

Audio

Heyser-
Energy-Time Test

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • JUNE 1976

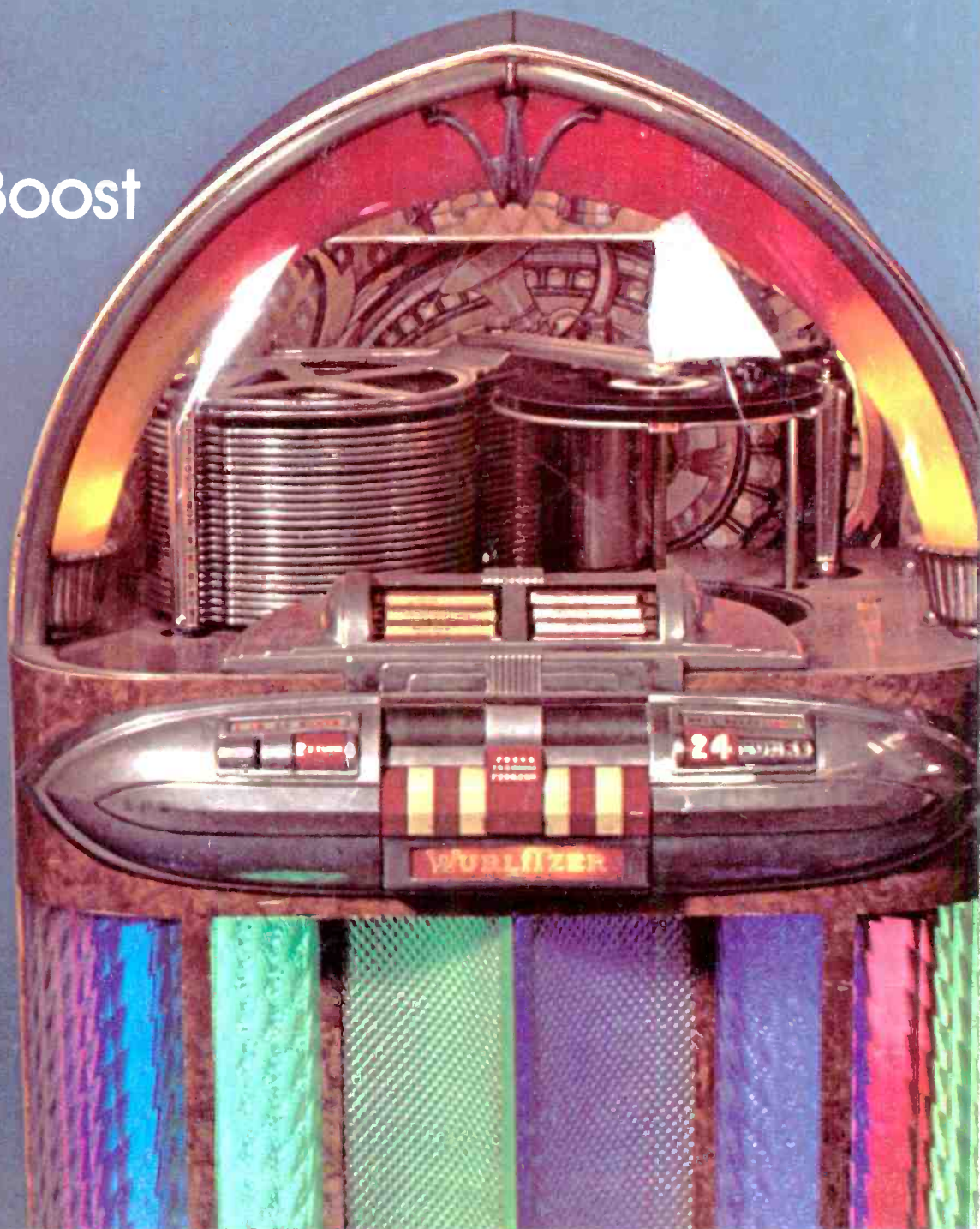
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Build A
Rumble/Boost
Filter

How
Records
Are

Made



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Pioneer HPM-200
5-way 5-driver system

Pioneer HPM-100
4-way 4-driver system

Pioneer HPM-60
4-way 4-driver system

Pioneer HPM-40
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So we invite you to listen and compare very carefully. Match the HPM in the price range of your choice against the corresponding speaker on the far right, or anything else in your dealer's showroom.

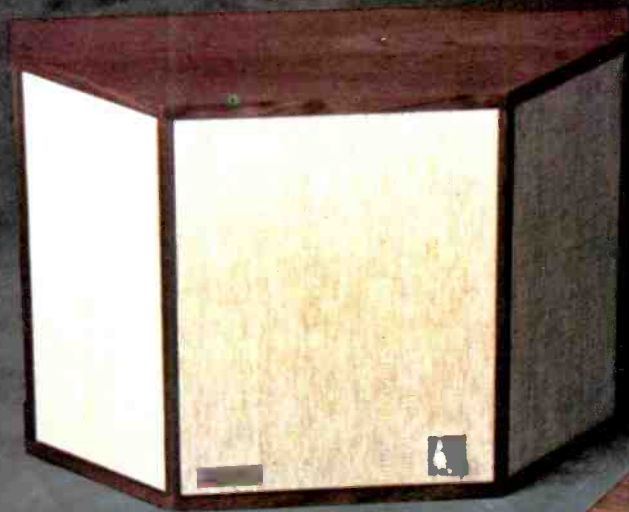
We think you'll end up agreeing that a good new idea beats a good old idea every time.

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**It would be foolish to create
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Audio

June 1976

"Successor to **RADIO** Est. 1917"

Vol. 60, No. 6

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“It’s a good turntable by itself, and as an added bonus it also stacks records.”

Creem, MARCH 1975

In the old days, a serious audio enthusiast wouldn’t touch anything but a manual turntable.

He felt he had no choice.

That anything with automatic features simply didn’t perform. But as *Sound* magazine says in its August 1975 issue:

“In recent years . . . the quality of the automatic turntable has risen dramatically. And the performance of the B.I.C. 960 certainly substantiates our belief that a serious music lover can attain extremely high quality in an automatic unit just as in the best manuals.”

B I C

In a Sept. 1975 test report, *Radio & Electronics* agrees, noting that B.I.C.:

“might well be considered a top-performing manual turntable in its price category.”

Modern Hi-Fi and Music (Aug./Sept. 1975) reports:

“wow and flutter of 0.03% at 33 $\frac{1}{3}$ rpm and rumble less than -65db; specifications which are more typical of a good manual than most automatics.”

And because they’re *not* imported (B.I.C. turntables are built entirely in the U.S.) the price of this performance comes as a pleasant surprise.

If you’re serious enough about your system to spend \$100 or more on a turntable, a B.I.C. 940, 960, or 980 has what you want and more of it — all three are multiple-play manual turntables sharing the same quality features and high performance.

See if your high-fidelity dealer doesn’t agree. He has literature with all the details. Or write to B.I.C. (“bee-eye-see”) c/o British Industries Co., Westbury, N.Y. 11590.

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Audioclinic

Joseph Giovanelli

Cartridge Output and Stylus Velocity

Q. In the "Equipment Directory" in the October, 1975 issue of Audio Magazine, there is one set of specifications that is confusing.

The amplifier section of the directory refers to and measures phono sensitivity in mV. The phono cartridge section refers to and measures output in mV at a velocity of 5 cm/sec. The specifications supplied by the manufacturers, however, do not in all cases state output in terms of this 5 cm/sec. figure. The Empire cartridges refer to a velocity of 3.53 cm/sec. The Pickering's refer to a velocity of 5.5 cm/sec. with brush.

Since a cartridge must be selected whose rated output exceeds the phono sensitivity of the amplifier being used with it, how does one match the two when there is no common reference?—L.L., Kew Gardens, N. Y.

A. The voltage output of a cartridge and the velocity of a stylus follow one another in direct proportion. Doubling the velocity of the stylus will increase the voltage output of the cartridge to twice its original value. Thus, if you have a cartridge which produces 2 mV at 2.5 cm/sec. and you want to know what the cartridge will produce at 5 cm/sec., you can figure from the above that this cartridge will produce 4 mV at 5 cm/sec. That is all there is to this sort of problem.

Select a cartridge which does not exceed the minimum sensitivity of the preamplifier section of your equip-

ment by more than about 6 dB as this precaution will prevent overloading the input circuitry. You can use a cartridge having higher output than this if you know the maximum signal level which can be handled without causing overload and watch your gain setting.

Ceramic and Magnetic Cartridges

Q. I have read the statement that a magnetic cartridge is better than a ceramic one. Why?

Instead of the ceramic cartridge which is supposed to be used with my receiver, would it hurt the receiver in any way if I were to use a magnetic cartridge?—Jim Pykonen, St. Clair Shores, Mich.

A. Both ceramic and magnetic cartridges produce a signal because their styli are moved by the groove on the record, however, the method used to produce the electrical signal is different. With the ceramic cartridge, the stylus does a considerable amount of mechanical work in flexing a small piece of "ceramic" material, usually barium titanate, which produces a relatively large voltage between the two sides of the element. In the magnetic cartridge, the signal voltage is produced because small magnets, attached to the back end of the stylus, are moved close to the coils attached to the main body of the cartridge, inducing the voltage. A great deal less work is necessary with this method. While the magnetic cartridge produces a smaller signal voltage than the ceramic type, the magnetic cartridge will track difficult grooves properly at much lower tracking forces, resulting in considerably reduced record wear.

One advantage of the ceramic type is that the signal voltage it produces is easy to equalize to the curve used in

recording, while the magnetic type requires more sophisticated circuitry for this. The ceramic type, however, almost always has some resonant peaks in its response and these peaks are difficult to remove with an economical circuit. The result is that the magnetic type, after equalization, has the flattest response.

It is for all these reasons that the magnetic type is considered superior.

While you will not hurt your receiver if you simply exchange the ceramic cartridge for a magnetic type, you will probably hear no sound (or at best a treble-heavy sound) when in phono mode as the receiver is set up for the higher signal voltages produced by the ceramic cartridge. If you wish to go to the magnetic type, you should purchase one of the preamplifiers made specially for such changes. They go between the turntable/cartridge and the receiver and boost the cartridge's signal to the proper level, as well as providing the necessary equalization for the magnetic cartridge.

Homemade Wind Screens

A few of my microphones have no wind screens. I improvised and discovered that the foam used in air-conditioning filters works well if you use two or three layers of the material and fasten it to the microphone with a hose clamp. Although this arrangement is unsightly, it works well.—Richard D. Taubold, Urbana, Ill.

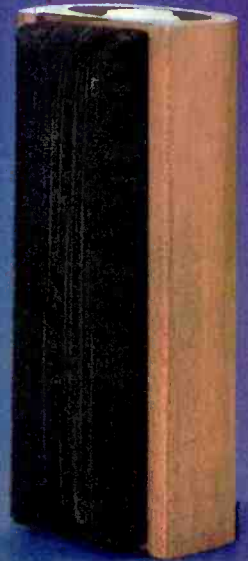
If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 401 North Broad Street, Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.

About The Cover: "Gee, Dad, it's a Wurlitzer!" The nostalgia trend has given a second life to the artifacts of our recent past. This whirling-colored, big-voiced 1947 Wurlitzer jukebox now delights bicentennial visitors to the Paper Moon, an old-time newsstand and cafe on trendy South Street in Old Philadelphia. And how's this for nostalgia, you get six plays for a quarter! Most popular selection? *Rum and Coca Cola* by the Andrews Sisters.



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Tape Guide

Herman Burstein

Taping Discs Revisited

In the September, 1975, "Tape Guide" column Mr. Ted E. Hayen asked about the difference in recording levels of about 4-to-5 dB between channels on records of different manufacturers. In his answer, Mr. Burstein covers the fact that there are sometimes variations in recordings between right and left channels. He also states that there might be an error in the calibration of the VU meters of the tape recorder used. He recommended that Mr. Hayen adjust recording level on the records he is trying to record, making the assumption that the VU meters are identically calibrated. Unfortunately, he did not give Mr. Hayen a method via which to check the calibration of his meters and record level controls.

In order to calibrate the entire system (or to check calibration of the entire system, including record level controls and VU meters), all that Mr. Hayen has to do is to play a monaural record with all the controls in his system in the stereo position. When a monaural record is played in this fashion, the same signal will appear at both record heads, and all one has to do is calibrate his record level controls so that the reading on both VU meters will be identical. If he now plays back a recording made in this fashion, and adjusts his playback controls (making the assumption that the VU meters work on playback and can be switched to read the signal coming from the tape), his entire system will be calibrated. In addition, if there are gross differences in the position of the record and/or playback level controls, he will know that there is something amiss and that part of his system requires adjustment or repair.

Indeed, this is the best way of adjusting any tape recorder in which you have both a master gain control and separate level controls for each channel.

C. Victor Campos
Acoustic Research
Norwood, Mass.

Track Spacing

Q. I've read that different heads have varying distances between the tracks. Is this a problem?—Ronald Slakie, Tacoma, Wash.

A. The same kind of head (for example, a quarter-track playback head) will have the same track spacing regardless of manufacturer—except for possible mistakes in manufacturing. Track spacing is specified by NAB (National Association of Broadcasters) and to my knowledge is followed by all manufacturers, within permissible tolerances. However, there are differences in spacing as between quarter-track and half-track heads. And there are slight differences for stereo heads, as between erase heads and those used for recording and/or playback. These differences are to make sure that the erase head spans all the recorded track and slightly more.

Hiss Reduction

Q. I have a Concord tape deck which has been biased for Scotch low-noise tape and is used only at 7 1/2 ips for music. However, there is a small amount of hiss. When recording material off TV I use cheap tape, operate at 3-3/4 ips, and turn the treble up to improve the treble response; yet I am amazed to find that there is less hiss than when using good tape at 7 1/2 ips. Other than the fact that I record off TV at a slightly higher level, I am at a

loss to explain why I get less noise in the latter mode.—Dennis Brandt, Emporium, Penna.

A. At 3-3/4 ips, high frequency response is appreciably less than at 7 1/2 ips for some tape machines. Hence tape hiss—all other factors remaining constant—would tend to be less noticeable at 3-3/4 ips in the case of such machines. When you turn up the treble at 3-3/4 ips, you may not be turning it up enough to cancel out the hiss advantage. When using low-noise tape, the treble boost in recording is supposed to be reduced somewhat, and the recording level is supposed to be increased somewhat. In adjusting your tape deck for low-noise tape, only the bias may have been changed and not the record treble boost and recording level. Accordingly, you get more noise than if all the required adjustments were correctly made. On top of this, as you state, you record at a higher level from TV (at 3-3/4 ips) than you do for music (at 7 1/2 ips). Finally, it may be that the nature of your hearing ability has something to do with the matter. When you turn up the treble at 3-3/4 ips, you may be satisfying your ears out to, say 10,000 Hz rather than to 20,000 Hz. If you can't hear much beyond 10,000 or 12,000 Hz, you may not be turning up the treble enough to increase hiss appreciably.

Stereo Playback

Q. I have a Lafayette transistorized 4-track mono open-reel tape machine with tape head outputs. I would like to incorporate a preamp/equalization circuit (transistorized) into the machine, thereby converting it into a stereo playback deck suitable for tape

(Continued on pg. 10)



Our performance can be put into words.

Your enjoyment will go beyond that.

To help you get the most out of BASF open reel tapes, we've improved our package.

We've included on it everything you need to know to achieve the most enjoyable listening experience possible. We're proud to, because there's no tape quite up to BASF standards.

Our Performance Series (formerly LH) is the DIN standard recognized throughout the world for open reel tapes.

Our Studio Series (formerly LH Super) with its high density formulation, results in a 50% increase in volume without distortion

across the full frequency range.

And our Professional Series is of mastering quality that's just that and not in name only.

All, of course, are polished for the extraordinary clarity that is BASF sound.

And while that sound can be put into words, charts and numbers, the listening experience itself can only be

felt the moment you hear it.

Which isn't surprising, considering BASF invented audio tape in the first place.



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RE-711

TEAC
RE-711

TEAC A-2300SD

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OFF

SPEED
HIGH
LOW

MIC

LINE

OUTPUT

TEAC

TEAC

REC

STOP

PAUSE

DOLBY SYSTEM

A-2300SD

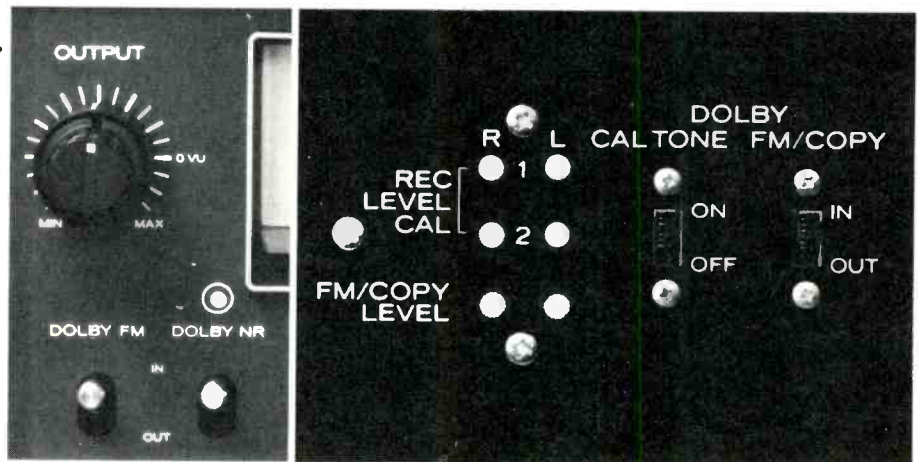
Music minus hiss.

Signal vs. noise. The one aspect of sound reproduction that makes all the difference between a clean tape and a hissy one. Even at 7½ ips.

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74dB

signal-to-noise ratio

**Actual measurements will vary with record levels and brands of tape. Our published specification of 74 dB or greater is referenced to 3% T.H.D. at 7½ ips with the NAB A-Weighting Curve and B-Dolby circuits, using Maxell UD-35 tape. In maximizing signal-to-noise performance at 7½ ips, we have recorded measurements of up to 80 dB with Ampex 456 tape.

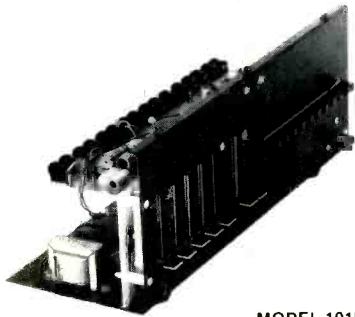
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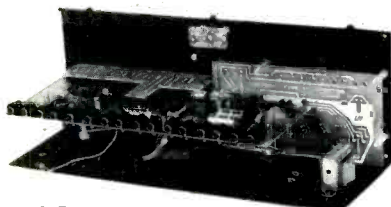
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(Continued from pg. 6)

dubbing. I don't wish to consider any separate tape preamps as they have additional features I don't want and are awkward to carry around. There is also enough room to mount a circuit about the size of a drinking glass, and I'd enjoy building the circuit. How do I go about doing this?—Joel Jevovtovsky, Brooklyn, N.Y.

A. You might copy the playback electronics now in your tape machine, or obtain a transistorized playback circuit from Nortronic or other sources. You might also refer to articles on tape preamps published in *Audio* and other periodicals in past years. You could also copy the playback circuitry of a high quality tape machine, or buy one of the tape playback preamps which you say you don't want to consider, dismantle it, then reassemble it inside your Lafayette machine. The cost of separate parts probably wouldn't be much less than buying the entire preamp. As to what you do once you have a desirable circuit or collection of parts before you is outside the scope of this column. Novices usually gain aptitude in this kind of thing through experience with kits or under the tutelage of a friend.

Recorder Comparison

Q. I have attempted to compare tape recorders on the basis of data appearing in Audio and other magazines. Most of the time one machine will look better in some categories and not in others. I would like to know how to analyze the data. Which categories are most important? How good would one deck have to be in lesser categories to make up for slight deficiencies in more important categories? Also, what is the smallest amount of difference in each specification that is worth considering in certain categories but not in others?—Jerry Sheppard, Atlanta, Ga.

A. The answers to your questions are not easy, and a complete attempt would require several pages. Perhaps the following may help somewhat. The most important requirements in the case of a tape recorder are flat and wide frequency response, high signal-to-noise ratio, low distortion, and low wow and flutter. A good quality machine would have response within ± 1 to $1\frac{1}{2}$ dB between about 30 and 16,000 Hz, signal-to-noise ratio bordering or exceeding (particularly with Dolby-B) 60 dB, and under 0.1% wow and flutter. Distortion is inferred in

the S/N specification, which is ordinarily based on a signal level resulting in 3% harmonic distortion at 400 Hz on the tape. In the case of specifications stated in dB, significant differences are on the order of about 1 to 2 dB. You might notice a difference between Machine A flat within 1 dB and Machine B flat within 2 dB. You would be likely to notice a difference between Machine A and Machine C flat within 3 dB. Similar parameters hold for S/N.

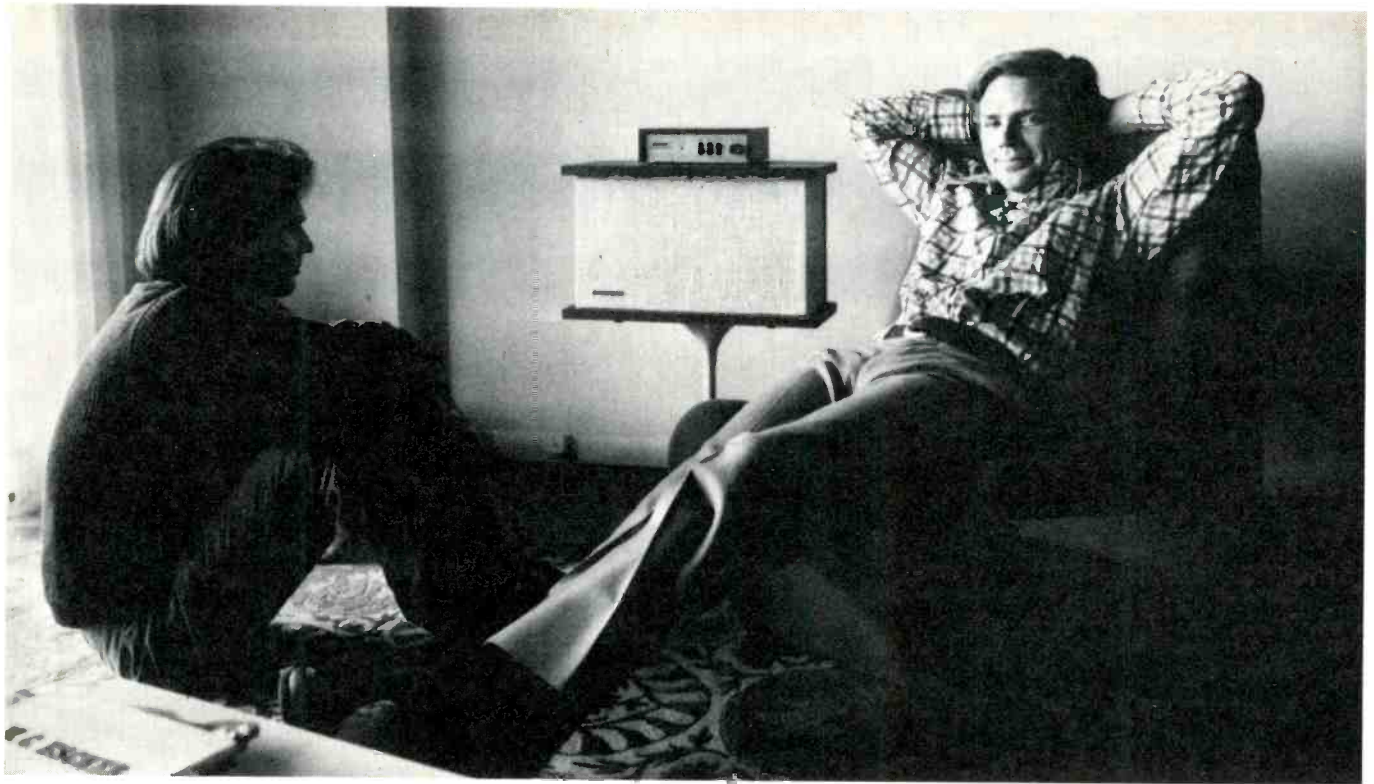
Dolby Dilemma

Q. I have several questions concerning the Dolby-B system. It is indicated that the gain of the system is controlled by the level of the input signal. This appears to be far from an optimum system as masking of noise occurs only if the desired signal has a strong component near the noise frequency. In the Dolby-B system, a signal in the bass would cause no compression of the signal, and one would be left with the full noise component which would be audible; there would be no masking due to the large frequency difference. Why is there only a 10 dB improvement in signal-to-noise ratio? I realize that large-signal amplifiers tend to distort, but why not lower the input signal to the Dolby by 10 dB, compress it 20 dB, and then amplify it again in a linear amplifier?—Jeffrey Ahl, Ithaca, N.Y.

A. Noise is most noticeable in the treble range. The principle of the Dolby-B system is to emphasize the treble when the signal level is low; because the level is low, such emphasis does not noticeably increase distortion in recording. In playback, when the signal is low, the treble range is correspondingly de-emphasized, thus restoring flat response and at the same time reducing noise (treble frequencies) that occur in recording and playback.

Why "only" 10 dB improvement in S/N? This is probably as much as is feasible in view of the problem of avoiding distortion due to treble emphasis in recording. Besides, 10 dB is quite an improvement; it can convert garden-variety 50 dB S/N into high-quality 60 dB S/N.

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.



Ask a friend to introduce you to a legend.

If you're thinking about stereo equipment, probably the single most important influence on your buying decisions will be the recommendations of friends whose judgement you respect.

Please talk to someone who owns the Bose 901® loudspeaker system. He or she is probably serious about music and can give you a serious opinion, along with a somewhat technical discussion of the unique qualities of the 901. (Bose owners tend to be a little passionate about their speakers.) And, loyalty aside, it's probably worth a few minutes of your time to listen to the story, because the Bose 901 is so drastically different from conventional speakers.

First of all, the 901 is far smaller than its performance, reputation, or price would lead you to believe. Then, the speakers are pentagon-shaped, and are set up a foot or two from the wall of the listening room, pointing at the wall, not at the listener. This is a critical difference between the 901 and conventional speakers. The 901 is a Direct/Reflecting® loudspeaker. It reflects most sound off back and side walls and then into the center of a room, surrounding the listener with the proper proportion of reflected and

direct sound, all frequencies in balance, almost anywhere in the room. The result is an extraordinarily open, spacious sound that very effectively reproduces the feeling of a live, concert-hall performance. This is in sharp contrast to conventional direct radiating speakers, which tend to beam sound (especially high frequencies), limiting optimum listening to a relatively small area in front of the speakers, and producing the somewhat harsh sound often associated with high fidelity.

There are more dramatic differences inside the 901: it has no conventional woofers or tweeters, just nine identical, 4½-inch, full-range drivers.

The nine drivers are acoustically coupled inside that very compact 901 cabinet. Coupling tends to cancel out, across all nine drivers, the small imperfections found in any sound reproduction device (ours included). What you will hear is an incredibly smooth, life-like sound, practically free of distortion.

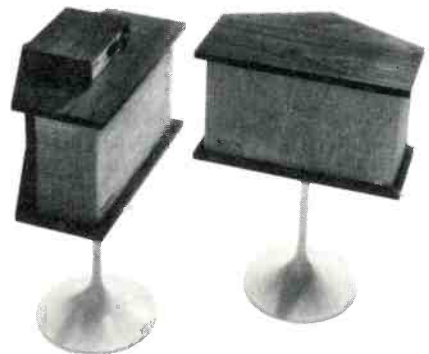
Besides two speakers, the 901 system includes a third part: the Active Equalizer. The 901 uses the Active Equalizer to automatically boost power at the frequencies where it's needed. The result is

consistent sound output up and down the frequency range, with full, steady high notes and solid, powerful low notes.

Now that you've heard the story behind the 901, we invite you to go to a Bose dealer and listen. Compare the 901 to any other speaker, regardless of size or price. Then you'll know why the Bose 901 has become something more than a loudspeaker system for thousands of music lovers all over the world.

For a full-color brochure on the 901 loudspeaker system, write: Bose, Dept. AU6, The Mountain, Framingham, Mass. 01701.

Patents issued and pending.



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Dear Editor:

More on TV Audio

Dear Sir:

I read with interest the letter from R. P. Markey in the April issue and felt that I might add something to his comments.

The problems with TV audio are primarily due to losses of quality through the AT&T long lines system and, at present, somewhat unavoidable. Be advised however that within two years the PBS (Public Broadcasting Service) stations throughout the United States will no longer be using the long lines system for distribution of network programming, going instead to a leased satellite system for both audio and video distribution.

The proposed specifications are as follows: Flat response from 15 Hz to 15 kHz, random noise (flat and new CMTT weighted) peak signal-to-noise ratio of better than 68 dB, distortion under 1% throughout the audio range, and crosstalk down more than 70 dB.

We can only hope that in the next few years AT&T will improve audio quality to the three commercial networks, or that perhaps the networks will follow Public Television's lead in striving for true hi-fi television audio.

Ralph Strader
Engineering Supervisor
WNIT-TV PBS
South Bend, Ind. 46624

Rack Mounting

Dear Sir:

One of the things that I have noted with delight is that a lot of hi-fi gear is once again available with rack mounts, as was the case 20 years ago. Almost all of the moosey power amplifiers come that way, and the noise reducers, the graphic equalizers, and a new AM tuner are like that.

So why don't the manufacturers of most tape recorders make rack mounts? I wrote many of the companies asking for information pertaining thereto. Most of the com-

panies I wrote sent me brochures that didn't say anything about rack mounts. A few do. The only cassette machine with rack mounts costs over \$1000.

Surely I am not the only person in "the biz" who specifies rack mounts in commercial installations and finds it convenient to have a recorder as part of a PA system. Radio stations in a town this size play news actualities and sometimes entire programs (ugh!) from cassettes, and they sometimes do that with battery portables, since no larger gear is very convenient. My home installation is rack mounted, and I'm convinced that the "ultimate" system—if there is one—has everything bolted down.

Audio magazine could certainly do a lot of folks a favor by prodding the manufacturers into making these things available, as they will listen to you more than to me. And if you can find me a rack-mounted cassette recorder-player for less than \$500, I'll take two. And I can sell three others to clients in Ridgecrest (population 15,000).

James Rieger
Engineer
Kitchen Productions
205 S. Silver Ridge Dr.
Ridgecrest, Ca. 93555

Dissident Critic

Dear Sir:

I read my first issue ever (and possibly my last?) of *Audio*. Yes, your "systems" articles are good. But let me tell you, your Record & Tape Reviews suck eggs! Having decided on a journalistic career, I feel it necessary to set the facts straight. Your "writers" of the column are legends in their own minds.

Fleetwood Mac is a highly skilled Rock Group. Chris McVie's warm voice and exquisite talent contributes to this albums glowing stardom. Land-slide happens to be a very hot song.

As for the "death of the progressive Fleetwood Mac", you couldn't be more wrong.

Now my second complaint. At this very moment, I am listening to an extremely talented artist. Dan Fogelberg proves once more, if you have the ability and talent (which he does) and the incentive, you can succeed (sic). He not only wrote the songs on the album, but he also played nearly all of the instruments on top of that, he does all of his cover artwork. Regarding your statement of Crosby & Nash being undertalented, I'm sorry to inform you, but this is also wrong. They were part of a very successful group. Although the group was short-lived, they went on to put out two very fine lp's. As for these reviews. . . . Performance: F.

I base my third conviction on the previously stated facts. Captain Fantastic and the Brown Dirt Cowboy. What can be said? Elton and Taupin have fallen from their lofty positions among the stars. Just because someone pumps out asinine albums, one after the other, does not mean they are successful. What it is, simply enough, is the fulfillment of a recording contract. You ask "How in 1976 does anybody review an E.J. record?" The answer is easy. Just as you would any other album. . . hopefully objectively. Just coz (sic) the guys have put out some top notch albums, that doesn't mean they're superstars. It takes alot (sic) to be a superstar, and "junk" albums aren't one of the qualifications.

I wouldn't be surprised if this isn't published. You have proven to me that your staff doesn't have enough balls to stray from the safety of their top 40 ideals.

M. J. Martis
Monongahela, Pa.

Editor's Comment: Thank you for your compliment on *Audio's* "systems" articles, and congratulations on your choice of journalism as a career field. Some things you should find

JVC has changed the face of high fidelity. Inside and out.



Despite the advancements in high fidelity, stereo receivers have become pretty much look-alikes and perform-alikes. Until now.

When you look at JVC's new S300 receiver you can see what we mean. JVC has eliminated conventional rotary controls completely and replaced them with direct-action push-buttons for all program sources, and precision slide controls for volume, balance and tone selection. This clean, uncluttered styling achieves a distinctively professional look. But it's more than a look. The S300 is quality all the way—sound, performance, engineering.

Even though the S300 is the middle model in JVC's new series of five professional receivers, it shares much of the advanced circuitry and many of the features of the top professional—the S600.

For instance, unheard of in a

moderate priced receiver, the S300 offers individual tone adjustment over the entire musical range with JVC's exclusive five-zone control SEA graphic equalizer system. And where conventional receivers include center-channel and signal strength meters only, the S300 also gives instantaneous power output readings with twin wattage meters. Recording fans will especially appreciate the dual tape monitor recording/dubbing feature.

The JVC S300 has a power handling capability of 50 watts per channel, minimum continuous power into 8 ohms, from 20 to 20,000 Hz, with no more than 0.3% total harmonic distortion.

Thanks to an FM tuner section with a dual-gate MOS FET and 3-gang tuning capacitor, plus phase lock loop IC and quadrature detector circuitry,

stations come in cleanly and effortlessly with incredibly low distortion and extraordinary channel separation. And you can select stations precisely with the unique gyro-bias tuning knob.

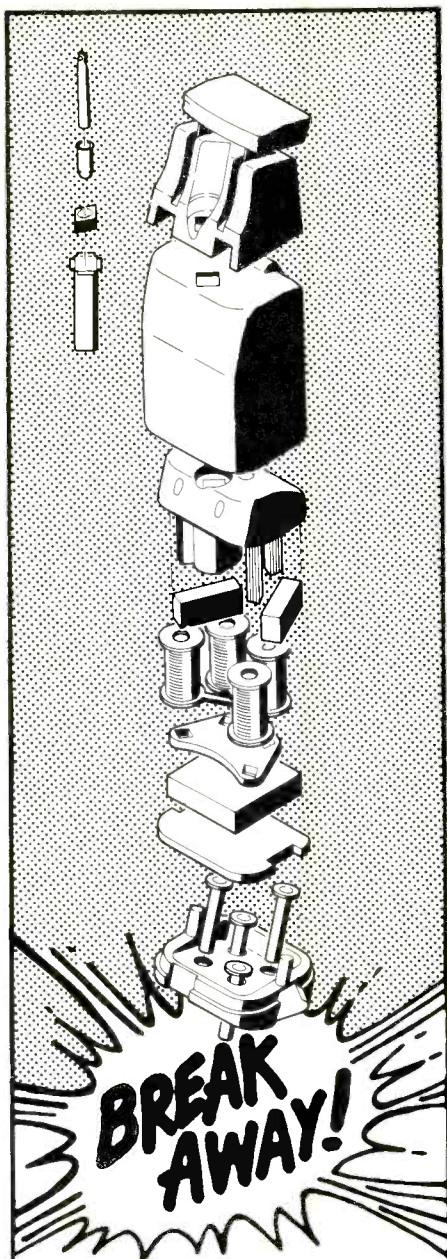
Call toll-free 800-221-7502 for the name of your nearest JVC dealer. Then visit him and see the professional JVC S300. You'll recognize it instantly. It's the one face that stands out in the crowd.

JVC America, Inc., 58-75 Queens Midtown Expressway, Maspeth, N.Y. 11378 (212) 476-8300

Approximate retail value of the S300 is \$400.

JVC

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The extreme accuracy of its reproduction allows you the luxury of fine-tuning your audio system exactly the way you want it.

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Already your system sounds better.



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helpful are: a good dictionary, a concise manual of grammar, some subscriptions to the rock journals, and some college courses in criticism.

Station Practice

Dear Sir:

In response to your request in the January issue for broadcaster's comments regarding the audio quality of radio stations, I would agree with Mr. Swartzendruber's observation that AM transmitters and their associated audio equipment are capable of audio quality which exceeds that of virtually all of the present AM tuners and receivers. It is not uncommon to find even relatively old transmitter designs capable of frequency responses of ± 2 dB from 25 Hz to 12 kHz. And now with more sophisticated modulation techniques, such as pulse duration modulation and others, as well as increasing use of completely solid-state transmitters with d.c. coupled modulators, response of ± 1 dB from 20 Hz to 15 kHz is not unusual. Also, square-wave response of the latest designs is very good, and THD at 95% modulation is usually under 1% for all frequencies and somewhat less than 0.5% for midband frequencies.

Unfortunately, this is not the kind of quality that many stations care to transmit. Many broadcasters choose to use the improved performance that results from the latest transmitter designs to increase the quantity (loudness) rather than the quality of their signals. But then, to many listeners, louder is better.

With FM transmitters, the situation is not quite the same as with AM. The current generation of FM exciters and stereo generators is still an order of magnitude or so below the quality of the very best state-of-the-art tuners. However, the inherent bandwidth and other limitations that are a part of both AM and FM stereo transmission systems prevent them from being as transparent as the electronics in most hi-fi systems.

In many cases, the reason for the poor audio quality of AM and FM radio is not the audio quality of the transmitter or receiver, but rather the audio quality of the programming. This quality depends upon how carefully the various assortment of turntables, tape machines, amplifiers, equalizers, filters, compressors, limiters, peak clippers, telephone lines, and station-to-transmitter microwave links that make up a radio station are used and maintained.

There are other factors affecting a station's air sound over which the broadcaster may not have much control. These would include the quality of the records (mostly 45s) that radio stations receive from the record companies and the quality-compromising problems related to the tape cartridges that have become so common in broadcasting. The somewhat less than state-of-the-art performance of much of the audio equipment available from broadcast equipment manufacturers has led some more progressive-minded stations to use high quality audiophile equipment instead. Also, the use of matrix quadraphonic encoders, the impending adoption of "discrete" quadraphonic FM, and the proposals for AM stereo don't help the situation.

Another factor affecting the audio quality heard on the radio is the widespread use (especially on FM) of automation equipment and prerecorded tapes to provide a station's programming. Often the equipment is not properly maintained or programmed and the tapes are of poor quality. Use of noise reduction equipment with tape machines, while standard practice in recording studios and very common with audiophiles, is virtually non-existent in broadcasting. Some stations receive their tapes from a programming service, and only a few of these companies have more than casual concern about the quality of their tapes. Since automation equipment can run for hours unattended, often it does. The listeners may actually know more about the station's programming and its quality than the station's personnel.

Certainly, there are many exceptions to all of this. But these are not the problem. The exceptional stations are still too few and far between. What is needed, is more stations becoming concerned about the quality of their air sound and then taking the time and effort needed to improve it. In addition, these stations will need the cooperation of the record companies, equipment manufacturers, programming services and the listeners as well. Listeners can help by simply providing feedback for the broadcaster in the form of constructive criticism, including specific suggestions, when possible. In fact, a visit to a local radio station can be a very enlightening experience for both the listener and the broadcaster.

Scott Pendergraft
Chief Engineer
Radio Statesboro
Statesboro, Ga.

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Manufacturer	Brand	MAGAZINE A		MAGAZINE B	
		S/N Ratio Weighted in dB	Output @ 3% THD	S/N in dB (re: 3% THD)	THD at 0 dB (%)
TDK	SA	66.5	+4.2	66.0	0.9
AMPEX	20:20+	56.4	+1.9	—	—
FUJI	FX	60.0	+2.3	—	—
MAXELL	UD	—	—	58.5	1.1
MAXELL	UDXL	62.5	+2.7	—	—
NAKAMICHI	EX	60.0	+2.3	55.0	1.1
SCOTCH	CHROME	—	—	64.0	1.3
SCOTCH	CLASSIC	62.5	+2.0	—	—
SONY	FERRICHROME	64.0	+2.1	64.0	1.8

Decks used for tests: Magazine A-Pioneer CT-F9191 (cross-checked on DUAL 901, TEAC 450); Magazine B-NAKAMICHI 1000.

Two leading hi-fi magazines working independently tested a wide variety of cassettes. In both tests, TDK SA clearly outperformed the other premium priced cassettes.

The statistics speak for themselves. TDK SA provides a greater S/N ratio (66.5 dB weighted and 66.0 dB @ 3% THD), greater output sensitivity (+4.2 dB @ 3% THD), and less distortion (THD 0.9%) than these tapes.

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Duntech Speaker



The Duntech DL-15 loudspeaker system incorporates a 15-in. woofer specially designed to match the dynamic behavior of the air mass inside the bass enclosure. Distortion is claimed as less than 0.3% THD or IM from 30 to 20,000 Hz at 90 dB SPL, and at less than 1.6% THD at 30 Hz at 100 dB SPL. Claimed frequency response is ± 3 dB from 27 to 20,000 Hz, and transient response is less than 1.5 cycles of overshoot at any frequency from 30 to 20,000 Hz. The floor standing system is 32½ in. H x 23V in. W x 18 in. D and weighs just under 100 lb. Price is \$449.00 each.

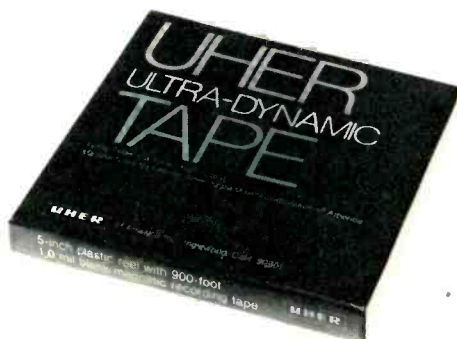
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Polyphony Magazine

PAIA Electronics is publishing a quarterly magazine called *Polyphony* for users of electronic music apparatus. The periodical will be primarily directed toward the user of electronic musical equipment rather than the designer. About a third of each issue will be generated by the readers with the remainder being staff material. The price is \$2.00 per year. A free copy can be obtained by checking the Reader Service Card number below.

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Open-Reel Tape



Uher of America offers its first open-reel tape, a 900-ft., 1.0 mil. blank tape called Ultra-Dynamic. The ferric-oxide formulation has high output and low-noise characteristics and comes on a five-in. plastic reel. Price: \$6.95.

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Tie-Clasp Microphone



The Sescom MC-325 is designed for professional use, with any low or medium impedance amplifier. Complete with a tie-clasp, battery, 13-foot attached cable and transformer, and a professional-style 3-pin connector, this moisture and temperature resistant unit is designed for such lavalier uses as radio and television broadcasting, audiovisual presentations or similar sound reinforcement applications. Price: \$45.00.

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Technics Turntable



The Technics SP-10Mk2 is a three-speed, direct-drive turntable for professional use, featuring a quartz-controlled, phase-locked servo circuit. The rubber mat on the platter is electrically conductive, helping prevent the build-up of static electricity on the record surface. Wow and flutter is specified as ± 0.035 DIN weighted, with S/N at 70 dB (DIN 45539B). The aluminum diecast turntable measures 12.6 in. (32 cm.). The unit is 14-1/2 in. (36.85 cm.) W x 3-15/16 in. (10 cm.) H x 14-1/2 in. (36.85 cm.) D and weighs 21 lb. (9.5 kg.). Price: \$699.95.

