

Audio

Christmas
Buying Guide

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • NOVEMBER 1976 \$1.00

47425 

Build the Latest CD-4 Demodulator

Four-Channel Radio Syndication



U0803760 0477 60616013P0201312

DON L HUNTER

2608 CENTRAL BLVD

EUGENE

OR 97403

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
3-way 3-driver system

PIONEER
Anyone can hear the difference.

The HPM series.

Four radically new speaker systems specifically designed to beat the best.

You can't beat JBL, Advent, Bose and AR with me-too ideas. They're really good speakers.

So, instead of just trying to make better conventional speakers, we knew we had to come up with a totally different and superior design concept.

After years of research and development, our engineers found the answer. They created a whole new technology based on the electrical properties of High Polymer Molecular film. The result is a sound that's louder, clearer, more natural, lower in distortion than you ever expected to hear out of a speaker system.

HPM film technology requires no magnet, no coil, no cone or dome, no moving parts at all. The amplified signal is converted into sound waves directly at the surface of a thin, light membrane. And the entire structure housing the membrane can be curved for the best possible sound dispersion.

Pioneer's new HPM drivers combine high efficiency with amazingly accurate transient response. Distortion is virtually nonexistent even at very high sound-pressure levels. The principle was evolved mainly for tweeters, although a giant HPM woofer is at least a theoretical possibility.

In each of the new Pioneer models shown here, regardless

of price, the top end of the audio spectrum is reproduced by an HPM driver. In the big HPM-200 system, so is the upper midrange.

The woofers used in the HPM series are almost as unconventional, even though they still have cones. But what cones! They combine low mass and high rigidity to an unprecedented degree, thanks to an exclusive method of reinforcement with carbon fibers. As a result, they move as true pistons, without any of the smearing of bass frequencies experienced with ordinary cones.

Of course, the proof of a new speaker technology isn't in the telling but in the listening.

If the new HPM speakers didn't have audibly more impact, more detail, more transparency than the best previous speakers at comparable prices, our engineering effort would have been a meaningless exercise. There are certainly enough speakers on the market today.

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.

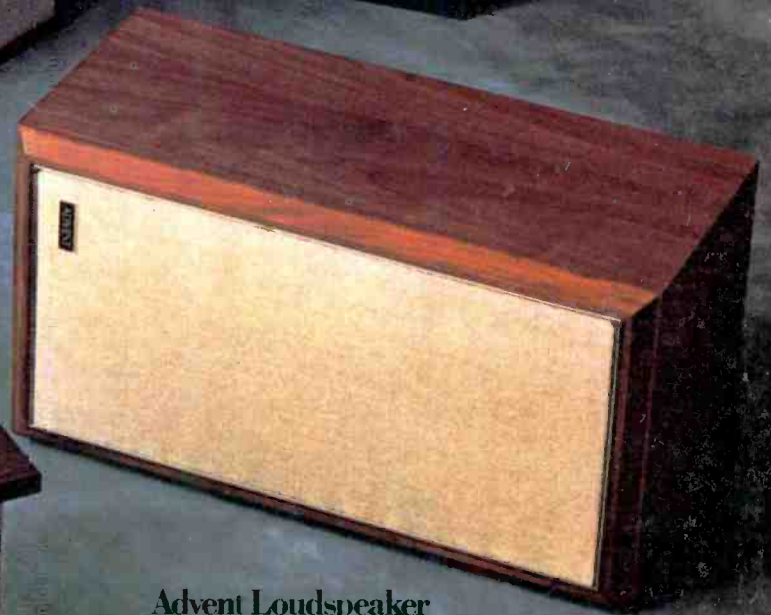
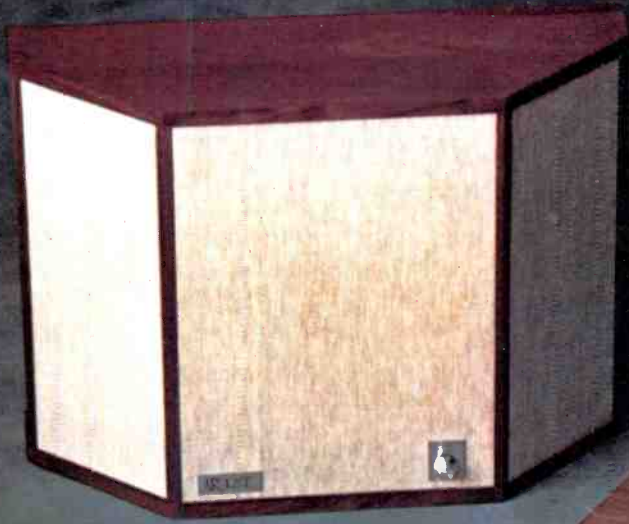
We think you'll end up agreeing that a good new idea beats a good old idea every time.

U.S. Pioneer Electronics Corp.,
75 Oxford Drive, Moonachie,
New Jersey 07074.

**It would be foolish to create
a new line of speakers
and not overcome these obstacles...**

JBL Horizon L166

Acoustic Research AR-LST



Advent Loudspeaker



Bose 901 Series II

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STAX SR-44—Incomparable frequency response, efficiency and transient rise time for \$85.



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Columbia, Mo. 65201

Audio

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Publisher Jay L. Butler

About the cover: Here is our artist's view of psychocybernetic quadraphony. The necessary printed circuit boards and knobs are mounted in mannequin heads. Then for a better high range, loudspeaker tweeters were also mounted in the heads for a sound conversation piece in your home.

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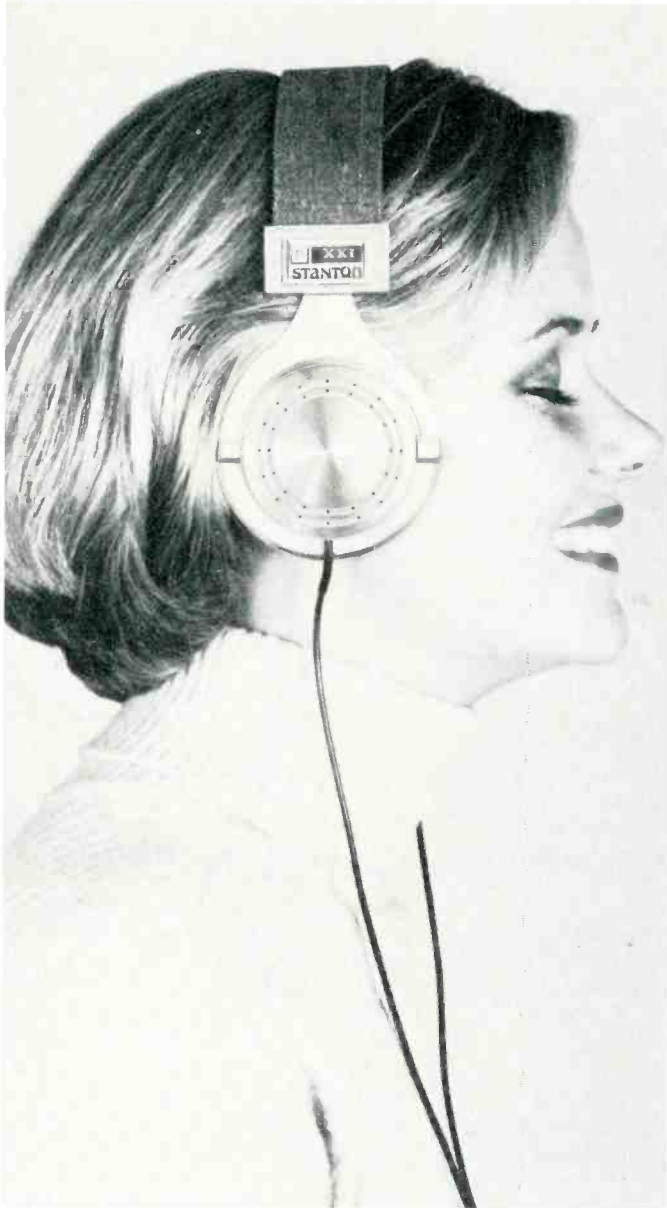
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Hail to a totally new concept and technology in headphones. And hail to an Open Audio design that gives you the lightest weight comfort you've ever experienced with headphones that possess truly top quality sound.

These ultra thin headphones have been designed and engineered to meet important professional needs: extreme comfort over long listening periods, a particular wide frequency response, and a broad dynamic range. A major factor in the success of the design is the use of rare earth elements in the compound of the permanent magnets of each earpiece. Besides having superior magnetic properties, these magnets



...Any Way You Look At It!

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The soft foam cushioned headband is exceptionally comfortable and has a trendy brushed denim fabric covering. The earpiece yokes incorporate specially designed pivots which allow the earpieces to fit perfectly against the ear, whatever the shape of the head.

Write us for the specs — they're magnificent! And ask for a demonstration as soon as possible at your Stanton dealer.



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You'll Get
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Phono
Cartridge
Is To
Show You
What Goes
Into One.



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Garden City, New York 11530

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Audioclinic

Joseph Giovannelli

A.C. Adaptors

Q. Can the a.c. adaptors, such as those sold for portable radios, calculators and recorders be left plugged in for long periods of time when they are not being used?—James R. Henderson, Victoria, B.C., Canada.

A. It is only in those instances where the adaptor serves something like an intercom, which must be ready for service at any time, that I recommend these adaptors be left plugged in when not actually in use.

These a.c. adaptors are actually complete power supplies and are comprised of a stepdown transformer, a rectifier system, and the necessary filter capacitor. When one of these devices is operated, there is some heat generated by the stepdown transformer which will not be significant unless the filter capacitor should short out. When this occurs, the transformer will run excessively hot and might cause problems.

Keep in mind that when the device is plugged in, but not feeding a suitable load, the voltage developed across the filter capacitors will be higher than the nominal output voltage of the a.c. adaptor. If the filters are made to operate at or close to their maximum ratings, this high voltage remaining across the capacitor for extended periods of time could cause a short circuit.

"Popping"

Q. My component system develops a "popping" noise in my speakers every five minutes or so. It sounds like a static discharge. It is heard whether my amplifier's mode switch is on FM, Tape or Turntable.

What do you suggest that I try in the way of trouble-shooting? The people in the store where I bought my system said, "let it get worse, and then the technician has a better chance of finding the problem."—Tuck Krehbiel, Cincinnati, O.

A. It will be hard to locate your "popping" problem because of its intermittent character, and that is why your dealer was reluctant to attempt servicing the equipment until such time as the symptoms become more

constant. This is probably to your advantage inasmuch as this kind of servicing can be expensive. Where a problem occurs more or less constantly, it is simpler to track down and, therefore, less costly.

You do know something about this problem, however. For instance, you know that the problem is not located in the early phono stages of the equipment. You know this because it occurs even when these stages are switched out. It is located in stages common to the rest of the input functions. You did not state whether or not the condition exists in just one channel. If the condition exists in both, you know that the "popping" is the result of some common component, and power supply or decoupling elements would be suspect. This condition could also indicate that the "popping" is external to your system. Transient voltage changes on the power line often cause this condition. Various filters are available which can suppress such interference.

Poorly soldered connections or minute cracks in the circuit "lands" could also cause the problem. Resolder suspicious joints.

Try signal tracing. Use a second amplifier to enable you to listen to the output from various stages in the defective equipment. Feed the input of this second amplifier via a blocking capacitor. This will allow you to make direct connections to collectors where this is necessary. Work your way from the input selector switch to the output of the defective channel. When the "popping" is heard in both amplifiers, this means that you have reached the output of the defective stage. You can then investigate the components in that particular stage. The ultimate source of the problem can be anything from defective semi-conductors to defective capacitors, resistors, or even solder or circuit foil problems. ▲

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.

AUDIO • NOVEMBER, 1976

Power Plus.

The Scott R336 Receiver.



Power is important. But power alone is not enough. That's why the popular Scott R336 gives you all the power you need. Plus the performance features you expect.

The Scott R336 provides 42 watts minimum continuous RMS power output per channel. More than enough for most listeners. And both channels are driven into 8 ohms from 20 Hz to 20 kHz with no more than 0.3% total harmonic distortion.

Power? Sure. But check these important performance features many other receivers in this medium price range have sacrificed.

IM distortion (lower than 0.15%). Far below the average. Provides cleaner sound and eliminates listening fatigue.

Signal strength and center channel tuning meters. Provide simultaneous visual indication of correct tuning and optimum signal strength.

Phase locked loop multiplex section. Maintains superior stereo separation. Remains in alignment for the life of the receiver.

FET RF stage. Assures higher sensitivity and overload immunity.

Log-linear taper volume control with detents. Spreads out volume levels. Provides finer control at low-to-moderate levels.

Clutched bass and treble controls with detents. Allow altering the frequency response of one channel without affecting the other. Systems can be "custom balanced" to compensate for room acoustics, decor or speaker placement.

Separate high-frequency noise filter. Permits cleaning up of noisy tapes, discs or broadcasts.

Three position FM de-emphasis switch. Permits proper reception of domestic, Dolbyized or European broadcasts.

Two completely independent tape monitors. Allow two tape recorders to be used simultaneously for direct tape-to-tape copying without passing through the receiver's electronics.

FM Muting. Silences interstation hiss while the tuner scans the frequency spectrum.

Pretuned LC notch filters in the multiplex. Reduce interference to a minimum.

Signal strength meter circuit. Employs two point sampling for wider dynamic range.

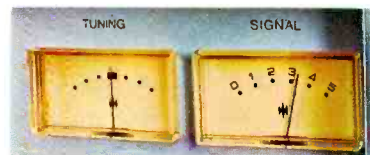
Over 120 db IF gain. Assures better limiting and better AM rejection.

Instantaneous electronic protection circuit in the output stage. Employs voltage/current sensing to prevent output transistor failure and speaker damage.

AM section designed around a tuned RF amplifier using J-FET. Improves signal-to-noise ratio.



Clutched bass and treble controls with detents.



Signal strength and center channel tuning meters.



Two completely independent tape monitors.

And the Scott R336 is backed by a three-year, parts and labor limited warranty. Another very important plus.

For specifications on our complete line of audio components, write or call H.H. Scott, Inc. Corporate Headquarters: 20 Commerce Way, Woburn, MA 01801, (617) 933-8800. In Canada: Paco Electronics, Ltd., 45 Stinson Street, Montreal, H4N2E1, Canada. In Europe: Syma International S.A., 419 avenue Louise, Brussels, Belgium.

 **SCOTT**
The Name to listen to.

Receivers/Tuners/Amplifiers/Turntables/Speakers
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Beyond specifications.

High fidelity engineering, to justify its name, has one goal: to reproduce music in the listening room with unqualified accuracy. Undistorted. Undiminished.

At Harman Kardon, we explore new technical directions not solely for their inherent challenge, but as methods of predicting and improving music quality.

Specifications are supposed to serve the function of predicting performance. Yet two competitive instruments with exactly the same set of conventional specifications often sound vastly different. Obviously, the reasons for this difference lie elsewhere. Conventional specifications *are* necessary. Necessary, but not sufficient.

Our 730 receiver meets specifications equalling or surpassing those of the finest individual component units. Yet it achieves a

quality of transcendent realism which these specifications alone cannot explain.

To predict musical accuracy, we have found it necessary to go beyond conventional specifications. We test, rigidly, for square wave response. We monitor, strictly, slew rate and rise time. These tests account for the sound quality of the 730—not in place of conventional specifications, but beyond them.

The 730 goes beyond the conventional in other ways. It is driven by two complete, discretely separate power supplies, one for each channel. Even when music is extraordinarily dynamic, the energy drawn by one channel will in no way affect the other. The music surges full. Unconstrained.

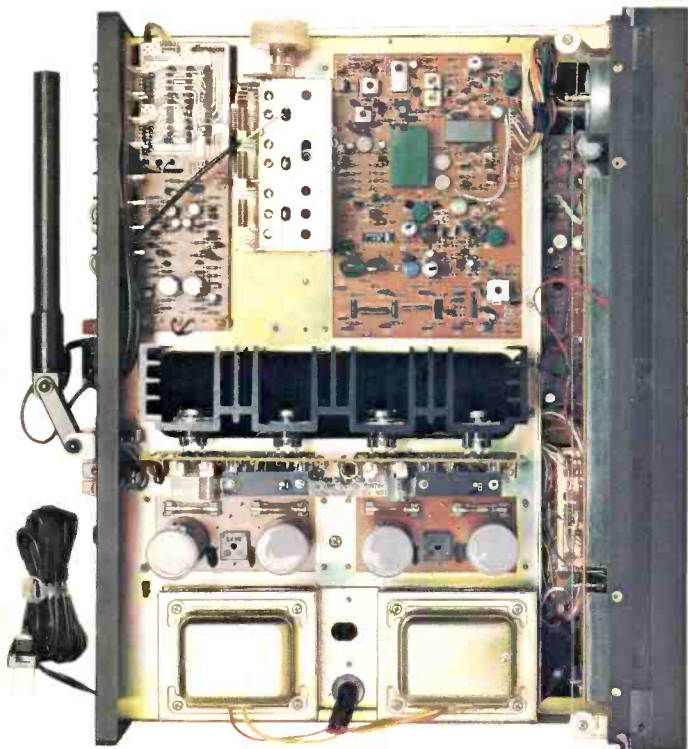
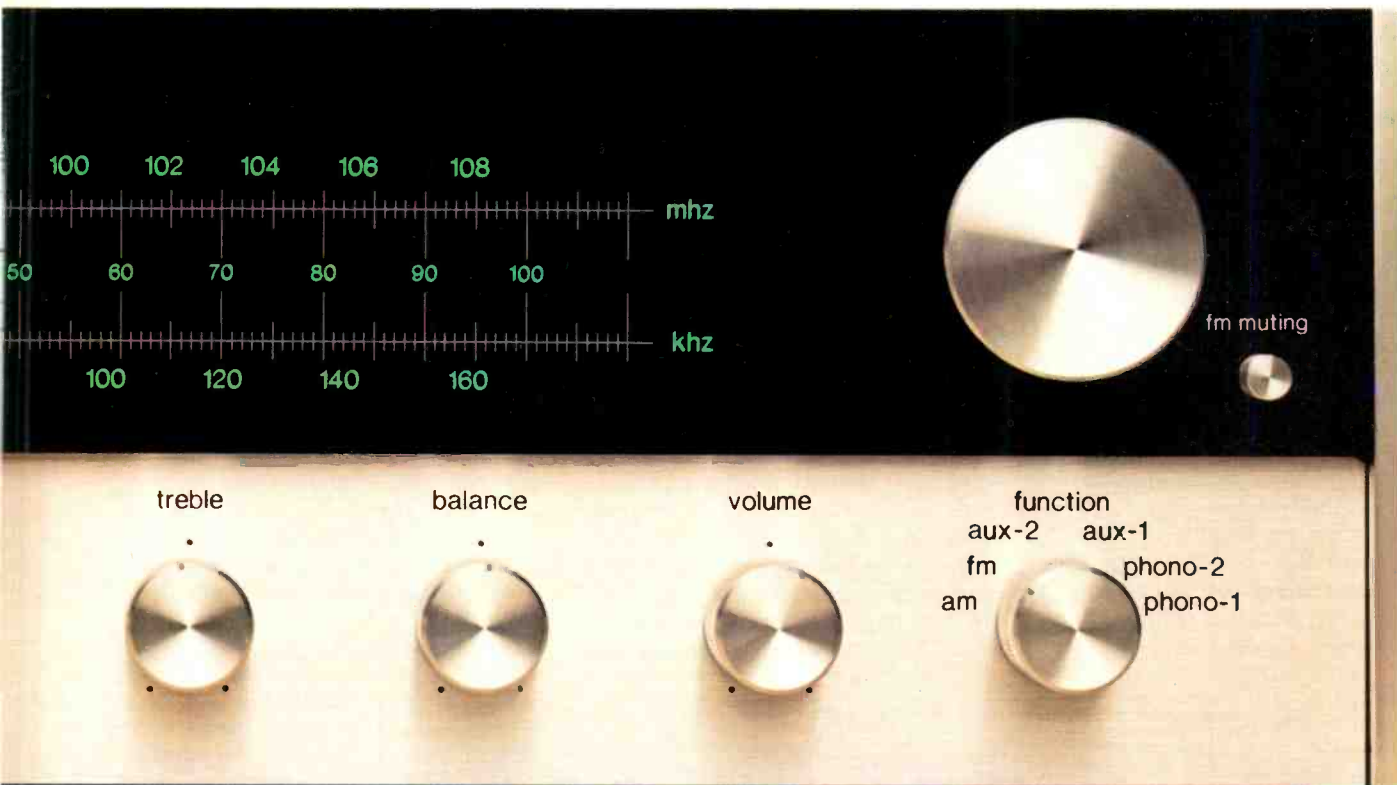
Any fine tuner measures signal strength. The 730 incorporates a

patented system which measures not strength, but signal-to-noise ratio. As a result, it can be tuned to the precise point where the signal is purest for listening or recording.

Equally important, the twin-powered 730 has all the basic design elements that identify it as a Harman Kardon instrument: wide bandwidth, phase linearity, ease of operation and a wide range of input and output elections.

All of this suggests further discussion. If you are interested in such an exploration, please write us (directly, since we imagine you are impatient with coupons and "reader service" cards, and so are we). We'll certainly write back, enclosing a brochure also unconventional in its detail. Just address: The 730 People, Harman Kardon, 55 Ames Court, Plainview, New York 11803.

harman/kardon



SPECIFICATIONS

Power Output	40 Watts Min RMS per channel both channels driven into 8 ohms from 20Hz to 20kHz, with < 0.1% THD.	Preamp Output Impedance	600 ohms
Power Bandwidth	From 10Hz to 40kHz at < 0.1% THD into 8 ohms both channels driven simultaneously at 20 watts per channel.	Phono Overload	>95 mV
Frequency Response	4Hz-130 kHz ± 0.5 dB	RIAA Equalization	± 1.0 dB
System Rise Time	1.5 μ sec	Tone Control Action	a. 50Hz ± 12 dB b. 10kHz ± 12 dB
System Square Wave Tilt	<5%	Contour Effect (50Hz)	+10 dB
Total Harmonic Distortion	<0.1% from 250 milli-watts to 40 watts RMS, both channels driven simultaneously into 8 ohms, 20Hz to 20kHz.	High Cut Filter (10kHz)	-10 dB
Intermodulation Distortion (40 watts—SMPTE)	<0.12%	Low Cut Filter (50Hz)	-6 dB
Intermodulation Distortion (1 watt—SMPTE)	<0.15%	FM Sensitivity	a. IHF 1.9 μ V b. 50 dB (mono) 3.3 μ V c. 50 dB (stereo) 35 μ V
System Hum and Noise	Better than 60 dB below rated output (unweighted)	Ultimate S/N	-70 dB
Damping Factor (1kHz @ 1 watt)	>30	Capture Ratio	2 dB
Power Amplifier Input Sensitivity	<1.2V	Image Rejection	-80 dB
Power Amplifier Input Impedance	33 kilohms	Spurious Response Rejection	-80 dB
Power Amplifier S/N (40 watts)	>90 dB	IF Rejection	-90 dB
Power Amplifier Square Wave Rise Time	<1.5 μ sec	AM Rejection	-60 dB
Preamp Input Sensitivity	a. Aux <150 mV b. Tape Mon. <150 mV c. Phono <2.5 mV	Alternate Channel Selectivity	80 dB
Preamp Input Impedance	a. Aux 30 kilohms b. Tape Mon. 30 kilohms c. Phono 47 kilohms	Multiplex Separation (1kHz)	40 dB
Preamp Input S/N	a. Aux > -75 dB b. Tape Mon. > -75 dB c. Phono > -67 dB	FM Harmonic Distortion (1kHz)	a. Mono 0.3% b. Stereo 0.4%
Preamp Harmonic Distortion	<0.15%	Pilot Suppression	-55 dB
Crosstalk	a. Aux -47 dB b. Tape Mon. -47 dB c. Phono -37 dB	De-Emphasis	75 μ sec
		Mute Level	Variable
		Mute Suppression	-65 dB
		Stereo Indicator Threshold	a. "off" <3% b. "on" >6%
		Audio Output	0.5V
		AM Sensitivity	>250 μ V/m
		AM Signal for 1 watt Output	<150 μ V/m
		AM Selectivity	35 dB
		Alternate Channel Selectivity	55 dB
		Image Rejection	-75 dB
		IF Rejection	-60 dB
		Hum	-40 dB

Audio etc.

Edward Tatnall Canby

One of the pleasures I've always found in occupying this somewhat ancient spot in our journal is what I might call the automated follow up—not by me, but by our readers. For every little bit of knowledge, evaluation or opinion I project here I get two large ones back via Uncle Sam's carriers, and this, surely, keeps me alive whether pro or con, last of which there is plenty, now that we've gotten so big. (Never forget that in a little journal, with no circulation, you can say *anything* you want, no matter *how* libelous. If I had much hair to tear, I'd be bald again thanks to the con, but the rest more than balances, and nowhere better than in the helpful additions. Astonishing what a breadth of contacts and information we all have, taken collectively.

Take Boyd Neal. Months ago, I wrote a piece concerning a recording of the complete Brandenburg Concertos (Bach) which had reached my turntable unheralded and, shall I say, unexplained—i.e., it looked brand new though I knew very well that it wasn't. Reissue? I speculated upon the possibilities in the evidence before me, the discs themselves and the markings thereon, notably a very clear "PB" and equally clear "DBH" indicating, as I figured out, two friends of mine in the biz, Peter Bartók and David B. Hancock. (I didn't recognize him at first but the wheels finally turned and out it popped.) Also my own very long memories of earlier recordings. For I knew the name Boyd Neel well and it wasn't yesterday.

Now I doubt if Boyd Neel ever con-

ceived of himself as a vital cog in the audio industry. His offerings have been purely as a musician, a conductor of his own excellent playing groups, notably the Boyd Neel Strings in Europe. Nevertheless, through his many years of conducting very good music for our medium, recorded sound, he is definitely an early cog in the mesh of gears that keeps us all turning merrily today in hi fi. Early, because his music goes back to the old 78 days of shellac, and forward to

Columbia does not normally pirate from itself to create its reissue legends, but there are vaster and more confused fields to cultivate, to put it mildly, and sometimes nobody really knows, as you will see. A whole new world of quasi-legal research is a-building, just to untangle the legitimate problems of legal reissue.

As for the pirates, you might think they had few problems, but you would be wrong. After all, you have to know just how pirate-like you are, and what are your risks and where. So a counterpart under-world of legal research must necessarily exist on this basis. And if you ask me, the over- and under-worlds are themselves so entangled that even the lawyers aren't sure which side they're on. That is the whole point, and the longer we go on producing recordings, then withdrawing them, the more utter is the total snafu. . . .

Anyhow, so much for intro and synopsis. I concluded on the basis of my own evidence, tactile and memory, that the Olympic recording I had in hand was in fact a reissue of a much earlier job done by an elegant but short lived company, Unicorn, out of Boston. But definitely, Peter Bartók had done recording for that label—I owned some of the results, though not the **Brandenburgs** above mentioned. And just as surely, it was Hancock who cut the disc masters of part of this series. Who else but DBH? Curiously, I have not heard from either of these gents, and some whimsical fluke in my head decided me not to call either one of them. As I said, I like a mystery. But then came



those of high quality tape. Forward still further, and with contemporary significance, into this very time of ours, now, when the entire former waxed, lacquered and taped repertory of recorded music is being systematically pored over by a thousand professional ears with one thing in mind—profitable reissue.

Profitable & Otherwise

Profitable first, of course, in terms of cash, whether legitimate or pirate—we run the gamut, there. Co-



KLH Research Ten Column Bookshelf Loudspeakers: For people who care more about music than money.

You are looking at three pairs of truly unusual loudspeakers. From left to right, they are the CB-10, CB-8, and the CB-6. What makes them so unusual is that each pair is capable of reproducing an amount and quality of sound that has heretofore been impossible to achieve from such modest sized devices. They are efficient and can be driven effectively by any reasonable power source (the CB-6 and CB-8 need as little as 8 watts per channel; the CB-10 will do quite nicely with as little as 10 watts per side). Yet all three pairs have the ability to handle as much as 100 watts RMS per channel! Their performance is perhaps best characterized as uncommonly open and airy,



with notably good bass response. Indeed, the CB-8 and CB-10 use our famous Megaflux Woofer™; the CB-6 has a "special six"—a new woofer that is easily among the best used in today's smaller loudspeakers. The CB-6, the smallest of the series, delivers about a third of an octave less bottom than the CB-8; the CB-8 about a third of an octave less than the CB-10. But all three models share exceptional smoothness and perfect musical balance. They also share something else. They are incredibly *inexpensive*.

Which can be a problem. Unfortunately there's a sizeable number of people who believe that if a speaker

doesn't cost a lot of money, it can't deliver a lot of sound. But if you trust your ears more than your checkbook, we suggest you listen to our CB loudspeakers soon. We think you'll love them *and* their sensible prices a lot.

For more technical information, visit your KLH Research Ten dealer. Or write to KLH Research & Development Corp., 30 Cross St., Cambridge, Mass. 02139. (Distributed in Canada by The Pringle Group, Ontario, Canada.)



KLH Research Ten Division
KLH Research & Development Corp.
30 Cross St., Cambridge, Mass. 02139

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from loudspeakers where pride of craftsmanship is the by-word... superlative sound that is only Frazier.



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in the audio industry

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the letters. At this point, I'd say both PB and DBH are not longer *de rigueur*, though it would be nice to chat with them. The automated follow up has taken care.

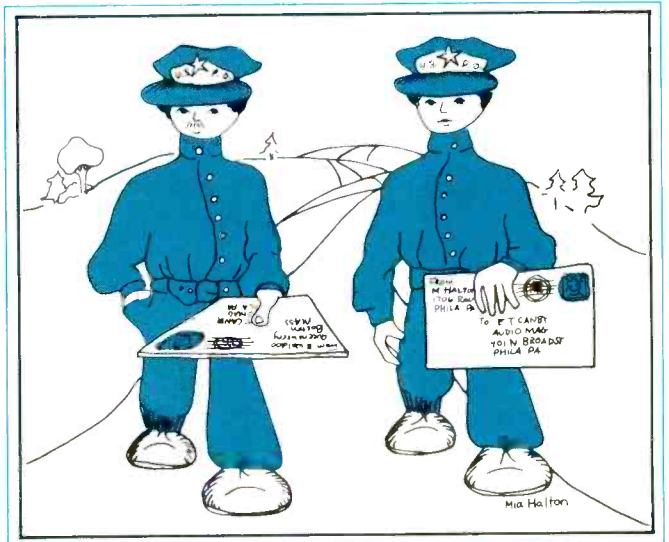
So many strands. First, I note a letter from Gregor Benko of the International Piano Archives. Mr. Benko's company is specializing in piano notables who have recorded in the past and he has a distinguished board of officials with him, from Arthur Loesser and Alicia de Larrocha (that dynamic Spanish pianist lady) to Mrs. David Rockefeller and Alice Tully. (If in NYC, visit Alice Tully Hall.) Two brothers, friends of mine from my days of singing in the Dessoff Choirs, had as their Swiss father a remarkable pianist, Ernst Levy, who did some tremendous recordings which, not surprisingly, I acclaimed (as the phrase goes) 'way back. I did a couple of comparative (tape edited) radio programs that stacked Mr. Levy's Beethoven against Artur Schnabel's and, if I remember, the then young Glenn Gould's. Phonomontage, direct from one to the other with commentary. Now Mr. Benko is on the trail of the Levy recordings and wondered whether I had in my collection the original discs, hopefully mint, that I might be willing to lend to him. (No, not mint—I played them to death. And no, not available—I can't find them.) Why this?

Masters "Misplaced"

Ah, ha (as I always say)—a clue! Mr. Levy recorded for two labels, one was Kapp records—was that the Kapp that made the famed styli? The other was an elegant company named Unicorn. One sentence tells all. "It seems that the master tapes for the Unicorn and Kapp records of Mr. Levy have disappeared."

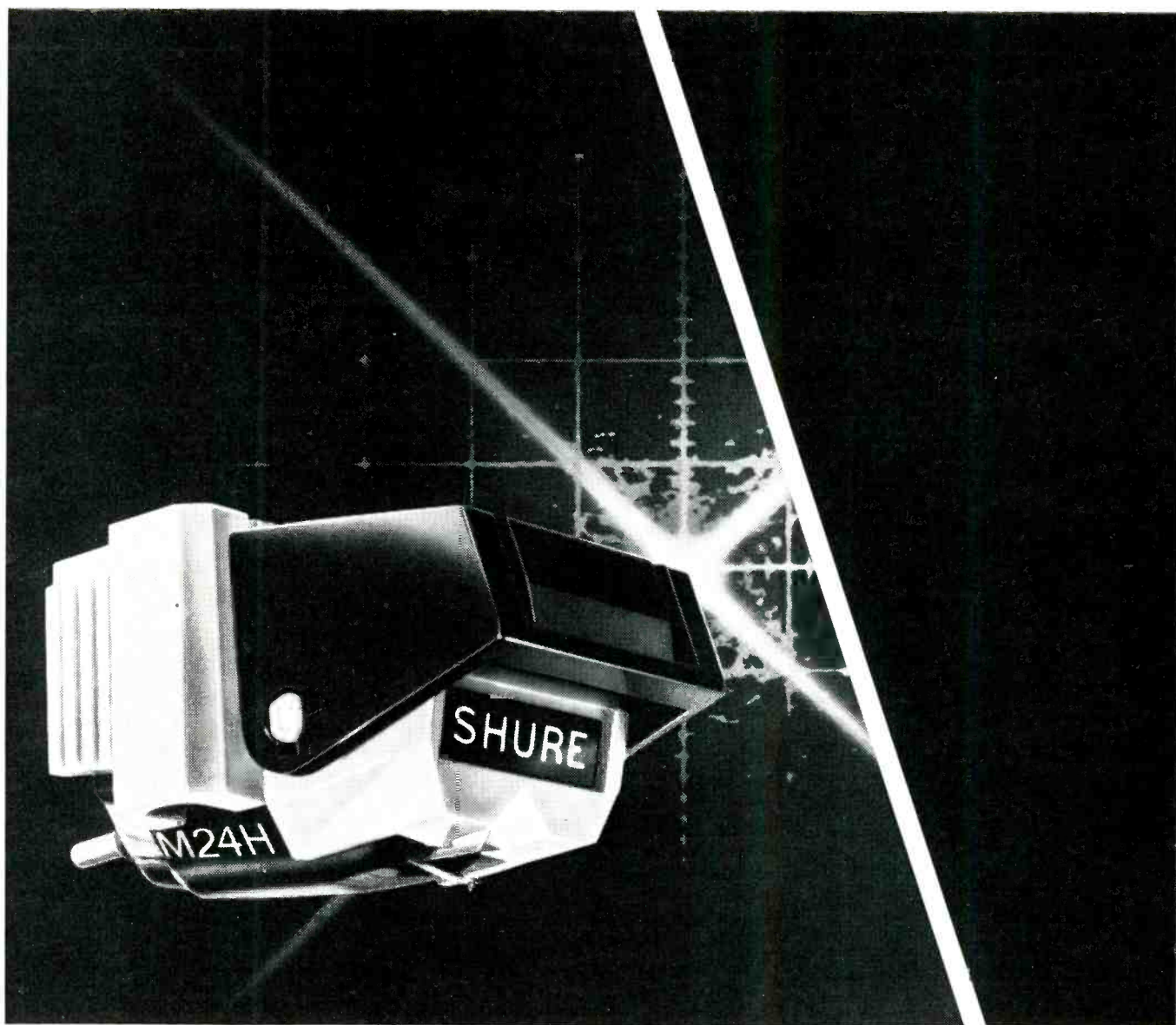
Now it just happens, you see, that the Boyd Neel **Brandenburg** Concertos on Unicorn belong straight in this same series of master tapes. If a first-line pro in the recorded archive business can't find *those* tapes, what of the Neel tapes? And now a second letter.

Daniel W. Doell of Columbus, Ohio, wrote me a long letter—he says that he owns a Neel recording of the same Brandenburgs, Realistic RM 2200, evidently an album—nobody has yet got all six of the **Brandenburg** Concertos on one disc. (More about *this* in a moment.) He says he must have bought this recording at Radio Shack in Boston around 1961 or 62; the discs are hand scratched G90P 9456/7/8/9 (that would be four sides) and also stamped UNLP 1040 and 1041. Ah, ha again—those were the Boyd Neel Unicorns I had in my catalogue, though the discs have been "borrowed" and not returned by one of my Bach-loving friends. Also to be noted on these Realistic disc are the initials PB. Take that, Peter Bartók. The sound of the recording (now) is good but muffled, says Doell. He adds a new bit



of mystery—"The signal seems to have been passed through a filter circuit that only lets go when the signal gets high and loud." Hmm—shades of the old H.H. Scott Dynamic Noise Suppressor. Neither Dolby nor dbx, of course; neither than existed. And filtering does NOT sound like either Bastok or David Hancock, especially if it is audible gating. Wanna argue? You can write Mr. Doell, and I guess he won't mind, at 1070C Weybridge Rd.S., Columbus, Ohio 43220. He also notes, I note, that the 1961 surfaces are "much quieter than most of the records I have bought recently." Fighting words, those.

Then we have Richard J. Hammond of Palo Alto. He owns the original Neel Unicorns, 1040 and 1041, and solves one point for me. They were definitely mastered by Bartók; it says so on the labels and the initials are on



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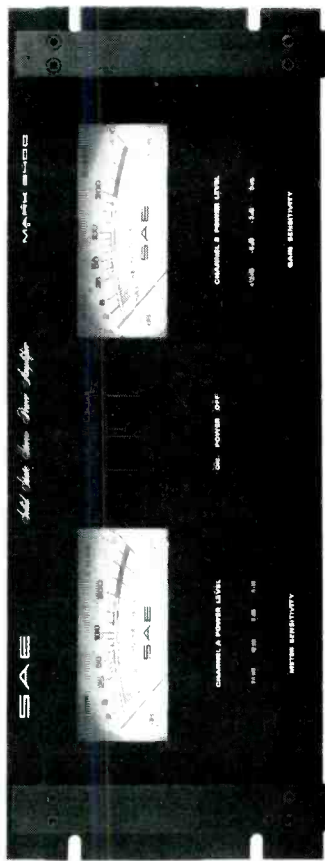
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the discs; whereas 1042, next in the series, was Boyd Neel Mozart, mastered (as I wrote, before) by Hancock. Mr. Hammond adds some bio material. He thinks that the playing group that did the Unicorns was a later orchestra, not the original Boyd Neel group that recorded for Decca in England (I guess my early Neels must have been Deccas). He says Neel emigrated to Canada after WW II and the English group was taken over by Thurston Dart. Yep, Check! I have L'Oiseau-Lyre recordings (Decca) by the Boyd Neel Orchestra under Dart. Later it became the Philomusica—that name I remember too. Neel, Mr. Hammond says, was originally a medical man and reverted to that profession during the big War. Interesting.

Editors' Additions

And so the evidence trickles in. Hey, how's this! A letter from our ex-Editor and still-contributor, George W. Tillett, who is, of course, British. (Didn't you know?) George is in Florida, as is ex-Editor/Publisher C.G. McProud. Seems that Mr. Tillett—George, pardon me—was an official at Decca ("C. E.") and in the late fifties the early Neel recordings were still selling well, though the String Orchestra under Neel's name had been disbanded several years before. Now those records must have been at least in part either from 78 originals or the 78s themselves? I persist in my memory of a batch of Boyd Neel shellacs, which is now lost somewhere in my attic. Decca (London) went over to LP very early, late '49 as I remember or thereabouts; but the famed *ffrr* wide range recordings first appeared on shellac 78s, as very few people remember. I think maybe George is a bit off on that disbanding, wouldn't you say? Not disbanded but taken over, at first under Neel's name, and conducted by Dart. Not that it makes much diff.; orchestras come and go, not necessarily in line with their names. How many different Columbia Symphony Orchestras were there, including Bruno Walter's and Stravinsky's and—? Matter of convenience. George thinks that Neel set up another group in Canada with a name such as "The Arcadians." Well, that sounds Canadian, all right. But what of the **Brandenburgs** done for Unicorn of Boston, U.S.A.? Mr. Hammond (above) thinks that this group used some British and some American soloists, though how he knows this he does not say, nor do I deny it—how could I? I wasn't there.

You will remember that I was be-

mused by the problem of Neel's age. If he made shellacs that I bought when I was a youth, then he is definitely no chicken right now, and indeed, I suggested that in order to have done a *brand new* recording, such as his Olympic album seems to be, he would have to be at least a Stokowski. (At last count, Stokowski was approaching the mid 90s and still operating.) No youthful, longhaired conductor, Neel! George Tillett says Neel visited Decca in 1958, went back to Canada "and dropped out of sight."

Dear me, George, not quite that. The very nicest letter I received in all this correspondence is one I am going to take the liberty of quoting.

Dear Mr. Canby. I don't know why you think I am so old and decrepit!! I play tennis 3 times a week and can beat all my students at squash. Yrs, Boyd Neel

So the automated follow up has pinned down our conductor—via himself—if not by any means all the interesting details concerning those Unicorn tapes, presumably, maybe, lost?—the discs, or some discs, re-appearing first in the early sixties and then again, on Olympic, this last year. On that score I give you a final mystery, and this one provided by Mr. Neel himself, to my astonishment and almost disbelief. Some readers may have seen an account of this in another journal; I hadn't.

Musical Manipulation

It seems that those Olympic discs, at least according to the conductor who did the music, *have had their tempi altered* from the original (but not their *pitch*, which is precisely OK)—by as much as two or three minutes a concerto, that is, a half side more or less. That's a lot. Mr. Neel had asked for an explanation, had received none, and proceeded to disown the first three concertos as "a complete travesty of my original recordings." The other three concertos mystifyingly (he says), were untouched and are OK in tempo.

How strange. Neel had not known, and many of our readers may not know, that one can indeed alter the pitch of a piece of music without changing the tempo, or the opposite—raise or lower the pitch at the same tempo—by one or another of the various ingenious sampling devices that have been around now for a number of years (but not back to the early sixties, I think). The first such machines were mechanical, with whirling tape heads that took gradu-

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ated samples from the original and magnetically spliced them together in a new chain, either shorter (by excising tiny bits) or longer (by overlapping part-repeated segments). Gotham Audio, in New York, handled one—and alas I forget its trade name and can't phone in at the moment, being definitely elsewhere. They might even know who did the job—but probably wouldn't tell you without consulting lawyers right and left! It's a complicated world.

I played with that German machine


at length, and it was absolutely astonishing. It could speed up or slow down anything to a huge degree and in the lesser stages with very little audible distortion or added noise; also change pitch by an outlandish amount. *For timing a piece of music to fit a time slot*—say a few moments shorter, or longer, invaluable. If the conductor of the music or the performer goes along. Maybe Olympic just didn't think it really made that much difference? If so, they don't know their musicians. Anyhow, clear-

ly the tempo changes were made, if they were made, in order to accommodate the music to the disc parameters in the recutting, which may have been somewhat different from Unicorn's, 'way back. Reasonable thought, as far as engineering is concerned. But music? It all depends.

A few years ago I heard the first all-electronic logic/computer type apparatus, to accomplish the same thing. It was awful—that is, for music. Lo-fi, and with a horrible saw-tooth background buzz. Never could have used that thing on any music at all. The current theory goes that for speech work, deaf people, learning problems, the speeding up of too-slow public speeches (is that a good idea!) and a whole complex of language teaching usage, this lo-fi "speech quality" sound will do just fine. I have always deplored this attitude, which has been taken for granted for decades in vast areas of education, children's entertainment, and sound-orientated speech research. Now, with the easy fi we can accomplish, I find it plain outrageous. I visited a children's disc outfit a few years ago and was stunned at the dreadful quality of the speech recording they promoted. There is no reason at all now why speech should not be subject to every bit of "fi" that counts, in every way equal to that which we apply to music. And I say this even if I am a musician. . . .

Anyhow, I hear there is a much improved logic for this pitch/speed alteration now which might allow a reasonable fi if applied to a recording of music; but I know for a first-hand fact that the old, bulky, clumsily expensive mechanical pitch/speed converter did a superb job and could well have been used in those Neel Olympic recordings if the pitch was indeed altered, and who are we to doubt it.

So much for automated follow up. More questions than answers? Of course! That's the kick of it. If Neel's tempi were altered, for instance, wasn't it done from the original master tape, or reasonable copy thereof? Therefore—did the Neel Unicorn tapes survive, all those years, have the Levy tapes (above) disappeared and are they hopelessly lost? Does Olympic maybe have Levy somewhere in its store room, maybe without even knowing it? These catalogues are often bought and sold in bulk, to be plowed through at leisure. One often gets a lot for a song, this way. But the process can be legitimate if it is legal, and surely helps keep our huge sonic "legacy" alive for a few more years. Definitely not better dead than alive.



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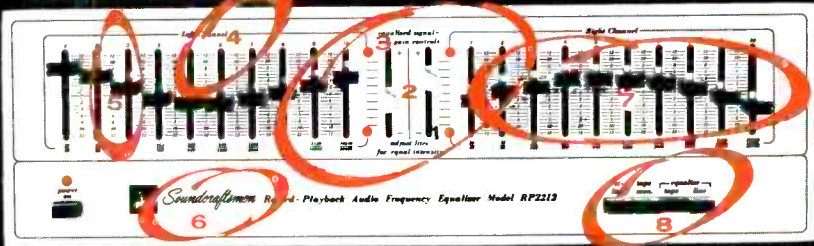
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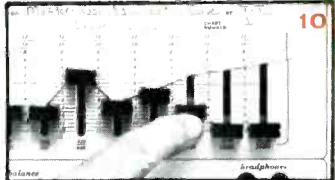
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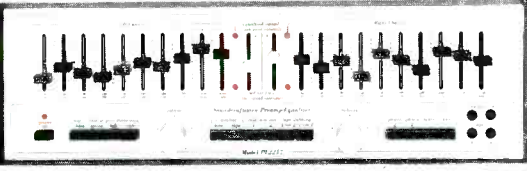


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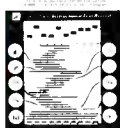
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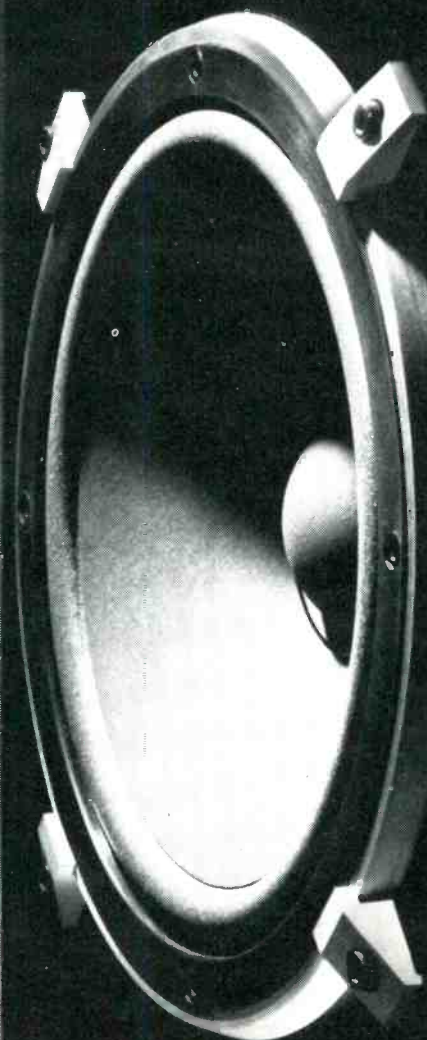
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Behind the scenes

Last month I reported on my visit to Decca Records in London and to the Decca cassette duplication facility in the village of Bridgenorth some 140 miles north of London. At the conclusion of my column, I described the listening test set-up by engineer John Baxter at the Bridgenorth plant, wherein one could switch between the stereo disc, the running master (from which the cassette is duplicated), and the production cassette of the same program. Now, on with the tests and the story.

Needless to say, levels between the three sources were precisely matched, as was synchronization of the signals from the playback machines. The disc was played with a Shure V-15 III phono cartridge into a Quad preamplifier. The running master and the production cassette were decoded through a Dolby 505 B Type unit. Quad amplifiers were used along with large Tannoy speakers.

On initial listening tests, switching between the three sources didn't reveal any readily apparent differences in sound quality. Even with more extensive and detailed listening, it was obvious that the differences which were perceived, were fairly subtle. Of course, the occasional tick and pop of record noise was a give away that I was listening to a disc. Difference between the *running master* and the *production cassette* were well-nigh imperceptible—the former perhaps a shade cleaner, with a smidgin less

noise. I think it is fair to say that the cassette is virtually a sonic mirror of the running master. Very careful comparison of the sound of the disc versus the cassette indicated there were some small variations in dynamic range, frequency response, and equalization. At this point I want to briefly discuss some aspects of disc cutting and tape processing.

