivers. With the Bottom End Series, bi-amping is readily carried out without a higher power level matrix or crossover network. The Goliath Series carries an internal crossover network, but can also be bi-amped.

• M&K ALSO INTRODUCE THE LP-1 PASSIVE CROSSOVER NETWORK FOR BI-AMPING STEREO SYSTEMS

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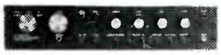

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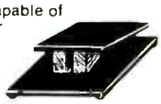

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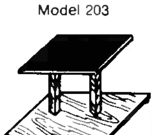

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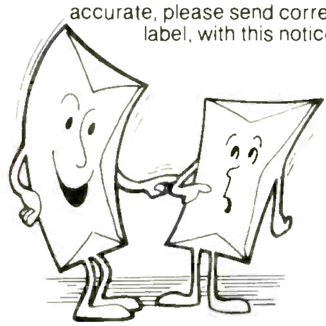

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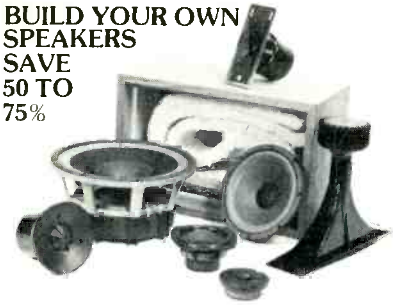

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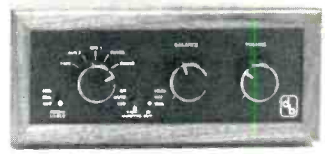

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An 8 ohm power rating alone tells just half the story of a receiver's true performance capability. Yet, as our chart shows, many receivers—particularly the high powered ones—are only rated this way. Not Marantz!

Marantz has made a major move by providing full power disclosure ratings which include distortion and full bandwidth on *all* Marantz receivers at both 4 ohms and 8 ohms. That's TRUE POWER Rating. It tells you that Marantz receivers can deliver at least 25% more power into 4 ohms than at 8 ohms—*and it's below 8 ohms where loudspeakers need extra power.*

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No other competitor offers a full FTC primary 4 ohm disclosure on every model from the least to the most expensive. We can only assume that if most other competitors can deliver equal or higher power at 4 ohms with full disclosure, they would so specify.

Of course, Marantz TRUE POWER Design is largely a matter of engineering know-how that requires more sophisticated and expensive circuitry. Which is why Marantz TRUE POWER receivers cost a bit more—but that's why they're worth it!

The Marantz 2600-400 watts per channel at 4 ohms (Minimum RMS, 20-20,000 Hz at 0.05% THD) 300 watts per channel at 8 ohms (Minimum RMS, 20-20,000 Hz at 0.03% THD)

The Marantz model 2600 with TRUE POWER Design looks stunning both inside and out. Its beauty and performance set the standard for the entire line of Marantz TRUE POWER receivers. See them all at your Marantz dealer now.

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*Based on manufacturer's published specifications and prices available 4-1-78. True Power is a trademark of Marantz Company, Inc.

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ES THE COMPETITION RATINGS AND WINS...