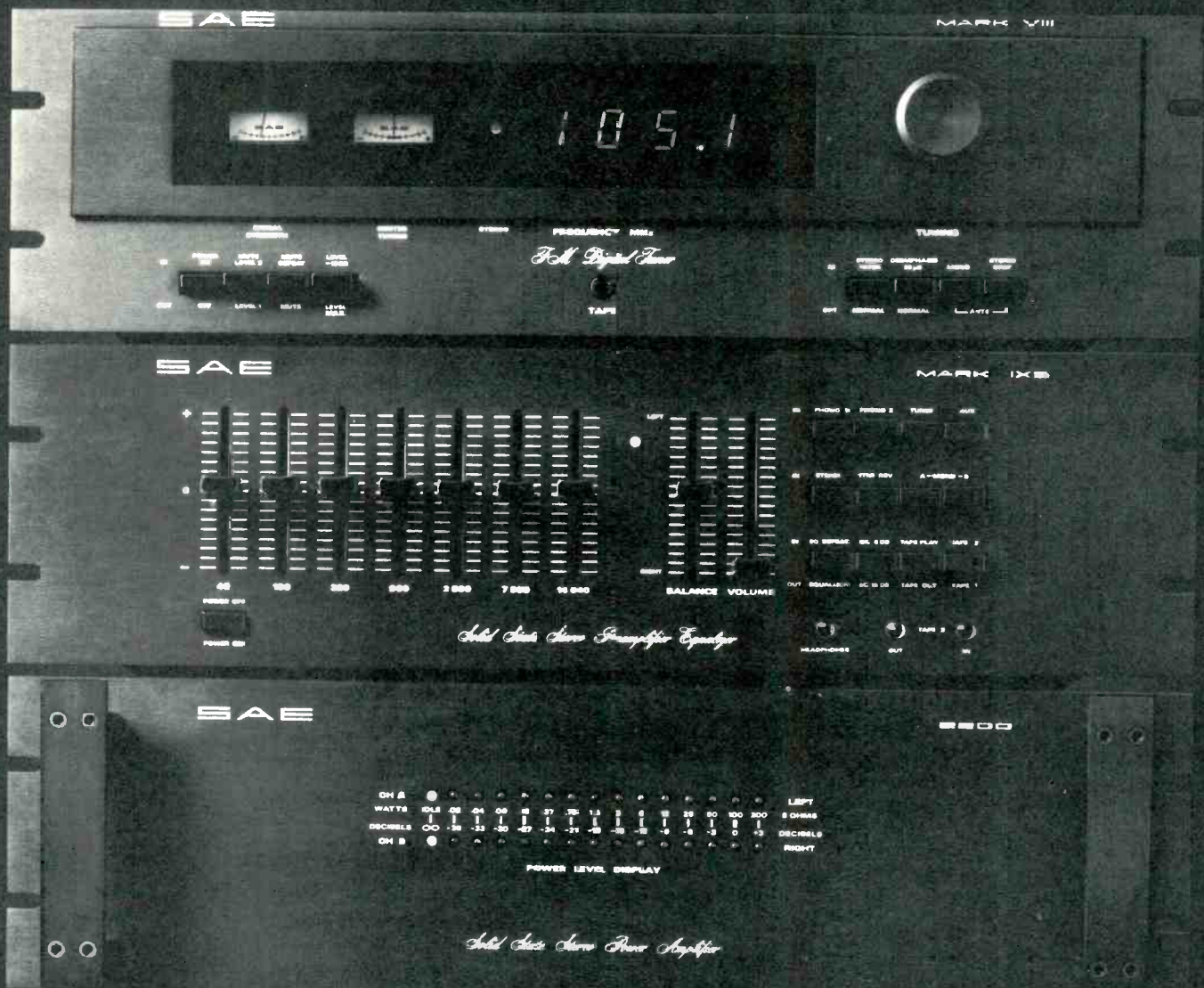
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Power Amplifier

The Bryston Pro-3 Amplifier is a fully complementary power amplifier of 100 watts per channel with distortion measurements typically below 0.02 per cent full band, full power or less. Specified IM and THD is 0.05 per cent, 20 -20 kHz. A slew rate stated at greater than 20 V per μ S, and damping factor is 500 at 20 Hz. Special attention has been paid to the elimination of objectionable transient distortion effects. Several years of empirical design work led to such features as protection circuitry allowing over 200 VA per channel into electrostatic loads, separate power supplies to all voltage-gain stages, and LED real-time overdrive indicators. Two stereo channels may be bridged into 400 W mono by throwing a single switch. Price: \$750.00, bridgeable version, \$30.00 extra.

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In the Black



Suggest Retail of System shown—Mark VIII(\$650.00), Mark IXB(\$400.00), 2200(\$450.00)—Total System \$1500.00

They say that you can't judge a book by its cover; that's true, but what a cover. What was, and is, the most beautiful look in the professional field is now the most daring look in general audio. BUT looks are not the whole story, in fact, not even the best part. Inside—that's where you find true SAE quality and performance. Here are just a few highlights of this SAE system:

MARK VIII FM DIGITAL TUNER—A 5-gang tuning cap., Dual MOSFET front-end, Linear-Phase IF filters with 7-stage limiter and PLL MPX. IHF Sen.—1.6uV, Stereo Sen.(—50dB)—30uV, mono THD—less than 0.15%, stereo THD—less than 0.2%.

MARK IXB PRE-AMPLIFIER EQUALIZER—Low noise phono circuits, 7-band equalizer with precision wound toroid inductors. THD and IM—less than 0.02%, Phono S/N(10mV ref.)—75dB, Aux. S/N—95dB.

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This system combines beauty, performance, quality and because its SAE a FREE 5 YEAR Service Contract. Compare and you'll find this is another great value by the people who make "Components for the Connoisseur."

SAE
Scientific Audio Electronics, Inc.

P.O. Box 60271, Terminal Annex
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Please send more information on the Mark VIII, Mark IXB, and 2200.

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Behind The Scenes

Bert Whyte

THIS ISSUE of *Audio* will appear during the Consumer Electronic Show in Chicago, around the middle of June. Many people in the hi-fi industry are anxious to see how much activity in quadrasonic sound there will be at this show. It is no secret that for the past two years quadrasonic sound has been in trouble in the audio marketplace.

To get a perspective on this matter, I interviewed Mr. Jerry LeBow, who is vice-president of Frank Barth Inc., New York, which handles the advertising for Sansui. Sansui is, of course, the Japanese company that invented the QS quadrasonic sound process. Mr. LeBow has been actively involved with all aspects of QS promotion and marketing and has demonstrated QS sound to many engineers in the audio, recording company, and broadcast fields. He is generally regarded as one of the most articulate spokesmen for quadrasonic sound, and in this interview, we herewith present his views on the current low estate of this medium.

B: Jerry, it would seem that certain segments of the audio press are determined to kill off quadrasonic sound, as evidenced by expressions in articles on the subject, such as "four-channel is dead," "the failure of quadrasonic sound," "the fading of four-channel sound," etc. How do you feel about this?

J: Many people have only a limited or superficial viewpoint of the quadrasonic scene, and I can understand why some of the entrenchment that has occurred in this field could cause some negative opinions. But four-channel sound is anything but dead. I think it is best described as in a dormant state or displaying a very low profile. It must be noted, that although quadrasonic sound enjoyed

quite a bit of activity in its early stages, for many reasons it was not properly brought to maturity.

B: In other words, it was brought out because the audio industry was looking for something new to improve the sales and profit picture, but unfortunately it was introduced prematurely, with many of the technical problems unresolved.

J: The crux of the problem was that the kind of quadrasonic equipment and some of the software that was originally sold to the consumer did not have the technical quality to impress and excite the consumer to a

high level of interest in four-channel sound.

Four-Channel Consumer

B: Quite true, however, I think we should define what we mean by a "quadrasonic consumer." There certainly was a large amount of very poor quality, mass market type of four-channel equipment sold, but most of the people who bought it were not discriminating enough to be annoyed with its shortcomings. I assume the consumer you refer to is one of that large group of people who own stereo component systems, but have not quite attained the status of audiophiles. Their opinion certainly has weight, and I should think that they constitute a large segment of the potential quadrasonic market.

J: I think quadrasonic sound is for everyone who has stereo and an interest in high-fidelity sound. They will like any system which can offer a substantial and easily perceivable increase of realism in the music they enjoy. You know, stereo was a dramatic improvement over monophonic sound, and when four-channel sound came along, they were expecting something equally spectacular. Because of poor equipment and misguided merchandising, many felt the improvement of quadrasonic sound over stereo was only marginal.

B: I couldn't agree with you more, Jerry, and unfortunately one of the factors that caused problems right from the beginning was the existence of three different systems for quadrasonic sound, your Sansui QS matrix, the CBS SQ matrix, and the JVC/RCA discrete CD-4. When the battle was joined among the competing systems, each touted their superior qualities, with the natural consequence that the consumer was



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The MD 500 dome midrange unit covers 500 to 5000 Hz with very low distortion, exceptional dispersion and correctly maintained phase relationship. The MD 500 possesses an extremely powerful magnet, ensuring critical damping and high power handling.

Ditton 66 employs a 12" bass transducer capable of exceptional quality low frequency reproduction. The diaphragm is formed of heavy fibre, plasticized to prevent resonances and suspended by means of a neoprene roll surround and concentric rear suspension. The result is ample linear excursion for lowest possible distortion on bass notes. Finally, a 12" auxiliary bass radiator with double roll suspension ensures correct ultra-bass reproduction to 16 Hz.

These drivers were totally researched, designed and built by Celestion to work together in the Ditton 66. Exceptionally clean, wide-open sound, outstanding dispersion and transient response, and total harmonic distortion of well below 1% at almost all frequencies—these qualities combined make a truly aristocratic performer of the Ditton 66.

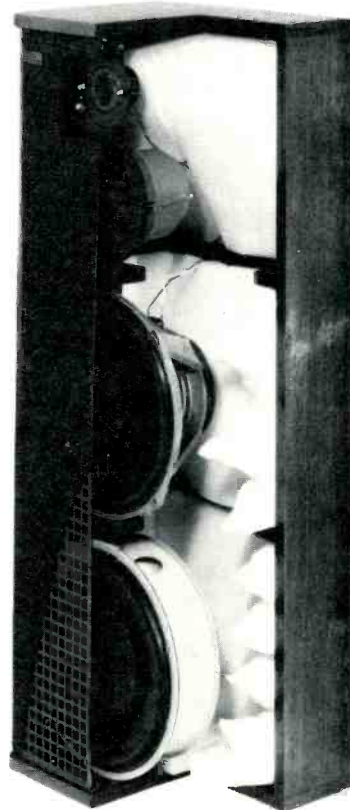
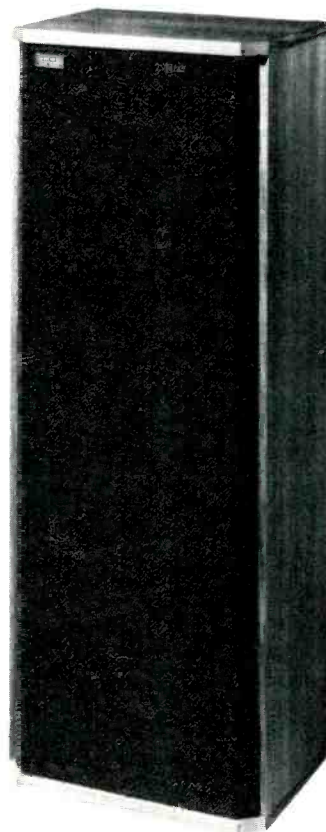
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more confused than enlightened. When it dawned on the three competitors that it might be to their advantage to "bury the hatchet" and jointly promote the overall concept of quadraphonic sound, it may have been too late.

J: Bert, you talk about three quadraphonic systems, but it must be remembered that much of the equipment was marked with such designations as Matrix 1 and Matrix 2, and Composer A and Composer B, plus RM, QS, SQ, and CD-4. . .no wonder the consumer was confused. Undoubtedly it would have been advantageous to have promoted quadraphony, rather than the particular systems.

B: Of course, one of the big problems with the three systems was that none of them had really achieved technical maturity. This was immediately noticed by the more discriminating audiophiles, and quadraphony got off on the wrong foot.

J: Unquestionably, the quality minded consumer was used to a very high level of excellence in stereo, with low distortion, good signal-to-noise ratio, wide dynamic range, extended bass response, good channel separation, etc., and he expected that quadraphony would be an extension of these parameters into another dimension. When the early four-channel equipment compromised the high standards of stereo in order to sell quadraphony at a reasonable price, this was not acceptable to the audiophile and the more knowledgeable consumers.

B: Jerry, you are aware that your Sansui QS system was some time in coming to your present high quality Variomatrix circuit, and the same thing can be said of the SQ system, which went from the most simple basic matrix to the advanced logic with variable blend circuitry. CD-4 was the most technically complex of the three systems and had more than its share of problems. We in the audio press had the responsibility of reporting on the development of these systems, and as the consumer read these changes, you can't blame them for feeling that the audio industry had gone into quadraphony a bit too early.

J: Well, it is easy to carp, but it is true that in the early days the three systems were quite rudimentary. The time it takes to develop integrated circuit chips for any decoding or demodulating system is substantial, and any chip requires a great deal of effort and quality control to make it work properly. Many manufacturers tried to

bring out receivers without IC chips, and these were strictly compromise units. Now, QS, SQ, and CD-4 systems all have IC chips that are the main parts, the integral parts of their circuits, and can fairly well be mass produced.

Three In One

B: Unfortunately, now that we have achieved a high degree of sophistication and good quality in the various chips, no receiver, at least none

"Many people
have only a . . .
superficial viewpoint
of the quadraphonic
scene. . ."

on the market that I know of, employs all three systems to maximum advantage.

J: That's correct. Manufacturers have found the cost of incorporating all three systems into a receiver would substantially raise the price of the unit. So they compromise by choosing to put in chips for two of the four-channel systems and use discrete components for the other system (usually of lesser sophistication). I think Sansui came quite close to a high quality universal quadraphonic receiver when they incorporated their Variomatrix with its own SQ decoding circuitry, plus CD-4 in their QRX units about a year and a half ago. The only thing that it doesn't have is the CBS logic system, because we feel the technology of variomatrix decoding is perhaps more advantageous than for logic decoding.

B: Getting into software, one of the early complaints about quadraphonic sound was that all three systems suffered from a scarcity of four-channel recordings, both in the popular and classical formats. Peculiarly, now that there are several thousand quad-

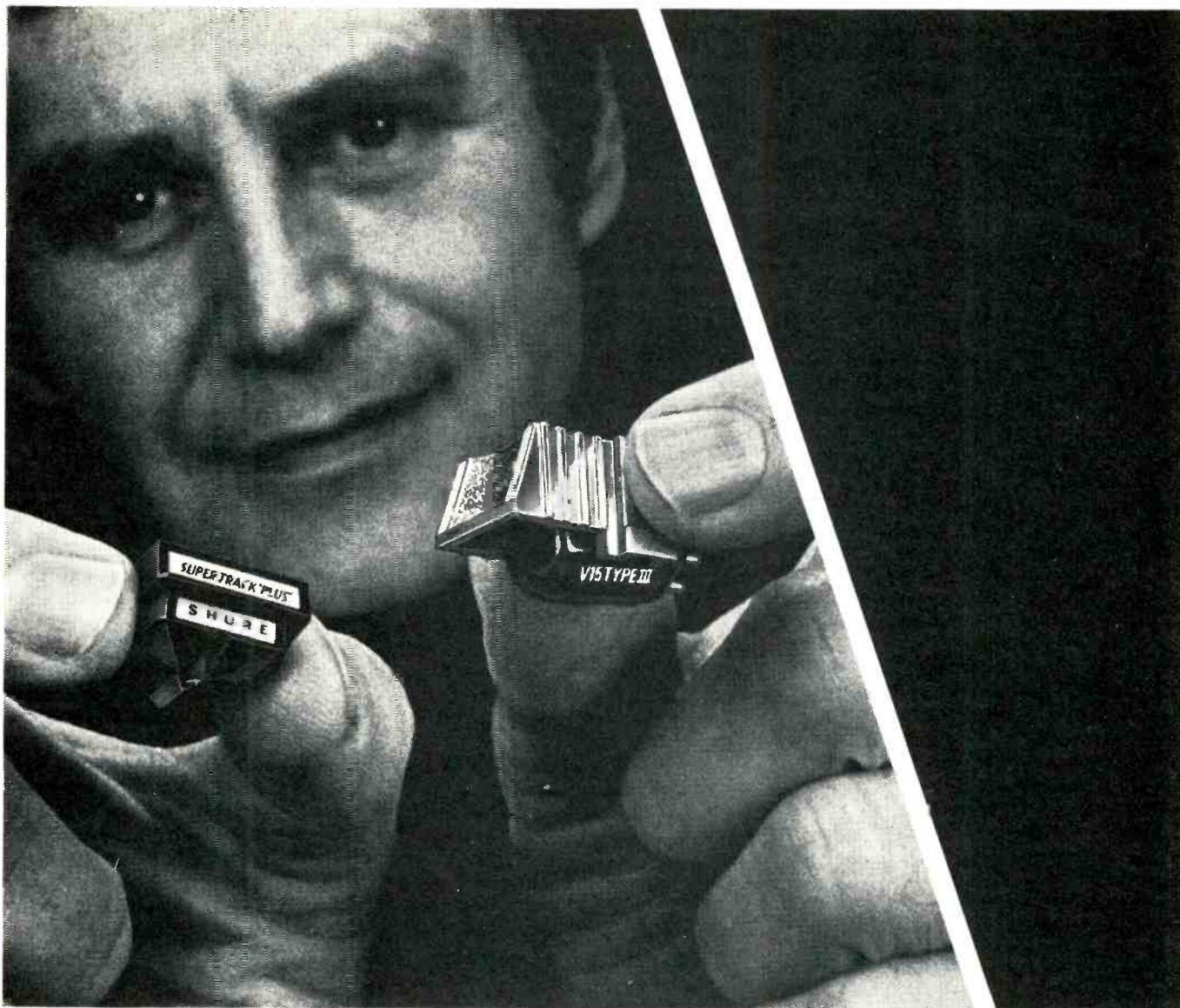
raphonic recordings available in the three systems, many people, including sections of the audio press, seem to think that the software shortage is still a problem.

J: I don't know why this notion hangs on, but in the early days of quadraphonic sound, there was indeed a lack of four-channel software, and I'd like to lay the blame squarely in the laps of the record companies. Record companies never seemed to take the initiative in terms of a major promotion to make four-channel sound ultimately successful. For example, the record companies got involved with quadraphonic experiments with the various systems, but they never really got behind anything and said they were going to produce four-channel records on a single inventory basis. The record retailer must also share part of the blame for the software shortage. Probably because of lack of information from the record manufacturer, the retailers felt that four-channel records were a breed apart from stereo records, that compatibility was non-existent, and therefore they segregated quadraphonic records from standard stereo production, much as they do with bird calls and ethnic music. This cut down on the exposure of a company's artist, who happened to be recorded in four-channel sound, since the retailer relegated the record to his quadraphonic bin, in an out-of-the-way corner of his store. Thus there was a reluctance on the part of the record companies to release four-channel records and mark them as such.

Single Inventory

B: Jerry, you recall that when RCA introduced the CD-4 discs, they were brought out in the single inventory mode, which of course was favorably received by the record dealers. But after a relatively short period they converted to a policy of double inventory, with a CD-4 recording and a stereo recording of the same program. Now we have the situation where almost every company which produces quadraphonic recordings is on the double inventory basis.

J: The idea of a single inventory was one of the guiding factors on which the QS process was founded. We have always felt that for a record company, and especially for a broadcaster who only has one option, that you must provide an acceptable stereo/monophonic playback as well as quadraphonic capabilities on your record. Since the inception of QS, record companies using this system



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Saving the best for last.

The chances are good that when you first bought a stereo system, it was a "package" that included a receiver, 2 speakers, and a record player with cartridge. But how much time was spent selecting the cartridge? Most probably it was just a minor element of the package. Even if it had a famous name, it probably was not a truly first-rank model.

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such as Ovation, ABC Dunhill, and Vox Records, and their European counterparts, Pye Records and French Decca, produced quadraphonic records in the single inventory mode. They evidently have faith in the stereo/mono compatibility of QS recordings.

B: I believe you have just returned from the convention of the National Association of Broadcasters where you noted that there is an ongoing interest in four-channel broadcasting. Whether the stations use your QS matrix system or the SQ matrix system, such broadcasts are increasing every month. Don't you think it is rather paradoxical, that with all this talk of "quadraphonics is dead," that four-channel broadcasting is in such a healthy state?

J: I certainly do!

Four-Channel Broadcasting

B: Many stations boast of 24-hour quadraphonic broadcasting, and while there are a substantial number of four-channel records available, one presumes that they are taking stereo recordings and running them through matrix synthesizers in order to have sufficient "four-channel" material for the 24-hour schedule.

J: Stations want to maintain a certain format in broadcasting quadraphonic sound, so that the listener at home does not continually have to use the four-channel mode switch on his receiver. They take whatever four-channel product is available and reduce it to one format. In other words, CD-4 and SQ records are decoded, re-encoded into the QS encoder, and then broadcast in the one transmission mode. And of course as you point out, there is extensive synthesizing of stereo discs through the QS encoder.

B: Did you hear anything at the NAB convention about when the FCC may make a decision on the broadcasting of discrete quadraphonic sound?

J: The FCC has a number of problems right now which far overshadows their interest in four-channel broadcasting. The vast backlog of Citizens Band license requests are absorbing a great deal of the Commission's time, as is the proposal of reducing FM interchannel bandwidth from 200 kHz to 150 kHz, as it currently is all through Europe.

B: Did anyone at the NAB convention bring up the subject of using Dolby with quadraphonic transmissions?

J: As a matter of fact, yes. A number

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J 2

of broadcasters asked us about the use of the QS encoder with Dolby, and we assured them that it was totally compatible. Probably a third of our 82 stations who are using the QS encoder also have Dolby encoders and are experiencing no problems.

B: Of course, there are no quadraphonic receivers from Sansui that have Dolby 25 microsecond facilities. So I presume listeners would need an onboard Dolby unit.

J: That is correct.

B: It occurs to me that this might be one avenue or approach to building new quadraphonic equipment, if things loosen up a bit.

J: There is no argument that quadraphonic sound is in a dormant state, but a lot of things are going on behind the scenes. There is definite activity in Europe, most specifically in Great Britain. For a number of years the British Broadcasting Corp. has been studying four-channel broadcasting and is coming fairly close to making some formal public statements about what they will accept and will adopt for a universal standard in England. I believe this will have a significant impact on American broadcasting.

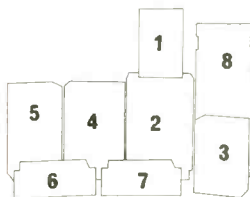
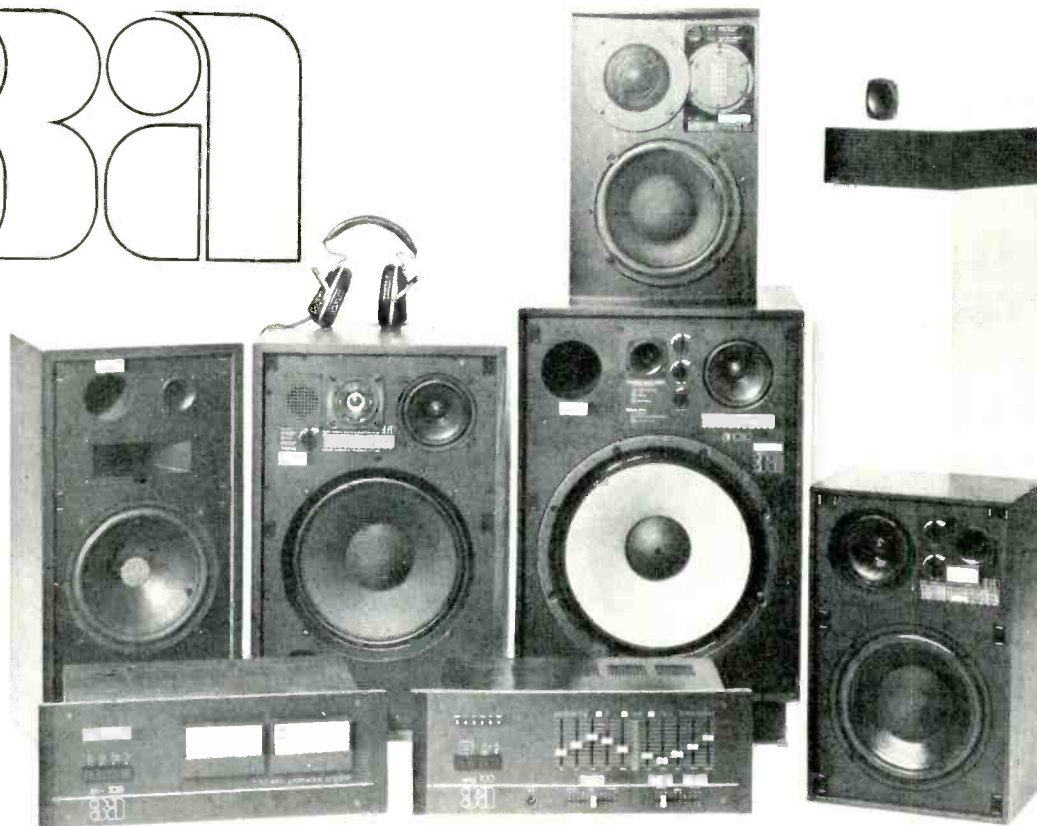
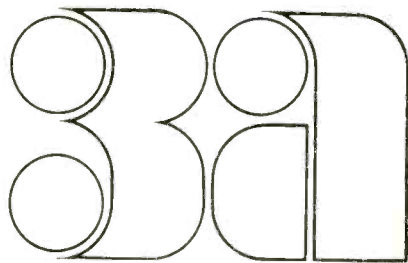
B: As a spokesman for Sansui, are there any new quadraphonic receivers in the works for the Consumer Electronic Show in June in Chicago?

J: Sansui is one of the few manufacturers who have continued to produce and sell four-channel receivers. We do have some plans, which I can't reveal at this time, but a new decoder, a new Variomatrix unit, the QSD-2 will be available, which will feature QS and SQ decoding along with two synthesizer functions. Several other companies are working on incorporating QS decoders into existing equipment, but it is difficult to tell whether they will be ready for the June Show.

B: Summing up, Jerry, it would appear that those who say that quadraphonic sound is dead are not correct. . . on the other hand we do admit that it is at a mighty low ebb, and my last question is what can we do to get four-channel sound going again?

J: I don't want to suggest that things will be better overnight, but sooner or later, the trial of the marketplace will shake out the three systems, and there will be a decision as to which technology is the most acceptable to record companies and broadcasters alike. When that is decided, the hardware people will move very quickly to produce appropriate equipment, and quadraphonic sound will be back and rolling.

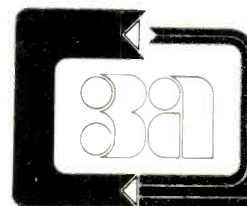
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Audio ETC

Edward Tatnall Canby



MY TECHNICOLOR (TM) memory of things past grows more vivid as I get older—it has, indeed, a sort of total recall on two counts, the directly visual and, equally, the directly “audible.” Mind-visible and mind-audible. The two coexist better than any videotape, and my own problem is merely dates—I can’t ever remember when.

I can see in my mind’s stereo eyes the very scene where such-and-such happened, orientated north and south or east and west. Usually I see a still picture, a snapshot—maybe because I’ve taken so many stills in photo-stereo color. I can see myself, for instance, in the R-J demo room at one of the early New York Audio Fairs, a room in the Hotel New Yorker (facing southeast)—holding up for the press one of the first of these “bull frog bass” enclosures. Or, much later (but when?), kibitzing around the edges of Edgar Villchur’s front mead-

ow at Woodstock, N.Y. (facing south?) while a string quartet played Bartok into outdoor stereo mikes for those AR “live vs. recorded” demos some of you remember. Had to have an absolute recording, i.e. near-anechoic, minus any ambience coloration—hence the open field.

I am always recalling exact sounds to match my memory vision; it’s a lifetime’s experience for me. Not merely audio sounds—everything. Can’t you just hear (as I can) that old 4-cylinder Dodge Car with the remarkable silent electric self starter (one and the same with the generator), a sort of discreet umph, umph, umph, barely audible? No whine, no wow-wow-wow at all, as though the engine were cranking itself. And my revered Uncle’s Franklins, of which he never had less than two and a new one each year until the Great Depression strapped him. I can see those Franklins (and recognize them instantly in current nostalgia ad

pictures), the elegant open touring models, the humpback he got for his wife’s shopping trips around town, the big sedan (1928), green, with a Roman temple for a radiator. But I can also hear them. Such a lovely gentle whistling sound, rising and falling as one footed the accelerator! A very high-bred and musical effect which for me was, and is, the ultimate in automotive swank. I know—it was just the Franklin air-cool fan; but how different from my current VW beetle! (*Editor’s Comment*—Hev, Ed, VW makes beetles, not Beatles, though I suppose a music-minded person such as you might be forgiven such a pun.—E.P.) One can, really and truly, design an air blower to sound swanky. Or sound VW-utilitarian.

Better, I can still vividly hear my Uncle’s voice, a sound which vanished forever in the spring of 1933, totally unrecorded. Lee Wilson Dodd was a poet and a Broadway playwright

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As for the specifications themselves, here are some examples. The Luxman M-4000 power amplifier has no more than 0.05% total harmonic distortion at any frequency from 20 to 20,000 Hz, even with both channels driven simultaneously to its rated output of 180 watts per channel minimum continuous average power into 8 ohms. Another M-4000 specification: signal-to-noise ratio beyond 100 dB.

Another example is the C-1000 preamplifier. Its phono-input circuits are virtually overload proof, accepting almost half a volt of audio signal at 1000 Hz. The distortion of its phono-preamplifier circuits is an astonishingly low 0.006%, and the rest of the preamplifier circuits add only 0.001% more.

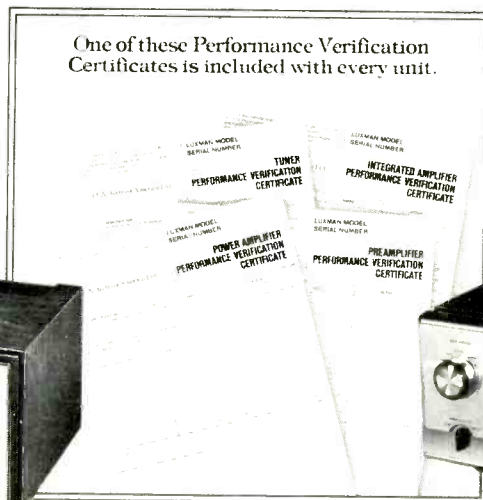
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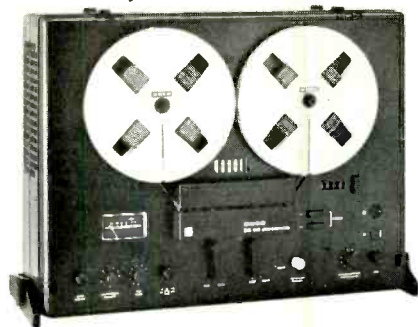
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in the 1920s, son of a railroad tycoon (hence the Franklins), professor of English and superb conversationalist and story teller, quizzical and enthusiastic. We have many a snapshot of the lithe figure with the jaunty straight pipe like FDR's, the sharp smile of delight as he relished the pay-off line in one of his own stories; *I can actually hear the precise sound of him*—even to the pitch of his voice and the quality, a sort of tenor-baritone, not at all loud or projecting but somehow rich and deep toned. A much beloved voice among his friends, as was the explosive laugh that ended every story—I hope some of them still hear it as I do. Dead for real.

I saw a Lowell Thomas TV show the other day—and there was old Hubert Heever, I mean Herbert Hoover, live in actual recorded sound c. 1931 or 1932—by golly, I instantly recognized *that* voice, though I would have thought I could only recall the round, deadpan Hoover of the still pictures you so often see. And in the same show we saw and heard old Thomas Edison himself, telling a story which he half forgot part way through, listening to his wife (?) through an ancient ear trumpet as she yelled into it; he was almost stone deaf by then. No electronic aids in those days. Yep, I even somehow knew *his* voice—just as I knew his picture, his face. So familiar.

Curious side lights to this. The first time I heard my own voice from a recording, I could not even recognize it as mine. Instead, I seemed to hear my own brother speaking! We have quite similar voices and the outside sound of his was far closer to what I heard on that 16-inch air-check transcription than the inside sound I heard as I spoke. Very common experience, this. Today, my inner and outer (played-back) voices are wholly one for me, after many years' experience. But that first time, from my very first-ever broadcast, which I had taken down via a New York recording studio (I think Nola), was NOT ME. And not very good, either. How could I be so awful? So I sat down with my half-hour script and studied that recording sentence by sentence, repeating the exact tones out loud so that I could find precisely what I had done to make such a mess of things. A revealing experience, direct audio, and far better than ten thousand courses in radio on so much paper.

When? Ugh—let's see. That was via old-band FM, station W75NY, still experimentally licensed; it soon be-

came old-band WABF, would-be FM commercial, before expiring with the near-death of all FM after the Big War when the new FM band obsoleted every receiver then in existence and television, in any case, had taken all the interest. Near-death for me, too, and I have been in non-commercial radio ever since.

I managed to preserve a few brief recordings of my own parents, now dead. A broadcast for each, my father in 1947 (via FM), my mother in a zany interview (so like her—the announcer was totally baffled!) perhaps in the 1950s; also some few minor home conversations, via Magnecorder PT-6 mono at 15 ips. All pretty high quality, and for me these tapes are totally realistic—I can hear my Ma and Pa so easily, just as they were! Wouldn't you? Yet a few years ago I played these very tapes for my aforementioned brother, who is totally unconnected with audio and recording. Afterwards, he sorrowfully admitted to me that he could not recognize any trace of either his own father or his mother. Just a lot of strange voices. He was puzzled and even distressed—rightly so. Wouldn't you be? I think there is a fundamental message there for all our audio. One must learn to interpret recorded sounds, however *hi the literal fi*. To the unprepared mind, they are often meaningless.

Do you think it is any different with, say, live music vs. the same recorded? Do you suppose that Beethoven would so much as even recognize a hi fi recording of his Seventh Symphony? I seriously doubt it. And by the way, do you think that stereo sound itself and, now especially, quadrasonic, registers automatically on any listening ear the first time? Absolutely NOT. One must learn to hear the stereo effect (as I myself had to learn it) by slow and repeated experience, as one learns the message of recorded music itself. Indeed, if it weren't for the general subliminal audio that we are all subject to so much of the time today, the entire process of sound and music reproduction would be largely meaningless for most normal people. How come the young rock fans always get the words in recordings, whereas most of us older listeners can't follow them at all? Practice! Training! Not a thing else. If more of us could realize all this, we might (and should) be a bit more confident about plunging into a new sonic medium such as quadrasonic. Stop, look and listen.

All of this is aside from my continu-

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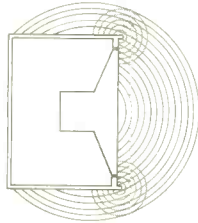
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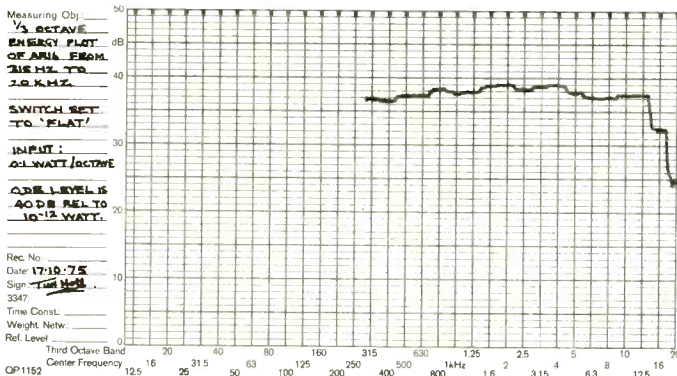
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ing leapfrog Survey & Nostalgia Course on Hi Fi History, as launched in the April issue. It's all a matter of re-collected sound, you see. Yes, there are many historical operating examples still around of the various types of speaker sound we have been buying up since hi fi got its official start (via LIFE magazine) c. 1947. (It was around much earlier but when LIFE wrote us up we were IN.) It is technically possible to hear what all the old systems sounded like, right now. Yet there are curious and mighty obstacles to any sort of realistic evaluation of them in the flesh, rather than (as in my case) inside the head.

Many are in audio museums, public or private. How many of us hear museums? Much more important, vast numbers of old hi fi systems still operate in the very living rooms where they were installed. But the trouble is, the people who hear them have absolutely no perspective on later audio nor any basis for comparative judgment, to place their sound in its own history. Very odd!

I am surrounded by such equipment in my Connecticut region, all of it properly maintained and operating like new. My nearest neighbor, an amateur cellist of European background, bought up a fairly expensive mono system about 1950 and she still plays as a matter of course the same excellent Brahms and Beethoven LPs she had back then, sort of to check on her own performance—carefully preserved Angel mono albums and the like. She can't borrow any of my zillion stereo records for fear of damage from the mono pickup. Is she happy? Of course! She has not the vaguest need for stereo, let alone quadraphonic, nor ever will.

Across the road, another old friend since my childhood has an unbelievable and almost brand new radio phonograph console, 78 rpm, and a batch of elegant old 78 classical albums to match—Rachmaninoff concertos and the like. She played them to me one time and I almost flipped—the old familiar sound once again, exactly as I remembered it, not only the original shellac discs but the very machine on which those discs were originally played!

She didn't flip. In fact, she was rather annoyed at me. After all, she had a perfectly good phonograph and what was I making all the fuss about? To her, the sound was normal, loud-speaker and all. Still normal. People like this live in total isolation from us—who move forward, if not always

upward, into newer and newer audio.

Take another neighbor, this man a retired New Yorker who has bought an enormous and decrepit mansion in a nearby town and just barely keeps it up—40 acres of lawn for his own mowing, without any help. He wanted to show me his super hi-fi recording system, with which he goes out and makes tapes of local events like an organ recital of Bach or a musical show at the school. I flipped again—for what did he have but a Berlant Concertone recorder, the Original Model, and some sort of all-tube very high-priced amp system, PLUS a perfectly enormous old speaker cabinet, six feet high, maybe a Jim Lansing? Mono—of course. He played his Bach organ and by gum, it was a beautiful tape, dated or no. In that cavernous big living room, c. 1902, I hardly noticed the absence of stereo. He hasn't the slightest interest in any newer equipment—in fact he is actively recording in the neighborhood right now. I must say I was impressed on this occasion. This was good sound, historical or not. It can be done! He also plays a vast collection of acoustic 78s on this relatively modern equipment, which does them good too.

So all of our hi fi history is still running concomitantly and *simultaneously*, if you look in the right places, each sound unique and good in its own living room, just as if there were no other. A crazy thought and the salesman types will blanch.

For several years recently I had a running correspondence with a gentleman in Australia who was having trouble with his system. He owned a pair of R-J speaker enclosures!! and had heard that they should be "tuned up" to match the drivers he had installed in them (at some prehistoric moment); could I tell him how? Back in the days of the R-J enclosure, you remember, hi fi speaker boxes were sold separately, the driver units the same. You put any unit you wished into the box of your choice. R-J did not sell drivers, only boxes. Phew—what a time I had. I was so flabbergasted that the R-J units—dating from when? before 1950?—were still in active use that I couldn't remember a thing about the system. This man, shall I say, importuned me; he kept at it. Finally I gave him an old address for J-Bill Joseph, one of the two R-J promoters and an electronic sales engineer who also sang bass in the same chorus as myself, 'way back then. R-Frank Robbins, was a busy and successful comic strip creator and

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also a classical Artist, probably too busy to bother with such things as R-J now. I think my friend eventually heard from J and is now happy. With his old speakers.

Good Lord, R-J! That was when a youngster named Canby first hit the hi-fi headlines (in this magazine) by dubbing the new R-J enclosure the speaker box with the bull frog bass. Helmholtz resonator, not unlike the basic bass reflex, but newly and ingeniously applied, a front loading on the speaker, to load down both front and back—a curious double half-moon curved slot in a plate mounted between grille cloth and speaker cone...was I vague! Front loading, yes—but was it tunable?? I somehow doubted it; didn't the slot shape have to do with smoothing the resonance...? So long ago.


The R-J enclosure, I can tell you without any doubts at all, was the first really practical and calculated solution to the need for big, smooth bass sound from a small box. And in its day it created a sensation. The R-J demo was the hit of the hi fi show that year (when?) and I was in the middle of it, naively, almost a salesman for the company out of sheer enthusiasm. I had to be tactfully restrained by our then Editor, who will remember. To the best of my knowledge, this revolutionary speaker cabinet in its brief day of fame really changed our industry; for this was the first of the familiar "bookshelf" speaker systems, the compact oblong designed to be used lengthwise or upright, to taste. Needless to say, after a very short time the other cabinet makers jumped on the bandwagon, in and around and alongside the R-J, and nearly swamped it with look-alike models.

It was easy, once the idea of the compact speaker box caught on; mostly it was done via more or less ingenious adaptations of the bass reflex idea (avoiding possible patent trouble with R-J, if & when), some sort of an extra hole in front that acted as a sometimes casual and hit-or-miss port to relieve the back pressure and maybe produce a convincing bit of boom bass out of a small space. Once the public got the idea of the bookshelf speaker and its compact relatives, there were no real problems—everybody made one and, alas, they all looked alike, if maybe they didn't always sound as good R-J nor produce as low or as smooth a bass. I would say that, unhappily, R-J suffered a sort of dilution which quickly extinguished its early fame. But a

much more radical innovation (surely made possible by the R-J success) soon came along with a coup-de-grace, the AR speaker, also "bookshelf." More on that later.

Just searched my attic out of curiosity and lo!—I found an R-J enclosure. (It seems to be one; there's no name plate left on it.) The company put out a number of models, with differing shapes for the front-load slot according to mathematical requirements of each enclosure. I have the fancy floor model, 12-inch speaker, in my New York apartment, serving as a coffee table—the honorable graveyard for dozens of my oldies. This one I have before me, with its back off, is the low-price model, unfinished, the original bookshelf. A pair of these, with handles, served me as my first portable speakers for lectures, demos, etc. (Ha! So I must have used them into the stereo era. That puts a terminal date on R-J viability in a fast-changing hi-fi world.) This box has a slot in its front face in the form of a diamond parallelogram, slant-wise. Behind it, inside, the speaker mounts on a platform fastened to side rails, with a calculated space underneath on each side communicating with the partially padded interior. There is no visible means of tuning, as I suspected.

No speaker inside—I must have removed the 8-inch unit way back. It was a blue Permoflux, an excellent low-cost little driver of the period with a softish cone and relatively low resonance, ideal for the new emphasis on big bass from small space; via added doping the cone could be (and often was) further modified for an even lower free-air resonance, unlike most 8-inch speakers which were then made tight and stiff, i.e. indestructible. Had to expect hard usage, when every loudspeaker was sold naked and out in the open! (I remember how surprised I was once when a similar small unit sounded better after I had accidentally torn a jagged hole in the cone with a screwdriver.)