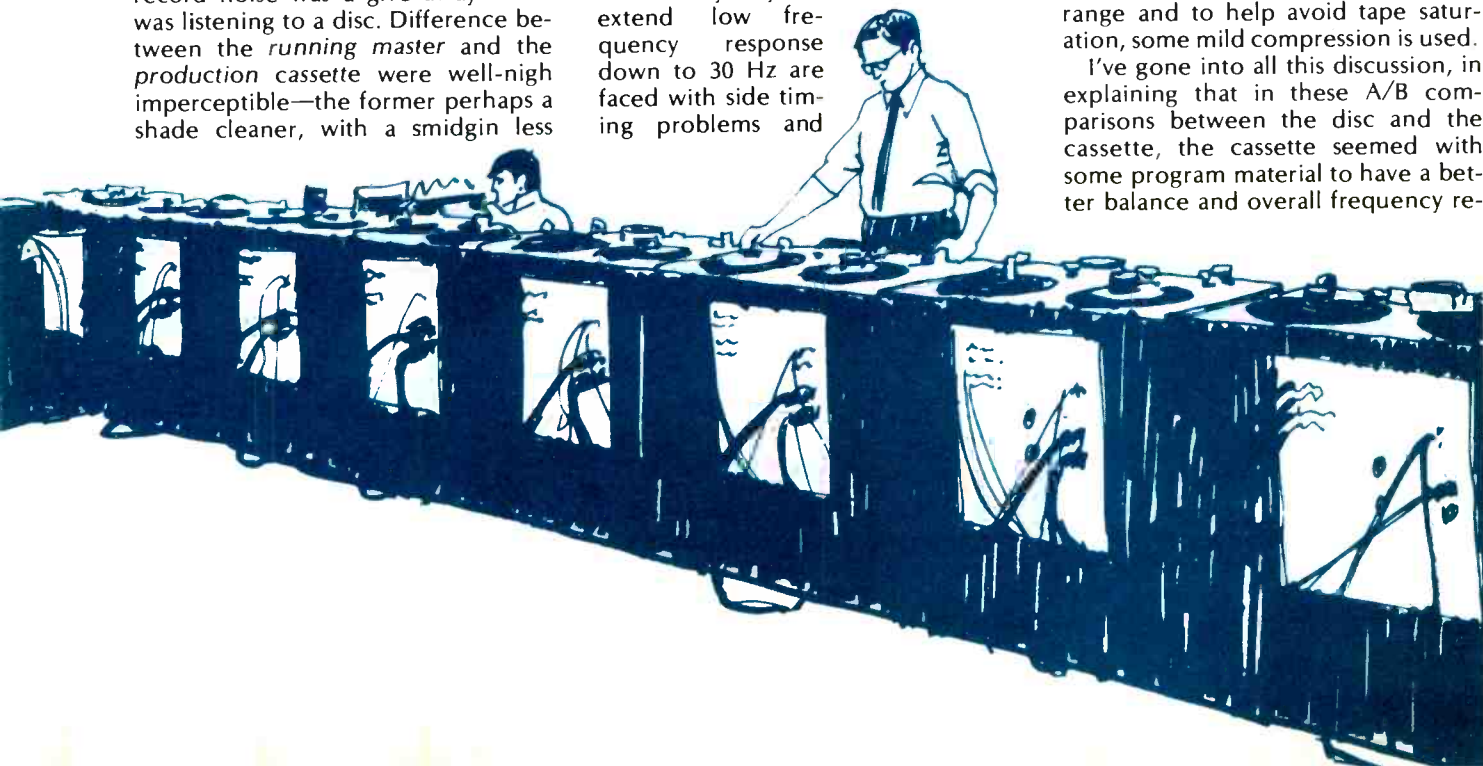
I have noted that in Decca's case the stereo disc is made from the cutting master and is a second generation product. In the transfer from tape to disc, there are certain basic restrictions in disc cutting technology that must be considered. This is achieved by a complex juggling of the inter-related factors of low-frequency response, dynamic range, running time of the side, and the electromechanical characteristics of the cutter head. Contrary to the propaganda about discs having a dynamic range of 70 dB (on lacquers, yes), under the best of circumstances a disc with a dynamic range of 55 dB is very good indeed. More often than not, the actual dynamic range is appreciably less than this. Sad to say, but in the quest for high record levels many companies deliberately roll off bass response below 50-55 Hz. Those who conscientiously try to extend low frequency response down to 30 Hz are faced with side timing problems and

copied with the energy and wide excursions of the cutting stylus at those low frequencies. Even with the aid of the automated controls for variable pitch and depth on the cutting lathe, dealing with all these variables is no mean feat. In spite of these problems and restrictions, the modern stereo disc is generally considered as the closest approach to the high fidelity of the original master tape.

Cassette Considerations

While the running master is made from the cutting master, since it is to be used for the production of cassettes, it is slightly modified to cope with certain problems of this medium, as well as to take advantage of other factors. For example, running time is not a concern, since on a tape there obviously can't be any inner groove distortion. With proper equalization, low-frequency response is easier to achieve on a tape. On the other hand, the narrow tape width and slow speed of the cassette limit its dynamic range and signal-to-noise ratio. Lack of headroom makes the tape prone to saturation with the subsequent easily discernible distortion. Thus, under "best case" conditions, the dynamic range on a cassette is held to about 40-45 dB. In order to stay within this range and to help avoid tape saturation, some mild compression is used.

I've gone into all this discussion, in explaining that in these A/B comparisons between the disc and the cassette, the cassette seemed with some program material to have a better balance and overall frequency re-



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sponse than the disc. In several instances, the bass response on the cassette was demonstrably superior to that on the disc. "Heresy," say you unbelievers? I'm just reporting on what I heard! Of course, these cassette productions were sonically "tailored" for this medium, but it shows that you can't just automatically assume that cassettes, even of this quality, are inferior to the stereo disc.

After the listening tests, we went into one of the old wards which was being used for cassette assembly. Local Bridgenorth girls were welding cassette halves, while others were using a machine which accepts the 14-in. recorded tape "pancakes" from the duplicating slaves and winds each program, complete with leader tape at each end, into the cassette shells. Several girls were employed in taking random samples of cassettes and checking them with headphones for quality and to make certain that the proper program was being processed. In still another section, labels were automatically affixed to the cassettes, after some girls had checked program against labels. Finally the cassettes were inserted into their cases, shrink-wrapped, and in various quantities put into shipping cartons. One special section handles London/Decca multiple cassette sets. These include operas and such items as the nine Beethoven Symphonies, the five Prokofiev Piano Concertos, etc. These are placed in cases which open like a book and can contain up to four cassettes plus applicable librettos or program notes. It is deluxe packaging and evidently quite popular.

Before leaving Bridgenorth, I want to once again bring up the subject of modulation noise in cassette recordings. I think it is altogether remarkable how free the London/Decca cassettes are from this sonic plague. I have now listened to some 30-odd productions and have encountered just the slightest trace of it—for a brief period—in only three of the recordings. How have they managed to cope so successfully with this problem?

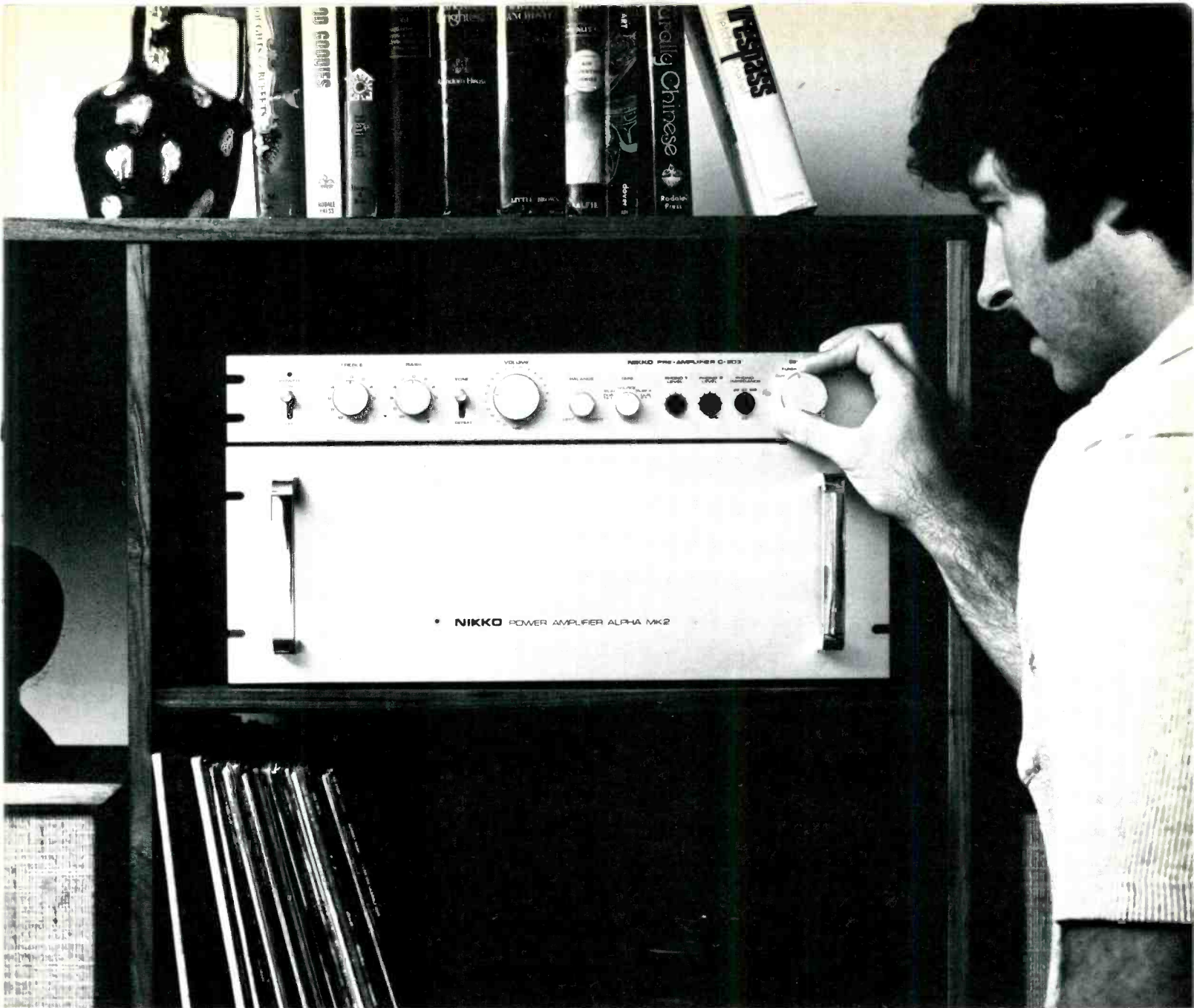
Modulation Noise

The main thing, of course, has to be the type and quality of the duplicating tape. I have just read an Ampex report on modulation noise in tape, and after much research into coating thickness, base thickness, solvents, binders, and methods of oxide milling, along with the viscosities of pigment dis-

persion...all of these turned out to be negligible factors. Among the things they did find significant is that magnetic orientation of the oxide particles with their long axis aligned in the direction of tape travel affords a 3-dB improvement in modulation noise. Even more important is the calendaring process and most specifically the type and construction of the calendaring roller. Calendaring tape produces a smoother finish to the oxide layer and a more even density of magnetic particles. The Ampex people found that irrespective of such aspects as heat and pressure, if the roller was a composite type—made up of layers of different materials—the non-uniformity in roller hardness caused oxide density variations. If the roller was homogenous, i.e. made of one type of material, calendaring was uniform and improvements of as much as 12 dB in modulation noise were noted. Decca uses both BASF and Memorex tape. I remember from my visit several years ago to the BASF tape manufacturing plant in Wilstadt, Germany, that their tape was particle oriented while still in the wet stage on the coating base. I can't say what kind of calendaring roller they used, but I suspect it was the homogenous type. Memorex evidently used similar techniques. Thus, with the uniform density of the tape and Decca's proprietary method of ensuring a very tight head wrap on their duplicating slaves, they appear to have licked the curse of modulation noise in their cassettes.

Before getting back to London and my visit to the Decca recording studios, I want to give you the results of some tests of signal-to-noise ratios on the London/Decca cassettes which I conducted when I returned home. Decca encodes all of their cassettes with Dolby B noise reduction, which in general should ensure low levels of tape hiss. But there are variables involved in the tapes, and people vary in their sensitivity to tape hiss. As a playback system I used a Yamaha





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Input Impedance:	Phono 1 & 2	22K/47K/100Kohm
	Aux Tuner	50Kohm
Total Harmonic Distortion:	no more than	0.015% (at rated output)
Signal-to-noise ratio (I.H.F.):	Phono 1 & 2	72dB
	Aux	100dB
Frequency Response:	Phono 1 & 2 (RIAA equalization)	30-15kHz \pm 0.2dB
	Aux Tuner	20-20kHz \pm 0.1dB
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TC800GL cassette deck feeding into a Mark Levinson LNP-2 pre-amp, a Luxman 4000 power amplifier, and a pair of Duntech DL-15 loudspeakers. I should add that I used the cassette deck's own integral Dolby B system, but also used a Dolby 505 B Type unit. The Yamaha deck was selected not only for its excellent motion, but also because playback levels can be set on the meters, which happen to read down to -40 VU and up to +6 VU with a red LED indicator at +4 VU. Mr. Haddy had kindly given me a BASF DIN "Bezugsband" alignment cassette, (a very handy item that costs over \$50) and my deck checked out within a few dB all the way from 31 Hz to 10 kHz. I used Dolby Labs level set cassette to line up playback on the Dolby 505 unit.

Hiss Levels

I played quite a number of the London/Decca cassettes to gain an overall impression of noise and then chose #SPC5-21148, which combines an excellent recording of the Tchaikovsky *Piano Concerto* by pianist Ilana Vered with a stunning rendition of a piano transcription of Stravinsky's *Petroushka*, for test purposes.

Using a General Radio sound level meter, I placed myself 15 feet on axis between the loudspeakers and set playback levels so that the meter registered a peak of SPL of 88 dB on the "slow" C scale on the loudest fortissimo passages. At this level, there was a barely perceptible trace of tape hiss in the quietest pianissimo passages. With the masking effect of levels above pianissimo, there was no audible tape hiss. Some people would feel that 88 dB SPL at 15 feet is quite loud, but such is the dynamic range on the cassette that the pianissimo sections are really quite low level. For better dynamic range and a heightened sense of realism, I increased the level to peak at 96 dB SPL. At this level, there is a tape hiss evident in the pianissimos but certainly not an objectionable amount, and here again the masking effect of higher levels helps out immediately. Those equipped with the Phase Linear auto-correlator will find that it removes the thin veneer of hiss very nicely. In fact, this is when the auto-correlator is at its best...removing small amounts of hiss from material which isn't grossly "hissy" to begin with. For those not so equipped, at the Decca studios I saw

and heard a "black box" proprietary single-pass noise reduction system, which worked quite effectively with no audible degradation of sound. This is to be used with older tapes, including Dolby, and perhaps even with new recordings. As with other record companies who Dolbyize their cassettes some of the old productions were made at a time when tape oxides and tape machine S/N ratios weren't as quiet as they are today. Used with new recordings, this "black box" should ensure really quiet recordings. I should point out that the perception of tape hiss can be heightened by the mid- and high-frequency peaks in a room, and needless to say, many speakers have response peaks which exaggerate tape hiss. With the Dolby 505 tracking on the nose, and my very flat playback system, even when ambient levels in my listening room reach below 40 dB about one o'clock in the morning, on average, tape hiss is not obtrusive. Summing up my overall attitude towards these new London/Decca cassettes, I'm bound to say they make a very strong challenge to the stereo disc. Most of the recordings are quite good, with a number of outstanding productions

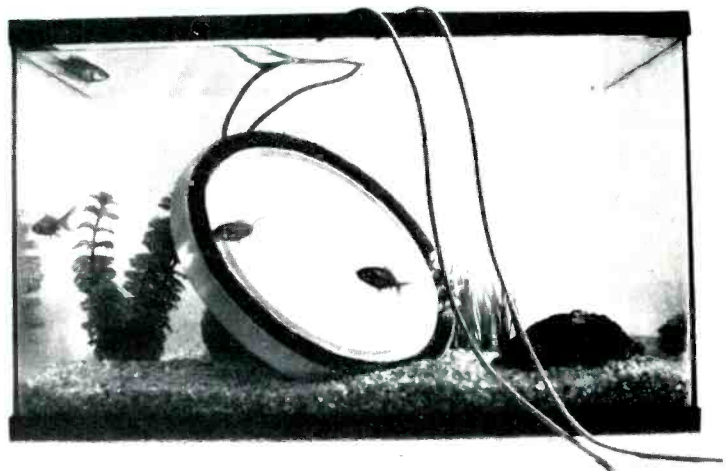
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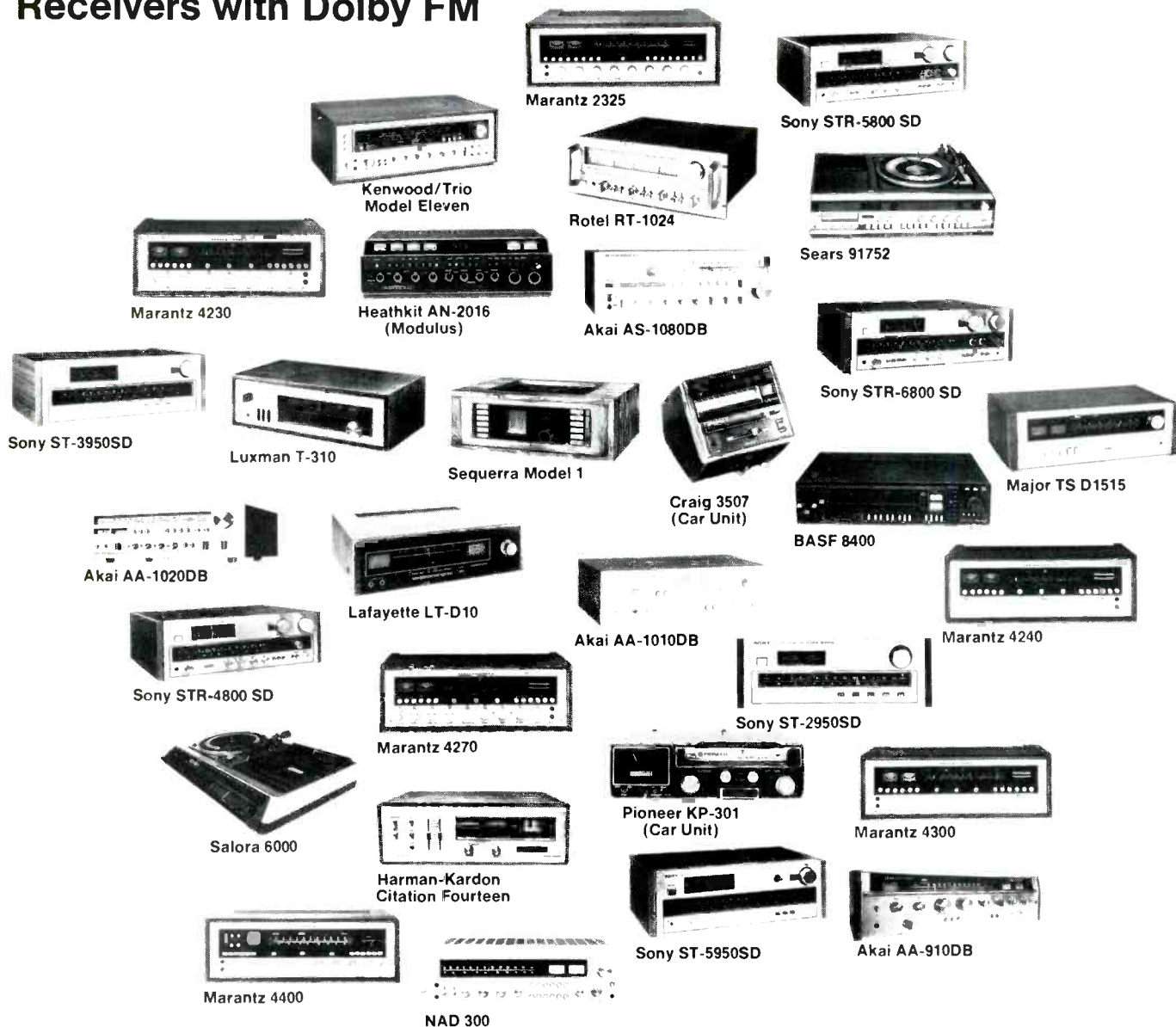


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See your hi fi component dealer for more information. If you would like technical details on how Dolby FM works, please write to us.

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like the complete *Porgy and Bess*, a *Madame Butterfly* which is really top drawer, *Scheherazade* and *An Alpine Symphony* with Mehta and the LAP, *Also Sprach Zarathustra* with Solti and the Chicago Symphony, *G and S Trial by Jury*. . . a real winner here...and the late Bernard Herrmann conducting *Great British Film Music*. It is early on in the game yet, with not many titles available; but thus far, the cassette processing has been really excellent and more important...consistent.


Old "Crooner" Returns

When we arrived at the Decca recording studios in London, Bing Crosby had just finished his first recording session in England in 14 years. Seems Bing is a very good friend of Sir Edward Lewis, chairman of the board of Decca Records, and this was a very special recording with Arthur Haddy himself in charge of the sessions. Bing is now 75, and, as you probably know, his recent operation left him with one lung. It was most astonishing to hear a playback of the recording, with Bing producing those deep sonorous chest tones as in the days of yore! Bing's session was held in the main studio, and that was my first surprise. It is a very large high-ceilinged room, big enough to hold a modest-size orchestra of sixty-odd men, and, by Gad, it is a *live* room with a reverb period of about 1 to 1.2 seconds! No ultra-dead studio acoustics here. Naturally, the room was replete with absorptive and reflective goboes, isolation booths, etc. The control room has a multi input/output console built by Decca, an 8-track Scully, and a 16-track 3M tape machine, along with the usual 2 and 4 trackers. Microphones were in mad profusion in the studio, with the usual assortment of Neumanns, etc. There are several other studios, this time of the traditional "dry/dead" variety with EMT reverb plates, and more multi-track recorders. There are also many rooms devoted to tape editing, dubbing, and preparation of running masters for the cassette operation. Tape machines in evidence were by Studer, Philips, and Scully. No Ampex units, but everywhere was the familiar rainbow label of Ampex 406 tape which they use by the mile. The one-in. running master for the cassette duplication is prepared on Ampex Grand Master tape. The disc-cutting rooms had the usual Neumann lathes, but the cutting amplifiers were special units of Decca's own design with the ability to cope with phase problems.

One room, a sort of test lab, was presided over by Cyril Windebanke, resident of "Golden Ear" and a fascinating repository of recording tales. Cyril personally likes quadrasonic sound, but "officially" Decca is still uncommitted. As you know, Decca records are all over the world, including the U.S. When their engineers go out on those remote symphony sessions, I understand a two-channel master is recorded on a Studer A80, and an 8-track, one-inch master is simultaneously recorded...just in case someday they might need such an item.

Disc Differences

Now to something which I know is going to kick up a storm of controversy. There is a highly vocal band of audiophiles and music lovers in this country who regularly shell out several extra dollars to buy imported discs from Decca, rather than the equivalent music on London Records, the Decca branch in the U.S. They do this because they are firmly convinced that the Decca pressing is of far better quality in sound and has superior physical qualities to those obtainable on London Records. I had a long conversation with Arthur Haddy about this, and he vehemently states that there is absolutely not one iota of truth in this notion. There was a rumor going around the U.S., that even if the Decca and London discs were made from the same stamper, the U.S. got discs from the "tail end" of the stampers life. Mr. Haddy states that, in fact, often the reverse is true...with London Records getting the first run from the stamper. The only difference between Decca and London records is that the Decca cover is of a lighter cardboard stock, and the cover picture is not the same as the U.S. version. Otherwise, everything is positively and incontrovertibly the same.

To conclude this story, while in London Ruth and I had the pleasure of a lovely visit with my friend Leopold Stokowski. At 94, this amazing man is a bit frail and moves a bit deliberately, but he is still very active and alert. The day before we saw him, he was recording for Columbia. We discussed the musical scene and repertoire, and I recalled the recordings we made together. He said, "Bert, that was the past...what are we going to do in the future?" Bless him! Believe it or not, he has just signed a six-year contract with Columbia with the last sessions to be held two weeks before his 100th birthday! I guess that kind of attitude is how you get to be 94. May he continue to flourish. 

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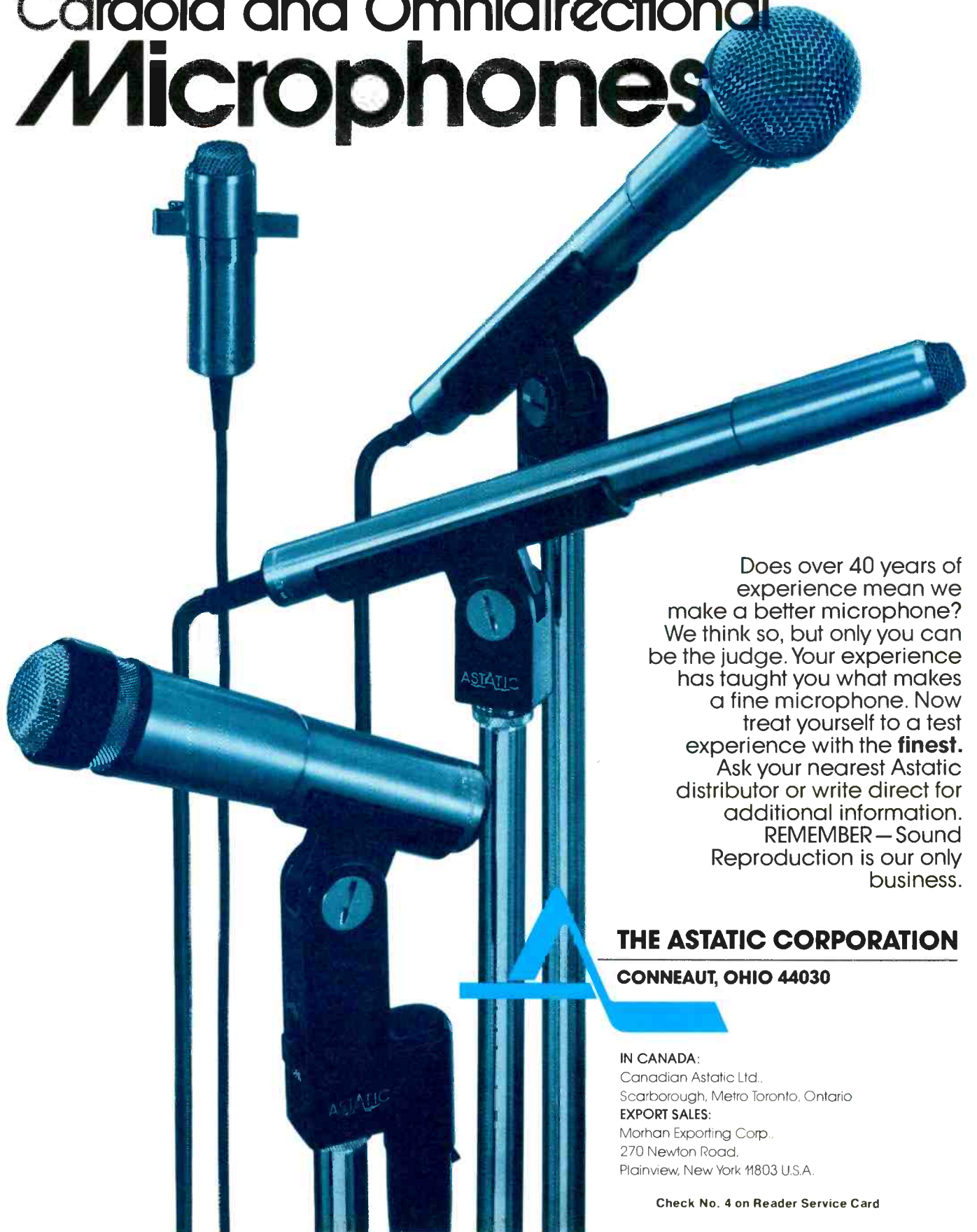

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Dear editor

Sub Sub-Bass System

Dear Kindly Editor:

Because there has been so much interest in the 12 Hz cutoff system mentioned at the end of my article, "Switched-On Bass," I'd like to briefly describe it.

The system uses the same basic enclosure as the 20 Hz unit with one modification. The vent dimensions are changed so that the vent area is 645 cm² (100 in²). The vent length is the same as for the system with the 15W38C. A 5.0 Ohm resistor is used in series with the 18W54C to adjust its Q. The efficiency is about 0.2 per cent.

Personally, I see no need to build such a system. There is no musical content below 40 Hz on most recordings. I know. I spent over 8 years as a recording engineer in Nashville. The musical instruments just don't have

any output in that region which is useful. Also, very, very few studio tape recorders are capable of accurately recording signals below 40 Hz. Furthermore, most recent psychoacoustic work tends to point to a 20 to 25 Hz cutoff in the ear. Nature seems to have included this in the ear's design to protect us from wind noise, etc.

Therefore, I recommend the 20 Hz system. Whichever you build, I wish good luck with your system!

One final note. There has been some confusion about which drivers are used in the 20 Hz system. This was caused by typographical errors in my manuscript which somehow slipped past the Erudite Copyreader. The correct model numbers are Altec 416-8A, CTS 15W38C, and JBL 2205A.

I am indebted to one of the Gentle

Readers, Mr. Jack L. Boyle of Philadelphia, for pointing out an error in the schematic of the crossover. The 0.33 μ F capacitors in the low-pass section, which feeds the subwoofer, should be 0.033 μ F.

W.J.J. Hoge
CTS of Paducah
Paducah, Ky. 42001

Wants AM Sections Reviewed

Dear Sir:

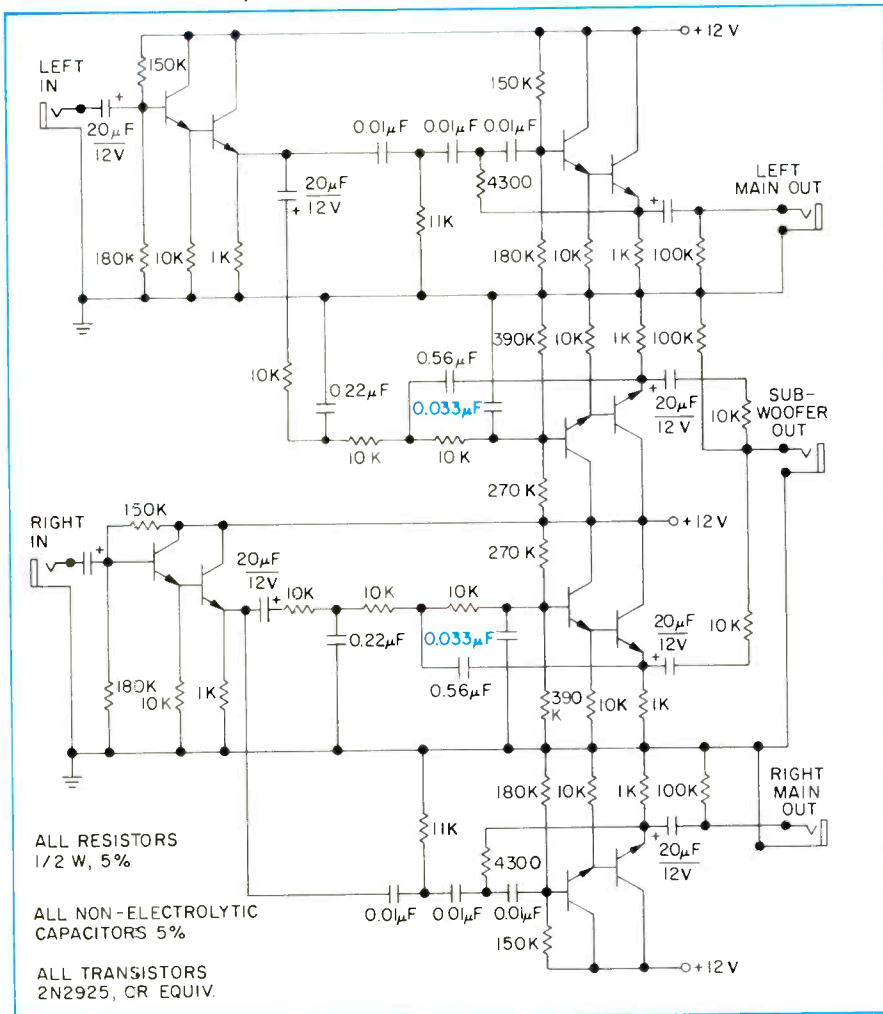
It is my strong belief that is inexcusable for manufacturers of high fidelity tuners, if they elect to include an AM band on their equipment, not to make a bona fide effort to provide quality reproduction. Despite the excellent article you published by George McKay Jr. on the subject a while back, there prevails the general notion that AM radio is hopelessly lo-fi with little to be expected from it, and I suspect that view is largely the result of audiophiles' familiarity with the performance of the AM section of supposedly high fidelity equipment.

Since your "letters," column shows a continuing interest in this subject, and since, apparently, only *Audio* is open minded enough to publish material on AM reception, may I cast my vote for a specific (even if brief) review of AM sections of tuners and receivers under test. It seems to me that only when the often despicable inadequacies of these AM sections are regularly made the subject of public examination are we likely to see an attempt by the manufacturers to bring about improvements.

By the way, our Chief Engineer at KEX, Paul Matthew, and his assistant, Donn Werrbach, have recently upgraded the radio station's audio to essentially flat response over the entire audio spectrum, to 15 kHz, with extremely low distortion. On the Miller Crystal Tuner (how I wish they still made those), we are clearly the best fidelity (and lowest distortion) AM station receivable in Portland, and our fidelity beats all the regional FM's too. We're proud of this and wish more people were able to hear this.

Eric G. Norberg
Program Director
Radio Station KEX
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24





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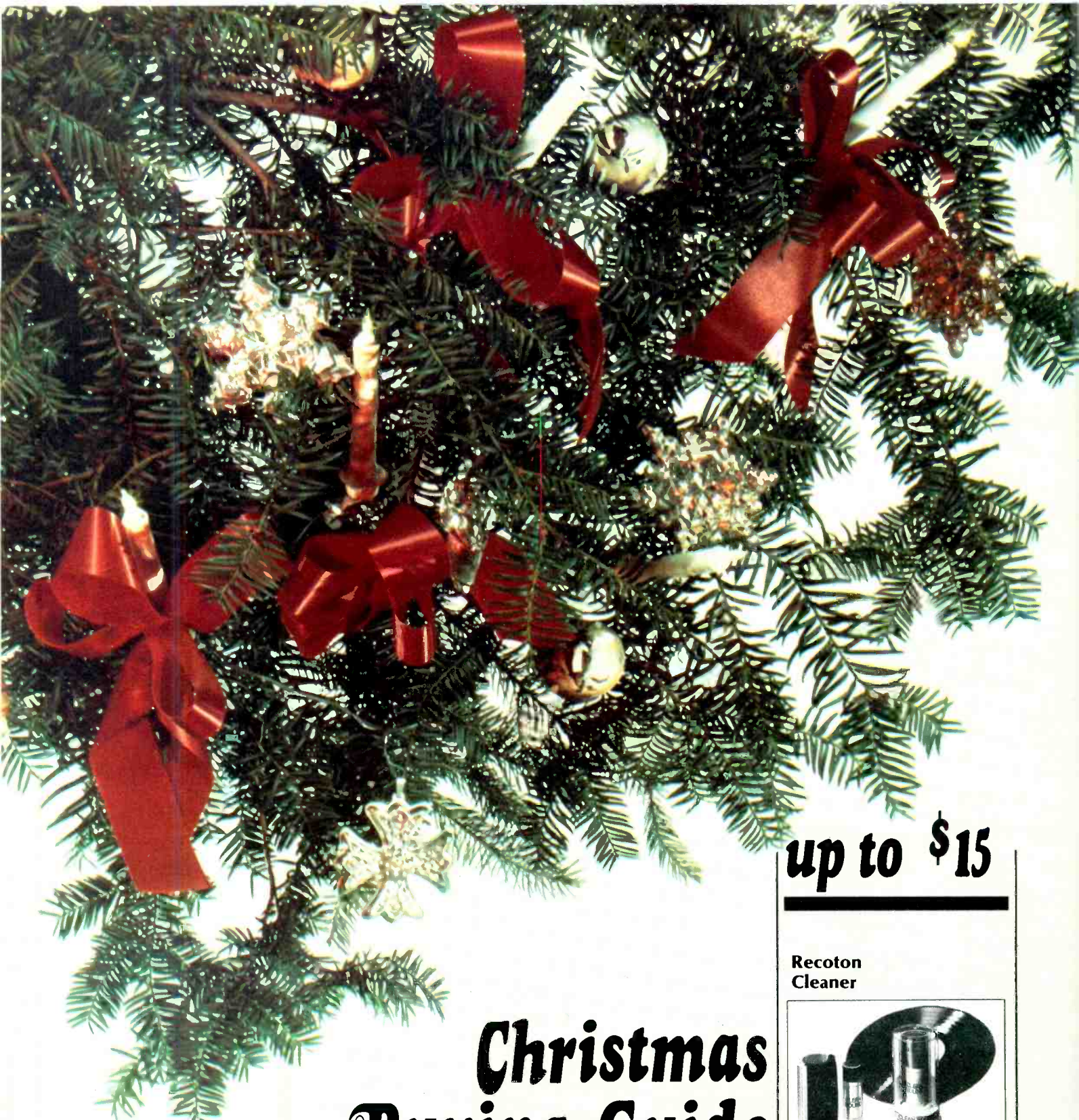
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Christmas Buying Guide

Bringing the sounds of Christmas, from stocking-stuffers to under-the-tree fillers, to Andy Audiophile can be an ear splitting, horrendous chore to the uninitiated. But here are some suggestions to bring the resonance of sonic contentment over Andy's ears on that happiest of days, no matter what size the stocking, tree or pocketbook. Broken down into three categories: up to \$15.00, up to \$100.00, and the sky's the limit; there should be something here to please every audiophile.

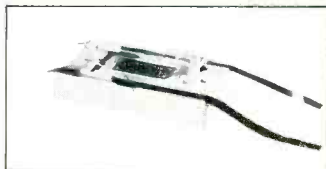
Recoton Cleaner



The Clean Sound system consists of two components, a cylindrical applicator and a non-alcoholic solution to clean the records. This solution, applied sparingly, is supposed to clean and provide anti-static protection for records. Price: \$15.00.

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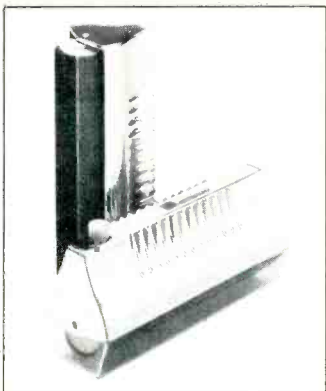
Robins Tape Splicer



The Universal Tape-Splicer is designed to splice open-reel, cartridge, and cassette magnetic tapes. The unit includes the splicer and cutting blade and is used with the standard 3/8 or 1/2-inch splicing tape. Price: \$2.89.

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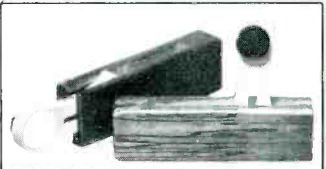
MetroSound Static Remover



The Metrostatic M-81 is a turnover roller consisting of two materials, a soft electrically conductive material to remove static charges from records and a velvet material for removing the dust. Price: \$9.99.

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Discwasher Stylus Cleaner



The SC-1 Stylus Cleaner kit contains a 5/8-inch nylon cleaning brush and magnify-

ing glass, within a walnut block, for cleaning and examining record styli. Price: \$6.00.

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Micro-Acoustics Fuse Kit

The F-Z Speaker Protection Fuse Kit is designed to protect speakers against prolonged overload in excess of the rated maximum power. The kit includes fusing assemblies for two speakers and



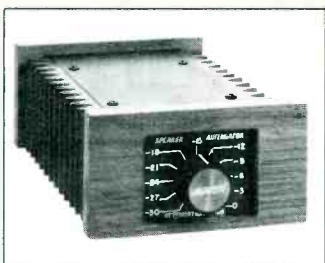
a five-year extension of the speaker warranty. Price: \$10.

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up to \$100

Amtech Speaker Attenuator

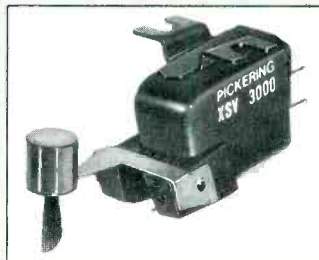
This bridged-T network is used for speaker system level control with each step of the control knob introducing a 3-dB change in level. Appli-



cations include control of remote speakers, equalizing the level of speakers with differing efficiencies, and as a crossover control. The unit is available in either one or two channel versions, either of which can dissipate 100 watts (sine wave). Prices: single, \$69.95; dual, \$99.95.

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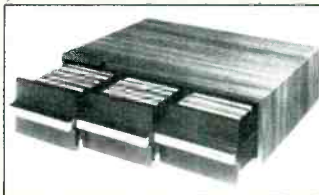
Pickering Phono Cartridge



The XSV/3000 utilizes a new stylus tip shape, named the Stereohedron, which is a spin-off of the firm's research into the requirements of styli for CD-4 record play. The new tip shape has increased record contact area, similar to the Shibata-type styli. Claimed frequency response is 10 Hz to 35 kHz, with channel separation spec'ed at 35 dB at 1 kHz. Output voltage is said to be 5.0 mV re: 5.5 cm/sec. record velocity. Price: \$99.95.

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TDK Case



The CP-36 is a woodgrain finish cassette case capable of holding 36 cassettes in three drawers, and designed to fit underneath the cassette deck. Price: \$33.95.

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Sescom Mike Splitter

The Model MS-1 Mike Splitter is designed to split the output of low impedance microphones two ways with isolation between the two units at 30 dB. Manufacturer's specifications claim a primary impedance at 150-250

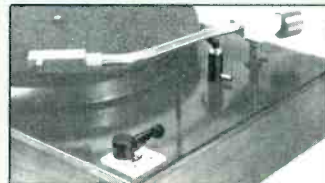


Ohms, secondary impedances of 150-250 Ohms, and input levels at -10 dBm at 30 Hz with 0.2 per cent THD. Price: \$36.30.

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Audio-technica Tonarm Lift

The Model AT6005 is a pneumatic tonearm lift for turntables without cueing



devices. Featuring a 20-inch rubber tube to permit placing the lift actuator on any turntable base, the arm operates by air pressure rather than fluid. Price: \$29.95.

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27

Technics Cassette Deck

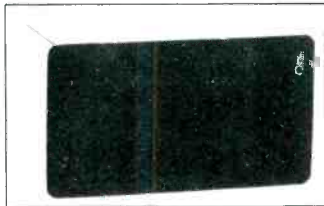
The Model RS-677US is a Dolbyized stereo cassette deck featuring vertical front



load; two-motors with an electronically regulated d.c. motor for the capstan; automatic or manual selection for CrO₂ or normal tape; a memory rewind and play; solenoid controls; a three-way source selector; mike mixing; a lockable pause control; a separate record/decode Dolby FM, and complete with a six-function remote control unit. The claimed wow and flutter is 0.07 per cent W rms, and frequency response is 30-

15,000 Hz on normal and 30-17,000 on CrO₂ tape. S/N ratio is specified as 52 dB, Dolby out and 65 dB with Dolby on CrO₂ tape. Price: \$499.95. Check 100 on Reader Service Card

Design Acoustics Speaker



The D-1A is a two-way acoustic-suspension system housed in a brushed aluminum enclosure. The thin-walled construction claims an increase of 13-18 per cent

in net volume for better reproduction of low frequencies. Power response is 50-15,000 Hz \pm 3.5 dB, with a crossover frequency of 1500 Hz. A double reflecting element maintains wide dispersion of high frequencies above 4 kHz. Weight 12 lbs. (5.44 kg). Price: \$100.00, a walnut veneer model, \$115.00. Check 101 on Reader Service Card

Spectro Acoustics Preamp

The Model 217 straightline preamp features front panel switching of phono cartridge loading, an 18 dB/octave third-order Butterworth subsonic filter, and a two-way tape copying arrangement which doesn't need to be



monitored. Response of the phono stage is said to be

within 0.5 dB of RIAA with less than 2.5 μ V of equivalent input noise for a S/N of -85 dB below a 10 mV reference with A weighting. Response of the high level stage is within 0.25 dB of flat, 10 Hz to 100 kHz, with less than 50 μ V equivalent input noise for a S/N of -96 dB below a 1 V reference with A weighting. Price: \$250.00. Check 102 on Reader Service Card

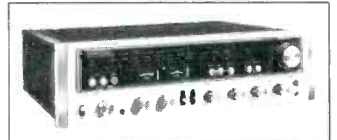
Lenco Turntable



The L-90 turntable, a new top-of-the-line model, is a two-speed, single-play, belt-drive unit, featuring viscously-damped spring suspension, 16-pole synchronous motor,

illuminated strobe, and fine speed adjustment of +7, -3 per cent. Wow and flutter are said to be less than 0.08 per cent, with rumble spec'ed at -63 dB (DIN). Price: \$299.95, with base and friction-hinge dust cover. Check 103 on Reader Service Card

Kenwood Receiver



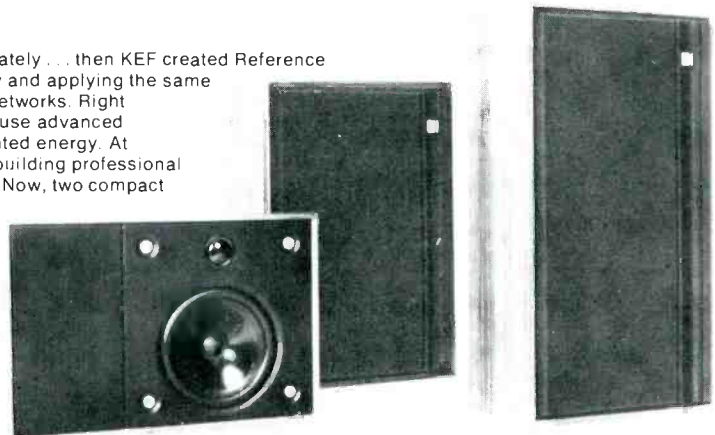
The KR-7600 receiver measures 80 watts per channel over 20 Hz to 20 kHz with 0.3 per cent THD. An "acoustic boost" switch peaks the 50 and 800 Hz regions from 3 to 6 dB to overcome bass deficiencies in program material. The tuner section's claimed capture ratio is 1.5 dB and alternate channel selectivity is 80 dB. A 25 μ S de-emphasis switch is used with Dolby-processed broadcasts. Price: \$529.95. Check 104 on Reader Service Card

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Tape guide

Herman Burstein

Increased Bias

Q. Please give me a procedure for increasing the bias of my tape deck in order to use low-noise tapes. I have an oscilloscope and VTVM, but no signal generator. What other adjustments must be made in order to take full advantage of low-noise tape? How would increasing the bias affect playback of already recorded tapes?—Michael Gray, Rolla, Mo.

A. You should have a signal generator in order to adjust bias. One way of making the adjustment in changing to low-noise tape is to increase bias as much as possible while at the same time maintaining treble response as flat as possible. That is, increase bias in small increments, at the same time checking treble response in playback. If you have no signal generator but trust your ear to tell whether treble is flat, you can dispense with the generator. Optimally, in changing from conventional to low-noise tape, one should not only increase bias but also reduce treble boost somewhat and increase the amount of audio signal fed to the record head. Changing the bias does not affect playback of previously recorded tapes; bias enters only into recording.

Binaural Recording

Q. I have become interested in binaural recording, that is, two-channel recording for earphone listening. Could you please advise me on the correct recording and microphone placement techniques, type of microphone, and whether or not I should use a dummy head with microphones placed in its "ears?"—Joseph Hardy, Fort Worth, Tex.

A. I doubt that it is absolutely necessary to use a dummy head for binaural recording. You can use two directional microphones placed approximately ears' distance apart. Or you can use a mid-side type of microphone (two microphones in one case), such as made by Neumann

(Telefunken), this last is rather expensive. If you employ separate microphones, you have the advantage of being able to experiment with distance between them and with angle of placement.

Also, see the May, 1976, issue of *Audio* for building your own inexpensive binaural mikes, and the September 1976 issue for corrections to the original article.

Deck Modification

Q. While the playback response curve of my tape deck is quite good (within 2 dB of flat), the record-playback response has a peak of over 8 dB at 12,500 Hz relative to 1,000 Hz. I would suspect some modification of the equalization is indicated. I would appreciate any suggestions.—G. F. Maughmer, Escondido, Cal.

A. I would not be inclined to modify the playback response, since this is quite good. Before doing anything about the record equalization, I suggest that you increase the bias to the record head. This will reduce the treble response and at the same time result in less distortion. To the extent that you do modify the record equalization, try to move the treble peak to a higher frequency, perhaps 20,000 Hz or so, which may result in reasonably flat response within the audible range, say out to 15,000 Hz.

Reverb S/N Ratio

Q. I have a Dokorder tape recorder and an Akai tape deck fed to my Kenwood receiver through a Pioneer reverb amplifier. I usually use my reverb amplifier with the reverb control backed all the way down. The result seems to be a signal boost which I have interpreted as an increased signal-to-noise ratio. Is this assumption correct?—Ronald Slakie, Tacoma, Wash.

A. It is not possible for your reverb unit to increase the signal-to-noise ratio. What may be happening is that

the reverb unit causes some treble attenuation, thereby giving the impression of less noise.

Tape Deck Friction

Q. I have a TEAC 4020 tape deck. On fast forward and reverse, electrical sparks shoot onto the tape from underneath the reel. On one occasion the tape almost caught fire, and I stopped the reels immediately. On normal forward and reverse, there are no electrical sparks or fire. What is wrong?—P. Kramen, Brooklyn, N.Y.

A. It seems that the brakes or something else is scraping. At high speeds, such scraping will, of course, result in more friction, heat, and greater possibility of fire than at normal operating speed. You should have your tape machine promptly checked by an authorized service station.

Head Cleaners

Q. On the recommendation of the service man at the store where I purchased my Revox tape deck, I have frequently used isopropyl alcohol to clean its heads and tape path. But the technician at another dealer says not to use isopropyl alcohol. He says it causes the head laminations to come unglued, and he recommended denatured grain alcohol. The best I could do was to obtain denatured wood alcohol. Also, Nortronics tape head cleaner is available, but expensive. What is the best head cleaner? What is the chance that my heads have been damaged?—Eric Church, Tolono, Ill.

A. A number of tape recorder manufacturers recommend isopropyl alcohol, although some do not. I do not know what is absolutely the best for your deck; it would be advisable to consult the manufacturer or the instruction manual. Chances are that you have not harmed the heads or else you would probably have known by now. Manufacturers are alert to the common use of isopropyl alcohol,

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and they would be unlikely to use heads that readily fall apart upon such use, otherwise they would issue a prominent warning against such use.

Playback Equalization

Q. I am contemplating the purchase of a tape transport, including head, and a separate playback amplifier—Shure or Pioneer. Don't tape machines need different playback equalization at different speeds? Don't playback preamps such as the Shure only provide equalization for 7 1/2 ips? Is there a preamp that would permit using all speeds (1-7/8, 3 3/4,

and 7 1/2 ips)? Is this speed equalization what is meant by NAB specifications for the preamp? Have I got the whole thing all mixed up?—David Ohde, Weaverville, Cal.

A. Yes, tape recorders require different playback equalization at different speeds, and the equalization generally offered in inexpensive playback preamps is usually the NAB standard for 7 1/2 ips. It may be that some more recent units that have come on the market offer variable playback equalization. Please query your audio dealer on this. If you have equalization for one speed, namely 7 1/2 ips, then for

the slower speeds you could touch up the equalization—that is, cut the bass a bit and boost the treble a bit until the sound seems satisfactory.

Channel Switch

Q. I have a TEAC 4020 tape deck, which has automatic reverse in playback only. I record monophonically on Track 1 (left channel) from left to right. When I switch to Playback there is no music, just a buzzing noise from both the right and left speakers. When I finish recording Track 1, I flip over the reel to record Track 4. On playback in the reverse mode, all the music of Track 1 comes through the speakers. The same problem applies to Track 4. This problem does not exist on the right channel which works perfectly.—P. Kramen, Brooklyn, N.Y.

A. Your playback problem on the left channel appears to be due to either a defect in one section of the playback head or a defect in the switching system.

Jammed Cassettes

Q. I have a problem with my cassette machine. Often when I attempt to play, rewind or advance the tape, it will not move in either direction. I have tried the major brands of cassettes, and it usually happens with the C-60 and C-90. Is the problem with the cassettes or with the machine? Will a jammed cassette damage the machine? Is it possible to modify the motor to make it more powerful or install a new, more powerful motor?—Sheldon Lichtman, Fort Bragg, N. C.

