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AUDIO

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The Authoritative Magazine About High Fidelity



EVR VIDEO RECORDING

3 NOV. 1971

Your year-long guide to Stereo Hi-Fi Equipment

THE 1972

STEREO

PREVIEW

DIRECTORY

- Preamplifiers
- Amplifiers
- Speaker Systems
- Stereo FM Tuners
- Turntables
- Headphones
- Receivers
- Tape Recorders
- Compact Music Systems
- Phono Cartridges
- Record Reviews

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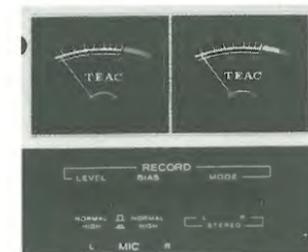
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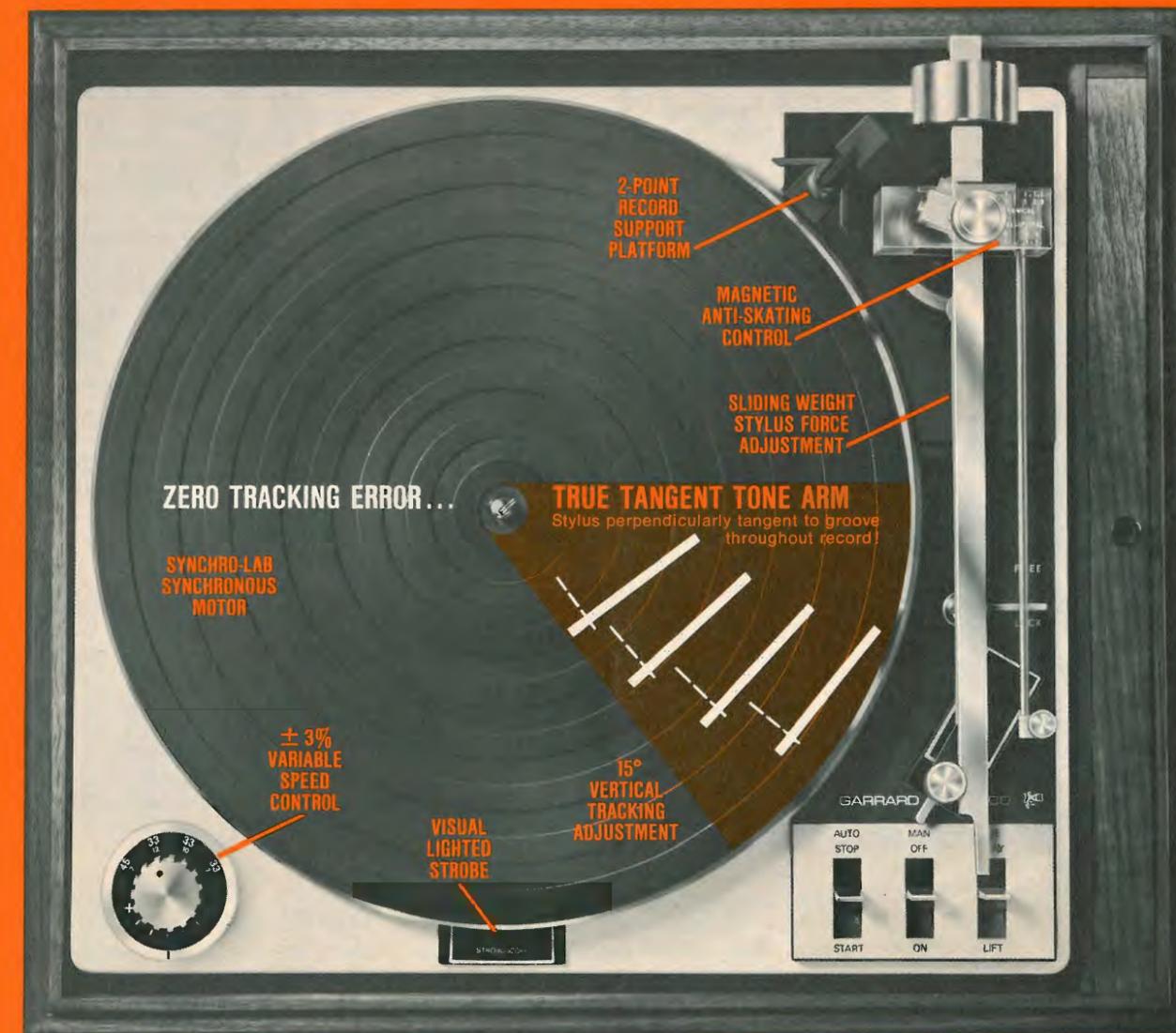
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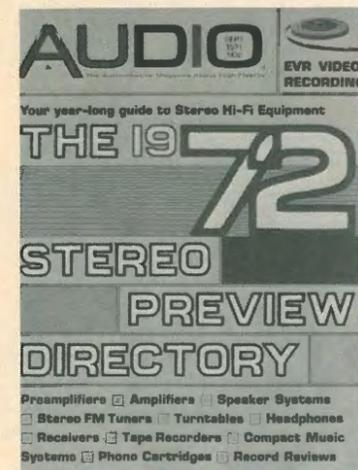
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The Electro-Voice, Sansui, JVC, CBS SQ, and Dyna systems examined in detail.