R-J flourished a few short years and months, and let us give them credit (R and J) as pioneers—for don't we still have bookshelf enclosures and other compacts to this very day? It was an exciting turning point in hi-fi history. Big, clean bass in a small space. And this, curiously, anticipating stereo's primary need at a time when few of us had ever heard of stereo and many years before the stereo disc. History thus often anticipates itself, before the fact. 

PART TWO: THE END OF THE DOUBLE STANDARD.

In the frequency range where you find most music, our least expensive speaker offers virtually the same flat frequency response and freedom from distortion as our most expensive speaker.

Until recently, you could consider the selection of speakers an act of faith.

Because of the lack of industry standards and the resulting confusion in the marketplace, the speaker buyer had to depend almost totally on personal taste and subjective evaluation.

But no longer.

At Yamaha, before we designed a new line of speakers that would equal the revolutionary standard of our electronic components, we first defined our goal:

High accuracy across the musical spectrum. One of the few objective criteria for rating speaker performance.

Then we proceeded to make all Yamaha speakers to a single revolutionary standard of accuracy:

A frequency response curve that varies by no more than ± 3 dB from 100 Hz to 15,000 Hz. With typically no more than 1% harmonic distortion.

But since the frequency range of all our speakers extends well below 100 Hz to beyond 15,000 Hz, why do we even bother mentioning this figure?

Because, with the exception of the very deepest rumblings of a pipe organ, all music is produced within this range. In fact, few if any commercially available stereo pressings have frequencies below 100 Hz and above 15,000 Hz.

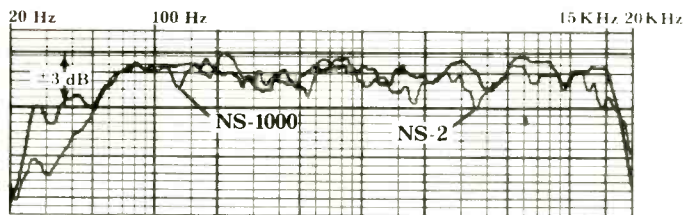
Yamaha's success in achieving a single standard of accuracy in all our speakers is confirmed in the chart above.

Unlike the frequency response curves of other speaker manufacturers which indicate unnatural booming in the bass, added sparkie in the treble, and extreme loudness level variations of as much as 10 dB, Yamaha's frequency response curves show a relatively straight line, which indicates uncolored, natural sound.

While many manufacturers offer accurate reproduction only in their top-end speakers, Yamaha brings you an extremely high degree of accuracy in all models throughout the line.

Yamaha's musical heritage.

Yet, in spite of Yamaha's objectivity in design, the perception of sound remains subjective.



While many manufacturers offer accurate reproduction only in their top-end speakers, Yamaha brings you an extremely high degree of accuracy in all models throughout the line. The above curves, comparing the NS-1000 with the NS-2, were recorded under the following conditions:
1. Equipment used — Bruell & Kjaer (B&K) 4133 microphone, 1022 oscillator, 2113 spectrometer, and 2305 recorder.
2. Input — A "pink" noise source was used with an input level of 3 watts (significantly higher, more rigorous, and more closely corresponding to actual home listening levels than the commonly used industry standard of 1 watt).
3. Measurement — Each loudspeaker was placed in a "free field" (off the floor and no closer than 5 feet to any wall boundary in an average size listening room). A multiplicity of curves were taken at various points in the listening room and averaged, to produce the total energy curves pictured.

That's why Yamaha speakers aren't designed to meet objective standards alone, but to meet a higher standard: the ears of the people who make Yamaha's world-famous musical instruments.

Since 1887, Yamaha has been making some of the finest musical instruments in the world. Pianos, organs, woodwinds, guitars, and brass.

With our musical instruments, we've defined the standard in the production of fine sound. And now, with our entire line of speakers and electronic components, we've utilized not only our studio engineers, but also our musical instrument designers to define the standard of music reproduction.

It's called Natural Sound. And it's totally unique to Yamaha.

Five different speakers, built to one standard.

Yamaha offers five different speaker models, ranging in price from \$1,350 a pair down to \$200 a pair.

At the top, the revolution-

ary beryllium dome NS-1000 Series, offering the ultimate in state-of-the-art performance. Following the NS-1000 are our other three-way types: the NS-690, NS-670, and NS-3. Our least expensive, but still highly accurate, is the two-way NS-2. Since each is built to the same high quality standard, you're probably wondering what those extra dollars are buying.

It's very simple.

To satisfy the most demanding audiophiles, those extra dollars buy extended response at the frequency extremes. Higher sound levels with equal or lower distortion. More power handling capacity. More tone controls to contour the tonal balance of the speakers with the characteristics of the room.

More specifically, on our model NS-670 and above, Yamaha offers die-cast speaker frame baskets to eliminate potential resonance. Luxurious wood enclosures (even rare ebony wood!). Tangential-edge

suspension for midrange and tweeter domes to provide smooth response. Acoustic equalizers on tweeters to flatten frequency response and enhance dispersion. Diagonally edge-wound voice coils for greater diaphragm control and increased transient response. Plus thick felt lining inside the cabinetry to isolate rear sound waves for distortion-free bass response.

But regardless of how much you pay, every Yamaha speaker is built to the same essential construction criteria and tonal accuracy.

Proven acoustic suspension design. Dome drivers for better high frequency dispersion. Carefully matched crossover networks. And heavily reinforced, extremely rigid enclosures.

The End of the Double Standard.

The single standard of performance found throughout the entire line of Yamaha speakers is a demonstration of product integrity that no other manufacturer can claim.

But in the final analysis, only your ears can be the judge.

That's why we invite you to visit your Yamaha audio dealer soon. His knowledgeable salesmen and extensive demonstration facilities can save you time and trouble in selecting the speaker that's right for your budget. And right for your ears.



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The Bookshelf

Sound System Engineering by Don and Carolyn Davis, 295 pages, 8 1/2 x 11, Howard W. Sams, 1975. \$19.95.

The eagerly awaited **Sound System Engineering** has arrived, bringing us rewards for our patience. Some portions of the text will be familiar to readers of *Audio* who have been enlightened by Don Davis' articles on speaker directivity and related subjects. That should whet the appetite for this in-depth treatment of those audio-acoustic areas that have been confusing to many.

The book fulfills the serious need for a one-stop source of information on taming the wild beast of sound reinforcement. After a chapter which provides clarification on decibel notation and usage, there are chapters on *Loudspeaker Directivity*, *The Acoustic Environment*, *Acoustic Gain*, and *Interfacing The Electrical And Acoustic Systems*. The text provides sufficient detail for the majority of readers to understand the theory and the necessary approaches to design. Those portions of the sound system that provide amplification and mixing are touched upon briefly.

Sound System Engineering is generally pitched to the contractor, but it should be useful and interesting to anyone involved in sound reinforcement. A chapter on installation includes valuable material on grounding, shielding, impedance matching, and time delay. *Equalizing the Sound System* gives both broad subject coverage from older methods to the real-time analysis now possible and critical examination of pertinent equipment characteristics, such as filter combining. There are also chapters on *Instrumentation*, *Sample Designs* and *Specification Writing*.

There are 11 appendices of various lengths and an adequate index. Worthy of particular note is the section on installation practices with very good coverage on both soldering and cabling. A listing of useful equations, a bibliography, and test questions and answers are also among the other helpful features. The printing and production of this hard-cover book is good with clear, pertinent, and up-to-date illustrations. The level of presentation is generally consistent and lucid, with just two unimportant errors noted. **Sound System Engineering** has a large format which provides twice as much material per page as the usual 6- by 9-in. book. As a result, it is effectively a "600-page" volume, putting it into the "good-buy" category. In a paraphrase of the authors' comments at the end of a chapter, this recommended book "will serve as a useful review for those already expert in this field and as a firm base for the person seeking to develop and expand his capabilities." *Howard A. Roberson*

The Complete Encyclopedia of Popular Music And Jazz, 1900-1950, Roger D. Kinkle. Four volumes, 2644 pages. Arlington House, 81 Chester Ave., New Rochelle, N.Y. 10801, \$75.00.

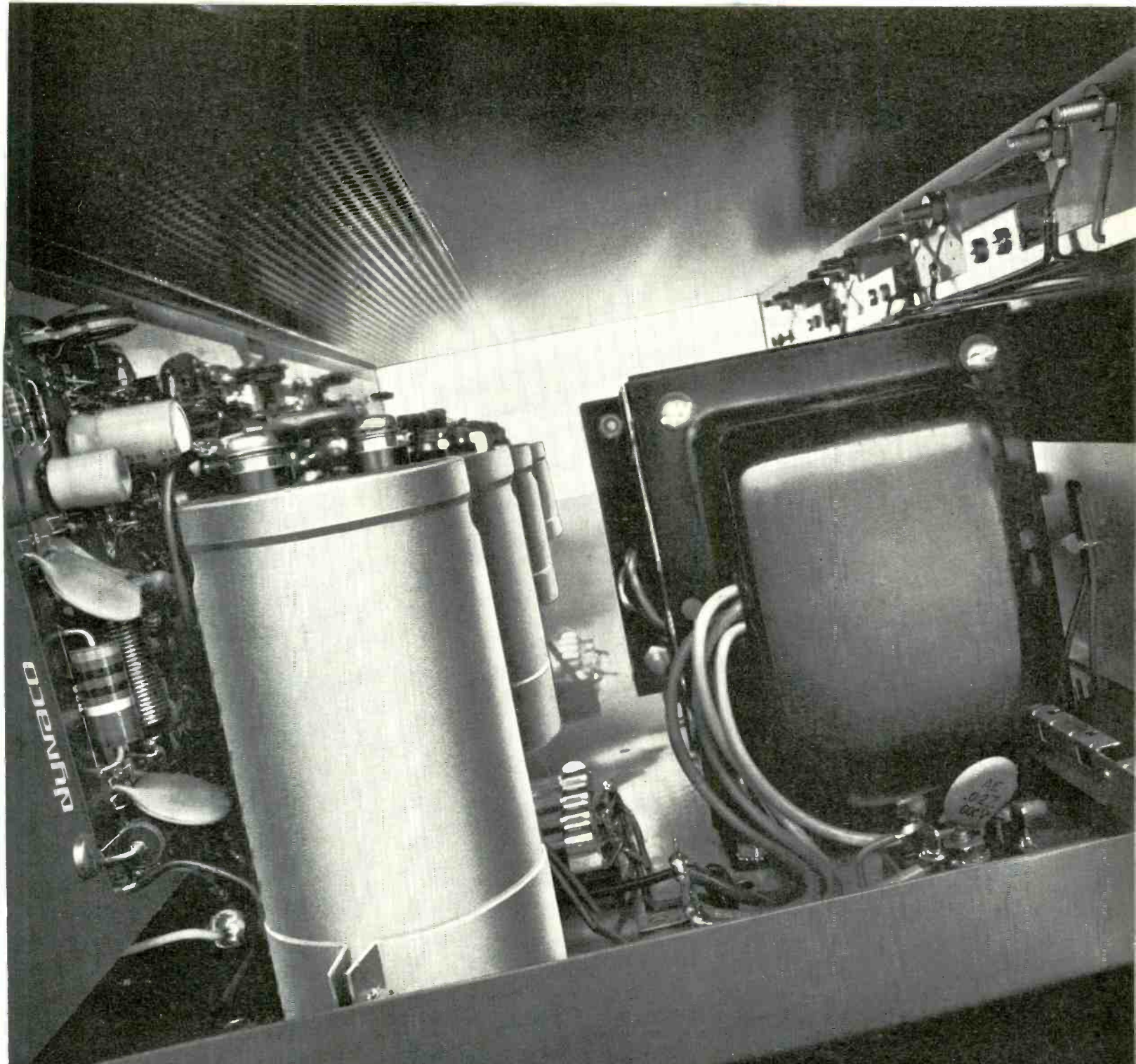
This four-volume set is the definitive data bank on American popular music and jazz for the first 50 years of this century. The coverage is exhaustive, including: *Movie Musicals* (1,230) — casts, songs, composers, year of release; *Performers* (11,505) — all major (and most other) singers, bandleaders, musicians, composers, actors, arrangers, and impresarios,

each with a career summary, key dates, film and Broadway credits, recordings, and compositions (by year). In brief, there is virtually every pertinent public fact about each performer and artist here.

The 100 to 200 most popular songs are listed by year along with their composers and the artists usually identified with them, plus another 20,000 which came out less successfully during that time. There are also the outstanding, and the typical, popular recordings from the first discs (78 rpms) in 1904, as well as outstanding jazz records starting with the Original Dixieland Jass Band in 1917 — about 75 a year. In addition, it includes a broad, in-depth discography for every performer. Further, all known Broadway musical shows are listed with their casts, playwrights, songs, and composers; a total of 1,522.

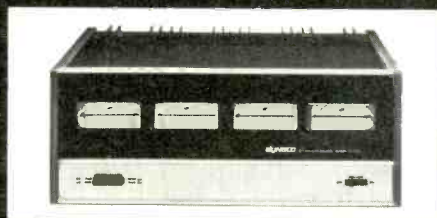
There are four massive indexes: 28,161 songs, 11,505 performers, 1,230 movie musicals, and 1,522 Broadway musicals. Five more indexes include a numerical listing of all discs released by the nine major companies from the mid-20s through the early 40s, by artist as well as song — 33,000 recordings. There are also the Academy Award winners and nominees from 1934 through 1973, along with all the *Down Beat* and *Metronome* magazine jazz poll winners from 1937 through 1973.

This is a unique reference work, absolutely essential to anyone writing on musical history of the first-half century of American jazz, popular music, movies, or musical comedy. No columnist, critic, biographer, or any other writer on these subjects can afford to be without a copy of this reference work. I've already sent off my \$75 for another set. *Charles Graham*



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In fact, the record's journey through lacquer manufacturing plant, recording studio, and record-pressing plant to the sales bin probably took six months or more. And throughout the process, each record has been tested and rechecked at least a dozen times so that you may enjoy sounds as close as possible to those that were recorded by the musicians themselves.

While the songwriter is still composing the music, lacquer-coated mastering discs are being manufactured at one of two plants in the United States. These extremely critical discs will bear the impressions made by electronic impulses that ultimately will be transferred through several metal platings to the final mold used in mass production of records.

Making A "Lacquer"

The base of mastering disc, commonly called a "lacquer," is a smooth, circular aluminum blank, slightly larger in diameter than a finished record and approximately 0.050-in. thick. It has a shiny, highly polished surface because it has been calendared by the aluminum manufacturer to a surface smoothness of 2 micro inches (500 angstroms).

At Capitol Magnetics Products' plant in Winchester, Va.—where the accompanying photographs were taken—a unique step is then taken, lapping which consists of grinding away the disc's surface and then repolishing it one additional time. This insures that no surface imperfections have been ground into the disc's surface in the calendaring. These imperfections, evident in this stage as tiny lines, rolling marks or pits, would show up later in the finished lacquer. Capitol has also found that a lapped surface results in better adhesion between aluminum and lacquer and is the best method for obtaining disc flatness. If the disc is not absolutely flat, it may not cut well and the sound of the final record will reflect the uneven surface.

Once the disc has been polished down to acceptable surface specifications, it is nearly ready to receive a coating of lacquer. However, before

coating, this smooth disc will have to pass through five chemical baths, a water wash, a drying process, and be checked once again before it is ready to be sent to the coating room.

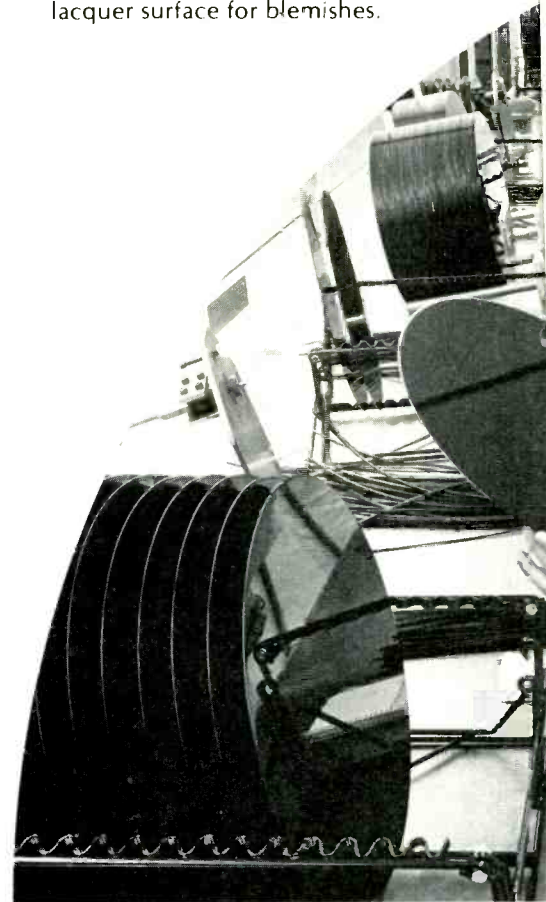
As the aluminum blanks are being lapped, etched, and dried, a special nitro-cellulose lacquer formulation is being blended, filtered, refiltered and then de-aerated in a series of large tanks in another part of the plant. Samples are tested regularly to determine the lacquer's chemical purity, composition, viscosity, and dispersion and to check for air. Any lumps or bubbles in this complex mixture must be removed before coating or they may later rise to the surface of the coated disc and cause noise clicks, pops or other audible imperfections when the disc is cut.

An exact balance of ingredients is also required so that the product will perform reliably through all the various electrical and chemical processes that will be performed on it during the manufacture of a record. For instance, a lacquer must not only cut well in the recording studio, but also process well once it has been cut and then sent to a manufacturing plant for plating and creation of the molds from which multiple copies of the record will be made.

The lapped, cleaned, and dried discs come together with the lacquer in the coating room, an environment-controlled "white room" filtered for Class-100 Air—the same standard of air cleanliness necessary for space components and surgical drugs. Air in this room must have less than 100 particles of dust, all less than 0.3 micron in size, per cubic foot of air. People working near the coating machine wear dustfree lab coats and caps and at no time touch the disc's surface. They also do not allow two discs to touch; if one disc even leans against another, the surface will be ruined.

The disc is coated on one side at a time and then carried by conveyor belt through several hundred feet of drying tunnels. Long, slow drying at correct temperature is necessary for even evaporation of gases and solvents used in blending materials which make up the lacquer. Rushed drying at high temperatures would boil off solvents too quickly, creating pin holes and blemishes on the surface. A quality finished lacquer has the smoothness of ground optics or 100 angstroms (0.4 millionth of an

Quality control inspectors check lacquer surface for blemishes.



The finished stamper is put into the record pressing machine.

*Ralph Cushino is Director of Engineering, Capitol Records, Inc., Hollywood, Calif. 90028.



The lacquer travels through the monitored drying tunnels.



MAKING RECORDS

Ralph Cushino*



Completed records are then put into sleeves and jackets for shipping.

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inch) in order to provide optimum low-noise properties.

After drying, the lacquer disc is

room specially designed for the proper acoustics, where engineers record the musicians, producing a master tape. Getting the exact combination

Once the reference lacquer is finished, it is sent back to the recording studio where the artists, producers, and sound engineers listen to it. If



The silver mother is carefully stripped from the master lacquer.

final plate from which the records will be made. Since the final mold must be a negative impression (the lacquer master was a positive impression, the silver a negative, and the nickel mother was positive), the nickel mother is sent back to electroplating for a final nickel mold called a "stamper." Later this stamper will be inserted in a pressing machine and used to stamp out records.

Several stampers are usually made from each mother since stampers wear down during the manufacture of records. For extremely long runs, such as for a record made by one of the Beatles, as many as 1000 or more stampers may be used.

As each of the three molds (silver, nickel, and stamper) is made, a specialist carefully peels the new material from its mold and checks to see that the new mold is flawless. The worker then places the material in a metal trimmer to cut away any excess material. In the next step, the mold is placed on a revolving turntable and carefully cleaned to remove any stray particles which might have lodged on the surface or in the mold's grooves. Alcohol is used to clean silver masters; jewelers rouge is used for nickel molds.

Testing of the "Mother"

Because the mother is so critical, this mold is sent to the testing area when finished to be critically checked for sound quality. This is the first time it can be played! Using specially designed electronic playback equipment, the quality control inspector listens to the audio signal. If any pops or groove damage are evident, the inspector either rejects the mother outright or, if the problem is minor, inspects the mother under a special mi-

croscope and then carefully makes the repair with a small needle-like instrument.

Correct testing of the mother is absolutely critical to getting quality finished records. Clicks and pops must be picked up here or they will be transmitted through the remaining molds into the pressing process.

After the final production mold, a stamper, is trimmed and cleaned, it is taken to the centering machine where a worker determines the exact center of the mold using a microscope with a graduated screen. A hole is then punched out which assures accurate location of the final spindle hole. At this point in manufacture, the stamper is also back sanded, die punched and formed to fit the mold configuration. Great care is taken that nothing happens to the stamper during all these processes. If the stamper is rubbed up against metal, for instance, it might get a tiny surface scratch, which would result in a clicking sound in the final record.

Each record has two stampers, one for each side. These final molds are placed in the pressing machine, permitting stamping of the final product on both sides at once.

Pressing

The record you buy in a music store is made of a vinyl compound which is mixed and pumped to the pressing machine area. Here it is released down through overhead pipes into the pressing machine where it is converted into small lumps known as "biscuits." Labels are attached, and the two stampers clamp together to press out a completed record.

Like all the other phases of record manufacture, this process must be carefully monitored. Vinyl must com-

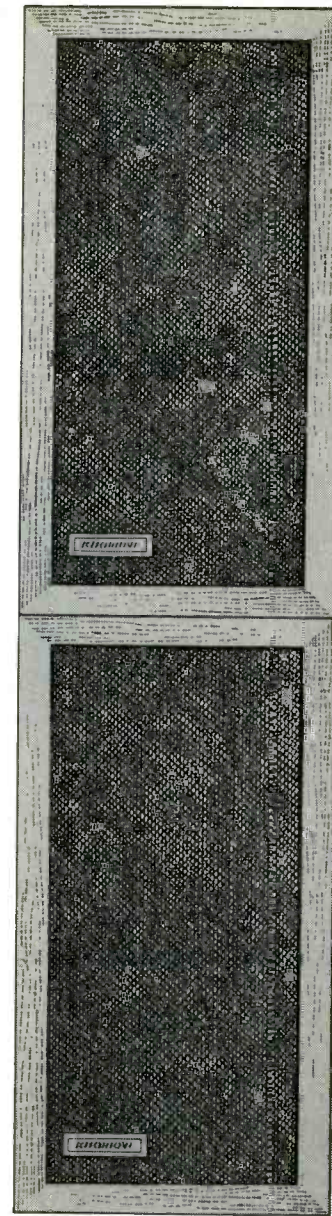
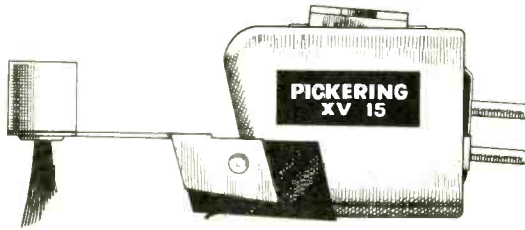
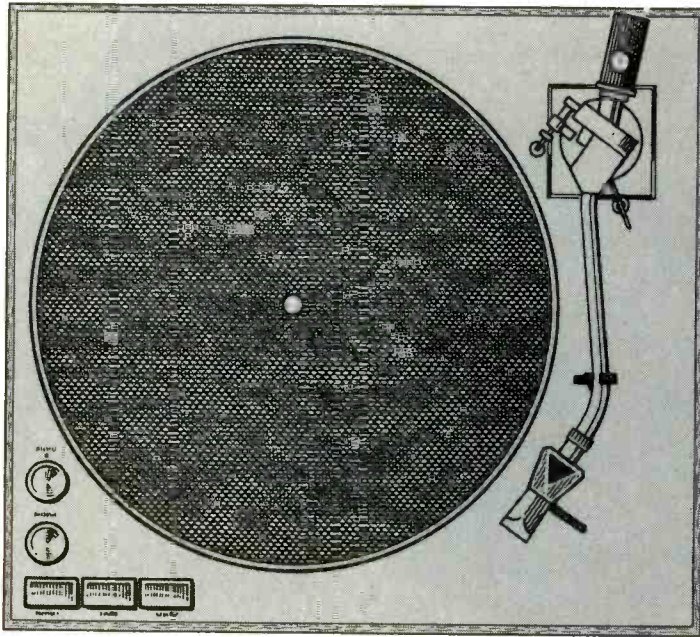
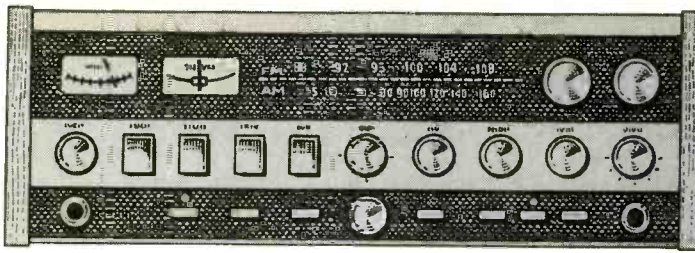
pletely fill the stamper's grooves, for instance, or sound quality will be affected. Also, stampers must be regularly inspected for wear, since a stamper that is used too long will produce records with noise.

Once records are pressed, they must be uniformly cooled. If cooling is not done properly, warping can result. Usually, completed records are placed on a spindle under weight.

Each fully automatic pressing machine at Capitol Records is able to produce about 1,800 12-in. records per day. A large pressing facility may have as many as 50 machines permitting production of up to 90,000 albums in a single day. Thus, record manufacturers can keep up with the consumer demand, which, last year, amounted to 276 million albums and 204 million singles.

The completed records now have only a few steps of their journey left. Once again, they are visually checked and inspectors listen to samples from each run. Any discs with chemical stain, scratches, dents or damaged grooves are discarded. Plant workers then carefully place all records passing final inspection into protective sleeves, and, in the collating area, insert them into album jackets along with other materials such as librettos and photos of the recording star. The albums are then packaged and prepared for shipment to record stores all over the world where you may buy the record and enjoy the sounds recorded in that studio many months ago.

From recording microphone to a grooved vinyl disc, making a record is a complex and exacting process, but it is one that lets you enjoy your favorite sounds over and over again in your own home.



First Discover The ~~Fourth~~ Component!

*What is your First component? Is it your receiver? Your turntable?
Your speakers? Or is it your phono cartridge?*

We have become convinced that it really is your phono cartridge, even though we have been modestly advertising it for the past few years as your *Fourth*.

Let's face it, the cartridge is that important *first* point where the music begins, and if the stylus cannot follow its path accurately, no amount of expensive equipment . . . speakers, turntable or receiver . . . can make up the distortion it can produce. That is why you need a cartridge you can depend on. One that's the best your money can buy. Specifically, a Pickering:

Because a Pickering cartridge has the superior ability to "move in the groove", from side to side and up and down, without shattering the sound of your music on your records.

Because a Pickering cartridge possesses low frequency tracking ability and high frequency tracing ability (which

Pickering calls *traceAbility*™). It picks up the highest highs and the lowest lows of musical tones to reveal the distinctive quality of each instrument.

Because Pickering offers a broad range of cartridges to meet any application whether you have an automatic record changer, or a high quality manual turntable, a stereo, or a 4-channel sound system. Your Hi-Fi dealer will be able to recommend a Pickering cartridge that is just right for *your* system.

Your stereo cartridge is the *First* part of your music system. It is too important to overlook, and so is a Pickering.

For further information, see reader service card

or write to Pickering & Co., Inc.

Dept. A, 101 Sunnyside Blvd.,
Plainview, N.Y. 11803



"for those who can hear the difference"

Check No. 27 on Reader Service Card

Build a Rumble-Filter/ Bass-Boost Circuit

Dick Crawford



Example #2: Rumble Filter

- 1—From Fig. 4 (boost vs. $R2/R1$) determine ratio of $R2/R1$ for desired boost. In this case, no boost is desired and $R2/R1=0$.
 - 2—From Fig. 5 or Fig. 6 determine either the peak frequency or the -3 dB frequency. In this case there is no peaking, so the -3 dB frequency is 43 Hz.
 - 3—Determine the scaling factor by dividing the frequency determined in Step 2 (above) by the desired frequency. Let's assume the desired -3 dB cutoff frequency is 20 Hz.
Scaling Factor = $46 \text{ Hz} \div 20 \text{ Hz} = 2.3$
 - 4—From the scaling factor, determine the correct value of $C1$ and $C2$. $C1=C2=0.047 \times \text{scaling factor} = 0.047 \times 2.3 = 0.11 \mu\text{F}$
(Use either $0.10 \mu\text{F}$ or $0.12 \mu\text{F}$).
-

HERE IS AN active equalization circuit that can be used either as a rumble filter or as a combination bass-boost and rumble filter (Fig. 1). Active equalization is one means of boosting the bass response of a loudspeaker. To get best results you should know the characteristics of both the loudspeaker and enclosure (See Bibliography). However, you can experiment with this circuit to improve the bass response of your speaker system. A word of caution, though; large amounts of bass boost can damage a loudspeaker if played at excessive volume levels. So take it easy with the volume control until you have everything set up correctly.

Of course, the ubiquitous tone controls can be a form of active equalization circuit and are usually used to achieve the desired sound. However, they often fail because their action is so general. That is, in order to get an appreciable boost in the low bass regions, a moderate boost results all the way into the mid range. Room equalizers and graphic equalizers deal with this problem by dividing the audio spectrum up into smaller chunks wherein more specific equalization is possible.

Another problem is that equalizing networks often boost the bass not only where desired, but also in the sub-audio region. This can lead to overloading the woofer with rumble and other low frequency garbage.

This circuit, however, is a little different. Over most of its frequency range it has a gain of one, that is, the output level will be the same as the input level. This bass boost occurs over a relatively narrow frequency range (about an octave), and then a sharp cutoff of greater than 12 decibels per octave occurs at sub-audio frequencies. This acts as the rumble filter.

Earlier I said that this circuit can act as both a rumble filter and a bass boost circuit. How can that be? The answer is that the ratio of two resistors ($R1$ and $R2$ of Fig. 1) determines the frequency response characteristics. This is shown in Fig. 2.

When the ratio of R2 to R1 is two, the circuit acts as a rumble filter with no bass boost. In technical terms this frequency response is a second-order Butterworth high-pass filter.

The interesting thing happens when the ratio of R2 to R1 is made larger than two. Several of these conditions are plotted in Fig. 2. Notice that as the ratio is increased, there is a low-frequency peaking of the response. The greater the ratio, the more the peaking. Also, the greater the ratio, the narrower the peaking. And, the greater the ratio, the faster the cutoff slope below the peak frequency.

Circuit Limitations

What about the limitations of the circuit? It is a relatively narrowband circuit, and while this is generally desired for active equalization in the bass region, it is not the type of circuit for use as a tone control. Furthermore, it is only really suitable for about 13 decibels of boost. Beyond that, the peaking of the boost gets so narrow that adjustment to the speaker's characteristics gets very difficult. Also, there are practical problems in the circuit itself beyond this amount of boost. If you need more boost and want to use this circuit, I suggest that you use two in series. The circuit is designed for use at about the one volt level, that is, the level at which most high-level inputs (tape recorders, tuners, etc.) operate. At the one volt level, the signal-to-noise ratio is greater than 80 decibels. The distortion, for both second and third harmonic distortion components, is shown in Fig. 3 for various output signal levels. This was with 12 decibels boost at 50 Hz and should represent the worst case as far as circuit design goes. But there is a variation in performance of monolithic operational amplifiers, such as the 741 or 301A, as regards to distortion performance. This is hinted at in the rather wild variation of third harmonic distortion in the sample tested. However, my experience has shown that the total harmonic distortion from this circuit, regardless of the integrated circuit used, should not exceed 0.1%.

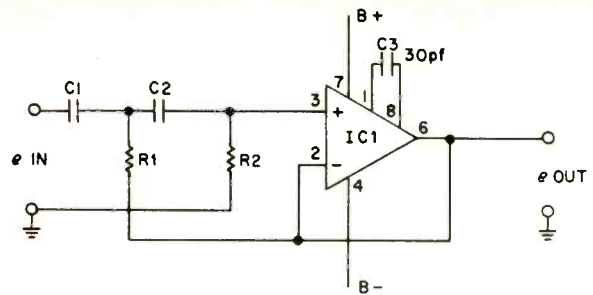
Design Adoption

Supposing that you wanted to build the circuit of Fig. 1, how would you start? Well, for one thing, the frequency response information could be plotted in more useful forms, and so it is in Figs. 4, 5, and 6.

Figure 4 shows the amount of boost at the peak in decibels as a function of the ratio of R2 to R1. Figure 5 shows the frequency at which this peak occurs, again as a ratio of R2 to R1. Figure 6 shows the lower 3 dB point, that is, the frequency at which the frequency response is down 3 decibels from the response at 1 kHz, and this is also plotted as a function of the ratio of R2 to R1.

Let's take a hypothetical case and see how the information in these graphs can be used to design the desired circuit. Suppose that a boost of 6 decibels is desired at 40 Hz. From Fig. 3 we see that a ratio of 14 is needed to give the desired 6 decibel boost. From Fig. 4 we see that, with the values of the components as given in Fig. 1, for a ratio of 14 the peak response is 135 Hz. But our goal for this peak is 40 Hz, so we have to "scale" the values of the components.

When an electrical engineer speaks of scaling, he is usually not referring to a finny fish or some craggy cliff. What he means is changing the values of a set of components so as to accommodate a new set of conditions. In the case at hand, we want to scale the circuit to the new frequency of 40 Hz while maintaining the ratio of R2 to R1 at 14. We can do this by changing either the resistors, the capacitors, or both. I recommend changing the value of the capacitors. If we wish to lower the frequency at which the peak response occurs, we have to increase the value of both of the capacitors in



IC1 = 741 OR 301A INTEGRATED CIRCUIT:

RADIO SHACK CATALOG # 276 - 007, OR MOTOROLA MC1741 C, OR RCA CA 3741CT, OR NATIONAL LM 301AN

Fig. 1—The boost and filter circuit.

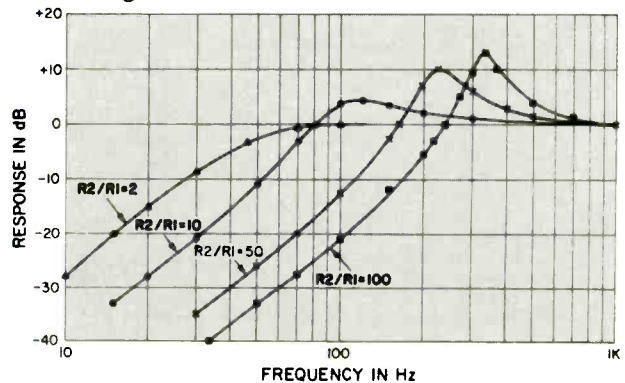


Fig. 2—Frequency response.

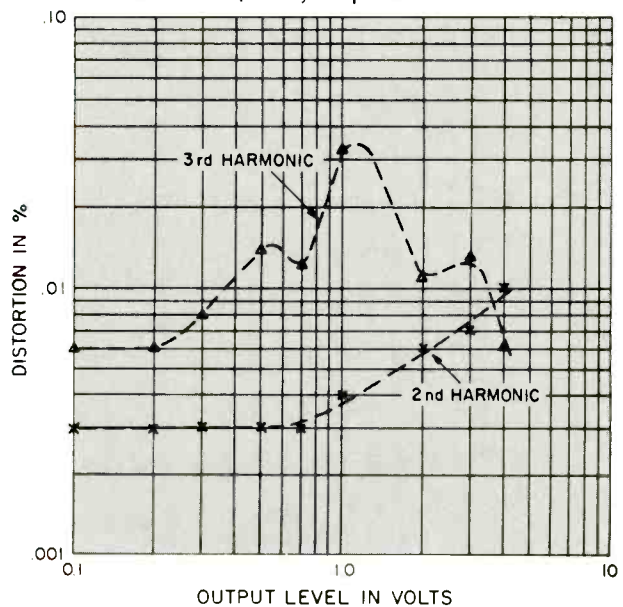
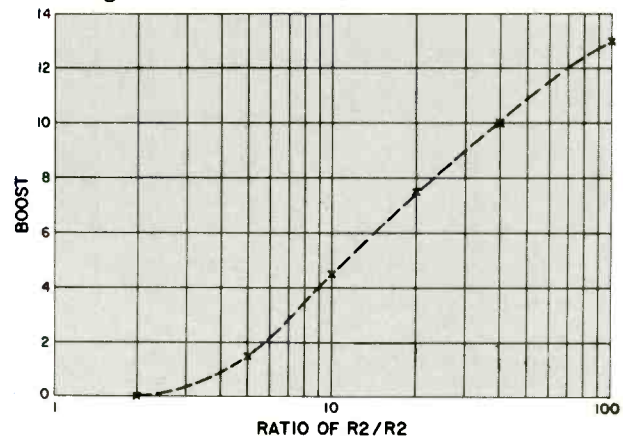


Fig. 3—Harmonic distortion vs. signal level.

Fig. 4—Boost vs. R2/R1.



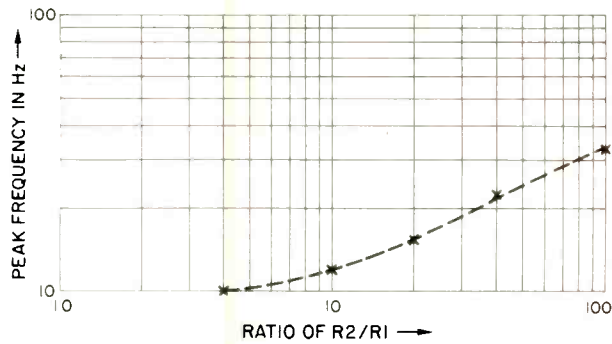


Fig. 5—Peak frequency vs. R2/R1.

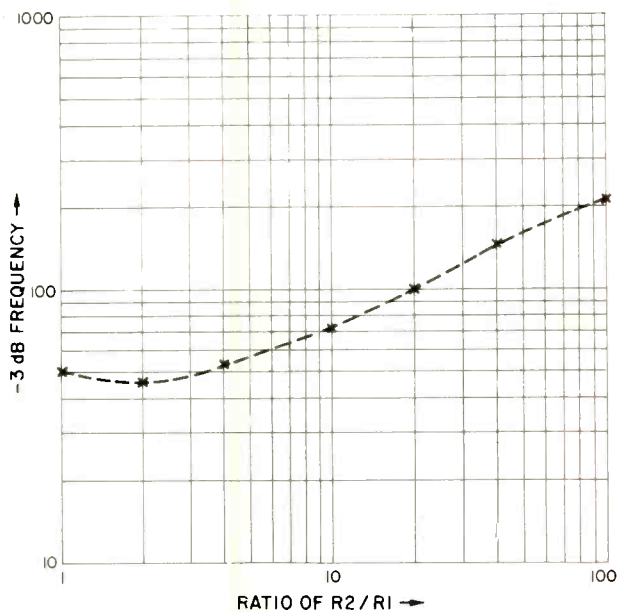
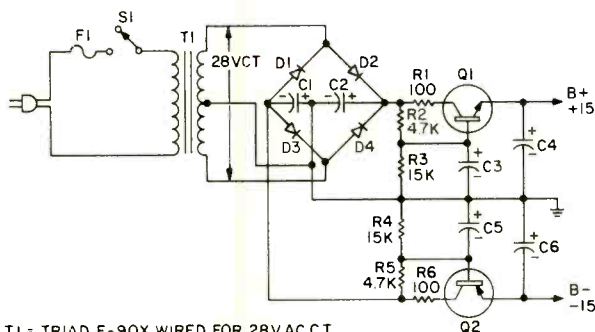


Fig. 6—The -3 dB frequency vs. R2/R1.

Fig. 7—Power supply.



T1 = TRIAD F-90X WIRED FOR 28V AC C.T.
 D1 THRU D4 = 50 PIV OR GREATER, 400mA OR GREATER
 R1 THRU R6 = 1/2 WATT, 10%
 C1 THRU C6 = 50μF OR GREATER, 25 VOLTS OR GREATER
 Q1 = NPN 3641 TRANSISTOR OR EQUIVALENT
 Q2 = PNP 3638 TRANSISTOR OR EQUIVALENT
 S1 = SPST, 3AMP AT 125V AC
 FI = 1/4 AMP SLO BLO

Fig. 1. If we double the value of the capacitors, the frequency of the peak boost will halve. In the case at hand, we wish to lower the peak frequency from 135 to 40 Hz, a scaling factor of 3.38. This means that the capacitors (C1 and C2 of Fig. 1) must be increased to 3.38 times the value shown in Fig. 1, or 0.159 μF. This is not a common value, so we will bend a little and choose the closest standard value of 0.15 μF.

Another example is shown in the accompanying box. In this case the desired response is that of a rumble filter, that is, no boost—just a fast cutoff. Notice the steps in the design cycle. If you are interested in designing your own circuit, I suggest that you try repeating the example of Fig. 7 so that you are sure you understand the procedure.

Notes on Parts

The components are non-critical, and 10% tolerance on capacitors and resistors is adequate. The integrated circuit can be either the 741 or 301A. None of the voltages exceeds 15 volts, so power dissipation or voltage ratings becomes non-critical. Vector board, punched at 0.1 inch intervals, is very convenient for assembly. Any electronic supply house, such as your local Lafayette or Radio Shack stores, should be able to supply these parts.

Power supplies? Well, if you are just experimenting and don't want to invest very heavily until you have decided that this is what you really want, your answer is simple. A pair of 9-Volt transistor radio batteries, such as those found in every drug and grocery store, is your answer. The circuit of Fig. 1 will work very well when using a 9-Volt battery for B plus and another 9-Volt battery for B minus. While some 50 hours or so of operation can be expected per set of batteries, be sure to include an on-off switch for the batteries so that their life will be extended.

For those who want a more permanent power supply, that shown in Fig. 7 should suffice. There is nothing magical about this circuit, and any supply giving plus and minus 15 Volts with low ripple will be adequate. The power drain is only a few milliamperes.

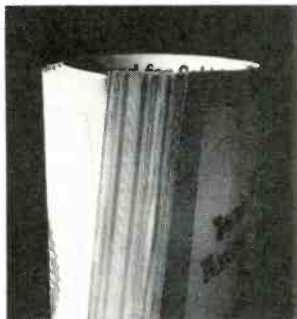
Two of the equalizer circuits are needed for stereo; they go between the preamplifier output and the power amplifier. Some integrated amplifiers and some preamplifiers have a set of connectors for active equalizers, and, if you are so blessed, that is where this type of equalizer goes.

I find that most everybody (except the neighbors!) likes lots of bass with their hi-fi. Active equalization is one way to get more bass, but, again, be careful in your experiments. In the long run, though, you are the final authority. If you want more bass, give this circuit a try.

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- 3—R.H. Small, "Closed Box Loudspeaker Systems," *Journal of The Audio Engineering Society*; Dec., 1972, and Jan./Feb., 1973.
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- 5—R.H. Small, "Passive-Radiator Loudspeaker Systems," *Journal of The Audio Engineering Society*, October and November, 1974.