A. The problem could be either in the machine or the cassette, but experience indicates that some cassettes give more trouble than others. The longer-playing cassettes with thinner tape are apt to be more troublesome. Follow your own experience in learning which cassettes are most trouble-free with your particular machine. But if there is no brand of cassette which prevents frequent jamming, your machine should be taken to an authorized service station. If the unit is left in the jammed state for even a few minutes, this may damage the motor. Thus, your motor may have already been damaged and may not have as much power as a new one. Consult the manufacturer with respect to replacement.

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Micro-Acoustics 2002-e cartridge.

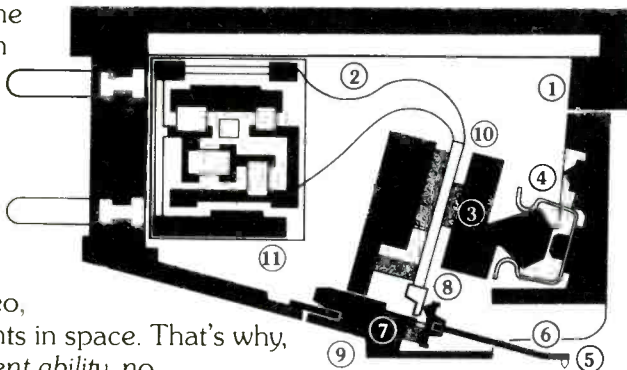
Because good tracking isn't enough.

Tracking is just the beginning.

While good tracking ability is vital, it's only an indication of how well the stylus keeps contact with record grooves on louder, harder-to-follow passages, at stylus pressures low enough to minimize wear. *But surprisingly, tracking ability tells almost nothing about how well a cartridge reproduces most musical sounds.*

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① Low mass body (4.0 grams) reduces warp flutter ② pure gold connecting wires ③ mechanical damper (one of 8) helps optimize transient and tracking ability ④ retainer spring for precise stylus assembly alignment ⑤ elliptical diamond stylus ground with the same precision as our famous Micro-Point recording stylus ⑥ beryllium stylus bar 35% lower mass than aluminum, for optimum high frequency tracking and transient ability ⑦ dual bearings and resolver for optimum tracking ability and precise signal resolution ⑧ direct coupling of stylus bar to electret for lossless transmission of groove undulations to transducers ⑨ user-replaceable stylus assembly ⑩ electret transducer permanently polarized dielectric generator, linear from 5Hz-50kHz ⑪ microcircuit, passive circuit makes cartridge output impedance fully resistive, eliminating effect of cable capacity, shunts preamp input, reducing thermal noise

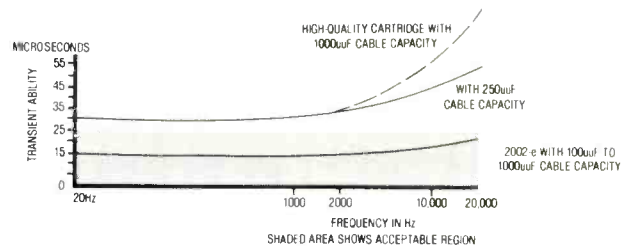
ma® MICRO-ACOUSTICS CORPORATION

Until now, it was simply one or the other.

Tracking or transient ability. Popular high-compliance cartridges, on the one hand, offered good tracking ability and low record/stylus wear, but sacrificed transient ability. And low-compliance cartridges provided good transient ability at the expense of tracking ability and increased wear.

A new technology.

Micro-Acoustics, the world's leading manufacturer of record-mastering styli, has combined for the first time superb transient and tracking ability. In the radical design of the 2002-e (patent pending), direct-coupled electrets and critical damping provide optimized transient ability, as shown in the graph. While an ultra-low-mass beryllium stylus bar and high-compliance dual-bearing suspension provide maximum tracking ability at 1 gram, for lowest possible record and stylus wear.



Transient ability best defines how accurately a cartridge can reproduce a musical burst at different frequencies. (Note that the 2002-e's results are independent of cable capacity!)

A simple way to convince yourself.

Micro-Acoustics has prepared a unique demonstration record to help you evaluate and compare cartridge transient and tracking ability. Just send \$3.50, and we'll mail you a record postpaid. For free information and the name of your nearest dealer, just complete and return the coupon.

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List Price: \$115.00

- () Please send me free information on the 2002-e cartridge, and the name of my nearest dealer.
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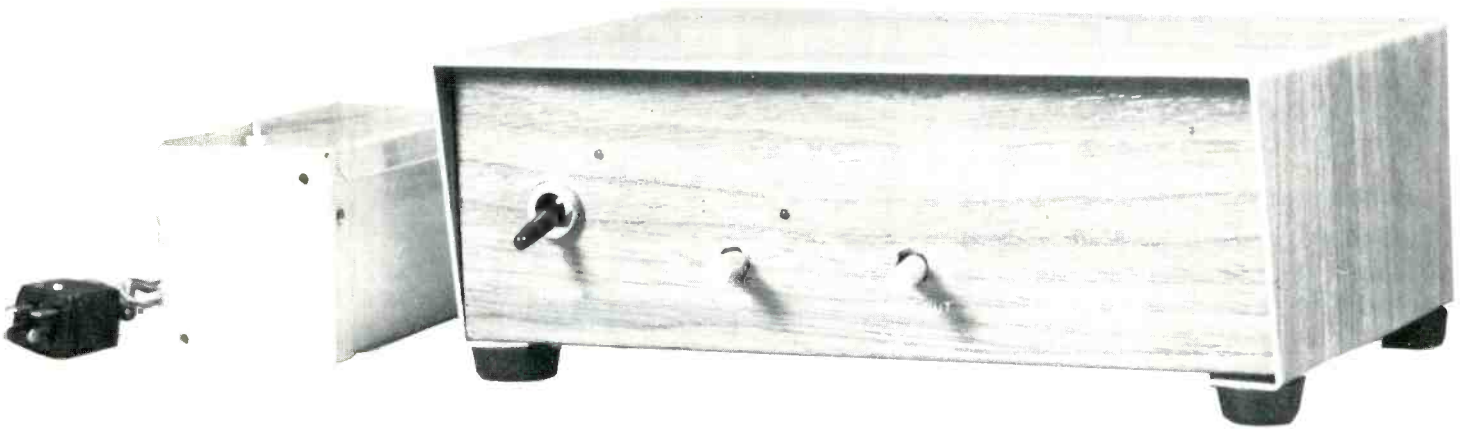


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AU11-76

Build the Latest CD-4 Demodulator

Joseph A. Giovenco*



36

Quadraphonic sound came upon the scene with a bang in the early 70s and represents an exciting and viable entertainment format for the music enthusiast, as well as for the artists and record companies producing albums in the CD-4 Quadradisc format. The state-of-the-art CD-4 disc can closely approach the master tape in terms of wide bandwidth and low noise and distortion. This DM-4 CD-4 demodulator construction project is offered for those who do not have CD-4 capabilities in their present quadraphonic equipment or who want to add the very best demodulator available commercially.

The Circuit

The DM-4 consists of two printed circuit cards and the associated input and output jacks and controls. The first card is the actual demodulator, a JVC TDM-29C. Unlike other kit-type demodulators, this unit is completely pre-assembled and adjusted for proper operation at the factory, and thus assures foolproof assembly. This demodulator card, however, will not accept a magnetic cartridge input. The answer to this is the second PC card, the

PA-1B, which is a high-gain phono preamplifier and RIAA turnover circuit (RIAA roll-off is supplied by the TDM-29C). These two cards, when properly interfaced, yield state-of-the-art CD-4 sound. The TDM-29C incorporates fast-acting muting/distortion reduction, automatic carrier level control, high precision ANRS (noise reduction) tracking, wide bandwidth, and an onboard carrier-acquisition lamp-switching transistor (to allow CD-4 disc play indication without external semiconductors).

While the DM-4 represents a great leap forward in demodulator performance and as such is highly desirable for the serious quadraphile, it is not a project for a novice. Since the PA-1B circuit board must be photographically etched and the interconnections must be done with a considerable amount of care, a fairly great amount of expertise is making electronic equipment from scratch is required. For those up to the task of building this demodulator, the reward will be superlative CD-4.

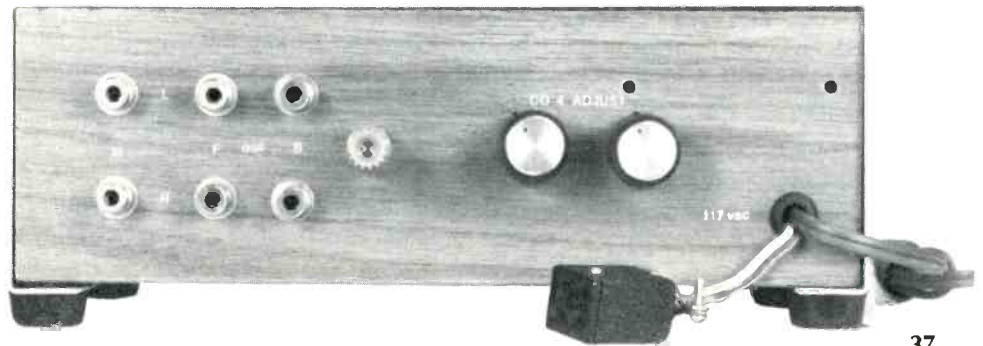
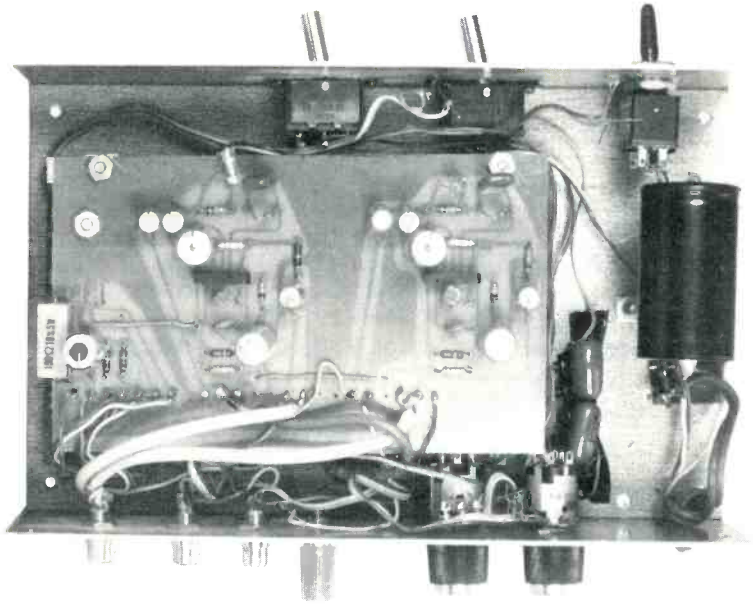
Construction

The PA-1B is made using a 4 x 6 1/2-inch, 1 oz., copper-clad epoxy-fiberglass circuit board. The use of cheaper phenolic-type cards is strongly dis-

*JVC America, Inc.
Polytechnic Institute of New York

couraged, as they will degrade performance characteristics and can introduce noise under certain conditions. The layout for the foil side is shown in Fig. 1. A 1:1 negative must be made of this layout so that the PC card can be exposed. The use of pre-sensitized cards is recommended. The use of spray-type resists is *not recommended*, as they tend to produce a sloppy etch, especially if not properly applied. The easiest way to get a negative from the layout is to have a print shop or a graphic arts shop which does photo-offset work do a 1:1 lineshot of it. A lineshot is a high contrast process. Ask them for an *unretouched* negative. During retouching, they may confuse pinholes for drill holes, leaving you with no drill references on the solder pads. Once you have the negative, expose and etch the board. Kits of the needed equipment, which detail the etching process, are available at most electronic shops or by mail from Lafayette or Allied Industrial.

After etching, inspect the board for any traces of unwanted copper. Drill the card for the leads of the components, then remove the resist with resist solvent. A coating of liquid flux can be used to protect the foil, but in any case the foil must be clean of



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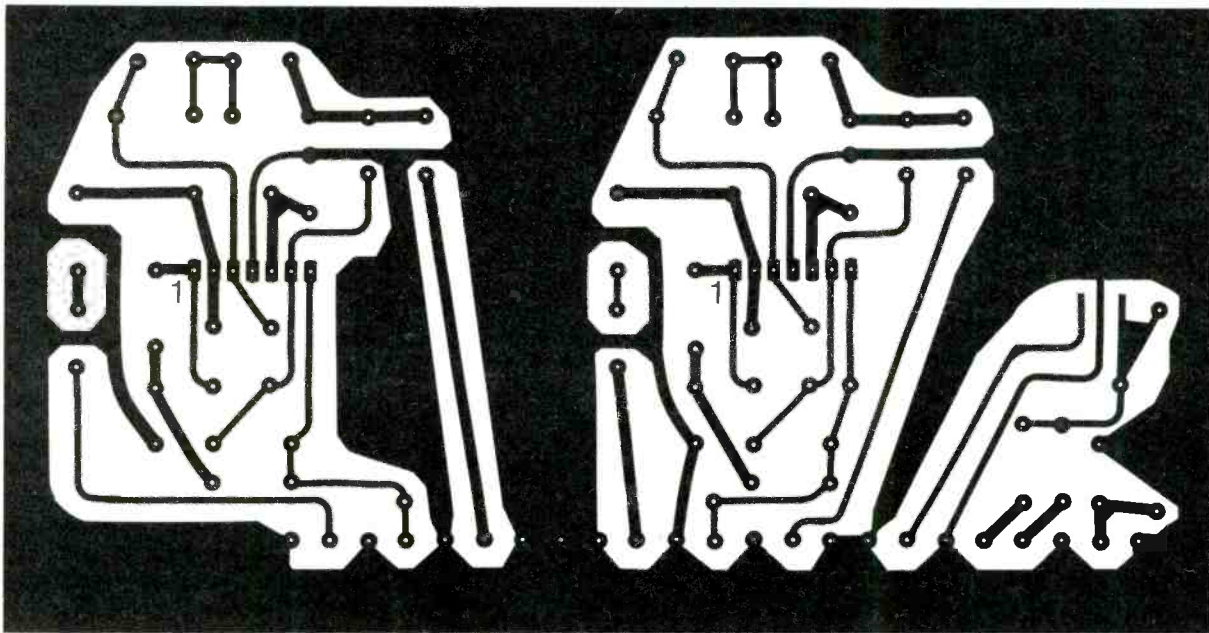


Fig. 1—Foil pattern, one to one, for PA-1B high-gain phono preamp card.

grease, oil, and any other foreign matter.

Mount the components on the board using Fig. 2 as a guide, and solder them in place using a hot iron and thin gauge 60/40 rosin-core solder. The use of Molex Soldercons or other strip-type IC sockets is not recommended since they tend to loosen and cause oscillation. Be especially careful when soldering near the ICs to insure that no solder bridges occur. The power-supply regulator IC (IC3) should be mounted on the foil side of the board. An extra heat sink should not be necessary, as the foil will conduct away most of the heat generated by the IC during operation.

There are no holes for the leads of the regulator IC. It is to be sweat soldered in the following manner: bend the leads so that they lay flush with the IC when it is placed on a flat surface (See Fig. 3). When bending the leads, be very careful not to break them off the IC. Tin the leads and the foil areas on the board that they will contact. Mount the IC with a nut and bolt (silicone grease will assist heat dissipation and is recommended), then "sweat solder" the leads to the foil.

Wire the power transformer rectifier and filter capacitor (T 1, D 1-4, C 6), and connect the output of the capacitor to the PA-1B board. The voltage measured at the regulator side of R 6, 7, and 19 should be 24 Volts positive polarity. If this value is low, measure the voltage across C 6, which should be greater than 30 Volts. If this voltage is not correct, check the transformer, rectifier diodes, and capacitor. If the voltage reading across C 6 is correct, then check to see that there are no breaks in the foil between +Vcc and pin 1 of the IC. If the IC is getting excessively warm, check for shorts to ground. If, after all these checks, proper voltage has not been obtained, replace the IC.

Once proper regulator IC operation has been verified, check the quiescent values at each TA7122 PB IC (see Table 1). These voltages should be within 20 per cent of the values indicated. If they are, you are ready to test the card; if they aren't within the 20 per cent tolerance, check component placement, your wiring, and the foil side of the board for solder splashes.

Apply a signal from a magnetic cartridge to the left and right inputs of

For those uninitiated to the concepts of CD-4, this is how it works: Four separate channels of audio information are fed to a mixing network. This network produces sum (front + rear) signals and difference (front - rear) signals from the inputs. The difference signals are fed to a modulating system, which produces an FM signal centered at 30 kHz. The modulated difference signals have been processed by a noise reduction system (called ANRS) and, after modulating, are combined with the sum signals, sent to a tracking-error correction circuit (Neutrex, which minimizes tracking distortion), and finally go to a cutterhead for 1/2 real-time cutting. The resulting lacquer is processed in much the same way as a conventional stereo lacquer. Finally, pressed vinyl records are made.

HOW CD-4 WORKS

The CD-4 record, played as stereo, reveals the sum of the front and rear channels for each side; played as mono, the sum of all four channels is reproduced, hence full compatibility is assured by the signal configuration chosen. Played back with a wideband phono cartridge equipped with a multiradial stylus, and using a CD-4 disc demodulator, the four original channels are reproduced undiluted by interchannel crosstalk, with a high degree of phase accuracy.

Today's CD-4 disc is capable of matching any stereo disc in terms of playing time (27 minutes on side one of Arista Records' **Funny Lady**), frequency response (Nonesuch's **Per-cussion Music**), and level (Gordon Lightfoot's **Sundown** on Reprise was actually cut 2 dB higher than the stereo).

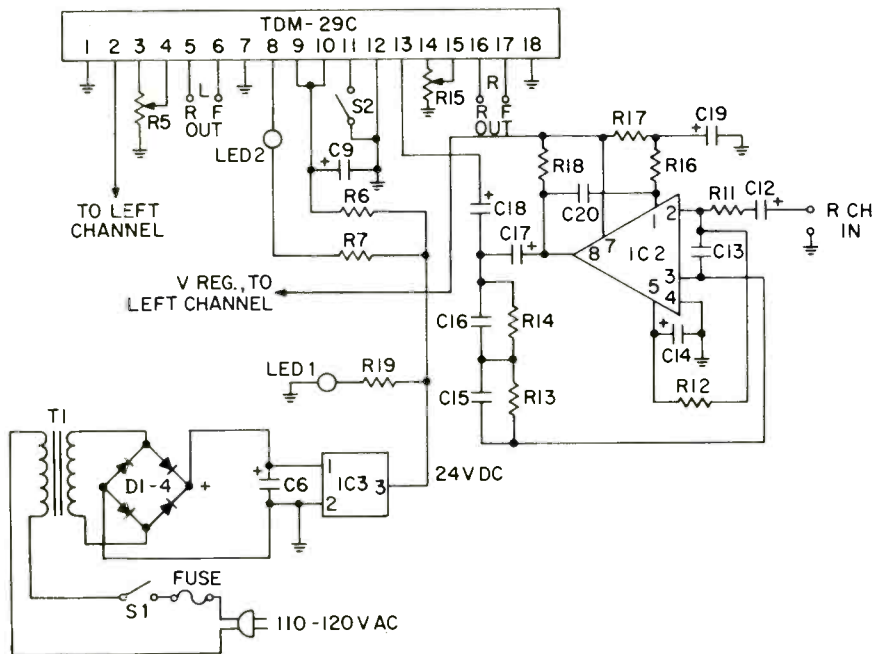


Fig. 1A—Preamp circuit diagram.

Many advances have been made recently in the CD-4 system. These include better, more durable vinyl resins; precision tracking, wideband phono cartridges with multiradial styli; improvements in tracing-distortion reduction systems (Neutrex II) and cutting styli; wide dynamic-range PLL modulation systems, which fit into as little as 12-inches of rack space, and improved cutterheads.

Many cartridges have been introduced with the wideband response necessary for proper CD-4 playback. The Pickering XUV-4500Q is an excellent example of how high quality stereo and CD-4 capabilities can be combined in one cartridge. Another, more modestly priced, entry in the super-quality cartridge category is Shure's new M24H, which combines clean stereo performance with quiet, well-defined CD-4. Empire's 4000D II is an excellent choice for more modest turntable requirements, as are the JVC 4MD-20X and the Audio-technica AT-14Sa, both of which are used by RCA and the JVC Cutting Center for test-pressing evaluation. For disco CD-4 use, Stanton's 780/4DQ is the logical choice, with high tracking force tolerance and low wear Quadradisc stylus including Stanton's patented V-Guard stylus protection system.

Speaking of disco duty, Ball Corporation's Sound Guard record lubricant has been found to be an effective wear reducing agent. The JVC Cutting Center has found that the use of Sound Guard results in a slight increase in noise (about 2-3 dB), but recommends its use on disco Quadradiscs. To obtain maximum protection with minimum noise, the Sound Guard protected disc should be buffed very hard on a flat, lint-free surface, as per Ball Corporation's instructions.

Listed are just some of the better Quadradisc recordings now available in the U.S. If you have difficulty in obtaining Quadradiscs, contact the RCA Quadraphonic Record and Tape Club which handles all U.S. manufactured Quadradiscs. The address is P.O. Box RCA-1, Indianapolis, IN 46291.

The following CD-4 records will give the best introduction to the world of CD-4 discrete four channel sound. In addition they are also excellent for use in showing off your demodulator.

Recommended CD-4 Records

For demonstrating separation:

Godspell	Arista	AQ 4001
Barry Manilow II	Arista	AQ 4016
Barry Manilow/ <i>Trying to Get the Feeling</i>	Arista	AQ 4060
Carly Simon/ <i>No Secrets</i>	Electra	EQ 5049
The Best of Bread	Electra	EQ 5056
Blackbyrds/ <i>Flying Start</i>	Fantasy	FPM 4004
Enoch Light & the Brass Menagerie	Project 3	CD 5036
Spaced Out	Project 3	CD 5043
The Beatles Classics	Project 3	CD 5084
Jerry Reed/ <i>Lord, Mr. Ford</i>	RCA	APD1 0238
Nilsson Schmillson	RCA	APD1 0319

For surround-sound listening:

Melissa Manchester/ <i>Melissa</i>	Arista	AQ 4031
Eric Carmen	Arista	AQ 4057
Brecker Bros./ <i>Back to Back</i>	Arista	AQ 4061
Outlaws/ <i>Lady in Waiting</i>	Arista	AQ 4070
Streisand/ <i>Funny Lady</i> (soundtrack)	Arista	AQ 9004
Baez/ <i>Diamonds and Rust</i>	A&M	QU 54527
Carpenters/ <i>Horizon</i>	A&M	QU 54530
Wakeman/ <i>Myths & Legends of King Arthur</i>	A&M	QU 54515
Mangione/ <i>Chase the Clouds Away</i>	A&M	QU 54518
Mangione/ <i>Bellavia</i>	A&M	QU 54557
Captain & Tennile/ <i>Love will Keep Us</i>	A&M	QU 54552
Midler/ <i>The Divine Miss M</i>	Atlantic	QD 7238
Spinners	Atlantic	QD 7256
Roberta Flack/ <i>Killing Me Softly</i>	Atlantic	QD 7271
Modern Jazz Quartet/ <i>The Last Concert</i>	Atlantic	QD2-909
The Wiz (Broadway cast)	Atlantic	QD 18137
Joni Mitchell/ <i>Court & Spark</i>	Asylum	EQ 1001
Bob Dylan/ <i>Planet Waves</i>	Asylum	EQ 1003
Eagles/ <i>One of These Nights</i>	Asylum	EQ 1039
Joni Mitchell/ <i>Hissing of Summer Lawns</i>	Asylum	EQ 1051
Sergio Mendez	Elektra	EQ 1027
Judy Collins/ <i>Judith</i>	Elektra	EQ 1032
Carly Simon/ <i>Playing Possum</i>	Elektra	EQ 1033
Tony Orlando & Dawn/ <i>To Be With You</i>	Elektra	EQ 1049
Woody Herman/ <i>Children of Lima</i>	Fantasy	FPM 4003
Creedence Clearwater Revival/ <i>Gold</i>	Fantasy	FPM 4001
Doobie Bros./ <i>Captain & Me</i>	Warner	BS4 2694
Doobie Bros./ <i>What Were Once Vices</i>	Warner	WS4 2750
Doobie Bros./ <i>Stampede</i>	Warner	BS4 2835
Doobie Bros./ <i>Toulouse Street</i>	Warner	BS4 2634
America/ <i>Holiday</i>	Warner	W4 2808
America/ <i>Hearts</i>	Warner	BS4 2852
Dionne Warwick/ <i>Then Came You</i>	Warner	BS4 2846
Seals & Crofts/ <i>Summer Breeze</i>	Warner	BS4 2629
James Taylor/ <i>One Man Dog</i>	Warner	BS4 2660
James Taylor/ <i>Gorilla</i>	Warner	BS4 2866
Arlo Guthrie/ <i>Last of the Brooklyn Cowboys</i>	Reprise	MS4 2142
Maria Muldaur/ <i>Waitress in a Donut Shop</i>	Reprise	MS4 2194
Gordon Lightfoot/ <i>Sundown</i>	Reprise	MS4 2177
Gordon Lightfoot/ <i>Cold on the Shoulder</i>	Reprise	MS4 2206
Frank Sinatra/ <i>The Main Event—Live</i>	Reprise	FS4 2207
Jethro Tull/ <i>Aqualung</i>	Chrysalis	CH4 1044
Jethro Tull/ <i>War Child</i>	Chrysalis	CH4 1067
Eric Clapton/ <i>461 Ocean Blvd.</i>	RSO	QD 4801
Montenegro/ <i>Neil's Diamonds</i>	RCA	APD1 0132
Montenegro/ <i>Hugo in Wonder-Land</i>	RCA	APD1 0413
Montenegro/ <i>Scenes & Themes</i>	RCA	APD1 0025
Mancini/ <i>Return of the Pink Panther</i>	RCA	APD1 0968
Charley Pride/ <i>Sweet Country</i>	RCA	APD1 0217
Stephen Michael Schwartz	RCA	APD1 0604
B.W. Stevenson/ <i>Calabasas</i>	RCA	APD1 0410
Ronnie Millsap/ <i>Pure Love</i>	RCA	APD1 0500
Hues Corporation/ <i>Rockin' Soul</i>	RCA	APD1 0775
Jefferson Starship/ <i>Red Octopus</i>	Grunt	BFD1 0999

For classical enthusiasts:

New Jersey Percussion Ensemble/ <i>Percussion Music</i>	Nonesuch	HQ 1291
Coronet Favorites	Nonesuch	HQ 1298
Festival of Trumpets	Nonesuch	HQ 1301
Bolcom/ <i>Piano Music by George Gershwin</i>	Nonesuch	HQ 1284
Ormandy/ <i>Fantastic Philadelphians</i>	Red Seal	ARD1 0002
Ormandy/ <i>Fantastic Philadelphians Vol. 2</i>	Red Seal	ARD1 0017
Shostakovich/ <i>Symphony #15—Ormandy</i>	Red Seal	ARD1 0014
Ormandy/ <i>Bach's Greatest Fugues</i>	Red Seal	ARD1 0026
Tchaikovsky/ <i>Nutcracker Suite—Ormandy</i>	Red Seal	ARD1 0027
Payne/ <i>Spaced-Out Bach</i>	Red Seal	ARD1 0439

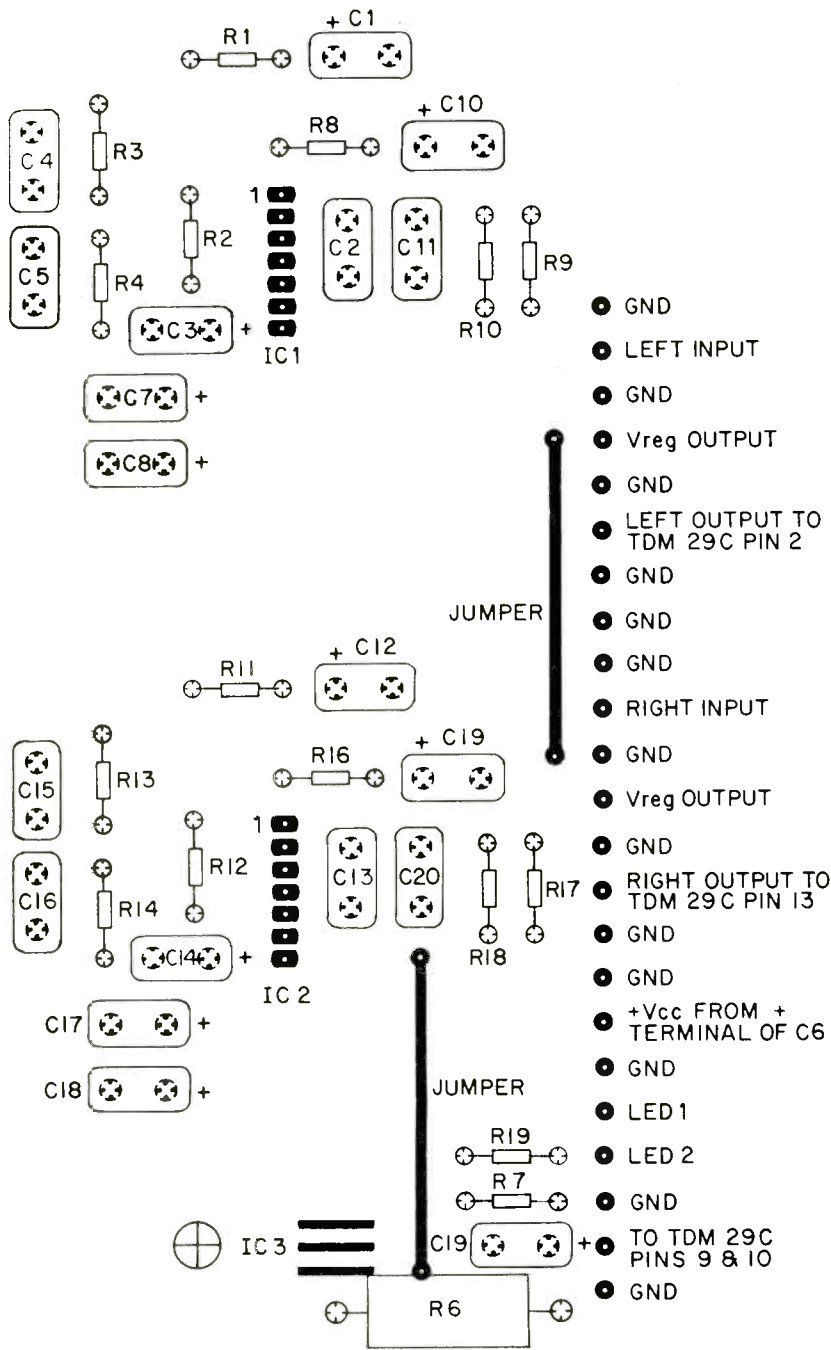


Fig. 2—Component mounting guide.

PA-1B, and connect the left and right outputs of the card to a suitable amplifier. Play a stereo record and observe the frequency response. The signal at this point has RIAA turnover but not rolloff (for the high frequencies) since this will be supplied by the TDM-29C, as mentioned earlier. The sound should be excessively bright with full, firm bass. If this is not the case, check R 3, 4, 13, 14, C 4, 5, 15, and 16.

If all systems are "GO" at this point, make the connections between the PA-1B, TDM-29C, LEDs, separation adjust pots (R 5, R 15), input and output jacks, and switches (See Fig. 4). Some ventilation should be provided in your mounting cabinet since the power supply and ICs do generate a small amount of heat in operation, which should be dissipated, especially in constant-duty use. Some experimentation in positioning the transformer for minimum hum will be required. Normally, four to six inches of space between the board and the transformer will be necessary.

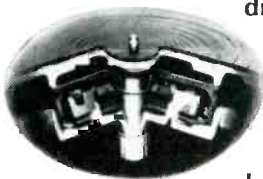
Once all the connections have been made, the DM-4 is ready for final test. Connect inputs and outputs of the demodulator, using a CD-4 capable cartridge and low capacity cables for the inputs. Turn the CD-4 separation adjust pots to the 10 o'clock position, switch the mode switch (S 2) to the 2-Ch. (closed) position and play a record. The sound should be clean and well balanced, since it now has full RIAA equalization. As before, if this is not the case, go back and check your wiring. Turn the CD-4 adjust pots fully counterclockwise. This should cause the volume of the sound to diminish and disappear. If this is not the case, e.g., the sound increases, you have reversed the leads on the end terminals of the pot. Play a CD-4 record with the CD-4 adjust pots fully counterclockwise and S2 in the 4-Ch. (open) position. This should cause the carrier acquisition lamp (LED 2) to glow and sound should come from all four speakers. You are now listening to the difference signals, which are the FM portion of the disc. Be sure your CD-4 cartridge is operating at the recommended tracking force and the anti-skate is set to the recommended value. If in doubt, remember this: as a rule a bit too much tracking force is better than too little. The quality of the difference signal output will vary depending upon the cartridge used, tracking force settings, alignment of the cartridge in the shell, and last, but not least, the condition of the disc you are playing. In

Your professional turntable cannot match the performance or reliability of this one.



The Technics SP-10 MK II.

Every professional needs the precision of the Technics direct-drive system. That's why radio stations use it. And discos abuse it. But every professional also needs abundant torque. And now you can have it. In the SP-10 MK II.



At $33\frac{1}{3}$ RPM, the SP-10 MK II will reach the exact playing speed within 0.25 of a second.

That's less than $\frac{1}{12}$ of a turn. While it comes to a dead stop in only 0.3 of a second. And you don't have to worry about subtle slowdowns because a tracking force of even 1,000 grams won't noticeably affect its speed.

You won't find any belts, gears or idlers in the SP-10 MK II. But you will find our lowest wow and flutter ever (0.025% WRMS). Inaudible rumble (-70dB DIN B). And a platter that spins at the exact speed ($33\frac{1}{3}$, 45 or 78 RPM) regardless of fluctuations in AC line voltage or frequency. The reason: A quartz-locked frequency generator DC servo motor.

And the SP-10 MK II is as reliable as it is precise. Even with its abundant torque, you can stop the platter with your hand. Because we designed it to take all the

punishment a professional can dish out. Even after years of continued use.

You'll also get all the refinements a professional needs. Like a quartz-locked stroboscope. Remote control. Electro-mechanical braking. A dynamically damped platter. And a separately housed power supply.

The SP-10 MK II. One component in the new Professional Series from Technics.

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Attention: Sid Silver,
Technical Service Specialist.

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 Have a Technics audio specialist call for an appointment.

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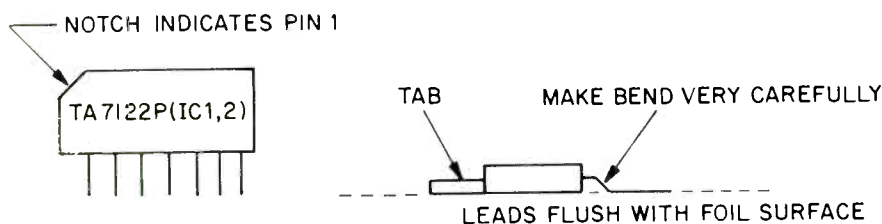


Fig. 3—Locating guide for IC 1, 2, left, and lead-bending diagram for IC 3, right.

general, the sound should be clear and clean, not unlike an FM broadcast. An important part of your assembly job is to dress the leads of both the input to the PA-1B and the output of the PA-1B to the TDM-29C to minimize crosstalk, which results in a "dirty" sound from the difference signals known to CD-4 engineers at Type II distortion. This is not unlike multipath in its cause and effects. Radiation of the carrier from one channel to the other, which is especially serious after preamplification, is the major cause of

Type II distortion. The design of the PA-1B, with its large ground plane and well-spaced inputs and outputs, helps minimize this problem, and adjusting your lead placement to have maximum separation of left and right channel signal cables should eliminate it. If the carrier acquisition lamp does not glow, check to see whether pin 11 of the TDM-29C is open. If it is, then check for high frequency signals shunting to ground in the connecting cables. Sometimes a capacitance in the cables will allow the low frequen-

cy signals to pass while obliterating the carrier signals, especially if an internal cable break is present. At this point, if all is well, you can put the cover on your demodulator and you are ready for the final setup procedure.

Final Adjustment

Using a suitable adjustment record, such as the JVC 4DE-205, play the mid-band sweep signals (warble tone) and listen to the rear channel speaker for the left side. Rotate the left side CD-4 adjust pots to obtain minimum output from that channel. Repeat this procedure for the right side. Once you have adjusted this demodulator, readjustment is not necessary unless the cartridge or stylus is replaced. There is no provision for carrier level adjustment since this is taken care of automatically by the demodulator.

A Special Hang-on CD-4 High Blend

There have been many advances in CD-4 technology since its inception, but many of the earlier recordings, by now quite worn, will produce noise which is difficult to eliminate, even

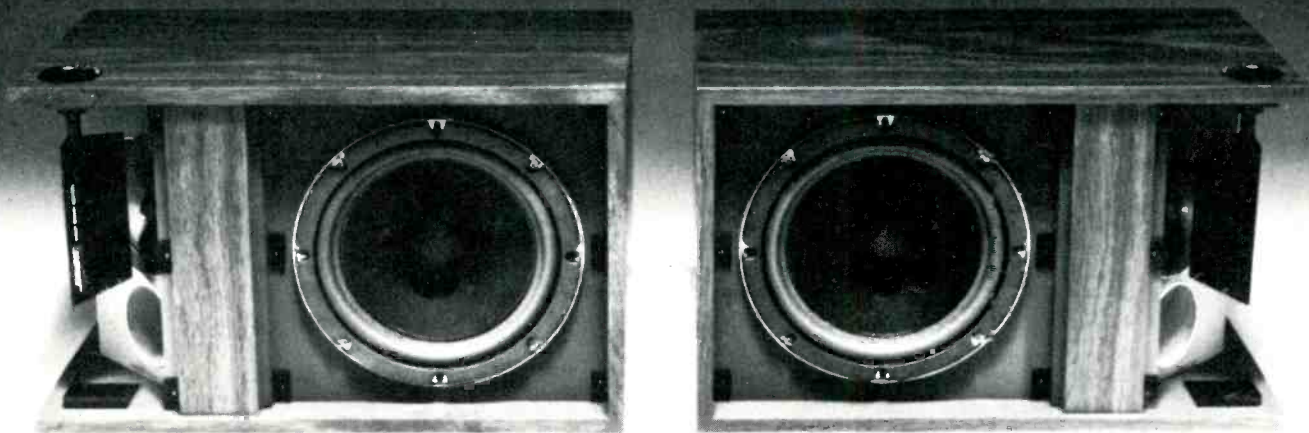
Table 1

TA7122P NORMAL VOLTAGES			
PIN	VOLTAGE		
1	1.8	4, 15	0.033μf 5% Mylar
2	0.5	5, 16	47pf 5% Mylar
3	0.02	6	1000μf 50V Electrolytic
4	0.0	7, 8,	10μf 25V Electrolytic
5	0.6	17, 18	
6	12.0	10, 19	47μf 25V Electrolytic
7	24.0	11, 20	5pf 5% Mylar
		21, 22	0.033μf 5% Mylar
			(for optional high blend ckt.)
PARTS LIST/DM-4 DEMODULATOR RESISTORS			
R 1, 11	1K	5%	1/4W
2, 12	120K	5%	1/4W
3, 13	68K	5%	1/4W
4, 14	10K	5%	1/4W
5, 15	10K	Screwdriver-Adjust Miniature Potentiometers	
6	150	10%	2W
7, 19	1800	5%	1/4W
8, 16	100K	5%	1/4W
9, 17	220K	5%	1/4W
10, 18	15K	5%	1/4W
CAPACITORS			
C 1, 12	2μf	25V	Electrolytic
2, 13	330pf	5%	Mylar
3, 9,	100μf	25V	Electrolytic
14			
LED 1, 2	Light Emitting Diodes 1.6V @ 20 mA.		
D1-4	200PIV 2 Amp Rectifier Diodes.		
IC 1, 2	Toshiba TA7122P-B or GTE/Sylvania ECG 1085.		
IC 3	National Semiconductor LM 340T-24.		
T1	Transformer 25.2 V secondary (for power supply)		
TDM 29C	Radio Shack #273-1386. JVC CD-4 Demodulator Card.		
S 1, 2 #	SP, one for power, one for carrier.		
S3	DP, DT for blend.		
	Six jacks, 2 input & 4 output		

Hookup wire, 24-AWG solid & small gauge shielded for signal interconnect.
Fuse & holder, 1-Amp standard.
Power cord and strain relief grommet.
Suitable case.

The TDM-29C is available from JVC America, Inc., CD-4 Information Center, 58-75 Queens Midtown Expressway, Maspeth, NY 11378. Price is \$35.00 postpaid. New York City residents, please add 8 per cent tax. A kit consisting of a pre-etched, drilled PA-1B card, the three ICs, and a CD-4 demodulator adjustment record is available from: Applied Research Engineering Assoc., P.O. Box 12 Station A, Flushing, NY 11358. Price: \$35.00. The PA-1B card is also available alone at \$15.00. (N.Y. state residents please add applicable tax.) Technical assistance is available from the author through Applied Research Engineering Assoc. at the above address. In your letter, please be specific about the problem, noting the turntable and phono cartridge, and include a stamped, self-addressed envelope.

Odd Couple.



This is a pair of Bose Model 301 Direct/Reflecting® bookshelf speakers with their grilles removed.

What's odd about them might not be immediately obvious, but it's very significant. Unlike most pairs of speakers, they're not identical. Instead, the left-hand speaker is a mirror image of the right-hand speaker.

Bose goes to the extra trouble and expense of making the two speakers of the pair you buy different to provide the proper proportion of reflected and direct sound at high frequencies, a feature unique among bookshelf speakers.

To accomplish this, each speaker is of an "asymmetrical"

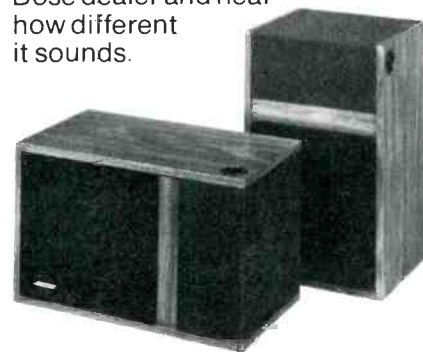
design. As a result, a pair of Model 301s has woofers pointing straight ahead and tweeters angled outward. A large proportion of the high frequency energy is reflected off the side walls and then into the center of the listening room, rather than being aimed directly at the listener. As in a live performance, the listener is surrounded with a balance of reflected and direct sound. This is the same principle used in the Bose 501 and in the legendary Bose 901® Direct/Reflecting speaker system. The result is extraordinarily open, natural, and spacious sound.

In addition, the Model 301 Dual Frequency Crossover™ network causes the woofer and tweeter to operate simultaneously for more than an octave, providing exceptionally smooth midrange response and an open spatial quality.

With the unique Direct Energy Control, the Model 301 provides excellent performance in a wide variety of rooms, including small apartments and dormitory rooms. And it is truly small enough to fit in a bookshelf.

These features make the Model 301 an unusual speaker with unusually fine performance. Its suggested retail price—less than \$100 per speaker—makes it an extraordinary value.

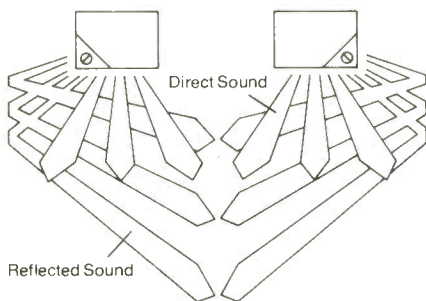
You already know the Model 301 looks different from other bookshelf speakers. Now visit a Bose dealer and hear how different it sounds.



BOSE®

**The Mountain
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Patents issued and pending.
For a full-color brochure on the Model 301, write:
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Mass. 01701.



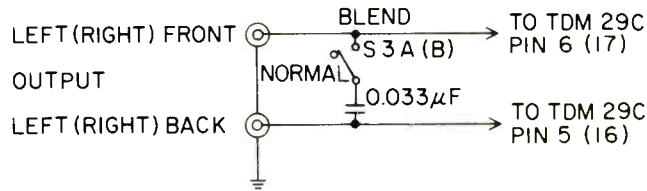


Fig. 5—CD-4 static high-blend circuit, parentheses indicates right-channel connections.

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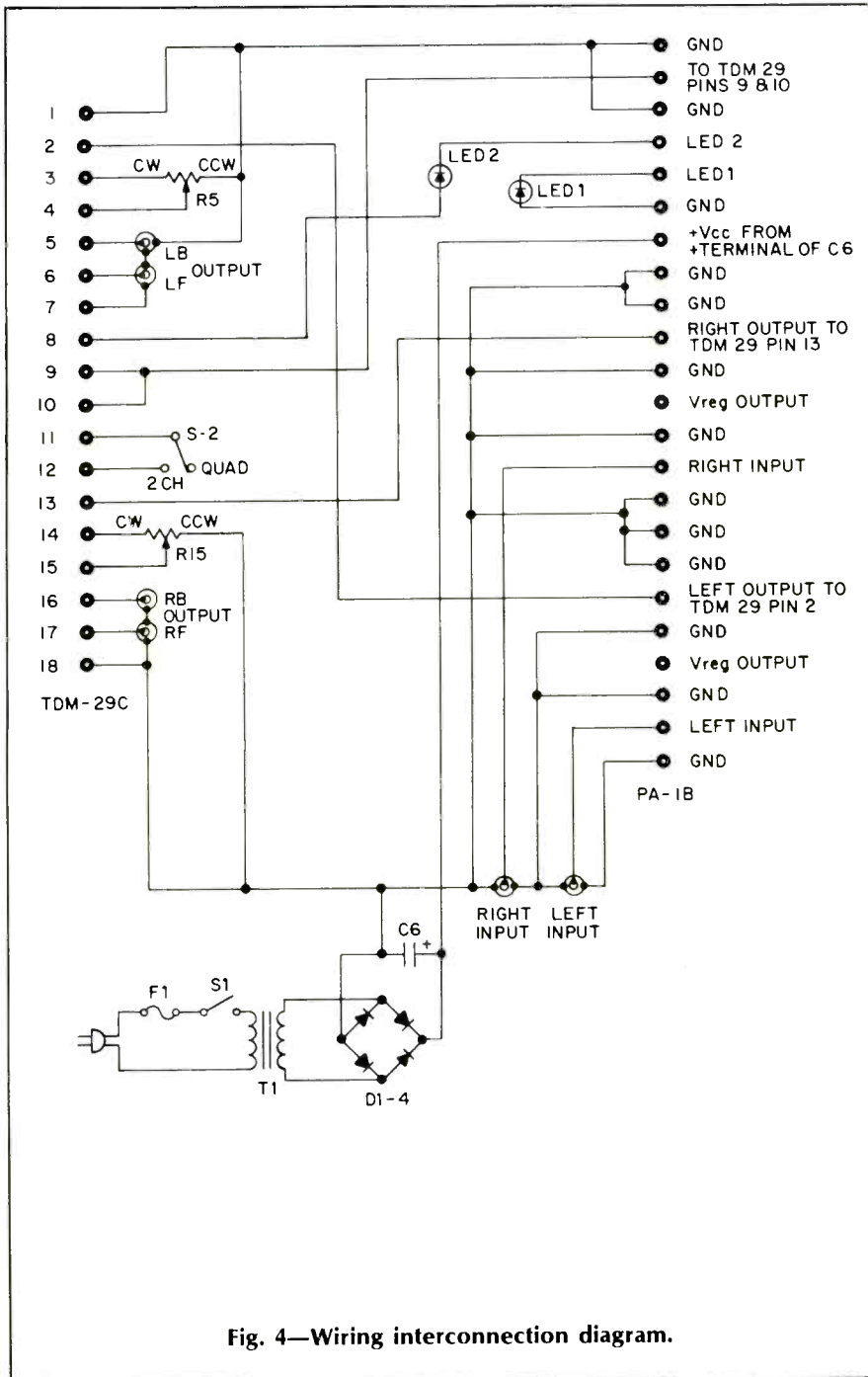


Fig. 4—Wiring interconnection diagram.

with the most sophisticated demodulator. Since most of this noise is attributable to the FM portion of the signal, blending the high end (or rolling off the carrier response at high frequencies) will tend to reduce high frequency noise. This is usually done by rolling off the difference-signal response before the sum-and-difference mixer. The design of the TDM 29C makes this difficult without extensive modification of the card. What this author has found to be a most effective method is shown in Fig. 5.

This circuit is applicable to the DM-4 and many other outboard CD-4 demodulators, depending largely on the phase linearity of their output amplifiers at high frequencies. Note also that the blending action works only on frequencies above about 4 kHz, resulting in a reduction of high-frequency separation. *Do not confuse this circuit with a high frequency filter.* This modification has no net effect on the amplitude of the high-frequency information, it only reduces its directionality. Low and midband separation is unaffected by this device. Use of the high blend is recommended only for noisy discs. During normal playback, disable the circuit using S 3.

In Conclusion

Four-channel sound is a dramatic improvement over conventional two-channel stereophonic sound. With the DM-4, you will hear CD-4 as it should be heard, and you'll probably never want to hear another two-channel record.

The printed circuit design and various refinements in the circuit, as well as continuing research on a dynamic high blend device for the DM-4, were done as part of Senior Course EE 299 at the Polytechnic Institute of New York. The author would like to thank Professor C. P. Rubenstein for his valuable advice and assistance.

From the company that's brought new thinking to speakers, come new speakers that think.

In a field where most of the leading brands have been established for decades, B-I-C VENTURI™ speaker systems have achieved eminence overnight.

In sales, where we are rapidly closing in on first place.

But, more importantly, in speaker technology.

At a time when most believed the technical frontiers had been thoroughly explored, B-I-C VENTURI speakers have been awarded two basic design patents in the space of six months.

#3,892,288 for the application of the 'venturi' principle to acoustics, which revolutionized bass reproduction.

And #3,930,561 for the BICONEX™ horn, which combined the virtues of conical and exponential flare rates.

The resulting gains in efficiency, bass response and dynamic range have established new performance/value criteria.

And, already, many long-time leaders in speaker design are attempting to follow our lead.

Thinking defined.

Now B-I-C VENTURI introduces two new high-efficiency speakers, that go on to do what no others have ever attempted.

They're called the Monitor Series.

And, by any definition, they're the first speakers that can think.

Both the Formula 5 and Formula 7 are equipped with electronic circuitry capable of taking measurements, displaying information, even initiating specific action.

For example, they can tell when your amplifier is 'clipping,' and signal you.

They can warn when they're being overloaded, and protect themselves.

They can automatically adjust their frequency response to match the aural response of the human ear.

And the Formula 7 can even let you see what you're hearing.

These unique abilities elevate the loudspeaker to a new role in the stereo system. That of a system monitor, which can literally help you hear better.

Get 'clipped' no more.

Until now, there has been no way for the user to accurately identify amplifier distortion due to clipping, or the precise point at which it occurred.