Equipment Reviews Include:
Tannoy Orbitus loudspeaker
Rabco ST-4 turntable



About the cover: This is a departure from our usual style and it emphasizes that this is THE Directory issue. What else can I say?

Audioclinic JOSEPH GIOVANELLI

Proper Amplifier Grounding

Q. It would often be more convenient to ground an outfit at one of the speaker terminals. This is not generally recommended. Why?—Joseph P. Laronda, Cheshire, Conn.

A. We generally ground sound equipment at a point which is located near an input terminal. Unfortunately, all too often, ground is not really ground. There is likely to be a voltage difference between ground and what we are using as a ground reference in our homes, such as a radiator or a waterpipe. Just as is true in that instance, there is likely to be a voltage difference between the speaker ground and the ground point for the components of a low-level input circuit. If we ground the system at the speaker terminal, this voltage difference may modulate the signal, especially from phonograph and tape head inputs. This difference in voltage will vary according to the powerline frequency, causing hum.

You may also find that it is sometimes better not to ground a given sound system. Hum may be aggravated when grounding is attempted.

Some solid state amplifiers were designed in such a way that neither speaker terminal is at ground potential. By attempting to ground such an amplifier at its speaker terminals, damage to it is sure to result.

There are also some tube amplifiers which do not ground the speaker terminals. These circuits are probably equipped with damping compensation. These amplifiers must not be grounded at their speaker terminals.

Time Delay Distortion

Q. What is time delay distortion as applied to loudspeaker systems?—Sgt. Dennis G. Mueller, APO San Francisco, Calif.

A. The idea behind time delay distortion in loudspeakers is that the cone does not move immediately upon the application of a signal to the voicecoil. This failure to move is a result of the inertia of the cone.

I think the easiest way to gain a better picture of this is to think of yourself rowing a boat. The boat does not move immediately when the oars are moved. Further, when attempting to stop the boat by backstroking, the boat does not stop immediately. Both of these effects are the result of the inertia of the boat.

Have you ever placed a glass filled with water on a napkin and then pulled the napkin from under the glass quickly? If you have, you found that the glass did not move. When the napkin is pulled straight and quickly, the glass won't move and the water won't spill. Again, this phenomenon is due, in part at least, to the inertia of the glass of water.

Amplifier Switching System

Q. I wish to set up a pair of remote speakers in my bedroom. What I would like to do is use these speakers with my main system, but I want also to be able to use them with a medium-powered receiver which is also located in the bedroom. The main system and the bedroom receiver will never be operating at the same time. Will I be able to use the bedroom speakers with both systems?—Corrado J. Bendotti, Bronx, N.Y.

A. You definitely can use your bedroom speakers, operating from two different sound systems. I suggest, however, that you provide a switch which will connect the bedroom speakers to either amplifier as desired, but not to both at one time. See Fig. 1. This operation requires the use of a 4-pole, two-position rotary switch. The speakers are connected to the wipers of the switch, while the amplifiers' output terminals will be on the switch contacts. For safety's sake, you should switch both sides of the speakers. As a further safety precaution, use a break-before-make switch.

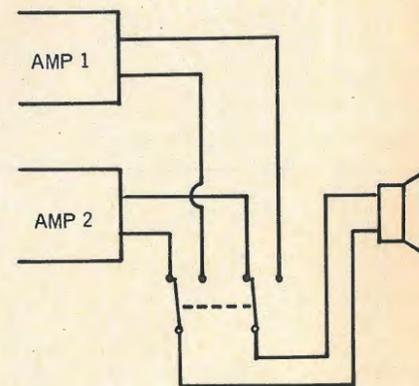


Fig. 1—Amplifier switching system, using two amps and one set of speakers (one channel shown).