ONCE AGAIN, THE EPI 100 HAS RECEIVED TOP RATINGS FROM THIS PRESTIGIOUS PUBLICATION.



In its February issue, the leading independent consumer testing magazine rated the EPI 100 the best speaker for the price among medium-priced speakers.

That's the good news.

The bad news is, because of its policy of strictly enforcing the copyright laws, we

can't name the magazine or quote it directly.

But we can tell you this: This is the third time running the EPI 100 has been so rated by the publication. And no wonder.

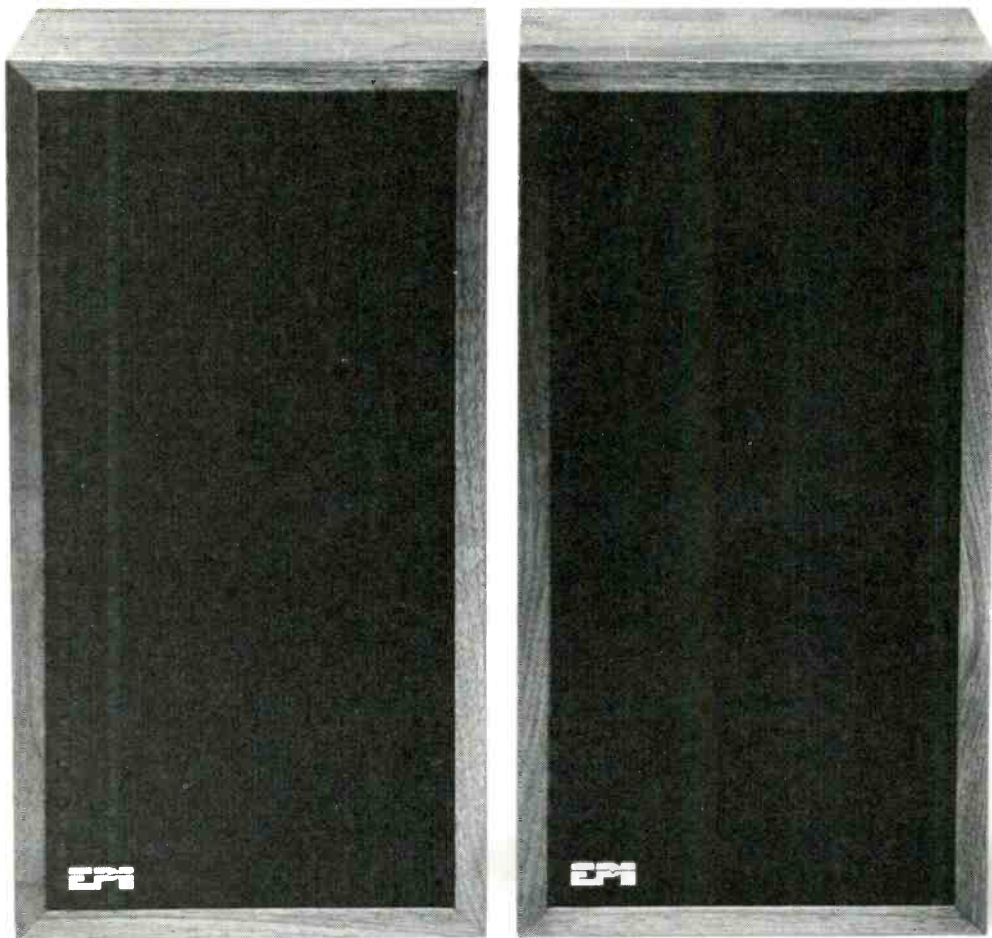
The EPI 100 offers EPI's celebrated Linear Sound: a pure, uncolored, natural sound from top to bottom. With no artificial boosting of the bass to impress the innocent. And all the nuances at the treble end that, on most speakers, just fade away.

The Model 100 doesn't just deliver the Linear Sound of EPI straight ahead, either. In fact, up to 15,000 Hz, the speaker's off-axis dispersion is down an average of only 3 db.

With its excellent dispersion and EPI's Linear Sound, we'd say the EPI 100 is clearly the finest speaker you can get for the money.

But don't take our word for it.

Take 's.



The Model 100 is available in a hand-rubbed walnut veneer or a vinyl finish (Model 100v).

THE LINEAR SOUND OF EPI

EPI is a product line of Epicure Products Inc., Newburyport, Mass. 01950

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The \$900 Sony Turntable.



Study this page, because we don't want the price to suck you in.

It would be a shame.

People responding to something because it costs \$900*. Not because it's worth \$900.

People captivated by price, not performance.

We at Sony don't want anyone spending good money for a great turntable for a bad reason like an impressive price tag.

Especially because there's so much technology in the PS-8750 for you to fall back on. After you spring for the \$900.

So before you spend a lot of money on us, spend at least a little time with us.

Total speed accuracy is our speed.

Speed accuracy can be a problem for turntables because the stylus continually puts pressure on the record (and, in turn, on our engineers.)

In fact, as little as one gram of stylus pressure can cause a slow-down in record speed. A slow-down that is particularly noticeable in loud passages.

Up till now, most good turntables achieved accuracy with a direct drive motor and a servo-system to control speed variations.

It was fine for most people. And it still is.

But for those with more elegantly attuned hearing, it's just not good enough.

That's because the servo-system will not serve when it comes to small, low-frequency speed variations. It is not sensitive enough, and the result is there to be heard—if you have the discernment to hear it.

To get around this, Sony took the conventional servo-system and revolutionized it by adding a quartz reference and a phase lock circuitry.

That mouthful is really easy to digest. The stable quartz generator emits a constant frequency. Any variations in speed monitored by the magnetic head are converted to changes in the phase of the signal. This is then compared against the quartz generator's phase signal.

If they do not match, our Xtal-Lock corrects the speed variation instantly.

A conventional servo-system has to wait for the error to appear as a change in frequency, and then it takes time to correct it.

Sony can make the corrections 10 times faster. And within one cycle. All because Sony uses the phase difference as a source of information on speed error, rather than using the angular velocity.

Chart A dramatically illustrates the dramatic difference.

Why our tone-arm costs an arm and a leg.

After conquering the drive system, Sony sped along to the tone-arm. The problem: constructing a light, strong tone-arm that has a low resonance quality.

A high resonance quality means the tone-arm vibrates—performing a duet with whatever record is playing.

Sony wrestled with the arm problem and

ating both the drive system and the return mechanism. Meaning that the turntable is linked to the tone-arm. And very often, this linkage produces a drag on the arm.

The PS-8750, however, proves that two motors are better than one. The motor that runs the tone-arm is totally isolated from the other motor that runs the turntable.

This eliminates the drag, particularly the drag at the very end of the record.

This drag is really a drag, because the return mechanism is preparing to activate itself, and the friction is therefore increased.

Sony further innovates by designing pick-up and return cues that are optically activated. Like the doors in a supermarket, if you will.

With the PS-8750, you get the best of the direct drive manual and the best of the semi-automatic. With none of the worst of either.

Does your turntable give you bad vibrations?

The same sound waves that travel from your speakers to your ears also travel to your turntable.

This transference excites the equipment. Becoming acoustic feedback, or IM distortion. And the louder you play your record, the more of it you get. There's cabinet resonance. Caused by sound waves.

And there's something called record resonance. Caused by the friction of the stylus in the groove of a warped record.

Sony, however, deals resonance a resounding blow.

We have built the PS-8750's turntable base of an inorganic material that is acoustically dead.

We have also undercoated the platter with an absorbing material that prevents it from transferring any bad vibrations to the good vibrations on the record.

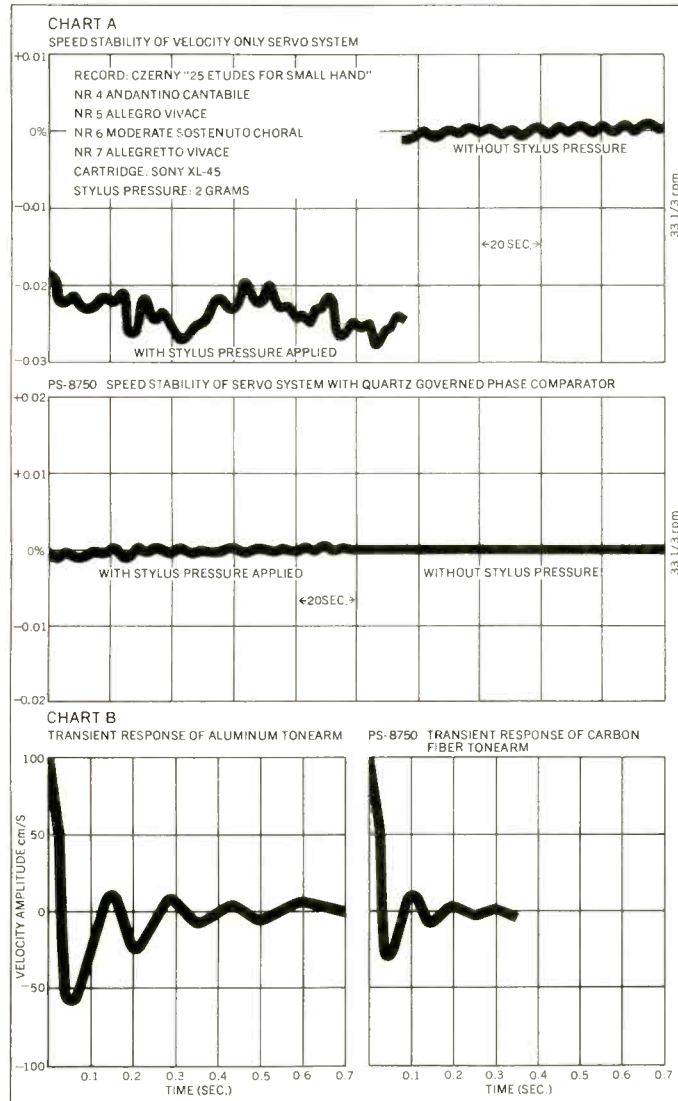
And we cut down on record resonance by pumping a silicone damping material into the record mat itself. By having contact with the entire record surface, it offers more support.

Not for people who want the latest. But the greatest.

The PS-8750 represents a tonnage of innovation and a couple of real breakthroughs.

It is not for those who want to spend \$900 so they can say they spent it.

It is for those who want to spend \$900 so they can hear they spent it.



came up with a different material: a carbon fiber of enormous strength and equally enormous lightness. Moreover, it has a much smaller resonance peak than the aluminum alloy commonly used. (See Chart B, where the difference is demonstrated.)

The carbon fiber worked so well that it was even incorporated into the head shell of the PS-8750. But Sony didn't stop at the tone-arm's construction. Next came the actual operation of it.

Most turntables have one motor, oper-

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Equipment Profiles

Akai Model AA-1050 AM/FM Stereo Receiver

MANUFACTURER'S SPECIFICATIONS

FM Tuner Section

IHF Sensitivity: 1.8 μ V. **S/N Ratio:** Better than 75 dB, mono. **Selectivity:** Better than 100 dB. **Capture Ratio:** 1.0 dB. **THD:** Mono, less than 0.15%; stereo, less than 0.3%. **Image Rejection:** 95 dB. **I.F. Rejection:** 100 dB. **Spurious Rejection:** 90 dB. **Stereo Separation:** 1 kHz, better than 40 dB. **Muting Threshold:** Variable, from 3 μ V to 300 μ V.

AM Tuner Section

IHF Sensitivity: 180 μ V/M (internal antenna); 8 μ V (external antenna). **Selectivity:** 30 dB. **Image Rejection:** 55 dB. **I.F. Rejection:** 45 dB. **S/N Ratio:** Better than 50 dB. **THD:** Less than 0.6%.

Amplifier/Preamplifier Section

Power Output: 50 watts per channel min. rms, at 8 ohms, from 20 Hz to 20 kHz. **Rated THD:** 0.15%. **S/N Ratio, IHF:** Phono, 80 dB; AUX, 90 dB. **Input Sensitivity:** Phono 1 & 2, 3



mV; AUX, Tape, 150 mV. **Phono Equalization:** RIAA \pm 1.0 dB. **Tone Control Range:** Bass, \pm 10 dB at 100 Hz; treble, \pm 10 dB at 10 kHz. **Filters:** High cut, $-$ 10 dB at 10 kHz; low cut, $-$ 8 dB at 50 Hz.

General Specifications

Dimensions: 18.9 in. W x 6.1 in. H x 15.4 in. D. **Weight:** 28.6 lbs. **Suggested Retail Price:** \$450.00.

Akai Electric Company, Ltd. of Japan, whose products are sold by Akai America Ltd. in the U.S., is perhaps best known in this country for its fine line of stereo tape decks, both open reel and cassette. The fact is that the company also produces an extensive line of purely electronic products, including both stereophonic and quadrasonic receivers. Interestingly, at a recent industry trade show, Akai was one of the few companies (if not the only one) to introduce two new four-channel receivers at a time when other companies were backing away from this format.

The Model AA-1050, tested for this report, is the company's top stereo receiver. Its styling follows the new format adopted by so many better known brands, in that the old, traditional blackout dial treatment has been replaced by a bright gold dial area, of narrow but extra long dimensions, which blends nicely with a brushed aluminum front panel. Numerals, screened in a contrasting dark color, are highly visible even when the unit is not powered and the only other items within the dial area are the familiar stereo indicator light and an AFC light just below it. FM calibration is linear, with markings evenly spaced at every half of a Megahertz. A good sized tuning knob, coupled to an effective flywheel is located to the right of the dial area. Separate cutouts in the panel below the left section of the dial disclose signal-strength and center-of-channel tuning meters which are also well illuminated when power is applied. Adjacent to the meters are the low and high cut filter pushbuttons and an audio muting button which reduces overall listening level by a fixed 20 dB when depressed. Next come four tiny indicator lights which denote program source selected, the FM muting switch and an associated small rotary control which varies muting threshold. Along the lower edge of the panel are a Power on/off switch, headphone jack, speaker

selector switch (with every possible combination of two out of three or one out of three pairs of speakers which may be connected to the receiver, plus an "off" position for headphone-only listening), Bass, Treble, Balance and Volume rotary controls, a Loudness switch, Mono/Stereo Mode switch, a Tape Monitor switch (with positions for dubbing as well as monitoring of either of two tape decks which may be connected to the unit) and a program selector switch. The selector switch includes positions for mono as well as automatic FM listening, and in the latter position the stereo multiplex circuits automatically are switched in which a stereo FM transmission is received.

The rear panel of the Model AA-1050, pictured in Fig. 1, has separate terminals for 300-ohm FM and external AM antennas, as well as a coaxial connector and clamp for 75-ohm transmission lines. Dual phono input pairs, AUX inputs, and the two sets of Tape out and in jacks are neatly clustered together below the pivotable AM ferrite bar antenna, while the three sets of speaker connection terminals (of the spring-loaded type which require insertion of the stripped wire ends of speaker cables) are located at the opposite end of the rear panel, each set color coded for proper phasing of speaker wires. One switched and two unswitched a.c. convenience outlets are also located on the rear panel for connection of other components. A DIN multiple-pin connector parallels the Tape-1 input/output jacks for those tape decks that are equipped with that type of plug.

Akai does not supply a schematic diagram with the Model AA-1050, so it was not possible for us to study the circuitry in detail. We did, however, remove the vinyl-clad wood cabinet supplied with the unit and examined internal construction and layout (see Fig. 2). A separate, sealed front-end, employing a four-section FM tuning capacitor and a three-

gang AM tuning capacitor, is used, and it is mounted directly above the tuner board, well towards the rear of the chassis and close to the antenna input terminals. Both the tape and selector switches are coupled via long shafts from their desirable rear-of-chassis locations to eliminate needlessly long shielded wire harnesses. Power supply parts, including a good-sized power transformer, are centrally located and well ventilated, as are the power amplifier p.c. module and vertically mounted output transistors and heat sink assembly at the opposite end of the chassis from the tuner board. Smaller, secondary p.c. modules up front take care of low-level tone control and voltage amplification circuits, and there is a minimum of inter-module wiring, all neatly dressed and properly tied down to prevent variations in performance from unit to unit. Rather surprisingly, the heat sink assembly is not black colored (as are so many others, for better heat transference), but this does not seem to bother the receiver thermally, as evidenced by our later heat run and power output tests. A protective metal screen covers the power output area, providing additional heat conduction and preventing the possibility of minor electrical shock in the event that inquisitive enthusiasts insist upon removing the main wood cover, as we did.

FM Performance Measurements

It is always a pleasure to come across an FM tuner or the FM tuner section of a receiver that meets its usable sensitivity spec. As readers of our previous test reports know, this spec is not all that significant, but so many manufacturers publish one number and are content to "pass" production sets which fall somewhat short of meeting that number. In the case of our sample, IHF usable sensitivity measured exactly $1.8 \mu\text{V}$ (10.5 dBf) as claimed. More importantly, 50 dB of quieting in mono was reached with a quite low signal input of only $2.5 \mu\text{V}$ (13.35 dBf) in mono. Usable stereo sensitivity was $3.2 \mu\text{V}$ (15.5 dBf) and switching to stereo occurs at a very low $2.0 \mu\text{V}$ (11.4 dBf) with $32 \mu\text{V}$ of signal (35.5 dBf) required for 50 dB of quieting in the stereo mode. Signal-to-noise ratio in mono reached 73 dB for strong (65 dBf) signals and 67 dB in stereo. Only the distortion figures were at all disappointing for, even though 0.41% (mono) and 0.25% (stereo) are acceptably low numbers, both are short of the figures claimed by Akai (0.15% in mono, 0.3% in stereo). We suspect that the set was slightly out of alignment (particularly the FM detector section) since the center-of-channel meter needle always ended up slightly off-center when minimum distortion was achieved. That's okay for lab tests, but a consumer guided by the meter would not normally tune for lowest distortion because of this slight misalignment. We also noted that distortion in stereo was lower than in mono, a situation which usually connotes the addition of two larger values of distortion which tend to partially cancel each other. The built-in AFC circuitry of the Akai AA-1050 is such that it operates when tuning is close to optimum (at which time the "AFC" light on the front panel lights up), but we found that with the AFC light on, it is possible to detune the set sufficiently to cause significant increases in THD readings.

Results of our quieting and distortion measurements versus signal input are plotted in Fig. 3, while distortion versus audio frequency and stereo separation for the FM section are shown in the graph of Fig. 4. While THD in mono and stereo were a bit on the high side, they did remain fairly constant at all tested frequencies up to 6 kHz, indicating a lack of "beats" in the stereo mode at higher audio frequencies. Separation was outstanding, reading nearly 50 dB at 1 kHz and an unusually high 40 dB from 50 Hz to nearly 10,000 Hz. Other specifications measured include a capture

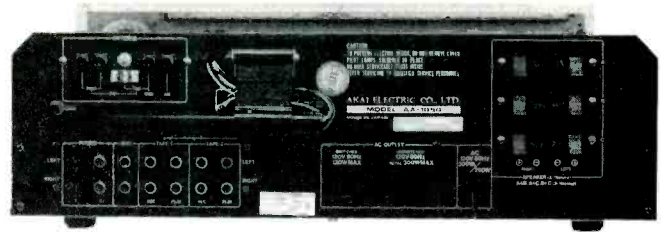


Fig. 1—Rear panel.

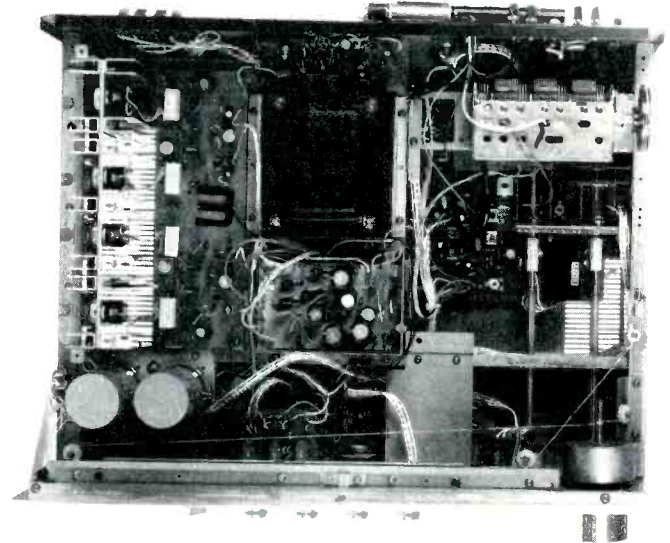


Fig. 2—Interior view.

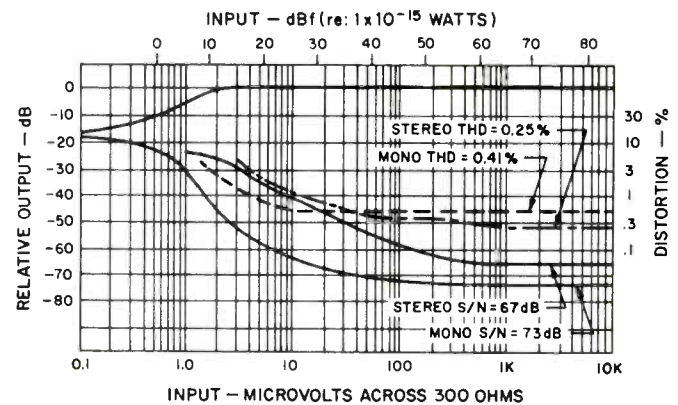


Fig. 3—FM quieting and distortion characteristics.

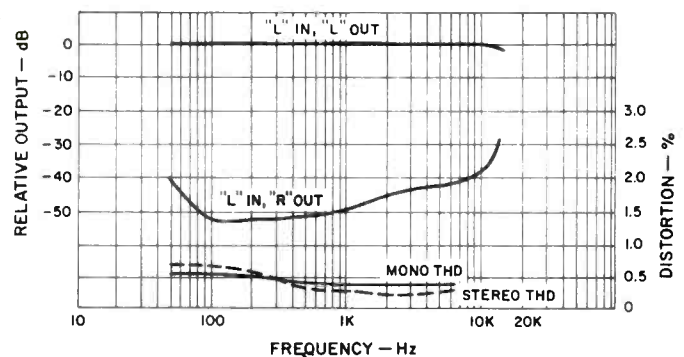


Fig. 4—Separation and distortion vs. frequency.

You're looking at our attitude about cassette decks. The HK2000.

We make only one cassette deck. We certainly are capable of making more. Perhaps some day we will. But it's unlikely — unless there are compelling mechanical or sonic reasons for doing so.

We have an attitude about high fidelity instruments: to give the finest expression to every function of music reproduction. And wherever we feel we have something to contribute, to do so without compromise. The HK2000 (with Dolby*, of course), represents our attitude about cassette decks.

Its predecessor (the HK1000), was evaluated by High Fidelity Magazine as, "the best so far." When our engineering explorations suggested that improvements were feasible, we replaced it. With the HK2000.

We consider that the cassette deck has a definite and honorable utility as a means of conveniently capturing, retaining and reproducing material from phonograph records, tapes or radio broadcasts.

With one major caveat. It must perform on a level equivalent to the source.

The HK2000's specifications offer measurable evidence of its quality. For example: wow and flutter levels of 0.07%.

But performance specifications are only one influence on sound quality. Just as in all Harman Kardon amplifiers and receivers, the wide-band design characteristic of the HK2000 produces sound quality that transcends its impressive specifications.

It utilizes narrow gap, hard-faced, permalloy metal heads (the only heads used in professional studio tape machines) for extended frequency response and low distortion. Low frequency response is so linear that the HK2000 required the incorporation of a sub-sonic filter control that can be used to remove signals issued by warped discs.

These few factors, not individually decisive in themselves, indicate the attitude with which we conceived, designed and built the HK2000 — the only cassette deck we make.

There is, of course, a good deal more to say. Please write *directly* to us. We'll respond with information in full detail: Harman Kardon, 55 Ames Court, Plainview, New York 11803.

harman/kardon

*Dolby is a registered trademark of Dolby Laboratories, Inc.



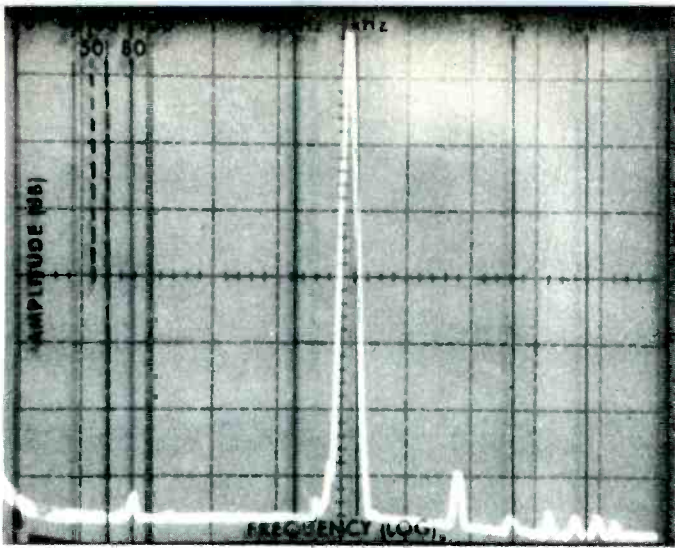


Fig. 5—Spectrum analysis of 1 kHz output signal at clipping level shows presence of 3rd and some higher order harmonics.

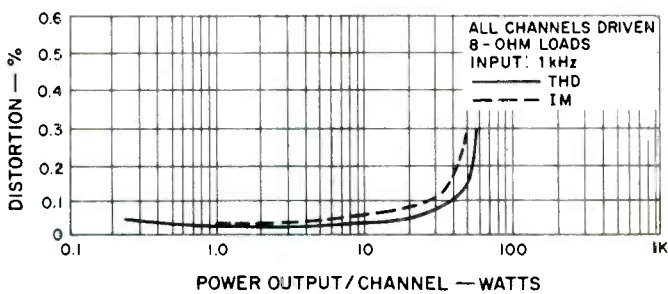


Fig. 6—Harmonic and intermodulation distortion characteristics.

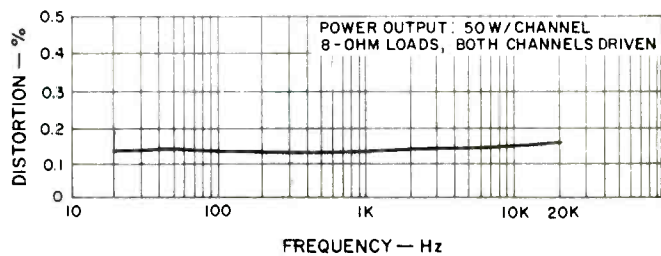
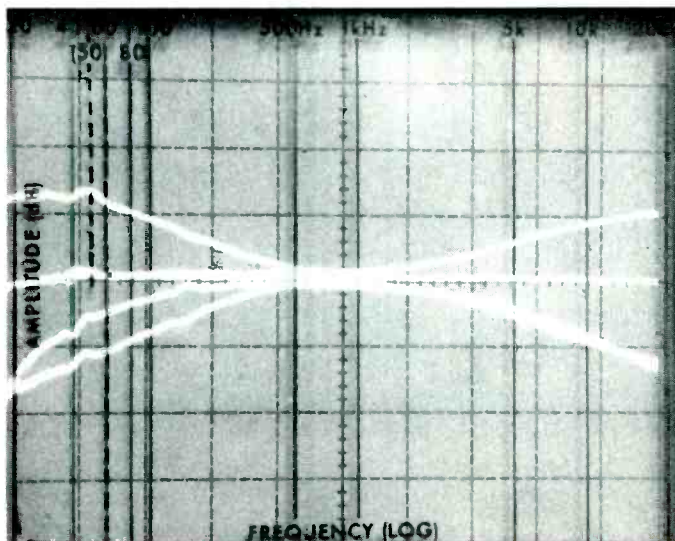


Fig. 7—Distortion versus frequency.

Fig. 8—Tone control and filter range.



ratio reading of 1.2 dB, alternate channel selectivity of 88 dB, image and i.f. rejections of just over 95 dB and spurious response rejection of 90 dB, exactly as claimed.

All in all, a very fine set of measurements for an FM tuner section in a receiver in this price category.

Amplifier Section Measurements

Although Akai's basic published statement of power output is quoted correctly, they also publish a "power bandwidth" which is listed as extending from 7 to 70,000 Hz. This, of course, is the "Old" IHF power bandwidth statement which is superseded by the FTC's definition of that term. In the FTC's version, power bandwidth means the extreme frequencies at which full power can be delivered at rated distortion (in this case, 20 Hz to 20 kHz, as stated in the basic power disclosure), whereas the older definition meant the frequencies at which half-rated power can be delivered.

Be all that as it may, the Akai AA-1050 *did* deliver its full rated 50 watts down to 20 Hz and all the way up to 33 kHz, with both channels driving 8-ohm loads, at the listed 0.15% total harmonic distortion. At mid-frequencies, power output increased to 58.8 watts per channel for around 0.3% THD, the point at which clipping was observed. The harmonic content at the clipping point is displayed on our spectrum analyzer 'scope face reproduced in Fig. 5 and is seen to include primarily third-harmonic content, with lesser contributions of higher order harmonics down some 75 dB below the fundamental signal (equivalent to about 0.018% each). IM distortion (which reached 0.28% at 50 watts output) and THD are plotted against power output in Fig. 6. THD versus frequency is shown in Fig. 7 and remains virtually constant over the entire audio range from 20 Hz to 20 kHz.

Preamplifier Section Measurements

Input sensitivity in *Phono 1* or *Phono 2* of the Akai AA-1050 (both circuits are identical) measured 3.1 mV, while high-level AUX and tape required 142 mV input to drive the amplifier to rated output. Phono overload occurred at a very respectable 142 mV. Signal to hum and noise in phono referred to measured input sensitivity was an excellent 73 dB. Translated to the 10 mV input which Akai and most others use as a reference, this would be 83.2 dB, much better than the 80 dB claimed. Considering the fact that our measurements were made with no weighting curve, the measured results become even more outstanding.

Hum and noise referred to high level input sensitivity (but again with no weighting curve applied) was 82 dB, and residual hum and noise (with volume control at minimum) measured 90 dB below full output. Overall frequency response measured from AUX inputs to power amp outputs was within 1 dB from 13 Hz to 50 kHz, and response was down 3 dB at 7 Hz and 62 kHz. RIAA equalization was within 0.6 dB of the prescribed playback curve from 30 Hz to 15,000 Hz with maximum deviation occurring in the 50 Hz region.

Tone control range of bass and treble controls is shown in the 'scope photo of Fig. 8 and conforms closely to published specs. Also shown in this photo is the action of the low-cut and high-cut filters, superimposed upon the maximum tone control setting curves. While the low-cut filter achieves approximately 15 dB of attenuation at 20 Hz with less diminution of upper lows than does the bass control rotated fully counterclockwise, the high-cut filter follows the maximum treble cut response almost exactly and therefore offers little additional benefit as a noise-reducing device.

Loudness control action is illustrated by the group of curves shown in Fig. 9 and, as can be observed, a moderate

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Sansui. The turn the tables

Sansui now offers a complete line of turntables for every taste and pocketbook. Sansui is now one of the leaders in the manufacture of high quality turntables. Sansui has it all. From belt to direct drive, from stereo to 4-channel capability, from 4-pole synchronous to 20-pole servo-controlled brushless motors. All in all Sansui, with these new turntables, lives up to its reputation as creative innovators in sound reproduction technology. And Sansui's new tonearm design and unique drive systems clearly represent a major advancement in high quality turntables.

Here is the line-up:

Sansui SR-212¹ at under \$130.00.* Auto-return, two speed, belt drive by 4-pole synchronous motor.

Statically balanced S-shaped tonearm, skating force canceller. Low capacitance cables.

Sansui SR-313² at under \$170.00.* Two speed, belt drive by 4-pole outer-rotor synchronous motor. S-shaped tonearm, advanced suspension, lateral balance, skating force canceller. Heavy aluminum alloy die-cast platter. Low capacitance cables. Wow and flutter less than 0.06%. Direct-reading stylus pressure scale.

Sansui SR-525³ at under \$280.00.* Direct drive. 20-pole DC brushless servo-motor. S-shaped tonearm, special Sansui resonance absorber, knife-edge support system. Low capacitance cables. S/N: better than 64 dB. Pitch controls. Illuminated stroboscope. Heavy aluminum die-cast platter.

Sansui SR-717² at under \$350.00.* Direct drive. 20-pole DC brushless servo-motor. Wow and flutter less than 0.03%. Statically balanced S-shaped tonearm, one point/knife-edge support. S/N: better than 66 dB. Pitch controls. Illuminated stroboscope. Direct read-out stylus pressure dial.

Sansui FR-3080² at under \$200.00.* Full automatic, two speed belt drive. S-shaped tonearm with Sansui's Dual-Magnet cartridge, Shibata stylus, skating force canceller. For any 4-channel or 2-channel record.



SR212

SR313

1. Simulated walnut grain base
2. Base of simulated Andes rose
3. Metallic finish

*The value shown is for informational purposes only. The actual resale price will be set by the individual Sansui dealer at his option.

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turntables that on all the others.



FR3080



SR525

Stop in soon
at your nearest Sansui
franchised dealer to hear
any of the fine Sansui turntables,
designed so beautifully they
make heads turn.



SR717

Sansui

amount of treble emphasis is included in this circuit along with the usual bass enhancement at lower listening levels.

Using and Listening To The Akai AA-1050

Controls on the receiver handle well, although we felt that the variable muting action should have allowed a lower

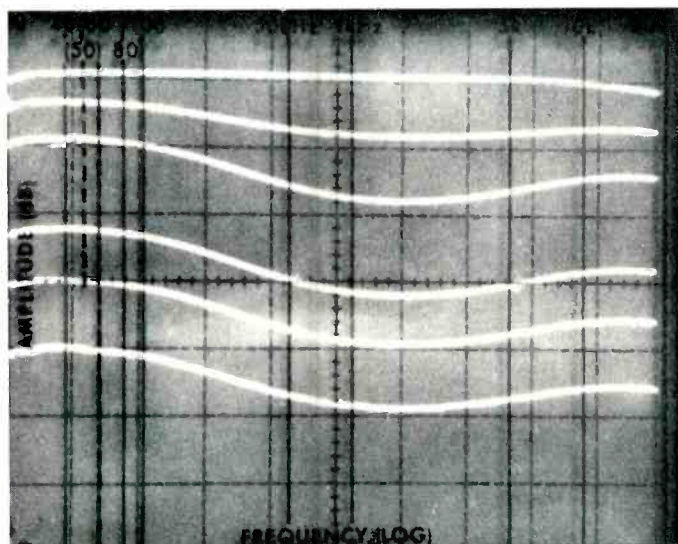


Fig. 9—Response of audio section with loudness switch "on", at various settings of volume control.

threshold, given the fact that it is variable and could be adjusted to suit specific requirements. As it is, most sensitive threshold setting results in muting being overcome at a relatively high level of 20 μV (31.4 dBf), while in its extreme clockwise position, it takes nearly 600 μV (60.9 dBf) to overcome the muting. Dial calibration was excellent—within 0.1 MHz at all points, and station pulling ability was consistent with the previously measured specifications.

The excellent dynamic range capability of the phono section of the AA-1050 was clearly discernible during record listening, both in terms of high signal handling capability and low levels of hum and noise (actually, hum turned out to be lower even than the low random noise generated by the preamp circuit, the converse of what usually occurs in preamp-equalizer sections). We found that the tape monitoring switch with its separate dubbing positions is a practical way in which to combine both monitoring and dubbing functions in a single, easy-to-use and easy-to-understand rotary control.

While the amplifier section of the Akai AA-1050 may not be the most powerful of any stereo receiver on the market, it is a strong contender for that honor in its price class. Not too many years have passed since the time one would have had to go to a separate amplifier to get this much power. Distortion remains low at the frequency extremes and is fairly free of higher order harmonics.

The Akai AA-1050 certainly appeals to the eye and to the ear and its price is fully justified by its performance.

Leonard Feldman

Check No. 70 on Reader Service Card

B•I•C Model 960 Belt-Drive Programmed Turntable

Manufacturer's Specifications

Speeds: 33 $\frac{1}{3}$ and 45 rpm. **Motor:** Synchronous, 24-pole, 300 rpm. **Drive:** Precision ground elastomer belt.

Platter: 12-in. non-ferrous, machined die-casting.

Wow and Flutter: Better than 0.05% w rms.

Rumble: Better than -65 dB DIN.

Tone Arm: Tubular aluminum. **Length:**

Pivot to stylus, 216.2 mm (8.51 in.)

Weight: 12 lbs. **Dimensions:** 15 $\frac{1}{4}$ -in.

W x 12 11/16-in. D (motor board);

on base with dust cover, 17 1/16 in.

W x 14 11/16 in. D x 7 in. H; with dust

cover raised, 16 H. **Price:** \$159.95; walnut base

\$16.95, dust cover, \$9.95.



It is only logical that a newly created product should provide all the facilities of previous examples and possibly provide some desirable additional facilities, and do so in a manner which would simplify construction. This is just what the new line of B•I•C turntables has done.

Readily adjustable stylus force, equally adjustable anti-skating settings, cueing control, automatic operation—all these desirable features are present, as they are in most all good turntables. But in addition, the often troublesome idler drive is replaced with a belt drive which reduces the almost direct connection between the motor and the platter, but the motor itself, usually an 1800-rpm device, is here replaced with a synchronous 300-rpm unit, thus reducing the motor's contribution to rumble from 30 Hz to a low 5-Hz signal, which is below audibility.

In addition to the features which appear in most turn-

tables, the B•I•C models incorporate a program system

which gives the owner seven possible manual and single-play automatic options. This feature involves a control knob with the seven operating positions and *Off*. In the automatic mode, the user simply sets the control lever to the number of records on the spindle, and the unit plays them, returns the arm to its rest, and shuts the motor off. If the manual mode is desired, the user places the control at *Man*, and the unit plays the one record, returns the tone arm to the rest, and shuts the motor off. If the user wants to play the same record four times, he sets the control to "4," and the record is played the four times, the arm returned, and the motor

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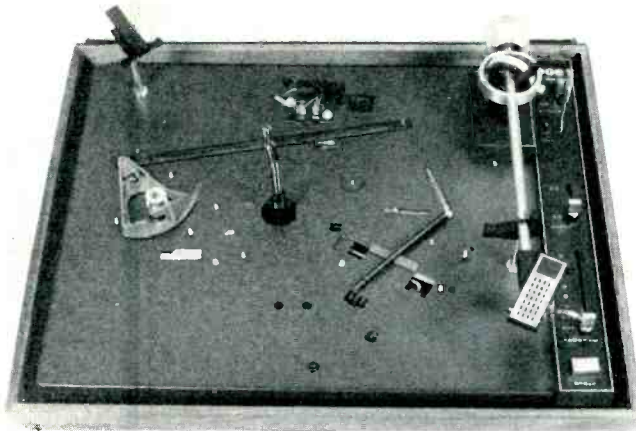


Fig. 1—Top view of the 960 chassis with the platter removed.

shut off. This can be done for any number of plays from one to six.

During automatic operation the record which is playing can be rejected and the next one dropped onto the platter by depressing the "cycle" button—an operation which requires a force of less than 100 grams and a travel of only 1/16 in.—so slight a motion and force as not to disturb the tone arm by the jarring common to most turntables.

Along the control panel are also located the lever which changes speed by moving the belt from one level of the motor pulley to another, and the stylus-lift lever, which raises the tone arm for cueing or to permit dropping the stylus to the record with greater precision than can be done easily by hand, thus avoiding possible record scratches.

Not the least of the virtues of the B•I•C 960 turntable is the use of a 300-rpm synchronous motor and the belt drive, which is commonly used on high-quality transcription turntables, but rarely on automatic models. In addition to eliminating the idler, the belt drive serves to provide an isolation between the motor and the platter so the rotating platter can more effectively act as a flywheel, yet permits reaching full speed at less than 1/2 of a revolution. Furthermore, the multiplicity of poles—24—provides a smoother flow of power than the usual four-pole design. While the platter reaches full speed in less than a revolution, it stops in about a quarter of a revolution, all of which aids in cueing. The motor is completely shielded to avoid any external magnetic field from affecting the cartridge. A manual spindle rotates with the turntable during manual play, eliminating wear on the center hole of the record and possible drag in cases of record-label extension over the hole as is sometimes encountered. For automatic play, a fixed spindle supports the center of the records, while a platform at the upper left of the platter stabilizes the record stack.

The counterweighted aluminum tone arm is mounted in a gimbal structure with vertical pivots consisting of needle bearings in a hardened ball race and the horizontal mounting consists of a brass shaft resting on a lateral ball race. Vertical friction is less than 5 mg, and horizontal friction is 6-to-8 mg. The effective mass of the tonearm is 18 grams, and its fundamental resonance is from 8 to 9 Hz, again below the audible range.

Stylus force is adjustable—after balancing the counterweight with the stylus-force control set at "0"—over the range from 0-to-4 grams in 1/4-gram steps. The levers for adjusting stylus force and anti-skating are located along the top of the gimbal ring, with the same indications serving for both adjustments, and the 1/4-gram divisions are about 1/16 in. apart. A separate lever on the main control panel is set for either elliptical or conical styli, and the calibrations on the anti-skate control are automatically compensated for the desired stylus.

Cueing time—that period required for the stylus to drop from its raised position to the record surface—is adjustable by a small knob directly in front of the tone-arm mount over the range from 1-to-3 seconds by varying the degree of damping.

The cartridge shell is fitted with a locating hole which fits over a rod in the arm, and with an angle-adjusting screw

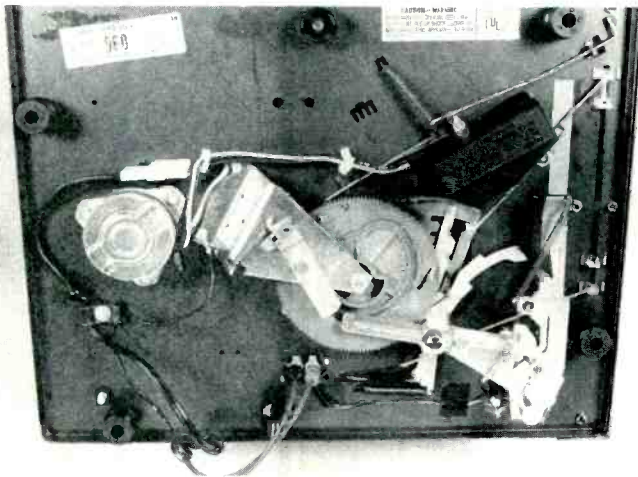
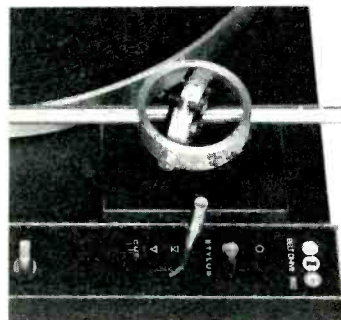


Fig. 2—Underside view of mechanism shows simplicity of unit. The 300-rpm synchronous motor is seen at left.

Fig. 3—Stylus-force and anti-skate knobs travel around the fixed ring of the gimbal, and employ the same scales, graduated in 1/4-gram intervals.



Four questions you must ask about any multiple-play turntable.

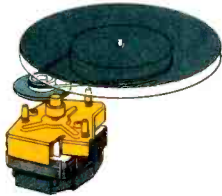
1. Does it perform as well as any single-play turntable?