But the new B-I-C VENTURI Monitor Series speakers come with a test record

that lets you pinpoint the output level at which your amplifier begins to clip the peaks of the waveform.

Each speaker has a Clipping Indicator lamp, and a control that adjusts lamp sen-



sitivity to your amplifier's maximum 'clean' output.

Once matched to your amplifier, the indicator will stay lit when clipping occurs. Lowering your amplifier until the lamp just flickers will allow musical peaks to be perfectly reproduced.

What's more, this circuit can be used to indicate speaker overload in those few instances where an amplifier has a power rating *higher* than the Formula 5 or 7 it's being matched with.

And, if overloaded, the speakers protect themselves by shutting off power to the stressed component. Individual indicator lamps (left above) signal you, and can also help isolate the problem.

Improving on nature.

One of the curious facts in acoustics is that the ideal in musical reproduction has long been 'flat' response.

Curious, because only at very high levels can the human ear hear flat. As listening levels decrease, the ear quickly loses bass and treble tones.

That's why our exclusive Dynamic Tonal Balance Compensation circuit (patent pending) was developed.

The idea is to improve on nature.

And by automatically compensating for what the ear can't normally hear, today's B-I-C VENTURI speakers bring you music that's music to the ears.



A balanced performance.

The Formula 7 takes the monitor concept an interesting step further.

A bank of Sound Pressure Level Indicators light in sequence, as speaker output increases. This visual display covers the range from 75db (normal speech) to 117db (jet engine at 70 feet).

A reference chart on the display panel further interprets the information.

Interesting in themselves, the SPL readings can also help you fine-tune your system to room acoustics, and compensate for imbalanced output levels in amplifier and tuner channels, tape heads and phono cartridges.

Tomorrow's technology today.

Once again, B-I-C VENTURI has extended the limits previously envisioned for speaker design.

These two new Monitor Series speakers take speaker technology an innovative step into the future. They establish a new, and larger, role for the loudspeaker.

And we confidently predict that they presage the speakers of tomorrow.



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B-I-C VENTURI SPEAKER SYSTEMS
TOMORROW'S TECHNOLOGY TODAY

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Syndication of Quadraphonic Radio Programs

Martin Clifford

We all like to go to concerts and sit in the fifth row center, but it's too bad there are only a few seats which meet that requirement. Whether it's an opera, a classical concert, or a rock or jazz performance, some places in the house just plain sound better than others. Oddly, however, one of the best places for sound is your own living room.

Bringing live performances into your living room has been the desire of radio stations since their inception. AM radio began with one carbon microphone placed in front of a singer or an orchestra, and sound was carried back to the radio station and on to the transmitter by a single telephone line, which had a frequency re-

sponse to about 5 kHz. In the 1920s and 30s this was an enormous step forward. With the proliferation of FM broadcast in the 60s, this one microphone and one telephone line system was dramatically improved, and the FM transmission medium with a 15-kHz bandwidth was a giant step ahead of AM in quality. Next came FM stereo with two or more microphones, two telephone lines, and a stereophonic transmission system which works magnificently. And now in the 70s we are going back to *live* radio, but now with quadraphonic sound.

Experiments in listening have shown that in order to create a truly lifelike sound field, more than two speakers are required in the playback area. What the optimum number is

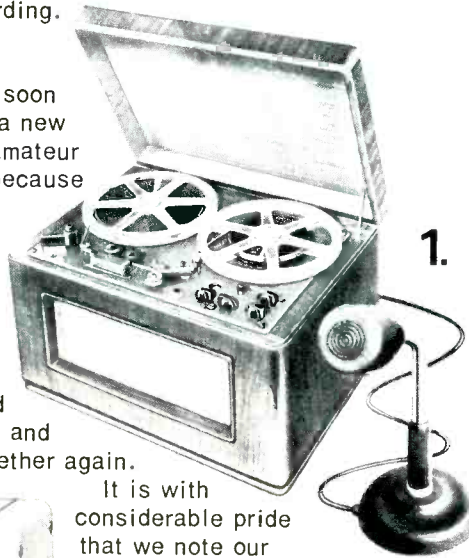
has yet to be agreed upon, but four seems to do a very meaningful job of reproducing the original sound. How then do today's live concerts get into your home? The ultimate experience, of course, is to receive these live programs in your living room at exactly the same time they are being performed on stage. The first step towards achieving this is to get a network of FM stations across the United States. A major step forward came when the Lincoln Center for the Performing Arts set up a network of FM and TV stations to simulcast live performances from the Center. The audio channels in this case were carried, in part, by two wideband satellite FM stations, yielding a signal-to-noise ratio in the transmission from New York to Los Angeles of almost 70 dB. Cer-

Our Contribution to the Realization of High Quality Music Reproduction in the Home over the Past 25 Years.

Our company was founded at the time of rapid developments in the field of magnetic tape recording.

During this period there were few machines available, but they revolutionized professional sound recording.

This advancing technology soon introduced a new era to the amateur recordist, because it was now possible to record sound on a reusable storage medium, which could even be cut and spliced together again.



1.

It is with considerable pride that we note our participation in these developments right from the very beginning.



2.

As long ago as 1954, our recorders were already equipped with the professional

three motor drive system.

What is it that makes REVOX recorders so successful?

The answer to this question must take into account the changes which have occurred in the consumer since the early days of recording.

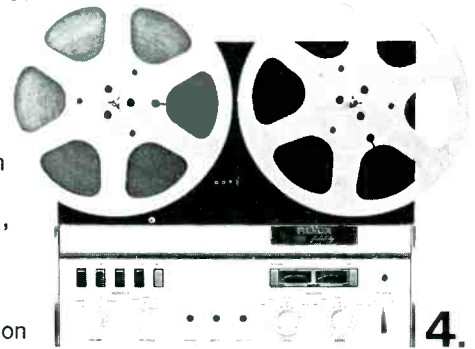
Today's audiophiles have an increasing awareness of true quality, and only a first-class product has a chance of being accepted by the serious recording enthusiast.



3.

The fact that REVOX tape recorders are in constant demand in such an increasingly quality-minded market is indicative of their high standard of construction and performance, but it also reflects the increasing sophistication of the serious audiophile, whose requirements can only be met by a small number of select products.

Our involvement in the design and production of professional equipment has led us to think in terms only of professional standards, even for our consumer products. This approach produces far-reaching effects; the performance of REVOX recorders with regard to durability, mechanical and electrical stability, and closely-held specification tolerances, will stand comparison with professional equipment, and this is our main contribution to the realization of true high fidelity sound reproduction in the home.



4.



5.

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Does your equipment meet the high standards you require?

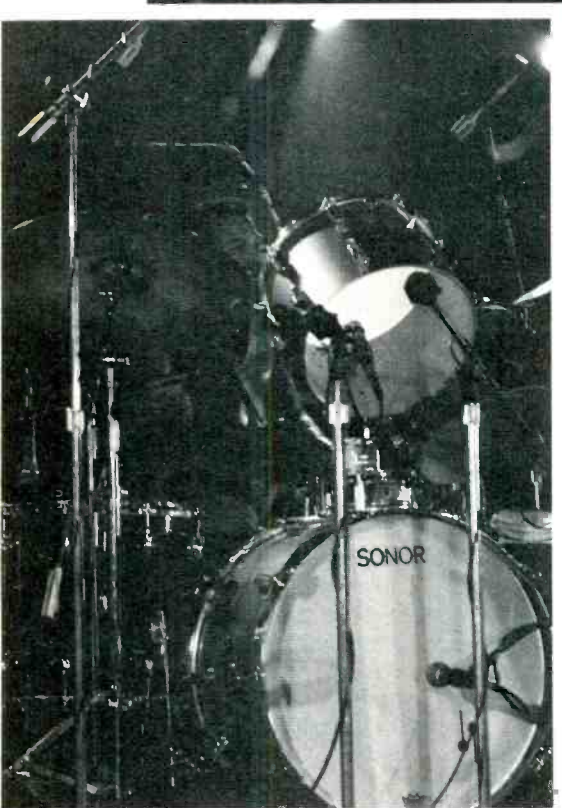
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2. REVOX A36 (1954)
3. REVOX D36 (1960)
4. REVOX A77 MK I (1967)
5. REVOX A700 (1973)
6. REVOX A77 MK IV (1975)

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out Eng and, Scotland, Ireland and Wales.

Syndication

The United States, in general, has been somewhat behind Europe in network stereo transmission development, although many experiments are currently going on over existing television coaxial lines. Certainly such a system is possible, and if enough audience pressure is put upon the networks for live programming in real-time, it will become a reality. Again, once you have established a network for the two-channel transmission system, you can also have four-channel broadcasts.

With AM stereo on the horizon, the increase in pressure for stereophonic and quadrasonic programming will not only come from the FM stations, but also from AM broadcasters. This may be the catalyst to bring these live quadrasonic shows to living room reality within the next few years.

A couple of good examples of live tape syndication are the Boston Symphony Orchestra recorded at Tanglewood, Mass., and the Agora Jazz Show recorded at the Agora Ballroom in Cleveland, Ohio. The contrast in production and miking techniques for the two programs bring out a lot of the "how to" in four-channel recording.

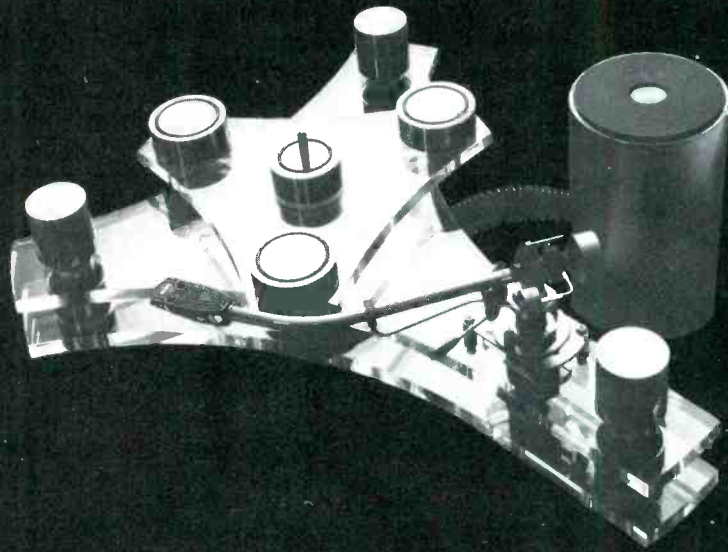
The Boston Symphony production is handled by Richard Kaye of WCRB

in Boston, who is Manager of the Boston Symphony Transcription Trust. The Orchestra, which has been syndicated for over six years, is carried by 130 radio stations both here and abroad, including Canada, Mexico, Britain, and Australia. The control room at the shed in Tanglewood contains mixing, encoding, and recording equipment specifically designed for four-channel production. The console takes up to 12 microphones and mixes down to four master buses. The outputs of these buses are passed through the four-channel encoder and are then recorded on an Ampex AG-440 two-track machine. Since the productions are QS quadrasonically encoded, only a two-channel recording medium is required. In addition, a four-track, half-inch Tascam recorder is used to make the master four-channel tape. Revox and Otari two-track machines record back-up copies.

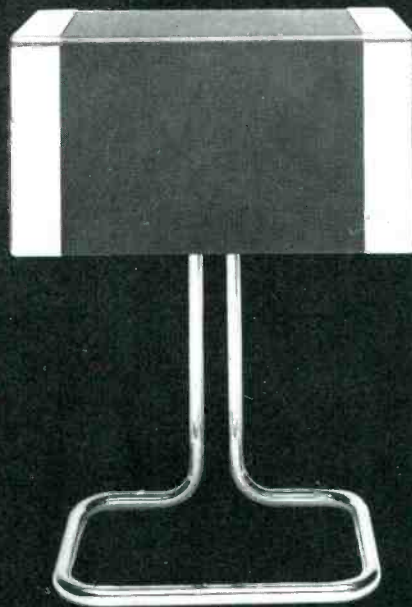
Recording Methods

When recording classical music, a minimum of gimmickry in four-channel technique is desirable. According to Mr. Kaye, "We really record the orchestra using basically four microphones. The four are all non-directional Neuman KM-73s. The front mikes are placed on either side of the stage, and the two rear mikes, which pick up the ambience, are placed higher than the front mikes, basically in a trapezoid arrangement. Occa-

tainly this was the right direction for getting live, real-time, high-quality high fidelity into the living room. With this two-channel transmission facility established, matrix four-channel experiments to yield real-time, four-channel programming were established. The British Broadcasting Corporation, for example, has a stereo distribution system for their VHF service throughout the United Kingdom. This uses an analog-to-digital technique and is carried along the BBC video network lines and dropped off at each FM station. It is therefore possible, and in fact happens, that when BBC broadcasts a live stereo and quadrasonic transmission from Royal Albert Hall in London, it is received in real-time in living rooms through-



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In addition, a unique cabinet material with a high density fibrous core dramatically reduces cabinet resonances.

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sionally, we use a fifth mike for the woodwind section or for a solo, but we never use any solo mikes on the pianos. We don't use any artificial reverb or time delay, but rely on the natural sounds to give us life-like production. In other words, we deliver the *natural* hall sound exactly as you would hear it if you were sitting in the fifth row, center."

When recording and encoding a jazz show such as "Live at the Agora," which runs on over 40 stations in the United States, producer Denny Martin feels that more latitude can be taken in a four-channel mix. The Agora Club is located beneath Agency Recording Studios, which is a 16-track studio facility. A full compliment of 20 or more mikes, both directional and non-directional, appear on the stage, and their output is mixed down for the 16-track Ampex which produces the master tape. The recording tracks not only include close miked instrumentals and vocals, but there are also ambience mikes hung about the room to get crowd noise for the live sound. In the mixing process, a lot of quadraphonic panning and placement takes place. Says Martin, "With musicians such as Mike Urbaniak, we can take a lot of liberties in placing parts of the band on the side walls and even behind. We use four quadraphonic pan pots in the mix, and sometimes make things move all around the audience, while at other times we even have various sounds moving in different directions at the same time to create very interesting effects."

Quadraphonic Mix

"We mix the 16-tracks down through the QS encoder and make a two-channel running master. From there, we carefully duplicate on Scotch 207 and send it out to stations carrying the show. The comments we have gotten," says Denny Martin, "are coming from stations all over the country. Many of them comment that this is one of the most live sounding concerts they have ever heard and the living room experience seems to be even better than the live experience."

Radio stations and listeners both appear anxious to get more quadraphonic programming on the air. Shows in QS and SQ such as: "King Biscuit Flower Hour," "Live from the BBC," "The Chicago Symphony," "The Boston Pops," "Rock Around the World," in addition to local four-channel productions by individual stations, continue to give the four-channel listener lots of live listening for his living room. A

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Any critic who wants to do a completely fair and impartial test of a tape recorder is very fussy about the tape he uses.

Because a flawed tape can lead to some very misleading results.

A tape that can't cover the full audio spectrum can keep a recorder from ever reaching its full potential.

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A tape that doesn't have a wide enough bias latitude can make you question the bias settings.

And a tape that doesn't sound consistently the same, from end to end, from tape to tape, can make you question the stability of the electronics.

If a cassette or 8-track jams, it can suggest some nasty, but erroneous comments about the drive mechanism.

And if a cassette or 8-track introduces wow and flutter, it's apt to produce some test results that anyone can argue with.

Fortunately, we test every inch of every Maxell cassette, 8-track and reel-to-reel tape to make sure



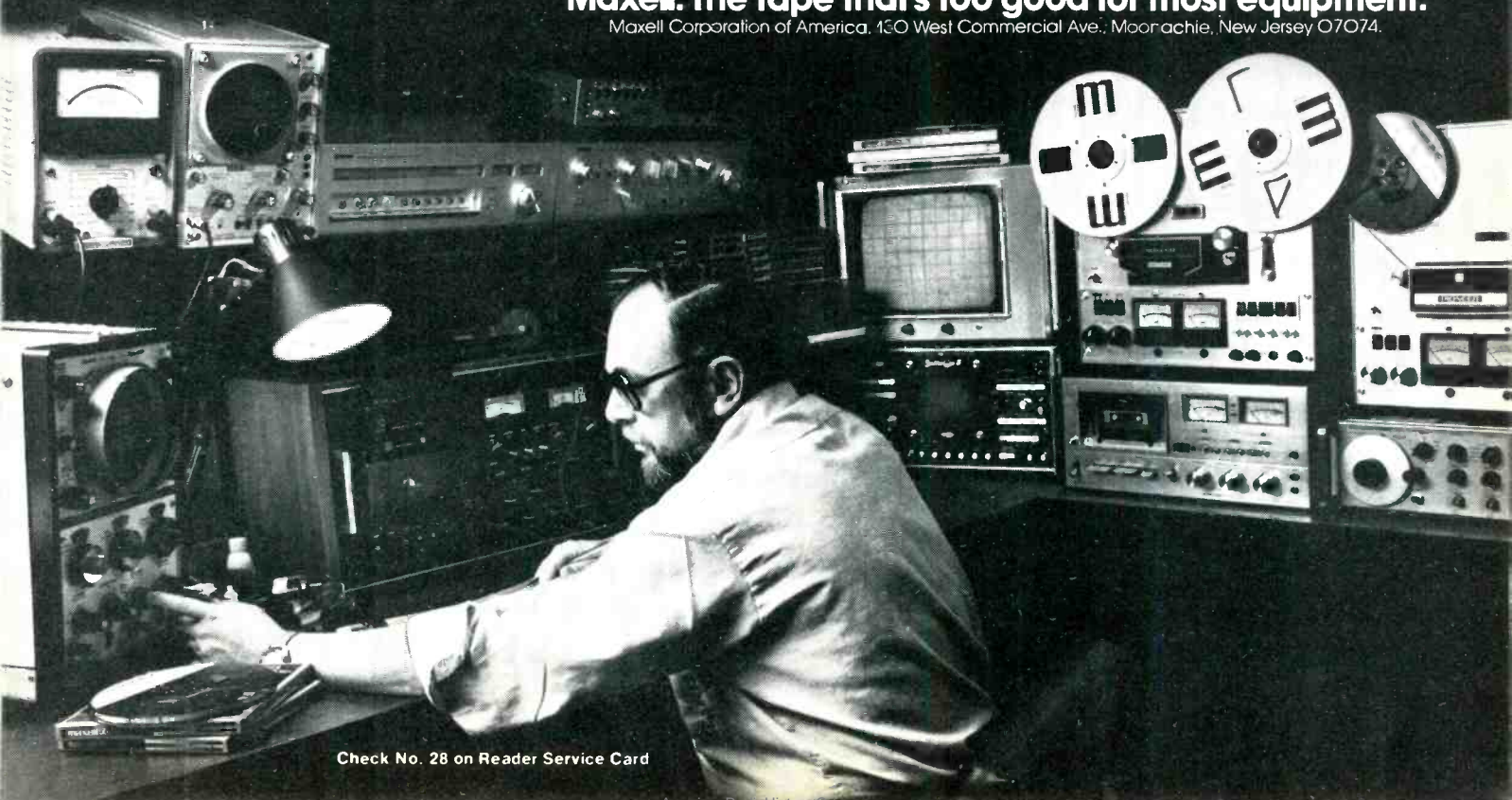
they don't have the problems that plague other tapes.

So it's not surprising that most critics end up with our tape in their tape recorders.

It's one way to guarantee the equipment will get a fair hearing.

Maxell. The tape that's too good for most equipment.

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Equipment profiles

Sonab Model C-500 Cassette Deck

MANUFACTURER'S SPECIFICATIONS

Motor: D.C. servo.

Wow & Flutter: Less than 0.13 per cent weighted peak.

Tape: Standard and CrO₂

Frequency Response: 30-15,000 Hz ± 3 dB standard tape; and 30-16,000 Hz ± 3 dB with CrO₂.

Signal/Noise Ratio: 51 dB and 58 dB with Dolby, chrome 53 dB, with Dolby 60 dB.

Meters: Quasi-peak indicating.

Power: 100 to 240 Volts a.c.

Dimensions: 15 in. (38.1 cm) L x 10 in. (25.4 cm) D x 4 1/4 in. (10.8 cm) H.

Weight: 10 lbs. (4.5 kg).

Price: \$399.00.



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Sonab is a Swedish company known in Europe and more recently in America as the producer of a kind of multi-directional loudspeaker designed by Stig Carlsson. A year or so ago, they decided to add other audio components to their line, and the Model C-500 is one of the first to appear. Although it is made in Japan, the styling shows a certain Scandinavian influence in the unusual layout and black finish only relieved by the white lettering. Styling is very much a matter of personal taste, and some will find the clean lines attractive, while others may prefer a more usual approach. As the French say—*chacun a son goût*....

Now for a look at the controls. A striking feature of the C-500 are the two VU meters located near the rear of the machine. Instead of the usual rectangular shape, they are nearly semi-circular, and while they are quite attractive looking, I feel that function has to some extent been sacri-

ficed to form. In front of the meters are three input and output controls set in small subpanels. The middle control is for a center microphone, and the outside pair control both channels using ingenious dual bar-type knobs. The output control affects only the signal at the headphone jack—which is quite logical enough, as there is a preset control at the rear for the main output.

In front of the three levels controls are push-button switches for CrO₂, Dolby noise reduction, and power on/off, with green lights just above to indicate these functions and a red light for Record located in between the meters. On the left-hand side, at the front, is a row of function switches for Record, Rewind, Stop-Eject, Playback, Fast Wind, and Pause. A digital counter and its associated Memory switch are located just behind the cassette compartment. A headphone and the three microphone jacks are

Fig. 1—Response from a standard 40 Hz to 10 kHz test tape.

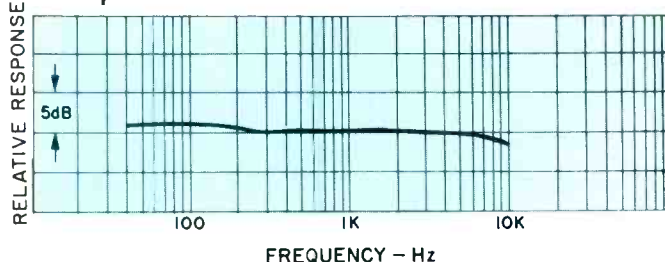
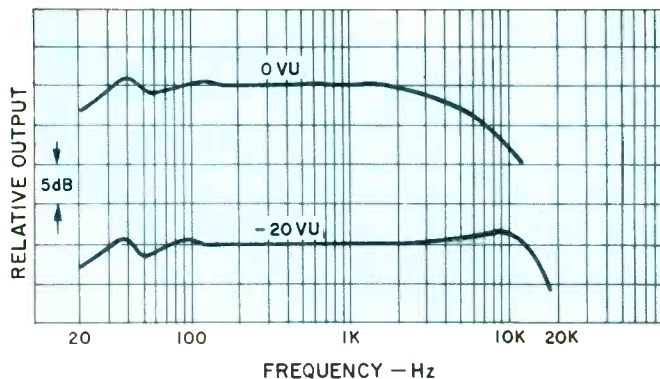


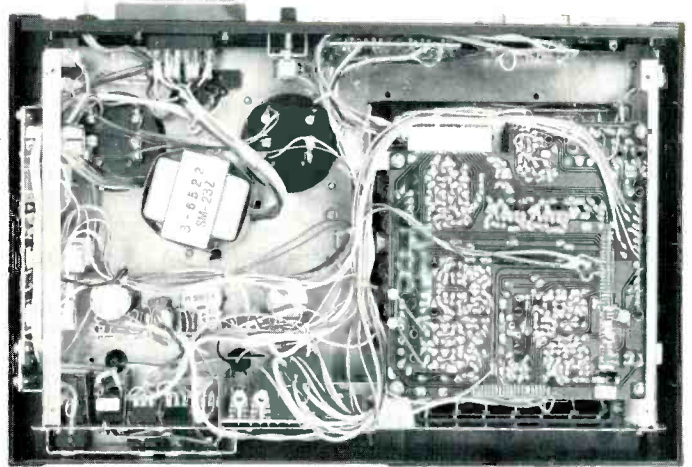
Fig. 2—Record-replay response using the Maxell UD tape.



on the vertical front panel; the other input and output sockets are at the rear with two record calibration controls and the four record calibration controls along with the previously mentioned output control. A DIN-type socket, a covered voltage selector, and a grounding screw complete the rear panel. This voltage selector is a rather ingenious item. It has four separate steps, from 100 to 240 Volts, with the individual voltage selection accomplished by inserting the bus so that an arrow printed on its points to the desired voltage. The C-500's motor is a d.c. servo type, notable for extremely low wow and flutter. Such motors are, in fact, now becoming a standard item on the more expensive decks.

Measurements

The first test, as usual, was for playback response using a standard 40 Hz to 10 kHz test tape with the results shown in Fig. 1. Next, the record-replay frequency response was measured at 0 VU and at -20 VU with Maxell UD tape. As can be seen in Fig. 2, the high frequency -3 dB point was just over 16 kHz. Changing over the TDK KROM tape produced very similar results with the -3 dB point just a hair above that achieved with the Maxwell tape. Distortion versus level at 1 kHz is shown in Fig. 3, and distortion versus frequency is given in Fig. 4. It should be noted that the 0 VU calibration on the meter is some 4.5 dB below the Dolby level which can cause some difficulties in recording Dolby FM transmissions, although it gives an apparent increase in headroom. The measured signal-to-noise ratio, referred to three per cent distortion, "A" weighting, came out at 56 dB for the UD tape and was 66 dB using the Dolby system. The TDK KROM was almost as good at 54.5 and 64.5 dB respectively. The noise level increased by 8.5 dB with the microphone input control at maximum, but it is rather unlikely that such a low sensitivity microphone would be used to make this control position necessary; a more realistic figure would be 3 or 4 dB. Input signal for 0 VU was 60 mV for the line input and 180 mi-

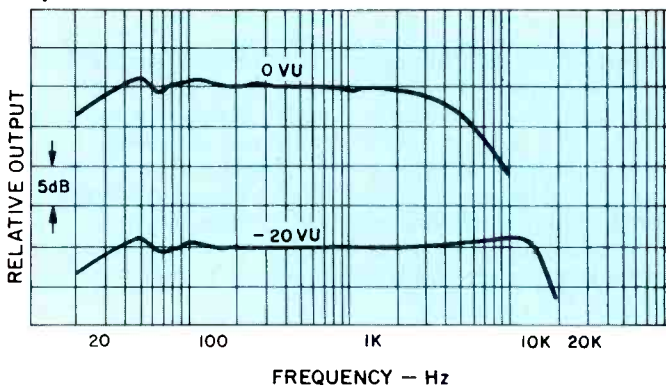


Interior



Back

Fig. 3 — Record-replay response with the TDK KROM tape.



crovolts for mike. Output under these conditions was 890 mV. Wow and flutter was 0.08 per cent (DIN), which is considerably better than the specified 0.13 per cent.

Dolby tracking was well within 1 1/2 dB, and so the actual response is not shown. Finally, fast rewind time was 75 seconds for a C-60. I have never thought this was a particularly important parameter, since good tape handling seems more important and conflicts somewhat with high speed, but if I miss it out, we are sure to get some querulous letters. So there it is, 75 seconds.

In-Use Tests

Some very satisfactory tapes were made, both from FM transmissions and from records. As might be expected, it was found possible to drive the VU meters further into the "red" than is usual with a cassette machine, but obviously some experimenting should be done to get optimum results. Characteristics of the meters are almost peak-reading, and their calibration extends from -20 to +3 dB. The controls all handled very nicely, being quite smooth in use, and the input and output bar controls use a slipping clutch arrangement, thus allowing each channel to be adjusted independently or in tandem—a nice feature. Provision for a cen-

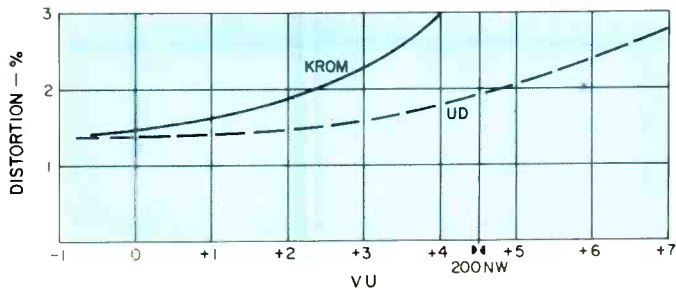


Fig. 4—Distortion at 1 kHz. Note that full scale deflection is ± 3 dB.

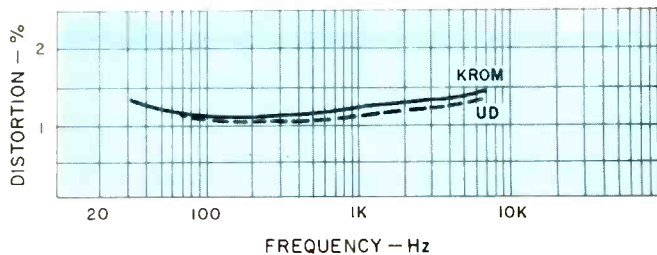


Fig. 5—Distortion versus frequency.

ter microphone is another refinement not found on all decks in this price range, and headphone users will appreciate the high output (2.5 Volts) and convenience of the separate level controls. Mechanical noise is very, very low, and with a little patience, it is possible to inch the tape past the head for cueing.

The instruction manual is written in Swedish, French, German, Dutch, and English, and is quite comprehensive and easy to follow. Little is said about adjusting the four record calibration controls; it is merely stated that the deck is factory adjusted for the tapes recommended.

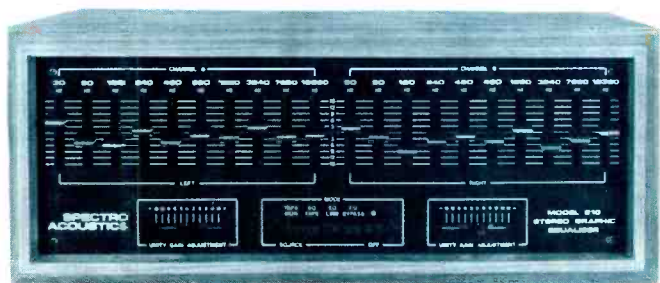
The *Stop-Eject* key must be pressed fairly gently, as with some others of this type, or otherwise the cassette will eject

itself, but I do not feel this is a strong criticism. I was bothered a bit more by the meters being set fairly deeply into the top of the machine, so that one needed to look down from nearly above them to get a really good look. One good way round this would be to mount the machine at about a 45 degree angle, being careful that the edge-stop on the shelf did not interfere with the mike and phone jacks on the front edge of the unit. Again, this is not a terribly serious thing, and I can find no real fault with the C-500. Indeed, I must hasten to point out that the overall performance parameters are well up to the high standards we expect today from the best quality cassette decks.

George W. Tillett

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54 Spectro-Acoustics Model 210 Graphic Equalizer



MANUFACTURER'S SPECIFICATIONS

Band Center Frequencies: 30 Hz, 60 Hz, 120 Hz, 240 Hz, 480 Hz, 960 Hz, 1920 Hz, 3840 Hz, 7680 Hz and 15,360 Hz.

Range per Band: ± 15 dB.

Filter "Q": 2.5 ± 10 per cent.

Gain Range Adjustment per Channel: ± 15 dB.

Frequency Response, Equalization In: 20 Hz to 20,000 Hz ± 0.25 dB.

THD: Less than 0.05 per cent at 1 Volt out, controls set flat. Less than 0.1 per cent with controls set in any position, with 2nd- and 3rd-harmonic controls set to same position as fundamental.

Equivalent Input Noise: $60 \mu\text{V}$, worst case settings; $15 \mu\text{V}$ all controls centered.

Output Voltage: Up to 10 Volts before clipping, except 5 Volts at 20 kHz.

Input Impedance: 50,000 Ohms.

Output Impedance: Less than 600 Ohms.

Dimensions: 17 in. (43.2 cm) H x 6 in. (15.2 cm) D x 6 1/2 in. (16.5 cm) D. Rack mount version, 210R, available.

Power Requirements: 110 to 130 Volts, 50/60 Hz, 14 Watts.

Shipping Weight: 12 lbs. (5.44 kg).

Suggested Retail Price: \$275.00, optional wood cabinet, \$40.00.

Readers of *Audio Magazine* need no introduction to the uses and usefulness of a good graphic equalizer installed in a component high-fidelity system. The extended tone-control flexibility of these multi-band devices has made them increasingly popular with serious audiophiles over the last few years. Differences between the models of one manufacturer and another consist primarily of the number of bands or segments into which the audio spectrum is divided and the variation in noise or distortion contributed by the added component. In the case of the Spectro Acoustics Model 210 Equalizer, that company seems to have done a good job on both those counts, and come up with a new circuit design wrinkle as well.

The Model 210 front panel has 10 separate octave-by-octave equalizer controls in the form of slide levers symmetrically positioned on the upper portion of the panel. Calibration marks in 3 dB increments provide a nominal indication to the user regarding the amount of attenuation or boost selected for each band. Since there is no physical detent or "click-stop" for these slide controls, it is necessary to look at the levers head-on in order to avoid parallax error when trying to set one or more controls to their "flat" positions.

Below each bank of slide controls is a horizontally moving *Unity Gain Adjustment* with a range of ± 15 dB. The purpose of this control is to restore equal overall audible loudness of

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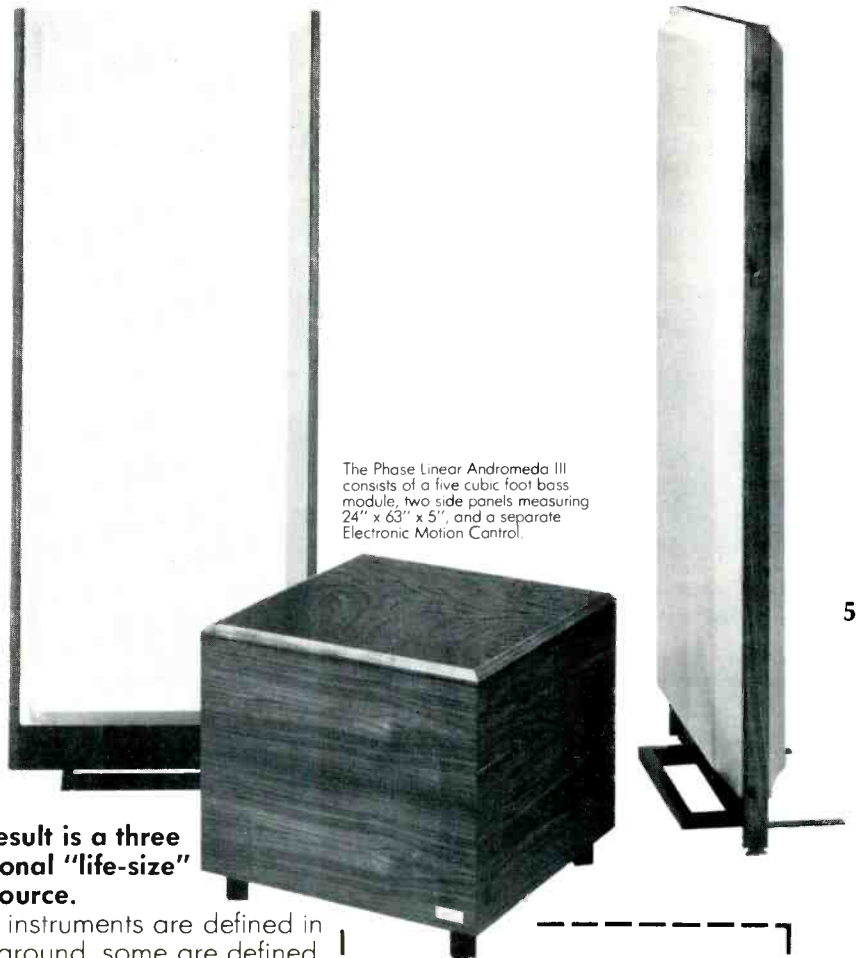
Our Goals And How We Achieved Them

Our goals in designing the Andromeda III included extended frequency response, low distortion, and full-impact transient response. Most of all, we wanted to capture the missing "third dimension" — that you-are-there element of space and depth which is present when music is performed.

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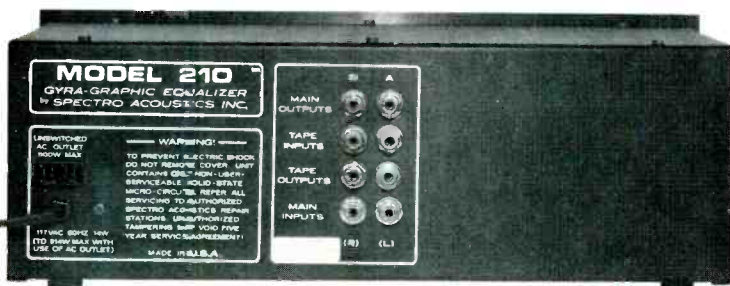
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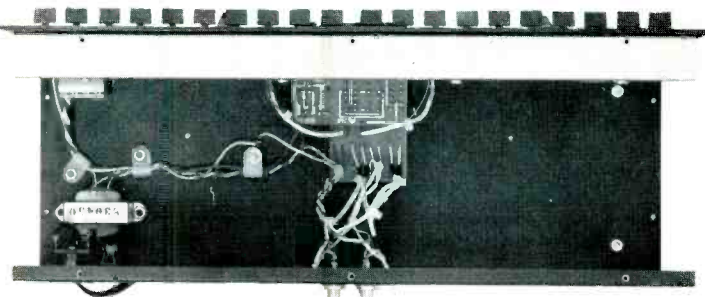
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equalized signals compared to the unequalized ones. So long as the octave controls are set to their center positions, these unity gain controls can be set to their mid-positions, but when several octave slides are either boosted or cut, the apparent overall loudness of reproduced music can vary considerably, making direct comparisons between equalized and unequalized signals difficult unless these gain controls are brought into play for altered overall levels. Other purposes of the gain controls are to prevent overload (as when all equalizer controls are set towards high boost values) and to maintain optimum signal-to-noise ratios regardless of octave control settings.

At the center of the bottom section of the panel are five push-button switches. The tape monitor switch introduces a tape-out/tape-in circuit to replace the one which may have been used to connect the 210 to your receiver or amplifier. If, in addition to depressing this button, the user also depressed the *Eq Tape* button alongside, it becomes possible to pre-equalize signals that are to be recorded. The next button, *Line Eq*, is for listening to equalized program materi-



56 Back view of the Spectro-Acoustics Model 210 Graphic Equalizer.



Interior view.

al while the fourth button bypasses the equalizer circuitry for instant comparison between equalized and unequalized material. The fifth button serves as a power on/off switch. A pilot LED indicator just above the power switch illuminates when power is turned on.

The rear panel of the Model 210 has pairs of main input jacks, output jacks, tape output and input jacks, plus a single convenience a.c. outlet. Internal construction of the 210 includes extensive shielding of all circuits that might be susceptible to hum pickup. Little was known about the circuitry of this equalizer, since no schematic diagram was provided with our test sample, but we did note a reference to Gyration synthesis employed in fabricating the tuning elements of each filter. We checked with the manufacturer and learned that they have cleverly used simple IC op-amps as single-pole "inductors" by connecting a series capacitor and resistor from high-impedance input to low-impedance output of the op-amp, thereby inverting the capacitive impedance of the capacitor so that it "looks" like an inductive impedance. The op-amp is not critical so long as it is used as a buffer with

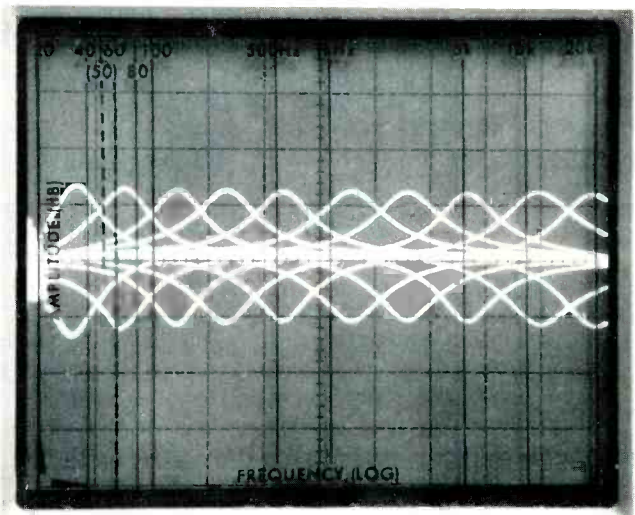


Fig. 1—Response range of each of the 10 octave controls (per channel) of the Spectro-Acoustics Equalizer.

unity gain. These synthesized "inductors" do away with the possibility of hum pickup and, of course, reduce costs that would result if conventional wound coils had been used.

Laboratory Measurements

Our first tests of the Model 210 consisted of boosting and cutting each of the 10 channel controls by its maximum amount and recording the change in response on our spectrum analyzer while sweeping successively from 20 Hz to 20 kHz. Results of all these superimposed sweeps are shown in the storage scope photograph of Fig. 1. Center frequencies are seen to be well within the 10 per cent accuracy specified by the manufacturer and, since the sweep is logarithmic and the controls are exactly one octave apart (nominally), spacing between successive peaks is virtually equal. Amount of boost or cut measured an average of around 13 dB, rather than the 15 dB claimed, but this is certainly more than enough for any practical equalization that one might attempt to perform on a home system and acoustic environment. (Editor's Note: The manufacturer says that their 15 dB boost or cut spec. is based on the combining effects of adjacent filters.)

Hum and noise measurements were conducted on an unweighted basis, with all components above 80 kHz sharply attenuated by the built-in filter of our Sound Technology distortion analyzer and metering system. With all octave controls set flat and gain controls set to their mid-positions, we measured -100 dB of hum and noise below an output reference of 1 volt for both channels.

Next, we measured what we thought would be a worst-condition case, all controls at maximum boost and gain controls set for maximum. Much to our surprise, the increased gain more than makes up for the increased hum and noise and, again referenced to 1 volt input, we measured a hum and noise level of -106 dB. The poorest S/N ratio was obtained with all controls set to maximum cut (this represents approximately 30 dB of signal loss through the 210, 15 dB because of the octave controls, another 15 dB because of the downward setting of the gain controls). S/N in this case measured -95 dB below 1 volt output.

Total harmonic distortion was measured with all controls set to their flat position. Under these conditions, THD measured for a rated output of 2.0 Volts was 0.0025 per cent at 20 Hz, 0.0022 per cent at 1 kHz, and 0.04 per cent at 20 kHz. Signal input was increased until a THD reading of 0.1 per cent was obtained. Output for this THD measured 11.5 Volts for



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If you thought you knew all there was to know about the sound of AR speakers, maybe you should pop over to your friendly neighborhood AR dealer and ask him to demonstrate the exciting AR-14. It's part of AR's new generation of acoustic suspension speakers that sets a new standard of accuracy to what other manufacturers' aspirations.

The AR-14 stands apart from the competition in three particulars you should know about. First, its new 10-inch woofer is mounted in the same size cabinet occupied by our larger, more expensive systems, so you get full accurate bass response right down to the lowest frequencies available in recorded music.

Second, its new 1-inch soft dome tweeter extends high frequency

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Third, AR has perfected an optimally damped second-order LCR crossover which matches the woofer and tweeter characteristics so precisely that a midrange driver isn't needed. This gives you professionally accepted AR accuracy and full frequency response at the substantially reduced cost of a two-way system. It's easy to get interested in a truly accurate loudspeaker for \$160; we suggest you visit your AR dealer for a demonstration of the new AR-14, using music with which you are intimately familiar. While you're there, ask to hear the same music played

through any other speakers in the showroom. We think you'll find the accurate sound of the AR-14 the one you want to live with.

- Please send specifications of the AR-14
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No more impedance peak. No more characteristic resonance. No more back-EMF problems. Your amplifier sees only a flat impedance curve; you hear bass energy of astonishing accuracy, life-like presence and power. At the same time, Infinity was developing...

Our Samarium Cobalt EMIT Line Source

Samarium Cobalt is the most magnetically powerful material in existence. We utilize it in our Electromagnetic Induction Tweeter — the magnetic analogue of the electrostatic (without any of its disadvantages) — in a 48" Line Source creating a fan-shaped cylindrical wave-front of high frequency energy.

You hear high frequency stereo imaging with an accuracy never before possible. Then we designed...

Our Midrange Line Source

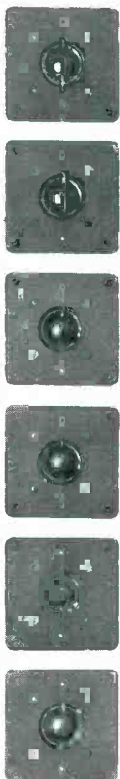
This usually treated grouping of six high-definition 1½" dome midrange drivers has been designed with careful attention to phase and acceleration capability, eliminating the problem of phase discrepancy.

And we added...

Our Midbass Coupler

This critical element in our acoustic design has a transmission-line configuration and is precisely phased to match the acceleration times and acoustic output between the Infinity-Watkins Woofer and our Midrange Line Source.

Approximately 50% of all musical fundamentals lie between 200 and 600 Hz, and we insist upon absolute accuracy in this critical musical range.



the Quantum Line Source

...will obsolete all existing speaker technologies.

Including our own.

Nothing like it has ever been heard. We believe this radical change in speaker designs — which “opens up” frequencies from 18Hz to 32 kHz (± 2 db) to previously unheard-of levels of power, cleanliness and depth — will change the course of audio history. Again. Certainly we’ve amplified our own thinking; you will now see elements of the Quantum Line Source incorporated in a new family of Infinity speakers.

By creating the world’s first Electro-magnetic Induction Tweeter; by utilizing it in a multiple configuration to produce a line source of high frequency energy; by introducing a radically new method of producing bass frequencies with no enclosure resonance peak and by configuring all drivers in a phase-coherent homogeneity, Infinity has created an instrument that stands at the limits of speaker technology — and stands alone.

No longer do you have to choose between the delicacy of music produced by a full-range electrostatic or the power of a large bass horn.

The QLS does it all. And more.

Listen to the opening of the first movement of the Horenstein Mahler 3rd (on Unicorn and Nonesuch).

It will leave you gasping. Its power and the clarity of its inner voices have never been heard like this. Or

Janice Ian; her presence and warmth becomes so real you could reach out and touch her. Or Fleetwood Mac; the sledgehammer impact and detail of low frequency content is absolutely staggering.

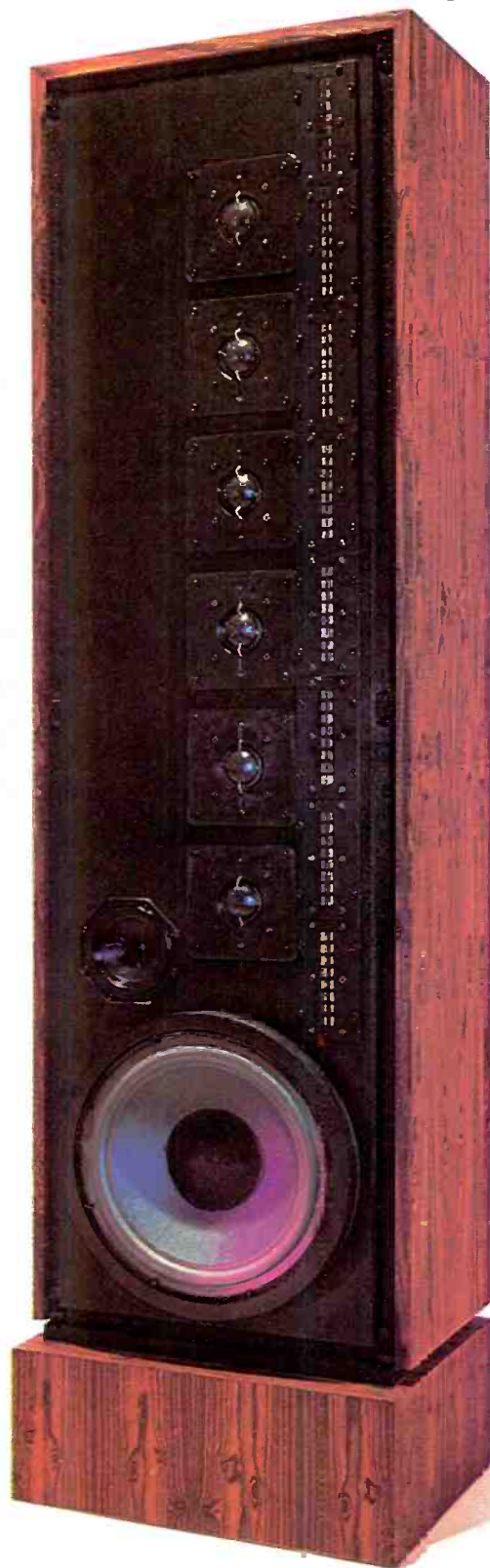
Suggested retail is \$1100 a side (15% extra in rosewood). A large price for perfection? But don’t let that deter you from asking for our Quantum Tech Paper which explains why and how we did what we did.

Most important: listen.

You might just agree with us that the Quantum Line Source is the state-of-the-art speaker.

 Infinity

We get you back to what it’s all about. Music.



frequencies up to 2 kHz, decreasing to 3.0 Volts at 20 kHz. The slight increase in THD at high frequencies is attributable to slew-rate limiting of the ICs used in the circuit, according to the manufacturer, and consists largely of third-harmonic contribution which would fall outside audible limits in any case. We attempted to measure IM distortion at a variety of levels from 5 Volts downward but found that our IM meter was reading the residual IM (around 0.002 per cent) of the signal source at all of these levels. Frequency response of the Model 210, with controls set flat, measured from 15 Hz to 30 kHz for the -1 dB roll-off points.

Listening and Use Tests

Besides the small difficulty encountered in setting the controls to their flat position "by eye," a user should find no problem in incorporating and using the Spectro-Acoustics Model 210 equalizer in any component high-fidelity system. The instruction booklet supplied with the unit goes into some detail regarding good equalization practice and cites the fact that desired curves may be achieved in a variety of ways. For example, a requirement of 6 dB of boost at the 960-Hz octave could be accomplished by boosting that single control the full 6 dB or leaving that control at "flat" and cutting all other controls by 6 dB. The makers suggest that users operate controls as near to "flat" as possible while obtaining the desired correction curve. We enthusiastically

endorse that philosophy—not because the Model 210 would audibly distort or add noise in extreme settings (we confirmed that it does not), but simply because over-equalization of an inadequately powered hi-fi system can easily cause distortion, clipping and overload elsewhere. Remember, a 10-dB boost at any octave means that an amplifier has to supply ten times the power it is delivering for other frequencies whenever that center frequency is encountered in program material. Few amplifiers can do this, especially if you are listening at nominal levels which make peak power demands on the amplifier (during musical transients) which are close to its power rating even without such added boosts.

We conducted several A-B tests of equalized and by-passed settings of the pushbutton switches with all equalizer controls set flat to see if we could detect any difference whatever between the "straight wire" condition (of having the equalizer out of the circuit) and the condition in which the unit is "in circuit." We could detect absolutely no difference in sound quality, distortion or residual noise when switching back and forth. That, and sufficient segmentation of the audio spectrum for meaningful equalization, is all one could ask of a consumer-type graphic equalizer—and Spectro Acoustics' Model 210 fills the bill on both counts.