	SANSUI G22000*	**PIONEER SX1980***	**MARANTZ 2600**	*AGAIN*
Suggested Price	$1,250	$1,250	$1,495	
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THD	0.02	0.03	0.03	
Frequency Response	20-20,000Hz	20-20,000Hz	20-20,000Hz	
4 Ohm Rated Power	**Not specified**	**Not specified**	**400 Watts RMS**	
THD	Not specified	Not specified	0.05	
Frequency Response	Not specified	Not specified	20-20,000Hz	
	SANSUI G5000*	**PIONEER SX750***	**MARANTZ 2252B**	*AGAIN*
Suggested Price	$450	$425	$459	
8 Ohm Rated Power	**45 Watts RMS**	**50 Watts RMS**	**54 Watts RMS**	
THD	0.05	0.1	0.05	
Frequency Response	20-20,000Hz	20-20,000Hz	20-20,000Hz	
4 Ohm Rated Power	**Not specified**	**60 Watts RMS**	**65 Watts RMS**	
THD	Not specified	0.1	0.1	
Frequency Response	Not specified	20-20,000Hz	20-20,000Hz	
	SANSUI G2000*	**PIONEER SX450***	**MARANTZ 2218**	*AND AGAIN*
Suggested Price	$240	$225	$250	
8 Ohm Rated Power	**16 Watts RMS**	**15 Watts RMS**	**18 Watts RMS**	
THD	0.15	0.5	0.08	
Frequency Response	20-20,000Hz	20-20,000Hz	20-20,000Hz	
4 Ohm Rated Power	**20 Watts RMS**	**15 Watts RMS**	**24 Watts RMS**	
THD	0.15	0.5	0.15	
Frequency Response	1 kHz	20-20,000Hz	20-20,000Hz	

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Introducing the Technics SA-1000. With more power and less distortion than any other receiver we've made: 330 watts per channel minimum RMS into eight ohms from 20 Hz-20 kHz with no more than 0.03% total harmonic distortion.

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On FM you'll get outstanding specs plus two RF stages with low-noise, 4-pole, dual-gate MOS FETs, Technics-developed flat group delay filters and a Phase Locked Loop IC in the MPX section.

FM Sensitivity IHF '58	Stereo-50 dB*	FM Selectivity	Stereo Separation at 1 kHz
0.9 μV	36.2 dBf	85 dB	50 dB

*IHF '75 standard.

As good as all that sounds, Technics Acoustic Control makes it sound even better, because it adds low and high range boost and filter switches which vary the way each tone control performs at a particular setting. There's also a midrange control with a variable center frequency. And 24 LED peak-power indicators that let you keep an eye on what your ears will hear.

The Technics SA-1000. In the world of receivers, it bats 1000.

Technics
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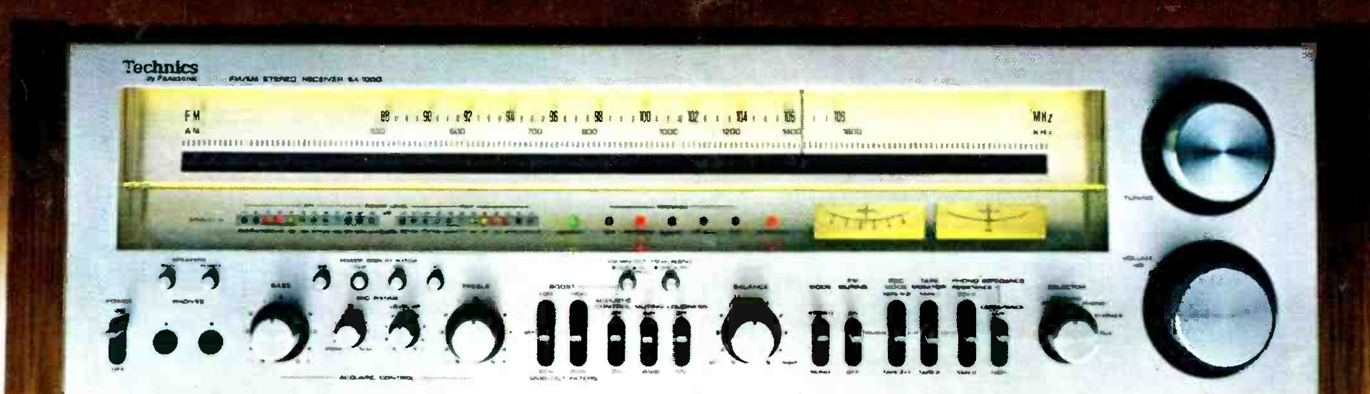
A few receivers give you 0.03% THD. Only Technics gives it to you with 330 watts per channel.



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