There are some who believe that a single-play turntable is somehow inherently better than a multiple-play unit. All right—the Z2000B *is* a single-play turntable. Its capacity to function as a multiple-play unit offers convenience with no compromise of performance. The *automatic* mechanism which gently indexes the arm, lifts it at the end of play, returns it to

the arm rest and shuts off the motor—is completely disengaged during record play. A 2-position control sets the proper vertical tracking angle for single or multiple play. The Z2000B can truly be called the automated, single-play turntable with multiple-play capability.

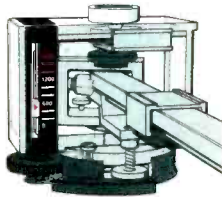
2. Does it have belt-drive and variable speed?



Garrard engineers have attained remarkable results by combining the world famous Synchro-Lab motor and an inventive belt/idler drive combination. A 5 lb., die-cast, dynamically balanced platter is rotated via a flexible belt. Not only are the tiniest fluctuations of speed smoothed out, but an extraordinary -64dB rumble is only one example of the im-

pressive specifications achieved. A variable speed control corrects out-of-pitch recordings and an illuminated stroboscope provides optical confirmation. The Z2000B combines all of these elements to achieve the main goal of Garrard engineering: superior performance at reasonable cost.

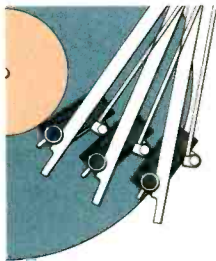
3. Does it handle records gently?



All responsible turntable manufacturers are concerned with protecting your records. With Garrard, it's an obsession. The Z2000B boasts an array of features designed solely to prolong the life of your records. In addition to the exclusive, articulated tonearm, it incorporates an exceptionally accurate magnetic anti-skating device. Cueing is viscous damped in

both directions. The ingenious built-in automatic record counter keeps track of how many LP sides the stylus has played. And unlike some of the highest priced changers that support records only at the center hole, the Z2000B supports them at the hole *and* edge, and the release mechanism operates at *both* points. Protection for your records indeed!

4. Does it eliminate tracking error?



The grooves of a record are cut by a stylus that travels in a straight line. Conventional playback tonearms move in an arc. The difference between these two paths is called "tracking error." Simply stated, tracking error launches a cycle of distortion and record wear. In good design, the error is averaged over the record so that distortion is minimal. But such

compromise was unacceptable in the Z2000B. What Garrard engineers did about it was summed up by High Fidelity Magazine which described the Zero Tracking Error Tonearm as "...the best arm yet offered as an integral part of an automatic player." The Z2000B is the *only* automatic turntable in the world without tracking error.

The Garrard Z2000B. Yes. Yes. Yes. Yes.



\$229.95

Garrard
The Automatic Choice

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which permits setting the cartridge at the preferred 15-deg. angle. This is done by a screw in the shell which has an eccentric projection that fits into a hole in the tonearm head. The screw may be turned with a small screwdriver to achieve the desired angle when the nut which secures the shell to the arm is loosened. In addition, to compensate between the angle offered by the cartridge when playing a single record or a stack of six records, a slide in the top of the shell is moved to the *M* or *A* positions (for manual or automatic), resulting in a slight shift in the cartridge position in the shell. The electrical connection between the shell and the arm is made by a 4-pin plug on the arm which engages a socket in the cartridge shell. This ensures a noise-free connector which is not likely to develop the problems often resulting from the sliding contacts commonly used in cartridge shells. A generously sized, stainless-steel finger lift completes the shell's features. A rest provided on the main chassis serves to accommodate the arm during normal operation, and to hold the arm firmly when the tone arm lock is engaged for transporting or moving the turntable. Two wing nuts hold the entire chassis firmly to the base during any transporting of the unit, but in normal operation the wing nuts are loosened permitting the chassis to float on its four elastomeric mounts.

Two molded projections are located at the rear of the base and when the smoked lucite dust cover is placed in position, they serve as a hinge point for raising the cover, which will remain in the raised position with no screws, bolts, or other connecting devices. There are two optional bases available—one of oiled walnut, and another of molded plastic with a matte finish. Both have the safety/hazard transparent bottom cover.

The chassis is extremely compact extending only 1 5/8 in. below the mounting board, and 4 15/16 in. above with the multiple-play spindle in place, or a total of 6 9/16 in. above the surface on which the turntable rests. With the dust cover in place, the overall height is 6 7/8 in., or with the dust cover raised, 16 in.

The paired audio output cable appears to be of the same size as a typical a.c. cord, but in reality it is a low capacitance cable, resulting from an extremely fine center conductor within the shield, with a capacitance of 20 pF/ft., thus being compatible with CD-4 cartridges.

The 980 model is essentially identical with the 960, but is fitted with a solid-state electronic drive and speed control which furnishes the drive power to the motor in place of the usual a.c. line supply. Its frequency, generated by a Wien-bridge oscillator, can be varied $\pm 3\%$ from the usual 60 Hz, resulting in an adjustable speed over the same range. A control knob located at the left front of the chassis controls this frequency, and the neon stroboscope light, illuminated by line frequency, shows when the speed is adjusted to the normal value. The stroboscope is viewed through an opening in the chassis by way of a built-in angled mirror. It's price is \$199.95 with base and cover the same.

Performance

With its compactness, appearance, wide range of adjustability and its many other features, how does the 960 perform? That is the crucial question.

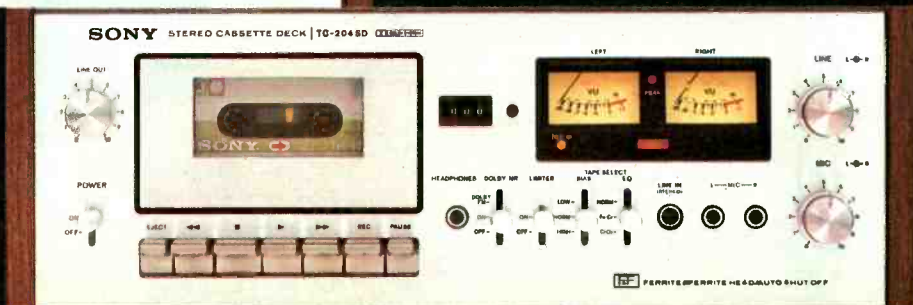
Simply stated, its performance provides the user with a simple, yet effective means for handling records—either singly or in a stack. The programming feature permits playing a stack through and then stopping the unit with a much

SONY® TC-186 SD



SONY® TC-209 SD

SONY® TC-204 SD



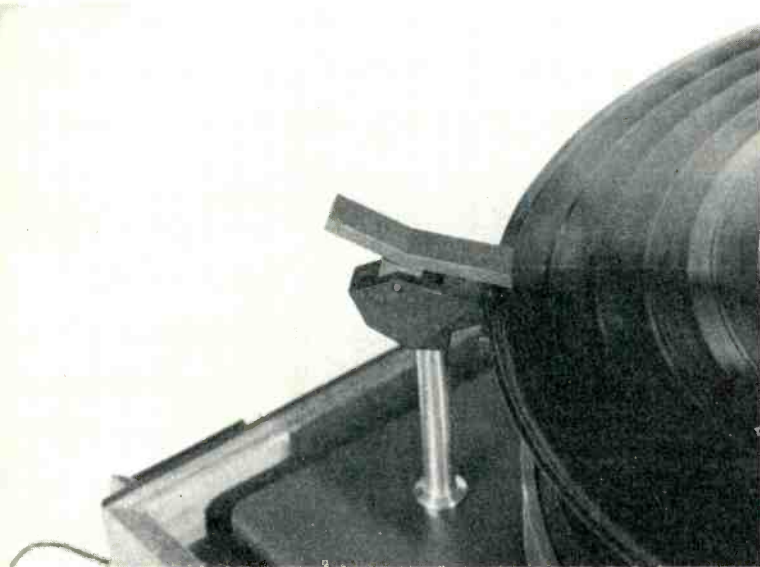


Fig. 4—The support post provides the simplest means of steadying records on the spindle.

simpler mechanism than is required for the more conventional types. And, of course, it is generally accepted that belt drives are freer of wow and flutter than most other types—with the exception of the expensive direct-drive units, and even with some of these we have encountered a form of flutter which shows up instantly if the platter is removed, thus eliminating the flywheel effect of the platter's mass.

Wow and flutter were measured separately, with the former measuring 0.04%—this resulting from measurement of frequencies below 6 Hz—and flutter—frequencies between 6 and 250 Hz—at 0.03%, and a total over the range from 0-to-250 Hz measuring 0.05%. Range of speed control on Model 980 was measured by reproducing a 1000-Hz record and feeding the output to a counter, with the range extending from 967 Hz to 1031 Hz, or just slightly over $\pm 3\%$. Model 960, with no means of varying speed, reproduced the 1000-Hz tone at 1001 Hz.

Rumble, which is probably the most important figure in any report on a turntable, measured 48 dB below the standard level of 3.54 cm/sec at 1000 Hz. Converted to normally reported figures, this means a rumble figure of -66 dB, since rumble measured on a flat system is generally accepted as being 18-to-20 dB lower than the acoustically perceived level. This is borne out by using the DIN test record No. 45544, "Rumpel-mess-schallplatte," and the specified measuring techniques, which produced a figure of -64 dB.

Cycling time for $33\frac{1}{3}$ -rpm records was measured at 15 seconds, with the cueing adjusted for a 3-second delay. Speeding up the cueing delay reduced the cycling time to 13 seconds.

On the whole, the BIC 960 and 980 turntables appear to provide everything a critical user could want, and at prices which do not create too large a dent in the budget. The measured performance certainly places these machines in the superior category, while their thoughtful designwork makes them easy to operate.

C. G. McProud

Check No. 72 on Reader Service Card

SONY FRONT-LOAD CASSETTE DECKS

FEATURE PRESENTATION:

Dolby* Noise Reduction System virtually eliminates high frequency tape hiss. Signal/noise ratio zips up as much as 10 dB at 5 kHz and over with Dolby in. That's impressive. There's a 25 μ s de-emphasis switch and rear-panel calibration controls for recording Dolby FM broadcasts.

Ferrite and Ferrite Head lasts up to 200 times longer than standard permalloy. Provides wide, flat frequency response. And—the high density of the ferrite and ferrite material and Sony precision craftsmanship of the head gap make possible a feature we call **Symphase Recording**. Here, you can record a 4-channel source (SQ** or FM matrix) for playback through a comparable 4-channel decoder-equipped sound system without phase shift. This means that

all signals will be positioned in the same area of the 4-channel spectrum during playback as they were in the initial recording.

Front Load convenience allows you to stack with other components.

Solenoid Operated Transport Controls mean feather-light operation. **Jam-proof Feature** lets you go directly from one mode to another—bypassing stop—without damaging either mechanism or tape. (Available on the 209SD only.)

FeCr Equalization, when used with the new Sony Ferri-Chrome tape, provides significantly improved dynamic range and signal/noise ratio, and optimum frequency response.

Level Measurement includes 2 VU Meters plus a **Peak Limiter**. Together, they eliminate sudden

transient high level input signals that can cause distortion and tape saturation—without compromising dynamic range.

Mic/Line Mixing lets you blend signals from various sources for master quality recordings. (Available only on 204SD, 209SD.)

Sony front load cassette decks have the features you need for the recordings you want. Check them out at your Superscope dealer soon. He's in the Yellow Pages.

Brought to you by

SUPERSCOPE®

Listen to us.

*TM Dolby Labs, Inc. **TM CBS, Inc.
©1976 Superscope, Inc. 20525 Northhoff St., Chatsworth, CA 91311
Prices and models subject to change without notice.

Phase Linear starts where state-of-the-art leaves off.

We build products with state-of-the-art specifications. But we don't stop there. Specifications are important to us, but equally vital is the achievement of *obviously audible improvements* in the reproduction of music with every separate component we make. This is the driving force behind Phase Linear, the single-minded philosophy that has produced so many innovative features, advanced circuitry and ultimately, products with more dynamic range and bigger, more lifelike sound than any comparably priced components available on the market today. Our Research Department, headed by Robert Carver, is staffed by imaginative design engineers deeply concerned with the entire spectrum of musical reproduction. Many more new products are in the wings; in the meantime, we invite you to review the present Phase Linear line and read what the critics have said. Then ask your dealer for a demonstration, and draw your own conclusions.

The Phase Linear 700B Stereo Amplifier

Has established performance and power standards unequalled by any other amplifier on the market... regardless of price.

"the lowest distortion, in spite of its enormous power capability, was on the Phase Linear 700..." Hirsch-Houck Labs in STEREO REVIEW

"Hum and noise figures were also well below anything we have encountered before." C. G. McProud in AUDIO.

"... in terms of sheer power it is the most impressive we have tested." HIGH FIDELITY.

The Phase Linear 400 Stereo Amplifier

Hailed internationally as the undisputed "best buy" among all the "super amps" available today.

"We were utterly flabbergasted when we discovered in our early A-B comparisons that the amplifier which sounded dramatically cleaner and more revealing turned out to be, when we removed our blindfold status, the Phase 400... In over 100 blindfold A-B comparisons with five other amplifiers at a time, the two Phase 400's kept coming back to the surface... No other amplifier... ever even tied the Phase 400 for naturalness, clarity, and lack of distortion." SOUND ADVICE, 225 Kearny St., San Francisco.

"Harmonic distortion proved to be almost unmeasurable on this amplifier." STEREO & HI-FI TIMES.

The Phase Linear 200 Stereo Amplifier

The newest addition to our amplifier line incorporates all we have learned to date

about power amplifier design. The 200 has not been reviewed, but with its advanced LED metering system, sophisticated protection circuits and excellent performance specifications, we are optimistic!

The Phase Linear 4000 Stereo Preamplifier

The model 4000 illustrates our philosophy of delivering far more than state-of-the-art specifications. It offers revolutionary features that make music sound better by providing greater dynamic range and a quiet background.

"... a combination of noise reduction and dynamic-range-expansion circuits whose sophistication far surpasses anything previously available on the audio consumer level... even without the assistance of its special noise reducing systems, it would rank as one of the quietest units we have ever encountered... makes any program played through it sound better than through any other preamplifier we have ever used... a most impressive technical achievement!" Hirsch-Houck Labs in STEREO REVIEW.

The Phase Linear 2000 stereo preamplifier

Beyond efficient handling characteristics and excellent specifications, the 2000 is capable of reproducing more of the music on your recordings. Its ability to reproduce ambient signals is a function found on no other preamplifier.

"Super in the listening as it is smooth in the handling... The extra flexibility in the tone controls delivers worthwhile options. We find the ambience recovery feature a decided plus." HIGH FIDELITY.

The Phase Linear 1000

A noise reduction and dynamic-range-expansion system designed to eliminate noise from all sources (records, tapes, FM, etc.) and restore the music we hear at home to its original dynamic range.

"... for any already top-quality music system, we doubt a \$350 expenditure in any other component could match the audible improvement made possible by the Phase Linear 1000." Hirsch-Houck Labs in STEREO REVIEW.

"In theory, the circuit (AutoCorrelator) can make the distinction and reduce the level of the noise component while reproducing the signal component unaltered. In practice, its ability to do so is far from absolute, yet audibly greater (to my ears) from that of any other noise-remover on the market." Robert Long, in HIGH FIDELITY.

To be released soon—

The Phase Linear 5000 FM Tuner

Loaded with innovations, the 5000 will feature circuitry capable of increasing the dynamic range of broadcast signals up to 9 dB! It will do more than just reproduce a mediocre broadcast perfectly; it will make FM signals sound virtually as good as recorded signals. This feature alone makes the Phase Linear 5000 FM Tuner worth waiting for!

Phase Linear Corporation, 20121 48th Avenue West, Lynnwood, Washington, 98036. Manufactured in the U.S.A., Distributed in Canada by H. Roy Gray, Ltd.

Phase Linear



Phase Linear 2000 Preamplifier • Phase Linear 200 Power Amplifier • Phase Linear 5000 Tuner • Phase Linear 1000 Noise Reduction System • Phase Linear 4000 Preamplifier • Phase Linear 700B Power Amplifier • Phase Linear 400 Power Amplifier • Phase Linear Corporation, Lynnwood, Washington, U.S.A.
Check No. 26 on Reader Service Card

McIntosh MAC-1900 AM-FM/Stereo FM Receiver

MANUFACTURER'S PUBLISHED SPECIFICATIONS

FM Tuner Section

IHF Usable Sensitivity: 2.5 μ V (13.4 dBf), mono. **S/N Ratio:** 70 dB, Mono. **THD:** Mono, 0.3%; stereo, 0.7%. **Capture Ratio:** 1.8 dB. **Selectivity:** 55 dB. **Spurious Rejection:** 90 dB. **Image Rejection:** 30 dB. **Stereo Separation:** 34 dB (at 1 kHz). **Frequency Response:** 20 Hz to 15 kHz \pm 1 dB.

AM Tuner Section

Sensitivity: 75 μ V, external antenna. **S/N Ratio:** 45 dB. **THD:** 1.0%. **Selectivity:** 30 dB. **Image Rejection:** 65 dB.

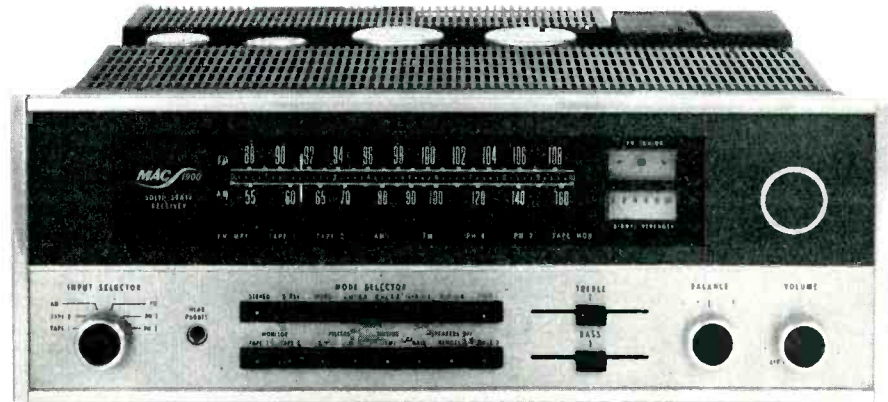
Frequency Response: -6 dB at 3500 Hz.

Preamplifier/Control Section

Input Sensitivity: Phono 1 & 2, 2.0 mV; Tape 1 & 2, 250 mV. **Hum and Noise:** Phono 1 & 2, 76 dB below 10 mV referenced input; Tape 1 & 2, 90 dB below rated output. **Bass Control Range:** \pm 16 dB at 20 Hz. **Treble Control Range:** \pm 16 dB at 20 kHz. **Low Filter:** -18 dB at 20 Hz, 12 dB/octave slope. **High Filter:** -18 dB at 20 kHz, 12 dB/octave slope.

Power Amplifier Section

Power Output: 55 watts per channel, continuous power,



into 8 ohms, at any frequency from 20 Hz to 20 kHz with no more than 0.2% total harmonic distortion; 40 watts into 4 ohms and 30 watts into 16 ohms, all other conditions remaining the same. All ratings with both channels driven. **IM Distortion:** 0.2% for any combination of frequencies between 20 Hz and 20 kHz. **Hum and Noise:** 95 dB below rated output. **Damping Factor:** 56 at 8 ohms.

General Specifications

Dimensions: 16 in. W x 5 1/2 in. H x 15 in. D. **Weight:** 33 lbs. **Suggested Price:** \$949.50.

It was 1965 when *Audio Magazine* last published a test report dealing with a piece of McIntosh high fidelity equipment. Certainly, this omission was not prompted by any desire on our part to ignore the products of that highly reputed manufacturer whose products have been well received by loyal purchasers since 1949. The fact that McIntosh Laboratories, Inc., has been able to survive and prosper in an era of fierce competition and intense advertising and promotion is in itself ample testimony to the power of word-of-mouth advertising. McIntosh owners, fiercely loyal to the product and the company, have on many occasions accused this and other publications of deliberately ignoring that firm's products because of their policy of limited advertising in this and other hi-fi publications.

What few readers realize is that the conspicuous absence of McIntosh test reports in these pages over the last several years was primarily due to McIntosh's own reluctance to permit "less than qualified" test reviewers to "measure" the equipment on "less than professional" laboratory equipment. We are happy to report that, after representatives of the company had an opportunity to examine our test facilities, they have reversed their earlier decision and, from time to time, we hope to make up for their overly long absence from these pages.

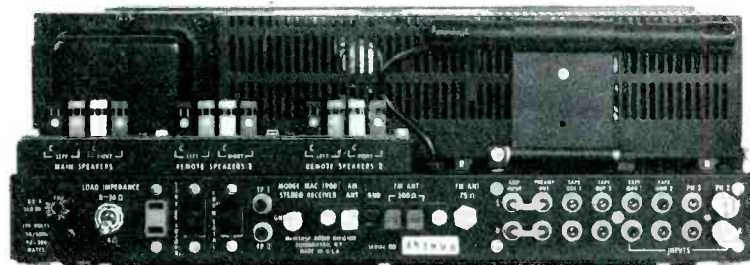
The MAC-1900 tested for this report is not a new product. It has been in production for some six or seven years, and

we were therefore particularly anxious to see how it would "stand up" against more recently designed receivers.

The ruggedly designed black and gold front panel extends beyond the chassis width and height, making custom installation simple; the MAC-1900 is normally supplied less wooden enclosure. FM, AM and logging scales, plus twin tuning meters in the dial area, are augmented by a series of illuminated rectangular areas below, which denote program source selected, tape monitor circuit activation, and stereo FM reception. A large tuning knob to the right of the dial area is coupled to a smooth and effective flywheel, dial string, and pointer combination. The pointer center is brightly illuminated.

The lower section of the front panel includes a six-position input selector switch and rotary balance and volume controls. The counterclockwise position of the volume control turns off power to the entire receiver. Horizontally oriented linear slide controls take care of bass and treble adjustment, and a slight detent in each slide helps locate mid-position for flat response. Two banks of pushbuttons handle all other control features. The upper bank of eight buttons handles a variety of reproduction modes including: stereo, reverse, channel source to both speakers, combined channels to any single speaker, and mono. A loudness switch completes this row of buttons. The lower bank of pushbuttons selects high and low filters, either or both tape monitor

Fig. 1—Back panel.



Photographed at 200X magnification with 1.5 grams tracking force, you can see record vinyl being worn away.



This is what happens every time you play a record.

Photographed at 200X magnification with 1.5 grams tracking force, record shows no visible wear.



This is what happens after you apply Sound Guard.

Introducing Sound Guard.™

The first product ever that protects records against wear, without resulting loss in frequency response or fidelity.

Every time you play a record you destroy some of its sound.

Under 200X magnification you can see the stylus peeling flakes of vinyl off groove surfaces. You literally see sound being worn away.

Until now, no product could protect records



against wear without interfering with sound fidelity.

An answer from outer space

From Ball Corporation research into dry lubricants for NASA's Orbiting Solar Observatories came a new technology, one derivative of which is now known as Sound Guard.*

Applied with a non-aerosol pump sprayer and buffed with a velvet pad (both provided), Sound Guard molecularly binds

itself to the groove surfaces to substantially reduce wear. (The film thickness is less than 0.000005")

Unlike sticky silicones, it is dry with a built in anti-stat.

But does Sound Guard adversely affect frequency response or fidelity? For conclusive proof, we asked the most respected of the independent audio laboratories for an exhaustive evaluation. Their results were astonishing!

Test results

1. The application of Sound Guard to a stereophonic or CD-4 quadraphonic disc does not in any way degrade audible frequency response.
2. Sound Guard increases the life of the records by significantly reducing record wear.
3. Sound Guard significantly retards increases in random noise content (surface noise) and total harmonic distortion caused by repeated playing.
4. Records treated with Sound Guard do not attract dust as readily as untreated discs.

A 12-page report of the complete test results will be mailed with every order.

Like it or your money back

As of now, the only way you can buy Sound Guard is by ordering direct. Just fill in the coupon (or write: Sound Guard, P.O. Box 3300, Muncie, IN 47302) and enclose your check or money order payable to Sound Guard. \$5.99 for one Sound Guard kit plus \$1.00 for postage and handling.

For two or more kits, pay \$5.99 each and we'll pay postage and handling. If not satisfied, return the unused portion and we'll refund your money or replace the product at your option.

Sound Guard keeps your good sounds sounding good.

Turntable used: Empire Model 598III.

Sound Guard
P.O. Box 3300, Muncie, IN 47302

Yes, I'm interested in Sound Guard.
 Please send me *one* Sound Guard kit. I am enclosing a check or money order for \$6.99 (\$5.99 plus \$1.00 for postage and handling).

Please send me _____ Sound Guard kits. I am enclosing a check or money order for _____ (\$5.99 *each* kit—postage and handling *free*). Make check or money order payable to Sound Guard.

Name _____

Address _____

City _____ State _____ Zip _____

(please print clearly) AU-6



*Sound Guard is Ball Corporation's trademark for its record preservative. ©Copyright Ball Corporation, 1976.

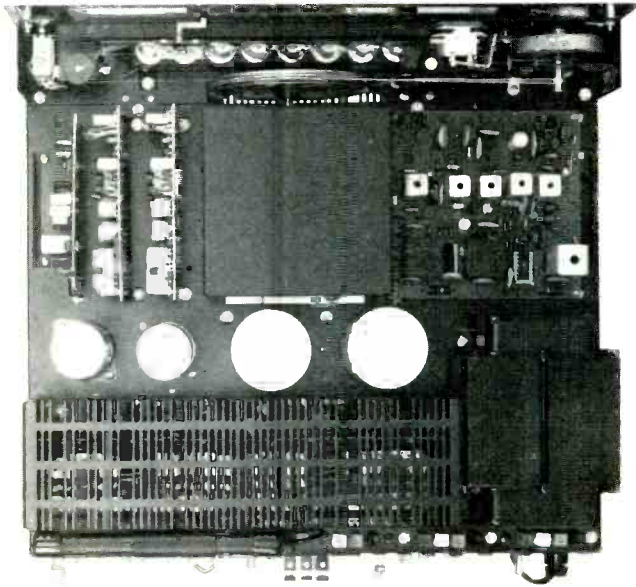
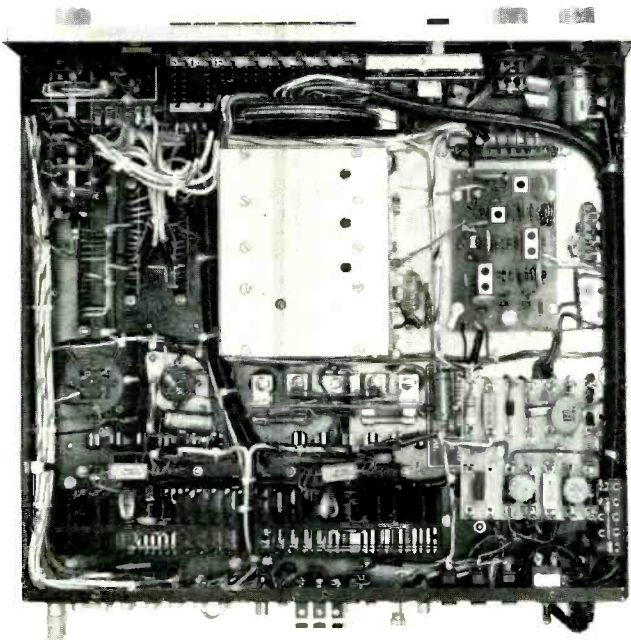


Fig. 2—Interior view from top.

Fig. 3—Interior view from bottom.



circuits, FM muting, and up to three separate pairs of loudspeakers which might be connected to the receiver. With speaker buttons in the *Out* position, sound is heard from the appropriate set of speakers, so that to turn any or all sets of speakers *Off* it is necessary to depress one or more buttons in this group.

The rear panel of the MAC-1900 is pictured in Fig. 1. All speaker connection terminals are mounted upright, which makes connection very easy since stripped speaker-wire ends are simply inserted in the spring-loaded, push-button terminals horizontally, as the speaker cables would normally be dressed. Care must be taken, however, not to strip and insert too great a length of wire which might project through to the opposite side of the terminal and make contact with metallic structures on the topside of the chassis.

The rear panel of the chassis contains three convenience a.c. outlets, two pairs of phono inputs, two sets of *Tape Out* and *Tape Monitor* (high level) inputs, antenna terminals for connection of external AM, 300-ohm FM or 75-ohm FM antenna transmission lines, a chassis ground terminal, and a pair of jumpers which connect between *Preamp Out* and *Main Amp In* jacks. Jumpers can be removed for independent use of these two sections of the receiver. A pair of jacks labelled *TP-1* and *TP-2* are intended for connection of McIntosh's Maximum Performance Indicator, a special scope/meter product sold by McIntosh that is useful in testing and evaluating audio system performance. A power line fuse and a pivotable AM ferrite bar antenna complete the rear panel layout.

The MAC-1900 is supplied less wooden enclosure but all components are fully shielded and enclosed in black finished metal covers, two of which were removed for the photo of Fig. 2 which is a top view of the chassis layout. The fully shielded r.f. front-end can be seen centered in the chassis with the i.f. section to the right and three of the many circuit boards vertically mounted at the left. A view of the underside of the chassis is shown in Fig. 3 and the orderly harnessed wiring is clearly discernible, as are additional circuit modules.

Circuit Highlights

Two stages of r.f. amplification (one a dual-gate MOS-FET, the other a JFET) are used in the FM r.f. section, and tuning is accomplished by means of a four-section variable capacitor (three additional ganged sections handle AM tuning). The mixer also uses a JFET, while the local oscillator is a bi-polar device. A monolithic silicon differential/cascode amplifier, in the form of an IC, serves as the first i.f. amplifier stage and is located within the r.f. housing. The FM i.f. section uses two additional IC's and two quad-tuned, link-coupled filters for a total i.f. gain of over 120 dB. Filters are sealed and require no realignment. A true Foster-Seeley discriminator is used as an FM detector. (Seeing it was like meeting an old reliable friend after an absence of several years.) The stereo decoder section of the receiver is fairly conventional in design and employs a bridge-type switching demodulator. Special attention is paid to SCA filtering.

The AM section, in addition to employing a separate r.f. amplifier and two i.f. stages, incorporates a 10-kHz adjacent-channel filter (another nicety that has been "overlooked" in so many receivers where AM is designed in pretty much as an afterthought).

The phono-equalizer sections use three transistors per channel for the 42-dB mid-band gain required, so that feedback is applied even at 20 Hz where maximum bass boost is required by RIAA playback curves. A differential amplifier is used at the high-level input stages, and tone controls are of

The Dual 1249.

**It will give you
more reasons than ever
to own a Dual.**

For several years, independent surveys of component owners—audio experts, hi-fi editors, record reviewers, readers of the music/equipment magazines—have shown that more of them own Duals than any other turntable. This is quite a testimonial to Dual's quality performance, reliability and fully automatic convenience.

We believe the new 1249 will add even more serious music lovers to the roster of Dual owners, as it provides every feature, innovation and refinement long associated with Dual turntables plus some new ones. And all in a newly designed chassis that complements the superb design and meticulous engineering of the 1249.

The low-mass tubular tonearm pivots in a true four-point gyroscopic gimbal suspended within a rigid frame. All tonearm settings are easily made to the exacting requirements of the finest cartridges. The tonearm is vernier-adjustable for precise balance; tracking pressure is calibrated in tenths of a gram; anti-skating is separately calibrated for conical, elliptical and CD-4 styli.

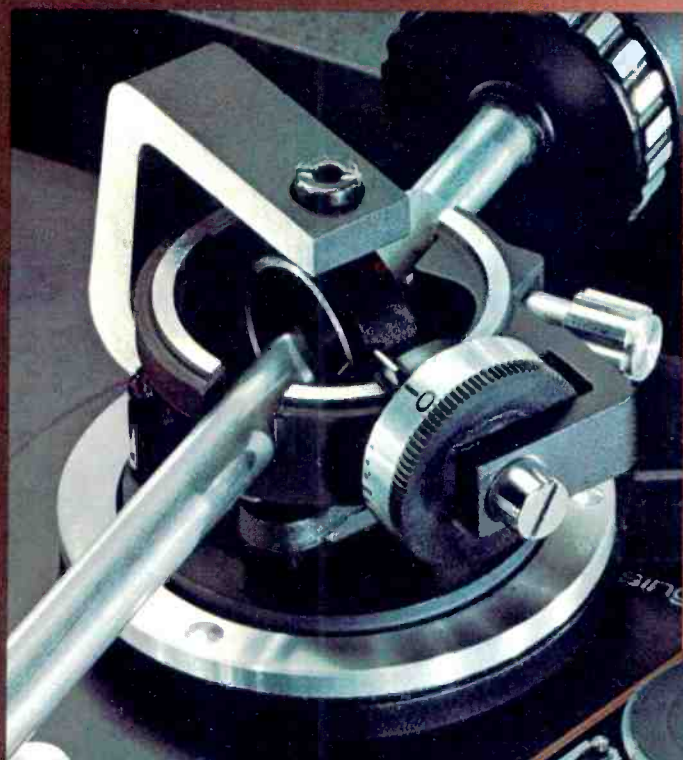
Tracking is flawless at pressures as low as a quarter of a gram. In single-play, the tonearm parallels the record to provide perfect vertical tracking. In multi-play, the Mode Selector lifts the entire tonearm to parallel the center of the stack.

All operations are completely flexible and convenient—and they are foolproof. The tonearm can be set on the record manually or by using the viscous-damped cue-control or by simply pressing the automatic switch. You also have the options of single-play, continuous-repeat, or multiple-play.

The dynamically-balanced cast platter and flywheel are driven by an 8-pole synchronous motor via a precision-ground belt. Pitch is variable over a 6% range and can be conveniently set to exact speed by means of an illuminated strobe, read directly off the rim of the platter.

Of course, if you already own a current Dual, you won't really need a new turntable for several years. However, we would understand if you now feel you must have nothing less than the new 1249. Less than \$280, less base.

Still, we should advise you of two other models in our full-size, belt-drive series. The 601, single-play, fully automatic, less than \$250. (CS601, with base and cover, less than \$270.) The 510, single-play, semi-automatic, less than \$200.



Tonearm of Dual 1249 pivots in four-point gyroscopic gimbal, suspended within a rigid frame. Each gimbal is hand-assembled, and special gauges assure that each will conform to Dual's stringent specifications.



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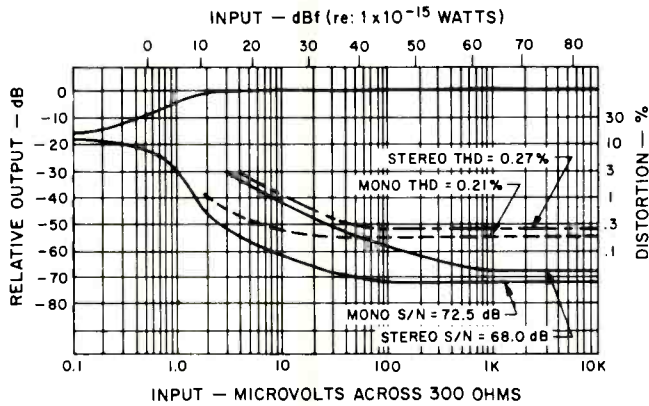


Fig. 4—FM quieting and distortion characteristics, 1-kHz signal, 100% modulation.

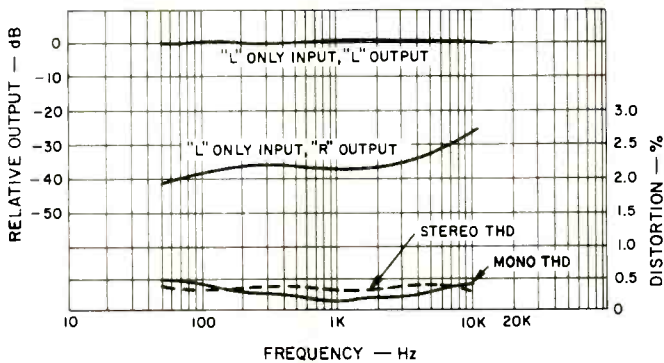


Fig. 5—Separation and distortion versus frequency.

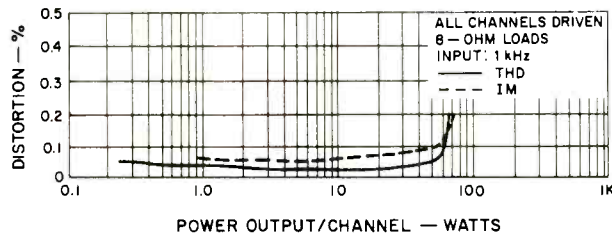


Fig. 6—Harmonic and intermodulation distortion characteristics with 8-ohm loads.

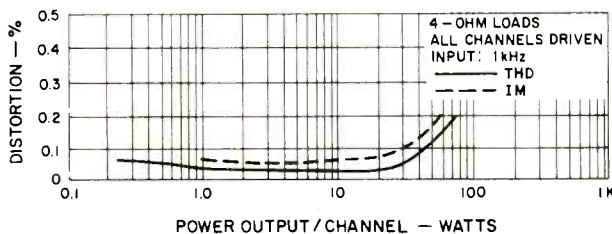


Fig. 7—Harmonic and intermodulation distortion characteristics with 4-ohm loads.

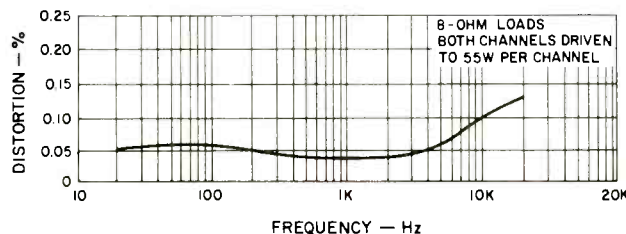


Fig. 8—Harmonic distortion versus frequency.

the familiar negative feedback type. Tone controls and associated components are mounted on a double-sided plated-through printed circuit board.

The power amplifier sections also use a differential input stage, one input of which is the negative feedback voltage from the power output stages. The output section is a direct-coupled, series push-pull amplifier. Circuit protection is afforded based first upon temperature of output transistor cases (a sensing device turns off a.c. in the event of thermal problems) and by McIntosh's Sentry Monitoring Circuit, which restricts drive to the output stages if power dissipation exceeds safe limits because of excessive mismatching or shorting of the outputs. Output signals are direct coupled, thanks to the dual polarity 40-volt supplies. An additional supply powers the driver stages, while two more regulated voltage supplies handle tuner and preamp stages.

FM Performance Measurements

Although McIntosh has modified its specification sheet to fully conform with the new FTC rule on power output disclosures, their statements regarding FM performance have not been up-dated to reflect requirements of the new IHF/IEEE tuner measurements standards. For example, signal strength figures are only quoted in microvolts (instead of dBf), and many of the new required stereo performance figures are absent. As we soon learned, these omissions are not the result of inadequate performance in these areas. Usable mono sensitivity, guaranteed to be better than 2.5 μV (13.4 dBf)—all McIntosh specs are stated as "limits" which every set is guaranteed to make or better—actually measured 2.0 μV (11.4 dBf). Stereo usable sensitivity (not quoted by the manufacturer) turned out to be an excellent 3.0 μV (14.9

dBf). The 50-dB quieting level in mono was reached with an input signal strength of 3.0 μV (14.9 dBf), while in stereo the signal strength required for this degree of quieting was an impressively low 25 μV (33.4 dBf). Best signal-to-noise ratio in mono reached 72.5 dB, passing the 70-dB mark at just under 50 μV (39.4 dBf), while in stereo best S/N was 68 dB. Quieting and distortion characteristics for a 1-kHz signal in mono and stereo at 100% modulation are graphed in Fig. 4. THD in mono reached a low of 0.21%, while in stereo THD was almost as low, with a reading of 0.27%.

Stereo separation, while not as great as in some more modern receivers which use phase-lock-loop MPX circuitry, exceeded mid-band specs and measured 37 dB at 1 kHz. Separation and mono and stereo distortion at other frequencies are plotted in the graphs of Fig. 5.

The single failing that we noted in the stereo section of the Mac 1900 was its poor rejection of sub-carrier products at the tape output (and even at the speaker output) terminals. Such high frequency output components were down about 35 dB at the tape output terminals and might cause problems when recording FM stereo programs "off the air" on tape decks not equipped with separate MPX filters, especially when Dolby encoding is used. On the other hand, 75-microsecond de-emphasis was just about perfect all the way out to 15,000 Hz—a situation very seldom encountered on tuners and receivers which sharply filter out 19-kHz and 38-kHz residual products.

Other performance measurements all turned out to be better than published specs as well, with capture ratio reading 1.5 dB, alternate channel selectivity readings of 62 dB, image rejection of 83 dB, and spurious response rejection in excess of 100 dB—the limit of our measuring capability.

Amplifier/Preamplifier Measurements

Figure 6 is a plot of distortion versus power output per channel with power delivered to 8-ohm loads. McIntosh's conservative ratings are even more apparent in the amplifier and preamplifier sections of this receiver than in the tuner section. Some 66 watts per channel was delivered by the amplifier before rated THD of 0.2% was reached. At Mac's rated output of 55 watts per channel, THD was still a mere 0.035%, while IM distortion measured just under 0.1% for that level of power output, reaching its rated value of 0.2% for 70 watts per channel of output power.

McIntosh is one of the few manufacturers which has continued to offer a 4-ohm power output rating in this era of FTC amplifier power regulations. In an addendum sheet supplied with the owner's manual, power output into 4-ohm loads is listed at 40 watts per channel. While this may seem contradictory to the laws of physics (nearly all solid-state amplifiers deliver greater power into 4-ohm loads than into 8 ohms), one must remember that the FTC power rule (specifically, the preconditioning requirement) places severe thermal limitations on amplifiers which might actually be expected to deliver much more power under musical or short-term high-power listening conditions. That, in fact, is just what happens if one measures the Mac 1900 at 4 ohms without regard to the one hour preconditioning requirement. It then delivers 72 watts per channel at mid-frequencies and not much less at the frequency extremes before reaching the 0.2% THD point. Power versus THD and IM for 4-ohm load conditions is plotted in Fig. 7. Figure 8 is a graph of THD versus frequency for a constant 55-watt output level per channel into 8-ohm loads. At the 20 Hz extreme, THD is still a very low 0.054%, while at 20 kHz THD

Live sound. Your reference and ours.

If you judge speakers by their ability to reproduce live sound, accurately... then KEF created Reference Series *for you*. Taking their latest advances in drive unit technology and applying the same uncompromising KEF standards to enclosure design and dividing networks. Right through development, live sound is the reference point. Drive units use advanced laminated diaphragms that prevent colouration by absorbing unwanted energy. At every point, the Reference Series benefits from KEF experience in building professional monitors, and from important new computer evaluation techniques. Now, two compact systems are winning world acclaim for the accurate, uncoloured quality they maintain even at high sound pressure levels...

Reference Model 104 Shelf or stand mounting 3-speaker system. High-power KEF tweeter, mid-range unit and acoustically coupled bass radiator all use latest materials technology. High-performance 6-element dividing network and, under the distinctive sculptured grille, an acoustic contour control.

Reference Model 103 Bookshelf system, with KEF tweeter and bass driver closely centre-line mounted on a unique steel baffle that rotates to keep ideal stereo image in any cabinet position. Again, the latest thinking in drive unit design, and high-density anti-resonant linings to the enclosure.