Leonard Feldman

Check No. 61 on Reader Service Card

McIntosh Model C-28 Stereo Preamp

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MANUFACTURER'S SPECIFICATIONS

Frequency Response: 20 Hz to 20 kHz, +0 -0.5 dB.

THD: 0.1 per cent at rated output, 20 Hz to 20 kHz.

Input Sensitivity: Phono, 2.0 mV (adjustable); microphone 2.5 mV, high level, 250 mV; tape head, 2.0 mV.

Signal-to-Noise Ratio: Phono 1&2, 78 dB below 10 mV input; high level inputs, 90 dB below rated output.

Output Levels: Main, 2.5 V; tape, 0.25 V; headphone & line, 0.75 V into 8 Ohms or 2.5 V into 600-Ohm line; center channel, 1.25 V.

Tone Control Range: Bass, ± 20 dB at 20 Hz; treble, ± 18 at 20 kHz.

High Filter: 12 dB/octave slope above 7 kHz.



Low Filter: 12 dB/octave slope below 50 Hz.

Power Requirements: 120 V, 50&60 Hz, 45 W.

Dimensions: 16 in. (40.63 cm) W by

5-7/16 in. (13.8 cm) H by 13 in. (33 cm) D, behind panel.

Weight: 25 lbs. (11.34 kg.)

Suggested Retail Price: \$649.00.

Upon receiving this sample of McIntosh's popular C-28 preamplifier/control unit, our first reaction was that someone had mistakenly shipped us a power amplifier or an integrated amplifier, since we can recall no preamplifier unit we ever evaluated that weighed 37 pounds in its shipping carton, let alone 25 pounds even after extraction from a fully protected packaging arrangement which includes a separate inner carton, well isolated from the outer shipping carton. But, as thousands of McIntosh equipment owners probably know, ruggedness of chassis and construction is one of the things in which that company takes great pride. Some of that extra weight, to be sure, is accounted for by McIntosh's unique *Panloc* mounting design which eliminates the need for any shelf or bracket to support the C-28, for should you wish to custom mount it behind a cabinet panel, the hardware and brackets supplied will completely support the unit

in such mounting arrangements. The front panel of the C-28, pictured here, extends beyond the largest width and height dimensions of the chassis, so that panel cutouts need not be made with great precision. Controls are symmetrically positioned on the face of the black, heavy glass front panel, with separate *Bass* and *Treble* control knobs for left and right channels along the bottom left and right extremes of the panel, together with controls for master volume (including power on/off switch), mode selection (seven positions of mono and stereo reproduction capabilities including reverse stereo and combinations of mono that permit feeding one channel to both speakers, two channel signals to a single speaker or a mono L+R mix to both speakers), six position program selection, and a dual concentric balance and compensation switch control arrangement which selects flat response, loudness compensation or

Beauty in sound. By Fuji.

Every Fuji cassette means beauty and purity in sound. No hiss, no dropouts. Widest frequency response and dynamic range. Total reliability. Fuji high-fidelity cassettes such as the FX will give you the best performance possible on your tape recorder. Already widely recognized by experts as the finest cassette in the world. Fuji. The cassette of the pro.



FUJI

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TEAC A-2300SX

OUTPUT

OUTPUT L R

REC BIAS

225,287 people already know listening is only half the fun

A classic

TEAC's A-2300SX is the latest version of a classic. The most reliable tape deck ever made. As of April 1976, more than 225,287 have been purchased. And they have the lowest incidence of repair and maintenance of any deck on the market today.

What is it about the A-2300SX that makes its performance and acceptance so remarkable?

With one touch of the EQ and bias switch you adjust the machine to different types of recording tape. Less noise. Less hiss. Better response.

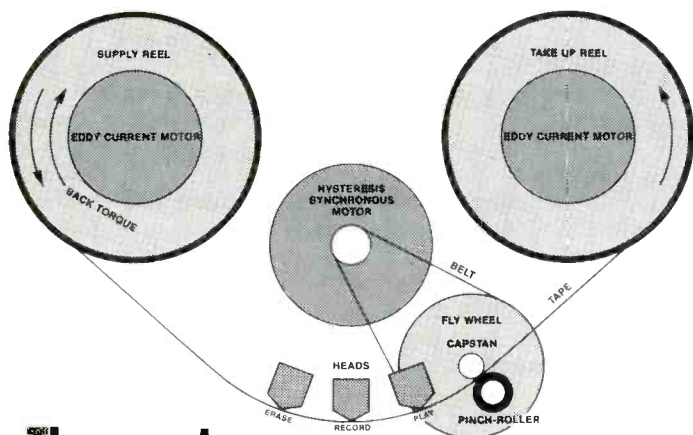
Three heads

Each of the three basic functions—erase, record and playback—is assigned to a separate head. Each head is designed to perform its specific assignment, and to keep performing, use after use.



These are some of the reasons so many TEAC tape recorders have been sold. Another reason is that so many people get tired of just listening to music.

Listening is fun, of course, but if you really want to enjoy your stereo system, try adding fun... try adding a TEAC A-2300SX. Just remember, you won't be alone.



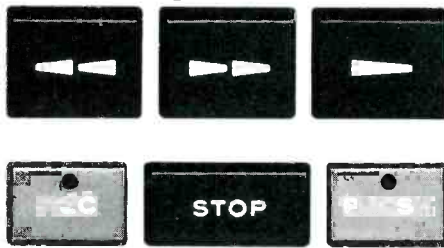
Three motors

The A-2300SX features TEAC's heavy-duty, 3-motor transport system. Each reel has a motor to assure proper tape tension at all times. A third motor drives the capstan and was designed to allow electrical, instead of mechanical, speed change. No gears. No idlers. Just dependable, smooth operation.

Fingertip control

With three motor transport you get the flexibility of touch button control. You can switch instantly from mode to mode—play, fast forward, rewind, pause and record.

With our new cue lever, editing is made easy. Instant starts. No bounce. No click.

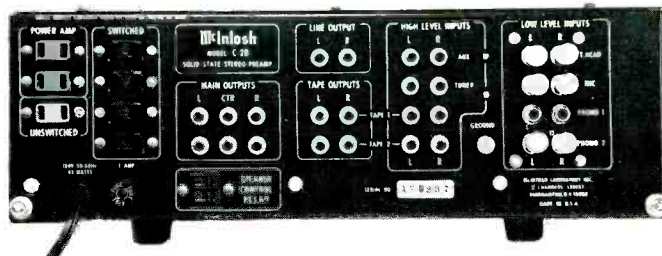


TEAC®

The leader. Always has been.

TEAC Corporation of America, 7733 Telegraph Road, Montebello, CA. 90640 ©TEAC 1976
In Canada TEAC is distributed by White Electronic Development Corporation (1966) Ltd.

"presence" mid-frequency emphasis. One input facility of the C-28 we have not encountered in some time is a *Tape Head* input which not only permits direct connection of tape playback to the pre-amp, but provides equalization as well. While we know of no tape transport systems currently sold for consumer use which are not equipped with their own preamplifier electronics (such tape playback devices were sold some years ago), this extra input facility does not impose significant penalties on the end price of the C-28, since the low-level preamplifier circuits used for phono



the pushbutton row are tape input and output jacks which parallel the rear panel *Tape 2* connections (and disconnect them if front panel jacks are used) and a headphone jack for connection of stereo phones powered by the built-in headphone & line amplifier of the C-28.

The rear panel of the C-28 has no less than seven a.c. convenience receptacles, two of which are specifically intended for power amp line cord connections, with one of the remaining five an unswitched receptacle for turntable system connection. Two pairs of main and center channel output jacks are positioned above a four-contact receptacle labelled "speaker remote control" which accepts a plug from an aforementioned speaker switching accessory. Line outputs, tape outputs and high level inputs come next, with all low level input jacks positioned at the extreme right of the rear panel, far removed from the a.c. line receptacles, line cord, and line fuse at the left. A ground terminal completes the rear panel layout.

Additional controls are positioned atop the chassis, as can be seen in the overall chassis view. These secondary controls include low-frequency trim controls, phono 1 and 2 input level controls, output level controls, headphone level controls, and a power switch which controls the rear a.c. receptacles specifically designated for connection of your power amplifiers. By means of this switch, power amps can be turned off during headphone listening, for example. As we soon learned, these extra controls provide a refinement of control that is rarely found in pre-amplifier/control units these days, and their designation as "secondary" controls fails to reflect their importance in helping to match up all elements of a good high fidelity component system.

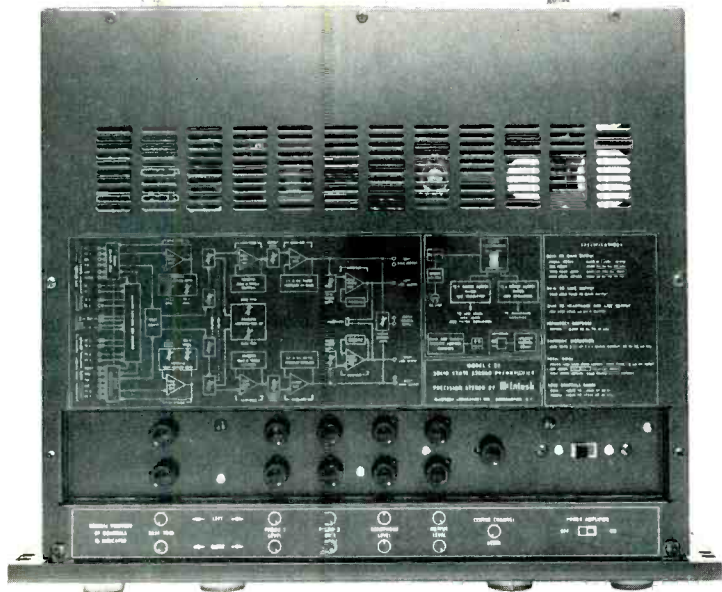
Circuit Features and Considerations

Each channel of the C-28 consists of four main sections: low level preamplifier, high level amplifier, active filters and headphone amplifier. A block diagram of the circuit is reproduced in Fig. 1.

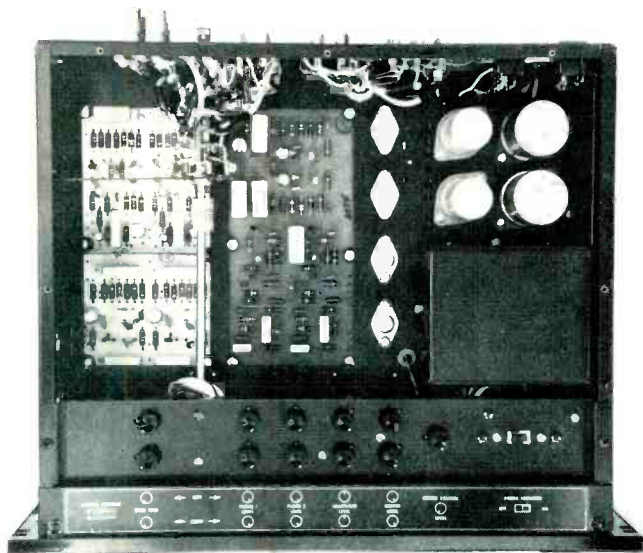
A four-transistor differential amplifier input circuit is used in the low-level preamp section. Equalization is applied by a negative feedback loop. Phono input sensitivity controls are also included in the negative feedback loop (rather than as simple input potentiometers) which permits gain reduction (if required, because of higher than average outputs from the phono cartridge selected) without degrading signal-to-noise ratios.

The high-level amplifier section has a gain of 20 dB and consists of a three-transistor circuit per channel with tone control action introduced via a negative feedback loop. Bass trim controls, presence, and loudness compensation circuits are positioned at the input of this amplifier section.

The filter amplifier sections utilize two transistors per channel in a compound emitter-follower configuration. In addition to the low-and high-cut 12 dB/octave filter components in this section, the filter amplifier also forms an active low-pass filter above 20,000 Hz. McIntosh subscribes to the philosophy that response beyond audible limits is neither needed nor desirable, and this filter design reduces



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double as a tape pre-amplifier (with a switched change of equalization curves). Selector and mode switches are coupled to tiny red illuminated dots, visible from behind the panel, which denote switch positions chosen. Eight rectangular pushbuttons, surmounted by rectangular, colored, illuminated areas above each, take care of two tape monitor circuits, tape-to-tape copying (from deck 1 to deck 2 or vice versa), low and high frequency cut-off filters, and main and remote speaker system turn-on (providing an accessory McIntosh SCR control unit is used in an installation). Below

Come and wrap the sounds around you.



The album was recorded live at an outdoor concert, and now it's all coming back to you. The heavy, magical electricity of a hot, metallic blue night—the air crackling with energy as the musicians tune up—the stage has become an island of colored light, chrome and glitter. Suddenly you're part of the interplay between rhythm, bass, lead and harmony as every note flows.

Each unfolding in your head. You're wrapped in the sound of KOSS PRO 4AA Stereophones, hearing all ten audible octaves. It's a power you can hear and feel as though you were in the spotlights with the musicians. And yet you're home, free to explore this private realm of listening pleasure. This uncluttered expanse of pure sound that makes KOSS PRO 4AA's the most popular

stereophones in the world.

Your audio specialist has a pair of KOSS PRO 4AA's you can try. Visit him, and gather the sounds of musical perfection around you. Or write for a free, full color catalog c/o Virginia Lamm. Either way, remember that, for the price you'll pay, KOSS PRO 4AA's are a rather inexpensive ticket to a performance that begins at your command and

goes on and on, encore after encore, for as long as you want. It's like buying a s'airway to heaven.

Koss Corporation

Koss PRO 4AA Stereophones



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from the people who invented Stereophones.

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How to mix power

The power of your amplifier is one of the most important elements in the performance of your high fidelity system. It gives your amplifier sufficient power to drive your speakers. And you need well engineered power to give you the instantaneous burst that music may require.

The pleasure of your tuner is fullest when properly matched with its power supply; when it is sensitive and highly selective, and offers noise- and distortion-free sound. In short, an instrument attuned to your musical pleasure.

Sansui Amplifiers and Tuners: Our newly expanded complete line of powerful amplifiers and beautifully designed tuners are engineered and matched to give you the full pleasure of power. From the fabulous AU 20000 with a striking 170 watts per channel, min. RMS, both channels driven into 4 and



...with pleasure.

8 ohms, from 20 to 20000 Hz with no more than 0.05% total harmonic distortion at about \$1000* to the AU 3900 with 22 watts per channel, min. RMS, both channels driven into 8 ohms, from 40 Hz to 20 kHz, with no more than 0.15% total harmonic distortion at less than \$160*, every AU amplifier is loaded with features designed for creative listening. The fully matched TU tuners from less than \$160* to about \$450* all feature appropriately low distortion, fine sensitivity and high selectivity. For example, the TU 3900: sensitivity, 11.2 dBf (2.0 μ V); selectivity better than 60 dB (at 400 kHz). TU 9900: sensitivity, 8.8 dBf (1.5 μ V); selectivity from 20 dB at 200 kHz to 90 dB at 400 kHz. The TU 9900 offers a choice of wide and narrow bandwidths for selection of individual stations even in crowded areas.

Your nearest franchised Sansui dealer will be happy to demonstrate any in this fine series to you. Your powerful pleasure awaits.

* Approximate nationally advertised value. The actual retail price will be set by the individual dealer at his option.

Buy Sansui.



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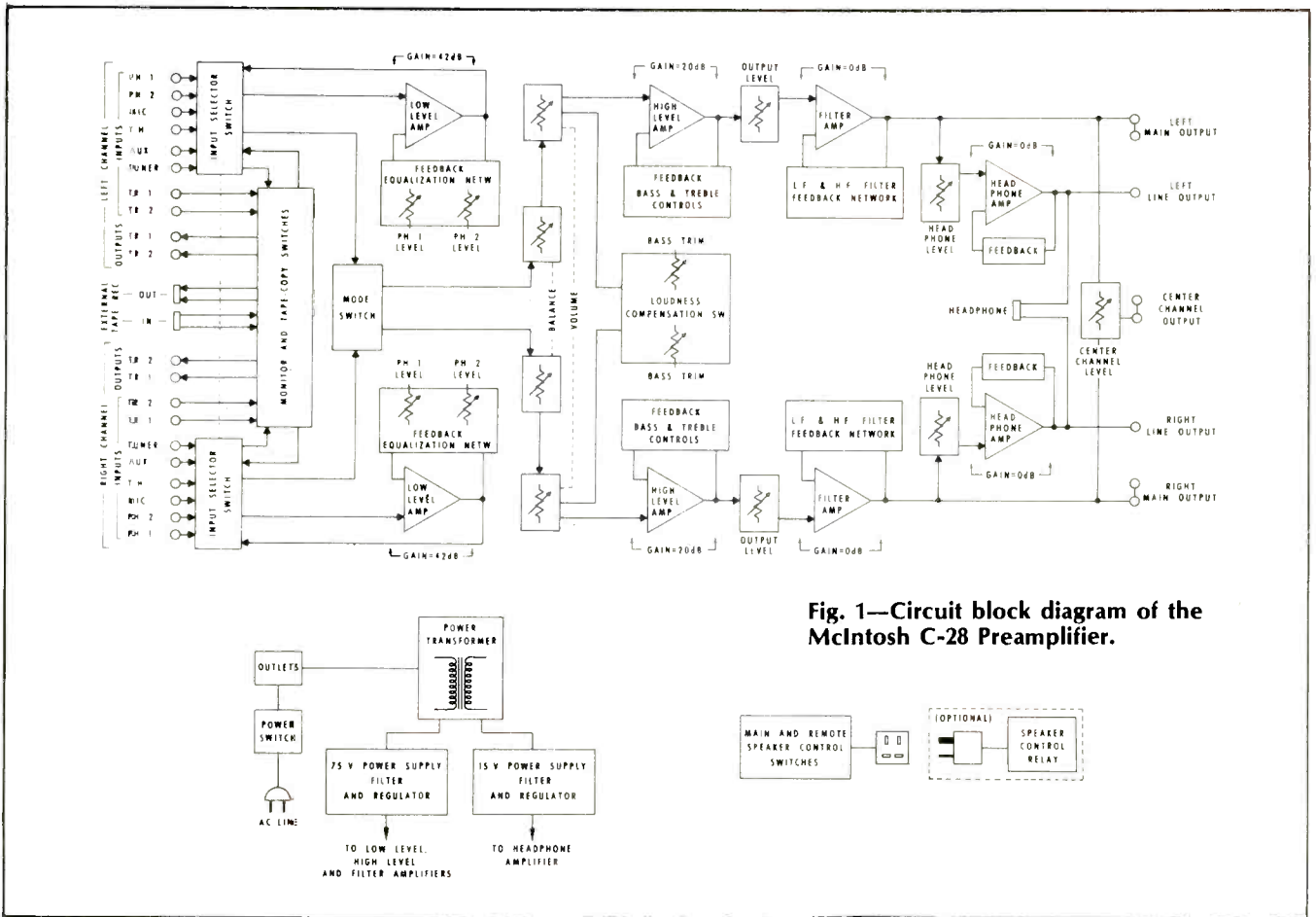


Fig. 1—Circuit block diagram of the McIntosh C-28 Preamplifier.

noise outside the useful audio spectrum while maintaining flat response out to 20,000 Hz.

The headphone amplifier section delivers 0.75 Volts of signal into 8-Ohm headphone loads (approximately 70 milli-Watts) or up to 2.5 volts into impedances above 50 Ohms. Internal impedance is low enough (0.2 Ohms) so that relatively long shielded cables can be used without rolling off high end response.

The power supply of the C-28 consists of a 75 Volt supply and a separate 14 Volt supply for the headphone amplifier circuits. Actual output from the 75 Volt supply, following series regulation, Zener diode regulation, filters, and voltage dividing networks, is 18 Volts, used to power the low level circuits.

Laboratory Measurements

Response, in high level input positions, measured within 1.0 dB from 12 to 21 kHz, with the upper -3 dB point at 40 kHz. The lower -3 dB point could not be measured accurately. During these measurements, we discovered that the action of the bass trim secondary control is dependent upon the setting of the master volume control. In other words, with volume control at maximum, the bass trim control, like the loudness compensation circuits, has no effect. Since most listening will, we presume, be done at lower settings of the master volume control, this circuit configuration does not practically reduce the effectiveness of this trim control, but we wondered why McIntosh chose to make it dependent upon that control. The presence setting of the

compensation switch is also only effective at lower than maximum setting of the master volume control. It would seem to us that *if* presence control action is desired (and that is a big *if* depending upon what kind of music you like to listen to), it should be possible to achieve that slight mid-range boost regardless of the master volume control setting.

As for distortion, it measured 0.05 per cent of any audio frequency from 20 Hz to 20,000 Hz for 2.5 Volt (rated) output signals (0.01 per cent at 1 kHz). Rated THD of 0.1 per cent was not reached until the preamplifier was delivering 14.0 Volts to the main output terminals.

Tone control action, depicted in the scope photo of Fig. 2, was extremely precise for each of the 11 steps of the bass and treble controls, with turnover points for both controls at approximately 1 kHz.

High- and low-cut filter action is shown in the scope photo of Fig. 3. No passive RC filter network could ever deliver the sharp-cornered filtering which is so effectively accomplished by the active filters of the C-28. This is important because it means that, when using these filters, all musical energy up to around 7 kHz and down to 50 Hz will be reproduced with virtually no attenuation while the objectionable hiss, noise and rumble which prompted switching the filters on in the first place is very effectively attenuated beyond those cut-off frequencies. Action of the loudness control feature is shown at various settings of the master volume control (approximately 10 dB apart) in the storage scope photo of Fig. 4 and is seen to be loudness compensation of the type that does not include any high frequency boosting (in agreement with more recent hearing tests than those

The new Dual CS721 is the ultimate expression of the principles that determine the performance of tonearms and drive systems. Its straight-line, tubular tonearm pivots horizontally and vertically within a true, four-point gimbal, thus maintaining dynamic balance in all planes.

Another Dual innovation—Vertical Tonearm Control—contributes in yet another way to fine tracking performance. A vernier height adjustment over

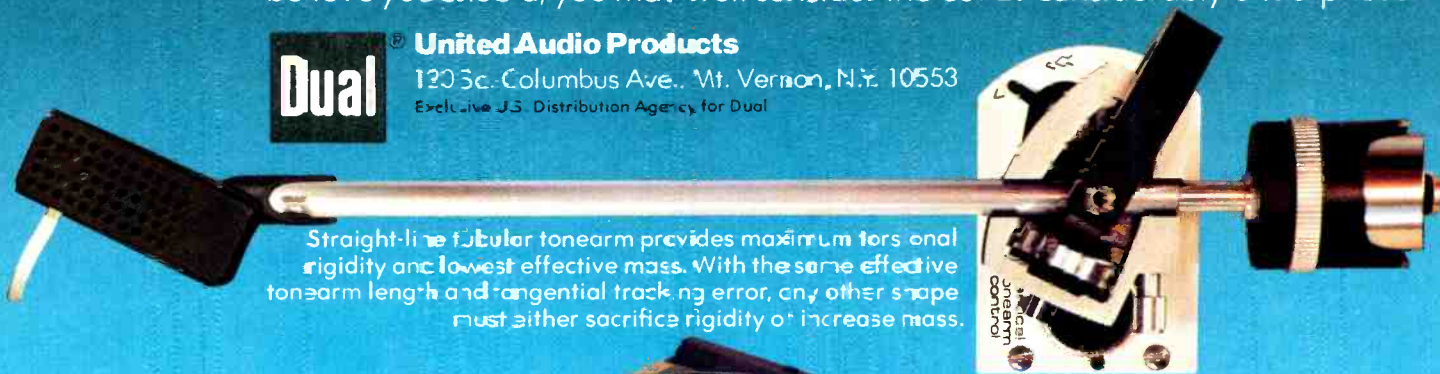
The new Dual CS721 represents everything Dual has learned about turntables.

an 8mm range parallels the tonearm to the record with any cartridge. This eliminates the added mass of cartridge spacers otherwise needed to achieve precise vertical tracking angle. In all, there are seven tonearm settings and adjustments — from stylus overhang to cueing height and descent speed—all serving to optimize tracking performance with any cartridge.

The direct-drive system of the CS721 is of comparable precision. The electronically-controlled, DC, brushless motor is the smoothest and quietest ever made. A major contributor to this end result is an exclusive Dual feature: two stacked coil layers, each consisting of eight coreless bifilar-wound coils that overlap to achieve a gapless rotating magnetic field. This eliminates the successive magnetic pulses typical of all other motor designs.

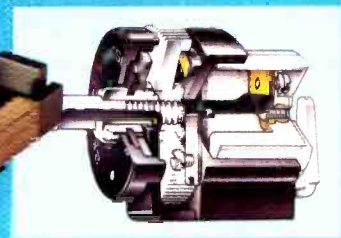
Although the CS721 is Dual's most expensive model, it is hardly the most expensive turntable available today. When you make comparisons, as we believe you should, you may well consider the CS721 considerably underpriced.

Dual [®] **United Audio Products**
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Straight-line tubular tonearm provides maximum torsional rigidity and lowest effective mass. With the same effective tonearm length and tangential tracking error, any other shape must either sacrifice rigidity or increase mass.

The Dual CS721. Single-play direct-drive turntable with fully automatic start and stop, plus continuous repeat. Features include: 10% electronic pitch control, illuminated strobe, dynamically-balanced 12" platter, anti-skating separately calibrated for conical, elliptical and "long-contact" styli. Less than \$400, including base and cover.
 Dual CS704. Similar except semi-automatic. Mechanical sensor locates lead-in groove of 12" and 7" records; tonearm lifts and motor shuts off at end of play. Less than \$310, including base and cover.



Counterbalance contains two mechanical filters, tuned to absorb energy in resonance frequency ranges of tonearm/cartridge system and chassis to avoid feedback.

Other Dual turntables: Fully automatic, single-play/multi-play: 1225, less than \$140; 1226, less than \$170; 122E, less than \$200; 1249, less than \$280. Semi-automatic, single-play: Duos: 502, less than \$160; 510, less than \$200.

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10 sound reasons to buy our new receiver.

Plus its sound.



Sony's new, more powerful STR-6800SD receiver should get a warm reception. Because it not only looks different from other receivers, it is different.

It has some features found in more expensive separate components—and other features found nowhere else at all.

1. The most-used controls all in one place. Electronically, it would have been convenient for us to scatter the level control, tuning knob and input and tape selectors all over our receiver. Instead we grouped them in the upper right-hand corner—so they're convenient for you.

2. A dial pointer that doubles in length when it's close to a station. Together with the signal strength meter and the center channel meter, this Sony innovation constitutes a system that helps you tune faster and more accurately.

3. A muting switch—great if the phone rings. Flick it down and volume crops. Flick it back up and volume goes back up to where it was. And this muting switch is right where it should be—right next to the level control.

4. A stepped level control to keep both channels equal. It guarantees unprecedented accuracy—to within $\frac{1}{2}$ db instead of 1 db. And it guarantees it: over the whole volume range instead of just in mid-volume.

5. MOS FET front end electronics unitized tuning. The 4-gang tuning section and all its associated electronic parts are mounted on one sub-assembly. So

temperature differences don't affect these circuits—the receiver tunes the same whether it's cold or warmed up. And, with MOS FET, the receiver has a very wide dynamic range.

6. Dolby noise reduction system. As more and more stations broadcast in Dolby, you can really use a Dolby system. And ours has a definite advantage: Instead of being an optional extra, it's built in—operated from the front panel.

7. Phase locked loop. It gives you greater stereo separation and less distortion.



8. LEC (low emitter concentration) transistor. This piece of advanced design in the preamp phono stage assures you tight RIAA equalization plus low noise, low distortion and a wide dynamic range. It's a Sony exclusive.

9. An acoustic compensator for easy control of highs, lows and middles. A conventional loudness control only lets you boost bass. Our acoustic compensator has three positions: For true

loucrless compensation, for bass boost and for mid-range presence

10. Sony's most powerful receiver. It delivers 8C watts minimum RMS continuous power per channel at 8 ohms from 20 Hz to 20,000 Hz with no more than 0.15% total harmonic distortion. It has a direct-coupled power amplifier with true complementary symmetry output stages.

And more. To these specifications (remember, we state them conservatively), add Sony's proven reliability. And you get a receiver that produces a sound that'll make you understand why you have ears.

That's the STR-6300SD at \$600. Or, for less power and a few less features — but no loss of fidelity — the STR-5800SD at \$500 and the STR-4800SD at \$400 (all suggested retail prices).
A sound investment.



SONY

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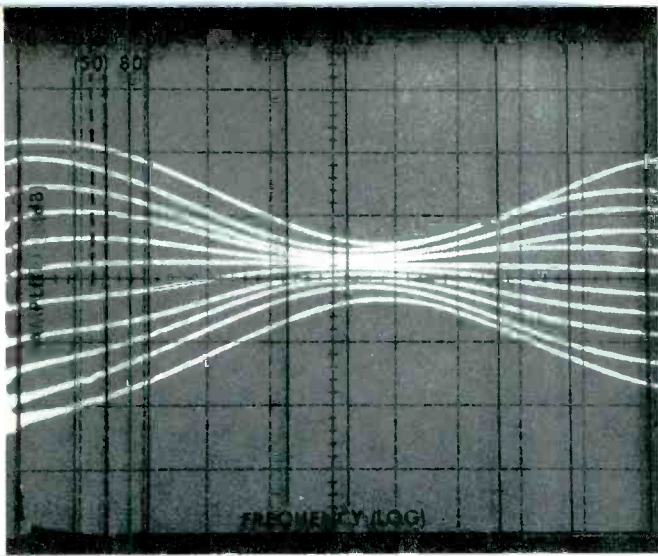


Fig. 2—Tone control range of the C-28.

Fig. 3—High- and low-cut filter response.

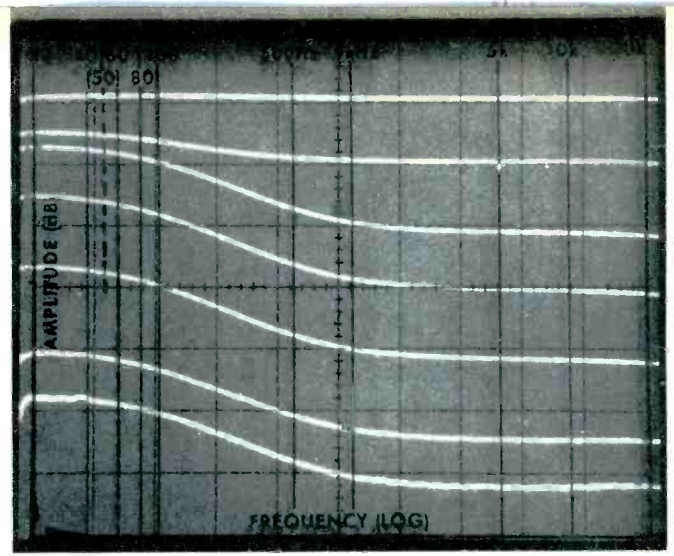
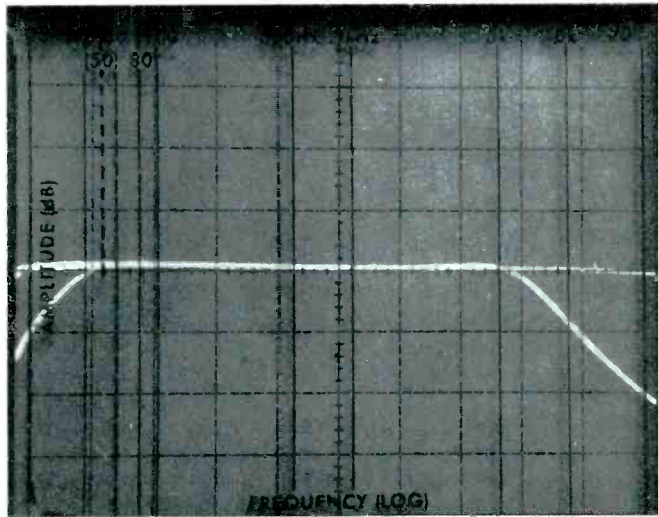


Fig. 4—Loudness compensation response.

originally conducted by Messrs. Fletcher and Munson back in 1933). The presence control setting was found to provide approximately 5 dB of mid-frequency boost at mid-settings of the volume control.

Input sensitivity at high level inputs (for rated, 2.5 Volt output) measured 180 mV, with secondary output controls full open, and hum and noise measured exactly 90 dB below that output level, as claimed.

Master volume control tracking maintained channel balance within 1.0 dB all the way down to -65 dB relative to full clockwise setting.

Low Level Amplifier Performance

Phono input sensitivity was adjustable from 1.3 mV to 5.0 mV by means of the secondary controls, and we set them for a 2.0 mV input sensitivity as a reference for our other measurements. The availability of these input sensitivity controls, as well as of the output level secondary controls, makes it possible to "calibrate" one's system so that the loudness control circuitry has some validity. Too many manufacturers of amplifiers, preamplifiers, and receivers include loudness control circuitry without providing any means for its effective use. Gain of the power amplifier, output levels of program source equipment, efficiency of loudspeakers and even room characteristics all determine ultimate sound pressure levels heard by a listener from a component system. Since "flat" response is supposed to be referenced at approximately 100 dB SPL (the sound pressure level at which our hearing is relatively flat), the volume control should, in theory, be such that it causes that SPL to be delivered to the

listener when the control is set fully clockwise. But how can that condition be achieved (except by pure accident) unless secondary controls are provided with which to calibrate the system? Obviously, McIntosh understands this problem and provides a neat answer in the form of those secondary controls. Additionally, of course, even if you never use the loudness feature, the controls permit balancing all your program sources with respect to each other so that you don't have to keep readjusting volume every time you switch from radio to phono, etc.

Phono overload occurred with an input signal level of 220 mV, well above any level likely to be encountered from a cartridge tracking a record groove. Hum and noise referenced to 10 mV of input signal was 78 dB exactly. RIAA equalization was accurate within 0.5 dB from 30 Hz to 10 kHz, while at 15 kHz it was down by nearly 1.0 dB.

Summary and Use Tests

It is difficult to make definitive "value for the money" statements regarding a preamplifier/control unit since, unlike the case of amplifiers or receivers, one does not even have a "dollars per watt" criteria upon which to base such conclusions. The audiophile who chooses to assemble the most "separate" of systems (one that consists of separate preamp, power amp, and program source components) invariably judges component value using other criteria, such as flexibility of controls, adequacy of switching features and, above all, the sound of the reproduced music. In all of these aspects the C-28 excels. There are more expensive preamplifier units on the market, many of them boasting multiple "zeros" after the decimal number used to specify distortion. There are even a few less expensive preamps available whose basic "specs" read better than those of the Mac C-28. Some have more controls and more light indicators. Some even have meters. But few that we know of can produce as faithful and unaltered output signals from a variety of program sources as the McIntosh C-28. Here too is a component that is obviously built to last a long time, manufactured by a company that prides itself on the quality of parts and integrity of design for all its products. Having met a number of C-28 owners who wouldn't trade their units in for any other preamp around, we can now begin to understand their dedication to this long-lived model. Rumor has it that Mac may soon be coming out with a new preamp which might someday replace the older C-28. If that happens, the C-28 is likely to become another one of those hard to get high fidelity "classics" which actually increase in value with time.

Leonard Feldman

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TANDBERG

10XD bridges the gap between consumer and professional tape recorders.

Meet the world's first and only 10½" reel tape recorder that operates at 15 ips and combines Tandberg's unique Cross-Field recording technique with the world-famous Dolby* B system. Result: A *guaranteed minimum* signal-to-noise ratio of 72 dB, measured on a 4-track machine using IEC A-weighting. Simply put, the 10XD completely eliminates audible tape hiss!

Here are some of the many sophisticated features that make the 10XD the finest tape recorder Tandberg has ever built:

- 3 speeds: 15, 7½, 3¾ ips. Electronically selected
- 3 motors; Hall-effect capstan motor
- 3 heads; plus separate bias head
- Electronic servo speed control
- Electronic logic mode controls, including photo optics
- Electronic balanced microphone inputs
- Echo, sound-on-sound, editing, A and B tests

- Peak reading meters
- Direct transfer from playback to record (flying start)
- Ferrite playback head with symmetrical balanced output for hum canceling purposes and differential playback amplifier.

Remote control and rack mount optional. Pitch control by special order. For a complete demonstration of this remarkable new advance in stereo tape recording, see your Tandberg dealer.



*Dolby is a trademark of Dolby Laboratories, Inc.

Tandberg of America, Inc., Labriola Court, Armonk, N.Y. 10504
A. Allen Pringle Ltd., Ontario, Canada

Yamaha Model HP-1 Orthodynamic Headphones



MANUFACTURER'S SPECIFICATIONS:

Type: Orthodynamic.
Diaphragm Diameter: 2 1/4 (5.5 cm).
Film: 12 μ polyester.
Magnet: Isotropic ferrite.
Frequency Response: 20-20,000 Hz.
Sensitivity: 94 dB/mW, 102 dB/V.
Rated Input: 3 W.
Maximum Input: 10 W.
Harmonic Distortion: Less than 0.3 per cent at 90 dB SPL.
Weight (with cord): 10 1/4 oz. (290 gms).
Suggested Retail Price: \$65.00

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Using what the maker describes as the "ideal drive system," this pair of phones offers about all that could be desired with respect to quality, comfort, and reliability. The "ideal drive system" referred to consists of having the voice coils printed directly on the surface of the mylar diaphragm which is, roughly, five thousandths of an inch in thickness, resulting in a low mass that is driven over its entire surface at once. Physically, the phones consist of two black plastic cups 2 3/4 inches in diameter and 15/16 inches deep, including the soft plastic pads. A series of slots are cut into the cups around the outer edge of the backs to provide proper freedom for the diaphragm. The cups are supported by a ball and socket arrangement reminiscent of the old Murdock phones of 50 years ago, as some readers may remember, a simple, but effective arrangement which gives a noticeable reduction in weight. The molded plastic cup supports are integral with a flat steel spring 3/4 in. wide, finished in a matte black surface. Adjustment for different head sizes is provided by a suede-like plastic band 2 1/2 inches wide at the center, tapering down to meet slides which move within the supports to furnish the necessary variation to accommodate the individual user. Again, simple, effective, and extremely comfortable to wear over long periods of time. The support brackets are lettered *L* and *R*, and the cord entering the right phone is additionally marked by a narrow orange plastic strip at the point of entrance. The eight-foot cord, which terminates in a molded plastic stereo plug, breaks into a "Y" 15 inches from the phone cups. The cord is a flexible twin type in black, with the tip of the plug being connected to the left phone. This is mentioned because there does not seem to be a standard, either on phone sets or on receivers. We have seen both tip-to-left and tip-to-right in both receivers and phones.

Measurements

The response curves were measured with an artificial ear consisting of an AKG-451E condenser microphone in a 6-cu.cm. coupler, and feeding into a Justi-Meter III chart recorder. The swept signal derives from a B & K QR-2009 test record, picked up by a Stanton 681-EE cartridge and fed into the *Phono* input of the Justi-Meter, and the signal output, properly equalized, is fed into an amplifier with the output adjusted to 3.0 Volts. The amplifier is terminated, and the phones fed through a 100-Ohm resistor, using one phone at a time. This level—3.0 Volts fed through 100 Ohms—has been used by this reviewer as a standard for determining the SPL of the phones in order to make comparisons between phones. Similarly, the 100-ohm series resistor closely approximates the feed usually available in the average receiver. By this method, the Yamaha phones present a SPL of +95 dB, which is slightly above average for "passive" phones, that is, those which require no external power supply.

These Yamaha phones show an exceptionally fine response over the lower frequencies, being down from the 1000-Hz response only 5 dB at 25 Hz, and reaching the 1000-Hz level at 200 Hz, then remaining flat with ± 2 dB to 7000 Hz, and dropping off gradually and down 5 dB at 8000. Beyond that, the dropoff continues and is down 10 dB at 15,000 Hz. The low-frequency response is among the best we have ever measured, and the smoothness of the curve is remarkable. However, it must be remembered that this response curve is not presented as an absolute figure, but solely to compare with other curves made on different phones with the previously described test set-up. It is important to note that this curve has no great variations throughout its range, and both phones match within ± 2 dB over the entire range from 60 to 10,000 Hz.

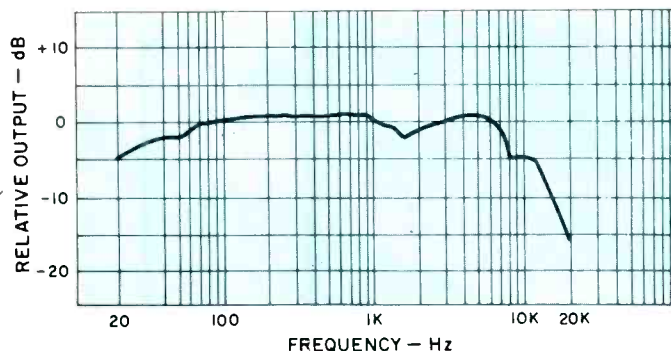


Fig. 1—Average response of left and right headphones.

Listening Test

Over a wide range of material, the listening qualities of these phones are quite pleasing, and they give even the best speaker systems a strong run for their money. While the isolation of the phones is less than 4 dB, which is to be expected since the back of the cups are acoustically transparent, this is of little real importance except when trying to record in the same area as the artist is performing.

But for just plain enjoyable listening, without disturbing others in the room (which is the main purpose of phones), the Yamaha HP-1 phones are comfortable and provide excellent sound quality at a reasonable price. C. G. McProud

Check No. 63 on Reader Service Card

JVC builds in what other receivers leave out. A graphic equalizer.



The only way you can equal the realistic sound capability of JVC's modestly priced S300 stereo receiver, is by adding an expensive, but highly versatile graphic equalizer, to another receiver.

For the price of a conventional receiver in its price range, the S300 has built-in JVC's exclusive graphic equalizer system. With five zone controls to cover the entire musical range. While most high priced receivers offer bass and treble controls, and some include a third for midrange, none approach the precision and flexibility of the SEA graphic equalizer system developed and patented by JVC.

371,293 ways to hear better sound.

By adjusting the five detent tone controls covering the frequency range at 40Hz, 250Hz, 1,000Hz, 5,000Hz and 15,000Hz, you can create 371,293 different sounds. A feat never before achieved (with a stereo receiver) outside a professional recording studio. But, then, the S300 is a JVC professional.

Get better performance from your components and listening room.

Why do you need such tremendous variations in tone? Quite simply, they help you to overcome the shortcomings of the acoustics in your listening room; they also can help you to compensate for the deficiencies in old or poor recordings.

Finally, they can do wonders for the frequency response of your speakers, and where you place them.

SEA is really quite easy to use. For example, the 40Hz switch reduces record hum or rumble, and it can add greater clarity to the ultra low bass of an organ.

The problem of booming speakers is simply handled with the 250Hz switch. And in the important midranges, the 1,000Hz control adds new dimension to the vocals of your favorite rock performers, while the 5,000Hz switch brings out the best in Jascha Heifetz. You can even reduce tape hiss and diminish the harsh sound of a phono cartridge at high frequencies, with the 15,000Hz control. Then, to double check any adjustment, SEA works with a tone cancellation switch which permits you to instantly compare your setting with a perfectly flat response.

SEA adjusts the sound of your system to the size of your room.

You see, small rooms tend to emphasize high frequencies, while large ones accentuate the lows. But the ingenious SEA allows you to compensate for room size

and furnishings—so your system can perform the way it was meant to, wherever you are.

While most manufacturers reserve unique features for their top of the line model, JVC has included SEA in three of its receivers. The S300, the S400, and, of course, the top professional—the S600.

When you hear these receivers at your JVC dealer (call toll-free 800-221-7502 for his name), think of them as two components in one. In fact, it's like having all the benefits of a graphic equalizer . . . without buying one.

JVC

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

Check No. 49 on Reader Service Card

Heathkit Model AA-1640 Stereo Amplifier

MANUFACTURER'S SPECIFICATIONS

Rated Power Output: 200 watts per channel into 8 ohms, both channels driven, with less than 0.1 per cent total harmonic distortion from 20 to 20,000 Hz.

Intermodulation Distortion: Under 0.1% at full power.

Frequency Response: -1 dB from 7 Hz to 50 kHz and -3 dB from 5 Hz to 50 kHz.

Meter Range: 0.2 to 200 W into 8 ohms; -30 to +3 dB.

Rated Output Level: 1.5 V.

Weight: 58 lbs. (26.3 kg).

Price: \$439.95; AAA-1640-1 meter, \$69.95; kit purchased with meter, \$489.95.



The AA-1640 is Heathkit's entry into the amplifier horsepower race. It is physically larger than most other amplifiers in the 150-300 watt/channel class and weighs in at 58 pounds. The kit is available with or without the AAA-1640-1 output meter accessory. The kit reviewed was built by one of the staff of *Audio* and was equipped with the output meter accessory.

The amplifier is built around an internal U-shaped chassis upon which are mounted the power transformer, two 7500 μ F/100 V filter capacitors, main supply rectifier bridge, and a socket for the power supply and speaker protection circuit PC board. Connecting to the rear of this internal chassis is the rear panel of the unit and to the front is a transverse sub-panel that is about 60 per cent of the amplifier's height. Two L-shaped side pieces connect the front sub-panel to the front panel of the unit. Two enormous heat sinks form the outer side pieces of the amp and connect the rear panel to the rear of the aforementioned L-shaped side pieces. Each heat sink has an associated main power amplifier circuit board that connects along one edge to the power transistor socket pins on the heat sink and to two multi-pin male connectors mounted to the top edge of the internal chassis. A U-shaped piece of aluminum on each main amp board serves to conduct heat away from the pre-driver transistors and to mechanically tie down the connector edge of these boards by bolting to the upper sides of the internal chassis.

A speaker output relay is mounted to the front sub-panel under the left main amp circuit board. The input buffer amplifier is mounted near the bottom of the unit on the front side of the front sub-panel. Another relay for preventing ex-

cess in-rush a.c. line current upon turn-on is mounted on the inside of the rear panel and is covered over by a protective piece of aluminum. Circuitry for the peak-reading meters is in the form of two PC boards mounted to the back of the meters with the meter terminal bolts.

On the front panel are the two peak-power meters, power On and overtemp LED indicators, two input gain controls, and a push-button power switch. Mounted on the rear panel are the a.c. line cord, a.c. line fuse, two speaker fuses, speaker connector socket, and two signal-input female phono connectors. The speaker sockets accept two polarized plugs each with two screw terminals, a quick connection arrangement.

Circuit Description

As is shown in the block diagram, the input signal, after passing through the input level control, is applied to the input buffer or unity gain amplifier. The purpose of this amplifier is to present a relatively high signal-input impedance (50 KOhms with level controls clockwise) and a low output impedance to drive the main amplifier. Circuitry for this amplifier consists of a NPN-PNP compound pair with 100 per cent feedback from second-stage collector to first-stage emitter.

The input stage of the main power amplifier circuit is a PNP differential amplifier with a transistor current source. The collector of the input diff amp is direct coupled to the base of a NPN transistor which, in conjunction with an associated PNP, form a compound predriver stage. Such a connection is like the input buffer except that the output is taken at the emitter of the PNP transistor, rather than the collector. This results in a linearized (by local feedback) effective common-emitter amplifier and is a logical step, as this stage has to produce the full amplifier output-voltage swing. A constant current source from the plus 91 V supply is connected through the output-stage bias diode network to the output of the compound lower predriver stage. Quiescent current in the composite predriver is about 20 mA.

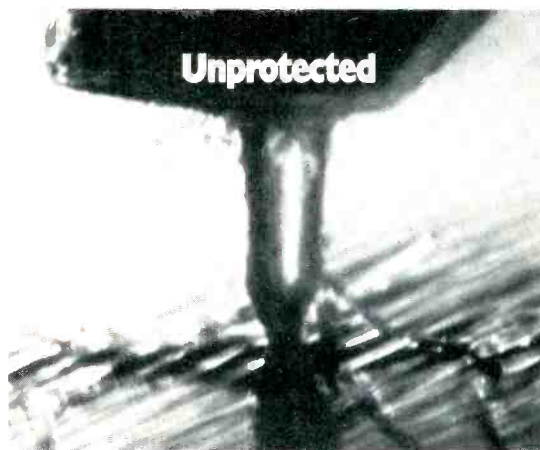
The output stage of the AA-1640 is a quasi-complementary one similar to that used in a number of other high power amplifiers and uses eight RCA 1B05 Pi-Nu output transistors.

Dynamic output limiting is in the form of a VI limiter which shunts away base drive to the output stage if current and/or voltage in the output stage is considered beyond safe bounds. Overall negative feedback is taken from the output back to the inverting input of the input diff amp through two paths. A speaker protection fuse is placed be-

Fig. 1—Back panel.



If you can see a difference, imagine what you'll hear.



Magnified, you can see record vinyl wearing away.

With same magnification, record vinyl shows no wear.

You're looking at the solution to one of the oldest problems in audio—how to protect records from wear, while at the same time preserving full fidelity.

It's called Sound Guard,* and it's remarkable.

Independent tests show that discs treated with Sound

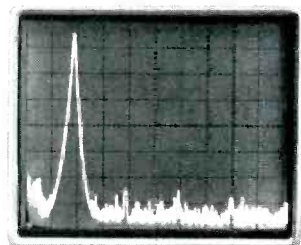
distortion as "mint condition" discs played once.

A by-product of dry lubricants developed for aerospace applications, Sound Guard preservative is so smooth it reduces friction, yet so thin (less than 0.000003") it leaves even the most fragile groove modulations unaffected.

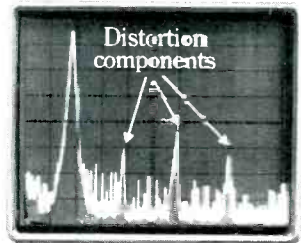
Len Feldman in Radio Electronics reports "At last! The long awaited record-care product has arrived.

It preserves frequency response

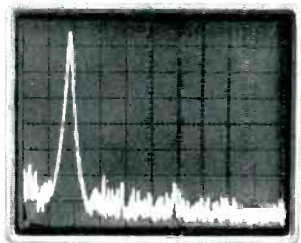
in a kit complete with a non-aerosol pump sprayer and



Test record played first time.



After 100 plays without Sound Guard.



Identical test record after 100 plays with Sound Guard.

Guard preservative played 100 times display the same full amplitude at all frequencies and the same absence of surface noise and harmonic

while reducing distortion and surface noise." It's effective and safe for all discs, from precious old 78's to the newest LP's.

Sound Guard preservative,

velvet buffing pad, is available in audio and record outlets.

Sound Guard™ keeps your good sounds sounding good.