The Dolby System: A Progress Report

Soon, more than thirty manufacturers will offer advanced new products incorporating the Dolby System.

The Dolby A-System is the professional noise reduction system. Every major recording company now uses it, and its use is rapidly increasing in motion picture studios, broadcasting stations, and communication networks throughout the world. The A-System has achieved virtually universal acceptance among professionals because it is precise and consistent in operation, simple to use, and has no effect upon the music or other signals being recorded or transmitted.

The Dolby B-System is the compatible high-fidelity noise reduction system for consumer applications. It uses the same basic principles as the A-System, but is much simpler and lower in cost than its professional counterpart. Dolby Laboratories makes only professional products, but licenses the B-System to manufacturers of home tape recorders, receivers and Dolby adapters. More than 30 companies soon will be making products incorporating the B-System, and others are joining the list each week.

ADVENT	KENWOOD (TRIO)
A.G.S.	LAFAYETTE
ALLIED RADIO SHACK	LENCO
AMPEX	MITSUBISHI
BELL & HOWELL	NAKAMICHI
BENJAMIN	PLANET
BIGSTON	RANK WHARFEDALE
CONCORD	REVOX
CROWN RADIO	SANSUI
FERROGRAPH	SILVER
FISHER	SINGER/K.L.H.
HARMAN-KARDON	TEAC
HIGHGATE (ALPHA)	TELETON
HITACHI	TELEX/VIKING
JANSZEN	3M/WOLLENSAK
KELLAR	

The Dolby B-System has been acclaimed by music and technical writers with a unanimity which is rare. The judgment of the reviewer of the New York Times is typical: "Dolby cassettes can produce almost disk-quality sound even when played on a first-quality machine that predates the Dolby technique. If you have one of the new players with built-in Dolby, the results can be quite spectacular."

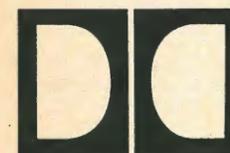
Hundreds of different commercially recorded Dolby cassettes will be available by the end of the year. Many are already being released regularly by Columbia, Ampex, London/Decca, Vox, Musical Heritage Society, RCA (U.K.), and Pye/Precision (U.K.). Twenty other companies have obtained the professional B-Type encoders needed for duplicating such cassettes. There is no royalty payment to Dolby for these recordings. Listeners and dealers everywhere agree that Dolby cassettes are perfectly playable on any cassette recorder, and usually sound better even on non-Dolby equipment.

The Dolby B-System and new tape formulations (such as chromium dioxide) work very well together. Although their noise reduction effect is much less than that of the Dolby System, some of the new tapes provide a useful extension of high-frequency response. Used with the Dolby System, they provide striking evidence of the cassette's real capability. Although chromium dioxide tape is not compatible with the vast majority of cassette recorders in the field and on dealers' shelves, more and more manufacturers are providing new machines with the necessary circuitry, along with the Dolby System.

The Dolby B-System has been used in FM broadcasting with excellent results. FCC rules permit broadcasting of Dolby-encoded signals in the U.S.; experiments of this kind are taking place in other countries as well. The reduction in noise given by the system can more than double the area in which high-fidelity listening is possible, with no increase needed in transmitter power. Later this year Fisher and Harman-Kardon will be the first to offer receivers with the Dolby System built in.

Integrated-circuit versions of the Dolby B-System will be available next year. An IC is being developed jointly by Signetics and Dolby Laboratories; the technology will be made available to IC manufacturers everywhere, to insure industry standardization and lowest cost to consumers, as well as reliable supply to manufacturers. Ultimately, the increased retail cost incurred by adding the Dolby System to a tape recorder should be \$10 to \$20.

The cost of licensing the Dolby System has been reduced considerably because of rapid industry acceptance of the system. Manufacturers now pay on a simple per-unit basis, with royalties as low as ten cents per channel. The licensing agreement also entitles a manufacturer to sustained technical support from Dolby Laboratories in noise reduction applications. Dolby employs a staff of more than 100 at its London facility, and maintains offices in New York and Tokyo, all devoted exclusively to noise reduction system development, manufacture, sale and licensing. To date, 80 patent applications have been filed in 17 countries to cover the Dolby System; 19 patents have already been issued in 10 countries, including the United States.