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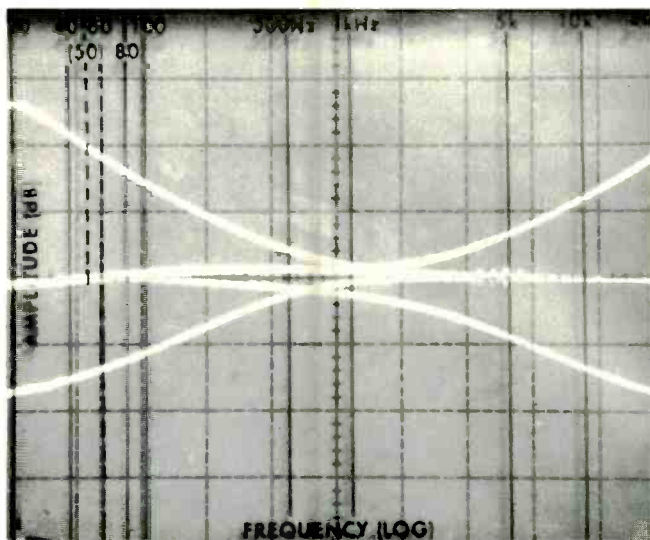


Fig. 9—Action of tone controls at full adjustment.

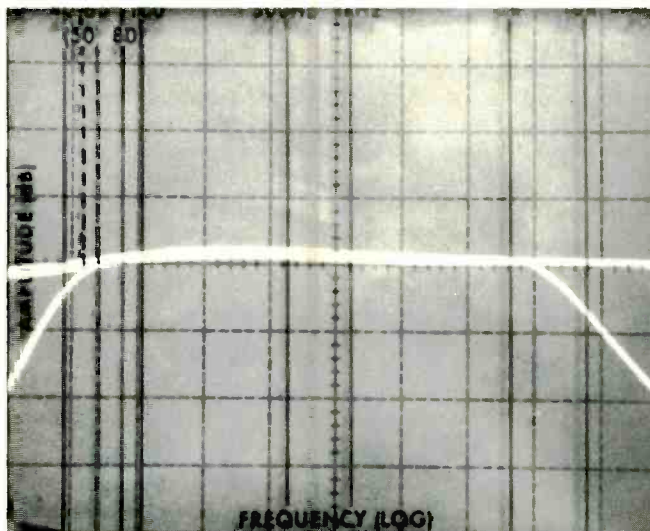
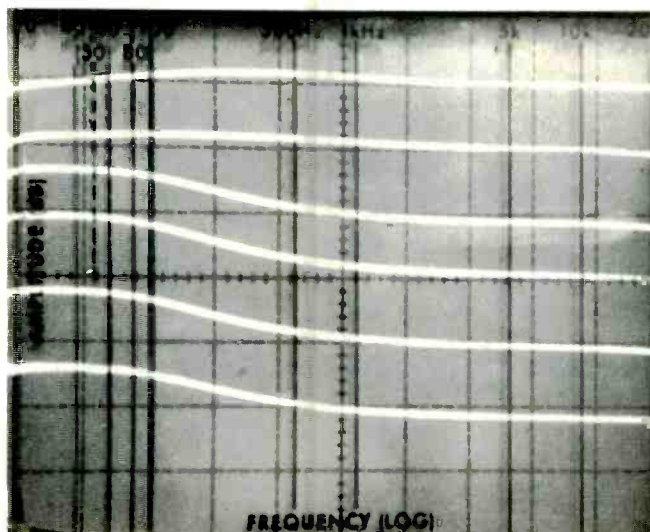


Fig. 10—Action of low- and high-cut filters.

Fig. 11—Action of loudness control.



reaches 0.13%—still well below the 0.2% nominal THD rating. At the 55-watt output rating, McIntosh could well have specified the power band as extending all the way from 16 Hz to 28 kHz had they been willing to “push” the published specs as far as some other manufacturers.

As for the preamplifier and control sections of the Mac 1900, we measured an input sensitivity for both sets of phono inputs of exactly 2.0 mV, as claimed. Phono overload at 1 kHz occurred at an input level of 110 mV (not the highest we have ever recorded, but certainly high enough for all practical purposes). Hum and noise in phono, referred to actual 2.0 mV input sensitivity was an amazingly high 72 dB. Translated to a 10 mV input reference, the figure becomes an incredible 86 dB! RIAA equalization was accurate to within 0.5 dB from just under 100 Hz to 15,000 Hz but was off by about 2 dB at the 30 Hz frequency extreme.

Bass and Treble control range is depicted in the sweep-frequency plots of Fig. 9, while the precise characteristics of the low- and high-cut filters are similarly plotted in the ‘scope photo of Fig. 10. Loudness control action, in 10-dB increments beginning from full clockwise rotation of the volume control, is depicted in the sequential traces of the storage ‘scope photo in Fig. 11. Hum and noise measured via the high-level (tape) inputs of the MAC 1900 measured 92 dB, while residual power amplifier noise and hum was 96 dB referred to full power output.

Listening and Use Tests

One can argue about the importance of “super-low” distortion, ultra wide-band frequency response (the MAC-1900 rolls off 3 dB at 8 Hz and 45 kHz), ultra high damping factors (the MAC 1900 has a damping factor of 56 at 8 ohms), and the need for super-high phono overload capability all day long, but the proof, after all, is in the listening. And the MAC-1900 “listens” extremely well. Bass is tight and well defined and, rated power notwithstanding, we were able to drive several low-efficiency speaker systems (which are reputed to require higher input power than the MAC-1900 provides) to bigger-than-life sound pressure levels with no audible evidence of amplifier clipping or other forms of audio misbehavior. In terms of absolutes, the FM tuner section does not measure as well in many respects as do some of today’s brand new tuners and receivers, but then again we come back to the question of program sources available from FM stations, the majority of which are far poorer than the inherent performance capability of the tuner section of this relatively “old” McIntosh design. We should note, by the way, that the AM tuner section of this receiver is extremely well designed for its time or even in terms of what is generally provided as an AM section on most of today’s competitive AM/FM receivers.

All of which brings us to the suggested retail price of the MAC-1900, which seems, at first glance to be out of line if measured on a watts/dollar basis. Talk to any Mac equipment owner, however, and you will rarely hear a complaint about the high initial cost of McIntosh equipment. The Mac loyalists inevitably end up talking about long-term reliability, quality of parts used in construction (we heartily concur here), absence of service problems and “down time,” and total willingness of the company and its selected dealers to render prompt and complete service if the need ever does arise. These components of the “McIntosh Mystique” are hard to translate into dollars and cents, to be sure, but sufficient numbers of Mac enthusiasts have been able to justify initial costs of McIntosh equipment to make that company one of the longest lived and highly respected in the United States and abroad.

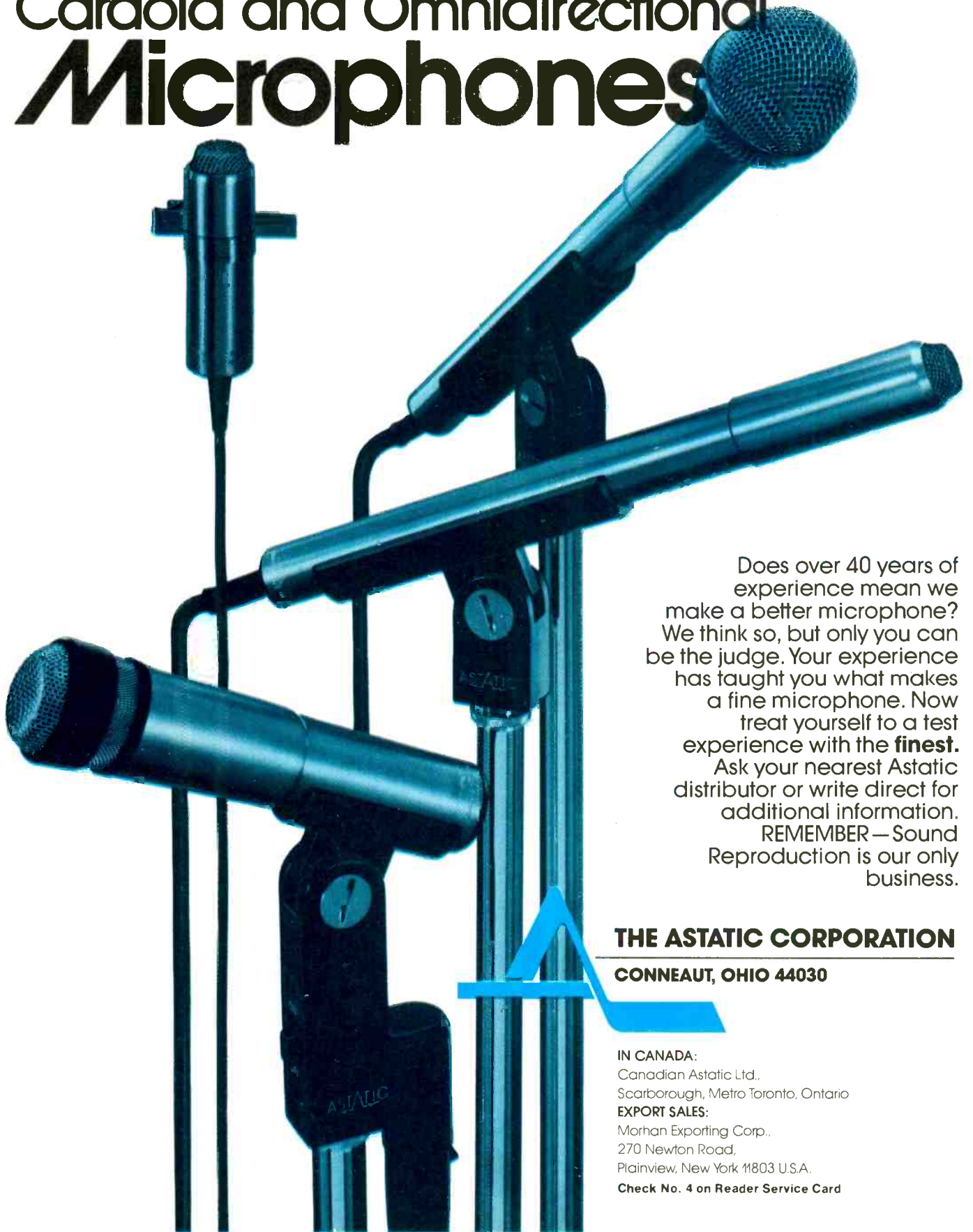
Leonard Feldman

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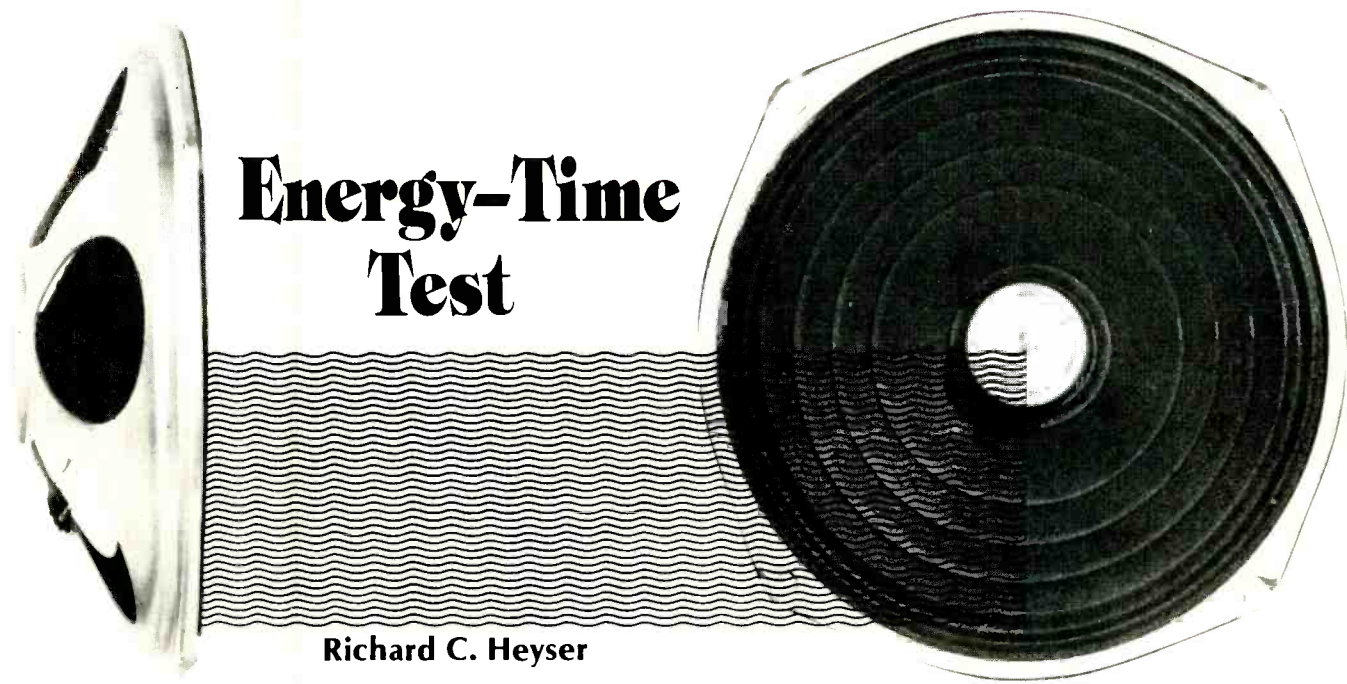
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Energy-Time Test

Richard C. Heyser

TRANSIENT RESPONSE, like the weather, is something many people like to talk about, but darn few do anything about. *Audio* has done something about transient response by providing a measurement of the time spread which a speaker imparts to a dynamic signal. It is known as the energy-time test. First, let's consider the nature of transient response and what it means to the illusion of sound in reproduction.

Transient sounds are sudden changes. They are the "now" sounds that give liveness and sparkle. Transient sounds, of the type to be discussed here, are over and gone in a very short time and hence are generally unpitched to the listener. A mathematical analysis of them, however, usually shows a broad frequency distribution of sound energy that may be many octaves wide and extend upward beyond the limit of audibility. Transient sounds are the opposite of steady-state sustained notes.

What does poor transient response in a speaker mean to the reproduction of sound? For one thing, it generally means a loss of realism. The bite of brass, attack of strings, and snap of percussion are all affected. Quite often we sense that all the frequencies are there but the reproduction is indistinct. The sibilants of an otherwise good stereo image of a choral group may tumble over each other in a cascading waterfall of sound and destroy the illusion of depth.

How do we test for transient response? There are many tests but the most meaningful derive from an im-

pulse as a source. Before it was finally accepted as a respectable generalized function, the impulse was usually regarded by mathematicians as a pathological entity that didn't quite fit into the scheme of things, even if it gave correct answers. A true impulse, for the purpose of speaker testing, would be an infinitely short duration, infinitely large voltage spike which at the moment of application would have a known constant energy. No one is going to generate that in any laboratory, you can be sure. But we know that if you could, the speaker would generate a sound called the impulse response. The impulse response will persist long after the impulse is over, just as a bell rings down after a sharp hammer blow.

The usefulness of the impulse response is due to the fact that any signal, no matter how complicated, could be duplicated by a continuing progression of impulses. In other words, if you know the response to an impulse, you have everything to know about the response to any arbitrary signal. And now you have a direct handle on the description of a transient.

Finding the Impulse

Fortunately, we don't have to try to generate an impulse for testing. We can compute the response. This neat little trick is made possible because the impulse response of a device is mathematically identical (almost everywhere, as the strict mathematician would insist) to the Fourier transform of the true steady-state frequency response.

This is exactly how we go about it. We start from the true frequency response, which *must* include the phase as well as amplitude, and compute the impulse response. We're not home free yet, because the conventional impulse response is a signal that generally looks like a series of overlapping oscillatory wiggles. While all the transient information is there, the waveform is almost unintelligible unless you are an expert at deciphering the story it tells.

What we have done is gone a step further and computed the total energy density represented by the impulse response. But a little history is in order.

The true frequency response is a complex quantity which has a magnitude as well as a phase angle. It wasn't too long ago that most people rebelled at the idea of loudspeaker phase response, but now most accept that reality. The thing we compute from the frequency response is, in fact, the time response of the loudspeaker. Time response also has a magnitude and a phase, and what *Audio* plots is the magnitude of the time response. To put it mildly, this is a whole new idea in audio measurement. While we also compute the phase of the time response, we have elected to plot only the magnitude because it is a measurement you can understand with very little practice.

So what happened to that wiggly line known as the impulse response? It has been absorbed into the energy density plot. The energy-time plot is the true magnitude of the envelope of

First nuclear-powered loudspeaker with gyroscopically-damped titanium woofer and turbo-thrust voice coil.

Ridiculous? Of course! ... But it makes about as much sense as many of the exaggerated claims and earth-shaking "breakthroughs" so loudly proclaimed in many of today's loudspeaker advertisements. The problem is, how do we counter these extravagant claims and establish credibility for our product ... since the Duntech DL-15 speaker is indeed, a basically new design, embodying many new concepts? We'll have to just, "tell it like it is" ... which means being somewhat blunt, and a bit challenging in our statements, TO WIT:

■ **The Duntech DL-15 has the flattest frequency response of any speaker you can buy ... no "ifs, ands, or buts" ... plus or minus 3 dB from 27 to 20,000 Hz.**

■ **The Duntech DL-15 is one of the very few speakers for which the manufacturer dares to quote distortion figures ... less than 1.6% THD at 30 Hz at 100 dB SPL, at 1 meter distance on axis ... less than 0.3% THD and IM distortion at 1 watt (nominal 90 dB SPL), 30 to 20,000 Hz, one meter on axis.**

■ **Almost no one quotes data on transient response ... the Duntech DL-15 has less than 1.5 cycles of overshoot at any frequency from 30 to 20,000 Hz.**

■ **Diffraction distortion ... a form of time delay distortion that "smears" or "blurs" transient response is virtually eliminated in the DL-15, resulting in ultra-precise positioning and perspective of stereo images.**

■ **The achievement of low distortion bass response below 30 Hz has not been at the expense of speaker efficiency ... 1 watt input at 8 ohms results in 90 dB SPL, at one meter distance on axis.**

We call the Duntech DL-15 the first "Total Performance" loudspeaker for its completely neutral, uncolored purity of sound across the entire frequency spectrum. The Duntech DL-15 makes use of the mathematical analogues that exist between electro-magnetic "Field Theory," and acoustic theory. The utilization of these analogues permit an exact mathematical representation of all speaker parameters, giving Duntech engineers a new degree of control over speaker performance. The applications of this research has resulted in the use of some unusual materials ... for example, diffraction distortion is controlled by use of a specially formulated variable density plastic foam, which wraps around the sides and front of the top section of the speaker cabinet, with contoured cut-outs for the mid-range and tweeter driver units. In designing the bass enclosure, "Field Theory" and "boundary value" solutions were borrowed from antenna design, to avoid standing wave moding problems, and here too, another type of high density plastic foam was used, so that acoustically the woofer enclosure has no parallel walls. The 15 inch woofer was specifically designed for this enclosure, and critical damping was achieved for optimum transient response. A short acoustical matching section fabricated from a special soft compound surrounds the periphery of the 1 3/4 inch tweeter to provide optimal coupling to the frontal air mass. The 5 inch mid-range driver is mounted in its own separate air-tight critically damped enclosure. A computer designed complex crossover network, with air core inductors provides seamless transition through the crossover frequencies of 350 and 4000 Hz.

Duntech believes speaker design should be more science than art, and to this end maintains its own anechoic chamber and elaborately instrumented laboratory, with the most advanced frequency spectrum analyzers, 1/3 octave

analyzers and graphic chart recorders, etc. Our measurement practices utilize established techniques with sophisticated new measurement technology. We state unequivocally, that the claims we make for the Duntech DL-15 can be confirmed in any acoustic laboratory following the same techniques and using equipment similar to our own.



THE DUNTECH DL-15
Suggested list price: \$449/each

All this new technology embodied in the Duntech DL-15 is in aid of just one thing ... the reproduction of music unsoftened by the artificialities and distortions of exaggerated sizzling high frequencies, mid-range peakiness, and boomy, over-resonant bass.

If you want to hear honest "ungimmicked" sound, unsurpassed for its sheer musicality, ask your dealer to demonstrate the Duntech DL-15 Total Performance speaker against any speaker in any price range.

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The Pre-Amplifier

Would you believe an all FET design, with no inverse feedback loop around output stages, with phono S/N of better than 90 dB below 10 millivolts, which reproduces near-perfect square waves, up to 6 volts peak to peak output from phono stage, over a range from 20 Hz to 50,000 Hz?

The Power Amplifier

Would you believe a 200 watt per channel amplifier, all FET, except the output stage which employs a new type of bipolar transistor, that has **no** inverse feedback loop, and **no** measurable transient intermodulation distortion?

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the impulse response. The impulse response fits into the energy-time response like a hand in a glove, but now the energy response fills in all the spaces between the peaks of the impulse response. What has happened is that the time response may either be represented in rectangular coordinates with an inphase and quadrature component or in polar coordinates with a magnitude and angle. The impulse response is the inphase rectangular component, and since in our case it represents instantaneous sound pressure, it contains the information relating to potential energy density of the generated sound. The quadrature component, once you compute or measure it, contains information relating to kinetic energy density. We actually compute this and then, when we convert the rectangular data into polar format, the magnitude is now related to total energy density since it properly contains kinetic and potential energy density in the proper proportions.

Two other considerations are needed before we close off this technical summary. First, we deliberately restrict our computation to cover only those frequencies from d.c. to 20 kHz. This simplifies the computation and is reasonable from the standpoint that sounds above 20 kHz are not gener-

ally considered in loudspeaker measurement. The true Fourier transform requires using all frequencies from d.c. to infinity. The result of using a restricted band of frequencies is that a perfect time response is spread from the infinitely narrow impulse into a broader peak and, in fact, will have time sidebands extending both prior to and following the true time of impulse. This leads to the second consideration because simply chopping off the frequency spectrum as if it were a rectangle gives a $(\sin t)/t$ time pulse which dies off too slowly to be of value in evaluating speaker transients. We therefore weight the frequency response with what is known as a Hamming response prior to conversion from frequency to time. This gives a slightly broader time response for a perfect loudspeaker but knocks down the clutter very well.

Using the Data

Now, let's consider how to use the data. Suppose we had a perfect loudspeaker situated in front of a microphone such as sketched in Fig. 1. Directly below the sketch of microphone and loudspeaker we have a plot of received energy versus time. The perfect loudspeaker would cor-

respond to a hump of energy centered at one meter distance, corresponding to about 3 mS air path delay. The spike is the impulse we would get if infinite frequencies were considered while the blunter peak is what we get from using 20 kHz.

If, as in Fig. 2, some reflecting surface causes sound to scatter toward the microphone, the two signals will be picked up. One signal is the direct sound due to the actual speaker, while the second is reflected sound due to the image speaker. This then shows up as two energy humps.

Now let's put our speaker in a box. In typical fashion we will cut a hole in the front panel and mount the speaker on the backside, creating a small resonance cavity due to the finite panel width. Other physical considerations are as shown in Fig. 3. The first sound heard is the direct sound shown as (a). Early reverberation produces the multiple humps (b). The spherical sound wave expanding from the loudspeaker will diffract from the molding trim, or any edge discontinuity, first at (c) then at (d). Sound from the back of the cone might reflect from the rear and reappear as (e).

This direct tie to the physical structure of a loudspeaker system can tell a great deal about the sound to be expected. For example, the staccato ef-

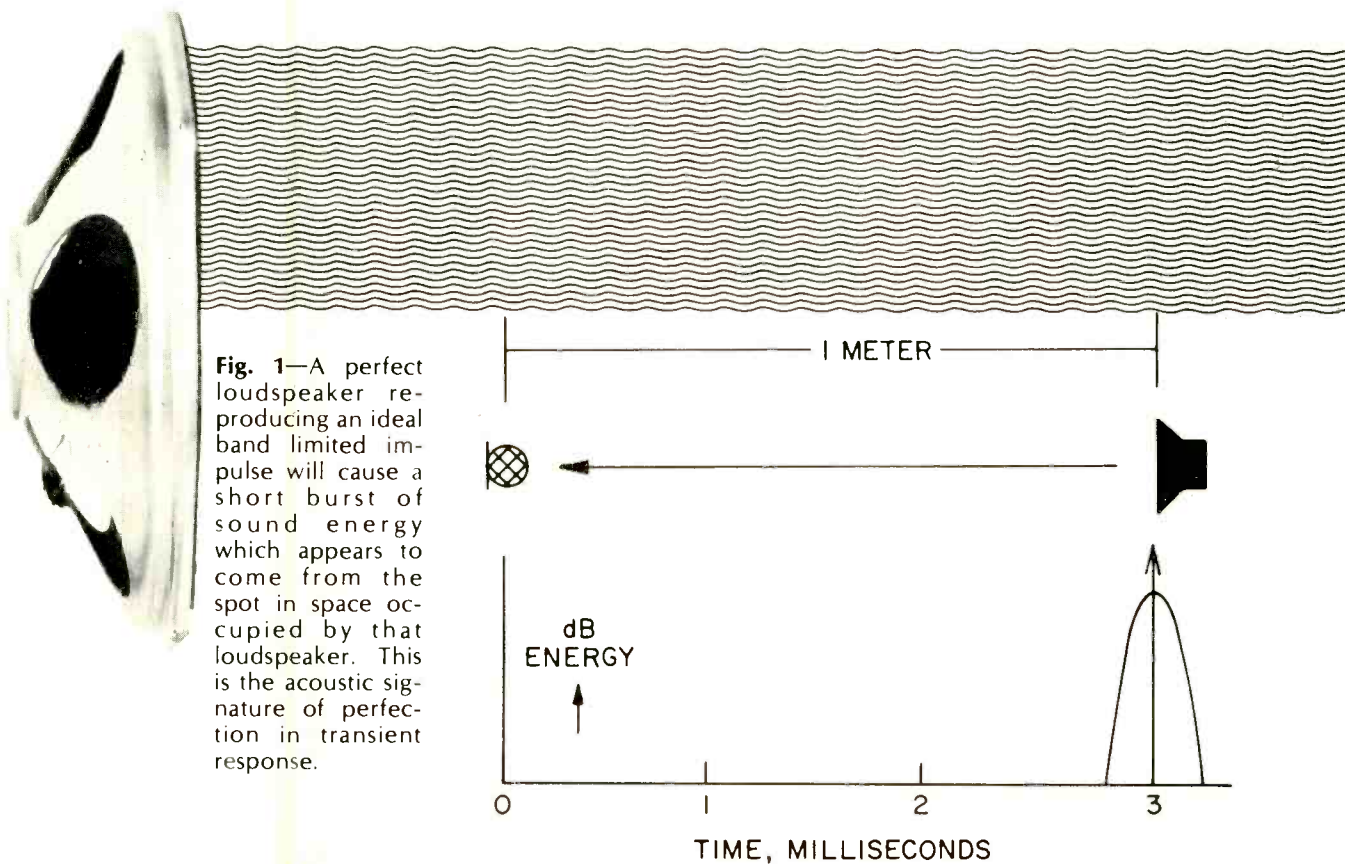


Fig. 1—A perfect loudspeaker reproducing an ideal band limited impulse will cause a short burst of sound energy which appears to come from the spot in space occupied by that loudspeaker. This is the acoustic signature of perfection in transient response.

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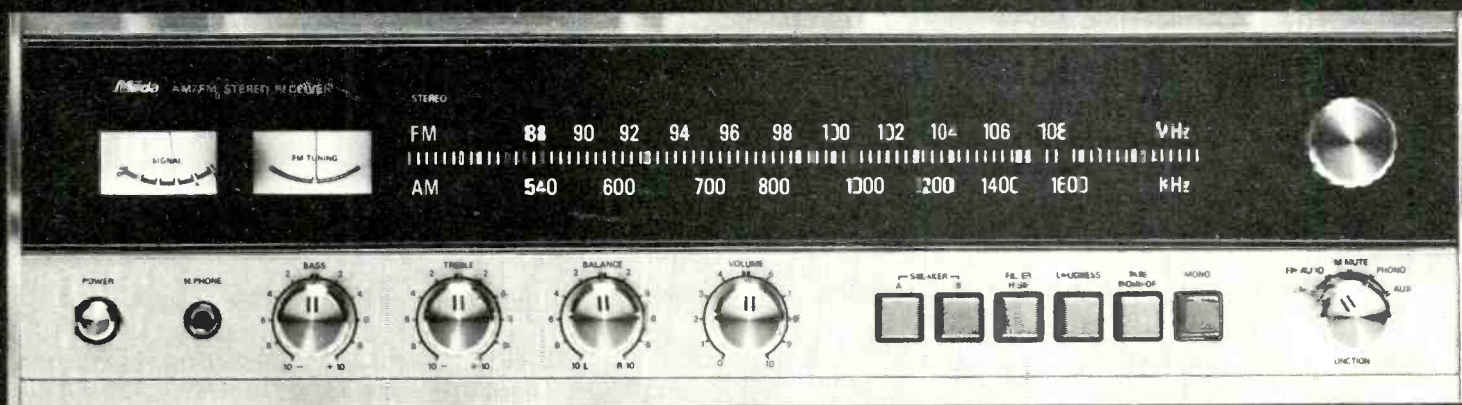
The T3115 Direct Drive Turntable is more than equally impressive. It has a full 13 1/2" platter. Only one other maker has this size but their suggested retail

value is about \$100 more. The T3115 has rumble of -70 db and with wow and flutter of .03% or less.

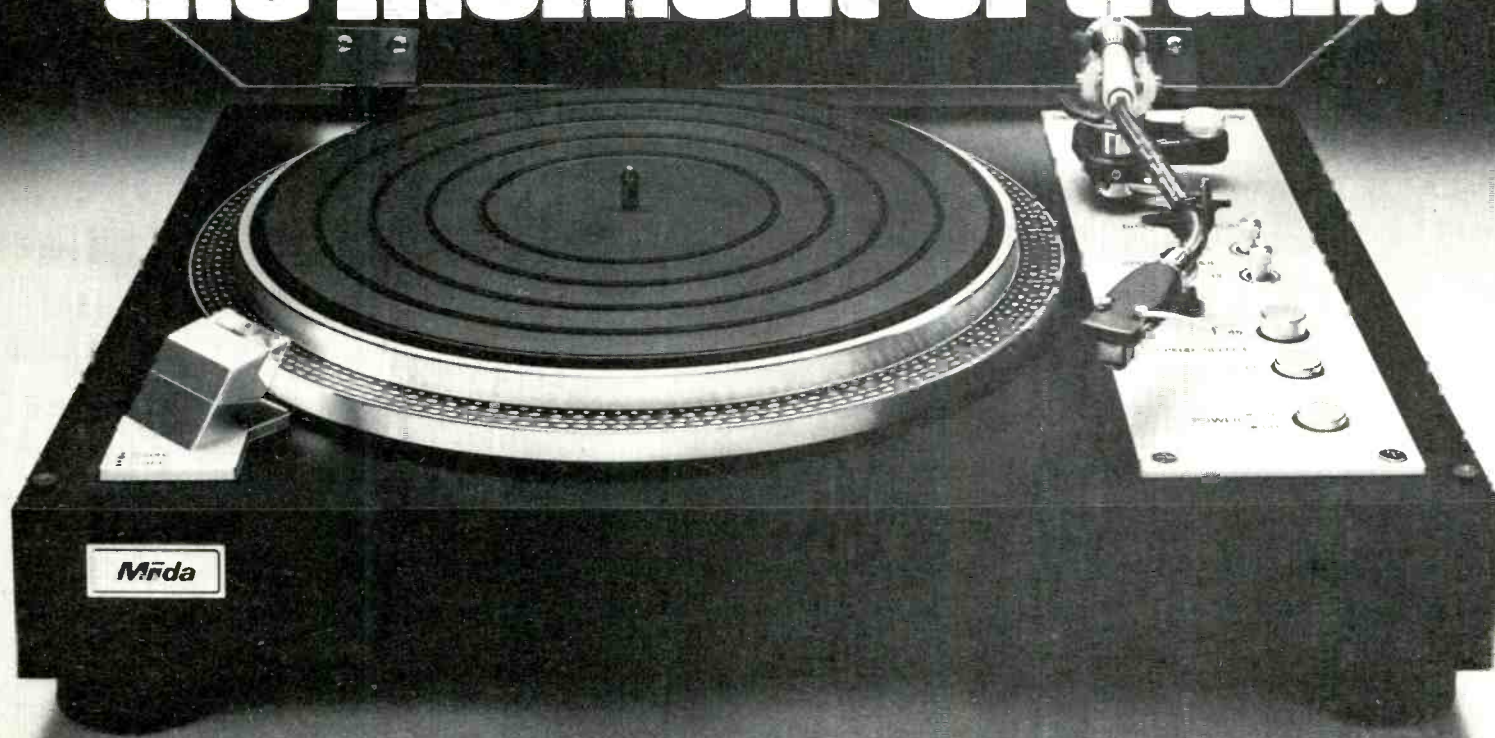
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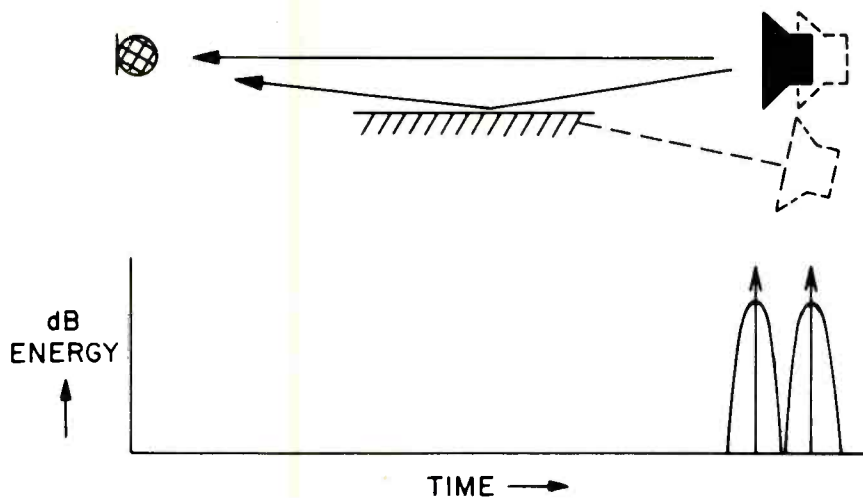


Fig. 2—A scattering surface will cause two bursts of energy to be heard from an otherwise perfect loudspeaker. Transient response is now degraded by this added echo.

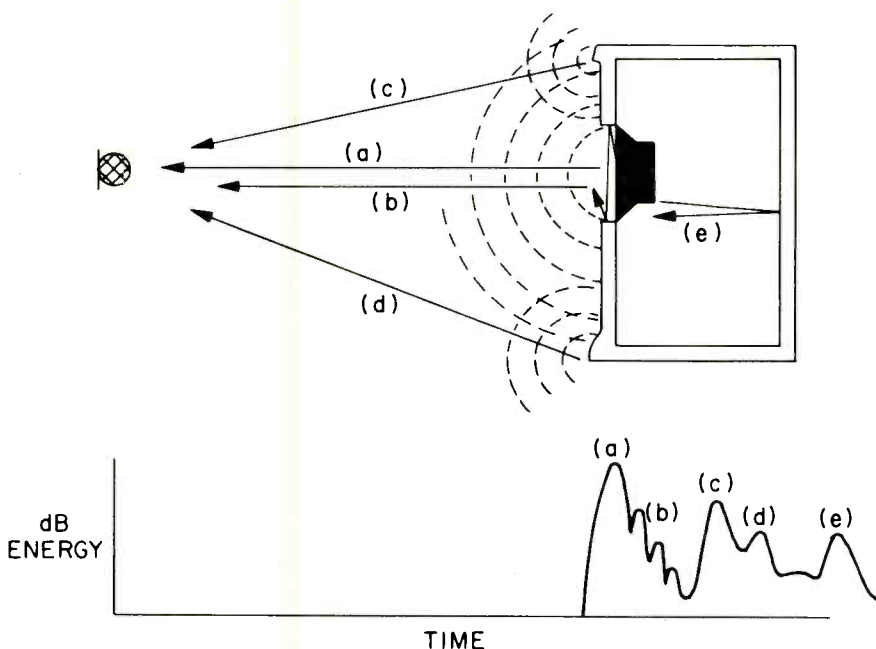


Fig. 3—Mounting an otherwise perfect loudspeaker in a box causes degradation of transient response by creating sound scattering heard as echoes and reverberation. These transient robbing sounds are measured by the time smear of energy which an actual speaker imparts to a perfect band limited impulse. By calibrating the arrival time and amount of these scattered sounds it is possible not only to tie them to the speaker system structure which causes them, but identify the amount of space smear which is imparted to otherwise perfect transient sounds.

fect of reflection in Fig. 2 is clearly in evidence in most loudspeakers. Usually the scatter giving rise to this is so short in time that all we sense is a "smear" in detail. If you want to determine what such an effect sounds like, walk up close to a reflecting surface, such as a hard wall, and listen to some percussive sound, such as a typewriter. (It helps to plug the ear opposite to the wall when doing this.) Not a very accurate portrayal of the sound of the typewriter, is it?—particularly when you can turn around and hear what it should really sound like.

A desirable plot, then, from the standpoint of excellent transient response, will have a narrow primary energy arrival with very few peaks following this and all the later peaks much lower in level than the primary signal. This type of loudspeaker will reproduce short transient sounds realistically. Any broadening of the primary energy or appearance of subsidiary reverberant energy will dull the performance to some extent.

Because this one-meter energy-time measurement is obtained directly from the one-meter frequency response, it is possible to correlate structural problems with frequency response problems. A loudspeaker that has a good frequency response when mounted on a large surface in an anechoic chamber can have a poor response when placed in a "busy" enclosure. Some manufacturers, however, use the measurements made anechoically with a large baffle in their literature and ads, rather than the response of the actual system that would be used in the home. A response aberration such as (c) in Fig. 3 may be loosely tied back to frequency response by looking at that portion of the frequency range which has the distance between (a) and (c) as an integral fractional wavelength.

We usually restrict the energy-time measurement to one curve for simplicity. The curve we do give can tell the best story about transient response for the first few milliseconds, which is probably the most meaningful part of the story. Because the tweeter and midrange units cover a broader frequency range than the woofer, their contribution to energy for this time must be correspondingly greater, and the physics of reproduction says it must be. One piece of information that is not shown is the pitch contribution of each source of energy. The pitch information would be contained in the equivalent time-phase plot. It may happen that the timbre of re-

The first direct-drive full range electrostatic speaker system... the Acoustat X

The promise and the quest

It has long been believed that if an electrostatic speaker could be made to reproduce the full audio spectrum at high power levels, with its inherent advantages of lightning fast transient response, vanishingly low levels of harmonic and IM distortion, high definition, no time delay distortion, and its distinctive transparency of sound, this would be indeed, "the ultimate transducer." This elusive goal has been pursued by speaker design engineers for many years, and they have been thwarted in their quest by problems which were insoluble by the application of conventional speaker design technology.

The problems

There have been, and are now on the market, a number of so-called "full-range" electrostatic speakers. They have suffered in common from what has been charitably described as "inadequate bass response," which translates into, "they have no bottom end." Some of these units take an abrupt "nosedive" as high as 65 Hz. Others, even when used in staggeringly expensive multiple arrays, roll-off rapidly below 50 Hz. Another failing of these speakers is their requirement for amplifiers with enormously high power outputs, and even with these expensive brutes, the sound pressure levels obtained are inadequate to the demands of program material of wide dynamic range. Most of these amplifier shortcomings are caused by the great capacitive load, often as much as 800-1000 picofarads, presented by the electrostatic screens. This necessitates using 100 to 1 step-up transformers to obtain the high voltage to drive the electrostatic diaphragms. For most amplifiers, which normally handle resistive loads in conventional dynamic speakers, this huge mis-match taxes the stability of these units and often leads to destructive failure of the electrostatic panel elements. In addition, the use of high voltage step-up transformers introduces hysteresis and "ringing" effects, and non-linearities due to poor control and damping of the signal. Although using the electrostatic principle, some of these speakers nonetheless are divided into woofer, mid-range and tweeter sections, necessitating the use of crossover networks with their inherent problems of phase shift and time delay distortion.

The realization... the Acoustat X direct drive full range electrostatic speaker system.

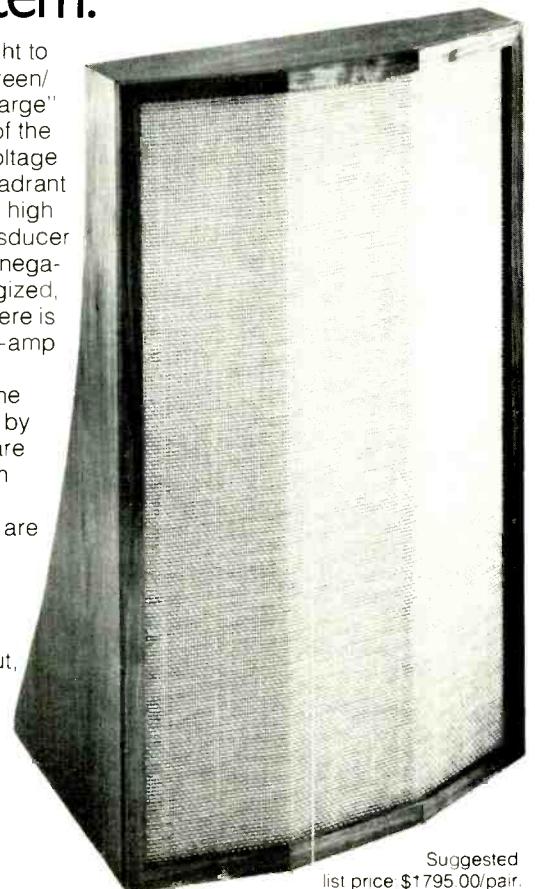
The full potential of the electrostatic speaker principle is finally brought to fruition in the Acoustat X. Acoustat research revealed that the electrostatic screen/amplifier interface problem could be solved by designing a special "servo-charge" amplifier, which would be compatible with the 800 picofarad capacitive load of the Acoustat electrostatic panels. This unique amplifier employs solid-state low voltage input circuitry, with an output section using special long-life tubes in a four quadrant "push-pull" configuration which drives the electrostatic panels directly from the high voltage tube elements. Thus better than 3000 volts are available to drive the transducer grids without the use of intermediate step-up transformers. In addition, a servo negative feedback loop, deriving its information from the point the panels are energized, corrects any anomalies and provides optimum control and waveform purity. There is also an "instant-on" relay circuit which eliminates power umbilicals from a pre-amp source. The amplifier is concealed in the base of the speaker.

Acoustat manufactures its own electrostatic panels, which are immune from climatic effects and completely free of arcing. They cannot be damaged by over-driving. Although three panels are used in the Acoustat X, electrically they are one. Considering the dipole radiation, there are over 17 square feet of diaphragm in each Acoustat X, and when each speaker is driven with its own 100 watt servo-charge amplifier, sound pressure levels of 110 dB at one meter on axis are produced. (105 dB for two speakers at 20 feet).