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

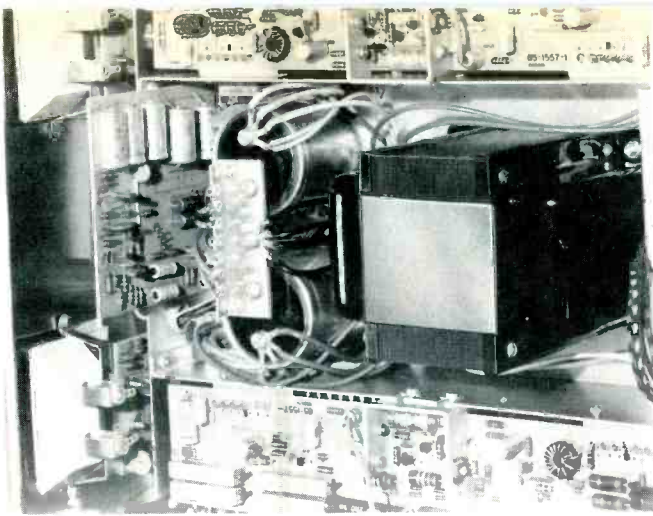


Fig. 2—Interior view.

tween the output stage and the output RLC buffer network and is included in the main feedback loop (12 k) in order to eliminate the series resistance of the fuse. The secondary loop is a higher (68 k) path from the output stage back to the inverting input to keep the amplifier d.c. centered when the fuse opens. Located on the plug-in power-supply PC board is the speaker protection circuit. This circuit, by controlling a relay in series with the output terminals, functions as a turn-on time delay and a speaker protector by opening up the relay if the d.c. output voltage of either channel goes more than a few volts, plus or minus, from ground.

Two thermal cutouts, one on each channel heat sink, are wired in series with the speaker relay coil and, if either channel heats up excessively, will open the relay, thus removing the load from the amplifier. Also on the plug-in power-supply board are six rectifier diodes, two Zener diodes, and associated resistors and filter capacitors to provide plus 12 V for the speaker relay, regulated plus and minus 15 V for the speaker protection circuitry, input buffer amps, and meter circuits. An additional plus 35 V is developed for the LED indicator diodes. The main high voltage supply for the power amp proper is plus and minus 91 V at idle across two 7500 μ F, 100 V filter capacitors.

A line-operated relay shorts out a 5-Ohm resistor in series with the power transformer primary as fast as it can pull in upon power turn-on. This helps to reduce the high a.c. in-rush current that would otherwise occur.

The peak-reading meter circuit consists of a full-wave, two-diode, break point linear-to-log converter, a differential amplifier, a diode peak detector, and an emitter-follower buffer driven by the storage capacitor. The circuit is arranged so that negative feedback is applied around the peak detector and buffer back to the inverting input of the diff amp so that the buffered peak-held voltage matches that coming from the linear-to-log converter. This insures that the circuit will respond to short narrow input pulses. The decay time is longer than 0.5 seconds. When a peak comes along, the circuit quickly (less than 50 μ S) captures the peak and holds it long enough for the meter movement to come up to the correct indication. Actually, the held voltage is decaying while the meter is coming up to deflection but this amounts to a relatively small error.

Kit Builder's Notes

This is a big kit, with a lot of parts, so a large bench or desk area that can be monopolized for several weeks should be the unpacking site. I found empty egg cartons handy for nuts, washers, and bolts, as well as Rs and Cs, while other parts, such as relays, fuse holders, etc., hibernated in the paper bags they were packed in.

While Heath does supply a plastic nut driver and a small

wrench, you'll also need a soldering iron, screwdriver, wire cutters, and a long-nose pliers. I strongly suggest here that a good pencil-type iron be purchased, if you don't already have one, since the cost is low when one thinks about the time involved in going back to look for cold solders. It will also get the work done faster.

Total time spent on the project was about 23 hours, which was spread over a 7-week period with a couple of weeks out in the middle. The work seemed to go more quickly if I spent a couple of hours at the bench each day; usually I worked in the early morning in an attempt to escape a combination of a hot soldering iron and 90° weather. While this is easily the largest kit I have ever worked on, I was not intimidated principally, I believe, because of Heath's usual fine manual and a growing sense of accomplishment as I completed each section. One starts out building a small VOM, which is later used to check various construction stages and parts. The parts density of the various boards is moderately high, but this did not interfere with construction as Heath has laid the steps out the easy (read sneaky) way. Mechanical construction was simple.

Troubles? Relatively minor when one considers the complexity of the kit. One open and one shorted transistor in the right channel required a trip to the Heath parts depot for replacement during the late stages of construction. Strain on the associated parts in this channel may be what later resulted in the other channel having better measurements. Quite clearly, however, the unit was operating properly after the cover was finally buttoned on.

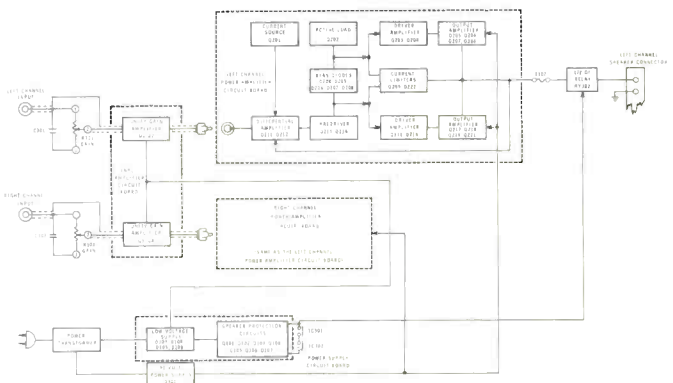
The amplifier sounded extremely good to me during a short listening test performed with a Shure V-15 III on a Technics SL-1350, Phase Linear 4000 preamp, Marantz 20B tuner, Sony 277-4 tape deck, and Duntech DL-15 speakers. Bass was strong with good definition, and the midrange seemed clean and warm, though the highs seemed very slightly compressed in dynamic range. This is one of the more powerful amps I have ever auditioned, and one should normally expect to run out of speaker before this amp quits.

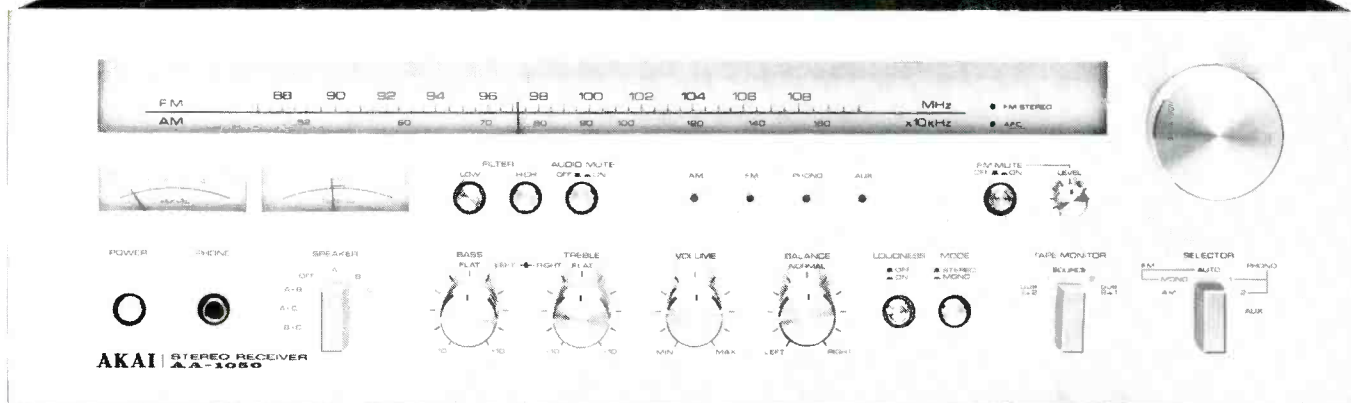
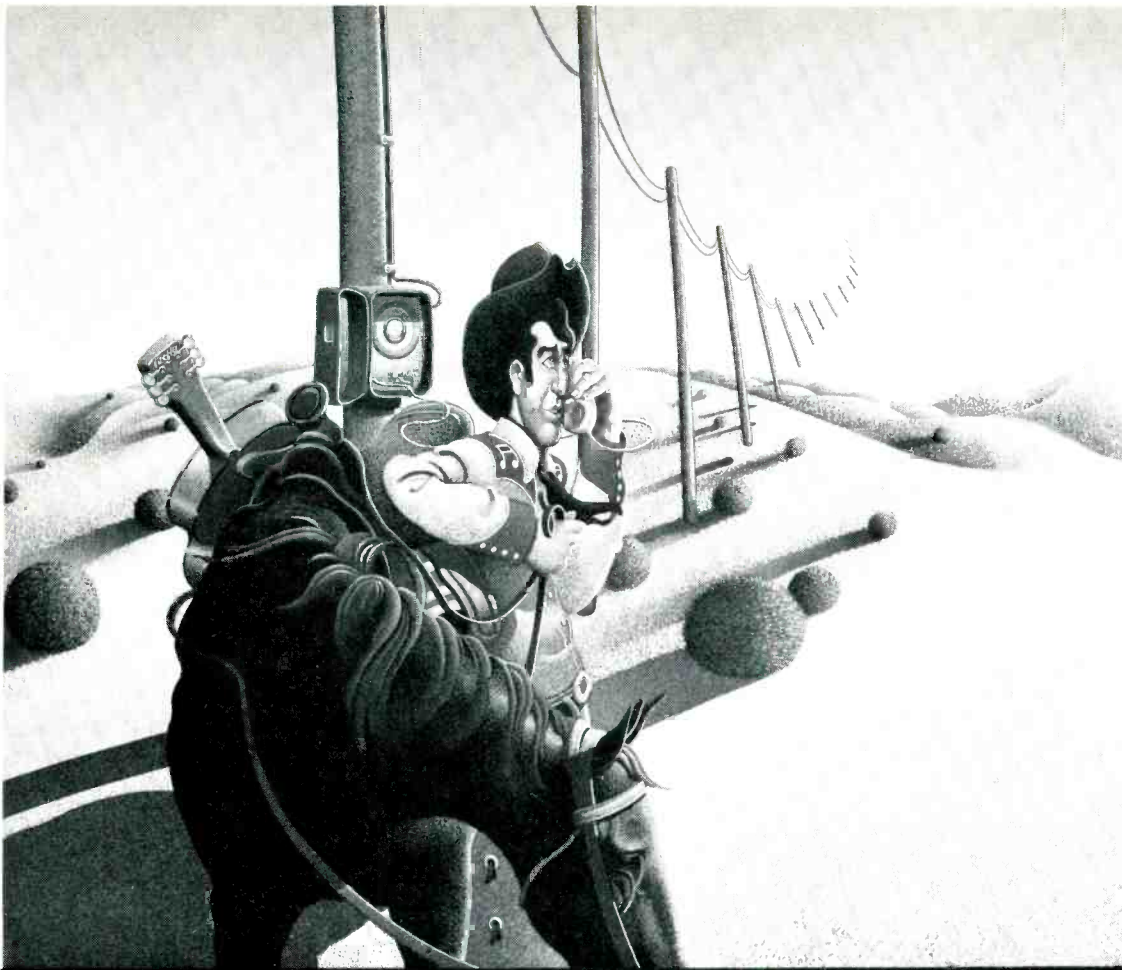
In its overload characteristics, the 1640 seemed quite forgiving and smooth, without the "crunch-clunk" which sometimes occurs. For me this is an amp I can live with easily, one of the best around. Besides, I had fun building it.—E.P.

Listening Tests

Listening was done with Dahlquist DQ-10s and Magnepan MG-II's, both on loan from the manufacturers for amplifier review purposes. Phono pickups used were Supex SD-900, Fidelity Research FR-1 MK 2, and an EMT XSD-15, all moving-coil units. A newly acquired M&K-modified Rabco SL-8

Fig. 3—Block diagram.





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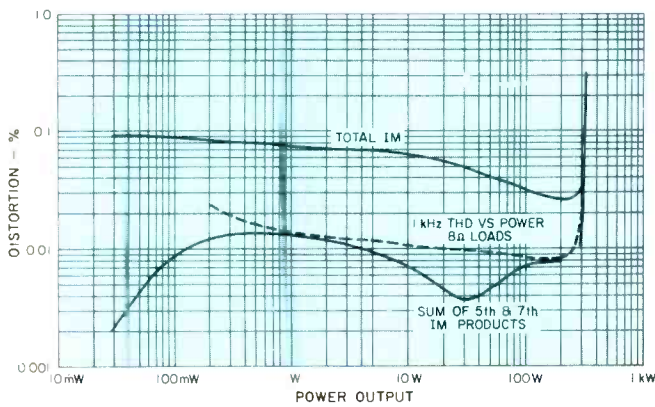


Fig. 4—IM and harmonic distortion vs. power output.

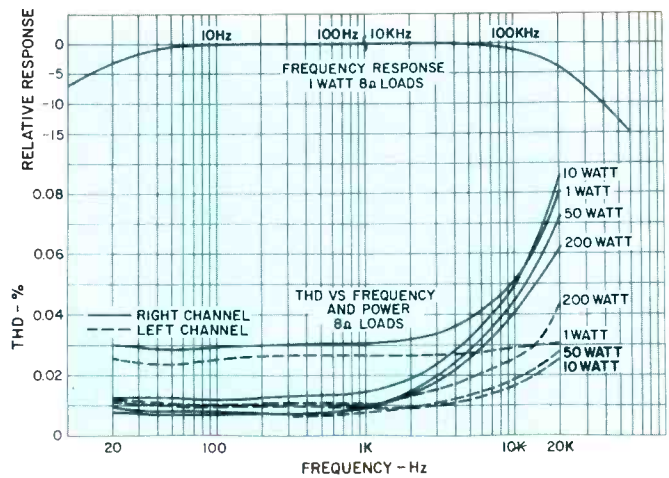


Fig. 5—Top curve, 1-watt frequency response into 8-Ohm load (note break in curve at 100 Hz/10 kHz). Bottom curves, THD vs. frequency and power into 8-Ohm loads.

80

arm was used for this testing. Preamps used included a Levinson JC-2 GAS Theadra, and the reviewer's own reference moving-coil tube preamp. The sound of this amplifier when compared to some of the better bipolar amps previously reviewed is noticeably softer in nature. When the program source is clean, the AA-1640 seems to very slightly dull some of the transients and remove a bit of the spaciousness and air about the instruments. On the other hand, when the source signal is dirty and edgy, which unfortunately is far too often the case, the amp seems to make the overall sound less distorted and more musical sounding. These effects are certainly not gross but are discernable to a highly critical listener. When driven hard and into clipping with difficult low impedance loads, the AA-1640 sounded clean with graceful, non-offensive overload characteristics. If this reviewer had to pick between the AA-1640 and one of the many solid-state amps that are on the edgy side of neutral, the choice would be unhesitatingly for the sound of the Heath.

Measurements

The AA-1640 was run at one-third of rated power or 66.7 watts per channel into 8-Ohm loads for one hour with a

1-kHz sine-wave test signal. The heat sinks got hot after one hour but not excessively so.

Voltage gain was measured and found to be 29X (29.2 dB) and 27.5X (28.8 dB) for the left and right channels respectively. IM distortion and 1-kHz THD are shown as a function of power in Fig. 4. It was found that this amplifier had quite different distortion characteristics in the two channels. The right channel appeared to be underbiased compared to the left and generated more distortion at low levels and high frequencies. The right channel figures are shown in Fig. 4. Figure 5 has THD plotted vs. frequency and power for both channels, along with the 1-watt frequency response. The differences between the channels are most readily apparent in the nature of the rise in high frequency distortion. It is not known whether other AA-1640s have a more closely matched behavior between channels. However, note that all these measurements are within spec. An attempt was made to raise the idling current in the right channel by adding a small resistor in series with the five bias diodes. Distortion could be lowered but the increase in idling power required was too much.

Figure 6 is for a 10-kHz square wave at 10 V p-p output

Fig. 6—Top trace, 10-kHz square wave into 8-Ohm load; bottom trace, 10-kHz square wave into 2-μF load. (Scales for both traces: 5V/cm, 20 μS/cm.)

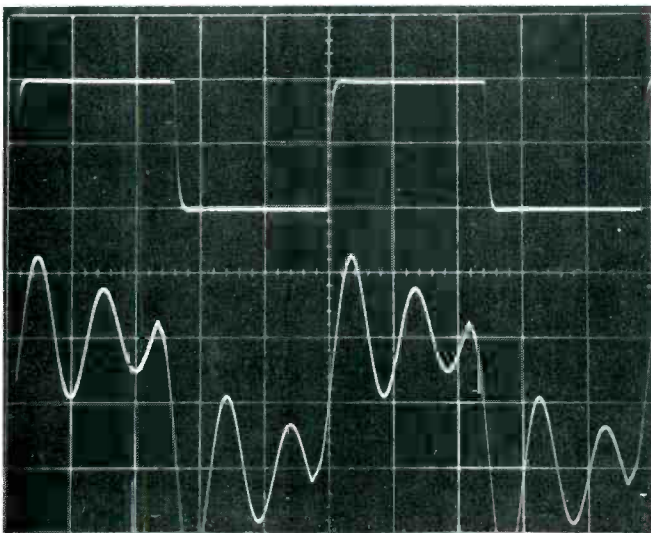
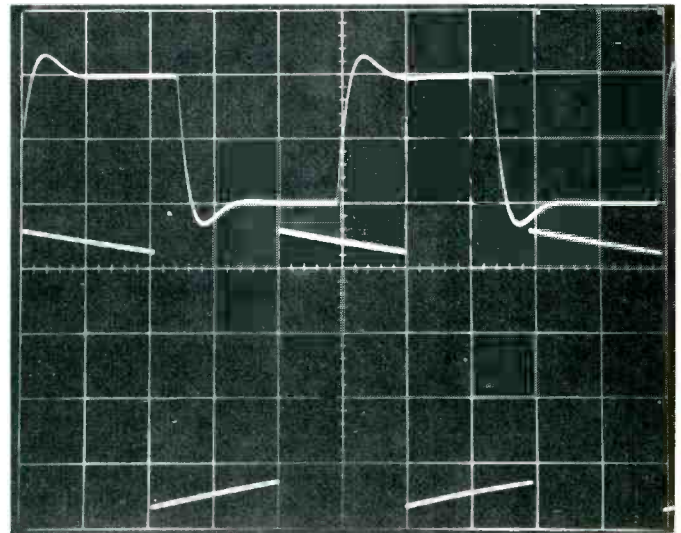
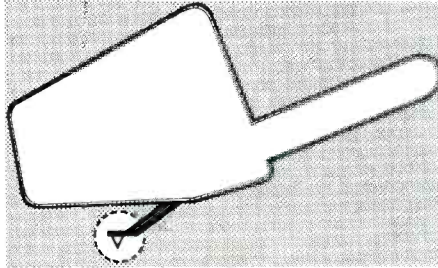


Fig. 7—Top trace, 10-kHz square wave into load composed of 2 μF in series with 2 Ohms; scales 5V/cm, 20 μS/cm. Bottom trace, 50-Hz square wave into 8-Ohm load at 200 watts; scales, 40 V/cm, 5mS/cm.



This is all you need for a dramatic improvement in your present cartridge . . .



THE NEW WALCO EXTENDED RANGE REPLACEMENT STYLUS

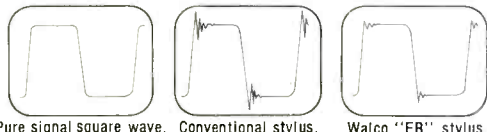
INTRODUCING A NEW AUDIO COMPONENT

Now there is a new audio component you can buy, to make a fantastic improvement *in the phono cartridge you are now using*. It's the Walco "ER" Extended Range Replacement Stylus assembly, designed to fit into your present cartridge just like the original. The dramatic difference is a reduction in tip mass—for the lowest tip mass of *any* stylus.

What can you expect? A remarkable number of improvements that all add up to total *better sound*. Immediately you notice that records are clearer, purer, more listenable than ever before. The sound is more "open," and more effortless. There is less harshness, so you can listen longer without suffering from "distortion fatigue".

Why The Walco "ER" Is Better Than Your Original

Look at the illustration below. The one on the right is the Walco "ER" Replacement Stylus Assembly fitted into one of the most popular and most expensive cartridges you can buy. The center illustration is that same cartridge with its original stylus.



You don't have to be an engineer to know that the one on the right is closer to the pure square wave: more accurate, less distorted, a noticeable improvement in reproduction. The difference is *lower mass at the stylus tip*.

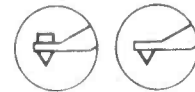
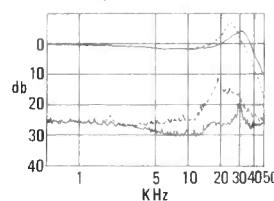
Any stereo or four-channel cartridge can be improved by reducing the effective mass at the tip. But until now the diamond tip had to be the size it is, so it could stick up through a hole in the cantilever (arm) where it is cemented in place.

Walco Achieves An Engineering Breakthrough.

But now Walco Electronics has perfected a way to reduce the size *and mass* of the diamond tip more than 32%! This technological breakthrough is available as a *replacement stylus* for top quality magnetic cartridges . . . whether two or four-channel.

In the new assembly method, a tiny, naked diamond—at least 60% smaller than ever before—is bonded to the *underside* of the cantilever only. No mounting hole needs to be drilled, so a lighter and smaller arm can be used, for full compliance with greater strength. *The net result is the lowest total tip mass of any stylus!*

The unique tip mounting method plus lower tip mass, also permits the center of gravity of motion, between stylus and fulcrum to be held closer to the centerline—extending high frequency response to an amazing 50,000 Hz! Channel separation (distance between upper and lower curves in graph illustration) is greatly improved, and dramatically increased to 20 db even out to 40,000 Hz!



All other stylus tips. New Walco "ER" lowest mass tip.

Walco "ER" response (solid line) is flatter, more extended, has better separation than original stylus in same cartridge!

Parabolic (Shibata type) Tip for CD-4 and Stereo, Too.

The new Walco "ER" Replacement Stylus also features a parabolic-shaped stylus tip—imperative for four-channel but similarly excellent with stereo, too.

Compared to elliptical tips at the same low tracking force, the parabolic shape contacts a greater area of the groove wall. Pressure is distributed more evenly as well, thereby increasing the life of your records. And transient response is near perfect!



Stress analysis photos show less groove pressure with "ER" (right) vs. elliptical.

In addition, because the parabolic shape traces record grooves more accurately without bending them out of shape, you gain improved fidelity plus an *audible* improvement in reducing surface noise—even on older records!

A Stunning Advance in Sound Reproduction.

You can only *improve* your present cartridge, no matter how good it is now, with the Walco "ER" Lowest Mass Stylus. It's guaranteed to fit *perfectly*, and you can install it easily as *any* replacement. It is warranted for two years. Yet it costs no more — and probably less — than a conventional elliptical replacement from the original manufacturer.

Send for complete list of cartridges for which units are presently available. Or ask your dealer. The Walco "ER" Replacement Stylus is available from fine Audio and Record shops nationwide.

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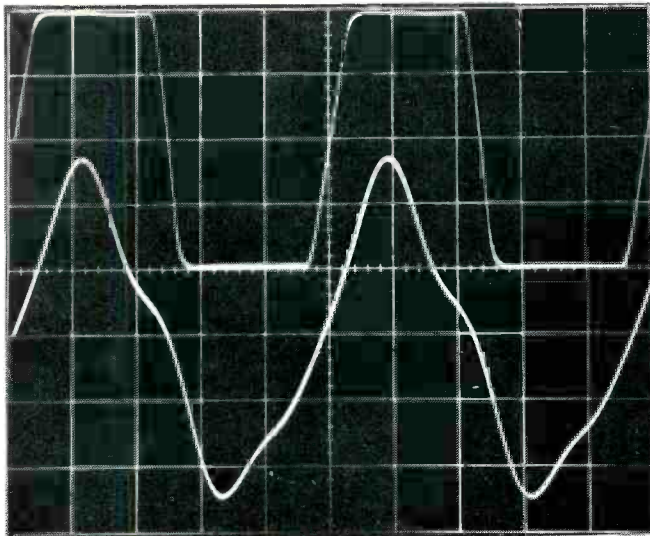


Fig. 8—20-kHz square wave into 8-Ohm load; bottom trace, 20-kHz sine wave into 1- μ F load. (Scales for both traces: 20V/cm, 10 μ S/cm.)

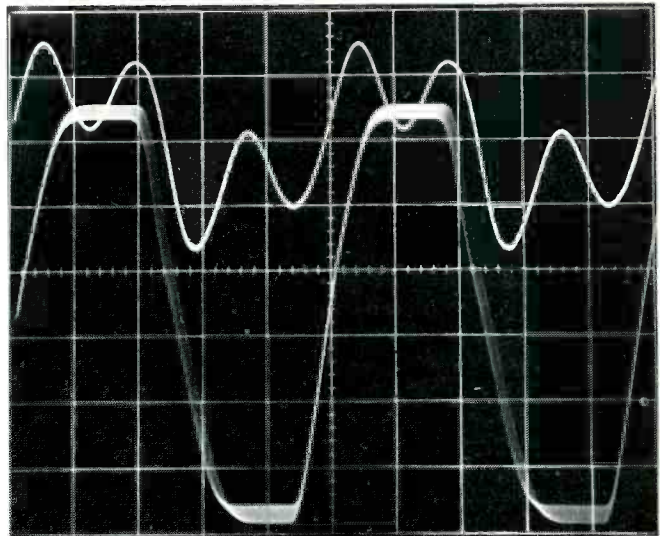


Fig. 9—Top trace, 20-kHz square wave into 1- μ F load; scales, 10V/cm, 10 μ S/cm. Bottom trace, 20-kHz sine wave into 8-Ohm load at 2-dB overdrive; scales, 20 V/cm, 10 μ S/cm.

with 8 Ohm and 2 μ F loads. Ringing is fairly pronounced as in other amplifiers, but is considerably improved (as would be other amps) with the addition of 2 Ohms in series with the 2 μ F which would be a good deal more representative of the situation with an actual capacitive transducer. This is shown in the top trace of Fig. 7. The bottom trace is a 200-watt, 50-Hz square wave into 8-Ohm loads. Low frequency tilt is noticeably more than some of the better a.c. coupled amps reviewed. Figure 7 shows a 80 V p-p 20-kHz square wave into 8 Ohm loads. The asymmetry of the leading and trailing edges suggests the current source predriver load can't pull the output stage plus as fast as the compound predriver can pull it minus. Corresponding slew rates are about 11.4 V/ μ S for minus to plus and 20 V/ μ S for plus to minus transitions. Recovery from slewing is smooth and well damped. The bottom trace of Fig. 7 is for a 20-kHz sine wave into a 1 μ F load. Distortion under these conditions is low up to about 150 VA and then begins to distort as shown. It appears that VI limiting prevents the amp from delivering 200 VA at 20 kHz. An attempt to drive a 20 kHz square wave into 1 μ F is shown in the top trace of Fig. 9. Severe asymmetry begins to occur above the level shown. The bottom trace is for a 2 dB increase in input level beyond the onset of visual clipping at the output for a 20-kHz sine wave into 8-Ohm loads. The blurring of the trace is due to 120-Hz power supply ripple modulation of the output signal. Sticking per se is relatively absent in this waveform. The behavior with high frequency reactive loading suggests that the AA-1640 might

possibly be in audible distress with some of the more inefficient electrostatic transducer loads when pushed to very high power at high frequencies. As has been mentioned under the listening tests, the amp is fine at high powers with conventional speaker loading and indeed may be perfectly OK with electrostatic speakers.

Damping factor was measured as a function of frequency and was found to be higher for the left channel although such differences between channels are not unusual. Both channels came to the same values above 5 kHz. Low frequency values for the left channel were about 213 and with about 160 for the right. The right channel decreased smoothly to 145 at 1 kHz dropping to 46 at 7 kHz and 16 at 20 kHz.

Output noise as a function of measurement bandwidth and input gain control position appears in Table 1. The left channel was producing some 60 Hz hum and high frequency 60 Hz gated bursts with the gain control at about half rotation. It is felt that this was not amplifier instability but something else in the chassis that was picked up by the input circuit when the source impedance to the input buffer amp was highest.

The meters were checked for steady-state reading accuracy. The figures are rather impressive, i.e. 462 watts/channel into 4 ohms, 320 watts/channel into 8 ohms, and 189 watts/channel into 16 ohms, all with a 1-kHz sine wave until visual onset of clipping. It wasn't possible to check for reading accuracy for short transient signals due to the lack of a tone burst generator when testing the amplifier. It is believed that the meter circuit would perform well for transient signals due to the inherent nature of the circuit design. The AA-1640 met its published specs with the two exceptions of 1-watt 20-kHz THD in the right channel and noise (60-Hz hum) in the left channel with the input level control other than fully clockwise or counterclockwise.

Measurements and the fact that the right channel wasn't as good as the left side, the amplifier sounded quite good to this reviewer. If the novice kit builder has doubts about whether he has constructed his AA-1640 correctly, despite its having passed the tests Heath has in the construction manual, the builder can have the unit checked over by one of Heath's competent technicians to make certain everything is in order.

Bascom H. King

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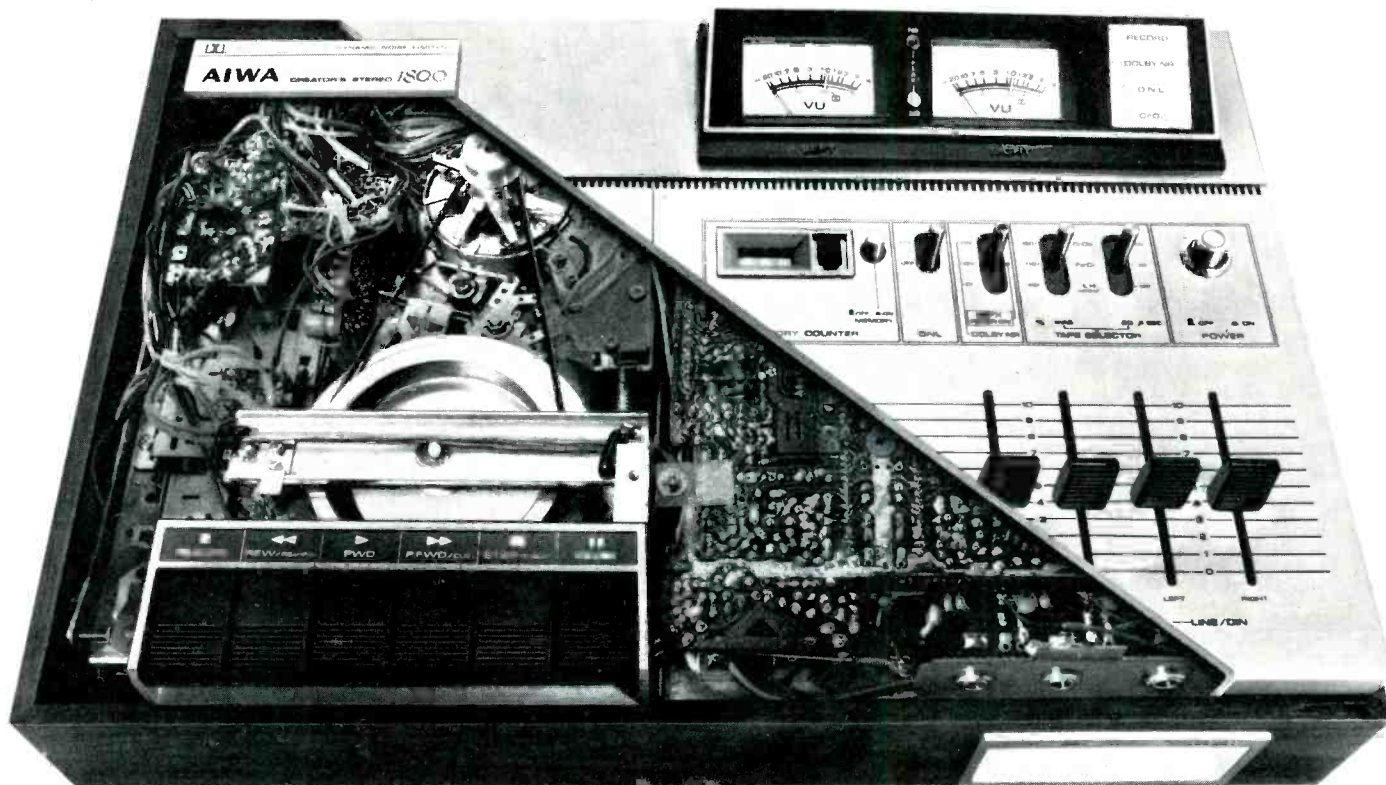
Table 1

Output noise vs. bandwidth and input gain rotation

Measurement bandwidth	L			R		
	CCW	WC	CW	CCW	WC	CW
20 Hz - μ V	275	390	265	65	90	60
20 kHz dB	-103.2	-100.2	-103.6	-115.8	-113.0	-116.5
400 Hz - μ V	34	73	34	34	74	35
20 kHz dB	-121.4	-114.8	-121.4	-121.4	-114.7	-121.2

Note: CCW = counterclockwise; WC = worst case; CW = clockwise
OdB reference is 200 watts, 8 ohms.

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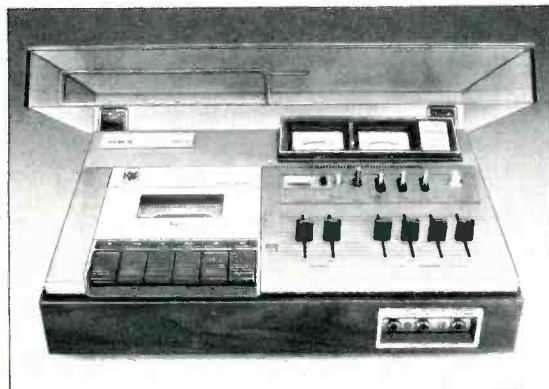
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Dynaco A-25XL Loudspeaker

MANUFACTURER'S SPECIFICATIONS

Enclosure Type: Aperiodic suspension.
(highly damped vent).

Woofer: 10-in. (25.4 cm).

Tweeter: 1-in. (2.54 cm).

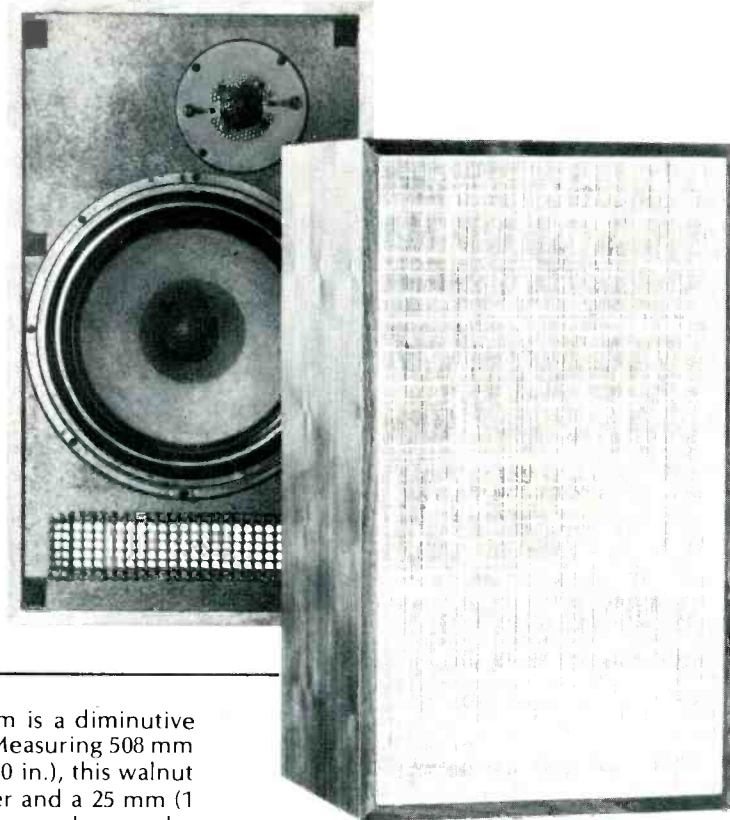
Impedance: 8-Ohms, nominal.

Power Handling: 50 Watts.

Size: 20-in. (50.8 cm) x 11½-in.
(29.2 cm) x 10-in. (25.4 cm).

Weight: 25 lbs. (11.34 kg).

Price: \$109.00.



84

The Dynaco A-25XL loudspeaker system is a diminutive reproducer that can fit almost anywhere. Measuring 508 mm (20 in.) by 292 mm (11.5 in.) by 254 mm (10 in.), this walnut enclosure houses a 254 mm (10 in.) woofer and a 25 mm (1 in.) non-rigid dome tweeter. Although the speaker can be placed on any bookshelf (it weighs only 11 kg (25 lbs.), Dynaco provides wall brackets and screws for hanging the speaker directly on a wall.

The system is rated at 8 ohms and speaker connection is made to well-marked terminals in a recessed well on the rear of the enclosure. Also provided is a three-position, rotary tweeter level control with the center station marked *Normal*. Rotating the control adjusts the tweeter level a calibrated amount with clockwise rotation for increased tweeter output. A short but reasonably complete brochure accompanies each speak system so do-it-yourselfers should have no problems in hooking the system up.

Technical Measurements

The magnitude of terminal impedance measured for the three rear-mounted switch positions of *Hi*, *Normal*, and *Low*

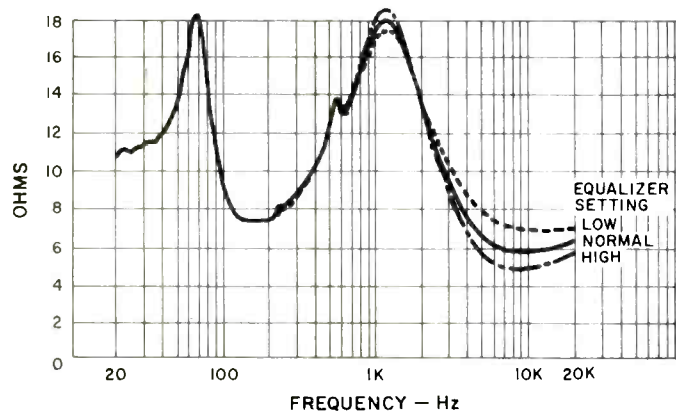
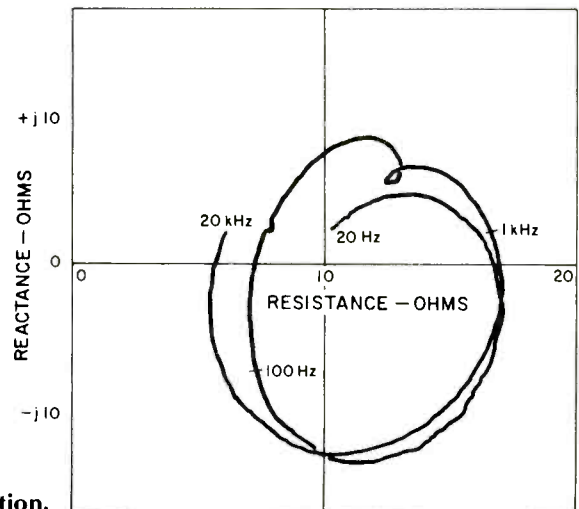


Fig. 1—Magnitude of terminal impedance for three positions of the equalizer.

Fig. 2—Complex impedance for *Normal* equalizer position.



is shown in Fig. 1. The lowest impedance presented to a power amplifier occurs at near 7 kHz with the clockwise, or *Hi* switch position, and is approximately 5 ohms. This is a low enough value that I would recommend against connecting two A-25XLs in parallel if the *Hi* switch position is chosen.

The A-25XL is a vented cabinet with a high degree of acoustic damping in the vent. This gives the unusual looking low frequency tail on the bass resonance peak. The single bass resonance peak at 70 Hz is quite normal, as is the second resonance peak at 1200 Hz which is presumably due to the crossover network. But the subsidiary impedance peaks at 220 Hz and 560 Hz, and the dip at 7 kHz warrant some closer scrutiny.

The polar impedance plots for normal equalizer, and for clockwise, or high, control positions are shown in Figs. 2

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★ **SQUARE WAVE, TRACKING AND INTERMODULATION TEST RECORD STR 112** Enables detailed study of tracking capabilities of stereophonic phonograph pickups. The square wave modulation allows a rapid appraisal of stylus-lip mass, damping, and tracking. Low frequency compliance and tracking are determined by means of 300-Hz bands of progressively increasing amplitude. Intermodulation distortion measurements are made possible by graduated 200-Hz intermodulation test bands. The Str 112 has been cut with vertical angle approximating 15°, which is representative of current recording practice.

★ **BROADCAST TEST RECORD STR 151** Developed especially to meet the needs of broadcast engineers, audiophiles, and other professionals seeking a convenient signal source for the testing and adjustment of all audio equipment. Tests include: phonograph pickup response and separation, speed accuracy at 33 1/3 and 45 rpm, wow and flutter, rumble and hum detection, ballistic test of V.U. meters and many others.

★ **RIAA FREQUENCY RESPONSE TEST RECORD STR 130** Provides RIAA frequency characteristics for the calibration of professional recording equipment and for testing the response of professional and consumer record reproduction equipment. This record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation. Spot frequency bands for use without automatic equipment are included.

★ **318 MICROSECOND FREQUENCY RESPONSE TEST RECORD STR 170** Provides pickup designers and recording studios with a high-level, easily-equalized signal for frequency response and channel separation measurements. The STR 170 employs a 318 microsecond characteristic corresponding to the "test" or "flat" mode common to most disc recording equipment. Constant amplitude recording is employed in the region below 500 Hz with constant velocity recording in the region above. The transition is smooth, in contrast with the STR 100 which employs a sharp breakpoint at 500 Hz. The record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation.

★ **WIDE RANGE PICKUP RESPONSE TEST RECORD STR 120** Makes possible the measurement of pickup response at frequencies far beyond the audible range, where elusive distortion elements can cause audible distortion. The low-frequency range includes glide-tones at twice normal level for the detection and elimination of arm resonance, loudspeaker cone and cabinet rattles. Other tests include: silent grooves for measuring rumble and surface noise characteristics; and standard level bands at 0 dB for overall system S/N measurements. This record is suitable for use with a graphic level recorder to provide permanent, visible records for precise evaluation.

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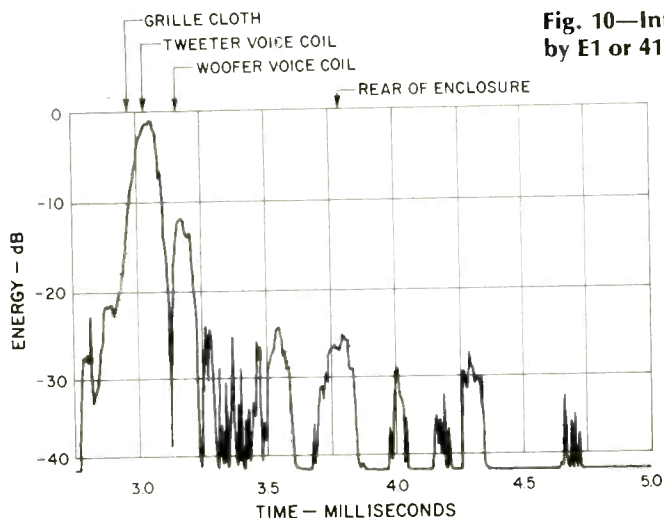


Fig. 10—Intermodulation distortion of A4 or 440 Hz by E1 or 41 Hz mixed one to one.

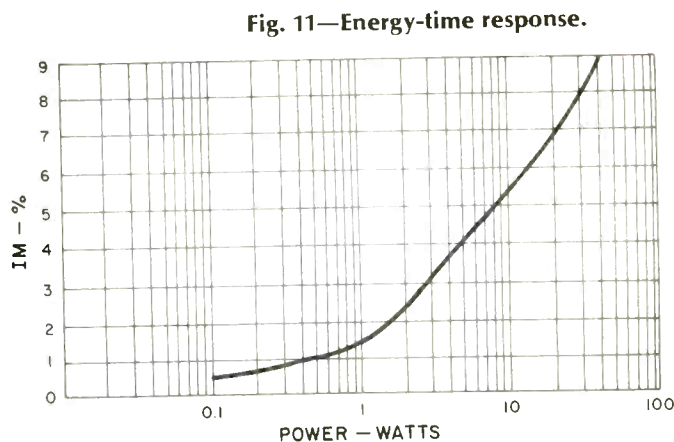


Fig. 11—Energy-time response.

zontal or vertical enclosure mounting is equally good, I found that I quickly preferred a mounting configuration with the long axis placed vertically.

My impression was of good spectral balance for stereo listening, but a mild polar fingering caused me to prefer rotating the enclosures slightly toward the listening area.

The A-25XLs are moderately efficient and can kick up quite a fuss with a reasonable amount of amplifier power. However, I had the subjective impression that the sound was ever so slightly compressed, not distorted, but just a bit compressed on dynamic peaks.

The super low frequencies are absent, and in my opinion

there was a slight midbass peak. But the top end is superb. High frequency transients are reproduced very cleanly. After extended listening, I found that I preferred the treble control in the *Low* position for symphonic music, while some vocals gave a more accurate sound with the *Normal*, or occasionally, the *High* equalizer position.

The reproduction of piano music is moderately good but I felt that it was a bit bright and somewhat compressed on strong dynamics. The stereo imagery is good in lateralization, and there is reasonable depth to the image. Not perfect, but quite good for the price.

Richard C. Heyser

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White Model 140 Sound Analyzer

MANUFACTURER'S SPECIFICATIONS

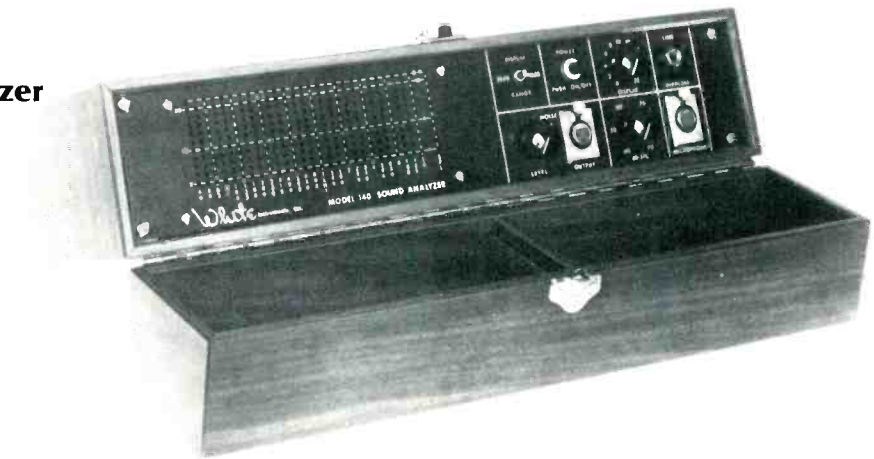
Display: 1 dB steps for 10-dB range, 2 dB steps for 20-dB range, 40-dB dynamic range with attenuator adjustment.

Filters: Meet ANSI S1.11-1971 Class II. Overall response of all 1/3-octave channels ± 1 dB with pink noise from 40 Hz to 16 kHz.

Input Sensitivity: Dynamic microphone, 2.6 microvolts for 40 dB SPL; line, 2.6 mV at 20 k Ohms.

Attenuators: Input, five 10-dB steps; display vernier, 10 2-dB steps.

Noise Generator: Response, 40 Hz to 16 kHz; maximum level, 20 mV (microphone) and 0.5V (line).



Dimensions: Basic unit, 3 1/2 in. (8.9 cm) H x 19 in. (48.3 cm) W rack panel x 7 in. (17.8 cm) D; in portable carrying case, 4 1/4 in. (10.8 cm) H x 19 3/4 in. (50.2 cm) W x 11 in. (27.9 cm) D.

Weight: 8 lbs. (3.6 kg); 18 lbs. (8.2 kg) in carrying case with optional 141 Micplexer.

Price: \$3620.00; additional for Micplexer.

The White Model 140 real-time analyzer provides many useful features in a rugged, compact carrying case. The left half of the front panel is fairly well filled with the 11 x 28 matrix LED display. Ten of the vertical positions are for discrete levels, switchable to one or two dB steps. The top-row LEDs are over-range indicators. Twenty-seven of the horizontal positions are for the 1/3-octave filter output indicators. The standard ISO center frequencies from 40 Hz to 16 kHz are imprinted at the bottom of each vertical row. The most right-hand row indicates the overall SPL (sound pressure level), relative to the standard 20 micropascals. At the upper left of the right side of the panel is the *Display Range* switch which selects either 10 or 20 dB, for 1 or 2 dB per step. Next to the right is the power *On-Off* switch. The adjacent display vernier allows shifting the display over a 20-dB range in ten 2-dB steps. The phone jack line input is at the very right with the overload indicator just below. The built-in pink noise source has two output ranges available at the male XLR output. When the level knob is in, the output is appropriate to mike inputs. With the knob pulled out, the level matches line inputs. A jumper with XLR connectors is supplied to couple the internal noise source to the mi-

crophone input, a self-check feature. The line/mike input attenuator has six positions from 40 to 90 dB SPL.

With the carrying case open, the White 140 is easily tilted to a good viewing angle. The front section of the unit supplied contained the microphone multiplexer available as an option. The case also has space for adapters and other accessories. With the main unit removed from the case as for rack mounting, access is gained to a barrier strip with input, output and scope sync connections. All construction was solid and rugged with high-quality circuit card components in evidence throughout.

Circuit Description

The White 140 includes both mike and line level inputs, with an overload detection on both the preamp and line-amp outputs. The line amp drives the broadband-SPL channel and the 1/3-octave filters through the display vernier and a buffer amp. The filters use an active stagger-tuned design with two pole-pair bandpass responses meeting ANSI S1.11-1971 Class II for better rejection of out-of-band energy. Each channel has its own a.c./d.c. converter and output smoothing, chosen for a good display with pink noise input. The outputs of each of the channels, including

broadband SPL, are scanned every 30 milliseconds, feeding the d.c. levels sequentially to the log amp. The output of the log amp goes to scope monitor terminals and to the level discriminator, which can be set for a 10 or 20 dB display range. The level discriminator sends enable signals to the corresponding vertical position in the LED matrix. The scanner sends the stepping signal for the horizontal position in the matrix, completing the decision process for which indicator, if any, should turn on. The LEDs appear to be continuously lighted, even though each channel is sampled just once every 30 milliseconds, presenting a real-time graphic display of the audio spectrum. The built-in pink noise source utilizes digital shift-register techniques.

Performance

The overall response of the White 140 display was checked by feeding in pink noise from a General Radio Type 1382 noise generator. The LED display was a straight line, and the oscilloscope monitor showed that the response of the analyzer was within a fraction of a decibel over the 40 Hz to 16 kHz range (Fig. 2). Using the built-in noise source, the LED display corresponded very closely, with just occasional out-of-flat indications on a

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couple of the channels. The input attenuator with its five 10-dB steps checked exactly with a precision attenuator. All settings of the 2 dB per step display attenuator were very close with the exception of some slight non-linearity around 2 to 4 dB. The 1-dB steps of the display were within a fraction of a decibel including *Off* and *Over-Range*. The 2-dB steps were within 1 dB over the same range.