Thus in the Acoustat X is the ultimate expression of the electrostatic speaker, with **no** woofers, **no** mid-range, **no** tweeters, **no** crossover networks, **no** step-up transformers... with frequency response plus or minus 3 dB from 30 to 20,000 Hz and harmonic distortion less than 1% at 3 dB below full output, from 30-20,000 Hz. Since the Acoustat X speakers have their own integral amplifiers, all one need do is add a high quality pre-amplifier, sit back, and enjoy a new dimension of realism in the reproduction of music. The Acoustat X is 28 inches wide, 48 inches high, 19 inches deep at base, and 7 $\frac{3}{8}$ inches deep at the top.

Acoustat Corporation

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Suggested list price \$1795.00/pair.

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sponse (c) is different than that of direct sound (a). In truth, the "timbre" of any given loudspeaker is made up of the net contributions of each of the parts, a and b and c and so on.

There are several things to look for in the plot *Audio* provides. We use a logarithmic energy density scale, calibrated in dB, to make certain features stand out. A time response that has an exponential decay, such as the ring down of a strong resonance, will show as a straight line fall off of log energy versus time. The slope of this decrease is related to the "Q" of the peak. Multiple reverberation, which is a discrete form of exponential decay, will show as (b), peaks which are joined by a straight line reverberation characteristic. In fact, the reverberation time may be obtained by extrapolating the curve to -60 dB relative to the first peak.

Energy Decay


A logarithmic plot of energy density also allows for greater visibility of transient distortion than the conventional linear plot of impulse response. Coherent signal fragments 40 dB down are clearly audible but would require an enormous linear plot to be seen. Remember that in order for a

second sound to be judged "half as loud" as a first sound it need only be down between 6 and 10 dB in measured level. Some of these early reverberations which are 20 dB down from the principal peak are not inaudible by any means.

Experience has shown that the form of many of the aberrations in speaker transient distortion show more readily in a log plot. One "form" that repeatedly shows is the characteristic of diffraction due to a diffuse surface. The shape of direct energy sources, such as (a), are relatively smooth at peaks, whereas diffraction effects, such as (c) are generally irregular.

When a cone loudspeaker is under test, the first signal energy you may see is due to sound coming off the edge of the cone. This is usually an energy peak on the rising slope of the first main peak. Elastic waves in a speaker cone consist of a combination of shear and compressional components and propagate faster than sound in air. These are first to reach the front of a speaker, and if the cone surround is not a perfect absorber, they will "launch" a sound wave from that point as they reflect back toward the voice coil. Normally this is a very inefficient mode, and the energy is

very low. However, the propagation of the elastic waves down the cone can efficiently launch pressure waves as it travels, an effect ingeniously capitalized on by Lincoln Walsh in his now famous driver. Many direct radiator speakers have poor polar and transient response for the first few tenths of milliseconds because of these sound waves caroming off domes, whizzers, and the cone itself. This will show clearly in the energy-time plot.

We realize that the concept of the time response of a speaker is a whole new ballgame to many people and is probably a bit confusing if all you ever considered before was steady-state frequency measurements. However, once you begin to use such data and get accustomed to both time and frequency measurements, the tendency is to get hooked and not want to go back to only frequency measurements. You then realize you need both types of data to fill in the whole story of loudspeaker performance. *Audio* has introduced the plot of energy density as a function of time not because it is the only possible one, but because if you must give only one measurement of time performance, this is perhaps the most meaningful for evaluating speaker sound. 

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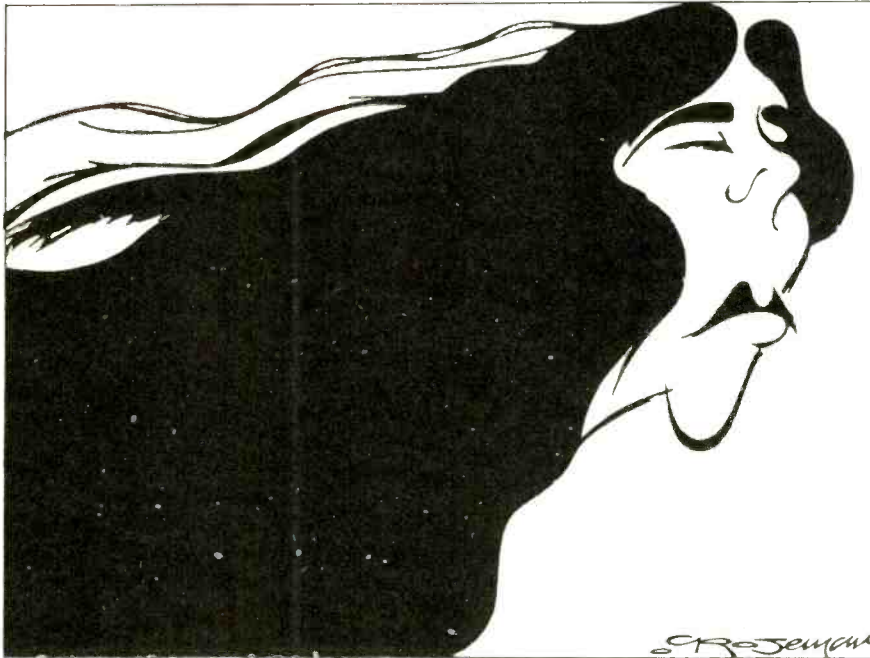
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The Column



Smile: Laura Nyro
Columbia PC 33912, stereo, \$6.98.

Smile is Laura Nyro's most open and friendly and, yes, accessible record ever. Her first in over four years, it marks her reunion with Charlie Calello who produced her two best previous albums, **Eli** and **The 13th Confession** and **New York Tendaberry**. For **Smile** he has smoothed out the classic Nyro idiosyncrasies into a shimmering direct sound, bell-clear.

After a warm, tinkly version of Smokey Robinson's *Sexy Mama*, which reintroduces Nyro's musical vernacular, her own *Children of the Junks*, reaffirms her romantic fascination with things Oriental. Her backing vocal on *Kowloon* is absolutely bewitching. Her piano here is authoritative, as it proves to be throughout, and the interplay with Richard Davis' stand-up bass, reminiscent of his brilliant work on Van Morrison's **Astral**

Weeks, is the first hint of one of the album's recurring delights.

Money is more electric and drives hard, a most impressive piece. Michael Brecker's sax solo is riveting and intense, and is matched with an equally fine trumpet part by brother Randy on *I Am The Blues*. Both songs reflect on the personal desolation which followed the money battles around Laura's music that drove her to seclusion. *Stormy Love* is about the failed marriage of her isolation falling apart, independence beckoning, while *Midnight Blue* appears to be another scene from the same tableau.

After that much emotional turmoil, *The Cat Song* is a welcome piece of whimsy, sung from the view of Laura's cat, Eddie. **Smile** is an amalgam, first a song of love's passion set against winter's desolation, then becoming a spacy instrumental.

Throughout **Smile**, the sound is un-

mistakably Nyro and from the first note, more polished than even the **Eli** album but without that disc's sterility and pretension. **Smile** is vibrant and alive, a reaffirmation of an original and mighty talent. Welcome home, Laura.
Michael Tearson

Sound: A Performance: A

The Best of Leonard Cohen: Leonard Cohen
Columbia PC-34077, stereo, \$6.98.

A good selection, very handsomely packaged with the unexpected bonus of notes on the songs written by the artist, makes this a retrospective of unusual worth. Beside the obvious "hits" (*Suzanne*, *Bird on the Wire*, *Hey, That's No Way to Say Goodbye*, and *Sisters of Mercy*) are some not so obvious choices which flesh out a musical portrait of the poet Cohen.

Leonard Cohen has suffered for years from the bad rap that his work is depressing. Not so. His humor is subtle and his poetry is among the very best and the performances superb, (especially in concert he is transcendent). Cohen's **Best of** is an excellent overview of one of our most important and, especially in America, most shamefully overlooked artists.

Michael Tearson

Sound: A Performance: A

Frampton Comes Alive!, Peter Frampton
A&M SP-3703, stereo, \$7.98.
Captured Live!, Johnny Winter
Blue Sky PZ 33944, stereo, \$6.98.

It used to be that a group would put out a live album to show what could be done without the magic of the recording studio, overdubbing, and seventeen zillion violins. The technical advantages of the studio would be replaced by the spontaneity of an art-

ist who is working in front of an audience, the violins replaced by the screaming audience. The added bonus would be in the creative process which takes place when the performer has to do it all in one take.

Nowadays, things are different. With a remote recording unit you can get just as fine a recording sound as you can within the sound baffles and hallowed halls of any recording studio, and as the expense of doing a live recording is minimal these days compared to that of renting a studio, you can record several concerts and get the best takes—so much for the one-take magic. And as most rock performers have their act so calculated and preplanned that there is no more room for error than there is for exceeding oneself, the rock concert has become (save for its visual aspects) a tedious recreation of the artist's previous recordings. The object of a concert, nowadays, is not to come up with something new and exciting onstage but just to come as close to the original recording sound as possible, and this doesn't make for particularly memorable live albums.

Take these two as perfect examples. Both guitarists play fairly well here, the singing is slightly below par, the sound is very good, and the crowd response is (per usual) slightly hyped-up. Frampton's two-record set is his first on his own (his only other was with **Humble Pie**, a classic of the live LP genre, featuring material never before recorded by the band) and contains the Greatest Hits of his career (selections from his four solo albums and *Shine On* from **Humble Pie**). Although his first two solo albums are very good, his third and perhaps even his fourth are completely dispensable if you've got this album, as the live versions excel the others. Unfortunately, Frampton uses altogether too many devices on his guitar so that his playing (once quite extraordinary) is often secondary to the effects, if not buried in Bob Mayo's rhythm guitar.

Winter's record is decent, with a fine choice of songs and speedy axe-work by the notably Hendrixian Winter (although Robin Trower makes his guitar sound like Hendrix's, J.W. actually plays very much like the late great). But my complaint with both of these albums is not that they're crummy, but that predictability defeats the whole purpose of a live album. Too much polish and not enough shoe, if you know what I mean.

Jon Tiven

Performance: C+ Sound: A

Frampton Comes Alive: Peter Frampton
A&M SP3703, stereo, \$7.98.

Live albums usually are issued at the end of an artist's contract with the company or when he has no creative push left. Peter Frampton's means more than that. With an especially lucid set of liner notes by Cameron Crowe to flesh out the context, **Comes Alive** reviews Frampton's career from Humble Pie onwards revealing him as a thoughtful, tuneful writer and an excellent performer. His band is basic, spare yet solid, graceful and strong. The show is paced well: a rock & roll open followed by a short acoustic set, then gradually reintroducing the band and building to a smashing extended showcase finale. All of his four solo albums are represented, plus *Shine On* from the days as part of the Pie.

Frampton's work with the talkbox, a device that channels the guitar sound through the human voice, is extraordinary. It's a sound that figures to be one of the staple novelties for 1976, especially on disco records, but it is unlikely that such restraint and intelligence on this toy will be seen again.

With a successful live album, featuring some of the best live sound ever recorded in rock, he has covered his bases and built a sturdy foundation. The future's up to him.

Michael Tearson

Sound: A+ Performance: A-

Between The Lines: Janis Ian
Columbia PCQ 33394, SQ Quadraphonic, \$7.98.

Aftertones: Janis Ian
Columbia PCQ 33919, SQ Quadraphonic, \$7.98.

The elusive Janis Ian "Queen of the melodic bittersweet" has again emerged into the public eye as a major artist. Her introspective, self-evaluation type lyrics have finally found their time and audience. Her youth has given way to a sensitive, vital woman and her self-esteem, or lack of it, comes from a very honest place all of us can identify with, and her images of love are both full-blown and cautiously sultry. Her images touch on areas that in one way or another exist in all of us. Her love songs are a full indication of this maturation.

The songs in **Between The Lines** are all strong, and total good taste is to be found in every note and word on the record. The quadraphonic sound is both lush and tasteful.

In **Aftertones**, her music like her words, is the work of a serious musical artist, charged with the competence of a committed energetic artist. Until **Aftertones** she has chosen to hold back the most obvious quality, that of a very fine, rich vocalist. She usually emphasizes her musical acumen, but here she sings, plays, arranges, and writes at the same high level. The album is eloquent, she gets it all on.

Aftertones is her only album without a "supersong," yet it hangs to-



gether so well as to be enchanting from start to finish. *This Must Be Wrong*, *Aftertones*, *Belle Of The Blues*, *Don't Cry Old Man* and *Hymn* all have that look of whimsy, warmth and wisdom that has always been a part of this young woman. Each song on the album has its own special magic. Janis Ian has emerged from a puckish, arrogant kid to a real stand-up and take-notice artist. *Fred De Van*

Between The Lines

Sound: A Performance: A

Aftertones

Sound: A Performance: A

Greg Kihn: Greg Kihn Bezerkely BZ-0046, stereo, \$6.98.

What makes for a pop star? That question has rattled around ever since I abandoned my own singing plans around 1969 and left Baltimore to try out on Philadelphia radio.

One kid I left behind and expected good things from was Gregory Kihn. We used to play gigs around the local folkie scene together and I remember that even then he had a flair for really fine melodic songs inspired by the likes of the late Tim Buckley, Fred Neil and Donovan. And I still miss the crazy times we used to have.

Well, I went my way and Greg went his. Now that I no longer hope or expect to make records it was a real thrill to see a pair of Greg's songs on the Bezerkely Chartbusters collection, both of them more hook-filled and hummable than ever. Now his own elpee is out.

At his best Greg Kihn writes natural Top 40 songs with hooks that perhaps don't mean much, but wind up haunting you as you walk around and fill up surprising amounts of empty space in your mind. *Don't Expect to Be Right*, *Any Other Woman*, *Worse or Better* and the reggae-tinged *Satisfied*, any of these might be the one that breaks as a hit for Greg. Each is nicely bite-sized and strongly insinuating. On the debit side, *Emily Davison* is forced and cloying, but on a debut album like his what counts is what works, not the misses. Greg Kihn's debut is refreshingly free of pretense. Mostly it's fun.

Michael Tearson

Sound: B Performance: B-

Back Roads: Kate Wolf & The Wildwood Flower Owl L-001, stereo, \$6.98.

Kate Wolf's album is a fine example of homemade music. Her own songs

are gentle, acoustic country songs in the story-telling tradition. *Emma Rose* is an especially poignant song of growing old, alone and bitter. *Tequila & Me* is a fine drunk song. A pair of songs by friends David West and Cyrus Clarke of the Cache Valley Drifters, *Telluride* and *Legend in his Time* written in tribute to the late Gram Parsons are real winners. *The Redtail Hawk* by friend George Schroder is equally fine.

The liner notes mention that the album was recorded in a living room before an open fire, friends coming and going. It almost sounds that way, warm and comfortable like an old, overstuffed chair.

(Editor's Note: Copies of the record can be obtained from: Owl Records, P.O. Box 711, Sebastopol, Ca. 95472.)

Michael Tearson

Sound: A Performance: B

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Rocking Chair: Jonathan Edwards
Reprise MS 2238, stereo, \$6.98.

With a new label, Jonathan Edwards has taken a bit of a change of context. Leaving Boston folk behind, Edwards has enlisted Brian Ahern for production and Ahern's most recent client, Emmylou Harris and the Hot Band, for support. All the ingredients are there.

However the cake fell. The album sounds sleepy and distant, utterly lacking fire. Edwards, Ahern and the Hot Band never really connected like Edwards and the group Orphan did on the excellent live album **Lucky Day** (Atco SD 36-104). *Michael Tearson*

Sound: C Performance: C -

On The Road: Jesse Colin Young
Warner Bros. BS-2913, stereo, \$6.98.

Jesse Colin Young has become one of the most consistently pleasing artists around. This live album is a testament to just that consistency, featuring several of his very best songs: *Sunlight* from the days of the Youngbloods, *Peace Song*, *Miss Hesitation*, T-Bone Walker's *T-Bone Shuffle* and a fine, extended *Ridgetop*, all from his recent solo albums. About the rest, *Walking Off the Blues* dates from Jesse's early folksie days while *Corinna* is a blues favorite he's been singing for years in one form or another. *Have You Seen My Baby?* is the great Randy Newman song and *What's Going On/Mercy Me* (*The Ecology*) comes from Marvin Gaye. More than adequate live sound and a tight, emotional band make **On the Road** as rewarding as could be expected. *Michael Tearson*

Sound: B+ Performance: B+

Faithful, Todd Rundgren
Bearsville 6963, stereo, \$6.98.

"There's no more of that funny music on the new Todd album," confided Todd's one and only squeeze, Bebe Buell, "but don't say anything to him about it or he'll start playing it again." Beulah was right, rock-fans—Todd has returned to the 4/4 forte after meandering about in the jazzoid cosmos. Todd's flirtation with the void ended, his new album **Faithful** is without a doubt one of the high points in his career. I had my doubts about Todd's ability to return to the style for which he was best suited—the beautiful ballads and throbbing rockers of *Something/Anything* seem so much a part of Todd's days gone by—but rock 'n' roll's Punk



Monk has a new album of terrific songs which are as disciplined as anything on his first three solo albums, yet revealing the musical/spiritual progression Todd has undergone in the time since.

Side One is Todd's sandbox, in which he plays with his toys (the recording studio, primarily) without much concern for creating something wholly original but only distinctively Todd. This is accomplished by a series of recreations of rock 'n' roll classics, in which our hero plays the part of John Lennon (*Rain* and *Strawberry Fields Forever*), Bob Dylan (*You'll Go Your Way & I'll Go Mine*), Jimi Hendrix (*If Six Were Nine*), and all fifteen zillion voices of the Beach Boys (*Good Vibrations*). Other rock personalities have made albums of their favorite oldies, most notably Bryan Ferry, David Bowie, and John Lennon, but all of them were anxious to put their stamp on the record by changing the sound of the song as much as possible. Todd keeps absolutely **Faithful** to the original versions, taking great pains not to stray from the path and letting the listener know that it's Todd doing these renditions by his ability to come so incredibly close. His enunciation gives him away every time—Todd never lapses into the perfunctory rock mumble, and a grateful listener can hear every lyric—and although the musical arrangements are practically identical, there is a clarity present

which often clouded the sound of the original. Proving Todd is not only a strong creative talent but a careful listener as well—and his vocal send-up of Bob Dylan is absolutely hysterical.

As for side two, Todd has written a bunch of tunes which contain no more funny music but are distinctively Toddish, proving that you don't have to try to go out on a limb in order to sound unique. Todd has been slagged in the past, but record reviewers are going to have a hard time finding something to dislike here—from the slightly Dwight Twilleyesque backbeat of *Black and White* to the lush *Common Man* or *The Verb To Love* you'll find nothing but dynamic, interesting rock music with a sense of humor that takes the listener by the seat of his pants and refuses to let go. It might be interesting to note that Todd hasn't had a record that sounded this good (in terms of actual recording quality) in years... at last he's learned how to produce himself within the context of "progressive rock."

All in all, **Faithful** is one of the most outstanding recording achievements from an American artist in the entire history of rock, a record which preserves the past and moves toward the future. Thank goodness there's a musician with as strong a personality as Todd's who knows how to keep both his music and nonmusical overtones in balance—and we should all be glad that one of the world's great song-

writers is again back at the top of his form.

Jon Tiven

Sound: A+ Performance: A+

Eric Mercury: Eric Mercury
Mercury SRM-1-1026, stereo, \$5.98.

I haven't the foggiest notion who Eric Mercury is, but his record is a pleasant surprise. I really like it; I like his strong black voice, along with the songs and their presentation. If the name is a gimmick that is where the games end.

The music is a solid rock collection of really good songs. The cuts range from semi-country to R&B with soft ballads for flavor. *Tell Me Love*, *Color Yesterdays*, *Nothing Lasts Forever*, and *No One* are all cuts that will be remembered once heard. His performance throughout is accomplished, unstrained, and energetic. His delivery and style is a savory surprise if you like strong male vocalists with style and class. On performance alone, this superb record should not be missed.

The sonics are excellently produced and recorded, the disc is perfect. I wish the folks at Mercury would give this record the real quadrasonic treatment because it has the capability of being a real stunner. Give this album a try—it is a joy.

Fred De Van

Sound: A Performance: A

Escape From Babylon: Martha Velez
Sire SASD-7515, stereo, \$6.98.

Produced by Bob Marley, with the Wailers for a backing band, plus their back-up singers, the I-Threes, it is remarkable this album was even cut. But it was with fascinating results.

The Wailers sound great, absolutely superior. The mix on their tracks is perfect, lots of presence with a bass sound that reaches out and throbs your gut. Martha Velez, down from Woodstock, even did her best. Sometimes, as on the Wailers' *Bend Down Low*, she tries too hard and oversings, but on two new Marley tunes *There You Are* and *Happiness* and her own *Money Man*, she shines. *Disco Night*, a Marley/Velez collaboration, is no less than a celebration.

Only rarely pushing too hard, Martha Velez' **Escape From Babylon** is made for some easygoing yet hot music. It must have been fun to record. One quibble, only 4 songs per side, barely 30 1/2 minutes total seems kind of skimpy.

Michael Tearson

Sound: A Performance: B+

Locked In: Wishbone Ash
Atlantic SD-18164, stereo, \$6.98.

Wishbone Ash's rep was made with searing twin lead guitars. Next to nothing of that appears on **Locked In**, which is the group's debut for Atlantic. What there is is a bunch of amazingly unmemorable and generally slow songs that never lift off. Give

en the dull and uninspired sound that Tom Dowd produced for the band, they really don't have much chance this outing.

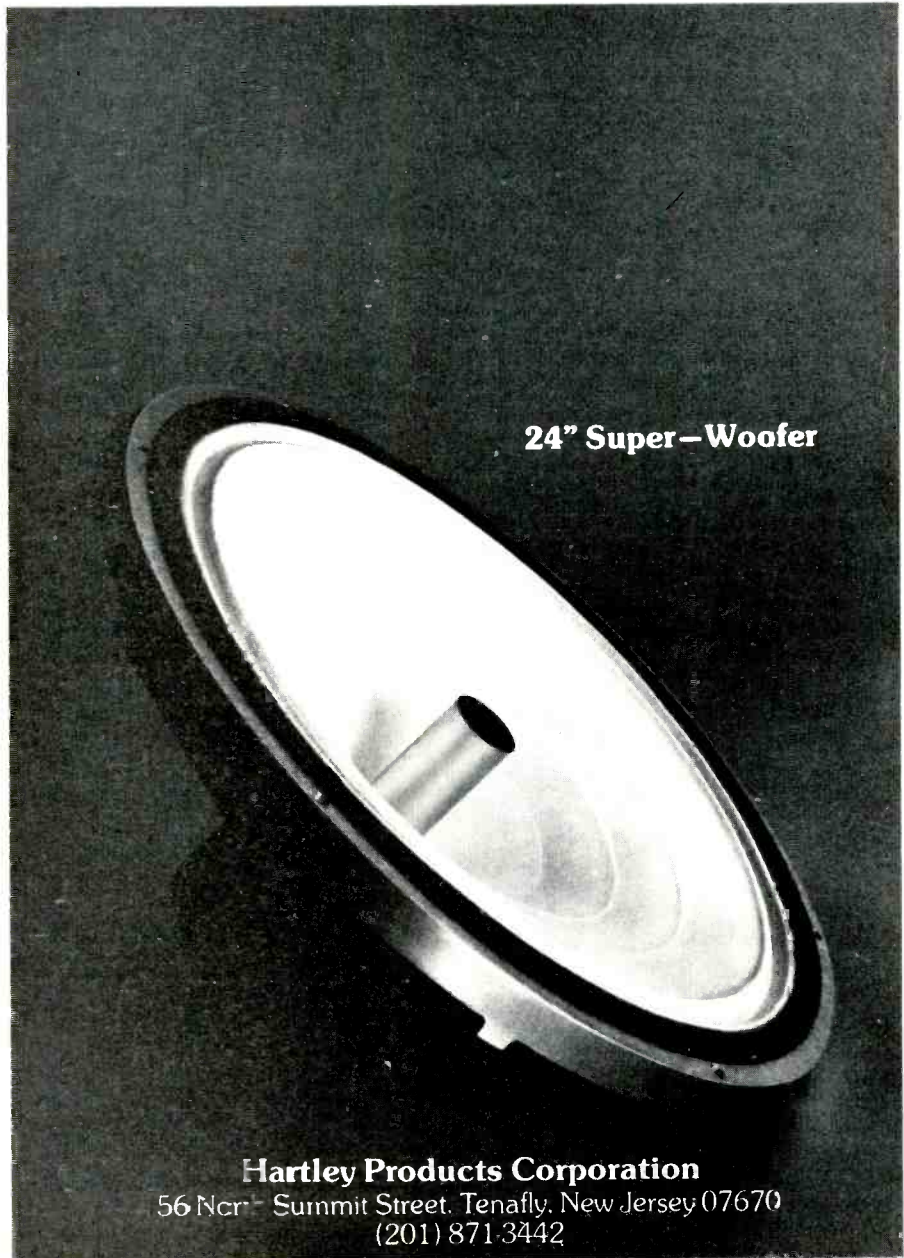
In the words of a country song, "There's nothing cold as ashes after the fire is gone."

Michael Tearson

Sound: F Performance: D

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Kingfish: Kingfish
Round RX-LA564-G/RX-108, stereo,
 \$6.98.

A fiery enthusiasm rarely found on recent Grateful Dead family records distinguishes Kingfish. The band is spearheaded by Deadman Bob Weir and former New Rider of the Purple Sage, Dave Torbert. Fortifying enthu-

siasm is some solid songsmithing and dandy playing.

The two Bob Weir-penned leadoff songs, *Lazy Lightning* and *Supplication*, have a strong, infectiously soulful feel not remote from the best of Steely Dan, while his *Home to Dixie* has a trace of Big Pink Country. A good Torbert number, *Wild North-*

land, and two impressive songs from the outside source of Carter/Gilbert, *Jump for Joy* (to the tune of *I Know You Rider*) and the terrific *Asia Minor*, round out side one.

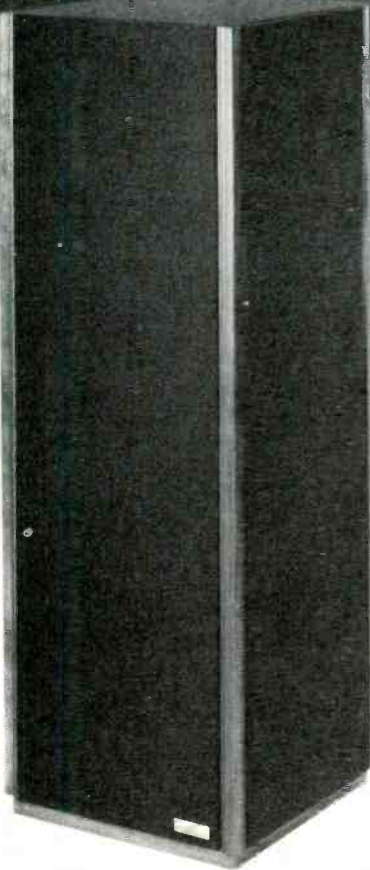
Kicking off the flip side, *Good-Bye Yer Honor* has a *Bye Bye Johnny* tinge to it and leads into Marty Robbins' *Big Iron* for a double dose of outlaw stories. *This Time* and *Hypnotise*, both co-written by Torbert with guitarist/singer Matthew Kelly, are the album's very best, the former a convincing ballad, the latter a rocker which opens up to give lead guitarist Robby Hoddinott his hottest moments on the disc. (*I Will Understand It Better*) *Bye and Bye* done up reggae closes the show.

Kingfish is making top-flight good-time music for today. They'll cheer you up or make a party jump. Their debut feels good. *Michael Tearson*

Sound: B+ Performance: A-

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 Distributed in Canada by Superior Electronics, Inc.

Chester & Lester: Chet Atkins & Les Paul

RCA APL1-1167, stereo, \$6.98.

This is the first recorded meeting of the two guitar giants. Best of all, it is as good as it should be. Each man is completely at home with the other and the rhythm section never gets in the way, giving Atkins and Paul all the room they want. A good amount of session atmosphere and banter is left in to make the music seem all the more real and to best illustrate the empathy of the two playing some old favorites, stand-bys like *Avalon* and *Birth of the Blues*. Further, except for overdubs on *Caravan* and *Lover Come Back to Me*, the music is unadulterated, warts and all.

There's never even the slightest problem figuring who plays what since the "sound" of each man is intact; the melodically rich, reedy sound of Chet Atkins and the otherworldly sound of Les Paul, aided by reverb and other mostly self-invented electronic devices still reminiscent of his classic hits with Mary Ford. (Incidentally, Capitol has an excellent Les & Mary set called **The World is Still Waiting for the Sunrise**, ST-11308.)

Special mention must go to Nat Hentoff for his extraordinarily enlightening notes, the best since Pete Hamill's job on Dylan's **Blood on the Tracks**. *Michael Tearson*

Sound: B+ Performance: A

Jazz & Blues

King Cobra: Woody Herman
Fantasy F-9488, stereo, \$6.98.

Woody Herman, now in his fortieth year as a bandleader, has been trying to bring the generations together with his jazz-meets-rock efforts recorded for Fantasy and performed on cross-country concert tours and college seminars.

As on past Fantasy albums, the Herman musical message is delivered dynamically with a brassy elan, contemporary energy and excitement. Unfortunately, the jazz element is not as strong in this collection, rather the album is saturated with fuzztones, feedback, wah-wah pedals, and other electronic distortion effects that form the most irritating part of the rock vocabulary. The material ranges from Stevie Wonder (*Don't You Worry 'Bout A Thing*) through Carol King (*Jazzman*) to Chuck Corea (*Spain*). There are an unduly number of electric piano solos, and call me a reactionary if you will, but the electrified piano has a positively anemic sound when compared to the sonorities and resonance of the acoustic instrument.

Herman remains a fine jazz soloist; his work on the soprano sax is fiery and volatile, and his lush, rich Johnny Hodges derived alto is a consistent joy as it sings out in a lustrous performance of the Harold Arlen-Johnny Mercer standard, *Come Rain or Come Shine*, the only non-contemporary title in **King Cobra**. Tenor sax man Gregory Herbert plays with muscular eloquence, and Woody wails in the lower registers of the clarinet on a bluesy instrumental called *Toothless Grin*, another good track. Aside from



these two selections, I was bored by Herman's unrelenting efforts to stay *au courant*.

As on all Herman Fantasy LP's, the recording and remixing job by engineer Jim Stern is first-rate; the album has a clean, expansive sound.

John Lissner

Sound: A Performance: A

Batch of Jazz: Harry James and Woody Herman

Tulip TLP 107, mono, \$5.98.

One would need to have a singular devotion to big band jazz and to Harry James and Woody Herman to buy this curio, an album made up of badly-recorded, late 1944 Armed Forces

Radio broadcasts from the Hollywood Palladium. The Herman band was in its transition period, moving from Swing into its "First Herd" progressive jazz phase, and one can hear a preview of such First Herd classics as *Apple Honey* and *The Good Earth* (still titled *Helen of Troy* in this performance). The muddiness of the off-the-air "bootleg recording" is such that the powerful ensemble work and exciting solos, soon to inflame the jazz scene in 1945, are badly muffled. In addition to the jazz instrumentals, Woody sings several innocuous pop tunes including *Straighten Up* and *Fly Right* and *Tain't Me*.

The Harry James broadcast has a slightly improved sound quality and

there are two swing-jazz instrumentals, *The Mole* and *9:20 Special*, but if you own the original recordings, or the LP re-issues, who needs these unless you're a Harry James freak? The five pop tunes sung by Helen Ward and Buddy DeVito are as bland as can be.

John Lissner

Sound: D Performance: B

Phenix: Cannonball Adderley.

Musicians: Cannonball Adderley, soprano and alto saxophones; Nat Adderley, cornet; George Duke, keyboards and synthesizers; Mike Wolff, keyboards; Sam Jones, bass; Walter Booker, bass; Louis Hayes, drums; Roy McCurdy, drums; Airto Moriera, percussion, conga drums.

Songs: *High Fly, Work Song, Sack O' Woe, Jive Samba, This Here, The Sidewalks of New York, Hamba Nami, Domination, 74 Miles Away, Country Preacher, Stars Fell On Alabama, Walk Tall, Mercy, Mercy.*

Fantasy F-79004, stereo, two discs, \$8.98.

bring together George Duke, Sam Jones, and Louis Hayes for an inviting acoustic set in a long overdue recorded reunion. The second disc (sides 3 and 4) is a set of more recent tunes, more electronically oriented and featuring Adderley's then current group.

While it is true that all of the tunes on **Phenix** have been recorded by the Adderleys in the past, Cannonball's new treatment of earlier material is nothing less than refreshing. His rendition of *The Sidewalks of New York*, a decades-old standard, is testimony to the ageless quality of good music when it literally receives a breath of fresh air from a genius. Adderley was one of those few who could transcend the instrument itself, the personality and mood of the man came forth with his unmistakable sound, not just the common vocal utterances of the saxophone itself. There is a fiery quality about Adderley's playing even within the serenity of *Stars Fell on Alabama*.

The last appearance the Adderleys made, which I attended, left me with an unforgettable impression. It was a relaxed, pleasant warm country-like

cooking, the two brothers brought with them a stage presence sparking an indescribable sensation over the audience, and lasting the entire evening. Adderley, in his almost mockingly intellectual style, \$20 words, and all (like Bird used to do), announced that the audience would be "thusly provided with . . . a spiritual uplift. . ." This is apparent on **Phenix**.

Nat Adderley is perhaps the most overlooked cornetist. He demonstrates his unflinching creativity on *Domination*. Opening with a very swinging up-tempo modal beginning, acoustic comping by Mike Wolff in the Tyner vein, the group makes way for some funky electric piano ramblings, a McCurdy solo, percussion by Airto, an Adderley soprano shot, and a return to acoustics.

Jazz is the audible essence of the impromptu—a phenomenon affected by the surroundings, atmosphere, and the convergent personalities of musicians and audiences alike. Sensitive musicians have a sixth sense for anticipation and interpretation of music and life's activities in general. Cannonball's was at such a peak on **Phenix**. The phoenix is used as a symbol of immortality in Egyptian mythology, and here appropriately represents one of Cannonball's finest recorded efforts, musically and in terms of audio quality, in a brilliant career.

Eric Henry

Sound: B+ Performance: A —



This was the last album Cannonball Adderley recorded before his untimely death in 1975. Coincidentally, it represents a synopsis of the groups he led over the last 15 years. Sides 1 and 2

summer evening at the Temple Music Fair when two ebullient figures dressed in almost celestial white leisure garb made their way on stage. With the rhythm section already

Long Yellow Road: Toshiko Akiyoshi-Lew Tabackin Big Band
RCA JPL 1-1350, stereo, \$6.98.

Formed in Los Angeles in 1974, this outstanding big band has enjoyed great success in Japan, where this album (and the band's first LP, **Kogun**) was first released. It has also been heard at the Monterey Jazz Festival and is building a following in California. No doubt, the welcome U.S. release of this disc will help extend its reputation further.

This is a band with its own sound. All the arrangements and most of the compositions are by Toshiko, until now best known as a pianist—a talent she modestly doesn't feature strongly within the band. Her writing for five flutes (ranging from piccolo to bass flute) is particularly striking; it is well displayed on *The First Night*. Her use of rhythmic accents is also very personal. It doesn't express itself in odd time signatures but rather in the phrasing of the music.

The band has enjoyed the relative stability of personnel without which it is impossible to build a first-rate large jazz ensemble. A key factor is co-leader Tabakin, a superior tenor saxophonist, an excellent flutist, and the band's outstanding solo voice.

There are others, however. Alto (and soprano) saxophonist Gary Foster, influenced by Lee Konitz but with his own voice, is heard to good advantage, as is veteran reedman Bill Perkins. There is good trumpet work by Don Rader and Bobby Shew, and trombonist Charlie Loper has his say. The rhythm is well handled by bassist Gene Cherico and alternating drummers Chuck Flores and Peter Donald.

The most exciting piece, *Opus No. Zero*, features Tabakin at his most Sonny Rollins-like, plus extensive chases involving the whole reed section. The most exotic entry is *Children in the Temple Ground*, featuring Toshiko's piano, and singer Tokuko Kaga in a charming Japanese introduction.

Quadrille, Anyone, reflects an Ellington influence in terms of timbre and spots Perkins' warm britone sax as well as the use of flute doubles. Foster's soprano solo is fluent and musical.

The most moving solo work, comes from Tabakin in *Yet Another Tear*, dedicated to the memory of the great tenor players—Coleman Hawkins, Don Byas, Ben Webster and Paul Gonzales—no longer among the living. He does them justice.

This is the most musically rewarding big band to come along since the Thad Jones-Mel Lewis Orchestra by which, incidentally, it is influenced. It offers welcome proof of the continued viability of this sturdy branch of jazz, and I unhesitatingly recommend the album to all lovers of the genre.

The domestic pressing, while adequate by U.S. standards, is much inferior to the Japanese edition.

Dan Morgenstern

Sound: A

Performance: A

Awakening: Sonny Fortune

Musicians: Fortune, alto sax, flutes; Kenny Barron, John Hicks, piano; Wayne Dockery, Reggie Workman, bass; Chip Lyles, Billy Hart, drums; Angel Allende, percussion.

Songs: *Triple Threat, Nommo, Sunshower, For Duke and Cannon, Awakening.*

Horizon SP-704, stereo, \$6.98.

Awakening brings to life the post-bop side of Sonny Fortune's sprawling

talents. While with Tyner his playing was more often compared to that of John Coltrane's creative outputs during the classic quartet years (circa 1961-64). Fortune is more concerned with the roots of jazz, strong, swinging foundations in the acoustic rhythm section, colorful changes, and perhaps an all-around change of pace from the electronics and "crossovers" everyone expects, in general, and his past performances, in particular.

Triple Threat, a 10-minute cut is long by producers' standards, too short by mine, considering the inde-

scribable musical niceties, swinging solos, and fun blowing for all involved. If you listen to this cut a thousand times, you're still merely wetting your pallet. *Nommo*, written by Philadelphia bassist Jymie Merritt, is a 7/4 cooker, featuring the formidable Reggie Workman (one time bassist with Coltrane). This cut was recorded previously by Lee Morgan (**Live At The Lighthouse**, Blue Note BST 89906) while Merritt was a part of this group, and some interesting comparisons can be made between Morgans' solo and

(Continued on pg. 95)

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(Continued from pg. 89)

Sullivan's on this date. Once again, Billy Hart is an articulate, powerful drummer, always listening, always complimenting, never even hinting at being musically obstreperous. He is underrated, perhaps, by listeners, yet here he is appearing on another, essential contemporary jazz recording.

While Fortune's directions are situated more middle-of-the-road on **Awakening**, his portrait as a musician cannot and should not be placed exclusively in one school of playing or another. His ever growing reservoir of abilities draws from diverse and far reaching musical tributaries. It would be nice to hear Fortune perform on tenor sax in future albums, since his performances with Tyner were so sparkling.

Kenny Barron's keyboard prowess deserves special mention. He has certainly developed into one of the most important pianists, and he's done it in a very quiet way. It's almost as if he's come quietly in through the back door of jazz's mainstream and is now really roaring. Barron and Fortune not only come from Philadelphia, but they also look alike! They were a part of Buddy Rich's small group around the time this LP was recorded, and perform comparably well on **Very Alive At Buddy's Place** (Groove Merchant GM 3301).

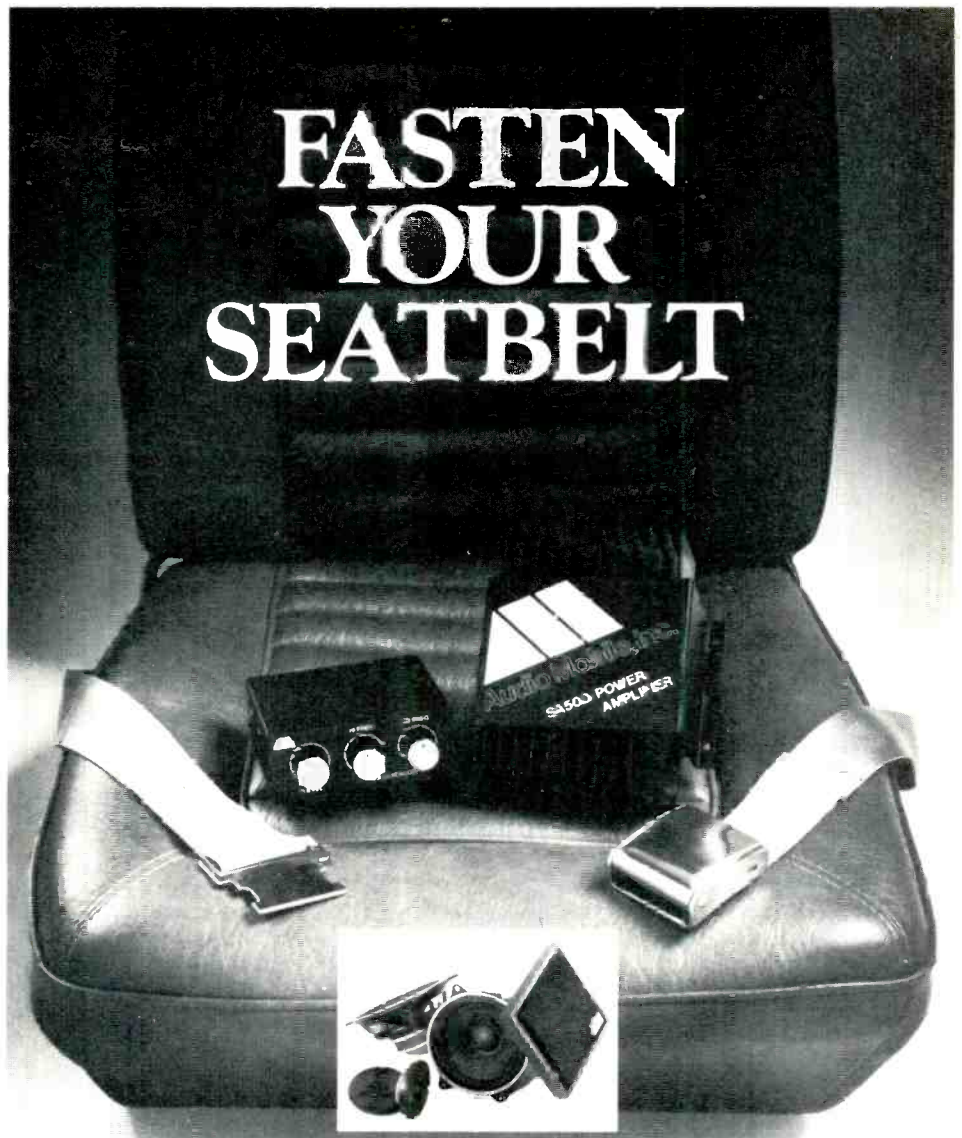
The recording and packaging of **Awakening**, as with all the Horizon's I've seen and heard, is a giant step in the right direction. Horizon has taken the rare initiative of including a lead sheet of *For Duke And Cannon*, with the album, with worthwhile and extensive liner notes, complete recording dates, places, personnel, etc. and a stereo mix diagram of one cut. The recording quality even approaches that of the top jazz imports (Steeplechase label from Copenhagen, ECM, etc.) which use their masters to press but 10,000 copies instead of the who-knows-how-many pressings per master in the States. Oh, by the way, Horizon claims "one of the important reed sidemen makes his debut as a great leader," on **Awakening**. Disregard this! **Long Before Our Mothers Cried** (Strata East SES 7423) was recorded two years ago by Fortune (and is more worth picking up for your enjoyment).

The stimulating, invigorating music of **Awakening** is made more pleasurable by the magnificent recording. **Awakening** is a gem.