The LED display can be switched to either 10 or 20 dB, but the system dynamic range is greater than that displayed. With the use of the display attenuator, it is possible to shift levels and examine the status of 1/3-octave bands that were out of range. The 40 dB range claimed by the manufacturer was met with slight compression at the highest levels, noticeable above 8 kHz. In general, it was possible to see a greater dynamic range on the scope output, but the usual precautions applied about keeping test signals above the noise background and below amplifier overload. The response of two typical filters was measured by feeding in a mixture of 160 Hz and 2.5 kHz (Fig. 3). The level at 160 Hz was set high purposely to cause some compression in the display. The adjacent octave responses of the 2.5-kHz tone were down 30 dB, meeting ANSI S1.11-1971, where pertaining to Class II filters. All filters were centered accurately to ISO standard frequencies.

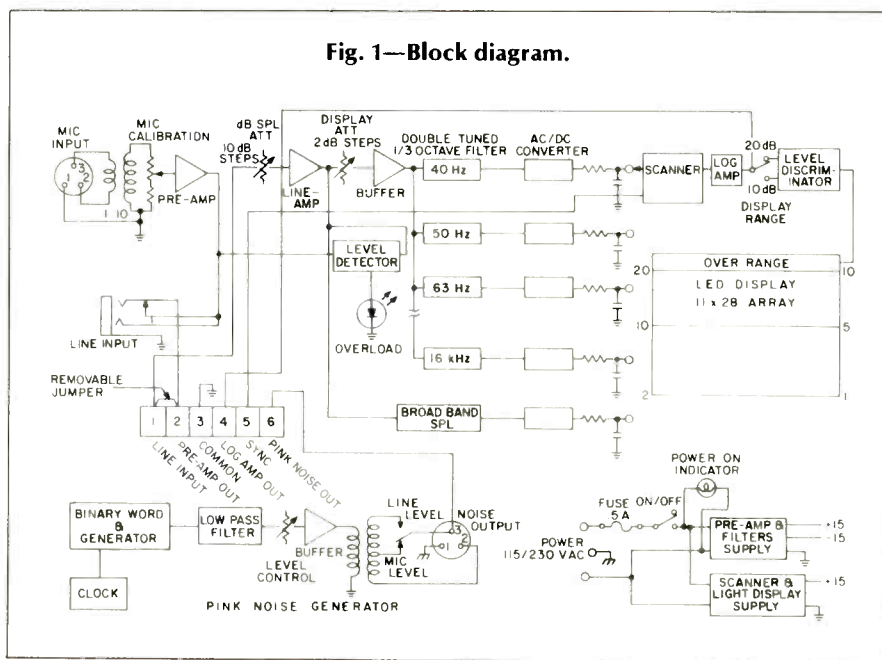
The sensitivity of the microphone input ranged from 2.6 microvolts to

7.5 mV, substantially the same as specified. An attractive feature of the White analyzer is its ability to read actual sound pressure levels, over a range from 40 to 110 dB. As supplied, the unit was calibrated for a microphone with a -56 dBm sensitivity. There is an internal gain adjustment to accommodate to other sensitivities within 3 dBm. A check in a random noise field with reference to a precision sound level meter gave evidence that the calibration was within a decibel. Adjustment of the pot was somewhat difficult, however, and would be improved if there was access from the outside of the chassis. The specified line input range was matched at the low end and exceeded at the high end with a range from 2.6 mV to 5.2 V. The noise generator output was adjustable up to 20 mV in microphone mode and up to 0.5 V in line mode.

Brief checks were given to the battery-powered microphone multiplexer, available as an option. The three microphone channel gains were close to 60 dB and within 1 dB of each other. The output of the Micplexer was not affected by line length, although the unit itself had a slight droop of 1 dB at 16 kHz.

In-use Tests

The White 140 real-time analyzer received for review was mounted in the attractive carrying case, complete with the optional Micplexer in the cover. For the series of tests in actual use, the analyzer was removed from



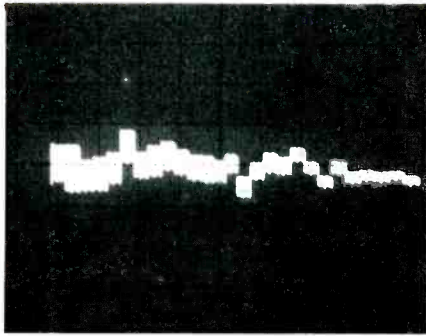


Fig. 2—Display of pink noise from General Radio 1382 generator in vertical 1 dB divisions.

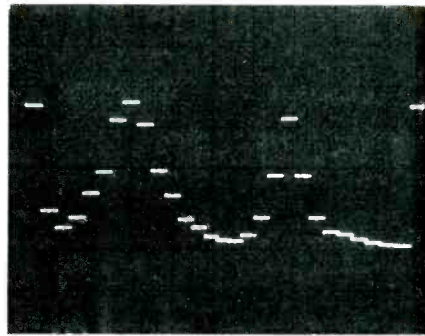


Fig. 3—Display of 160 Hz and 2.5 kHz with the 160-Hz level into compression. The 2.5-kHz response is down 30 dB at 1.25 and 5 kHz. Shown in 10 dB vertical divisions.

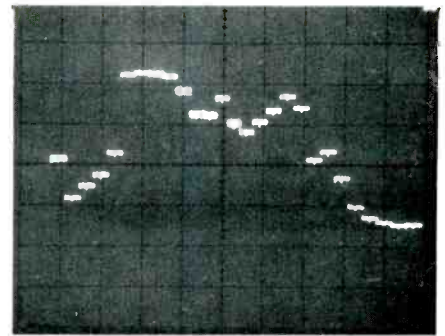


Fig. 4—Sound system response in church before equalization.

Fig. 5—Sound system response after equalization, including low-end roll-off and feedback suppression. Measured in 5-dB vertical divisions.

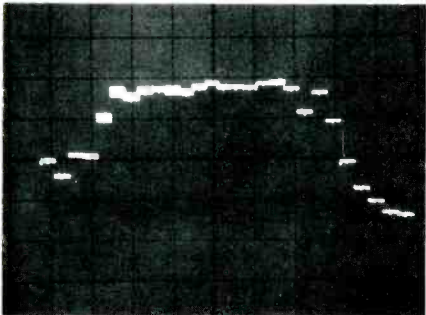


Fig. 6—Actual equalization inserted by UREI 529 for system response in Fig. 4.

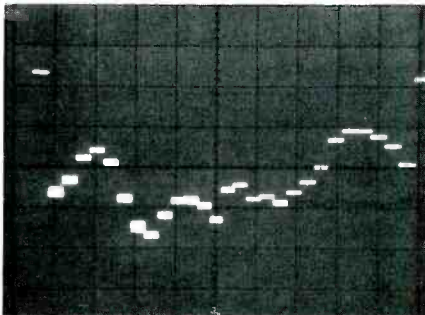
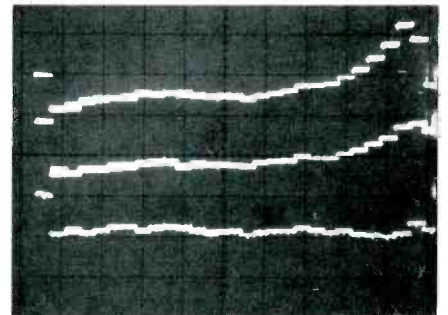


Fig. 7—Tape recorder record/playback response using a Sony 352D and Maxell UD tape. Top trace: Maxell UD on normal; middle trace: Maxell UD on special; and bottom: Maxell UD with equalization with Soundcraftsmen 20-12.



its case and mounted in a portable rack along with a UREI Model 529 1/3-octave room equalizer. The response of a church sound system using the pink noise source is shown in Fig. 4. After equalization, the response was basically flat out to 4 kHz. The lowest frequencies were then rolled off to remove some boominess and to improve speech intelligibility (Fig. 5). Figure 6 shows the equalization that was added to achieve the response shown above and to add some feedback suppression. The 140 was very easy to use in pinpointing troublesome frequencies. Its high sensitivity allowed examination of the spectrum at very low sound levels in the sanctuary. Even slight tendencies to feedback could be observed, facilitating increases in system gain while simultaneously eliminating any ringing. The combination of the real-time display, both LED and scope, wide dynamic range, built-in noise source, and good sensitivity had proven the analyzer to be an accurate and worthwhile instrument for room equalization.

The combination of the White 140 and the UREI 529 were also used in a

portable PA system at two graduation ceremonies. Success was demonstrated by the number of comments received on "excellent clarity" and the complete lack of any ringing. It had been thought that the LED display would not be usable outside in bright light, and while direct sunlight did wash it out, shielding made the display easily read. The White unit was put into service for a fast determination on what to do with an untried recorder/tape combination. The pink noise output of the 140 was fed to the recorder which was set first to *Normal* (Fig. 7, top trace), and then to *Special* (middle trace) during recording with simultaneous playback. It is easily seen that the *Special* setting provides much flatter response. The bottom trace shows the record/playback response obtained with some equalization from a Soundcraftsmen 20-12. (The positions of the traces are shifted for illustration purposes.) The White 140 sound analyzer with its built-in noise source can also be used for head alignment checks and bias adjustment, program content monitoring, setting up noise-masking

systems, and so many other things that a 1/3-octave real time analyzer can be used for.

The instruction book is of good length, with all required information clearly presented. (For greater detail on the equalization process, other sources are available including a pamphlet from White.) There are no detailed schematics or board layouts supplied, which is in keeping with the manufacturer's recommendation that internal maintenance should be at the factory. A plastic overlay for the LED matrix is supplied which can be marked for record or for guidance. A word of commendation should be given on the Micplexer which scans the outputs from three microphones providing a spatial averaging of the sound field. This is *not* the same as mixing three mikes which is actually a voltage addition that can generate a very distorted picture of the actual distributed sound field. The Micplexer is a useful accessory to the White 140 sound analyzer, which promises a good return on the financial investment required. H. A. Roberson

Check No. 66 on Reader Service Card

Crown M600 Mono Power Amp

MANUFACTURER'S SPECIFICATIONS

Power Output: 600 W rms in 8 Ohms with 0.05% THD from 1 Hz to 20 kHz; 1000 W rms into 4 Ohms with 0.05% THD from 1 Hz to 15 kHz.

I.M. Distortion: Less than 0.05% from 0.01 to 0.25 W and less than 0.01% from 0.25 to 600 W into 8 Ohms.

Slew Rate: 16 V/mS.

Damping Factor: Greater than 800, d.c. to 400 Hz into 8 ohms.

Input Sensitivity: 3.46 V rms ± 1 per cent for 600 W rms into 8 ohms.

Signal-to-Noise Ratio: 120 dB.

Dimensions: 19 in. (48.3 cm) W x 8 3/4 in. (22.2 cm) H x 16 1/2 in. (42 cm) D.

Weight: 92 lbs. (41.7 kg).

Price: \$1795.00.



When I unpacked the M-600, it was clear this was no toy. The unit weighs 92 lbs. and has an industrial look I immediately liked.

Viewing the amp from the top through its perforated screen, one can see two large power transformers, each secured by four bolts to the chassis and by two additional bolts to the front plate. This arrangement is indicative of the care Crown has taken to make this amp suitable for commercial applications. I've seen the power transformers of less sturdy units literally fall out of their chassis from shocks and vibrations during transportation and set-up.

The M-600 utilizes a unique type of heat sink. Unlike the extrusions found on most units, they have a corrugated internal structure especially built for forced air cooling and which has much more surface area than extruded heat sinks of equivalent size. There are eight of these "refrigerator sinks" mounted four on the top and four on the bottom of a side-to-side oriented wind tunnel fed by a thermostatically controlled, two-speed cooling fan on the right side.

The front panel includes a peak-reading power meter, calibrated for 600 Watts at 0 dB, and two indicator lights, one red light which can be calibrated to come on at or a specified number of dB below maximum output, and a green one which lights at a calibrated number of dB below the red light setting. I've never seen an arrangement like this before but soon learned to appreciate its usefulness.

Directly below the meter is a plug-in compartment with an input attenuator control and an input coupling switch offering either capacitor or direct coupling. This compartment also houses a blank plug-in P.C. card

which allows user-designed circuitry to be interfaced to the input of the amplifier. More about this card and its possible uses later.

The front panel is finished off with a heavy-duty push button power switch and two massive rack handles secured by Allen bolts. The panel itself is made of thick aluminum stock and is reinforced with an extrusion along the bottom. This extra-strong panel is impressive, and its layout is logical and aesthetically pleasing.

The rear of the unit houses the input and output connectors, two switches—one for the protection circuit and one for a turn-on delay—and has a special socket for stacking two M-600s together in bridge.

Circuitry

The M-600 circuitry is very similar to that of the DC-300A, i.e. op-amp input, quasi-complimentary output. It is basically a bridge amp with one important difference, one side of the output is grounded. In a bridge configuration, there are two amps driven out of phase with a load bridged across their outputs, resulting in one amp with twice the voltage capability. The slave half of the bridge gets its drive from the output of the first amp. Its circuit is essentially the same except that the load is presented to the collectors of the output devices. This is because the output of the slave is tied to ground. Now, if the output is tied to ground, something has got to give and that something is the power transformer windings.

The power supply is floating and the windings swing up and down with the signal. In that the load is in the collector of the output transistors, this stage exhibits a voltage gain, rather than unity gain as in the more com-

mon emitter-follower configuration. Because of this, the driver stage has to swing only a small fraction of the total signal excursion and hence requires less supply voltage.

Certainly a novel circuit, but one wonders however about the effects of the winding reactance of the power transformer, as this presents a more complex load to the output of the slave. Also, it is reasonable to assume that since the signal passes through twice as much circuitry on the slave side, resolution will suffer, since two amps in series must, by definition, produce a greater change in terms of harmonic complexity. This circuit topology does, however, have some important advantages, namely that two M-600s may be bridged together for up to 2000 watts and there are industrial applications where a grounded output is required.

(Editor's Note: Crown designers believe that the filter capacitors should dominate any load.)

The protection circuit utilizes current limiting while producing no fly back transients. It also senses any d.c. component in the output and switches the amp to standby. This latter function may be defeated by use of a switch on the back panel.

On the P.C. card in the front compartment, ± 15 Volts is available for user-designed circuits. Any number of nifty ideas could be implemented here, crossovers, limiters, isolation networks, etc.—a real convenience feature! The potential of this is only limited by one's imagination.

Measurements

We had to construct a special brine tank in order to measure the M-600s maximum power capabilities. Two electrodes were immersed in the

brine solution to specified depths, which determined the impedance between the electrodes. The impedance was periodically checked by monitoring the current as the brine solution evaporated. This gave us an accurate 3000-watt load resistor. With a 1 kHz-signal, we measured in excess of the rated 600 watts at 8 ohms, 1000 watts at 4 ohms, and 1300 watts at 2.7 ohms.

This amp measures well and exceeds its specifications for harmonic and I.M. distortion. I'm not going to show a harmonic or I.M. distortion graph because I've found that distortion measurements of this kind do not correlate with what an amp sounds like if the distortion magnitudes are below 0.25 per cent. There is, however, a probable correlation between sound and the nature of the distortion residual, i.e. its harmonic structure, and it seems logical that the higher order harmonics would be more offensive.

The Crown's distortion residual was primarily 2nd and 3rd order harmonics with crossover notches which were both steep and of fairly low magnitude. Examination of these notches with a spectrum analyzer reveals a splattering of higher order harmonics, mostly odds, to the upper ranges of the analyzer. The magnitude of these harmonics tapers off as the order increases. I don't know what all this truly means though I've always thought that odds sounded worse than evens, but at those magnitudes one wonders how the ear could detect it. Still, every amp has a sound of its own.

Applications & Conclusions

Back to reality! We took the M-600 out on the job to find out what it could do. The job was high-level sound reinforcement, the acid test for any piece of equipment.

This amp performed! It's tremendous power capability was immediately apparent, and it had an effortless about it regardless of how hard it was driven. It's very stiff power supply allowed the amp to be driven into clipping without folding up. It has the best overload characteristics I've ever encountered in a high-power amp.

The efficient heat-sinking system results in a cool-running unit. It was driven for extended lengths of time into 3-ohm loads with the meters pegged. It just won't shut down. The fan switches to high speed but the unit never gets hot.

I tried in the lab to find out just how

long it would run into a 3-Ohm load before the thermal breakers open. I had to give up as the circuit breakers in the building couldn't stand the load.

Another important consideration in evaluating an amp is stability. Some amps will work well in a home hi-fi installation, but when placed in parallel with other units or with long cables attached to their inputs, they turn into oscillators and self-destruct. This is not the case with the M-600. It demonstrates rock-hard stability, refusing to oscillate under any conditions. I've worked with many amps under wildly adverse conditions, and considering the M-600s overall performance, I feel this is the best amp for sound reinforcement I've so far encountered. It has fantastic bass. The midrange is very clear, slightly on the hard side, but no more so than any other high power transistor amp. It projects and articulates the individual sounds of vocals and instruments well. The high frequencies are slightly grainy, however, I doubt this unit would be used for driving tweeters as its extreme power capabilities would be wasted. Rather, I believe some mellow tube amp should be used for the highs. It is also worth mentioning that the amp will drive highly reactive loads without the limiter activating.

If you are going to use this amp for sound reinforcement, here are some suggestions. First, since it is susceptible to contamination through the cooling screen on the top, mounting this unit in a suitable cabinet is advisable. Second, if the amp is used for bass, the low-frequency protection circuit should be deactivated by use of the switch on the back. This circuit switches the amp to standby if more than 10 volts of d.c. is present in the output, and it is prone to activation by microphone popping and various other low-frequency transients.

Finally, some type of rear connector panel would be handy. The dress panel already there may be reworked for this purpose (speaker connectors, fuses, etc.). We removed the dress panels on our amps and replaced them with wood.

I've grown to respect this amp. It's fairly expensive (\$1795.00), but not when you consider the cost of purchasing a not-so-industrial amp and installing the cooling system necessary to make it reliable.

At a respectable \$1.79 a watt with a 4-ohm load, it is a cost effective tool for the professional. *Ed Goldman*

Check No. 67 on Reader Service Card

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On the other hand, unlike the little "underground" audiophile reviews, The Audio Critic recognizes the journalistic obligation to meet deadlines and show up in your mailbox on schedule. Not at six-month or nine-month intervals, or possibly never again . . .

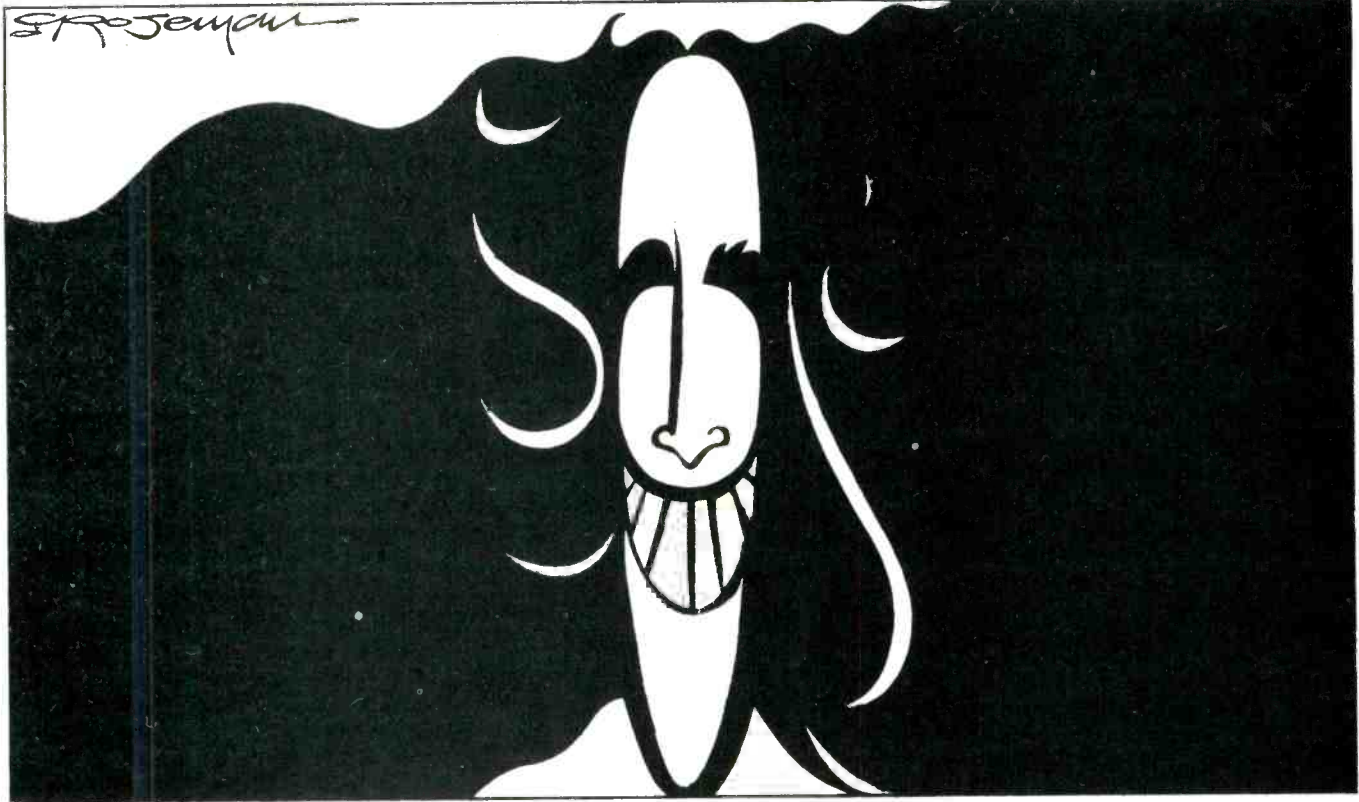
Also unlike the undergrounds, The Audio Critic has the professional depth (and capital!) to operate its own, in-house laboratory facility, complete with spectrum analyzer, highly specialized signal generators and other sophisticated test equipment. These are used as an indispensable check on The Audio Critic's subjective, "golden-ear" evaluations, which of course have top priority.

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The column



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Hasten Down the Wind: Linda Ronstadt
Asylum 7E-1072, stereo, \$6.98.

On Linda Ronstadt's last album, the title, **Prisoner in Disguise**, in retrospect is a succinct critique of an album trying to follow the successful format of the very successful efforts just before it. Happily, **Hasten Down the Wind** breaks the mold, with Linda's first heartrendingly emotional singing in years, combined with Peter Asher's typically immaculate production and some nervy arrangements courtesy of

Andrew Gold and Kenny Edwards. Tracy Nelson's best song, *Down So Low*, could have been outright disaster area of schmaltz. However, a full chorus instead of the expected string arrangement deftly pulls the song off. *Rivers of Babylon*, from the movie soundtrack of "The Harder They Come," is sung in perfect three-part, a cappella gospel style and leads into Orleans near-reggae song *Give One Heart* exactly right.

The album's discovery is Karla Bonoff, who contributes no less than

three songs, most notably *Lose Again* and *If He's Ever Near*. Ms. Bonoff has made an auspicious debut.

A further departure is that Linda has co-written a pair of songs, the gorgeous Spanish song *Lo Sienta Mi Vida* and *Try Me Again*, a C&W instant classic.

Asher's production is the epitome of clean and strong sound. What it required and got was a Linda Ronstadt sounding involved. **Hasten Down the Wind** is a sturdy, strong album. *M.T.*
 Sound: A- Performance: A-

...out of love, hope, and suffering:
 Frankie Armstrong
Bay 206, stereo, \$6.98.

Frankie Armstrong is a singer of traditional English folk ballads and contemporary story-songs of enormous intensity. The only other album she has in this country is on The Antilles label (see *Audio*, September, 1976). This set has a few more contemporary songs, notably two Peggy Seeger

songs, the classic feminist anthem *I'm Gonna Be an Engineer* and *Too Much of a Good Thing*, Brian Pearson's *Bridget and the Pill* and Frankie's own *Doors to my Mind*. The traditional ballads tend to feature especially powerful women characters as in *Lord Bateman*, *Prince Heathen*, and *William Taylor*.

The accompaniment is stark and sparse, just enough to put the story

over with peak intensity. The recording is crystal clear with fine presence and accuracy. The camaraderie of music played by friends, especially in totally acoustic situations like this album, is a valued plus. The album's title is apt and honest.

For information write to Bay Records at 1516 Oak St., Alameda, CA. 94501. *M.T.*
 Sound: B+ Performance: B+

15 Big Ones: The Beach Boys
Brother MS 2251, stereo, \$6.98.

It isn't 1956, or 1966, but the year is 1976 and The Beach Boys are to many a listener a relic from an age gone by—there has never been a rebirth of the surf, just a nostalgic longing for days of yore. The Beach Boys are the only remnants left from an era when rock music was more interested in reaching your average surfer or car hop than drug fiend, but as the Beach Boys slipped into psychedelics they lost their mainstream audience and gained a cult following of pop hippies. With a new album, produced by Brian Wilson (who hasn't been particularly active in Beach Boys affairs during the Seventies), you've got an audience full of mixed expectations. A lot of people like to listen to the Beach Boys to stir memories, so it's pretty near impossible for them to come up with something new and please their audience at the same time.

So they decided to have fun instead, and do versions of two Phil Spector songs (one of Brian Wilson's major influences, so he chose to sing both songs), the hit *Rock 'n' Roll Music* (I wish it sounded as good over a good stereo as it did over a car radio), *Talk to Me* (forgettable), *Palisades Park* (Carl's shining moment on the album), *A Casual Look* (weak), *In the Still of the Night* (dull), and *Blueberry*

Hill. I can't argue with the choice of material as I wouldn't think the Beach Boys would have to resort to outside material with perhaps the greatest melodist around back in the group, but let me just suggest that *I Can Hear Music* beats all of these into the ground.

As for the originals, *Suzie Cincinnati* is an old single flipside but quite pleasant, *It's OK* isn't bad at all, *TM Song* is, *Had to Phone Ya* is conceptually all right but not well executed, *Everyone's in Love With You* is not the best song Dennis has written, *Talk To Me* is mildly charming, *That Same Song* is awkward, and *Back Home* is great only because Brian's new earthy singing makes it so. Some people may miss the sweetness in Brian's voice, but his newly-acquired soulfulness is, for this listener, the only new thing to be heard on **15 Big Ones**.

Sure, it's better than the new Carly Simon and Starbuck albums. But why not the live version of *The Letter* recorded in Hawaii 10 years ago with Brian singing lead? Why not the legendary *Shortnin' Bread*? I'll take 1966 outtakes over this anyday, but I'll take this if it's all I can get, for now. And if Brian is really back, I expect to see a little more evidence next time around. J.T.

Sound: A— Performance: B—

Run With the Pack, Bad Company
Swan Song SS 8415, stereo, \$6.98.

Above all, this is an honest album by a group with both feet upon the ground, both hands in the cash register, and a fairly realistic regard for the record industry. The record is honest because the positive and negative attributes of the band are fully exposed, and the group comes out ahead. So what if Mick Ralphs' lead guitar playing isn't so hot?!

Both he and Rodgers are quite capable songwriters, Rodgers' voice is enough of a lead instrument to carry it, Mick's rhythm guitar ka-chunk serves the purpose of a substitute Keith Richard well enough, and the rhythm section (Simon and Boz) keeps things curt enough so that the point is always driven home. Nobody said this was a virtuoso progressive rock band—the last album was a feeble attempt at a progression from the previous and failed miserably—but Rodgers, Kirke, Burrell, and Ralphs have returned to the style which they used on their first album (**Son of Free**) and with much success. Yes, this is a highly enjoyable album in the rock 'n' roll tradition.

But not exactly innovative. Bad Company does indulge in the highly lucrative and certainly not disrespectful art of plagiarism, copping

(Continued on next page)

Raspberries Best Featuring Eric Carmen: Raspberries

Capitol ST-11524, stereo, \$6.98.

Shake Some Action: Flamin' Groovies
Sire SASD 7521, stereo, \$6.98.

The Raspberries finally have the sort of gone-but-never-to-be-forgotten status now that Eric Carmen has made it to the top on Arista Records, and Capitol (his old label) actually took a certain amount of care in assembling this complicated compilation. They were, perhaps, the leaders of the Back-to-the-Sixties movement that kicked off the Seventies; Big Star never cracked the radio barrier despite several excellent albums, Blue Ash

barely raised an eyebrow, and the New York Dolls died peacefully.

Now the Flamin' Groovies (a West Coast rock'n'roll band that's been around for ages) are trying a similar sort of thing, but my guess is that they don't have a chance. They try to emulate the early Stones and Beatles, but besides not having a distinct sound of their own, the only conclusion reached on **Shake Some Action** is that there is not a single point of common ground between the Stones and the Beatles. Dave Edmunds, a clever

sound man enlisted as producer here and also a fine artist in his own right, can neither lift the Groovies beyond a lame vocal sound nor above the material, which is consistently mediocre. The title cut and *You Tore Me Down* are the best things here, but considering that their last album, **Teenage Head** (released four or five years ago), was pretty good, this disc as whole is a letdown. Maybe they don't need a singer...but they need something. J.T.

Raspberries

Sound: A— Performance: A

Flamin' Groovies

Sound: B— Performance: C



lines and riffs from Chuck Berry, The Beatles, and the Rolling Stones with cunning expertise. Mick Ralphs is the better hand at this, for he also lifts things from previous compositions of his mate Paul Rodgers; check the strong resemblance of *Live for the Music* and *Simple Man* particularly to Rodger's songs on the last **Free** album, **Heartbreaker**, and you'll see what I mean. But Bad Company hardly invented this art, they merely continue in the tradition of the Stones, the Beatles, the Kinks, and all of the other rockers who built their reputation upon the moribund licks of the past. **Run With the Pack** is a likeable album, but I truly hope that two or three albums from now they will be ready to take a step. At least a little one.

Jon Tiven

Sound: A Performance: A-

Below the Belt: Boxer
Virgin V2049, stereo, \$6.98.

It's inevitable that anyone who's got any distinctive talent and persists in the music business will make some sort of impact by the time the Seventies are over. So far, the ranks of current rockstars haven't been joined by fresh, youthful blood—ever notice that while the Beatles were in their early twenties when they hit, most Seventies popstars aren't emerging until their mid-to-late twenties? Although this writer had his doubts about a group called Patto making it four years ago despite their cleverness & talent, my guess would be that this recent reincarnation of Patto, which calls itself Boxer, will sell some records.

The two key men from the old group are Mike Patto (vocals) and Ollie Halsall (guitar/keyboards) who write the songs. This is one of the tried-and-tested teams of the music industry, having been together for about eight years in all sorts of groups. Mike's a good, gruff, aggressive singer and a fair songwriter; Ollie, on the other hand, is one of the most innovative and technically astounding guitarists ever and fully deserves the crown once foolishly tossed upon the head of Alvin Lee. And the only reason he might not get it is because Boxer barely exploits his talents.

I mean, why are there only one or two guitar solo excursions on Boxer's debut album? Why is Ollie only allowed one composition on his own when that particular tune, *Waiting for a Miracle*, is the outstanding track on the LP? No matter. Fate will probably



rule Boxer a success by this time next year, despite the lack of blinding fingerwork, and we can only hope that Boxer will live up to their potential to make brilliant records. In the meantime, we'll have to put up with ones like this, which are merely good.

Jon Tiven

Sound: A- Performance: B+

Keep Your Hat On: Jess Roden Band
Island ILPS 9349, stereo, \$6.98.

Jess Roden is no newcomer to the age old Rock Wars. In fact, this is the second album under his own name after being in several bands that successfully avoided any great fame. This one's all his own show and it's the best thing he's ever done.

The band is strong and funky, controlled yet emotional through a veri-



table maze of material, from Dr. John's *Mama Roux*, to the Eagles' *Desperado*, and the wonderfully bizarre Randy Newman title song. Even the C&W ballad *Too Far Gone*, last done by Emmylou Harris, is convincing.

The originals are funky and clever, especially Jess's own *Jump Mama, In a Circle* by guitarist Steve Webb and bassist John Cartwright, and Cartwright's *Send it to You*.

Geoffrey Haslam's production is clean and sparse enough not to get too much in the way of a band that already knows what it's doing. The sound is generally hot though *Too Far Gone* comes over a bit soft. **Keep Your Hat On** and the emergence of Jess Roden continues Island's tradition of giving classy artists plenty of rein to make music they can all be proud of.

M.T.

Sound: B Performance: B+

Farther Along: Spirit
Mercury SRM-1-1904, stereo, \$6.98.
All Alone in The End Zone: Jay Ferguson
Asylum 7E-1063, stereo, \$6.98.

With no small amount of hope the Spirit of **Farther Along** reunites 4/5 of the original band of the late '60s. The only missing alumnus is Jay Ferguson whose first solo effort since Spirit and the defunct Jo Jo Gunne arrived almost the same day, thus inviting comparisons between the two albums.

Unfortunately, what Spirit's album lacks is spirit. The album is quiet and moody to the point of inducing sleep. Nearly every track is laden with enervating string and horn arrangements. In addition the band as constituted on the album doesn't exist anyway since bassist Mark Andes is fully involved with Firefall who show every indication of becoming hot. The final give-away is the Montovanni-esque wordless treatment of *Nature's Way*, one of Randy California's best songs ever. Done this way it does not belong on a Spirit album. You can't go back.

Meanwhile Jay Ferguson made a rock and roll album aided by a superb band featuring Joe Walsh and energetic drummer Joe Vitale. It has sound sharp and hot enough to virtually jump through the speakers, quite the opposite of the Spirit album.

The fly in Ferguson's ointment is the material. The two best songs are the two oldies, Traffic's *Medicated Goo* and *To the Island* recycled from the Jo Jo Gunne songbag. Both of these are more memorable than any of his new songs. While the sound is right, the band solid, and Jay in good voice,

somehow conviction and assurance are lacking. The album's confusing cover again clues to the content. Jay Ferguson is too clever a writer and too good a performer not to rebound. In that sense **End Zone** is a decent fresh start. M.T.

Spirit

Sound: C- Performance: F

Ferguson

Sound: C+ Performance: C

Whistling Down The Wire: David Crosby/Graham Nash
ABC ABCD 956, stereo, \$6.98.

David Crosby and Graham Nash are, of course, the less flashy half of that famous non-group. As a duo, **Whistling Down the Wire** is their third album and clearly the best to date. It distills their strengths, omitting the trite and silly while covering the full range of their talents.

The album opener is the nicely ironic *Spotlight* which compares the performer/writer with those who live their lives through his songs and show. *Broken Bird* tells the story of a glass bird and a hammer and what they did to a fine relationship. After Crosby's love song *Time After Time* is his wordless composition *Dancer*,

which he has done nothing like since his solo *If I Could Only Remember Their Names*. The piece is fully realized with a perfectly lovely string arrangement. Followed with Nash's mild but mighty rocker *Mutiny*, the two pieces combine into the disc's strongest one-two punch.

JB's Blues, Nash's song to friendship, dovetails to the haunting *Marguerita*, a flip side to *Lady of the Island* from **Crosby, Stills and Nash**. Taken at *All and Foolish Man* both explore the questioning theme of the value of this musical path and answer the issue in the gorgeous *Out of the Darkness* which closes the album with hope.

With the solid support of Craig Doerge, David Lindley, Danny Kootch, Russ Kunkel, and Tim Drummond and given the loving, warm sound it projects, **Whistling** is a strong and positive album. M.T.

Sound: A- Performance: B+

Songs of The Tall Ships: The Starboard List

Adelphi AD 1025, stereo, \$6.98.

The Starboard List is Britishers Charles O'Hegarty and David Jones with American Peter Marston, all of them veterans of the sea, among oth-

er things. Their album is an entertaining and illuminating collection of traditional sea songs and shanties with the occasional hand-written but related song thrown in. Thus, the set includes Hamish Henderson's *Farewell to Sicily*, O'Hegarty's *Classic Yankee Clipper* and *Farewell to Tarwathie* written by George Scroggie in 1850 and popularized a few years ago by Judy Collins.

The instrumentation is appropriately sparse, close to the tradition, mainly concertina or pennywhistle with a guitar or two perhaps, with a couple songs performed with an ensemble led by producer John Townley. Each member of the List has his turn singing lead, each of them ruggedly impressive. The ensemble singing is wonderfully stirring. Beside intelligent choice of material to cover as much as possible, the List has avoided cutesy sound effects which more often than not backfire. The explanatory liner notes are welcome.

The recording is of professional quality and never intrudes on the exuberance of the performance. **Songs of the Tall Ships** is a finely wrought album and good fun, too. M.T.

Sound: B- Performance: B+

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Theater MUSIC

Donald M. Spoto



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Pacific Overtures: The Original Broadway Cast.

RCA Red Seal ARL 1-1367, stereo, \$6.98.

Over a century ago, the first serious international relations between America and the Orient began with the expeditions of our Commodore Perry. A short time later, Perry wrote in his journal: "If they are not prepared to accept our reasonable and pacific overtures, then I am prepared to bring them into our civilized world by whatever means necessary."

Pacific Overtures. It might sound like Rodgers and Hammerstein. But it is very far from that indeed. Stephen Sondheim, who gave us **Company**, **Follies** and **A Little Night Music**, wrote

music and lyrics for a new kind of musical theatre. It would be inaccurate to call it either a musical about history, or even a political musical (although there are elements of both). What the show settles in the mind as, is a bridging of cultures—musical, theatrical and dramatic. The story is staged by an all Asian cast; the style is a curious mélange of Kabuki and Noh traditions; the music is a mixture of Eastern and Western modes. It's a very mixed pudding, but it works. Sondheim's score—always inventive—has the energy which John Weidman's somewhat arid book does not.

This original cast album brings the score and lyrics to life in a way the performance I saw did not. The stag-

A conference during the recording of *Pacific Overtures* with Mako, the show's star; composer-lyricist Stephen Sondheim; and record producer Tom Shepard.

ing was so lavish, the orientalia so bright and brittle, that one needs this disc to ponder the words and savor the score. The opening number, *The Advantages of Floating in the Middle of the Sea*, establishes the atmosphere of a delicate world unready for foreign invaders, and it is followed by a tender and sad ballad (*There Is No Other Way*) in which a couple reflects on the painful duties imposed by a threat they do not understand. (One quickly recovers from the shock of

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hearing female roles sung by men on this disc—it's all part of the tradition to which Sondheim is faithful.) There's an effortless aptness to the Japanese flavoring of *Chrysanthemum Tea*, and the composer's own favorite, *Someone in a Tree*, may be the most pointed meditation on growing old that we have in American musical theatre. *Pretty Lady* is a disarmingly pretty ditty—sung by three sailors about to seduce a naive girl—and stings and horrifies when you listen carefully. There's much more to admire in this score, even when it patently imitates (*par homage*, one presumes) Gilbert and Sullivan (as in *Please Hello*), or when it comes dangerously close to pushing too hard (as in the concluding number for an augmented cast, *Next*).

I admire the courage of **Pacific Overtures**. Like all the previous Sondheim-Price collaborations, it refuses to be bound by convention or audience expectation. The recording has already won the Grammy for best original cast. I like it, in fact, better than the show, in which the music and lyrics frequently float out to the middle of some overbearing theatrical sea.

Porgy and Bess and **Showboat**: Symphonic Syntheses. Maurice Abravanel and the Utah Symphony Orchestra. **Vanguard Everyman Classics SRV 345 SD**, \$3.98.

Here is an absolutely delicious record, one to be savored over and over and over. Often the people with great musical works like **Porgy and Bess** and **Showboat** is that you don't want to hear the entire score, and the many recordings by various vocalists seem to be excuses for displaying their own, rather than the composer's, particular style. On this splendidly produced, elegantly performed version we have symphonic syntheses of the works that just fill the bill. In this year when American music is getting a fresh look, we have an added reason to rejoice and be glad.

Gershwin's **Porgy and Bess**—whether one considers it opera or something very close to opera—has such a flood of moving melodies, and such rich melodic inventiveness, that it is hard not to be swept up in the authenticity of its emotion and the tender ingenuousness of its feeling. Without condescension or flippancy, the composer borrowed from American black folk music, spiritual and gospel songs, street cries, work chants, play songs and ethnic dances.

AUDIO • NOVEMBER, 1976

It is something of a national treasure as the perdurance of its major arias—*I Loves You, Porgy; Bess, You is My Woman Now; It Ain't Necessarily So; Summertime; I Got Plenty o' Nothin'*—witnesses. The orchestration and arrangements by Robert Russell Bennett are expert craftsmanship itself: the lazy, croony woodwinds are never overdone, the right flavor of tambourines comes forth at the right moment, and the strings are augmented when it is apt.

And Charles Miller's arrangements of themes from **Showboat** are every bit as good. Its sentimental, melodramatic plot may be considered less than successful, as Nat Shapiro points out on his astute jacket notes, but there is no doubt about the importance of Jerome Kern's score. Three film versions and hundreds of productions testify to that. *Old Man River, Bill, Can't Help Lovin' Dat Man, You Are Love and Make Believe*—these are as distinctively American, and as instantly recognizable as the national anthem. I think their appeal (and arranger Miller has understood this) lies in the direct approach to a feeling. The lyrics, if you remember them, are everywhere right. But you don't really need them once you've heard them! And this record proves that. Once you've known the context, you can let it get a little fuzzy. Kern's melodic sense creates its own freshness, its own inchoate charm with every hearing.

I am terribly glad about this record. It is long overdue. Maurice Abravanel and the Utah Symphony, whose work is so often astonishingly alive compared to, let's say, other major cities' recordings, here turn in a proud deed. This is a record to treasure.

David Raksin Conducts His Great Film Scores: *Laura, Forever Amber, The Bad and the Beautiful.* New Philharmonia Orchestra.
RCA Red Seal ARL 1-1490, stereo, \$6.98.

Steiner's music for *Gone With The Wind* is probably the only other instantly recognizable theme besides David Raksin's haunting melody for *Laura*. It is interesting to hear the languor the composer seeks from his orchestra; phrases usually not caressed so lovingly become studies in *ral-lentandi*. It's really sensuous music. But it's only one-third of one side. The other film scores represented (*Forever Amber* and *The Bad And The Beautiful*) range from banal to sloppy. Utterly forgettable. The disc was nicely recorded—but was it really necessary?

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Edward Elgar: The Kingdon. London Philharmonic Choir and Orchestra, Adrian Boult, conductor. **Connoisseur Society CS 2089**, 2 discs, stereo, \$13.96.

This pellucidly beautiful oratorio, first performed in 1906, forms a trilogy of great Elgar works which are being given rightful attention. *The Dream of Gerontius* and *The Apostles* are better known, but this deserves serious reception too. Who but a devout Englishman—and one with a strong literary sense—could have known just

which verses from *Acts of the Apostles* would almost sing themselves? This oratorio, splendidly sung by a polished choir and soloists Margaret Price, Yvonne Minton, Alexander Young, and John Shirley-Quirk, has its reverent, meditative moments (Price's delivery of *The Sun Goeth Down* is sublime) and its phrases of stinging, sweeping acuity (Fentecost morn in the upper room), are sometimes dwarfed by the sheer volume of the rest of it. But Elgar—like Bruckner and Schoenberg—tried to wed faith and

art, and succeeded often enough, in highly personal accents. This is a lovely set, clean, precise and balanced.

Elena Obraztsova/Operatic Recital. Orchestra of the Bolshoi Theater. Conductors, Boris Khaikin and Odyssei Dimitriadi.

Columbia M 33931, stereo, \$6.98.

Obraztsova's triumphant Metropolitan debut last summer made news, as may this interesting record. There is a hearty rendition of Joan's aria from Tchaikovsky's *Maid of Orleans*, and the soprano really displays her power in selections from Mousorgsky's *Khovanshchina* and Rimsky-Korsakov's *Tsar's Bride* and *Kashchei, the Deathless*. It is a big, clear voice, ringing at the top and sonorous in the difficult lower register. But in an attempt to demonstrate international familiarity, she loses points when attempting arias from *Samson et Dalila*; The French is ghastly, the singing too heavy. She fares better in the cadences of *O mio Fernando* from Donizetti's *La Favorita*.

Plaisir d'Amour: Beverly Sills and André Kostelanetz.

Columbia Quadraphonic MQ 33933, stereo, \$6.98.

Here's a lovely surprise: Beverly Sills and her old friend André Kostelanetz taking a series of French love songs—by Lenoir, Bizet, Liszt, Gounod, Koechlin, Delibes, Poulenc, Martini and Dell'Acqua—and erasing every trace of cliché or sentimentality. All we're left with is the limpid charm of the music, the crystalline tones of diva Sills at her best, and an orchestra (The Columbia Symphony) which sounds so finely rehearsed and sensitively mannered—a *la française*.

Sills' French, I am happily surprised to relate, is really splendid. There's no elongation to those oddly difficult r's that have to be trilled instead of gutturally caressed, as in speech, and she has no difficulty with open vowels on high notes, either. The arrangement of the songs is clever too: the Lisztian phrases (in *Oh, Quand Je Dors*) counterpoising the spirit of Bizet's *Ouvre Ton Coeur* and Gounod's stylishly difficult *O Légère Hirondelle*. Sills does her usual splendid roudades, cavatinas and ad libita to perfection—although I wager there are a few excited breaths, especially in *Les Filles de Cadix*.

This is an eminently listenable recording, carefully produced and balanced by a team of Columbia engineers who must have worked closely with both the conductor and singer.

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Classical Reviews

Edward Tatnall Canby

Tchaikovsky: Symphonic Works: Fatum, The Storm, the Voyevode, The Tempest: Frankfurt Radio Symphony Orchestra, Eliahu Inbal.

Philips 6500 467, stereo, \$7.98.

Astonishing. Here are four "major" works for symphony orchestra by the familiar Russian composer, some of them his own favorites, and not one of them have I so much as heard the

recorded in absolutely superb Philips stereo. Phew! It pays to forget big-time publicity, I tell you. This is an all-time great recording.

The four works, from various periods, early and very late in Tchaikovsky's life, are of the "tone poem" sort, a big one-movement piece based on some species of story or plot. They aren't by any means all of equal interest and, indeed, the latest one, from the period of the *Pathetic Symphony* just before T's death and sounding very much of that work, is, I think, the least interesting. The vigorous, potent early music is much the best and one of the two meteorological pieces, *The Tempest* (Shakespeare) is a close relative to the ultra-familiar *Romeo and Juliet*. Not as good as *that* one (which is deservedly popular, one of the finest of all his works) but still good.

My own favorite here comes first on side 1, entitled *Fatum*. In this rich, alive performing, the unknown work is a major surprise and a big breath of fresh Romantic orchestral air, if you hear what I mean.

Tchaikovsky: 1812 Overture.

Ravel: Bolero. Boston Pops Orchestra, Fiedler.

Deutsche Grammophon 2584 0043, stereo, \$7.98.

What could be more American than a Boston Pops *1812*? Well, almost any other version than *this* one, though the sound does have a familiar Pops ring to it, here in Symphony Hall.

The Deutsche Grammophon recording is strictly double-Olympic swimming pool. You can hear that big orchestra, augmented by a batch of "steel lipped" brass players from Boston's Local 9 of the Musicians' Union, as it wows the swimmers down there at the deep end of the pool a few hundred yards away. I can almost detect splashing sounds and kids' happy yells, between brass blasts. And towards the end the swimming pool is full of incongruous bells and

(of course!) cannon shots—actually, three 12-gauge shotguns firing blanks (we hope). Not during the performance! We trust they were "overlaid" afterwards. All of which makes for a rousing sound, as clean as is likely (even the ear itself tends to foul up the extraordinary mixture of noises in this piece!) and played with Popsian verve. The *Bolero*, that thing that starts off *pianissimo* and ends with a *fortissimo* bray, is just more of the same, nicely paced by Mr. Fiedler. P.S. The music was recorded in Symphony Hall, which can always be made to sound like a swimming pool if you put your mikes in the right place.

Bach's Trumpet. Don Smithers; Wm. Neil, organ, Clarion Consort. **Philips 6500 925**, stereo, \$7.98.

Not really a trumpet disc as you'd expect, this is a group of Bach chorale settings, for organ and out of the Cantatas, the tunes played mainly on old trumpets (natural or with a few keys), some cantata "orchestral" parts also played by trumpets, with drums and strings, for a brilliant effect. Good Bach listening, economically presented, beautifully recorded.

Stravinsky: Suite from Pulcinella (Kochanski suite); other works for violin & piano. Eudice Shapiro, Ralph Berkowitz.

Crystal S302, stereo, \$6.98.

A splendid disc of Stravinsky for violin and piano, sounding so full and big and musical, you'd think there were whole groups of violins and an orchestra. It's done by good musicianship and very fine recording.

The *Pulcinella* music is that slightly acidified rewriting of 18th century tunes by Pergolesi which was first a ballet, then appeared in no less than four all-music versions, orchestra, cello, two different suites for violin. This one is the less familiar violin/piano suite (the other was later, done for Samuel Dushkin) and it's a corker. Astonishing the way this utterly expert duo makes *music*, not merely solo



names of before—have you? There is still a long way to go before we catch up with the important but neglected music in this world. Moreover, in this recording, we have not only "unknown" Tchaikovsky but (for the U.S.) an "unknown" orchestra and conductor who do an absolutely first-line job of performance, the finest Tchaikovsky playing I've heard for many a year—and the whole thing

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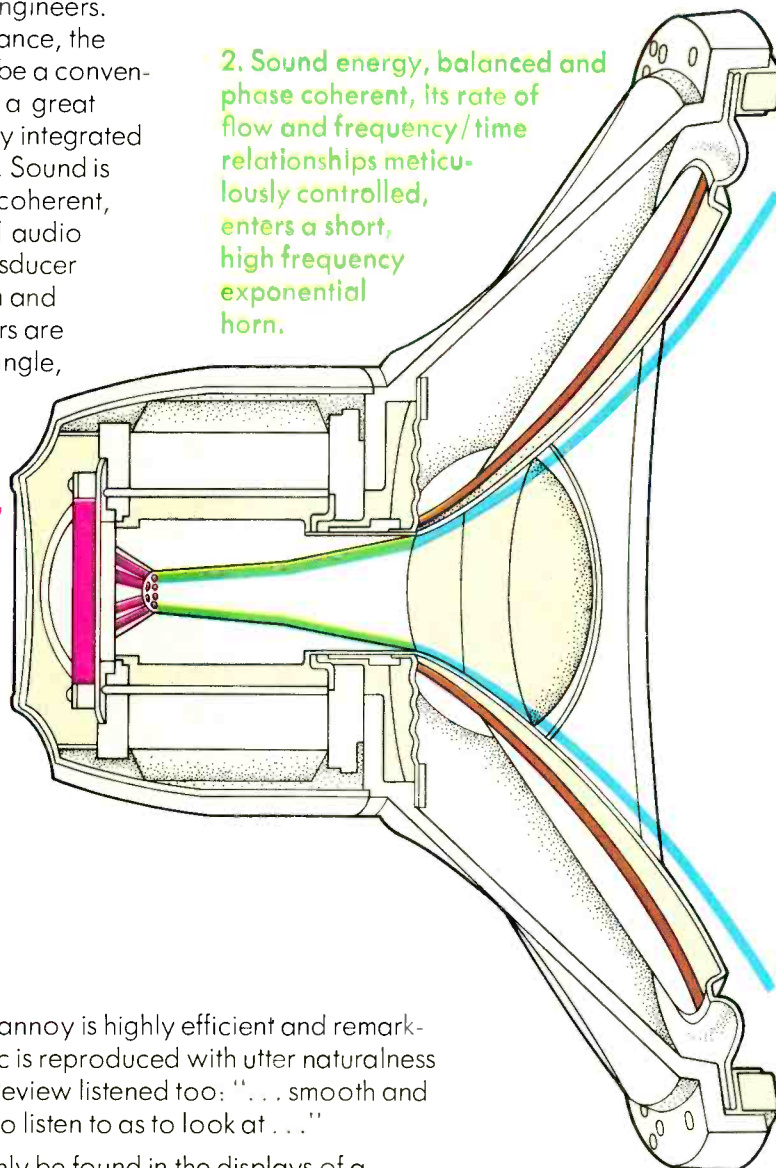
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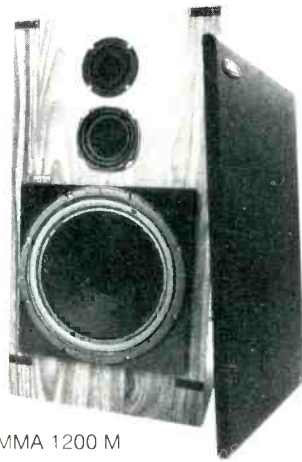
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violin and solo piano! Always fascinating, too, to hear familiar music in a new format, especially when it is Stravinsky, the master transcriber of all, next to Bach himself.