Eric Henry

Performance: A Sound: B+

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Canby's Capsules

Edward Tatnall Canby

Boulez Conducts Schoenberg Gurre-Lieder. Napier, Thomas, et al., G. Rich, narr., BBC choruses, orch. **Columbia M2Q 33303**, 2 discs, SQ quadrasonic, \$15.96.

Boulez Conducts Ravel: Daphnis et Chloé,, complete ballet. N.Y. Philharmonic, Camerata Singers. **Columbia MQ 33523**, SQ quadrasonic, \$7.98.

Shostakovich: Symphony No. 5. Phila. Orch., Ormandy. **RCA ARD1 1149**, CD-4 quadrasonic, \$7.98.

Shostakovich: String Quartets Nos. 7, 13, 14. Fitzwilliam Quartet. **L'Oiseau-Lyre DSLO 9**, stereo, \$6.98.

Saint-Saëns: Violin Concerto No. 3. Havanaise. Louis Kaufman; Netherlands Philh., Van den Berg. **Orion ORS 75177**, stereo, \$6.98.

Robert Kajanus Conducts Sibelius Symphony No. 1; Belshazzar's Feast (1930, 32). Vox Turnabout **THS 65045**, mono, \$3.98.

William Mathias: Music for Organ. Christopher Herrick, organ of Hereford Cathedral (England). **L'Oiseau-Lyre SOL 542**, stereo, \$6.98.

One of the first monster 78 albums, weighing tons, was of this gigantic collection of Romantic songs with soloists, narrator, vast chorus, huge orchestra; if you thought Schoenberg was "modern," just listen here! The music was blown up to size around 1900 but the orchestration is 1911, and sounds it; general style is super-Wagner, outwardly more old-fashioned than Mahler. Boulez scintillates here—after all, this is a Forerunner of the Contemporary. Four sides of gigantic SQ, quite something.

Daphnis is a milestone of early Contemporary and it's French, enough to excite Boulez to his best. This is a taut, economical, driving performance, good change from too much emphasis, in other versions, on the Impressionistic aspect, plus too much plain yelling and pounding in the big climaxes! Boulez holds the wordless chorus down to size.

The Fifth was for long *the* Shostakovich Symphony—that was before he went past nine and on into the teens. It is still a monument of the neo-Romantic style of the 1930s, and Ormandy, once again, is the man who remembers how it ought to sound. You could call this a definitive version. The *surround* sound is conservatively excellent, very much an orchestra in a big concert hall, and not bad CD-4 for a pre-quadrasonic operation. Quiet surfaces and only a few end-of-side squawks of protest from the demodulator. (Composers *will* put their loudest music in the wrong places...)

"...the aging composer, withdrawing more and more into his own private death-haunted world"—here indeed is the ultimately terse, wry expression of that sad and embittered face we see on the cover; this young English group, friends of the composer, play him as he should be played. As always, a difficult mixture of strong musical thinking and untamed musical platitudes, here boiled down to the essence, the last of a major 20th century enigma. Interesting.

Not all top-flight fiddlers have long hair and show-off personalities; if not, they often get side-tracked. This bald-headed oldster with the pleasant face is no show-off but his Kreisler-like playing is obviously the genuine article and his Saint-Saëns is a model of old-style violin performance. "A musicians' musician"? On discs, he's anybody's.

The very first Sibelius symphony recording of all—Kajanus, born 1856, was an older champion of Sibelius before the turn of the century, and made these recordings just before he died. The Symphony (anon. English orch., 1930) is typically close and dead, IM-tinny in loud parts, but very listenable; *Belshazzar*, two years later (London Symphony) is startlingly improved with good ambience, cleaner highs, an almost 1940s mike style. Lively horse's-mouth performances.

Who—? Well, this disc gives us *all* his published organ music to 1974, so now we know. Such a collection! (And mostly commissioned, too—he's famous). The man blissfully ignores modern developments, writes a snazzy 1940s style, nervously energetic, jerky, full of slick organ tricks, all for the old-fashioned monster organ, of course—what else? He gets himself played with immense dexterity by Christopher Herrick. An entertaining sort of music if incredibly sectarian—at least it is neither pretentious nor lugubrious, nor even long-winded. Just down-to-earth pro. Like a good dentist. A *smiling* dentist.

Bach: The Brandenburg Concertos. Boyd Neel Chamber Orch., Neel. **Olympic 8131/2**, 2 discs, stereo.

Liszt: Five Hungarian Rhapsodies. Claudio Arrau, piano (1951-52). **International Piano Archives (Desmar) LSM 1003**, mono, \$6.98.

Mendelssohn: Octet for Strings Op. 20. Janacek, Smetana Quartets. **Vanguard Supraphon SU 4**, stereo, \$6.98.

Teresa Berganza; Canciones Espanolas. Narciso Yepes, guitar. **Deutsche Grammophon 2530 504**, stereo, \$7.98.

The Baroque Sound of the Trumpet. John Wilbraham and Leslie Pearson. **Argo ZDA 203**, stereo, \$6.98.

Golden Dance Hits of 1600. Ulsamer Collegium, Collegium Terpsichore, etc. **D-G Archive 2533 184**, stereo, \$7.98.

Stravinsky: Symphony of Psalms (1929); Canticum Sacrum (1958). Choir of Christ Church Cathedral, Oxford, Simon Preston. **Argo ZRG 799**, stereo, \$6.98.

Stravinsky: Concerto for Piano and Winds (1924); Ebony Concerto (1946); Symphonies for Wind Instruments (1920); Octet (1923). Theodore Bruins, pf., Netherlands Wind Ensemble, De Waart. **Philips 6500 841**, stereo, \$7.98.

Bach: Mathus-Passion (St. Matthew Passion). Soloists, Amsterdam Toonkunst Choir, Concertgebouw Orch., Mengelberg. **Philips 6747 178**, 3 discs, mono, \$23.94.

A whole "Audio ETC" about this reissue without a word on the music. As of Boyd Neel's heyday, the 30s and 40s, these would have been definitely "modern" versions, with correct instruments, harpsichord, etc. Today they sound a bit old fashioned, somewhat heavy and slow, though still rating as "authentic". We go faster and lighter. Good stuff, just the same, and a very acceptable sound, probably at a bargain price.

Columbia made these 'way back, didn't release them—probably because of musical problems. The new Piano Archive people at Desmar have remastered in mono from the originals with excellent piano impact—the present elder statesman in his palmier days. Total finger fluency, but I found the Liszt piano whipped cream on the chaste side—might as well open 'er up in this sort of music!

This astonishingly expert work, written at 16, remains as one of Mendelssohn's best things, if youthfully wordy. Good to find here two top Czech quartets playing perfectly together with impeccable phrasing and shaping for a sterling performance. Drama—no. But better that way; the music "speaks" more honestly, even the cluttered last movement, without any extra dramatics a-la-virtuoso. Nice stereo eight-way spread.

This would be a standard solo vocal recital disc—except that all the music is "ancient," i.e. out of the musicological 13th to 16th centuries. Sad, because as such it is a musical mess, an opera voice in the wrong milieu. Of course, if you'll just take these as arrangements for modern voice and guitar, you'll find it all very lovely. She is a fine singer, but not for old music.

One of those trumpet records! Sorry, but this is NOT the sound of the Baroque trumpet, however thrilling it may be; we have here the modern professional; loud, fierce, and piercingly brilliant (and a fine player he is, too) plus an organ, a good old-fashioned churchy organ, not in the least Baroque. Oh, well—why make a fuss! It's all Baroque music, almost all English, and the sound is indeed gorgeous, from Agincourt to Jeremiah Clarke, resonantly recorded.

This is non-authentic in reverse! I read the title first as "1900," expecting more Joplin! Far from it—this is the real stuff, dance music on old instruments of the period, in a lively sequence of dozens of little tunes. Never can figure out how they could dance to these when they last only a minute or so. They don't say here, nor anywhere else in the album. The notes here give instructions—for dances NOT included in the music played. Fun & games.

The earliest recording of the *Symphony of Psalms* (I own it) was under Stravinsky, c. 1933—how immensely more assured and fluent is this fine new version. The best so far! Times change, what was unsingable now sings itself—no problems. The familiar angular Stravinsky style persists in the much later *Canticum*, complex and semi-serial, atonal, dissonant; yet these superb singers, the boys, the men, the soloists, and the instruments too, make every note clear and easy—really extraordinary. An outstanding Stravinsky disc.

Stravinsky for winds, played by the best wind group I ever hope to hear (see many Philips discs). This is the between-the-wars Stravinsky, jazzy, bouncy, ranging from early-dissonant to later-suave, with a good beat and plenty of earthy blats and bumps throughout. *Ebony*, composed for Woody Herman and first recorded by that bewildered Herd ('way out of their depth!), is here as smooth as butter, saxes and all; the rest is just as good, relaxed, and well styled. Just don't expect to fly the Romantic route, that's all. None of that.

What a monumental curiosity! This 1939 live performance, moments before the War, brings us Bach as of the late 19th C. faithfully perpetuated by old Willem Mengelberg. Bach a la Wagner! Amazing. But also often very musical. For 1939 a remarkably clear, clean sound, the big ensembles a bit muddy. Uncanny to hear that 1939 audience shuffling between numbers. How many survived the War? Anyhow, a fine comparison with present-day Bach performing on later records.

Classical Reviews

Edward Tatnall Canby

Sibelius: Symphonies No. 5 and 7. Boston Symphony, Colin Davis. Philips 6500 959, stereo, \$7.98.

No turn-of-the-century composer (that's when he did his most important work) has suffered such a changeable significance, in the years since, as Sibelius. He has been in, and out—now he is being revived in a new fashion—as one of those now desirable mystics of the pre-WWI era. Is he, though?

Once, Sibelius was the greatest "modernist" of them all. Even I can remember *that* and indeed the very first "modern music" I ever bought on records was the Sibelius *Fourth* which, incredibly, I remember as being totally incomprehensible to me at the time. Then Sibelius was joined up with Rachmaninoff as one of the big new-style Romantic composers, the ones who wrote those Big Themes to swoon over. Every major orchestra played Sibelius once a week. But, alas, Romantic music began to fall out of fashion in the 40s (that is, Brahms and Franck and Schumann were apologetically jazzed up and streamlined for modern consumption)—and Sibelius just faded away. Too old fashioned. Almost. There was always Ormandy and others of his generation to keep his music alive, if mainly for the old ladies in the audience. Young listeners cringed with horror at the very thought.

And now—mysticism. Back comes Sibelius in a new costume. Colin Davis does an interesting job of it. He's youngish; he isn't old enough to remember the solid earlier ways of playing the music—he does his very best, which is a lot, to make Sibelius into a genuine updated mystic. It almost works; he is a fine leader and the BSO, after all, had much to do with



the original success of this composer back under old Koussevitsky.

And so my mild criticism of the Davis Sibelius is simply that this composer is much too expert an orchestral writer to need what one might call overt interpretation, whether for mystic effect or any other. This, for my ear, is what Davis is doing. It isn't really right.

Sibelius is *not* a mystic—not, at least, in today's rather specialized extra-sensory sense. He merely loved his old Finnish legends and used them cannily for their suggestive power and their appeal to nationalism in the approved fashion of his own day. He was, even more, a writer of those big tunes and catchy themes that we all love; they speak for themselves *much*

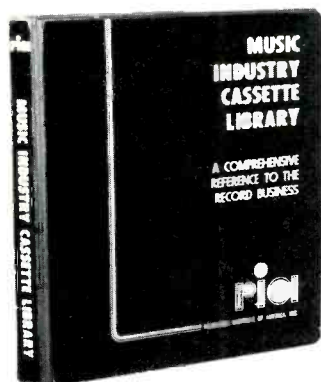
better when done forthrightly than when loaded up with extra expressiveness, as in these recordings.

I suggest trying Ormandy first (on RCA). He is one of the few real Sibelius traditionalists left, going straight back to the old days when the music was brand new and gorgeous—Ormandy knows how. After him, you can listen to Davis and undoubtedly enjoy him the more for the comparison.

Brahms: Deutsche Volkslieder (German Folk Songs). Edith Mathis, sop., Peter Schreier, ten., Karl Engel, pf., Rundfunkchor, Leipzig. Deutsche Grammophon 2709 057, 3 discs, stereo, \$23.94.

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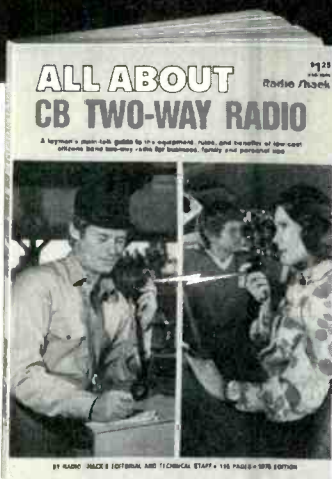
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Three discs, six whole sides, gorgeously musical settings of little songs for voice and piano—a soprano and a tenor alternate the solo songs for variety and the last side is for four-part chorus; it's a project as monumental as the *Brahms Gesellshaft* (complete works) in its own sonic way. But can one listen to 42 successive folk songs, then 14 songs for children, followed by nine for mixed chorus, all in a couple of hi-fi sessions? A big dose.

Well, we always face this problem when the LP record goes in for "complete" documentary recording. Three LPs do not compare to three printed volumes of visible source material; the medium is different. One tries for as much performing excellence as possible along with enough variety to keep up the sonic interest, and that is far from easy. This big "complete" set does its job to 85 per cent of perfection, which is a lot. But both soloists tend to be too loud, too close, for the simple song material—Edith Mathis in particular sings her high notes like something out of *Carmen* through Peter Schreier is better controlled. Not bad—just occasionally disturbing and gets in the way of good communication. The piano is exemplary—very important to Brahms—and the choral music on the last side is a good contrast.

Folk music? In all the fancy accompanying notes not a word is said about the contrast between this "folk" music and today's conception—at least in America—of authentic folk music. These tunes were taken down (when they were not actually composed) in written notation, with very free alterations to make them sound more like proper "art" songs. There was not the slightest thought of preserving the original "country" style, which would have then been considered crude.

Even so, there is a genuine folk quality to the music, if only in the memorably lovely tunes, each in numerous verses, often with a different piano accompaniment for each verse from Brahms. His music is the quintessence of pure "classical"—and absolutely marvelous stuff, if you ask me. He was always at his best in fixing up a good tune.

Nathan Milstein, J.S. Bach Sonatas & Partitas (solo violin). **Deutsche Grammophon 2709 047**, 3 discs stereo, \$24.94.

Poor man! This first-rate violinist, mature and at the very top of his abilities, will not travel by plane. And so he is unable to join the musical jet set, his peers, who fly all over the place and play their stuff on every continent. He waits for a boat.

So let his recordings bring us his music, then. Good for D-G! There are many beautiful recordings of these solo unaccompanied works (and some that are lousy—they get withdrawn quickly) and the competition is really tough, as tough as the music itself is to play. It needs absolutely perfect technique and, even more important, a totally secure musical ear—that can hear the implied harmonies which are merely outlined by the violin notes, suggested. If the player hears them, then you do. It's as simple as that. Nathan Milstein's versions are strong, quiet in a non-sonic sense, like the voice of quiet authority, absolutely accurate in detail and in the harmony. Calm, forceful, the offhand effect belies the superbly confident technique. Recording is ideal for the music, warm and live.

William Grant Still: From the Black Belt; Darker America. Music for Westchester Symphony, Landau. **Ulysses Kay: Six Dances for String Orchestra.** Westphalian Symphony, Freeman. **Vox Turnabout TVS 34546,** stereo, \$3.98.

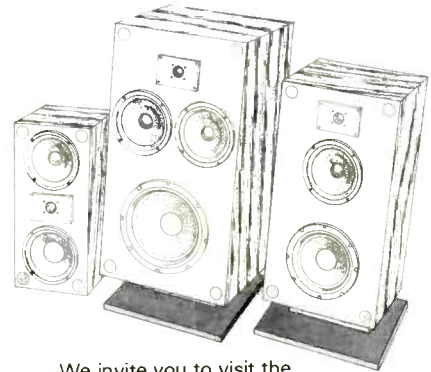
It's about time we put aside color in respect to music—except maybe in pop music, where black really reigns supreme even among white players! William Grant Still is one of those Deans—the Dean of black composers, with a much deserved rep as a pioneer in black respect, an enormously prolific catalogue of big works—operas, symphonies, you name it—and most of them firsts for his race. But times do change. His two short works of 1924 and 1926 now sound, color aside, as no more than graciously easy going, expertly tailored entertainment stuff, using black inspiration in what for today is not a very "black" style. No fault of his! The opposite. If it were not for these works, the later and more genuinely black music would never have happened.

Ulysses Kay is of the present mature generation—a contemporary composer, period, right out of the Eastman School of Music and study with Paul Hindemith at Yale. What matters in his fluent little dances is his own excellent sense of style and his special personality, which is genial and friendly. The dances are just dances—gently old fashioned harmonies deliciously tempered with rather sweet dissonance. The feel is of Europe, from waltz to the polka, but with a nice American irony, and there is nothing specifically "black" to be heard—why should there be?

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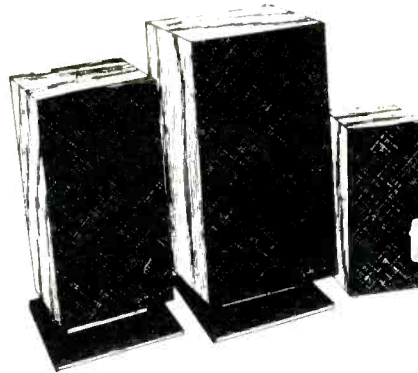
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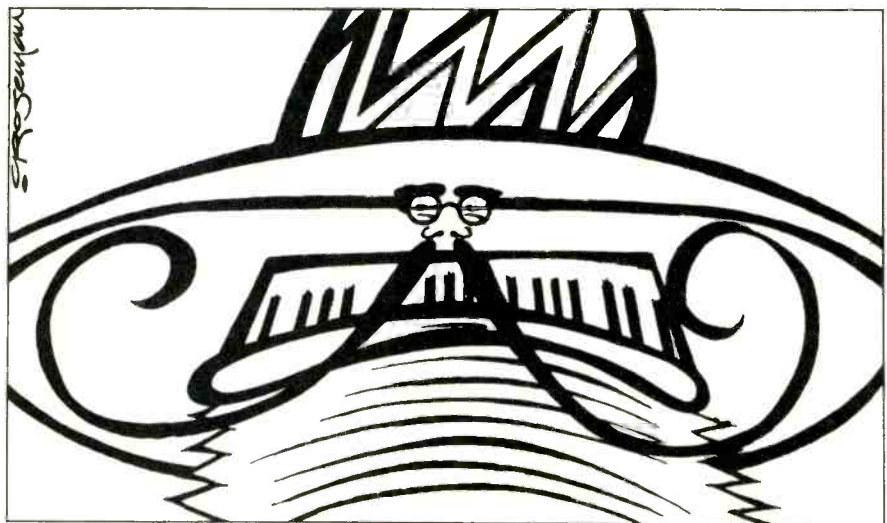
The Folk Bag

Tom Bingham

Texas-Mexican Border Music, Vol. 2:
Corridos, Part 1: 1930-1934
Folklyric 9004, mono, \$6.98.
Texas-Mexican Border Music, Vol. 3:
Corridos, Part 2: 1929-1936
Folklyric 9005, mono, \$6.98.
Texas-Mexican Border Music, Vol. 4:
Norteño Accordion, Part 1: The First
Recordings
Folklyric 9006, mono, \$6.98.

Of the several diverse regional and ethnic musics of the United States, the Mexican-based music of the Chicanos of South Texas is one of the least known on a national scale. This is somewhat surprising, considering the amount of press attention given its East Coast, Caribbean-derived Latino counterpart, *salsa*. Yet there are probably as many—perhaps more—Norteño albums available as there are *salsa* records, undoubtedly numbering in the thousands! Don't look for them in the Schwann catalog, because only a minuscule percentage are on labels distributed outside the strictly limited geographical areas.

Regional labels based in Texas and California account for the overwhelming majority of Tex-Mex records, all of them recorded since World War II (as most regional labels did not begin operation until the late 40s). Along with the first side of Vol. 1 of this series (*An Introduction, Vol. 1: 1930-1960*, Folklyric 9003), the three albums reviewed here are the only available repackagings of the classic Tex-Mex 78's from the pre-war era. Furthermore, as Folklyric is the "ethnic" reissue subsidiary of Arhoolie Records, these albums are, ironically, better distributed nationally than the modern-day *conjunto* albums on regional labels like Falcon, Del Valle, DLB, Norteño, and the like.



Having said all this, I must confess that I wasn't exactly looking forward to Vols. 2 and 3. *Corridos* are story-songs, narrative ballads in which the focus is about 90 per cent on the lyrics, with the melody remaining constant over the course of 20 or more four-line stanzas (in this pre-war era) with a repetitive guitar rhythm providing the only instrumental backdrop in the vast majority of cases. This is *not* intended as a criticism of the *corrido* genre, but it is a sort of warning to readers who share my incompetence with the Spanish language (my high-school Spanish has been completely dormant for the last dozen years). The repeated melody and lack of instrumental excitement are not due to an attendant lack of musicality on the part of the *corridistas*, but are simply an indication that the music of the *corrido* is purely functional, a framework through which to communicate the story of the ballad. As a result, if your knowledge of the language is limited, you may find a whole album of pre-WW II

corridos more than a little monotonous.

Language difficulties aside, the two *corrido* anthologies are fascinating historical and literary documents. The 32-page booklet, which only accompanies Vol. 2 (9004), contains the background to each of the 17 *corridos* on both Vol. 2 and 3, along with lyrics and translations. This booklet, written by Philip Sonnichsen, is itself a superb social-historical document. Several of the ballads deal with actual historical incidents involving legendary outlaws like Gregorio Cortez and Joaquin Murrieta, and less fabled unfortunates who, for whatever reason, ran afoul of the law. In all cases, the Mexican—whatever his deed—emerges as a hero, even if only for his courage and bravery; the Anglos, except for a prohibition agent named Charles Stevens, are always the villains, usually with justification (though the *corridos* often seem overly biased against Anglos). Other songs are slice-of-life *corridos*, microcosmic examinations of the hopes, fears, and hard times of

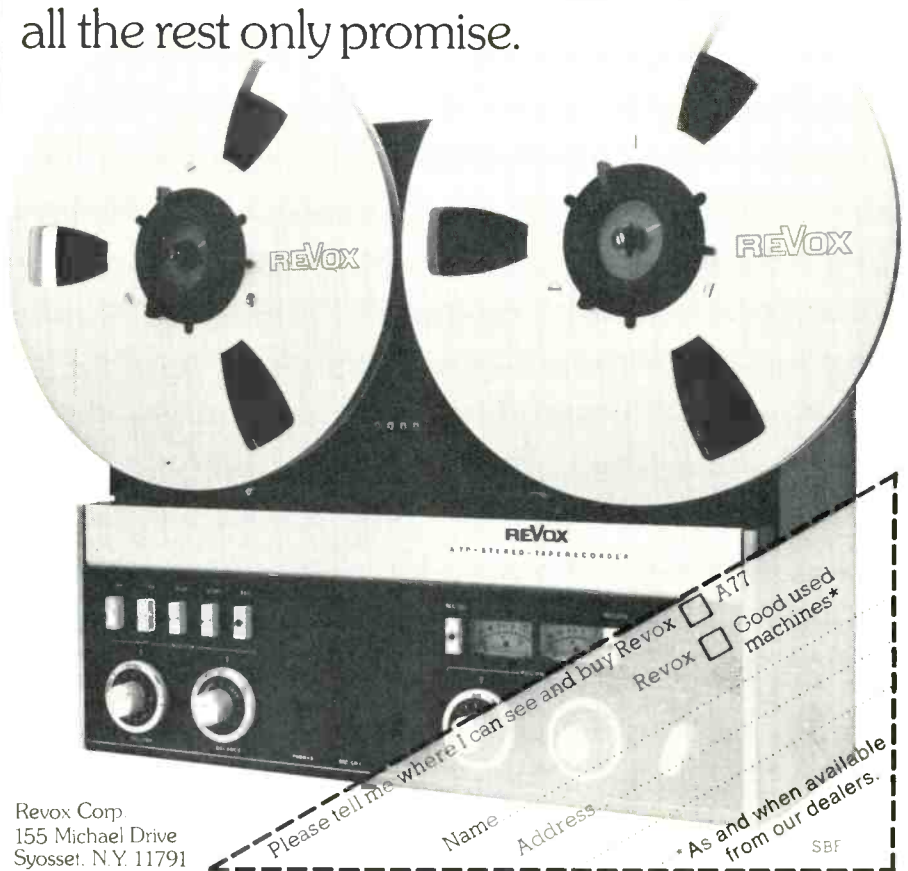
Mexican immigrants trying to make a better life in the U.S., as laborers (*El Lavaplatos*), migrant farm workers (the lyrically related *El Corrido de Texas* and *Corrido Pensilvania*), or even as bootleggers. Only one song on the two albums, *La Zenaida*, a *corrido de amor*, has a happy ending. The songs were intended to appeal to the poor Texan or Californian Chicano and, as such, they reflect a group psychology which often seems very foreign to the Anglo listener, who will no doubt consider them unduly depressing (and thought-provoking).

Oddly enough, the *corridos* are laden with grief and tragedy, they are sung sweetly, with much genuine sentimentality. Most are done in a genuine Mexican folk style in two-part harmony (usually in thirds), with the lower voice generally singing the melody and the higher voice adding a lovely, soaring second part. The only tracks featuring three-part harmony, gorgeously arranged, are those by Los Hermanos Sanchez y Linares (the original Los Madrugadores was on Los Angeles radio, not Texas despite the album's title). The trio is also worth hearing for Jesus Sanchez' pleasant guitar interludes, although their *Corrido de Los Hermanos Hernandez* (about two Arizona teenagers executed in the gas chamber) tends to rush in spots.

Also featured are Pedro Rocha y Lupe Martinez, also known as the *Trovadores Regionales*. Whereas most pre-WW II *corridos* are in $\frac{3}{4}$ or, less often, $\frac{6}{8}$, the *Trovadores' Corrido de Pensilvania* is in a slowish polka tempo (a commonplace in post-WW II accordion-backed *corridos*). Los Hermanos Banuelos are a more sophisticated duo, with a steel guitar (perhaps a Dobro) on a couple of cuts and a fiddle (also heard on Ramos y Ramirez' *El Corrido de Texas*) on another. The Banuelos' *El Deportado* has an intriguing 24-bar AABCCD form which differs greatly from the usual eight-syllable quatrains of the average *corrido*.

Other performers include Nacho y Justino, whose singing is lower-pitched than most and semi-operatic in approach, though the thick guitar backing on *Suicidio de Juan Reyna* (using both six- and twelve-string guitars, I believe) is thoroughly folk in style; Los Hermanos Chavarria, with guitar and *bajo sexto* (a 12-string acoustic bass guitar), and typically nasal Tex-Mex voices; Francisco Montalvo y Andres Berlanga (Berlanga was heard with Fred Zimmerle's Trio San Antonio on Vol. 1), with a very promi-

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nent *bajo sexto*; and Trio Matamoros, identified as a "vocal trio" on the original 78 label, though I hear only two voices; but then, the lead voice is so dominant, even the second voice is somewhat obscured.

With two exceptions, all *corridos* on these two albums are two-part performances, lasting as long as six minutes. The performance comes to a full stop at the end of part one, then a brief guitar intro opens part two (this was before engineers had developed the fade-out, fade-in technique used on most two-part 45s).

As all tracks are over 40 years old and have been taken from worn 78s, there are many surface pops, scratches, etc. Though the sound is acceptable enough, I feel no purpose would be served in giving a Sound rating to these historical recordings.

Volume 4 is devoted to early recordings (1930-1939) of Tex-Mex accordion music. As *corridos* began to lose their popularity in the mid- to late-30s, accordion instrumentals increased in influence. By the time the regional labels came to the fore in the late 40s, the familiar Norteño-style accordion polkas and accordion-backed vocal music (*corridos*, *rancheras*, *canciones*) were the Tex-Mex music of the lower economic classes. However, in the period covered here, instrumentals so predominated that 14 of the 16 tracks included on this record are instrumental. No language barrier here! In fact, one of the two vocal tracks is nothing less than everybody's favorite Mexican song, *La Cucaracha*, as sung by Flores y (Francisco) Montalvo (who sang with Andres Berlanga on Vol. 3), with accordion by Jose Rodriguez.

The accordion entered border music through the German and Czech immigrants who settled in the Rio Grande Valley. Thus, it is not surprising that many, if not most, of the melodies heard here are distinctly European in character. Not only that, but the accordion style of many of the earlier performers (Estanislado Salazar, on the *redova*, *La Liebre Ligera*; Jose Rodriguez, on *El Zacatal*, with *bajo sexto* counterpoint, and the exuberant polka, *La Petacona*) is in a thick, overtly Germanic style, unlike the lighter Norteño style developed by Narciso Martinez.

A few transitional figures emerge (at least from the evidence on this album) in Jesus Casiano and Bruno Villareal. On the former's *La Bien Polviada*, you can hear the rhythms begin to take on a more recognizably Chicano flavor, while Villareal plays two

distinctly European melodies (the schottische, *Los Siete Pasos*, and the mazurka, *La Cascada*) in a looser style than Rodriguez. Both Rodriguez and Villareal, incidentally, were accompanied by *bajo sexto* and a bass drum (tambora) rumbling away in the distance.

With Narciso Martinez, 1937, we arrive at the full blossoming of the Norteño style, with its de-emphasis of the left-hand bass register and a concentration on the higher notes of the two right-hand rows. The melody of the sprightly schottische, *Flor Marchita*, is definitely European, though Narciso's high-pitched approach and facile ornamentation are just as definitely Norteño. More significantly, *Salvador* (a *vals alto*, though I don't know what distinguishes an alto waltz from a normal waltz), a pretty tune with uniquely Martinez ornamentation; the fast and frilly *huapango*, *El Tecolote*; and a great polka called *Las Perlas* all have much more locally flavored melodies. By the way, Martinez' fine accompanist, Santiago Almeida, is credited with guitar or *bajo sexto*, though the latter seems much more likely.

Along with Martinez, Santiago Jimenez (whose son, Flaco, has recorded with Doug Sahm, as well as being a Norteño star in his own right) is the other great Norteño accordion pioneer. *Dispensa El Arrempujon* has the sort of Euro-Mexican melody which appeals to *Chicken Scratch* ensembles. (Chicken Scratch is Papago Indian popular dance music, played by *conjuntos* similar to the 60s-style sax-and-accordion Norteño polka bands; a half-dozen or so Chicken Scratch albums are available on the Canyon label—try Canyon 6093 by Elvin Kelly y Los Reyes and Las Molinas.) Jimenez is also heard on a lively polka called *La Nopalera*. Though his textures are somewhat thicker than Narciso's, Jimenez also uses the bass register rather sparingly and pops his buttons in danceable syncopations.

Lolo Cavazos' *El Golfo* has a more Eastern European melody to it, a beautiful poignant *vals alto*, performed with much feeling. Cavazos also plays *La Gardenia*, a very rapid-fire polka full of speedy 16th notes.

One of the most intriguing cuts is the other vocal track, *Adelita*, sung by Roberto Rodriguez y Clemente Mendoza (with accordion and *bajo sexto*). Can that 1930 date be correct? The number of the original 78 indicates it is, although this Norteño-style *corrido* could just as easily have been recorded twenty years later!

The instrumental accordion music heard on this record has never really died out, though it has undergone an alteration or two. A fairly recent (though undated, alas) polka album in my collection, *Machacado Norteño* by Rafael Silva (Del Sol DS 100), finds Silva's three-row button accordion accompanied by electric rhythm guitar, electric bass, and drums, though the most notable change is not in the instrumentation, but in the noticeably smoother approach to the music. Both the electricity and the smoothing of rough edges are quite common in modern Norteño *conjuntos*. *Tex-Mex Border Music, Vol. 4*, however, has the real thing, with the old Norteño fire and briskness left intact. In no way should this instantly enjoyable music be restricted to a minority audience!

Sound is somewhat better than on Vols. 2 and 3, though again many of the original 78's were (understandably) well worn. *Tom Bingham Vols. 2 & 3*

Performance: B- to A

Vol. 4

Performance: A- to A

Cyprus: A Collection of Best-Loved Greek Songs

Vanguard Everyman Nomad Series SRV 73012, stereo, \$3.98.

In light of what's happened on Cyprus in the past few years, it seems politically unwise to release an album of Cypriot music and not include the Turkish section of the island! But then this disc was originally issued in Europe in 1972, when things were relatively calm (if a bit uneasy).

In any event, this album presents the music of the Greek Cypriots. What the notes don't indicate, however, is that it is the island nation's modern urban popular music, directly modeled after the modern urban popular music (*laiko*) of mainland Greece. *Laiko* itself is the result of the influence of Western European popular music on older traditional Greek forms, and there is apparently little to distinguish Greek *laiko* from Cyprian *laiko*. Whether or not Cyprus has indigenous popular or folk traditions distinct from those of Greece (or Turkey) remains unanswered here.

Nonetheless, though traditionalists will howl, I have no doubt this music is representative of the urbanized Greek Cyprus of the 70s. With the rolling twang of the bouzoukis, distinctive two-part harmony vocals on choruses, and the frequent use of non-Western intervals, backed by a

Western-style electrified rhythm section playing with an indefinably eastern Mediterranean rhythmic lilt, most of it is very similar to what one hears on Greek-language American radio programs. As such broadcasts are obviously (because of the language barrier) intended to appeal primarily to the Greek-American community, the common academic argument that such relatively Westernized music is slanted toward the tourist trade doesn't hold up. Thus, what is heard here may be modern, but that doesn't preclude its being *authentic*.

As it is, the songs and singing seem little touched by the modernization which has so greatly affected the instrumental accompaniment. It's somewhat deceptive to label the unidentified backing group (apparently the same band on all 12 cuts) a "Bouzouki Ensemble." I'd estimate its instrumentation to be two bouzoukis, probably two rhythm guitars, flute, piano doubling organ, electric bass, drums, and percussion. It wouldn't surprise me if the bouzoukis were amplified as well.

This band provides a well-coordinated backdrop for the excellent of the Marcians, a male duo, and Stavros Mihalopoulos, who is joined by a female singer on choruses (identified on *I Gorgona* as Vicky Pappa; I'm sure she's also the second voice on Mihalopoulos' other two cuts). Despite its 5/4 rhythm, the Marcians' *Lemshani* is their most Westernized cut, while their *Thehos Tin Karthoula Sou* and *Balanda Tou Antrikou* rank with the best contemporary Greek music I've heard. And I wonder what would happen if Vanguard released the Marcians' *Oli Nichta* on a 45? It wouldn't surprise me if they had a fluke hit here!

The most traditional tracks in overall approach are the rousing 7/8 *Paplioma*, by Maria Liz, and Petros Milas' *Dirlada*, a nonsense song with male chorus and whistling, which somewhat resembles an older style of Italian comic song.

The three instrumental cuts are much less interesting. *Dodekanisiakos Horos* and *Atelioti Ine I Prosmoni*, by the unidentified backup band, are "sophisticated" arrangements of traditional themes, watered down for the "easy listening" audience. Yawn. Maria Liz' version of Mikis Theodorakis' familiar *Zorba The Greek* theme lacks the oomph and precision the tune demands.

It is material such as the three instrumentals which give rise to the "for tourists only" tag. Otherwise, this is a



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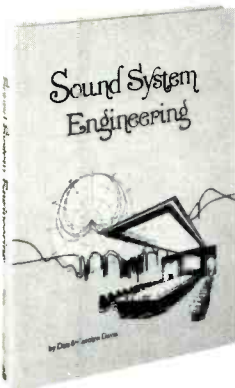
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highly entertaining album which should prove a very popular item in the "International" record bins. In the performance rating below, the first letter is for the instrumentals, the second for the vocal tracks.

Tom Bingham

Sound: B+ Performance: C-; A-

Traditional Music of Chile

ABC Command COMS-9003, mono, \$3.49.

Unlike so many Latin American countries, Chile has never produced a musical form which gained mass favor with her North American neighbors. Although the *tonada* (also associated with Argentina) and the *cueca* have enjoyed great popularity outside Chile, only leftist performers singing in a professionalized neo-folk style, such as the martyred Victor Jara and the ensemble called Quilapayun, have received even token attention in the American music press.

One should not, however, assume that Chile is any less musical than, for example, Argentina or Brazil, to name two South American nations whose music has entered and greatly affected the mainstream of American culture. On the contrary, Chile has a wide range of indigenous folk and regional musics. Some are clearly descended from Spanish models (as heard on side one of this record), while others reflect the impact of European influences on the Indians of northern Chile (as on side two).

Rather than attempt an exhaustive, panoramic survey of the many types of Chilean music, **Traditional Music of Chile** focuses on a handful of performers representative of a few of the more significant styles. This, unfortunately, encourages overemphasis on these artists' respective idiosyncracies, although it does allow an examination of how the chosen performers approach varied items from their repertoires. Nevertheless, many of the types mentioned in the enclosed booklet are not included on the record while, on the other hand, we are offered three selections by a village brass band and three by the singer-accordionist Eufrasia Ugarte. In the case of Ms. Ugarte, this amounts to one *tonada* with accordion accompaniment only, one *tonada* accompanied by accordion and wooden box, and one *cueca* accompanied by accordion and box. True, this enables the listener to compare and contrast three distinct aspects of Ms. Ugarte's repertoire. However, some of this

space could perhaps have been more usefully devoted to, say, a *cuando* or a *Mapuche* shamanistic chant (both are discussed in the notes yet both are absent from the record).

In any event, what is included is very interesting and generally entertaining, though in a few cases a bit of adjustment is needed to overcome culture shock. This is especially true in the case of the above-mentioned Eufrasia Ugarte, a rather elderly woman who sings in a very high, pinched voice with a falsetto squeal which is far from controlled. Nonetheless, she sings with gusto over her full-bodied accordion, with the somewhat spastic rhythms her husband pounds out on his wooden box adding a sort of refreshing quaintness to the performances.

Another elderly woman, Berta Indo, sings a lively *cueca* to thick, rhythmic guitar accompaniment. Also included on side one is a full 10-minute *canto a lo pueta*, with 10-line verses alternately sung by Santos Rubio and Manuel Saavedra. This long narrative ballad is accompanied on the *guitarron* (not the Mexican instrument of the same name), a 25-stringed guitar which sounds like a *pasaltery* which is strummed rather than plucked. The metrically irregular *guitarron* background concentrates on an up-and-down phrase which gets a bit tiresome after a while.

Side two opens with a sprightly march and a *huaino* (dance tune) played in rocking fashion on a pair of *zamponas*, panpipes with a much breathier, more burry timbre than the rounder-toned quills of the southern U.S. On the *huaino*, the pipes are joined by a booming bass drum (*bombo*). The next cut is played in parallel fifths on a pair of *tarcas* (flutes), which would have a very Chinese sound if it weren't for the loud rumble of the *bombo*.

The last three tracks, played by an Incan village brass band, are dance tunes with attractive European-flavored melodies and spirited, springy rhythms. Though the band has a noticeable tendency to slip off key (by our standards), only an ethnocentric bigot could resist the band's happy enthusiasm and unique brassy sound.

All selections are by genuine, non-professional folk musicians, as "authentic" as any scholar could hope for. The general listener, though, will no doubt find it a little raw at first, but much more interesting with increased familiarity. *Tom Bingham*

Sound: C+ Performance: C+ to A-

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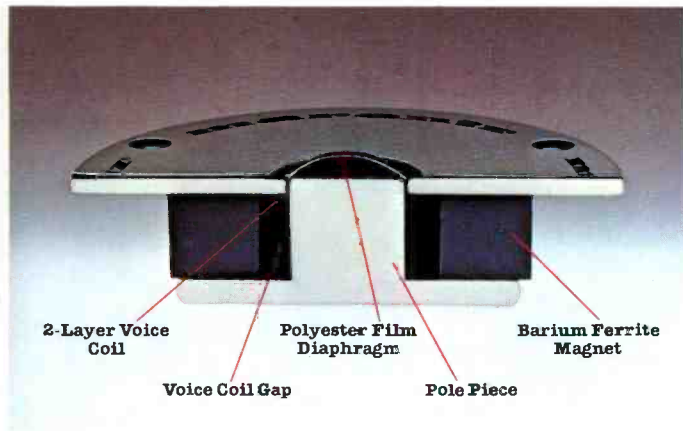
“It’s incredible. Marantz calls it **Vari-Q***. Pull out the high density acoustic foam plug and the system becomes a tuned port reflex. Push it back in and the port is absolutely sealed and the speaker becomes air suspension.”

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HD-88

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HD-88

HD-66

HD-55

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HD-44

Blueprint for Flat Frequency Response

In the graph below, frequency response was measured using the CBS 100 Test Record, which sweeps from 20-20,000 Hz. The vertical tracking force was set at one gram. Nominal system capacitance was calibrated to be 300 picofarads and the standard 47K ohm resistance was maintained throughout testing. The upper curves represent the frequency response of the right (red) and left (green) channels. The distance between the upper and lower curves represents separation between the channels in decibels. The inset oscilloscope photo exhibits the cartridge's response to a recorded 1000 Hz square wave indicating its resonant and transient response.

Smooth, flat response from 20-20,000 Hz is the most distinct advantage of Empire's new stereo cartridge, the 2000Z.

The extreme accuracy of its reproduction allows you the luxury of fine-tuning your audio system exactly the way you want it. With the 2000Z, you can exaggerate highs, accentuate lows or leave it flat. You can make your own adjustments without being tied to the dips and peaks characteristic of most other cartridges.

For a great many people, this alone is reason for owning the Z. However, we engineered this cartridge to give you more. And it does. Tight channel balance, wide separation, low tracking force and excellent tracking ability combine to give you total performance.

See for yourself in the specifications below, then go to your audio dealer for a demonstration you won't soon forget.

The Empire 2000Z.

Already your system sounds better.

Frequency Response—20 to 20KHz \pm 1 db using CBS 100 test record
Recommended Tracking Force— $\frac{3}{4}$ to 1 $\frac{1}{4}$ grams
(specification given using 1 gram VTF)

Separation—20 db 20 Hz to 500 Hz
 30 db 500 Hz to 15K Hz
 25 db 15K Hz to 20K Hz

I.M. Distortion—(RCA 12-5-105) less than .08% 2KHz to 20KHz @ 3.54 cm/sec

Stylus—0.2 x 0.7 mil diamond

Effective Tip Mass—0.2 mg

Compliance—lateral 3×10^{-6} cm/dyne
 vertical 3×10^{-6} cm/dyne

Tracking Ability—0.9 grams for 38 cm per sec @ 1000 Hz
 0.8 grams for 30 cm per sec @ 400 Hz

Channel Balance—within $\frac{3}{4}$ db @ 1 kHz

Tracking Angle—20°

Recommended Load—47 K Ohms

Nominal Total System Capacitance required 300 pF

Output—3mv @ 3.5 cm per sec using CBS 100 test record

D.C. Resistance—1100 Ohms

Inductance—675 mH

Number and Type of Poles—16 Laminations in a 4 pole configuration

Number of Coils—4 (1 pair/channel—hum cancelling)

Number of Magnets—3 positioned to eliminate microphonics

Type of Cartridge—Full shielded, moving iron