The rest of the record is the same, even more interesting—works as varied as two movements from *Firebird*—usually heard in full-orchestra format—and one from *Petrouchka* (the same), plus my favorite, the Tchaikovsky-derived *Fairy's Kiss* (the same). All these familiar pieces for orchestra, sounding via hi fi just as big and impressive in this two-instrument portrayal! You can really tell that these two players are very much more than just a pianist and a violinist, with good fingers. Shapiro worked with Stravinsky himself; Berkovitz has played with Everybody and was Dean at the Berkshire Music Center, Tanglewood, for some 18 years. Crystal's recording is big and blended, ultra clean and with very quiet surfaces.

Britten: Gemini Variations; Songs from "Friday Afternoons"; Psalm 150. Gabriel and Zoltan Jeney, Choir of Downside School, Purley, Britten. **London STS 15173**, stereo, \$3.98.

A nice little reissue bargain here in out-of-the-way Benjamin Britten, the composer himself in attendance—as of the mid-sixties. Curious piece, the *Gemini* thing. Two Hungarian twins, one plays flute, the other fiddle, and both play piano; so the music is composed for flute, violin and piano, sometimes piano-four-hands. The twins scuttle back and forth from one instrument to another in mid-stream. Nice idea, but will anybody else ever get to try the music? Could always be performed via a quartet! Two pianists, a violinist, and a flute. The twins, in any case, are very savvy and expert professionals, the music handily composed to fit their talents.

The batch of songs for schoolchildren, *Friday Afternoons*, is a living example of how to treat kids musically, assuming they are intelligent and can rise to all sorts of problems if within their abilities, etc. The songs are not easy but do these kids eat 'em up! And such lovely Brrr-itish diction, at such a young age. Mostly, these are humorous tidbits, mostly set to old, familiar texts, folk stuff, and nonsense rhymes. The man who jumped into a hedge and scratched his eyes out, then jumped right back and scratched them in again. The sage of yore, Chinese who kept turning around to get out from under his pigtail. Good fun and all the epitome of Britishicity.

AUDIO • NOVEMBER, 1976

Canby's capsules

Beethoven: Piano Concerto No. 5 ("Emperor"); Egmont Ov. V. Ashkenazy, Chi. Symphony, Solti. **London CS 6857**, stereo, \$6.98.

Elgar: Symphony No. 2. London Philharmonic, Solti. **London CS 6941**, stereo, \$6.98.

Brahms: Violin Concerto. Nathan Milstein; Vienna Philh., Jochum. **Deutsche Grammophon 2530 592**, stereo, \$7.98.

Chausson: Symphony in B Flat; Franck: Les Eolides. O'Orch. de la Suisse Romande, Ansermet. **London STS 15294**, stereo, \$3.98.

Beethoven: Late Choral Music. Ambrosian Opera Chorus, solos, London Symphony, M. Tilson Thomas. **Columbia MQ 33509**, SQ, \$7.98.

Beethoven: Piano Concertos Nos. 2 and 4. Stephen Bishop; BBC Symphony Orch., Colin Davis. **Philips 6500 975**, stereo, \$7.98.

A first-rate "Emperor," fresh and new where too many are tired, routinely energetic—the piece gets played too often. Solti is a fabulous Beethoven man and the "Ash Can" plays with a kind of sincerity not usual in such show music. This is a separate repackaging (also No. 4, CS 6856) out of 1973 set of all five concerti, CSA 2404.

An unusual new look at old Elgar, Edwardian hero of British music and "Pomp and Circumstance"—a powerful Solti reading of surprisingly complex and very chromatic music, unexpectedly modern (for England) as of 1911. It really moves, but (like Rachmaninoff) Elgar does tend to go on & on. This wasn't yet the day of compactness.

Warm, middle-period Brahms, related to his 2nd symphony, warmly and accurately played by the re-emergent American master, Nathan Milstein with authoritative orchestral backing under the experienced Jochum; it is a classic job, satisfying deeply, if unspectacular, very much the right approach for this elderly Romantic music, 98 yrs. old this summer.

London has hundreds of *ffrr* stereo tapes on hand for reissue, as here, on its low-cost "Treasury" series. Chausson, Franck's foremost follower, but killed early on a bicycle, writes a very Franckian French-Romantic style; F. himself, in his earlier tone poem about the winds, is less wordy, more atmospheric. Ansermet was particularly good for this sort of French music and *ffrr* still sounds like *ffrr*.

An unusual collection of seldom heard lateish Beethoven for chorus and instruments, ranging typically from near-potboiler to truly sublime, from rowdy show stuff to the quietly intense *Elegy*, Op. 118, a funeral ode. Biggest item is the King Stephen incidental music, a whole side of assorted choruses with orch. Other shorter works are virtually unknown to most of us, but everywhere are endearing bits of "9th symphony music"—that piece was composed intermittently throughout this period. Thomas is energetic in the peppier music but he lets the very slow (and beautiful) parts go plodding along.

Stephen Bishop is an excellent Beethoven player of the younger generation, superb in technique, with never a trace of show-off, an almost intimately personal way of musical thinking, excellent for home listening up close. He really gets over direct to you (not some impersonal concert audience out there . . .). I don't think much of conductor Davis in standard-fare works like these. The orchestra seems routine; Bishop keeps it going, not Davis.

Jazz & blues

The Memorable Claude Thornhill:
Claude Thornhill
Columbia KG 32906, stereo, \$6.98.

During the Swing Era, Claude Thornhill's was the only big band that approached Ellington's in the use of unorthodox and exotic textures and voicings. Indeed, Thornhill's orchestrations drew on Ellingtonian dissonances and the sensuous sounds of the impressionist composers. The arresting Thornhill style catapulted the gifted pianist-composer-arranger and his fine band into a brief period of popularity in the early 40s, but his short-lived success was curtailed first by the World War II draft and then by the declining interest in big bands.

Truly distinctive in feeling and tonal coloring, the identifying Thornhill sound heard on such ballads in this two record collection as *Night and Day*, *Where or When*, *Snowfall*, *Moonlight Bay*, *I Don't Know Why*, and *There's a Small Hotel*, was one of French horns and woodwinds used to procure languid, sustained chords that seem to hang in the air and immerse the listener in their harmonic opulence.

Thornhill's orchestra, though essentially a romantic ballad band, could play vigorous big-band jazz with humor, zest, and swing, along with striking aural imagery. During the six months ASCAP recording ban in 1941 that caused bands to seek out public domain material, there was a spate of big bands "swinging the classics." Because of his classical training and lifelong love of serious music, Thornhill was a master at swinging classical compositions, and two recordings in that genre appear in this Columbia collection. Schumann's *Traumeri* and Lizi's *Hungarian Dance # 5* bounce along briskly, with unison clarinets and crisp solos. The arrangements by Thornhill and his staffer Bill Borden, always respectful of the original, reveal a high degree of craftsmanship, particularly in the skillful use of contrasting dynamics.

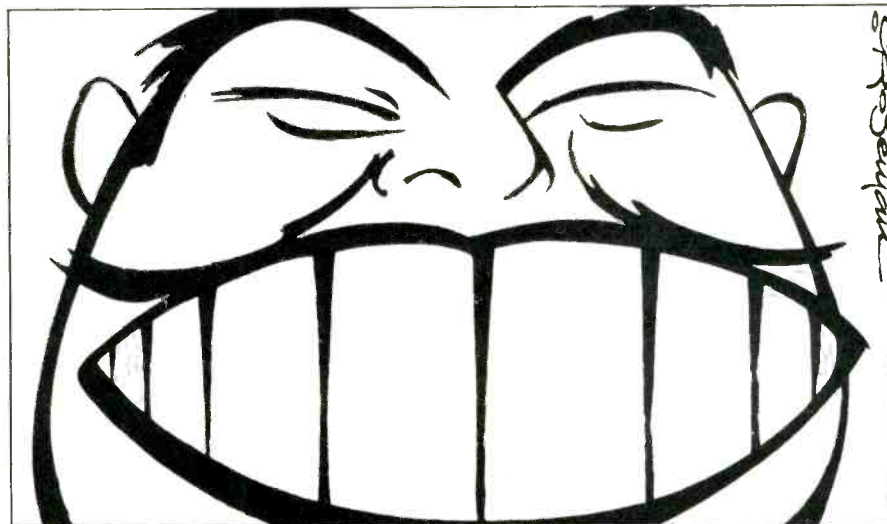
One of the most original and flamboyant of Thornhill's jazz performances is the 1941 recording of *Portrait of a Guinea Farm*, a dazzlingly animated, programmatic sketch full of

bold, striking orchestral effects punctuated by Thornhill's pixie piano solos. Jazz arranger Gil Evans joined Thornhill in 1942, and his arrival is marked by an explosive, driving instrumental piece called *Busters Last Stand* (Record One, Side Two) in which the Thornhill ensemble moves with split-second dynamics, with crackling phrasing by the jazz soloists and varied textures and unexpected shifts in the orchestral accents.

By 1942 the Thornhill orchestra had crested to its peak popularity with a string of hit recordings, but the band's reign was short-lived. Booked into New York's famous dance pavilion, the Glen Island Casino in New Roch-

A *Sunday Kind of Love* and her incandescent performance (Record Two, Side Three) gave the band its biggest hit. Gil Evans returned, and his adaptation of works by Charlie Parker (*Yardbird Suite* and *Anthropology*) and Sir Charles Thompson (*Robbins Nest*), all on Record Two, have become modern big-band jazz classics. Beautifully captured in the Columbia studios, the heady Evans ensembles, flowing sonorities and solos by altoist Lee Konitz, trumpeter Red Rodney, and guitarist Barry Galbraith, catch the cool-bop idiom dramatically.

But though admired by the "cool" jazz cult, after 1947 it was downhill for Thornhill. With the mass public turn-



elle for the evocative summer of '42, the band's personnel was decimated by the World War II draft, and in October, Thornhill called it quits, entering the Navy where he spent three years putting together special shows and dance band units. His own famed Navy band, second only to Artie Shaw's Rangers, played in the most forward areas of the Pacific war theater. Discharged in 1946, Thornhill returned to civilian life and formed a new band. But times had changed, Sing had replaced Swing in the public's affections, Sinatra and Como were selling more records than Goodman and Dorsey, and bop was "in" with the hipsters. Thornhill adjusted; he featured singer Fran Warren on

ing away from jazz experiments, and big bands collapsing by the dozens, the fine Thornhill orchestra slowly disintegrated. Thornhill hung on for years, breaking up and reforming bands of lesser and lesser caliber until his death in 1965. But the Thornhill sound has always maintained a fascination for musicians and the musically literate laity. Gerry Mulligan, 17 years old when he joined Thornhill, has said that "playing with Claude Thornhill's band was one of the luckiest episodes in my life. It was the most musical band I was ever with; it was like going to school."

Trumpeter Red Rodney made this tribute to Thornhill in a recent interview:

"That was the only band I can ever remember playing in where you could play a second- or third-trumpet part and chills would run up and down your spine because they would be beautiful melodies within themselves."

Columbia's Claude Thornhill reissue has an excellent technical quality considering the period when the original recordings were made. Most of these monaural 78s were cut at Columbia's Leiderkranz Hall, a studio that seemed to extract the fullness and richness of the splendid Thornhill orchestrations. The sound transfer job by Columbia engineers John Guerriere and Stan Weiss, even though "electrically re-recorded to simulate stereo," is fine indeed. *John Lissner*

Sound: A Performance: A+

Zootcase: Zoot Sims

Prestige P-24061, mono, \$7.98.

That Zoot Sims was an authoritative player over 25 years ago when these slides were cut, is impressively demonstrated by this two-record Prestige reissue. Side One, Record One, begins with three September, 1950, 78-rpm sessions (with John Lewis, piano; Curly Russell, bass, and Don Lamond, drums) that marked Sims' debut as an American recording artist. (The astute, jazz-loving Swedes and French had recorded Sims in the Spring of that year while he was touring with the Benny Goodman band.)

The 1950 and 1951 performances, all on Record One, whether ballads like *Memories Of You* and *My Silent Love*, or punching swingers like *Trotting* and *Zoot Swings The Blues* (two excellent takes included) are dominated by the sheer strength of Sims' playing.

The 1950/51 sides leave something to be desired sonically, because, as the album text explains, on many of the tracks, 78 rpm recordings from private collections, rather than original masters, were used as the source material. Record Two, however, consisting of 1952 and 1954 sessions that originally appeared on 10-inch LPs, is well recorded. Teaming with Sims on the 1952 date is fellow tenor Al Cohn, trombonist Kai Winding, pianist George Wallington, bassist Percy Heath, and drummer Art Blakey. Trumpeteer/trombonist Stu Williamson and pianist Kenny Drew are outstanding on the 1954 date. The driving power of Sims' solo work on selections like *Zootcase* and *Howdy Partner* are enough to swing the whole band and seems to inspire the other soloists, plus the excellent rhythm

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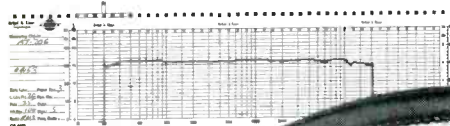
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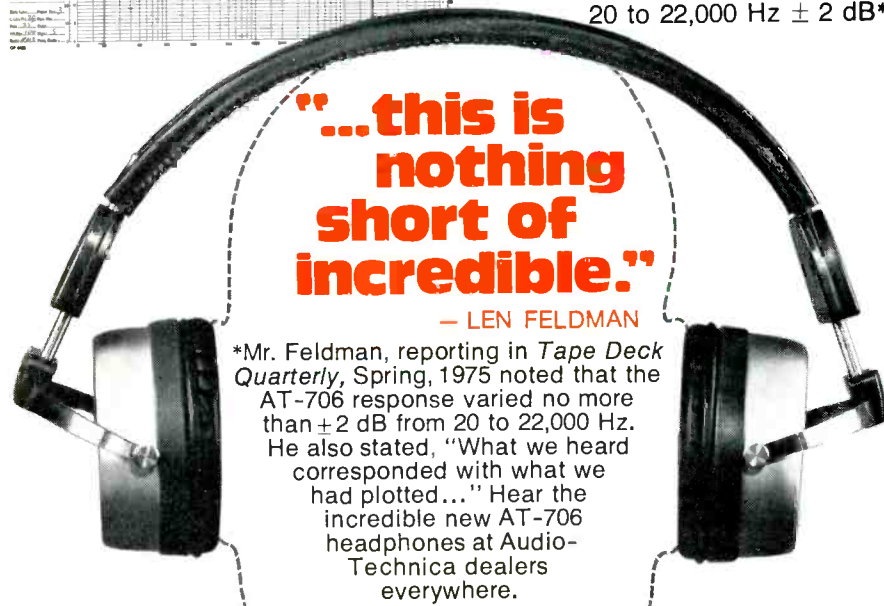


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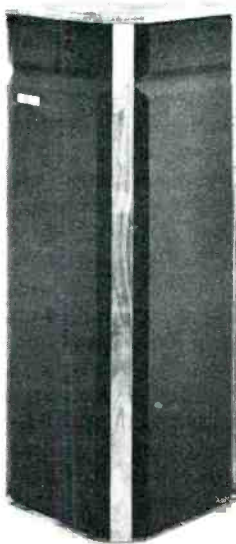
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*Higher in West and South

integrates into the Chicago context surprisingly well. His solo lines are intelligent and clean, his chording lushly subtle. Listen particularly to his intriguing intro and solo on *Going Down Slow*, his mellow obbligato to *Stormy Monday*, and his perky riffing on the shuffling *Feel All Right Again*. Lockwood's singing is also very good, with his sharp, highish voice carrying the songs with the drive they require to prevent his guitar sophistication from rendering the music too "pretty."

What keeps the album from deserving the "classic" status already assigned to it is the erratic contribution of the Aces, Chicago's best-known free-lance rhythm section. Louis Myers' second guitar (heard on the right channel, with Lockwood's guitar and vocals in the middle) provides the perfect blues anchor for Lockwood's jazzier instincts. Myers switches to lead on *Anna Lee*, Mercy Dee's *One Room Country Shack*, and the Bill Doggett instrumental *Honky Tonk*, the first two of which he also sings. Unfortunately, Myers' dull, semi-mumbled vocals hit a middle ground between pedestrian and ponderous, weighing down the already logy tracks. Louis' brother Dave does his job proficiently, though a little more bass action might have helped to pick up the slower tunes. There's little faulting Freddy Below's tasteful drumming, though.

Another problem is the over-familiarity of Lockwood's repertoire. What can be done with material like *Sweet Home Chicago*, *Going Down Slow*, *Worried Life* and *Stormy Weather* that hasn't been attempted time and time again? It's to Lockwood's credit as an imaginative and unique guitarist that he brings a personal dimension to these blues warhorses.

On the whole, *Blues Live In Japan* is an entertaining album which you will no doubt enjoy very much (especially if you haven't been over-exposed to the songs). But it is hardly *the* blues album of the millenium, nor in any way magical, mystical, or historically momentous.

The recording is slightly (not drastically) imbalanced, with Lockwood somewhat over-prominent in relation to the rhythm section, except on *Little and Low*, where he sounds rather distant. Nonetheless, it's a very atmospheric recording in that, while a bit muddled at times, it no doubt faithfully reproduces what was heard at the original concerts. *Tom Bingham*

Sound: B-- Performance: B--

AUDIO • NOVEMBER, 1976

Folk bag

Stay All Night and Don't Go Home: Jenkins, Cockerham, and Jarrell
County 741, mono, \$5.98.
Come and Go With Me: Tommy Jarrell
County 748, mono, \$5.98.

Though one hesitates to bandy the term "living legend" about too lightly, it definitely applies to Tommy Jarrell, the 75-year-old fiddler, banjoist, and singer from the mountains of North Carolina. In the past few years, he, in the company of a couple of other old-timers, Oscar Jenkins and Fred Cockerham, has become a frequent attraction at folk festivals, performing some of the most archaic "old time music" still surviving.

They are not a trio in the normal sense—not once do all three play on the same tune. The bulk of **Stay All Night and Don't Go Home**, their third album for County, features Jarrell on fiddle and vocals, accompanied by Cockerham on fretless banjo.

In contrast to Jenkins, Jarrell's fiddling is extremely old-time in style, thick-textured and earthy, full of quick spurts of ornamentation. His singing is intense and surprisingly full-bodied for a man of his age, while Cockerham's banjo backs him by combining melodic picking with rhythmic strumming in a very unique style, best heard on *Old '97*.

The album's best tracks, all by Jarrell, include *Fall On My Knees*, *Frankie Baker* (an unusual adaptation of *Frankie and Albert*), and a very odd *Boll Weevil*.

As impressive as Jarrell's fiddling is, his banjo work is even more astounding. **Come and Go With Me** is literally a solo album, just Jarrell singing and playing his banjo without further accompaniment. He plays in the pre-Bluegrass "clawhammer" manner, but in a highly unique style. The tunes are mostly familiar, traditional standards like *Little Maggie*, *John Hardy*, *Old Reuben*, *Cindy*, *John Henry* and others which have been played

to death (plus an honest-to-goodness "darkie" tune *Uncle Ned*). But when Jarrell plays them in his distinctive style, you forget you've heard them a thousand times.

In the review of another County record, I mentioned that the label is one of the last to still record in mono. As a result, these albums arrived with the legend "stereo" scribbled on the back covers with a marking pen, but they still sound like mono to me. Nonetheless, it's well-recorded, clear, and precise mono which is better than many small labels' stereo, so sound is no problem. However, surfaces are a bit crunchy at times. Both albums are highly recommended, and are available from County Records, P.O. Box 191, Floyd, VA 24091.

Both Discs

Sound: B — Performance: A

Lochaber No More: Boys of the Lough

Philo 1031, stereo, \$6.98.

The Boys of the Lough are perhaps the best of the many top-notch, neo-traditional, Irish-British ensembles who have sprung up in the wake of the Chieftains. They play traditional instruments in the traditional manner, but employ non-traditional voicings and textures.

The group consists of Cathal McConell and Robin Morton from Northern Ireland, Dave Richardson from Northumberland, and Aly Bain from the Scottish Shetland Islands, thus giving them three musical traditions to draw upon. **Lochaber No More** differs from their previous three albums in that it draws upon Scottish and Shetland Islands material, although the group's instrumentation gives them a distinct Irish flavor, as the set *Haughton House*, *Kataroni*, and *Da Back Reel* demonstrates.

On the other hand, several Irish tunes on the album may have been of Scottish origin. Such trading between the two cultures has been common

through the centuries, but the Boys are the first to exploit these interrelationships.

Both Morton and McConnell are first-rate singers on ballads as well as comic material, with good ears for strong lyrics and striking melodies. The vocal tracks add variety to the album in addition to being of great interest in themselves.

All four are masters of their respective instruments, Richardson on cittern as well as mandolin and concertina, McConnell on concert flute and doubling on whistle, Morton on certina and bodhran, and Bain on fiddle.

The recording is excellent, with all instruments clearly recorded and effectively balanced. There's some surface noise, mainly noticeable during single instrument and voice passages.

Sound: B — Performance: A

Mellow With Ale From the Horn: John Roberts and Tony Barrand
Front Hall FHR-04, stereo, \$6.98.

Since arriving separately in this country as students in 1968, John Roberts and Tony Barrand have become the best-known English emigres on the Northeastern U.S. folk circuit.

Their 1971 debut album, **Spencer the Rover Is Alive and Well and Living In Ithaca** (Swallowtail ST-1; available from Box 843, Ithaca, NY 14850), was a superb, primarily a *cappella* collection of traditional British ballads and humorous music-hall tunes. Their second album (1973), **Across the Western Ocean** (Swallowtail ST-4) was an artistically successful "concept" album, with thematic songs (as per the subtitle, **Songs From The Era of the North Atlantic Sailing Packets**) sung heartily by a small chorus (with Barrand singing most of the lead parts solo), and short narratives drawn from historical sources.



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* a British Army expression meaning taking a risk

Mellow With Ale From The Horn marks Roberts and Barrand's return to modal harmony singing (plus several solo vocals), though with more emphasis on instrumental accompaniment than before. The material is varied and entertaining, with a few songs picked up during their stay in America, including a lumbercamp song (*Save Your Money While You're Young*) and a couple banjo tunes. The heart of their repertoire remains British folk music, highlighted by an interesting variant of *Barbara Allen* and a sprightly children's game song (*Oats and Beans and Barley Grows*), both sung unaccompanied; plus *Staines Morris*, an atmospheric Restoration-period maypole song, accompanied by Roberts' guitar and Barrand's eerie, high-pitched, bowed psaltery.

Their interest in sea-songs remains evident in first-rate interpretations of *The Wings of a Goney* (sung in unison) and the popular *Handsome Cabin Boy* (sung with an appropriately roguish snicker by Barrand to Roberts' jolly concertina). A rather surprising inclusion is Stanley Holloway's classic monologue, *Albert and the Lion*, recited by Barrand with a mixture of whimsy, innocence, and sarcasm. For the first time, the pair also utilize new material by British contemporary-folk writers. The best of these songs are Glyn Hughes' poignant *Come Day, Go Day* and Roger Watson's sing-along/marchalong *Salvation Band* (with what appears to be a very low-pitched concertina doing a passable imitation of a bass trombone!).

Their instrumental work is quite proficient and well-integrated, though neither as distinctive nor as carefully worked out as their marvelous singing.

The sound is clear and well-defined, though a bit more presence would have been warranted on the solo vocals. The stringed instruments have a nice bite, though the sparingly-used percussion (bodhran, spoons) is a bit distant. (Front Hall Records, RD1 Wormer Rd., Voorheesville, N.Y. 12186.)

Sound: B— Performance: A—

Blue Sky Boys: Blue Sky Boys
Bluebird AXM2-5525, mono, \$7.98.

The 1930s was the golden era of brother duos in country music and one of the best and most popular of the teams was the Blue Sky Boys, Bill and Earl Bolick, from Hickory, N.C.

The Bolicks were unique among the brother duos in that they maintained

their popularity over a 15-year period without budging from the sentimental close-harmony ballads and lachrymose "mother's gone to heaven" lyrics with which they rose to fame as teenagers. (True, the Delmores were stars for a slightly longer period, but their music changed considerably over the years.)

This two-record anthology of 32 favorites spans their career, from their first Bluebird recordings in 1936 until just before their retirement in 1951.

The Blue Sky Boys sang with an understated detachment common to many country artists of the day. They accompanied themselves on mandolin (Bill) and guitar (Earl), both instruments played simply and without much variation through the course of a song. Their music was homey, restrained, totally non-virtuosic, honest, and consistent. Indeed, they were too consistent—many listeners may find an eight-song side a little tedious, as one track segues into another with the same tempo, guitar-rhythm pattern, and harmony, etc. (a problem less obvious to the 78-rpm listener). The brothers' repertoire consisted of traditional English ballads; religious material, which may strike the modern listener as unrealistic (even corny), and maudlin tales of sorrow, death, and tragedy which today sound unintentionally funny in their acceptance of unremitting desolation (*Since the Angels Took My Mother Far Away* and *Paper Boy* are the worst "offenders" in this regard). No matter what the topic, all songs are performed in the same dry, expressionless manner.

Beginning in 1946, the Bolicks added a fiddle (usually Curly Parker) and bass (often Charles Randolph Grean) to their records. The bass enlivens the rhythm a bit, but the fiddle generally gets in the way; neither was really necessary.

The brothers retired in 1951 when Earl decided he wanted to spend more time with his family. However, by then the Blue Sky Boys were already anachronistic (remember, by this time, country music had largely forsaken Bibles and Mother for Barrooms and Broads). Though they've made occasional recordings in the past quarter-century, they're too much a part of a long-dead past and their appeal is mostly to folk collectors and curious dabblers in nostalgia.

The sound is rather distant on the earliest tracks, becomes much better defined around 1938, though the post-war tracks are too trebly. Several cuts have audible ticks and pops

which seem to indicate 78 transfers; apparently RCA either lost or destroyed some of the pre-war masters. As usual, I've refrained from assigning a sound rating to historical material.

Performance: B

Texas-Mexican Border Music, Vol. 5:
The String Bands—End of a Tradition
Folklyric 9007, mono, \$6.98.

Volume 5 of Folklyric's pioneering Tex-Mex series introduces a few of the musical styles which were hurtled into oblivion by the Norteño accordionists heard on Vol. 4. This compilation of 16 sides from 1927-1940 is the first reissue ever of the music of the string bands, which almost totally disappeared from the border area in the late '30s.

Editor Chris Strachwitz has wisely chosen a broad range of material, from both the "folk" and "genteel" traditions (though the borderline between the two is fuzzier than usual).

Three of the most noteworthy selections are reminders that the trumpet, which has since become the identifying instrument in mariachi bands, did not enter this music until the mid-1930s. The mariachis heard here feature violin, guitar, *bajo sexto*, bass, and even piano and flute, besides the typical Mexican two-part harmony vocals—but no trumpets.

Pre-Norteño approaches to that staple of Tex-Mex dance music, the polka, are illustrated with striking contrasts. El Trio Alegre's *Peor Es Nada* is an attractive polka played by two violins and guitar with all the refinement of a Viennese salon. (Indeed, the trio's waltz, *El Poder Del Amor*, sounds positively Straussian!) *Adios Amor Mio* is played by a large string-and-woodwind ensemble, Orquesta Fronteriza, in a charmingly European style, albeit a bit too stuffy for this frisky little tune. Compare these with the homespun polkas of Santiago Morales and El Ciego Melquiades, who come quite close to the late-30s Norteño style, though using violins instead of accordions. The Medina River Boys' *Andale, Vamos Platicando* has the flavor of a 30s-Anglo string band, with country-influenced fiddling and superb Hawaiian guitar.

Other highlights include a meltingly sentimental version of *Cielito Lindo* by Orquesta Colonial, featuring Hawaiian guitar with a mandolin-and-flute ensemble; the folksy waltz, *Marosovia*, by Los Alegres, again with Hawaiian guitar; *Tamaulipeco*, an ani-

mated *huapango* with rousing group singing and vigorous guitar rhythms by the Trovadores Tamaulipecos; and Andres Huesca y su Trio Huracan performing *El Jarabe Veracruzano*, an intriguing example of Mexican *Jarocho* music, including what sounds like the world's tiniest harp! The last two tracks are 30s recordings by the still very popular Lydia Mendoza, singing lead in a family group.

For recordings of such obvious rarity, the sound is often better than you

might expect, though with much variation both in the original engineering and in the scratchiness of the 78s used. A sound rating would serve no useful purpose, therefore.

Future volumes will include an album of "the old songs," another Norteño accordion sampler, and a full album by El Ciego Melquiades. I have no doubt they will continue to uphold the series' remarkably high standards.

Performance: B to A

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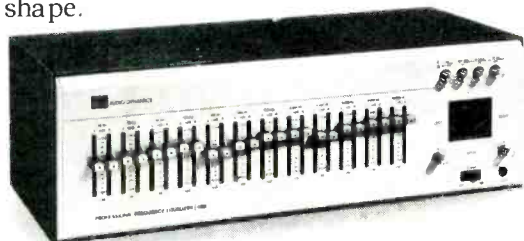
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Peter Bellamy

Green Linnet SIF 1001, stereo, \$6.98.

Peter Bellamy first gained recognition nearly a decade ago as melody singer for the Young Tradition, a trio (with Heather and Royston Wood) of young British folk-revivalists who sang traditional modal songs, hymns, carols, and ballads in intricate three-part a cappella harmonies. Two of their albums are still available on Vanguard, **The Young Tradition** (VSD-79246) and **Galleries** (VSD-79295). The trio's approach was professional, yet rustic, rhythmic, and extremely exciting, and was especially influential in their home country.

Bellamy's first American album, on Patrick Sky's adventurous Green Linnet label (Innisfree Records, 70 Turner Hill Road, New Canaan, CT 06840), is a solo album, with both unaccompanied vocal selections and Bellamy's self-accompaniment on guitar, concertina, and whistle. Bellamy has an unusual, unforgettable voice, emotional, expressive, yet far from warm, with a quality of pinched richness and a masterful understanding of lyrics. His singing is oddly disarming, yet paradoxically perfect for staunch British traditional music.

Actually, Bellamy's traditionalism isn't quite as staunch as his singing, since he's willing to toy with his material's "authenticity." *On Board a '98* and *Ward the Pirate* impressed him lyrically but not musically, so he wrote a new, perfectly respectable melody for the former and appropriated the tune of another ballad for the latter. Two other lyrics were found on broadsides without music, so he set these to his own tunes as well—that for *Ramblin' Robin* works so well, you could surmise that the original tune sounded very much like Bellamy's setting!

Many of Bellamy's songs were collected in Norfolk and are sung in that region's unique dialect (*Bungay Roger* and *Old Brown's Daughter* are particularly good examples). *Firelock Stile* is one of the more explicit dalliance ditties to see the light of day even in this anti-expurgation era. *Rigs of the Time* is a slightly sarcastic complaint against crooked business dealings during a 19th-century depression. Bellamy also does a couple contemporary songs; one is Al Stewart's shudder-provoking *Nostradamus*, which recounts a few of the famous French seer's uncanny fulfilled prophecies, then moves on to a chilling vision of things yet to come.

Bellamy is a fine concertina player, with a straightforward sense of me-

AUDIO • NOVEMBER, 1976

lodic variation, and a lively, rhythmic snap on quick-tempoed tunes like *The Poacher's Fate* and *Rag Fair*.

The recording is quite hollow at times, with a somewhat tight, restricted sound on other tracks, resulting in a general inconsistency of engineering. The surface pops a little, but is rarely intrusive.

Sound: C — Performance: A —

Trapezoid: Trapezoid

Skyline DD-107, stereo, \$6.98.

The hammered dulcimer is the Anglo-American version of the Persian santur, and is not related to the more familiar "Appalachian" or "Mountain Dulcimer." The hammered dulcimer is a trapezoid-shaped instrument in which strings of varying lengths are struck with wooden hammers. Although the instrument can be found throughout New England and the North Central states, it has until recently eluded most folklorists and folk music fans.

Now a band called Trapezoid has taken the task of reviving it, with all four members playing hammered dulcimers (two regular models, a bass dulcimer, and a soprano-ranged "dulcetta")—sometimes all at once. The

album's standout tracks are those utilizing multiple dulcimers, if only because of the uniquely echoed layers of sound produced.

The repertoire consists mainly of contra-dance tunes played New England style; though they also include two stately compositions by the fabled Irish harpist O'Carolan, the hymn *Wonderous Love*, and the old standby *Dill Pickle Rag*. There is also an attractive original *Carrie Under The Arbor*, featuring the dulcetta.

The performances are sometimes on the stiff side, no doubt because they are being so careful not to step on each other's toes. They make a goodly share of mistakes, mostly due to the doubling instruments. However, their spirit and obvious love of playing make the errors easy to overlook.

Because of the snapping attack and extended decay characteristics of these dulcimers, there is a heavy accumulation of overtones, added to by the use of multiple instruments, and the music would be unlistenable if poorly recorded. There is a tendency for a closely miked dulcimer to overpower the other instruments, but the engineers have done an excellent job of balancing the instruments, allowing

the various parts to be heard with sufficient definition. The dulcimers are given a life-like presence, and because of this the echoing overtones ringing through your ears can drive you batty when listening through headphones (which I don't recommend). At softer volumes the textures tend to become a bit confused. There is a perfect middle volume, but you'll miss a lot of delightful music if you spend too much time twiddling dials to find it.

Sound: B — Performance: C+

Hawaiian Steel Guitar, 1920s-1950s

Folklyric 9009, mono, \$6.98.

The impact of the Hawaiian steel guitar on American music is much more enormous than most people realize. The blues guitarists' bottleneck and slides, the dobro in bluegrass, and the pedal steel guitar in country music all grew out of the steel guitar as played by Hawaiian musicians who toured the Mainland during the first third of this century. This album, which includes both authentic Hawaiian guitarists and their Mainland emulators, is one of a growing trickle of albums attempting to bring long-overdue recognition to these forgotten artists.

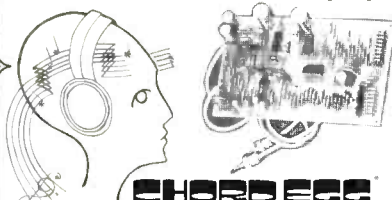
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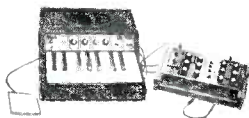


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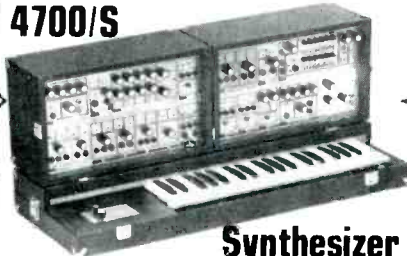
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Most of the 25 tracks date from the 20s and 30s, covering both pure, traditional Hawaiian music and the newer, jazz-flavored styles popular in that era. In the first category is a marvelous version of the well-known *Hilo March* by Kalama's Quartet, with a dual acoustic-steel lead over rippling guitar and ukulele rhythms, and a strong harmony vocal.

The jazz-influenced artists include Master's Hawaiians, whose *Blue Sparks* features a quick-strumming, minstrel-show tenor banjo under a

jazzy steel melody, culminating with *Hold That Tiger*. The Mainlanders playing Hawaiian music are a diverse lot—would you believe S. Cortez y sus Hawaiianos? Their *Caperucita* is a nostalgic Mexican waltz with a quite convincing Hawaiian flavor. The most celebrated playing in the American jazzy style of the 20s was Roy Smeck (whose recording career extended into the 60s), who turns *Indiana March* into a gem of a steel guitar rag.

As usual in historical recordings, the sound varies considerably, though the

original recordings seem quite clean and distinct for their age. The scratchiness of the 78s used ranges from very little to quite a bit, with most falling somewhere in between. As a whole, the sound is generally more than merely acceptable.

Performance: A

Silver Anniversary Concert: O' Neal Twins


Creed 3065, stereo, \$5.98.

It wasn't until Leon Russell "discovered" them a couple of years ago that Edgar and Edward O'Neal became known outside the specialist gospel audience. But as the title of their latest album indicates, the O'Neals are far from newcomers.

The Silver Anniversary Concert is (with some rather sloppy editing in a couple of spots) from a live performance in their hometown, St. Louis. A few of their songs are taken from previous performances including *I'd Trade A Lifetime* and their gospel adaptation of Billy Preston's *That's The Way God Planned It*. Fervent vocal backing is provided by the O'Neal's regular ensemble, The Interfaith Choir.

Despite the excellence of the album as a whole, it's the ten-minute finale that really stands out. *It's Gonna Rain* begins innocently enough, with the O'Neals intoning the song over a funky stomp rhythm propelled by Harry Scott's clapping congas. As the beat begins to build in intensity, the choir enters with a repetitive chant "No more water" over the brilliant counter-bassline by sessionman Jimmy Hinds. The pressure continues to mount as the other instrumentalists find solid grooves to work under the choir's constant repetition. Then, in what must be a gospel first, emcee Rev. Jerome Chambers vociferously introduces the band members individually, with each musician, in turn, gettin' down and cookin' to the cheers, shouts, and rhythmic clapping of the crowd.

The recording is very atmospheric and loaded with presence, the clutter of the up-tempo tracks, no doubt, reflecting the carryings-ons at the original concert rather than flawed engineering. The mixing favors the O'Neals and the band at the expense of the choir, whose relative distance tends to blunt their impact somewhat.

Gospel albums aren't always easy to find in areas without a large black population. In that case order from Nashboro, Dept. E, P.O. Box 60188, Nashville, TN 37206. 

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BUILD A HIGH ACCURACY, monitor quality speaker for much less than comparable brand name speakers. Kit includes the KEF B139 oval bass radiator, B110 midrange, and T-27 tweeter. Complete with wired second order Butterworth crossover at 350 and 3500 hertz, back plate, controls, and binding posts. Kit comes with one bass reflex and two transmission line plans. \$265.00/pair. Separate Drivers: B139-62, B110-24, T27-15. To order or for more information: Accurate Sound, 1213 "M" Street, Lincoln, Nebraska 68508 (402) 489-1218

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RENT OLDIES TAPES by year, over 100 songs per year. Free brochure. Rock 'n' Reel Rental, 4 Prescott Ave., Dix Hills, NY 11746

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CONTROL I—AUTOMATIC SIGNAL ACTIVATED Shut Off for Hi-Fi components. \$49.95. Details. ElectroMedia Design, Inc., Box 26, Livingston, NJ 07039.

PINK NOISE TAPES. Measure loudspeaker response accurately with a microphone and voltmeter. 1/3 octave bands ± 1 dB 31.5Hz to 16KHz. 15 ips - \$28 ppd. 7 1/2 ips - \$23 ppd. Both 1/4" halftrack. Cassette available. Instructions included for stereo system or P.A. application. STATEX, Audio Division, Box 5334-A, San Antonio, Texas 78201. QUALITY PRODUCTS SINCE 1929.

Hiss-s the Villian, and "LOST HIGHS" result from running tape on magnetized equipment. Now you can actually measure and eliminate damaging magnetic build-up. Standard Audiophile Han-D-Kit \$34.25. Deluxe Professional Han-D-Kit \$58.50 delivered in USA on prepaid orders. Ask for literature and "Notes on Demagnetizing" ANNISCD 1103 N. Delaware, Indianapolis, Ind. 46202 Phone 317 637 9282.

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FUZZBUSTER POLICE RADAR DETECTORS. Latest Model, big discount. Hughes Electronics, 45 Dunn Street, Asheville, N.C. 28806

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BUSINESS MANAGER/PARTNER needed for small audio products manufacturing company relocating in S.F. Bay area. Should have M.B.A. degree or equivalent experience as manufacturing mgr, strong sales/marketing skills, and minimum investment capital, potential of \$25K. Send resume to address:

HAYNES Microelectronics
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QUAD electrostatic speakers (any condition), electronics (including Model II). Mention lowest price. DMS, 1360 Lake Shore, No. 2202, Chicago, IL 60610.

EUPHONICS semiconductor cartridge. State model, condition, price. G. Minter, 9/77 Benson St., Toowong Q. Australia 4066

Young - blind/handicapped man is looking to buy a reasonably priced Teac 4070G or A4300 or other auto reverse tape deck. So turning of reels is not necessary. Send offers to - Harold P. Shaw, 625 Arlington, Greensboro, N.C. 27406

WANTED: JBL Model N1200 16 ohm Serial No. 4389. Rev. Burger, 28 W. Ash St., Three Oaks, Mi. 49128

WANTED: KARLSON K-Coupler Enclosure Plans, will pay \$20. N. Hicks, R3 Box 112-A, New Albany, Ind. 47150

ONE ELECTRIC VOICE. Call collect (305) 931-5238.

CASH FOR your unwanted LPs & reel to reel tapes. Records, Box 323, Hillburn, New York 10931

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Wanted: Two BDZAK B4000 Series Symphony speakers and Two Series B302A Concerto Speakers. State price and condition. M. Colitz, Box 610038, N. Miami, Fla. 33161

WANTED: WEBCOR Wire Recorder Model 80-1. New or used in working order. Scott R. McLean, Rt. 1 Box 215, Keystone Heights, FL 32656

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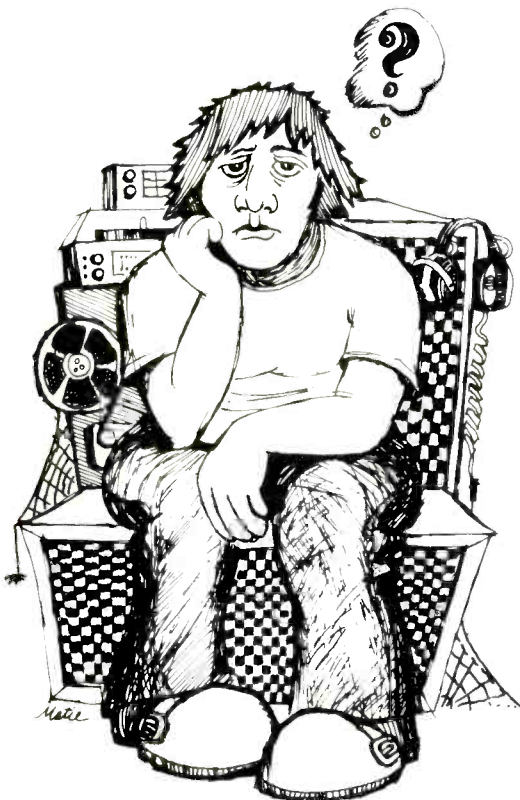
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“Marantz is just about the only component manufacturer around that’s devoted to system interfacing.”

Sound engineers and audiophiles were invited to evaluate Marantz professional components, including the 3800 Preamp, the 510M Power Amp and the 150 Tuner. The following comments were taken from that taped discussion.



The 3800 Preamp

“When you build a phono preamp, you never know what you’re going to plug it into. But the Marantz 3800 can interface with the outside world. Whatever amplifier you hang on it won’t affect the operation of the preamp one iota. The 3800 will drive any amp on the market — even the super amps!”

“Let’s say you use three Sony reel-to-reels with the nearest competitive preamp. You’d wipe out the bottom end. Not with the 3800. It’ll actually drive a load as low as 1000 ohms at a reasonable level and maintain full frequency response.”

“Until now you had to shell out over \$1000 to accomplish that with a preamp. This unit goes for what ... \$599.95*?”

“Then there’s the fact that the 3800 is virtually the quietest preamp going. Not only in specifications, but in perceived noise. Eight-tenths of a microvolt specified.”

“Another thing about systems planning — the 3800 has variable frequency turnover tone controls. Designed to complement both speakers and listeners. What that’ll let you do is bring up a string bass and leave the viola alone.”

“Or if you use the mic feature, like in a live recording, and you’re playing your string guitar and you want that nice ring you hear in recordings. You just put the tone controls in the four kiloHertz position and run the treble control up and you’ve got it.”



“It’s just one of the most versatile preamps in the world. Not only does it include a full-process Dolby** Noise Reduction System, but also the tone controls can be used for tape equalizing.”

“Maybe you want to listen to something else while you’re making tape copies. You just let one tape recorder talk to the other — one recorder is playing back and one is recording. And you can use the Dolby in that loop. Then you keep yourself entertained by listening to a regular FM or AM station at the same time. And the same preamp is available without Dolby for \$100 less. That’s the Marantz 3600.”



The 510M Power Amp

“This is a locomotive when it comes to power. Delivers 256 watts minimum continuous power per channel at 8 ohms with no more than 0.1% total

harmonic distortion and a power band of 20 Hz to 20 kHz!"

"The whole package is smaller. Heat dissipation is one reason why. That's where this baby really moves ahead... Marantz has implemented a new method of heat dissipation. It's based on turbulent air flow!"

"They call it a staggered finger heat dissipator. It was originally developed for the computer industry where they really have heat problems. What it does is break up the air flow. It's aero-dynamically designed to eliminate stratification and create vortices."

"Efficiency can be up dramatically compared to a convection system. And you do it all in a smaller, lighter package."

"There's one competitive unit that weighs over 140 pounds. The 510M weighs 43."

"It's got gain controls—two of them. Meter range switches with the advantage of not being part of the limiting circuit. And peak/overload indicators that are really sensitive to the fluctuations of line voltage."



The 150 Tuner

"Biggest advantage to the Marantz 150 Tuner is the ease of tuning. You can go 60 to 80 kHz of detuning with little change in distortion or separation characteristics. Tuning's less critical because good performance is obtained over a wider segment of the pass band."

"The Model 150, in stereo, performs for almost all conditions with FM distortion under 0.2%. In mono it's around 0.1%. And this is right down to test equipment residuals. You'd have to spend a lot of money for a tuner to match that!"

"The 150's 18-pole linear phase I.F. filters give you this excellent performance and long-term stability of alignment. It'll be right-on five years from now without alignment!"

"I'd go so far as to say it exceeds the performance of the original Marantz 10B and the 10B was the ultimate tuner in my estimation!"

"Gives performance so high in quality that if there's a problem with the signal you tend to question the source, not the tuner!"

"Phase lock loop. Of course. Even with multipath and antenna problems shown on the oscilloscope, it sounds cleaner than virtually any tuner around!"

"All this is accomplished through the use of the linear phase I.F. filter system—a system composed of three filter blocks of four poles and one block of six poles. Eighteen poles in all!"

"Of course, we can't forget the five gang front end with dual gate MOSFET RF amplifier and mixer. Gives the best image and spurious rejection I know of, combined with the best available sensitivity!"

The Marantz 3800 Preamp, 510M Power Amp and 150 Tuner are just part of the exciting Marantz component line. Prices start as low as \$199.95.* Each reflects the technical expertise and engineering excellence that has made Marantz the choice of professionals world-wide. Stop by your local dealer and see the exciting Marantz line. Or send for a free catalog.

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*Suggested list price. Actual selling price at dealer's discretion **TM Dolby Labs, Inc. ©1976 Marantz Co., Inc., a subsidiary of Superscope, Inc., 20525 Nordhoff St., Chatsworth, CA 91311. Prices and models subject to change without notice. Consult the Yellow Pages for your nearest Marantz dealer.

Sherwood S9910. What you hear is true.

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...ohms from 20-20,000
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...circuitry used to achieve this rating
...atures exceptional stability
...characteristics: a paralleled OCL
...direct-coupled output configura-
...twin 15,000 μ f filter capaci-
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...ondary power supply.

It has all the controls you need for fully flexible centralized operation: 5-position Mode switch, 6-position Selector switch, 8-position Speaker switch. Two Tape Monitor circuits [with a two-way, inter-deck dubbing capability]. Front-panel Mic Input and Mixing, with a frequency response suitable for use with a professional caliber microphone. And a Main-In/Pre-Out switch, which allows independent usage of the main amplifier section. The S9910 can accommodate three speaker groupings, two turntables, three tape decks and any auxiliary equipment.

It has State-of-the-Art tuner specs: an IHF FM Sensitivity rating of 9.84 dBf

[1.7 μ V]. A four-ganged tuning capacitor and dual-gate MOS FET's provide superior image rejection and spurious response rejection with minimal cross modulation. The newly developed digital detector system utilizes no tuned circuits and never requires alignment.

The Ceramic FM IF Filters are matched for optimal phase linearity. The Phase Lock Loop integrated circuitry in the multiplex decoder improves separation and SCA rejection, while limiting distortion.

It has all the features you need for the purest sound: Loudness Compensation, Hi-Filter and Subsonic Filter; precision detented Bass, Midrange and Treble controls [each with exceptional variance characteristics]; and a master Tone Defeat switch, for instant reference to flat response. Switchable FM Stereo Only and FM Muting. Dual Tuning Meters. And a Positune™ Indicator LED, which visually signals perfect tuning.

It has switchable FM Deemphasis [25 μ sec. and 75 μ sec.], to accommodate an outboard noise reduction unit. A built-in Ambience Retrieval System [A.R.S.] which recovers and

utilizes the frequently "hidden" ambient material found in conventional stereo recordings and derives an effective 4-channel sound from any stereo source.

It has plug-in driver boards [to facilitate servicing], which feature an I.C. differential amplifier input for stable operation.

It has relay speaker protection circuitry which automatically disengages your speakers if a potentially damaging situation arises.

It has everything we've mentioned. It has some features we haven't mentioned.

Best of all, it has a price of less than \$700*.

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