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With this, you can slow down a complex rush of notes, the better to appreciate the inner voices when you listen next at normal speeds. You can tune a recorded orchestra to match the instrument you play, and join in. Your tuning is not restricted to a paltry fraction of a note, either. You can exercise your urge to conduct, choosing whatever tempo suits you. And you can use it to extend your knowledge of the dance or language, or to accompany your slide or movie shows.

And at every one of these speeds, Swiss precision takes over. For example, the Lenco L-75's sleekly polished transcription tonearm shares many design concepts (such as gravity-controlled anti-skating, hydraulic cueing, and precision, knife-edge bearings) with arms costing more alone than the entire L-75 arm and turntable unit. And the dynamically balanced 8.8 lb. turntable reduces rumble, wow and flutter to inaudibility.



The L-75 complete with handsome walnut base at \$99.50 offers professional quality and versatility but at far less than studio-equipment prices. The B55 (lighter platter and an arm of almost equal specification) is only \$85.00 with base. Both are available now at your Benjamin/Lenco dealer. Benjamin Electronic Sound Corporation, Farmingdale, N.Y. 11735, a division of Instrument Systems Corporation.

Lenco turntables from Benjamin

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Tape Guide

Recording for Films

Q. We produce educational films, and often need to record background noises for scenes that are shot on location. It isn't economically feasible to tie up a sync recorder for this work. Since fidelity is not really important, we were thinking of buying an inexpensive reel-to-reel battery portable for this work. However, signal-to-noise ratio is a problem. Hiss is very apparent. If we replaced the two-track head that comes on these machines with a full-track head, would this improve S/N appreciably? What problems in matching the new head to the tape machine would we run into?—John Lord, Santa Monica, Calif.

A. Use of a full-track head in place of a half-track one would give a 3 or 4 db improvement in S/N. While this is nothing to be sneezed at, it will not go a long way in masking the hiss of the cheap portable tape machines. Replacing the heads may run you into impedance matching problems, and problems of adjusting bias current, signal drive current to the record head, and calibration of the record level indicator. And it will be necessary to make correct azimuth and other professional alignments of the replacement heads. While these problems are not insurmountable, the question is whether surmounting them is worth the effort.

Q. Recently I made a live recording of a symphony orchestra in a school auditorium and found a problem with their light dimmer radiating into the microphone cables. Also the clock correction signal came through loud and clear every hour on the hour: beep. . . .!!! The hook-up was from the school's mixer console into the line inputs of my tape recorder. The control room is located at the rear of the auditorium, and contains all the power equipment, the mixer, and the dimming panel. Hence the microphone cables run all the way from the front of the hall to the rear. What might be done to eliminate the problem, barring shutting off the dimmer panel?—Ronald L. Nelson, Oak Park, Ill.

A. One possibility is to investigate what might be achieved through electrical filters between the offending equipment and the current outlets. Can the mixer console be moved away from the offending equipment, and preferably be brought backstage? Can a portable mixer be brought on location?

Motors & Meters

Q. I am trying to choose between two high quality tape machines. One of these has but a single motor and uses an electronic eye as the record level indicator. The other has three motors and uses a

meter as the record level indicator. Could you advise me as to which machine would be the most desirable.—Philip Legendre, Minneapolis, Minn.

A. Basically you will have to decide for yourself, but the following comments may be of some help. Good engineering enables a home tape machine to perform as well with one motor as with three. On the other hand, for long, hard work, a 3-motor transport may prove more rugged. I find an electronic eye easier to work with than a meter in setting record level properly. The meter tends to understate peak signals, and may therefore lead one to record at too high a level for satisfactorily low distortion.

Cassette Quality

Q. I would like to ask if you consider the Norelco Compact Cassette Model 2401A a good addition to my system, which consists of a Scott receiver Model 342B, Garrard turntable Model SL95, and two W60D Wharfedale speakers. If for any reason you do not like this cassette model, will you recommend a good buy in a tape recorder? I prefer a cassette type to the reel-to-reel type.—Leonides O. Florin, Miami, Fla.

A. I can only comment in general that I don't think the quality of reproduction via cassette has reached the quality which we associate with high fidelity. In other words, reel-to-reel machines still offer better quality. On the other hand, cassette performance is steadily improving, and the situation may be different a few years from now. For specific recommendations, please consult your audio dealer and the equipment reviews in this and other magazines.

Test Equipment

Q. What test equipment do you consider desirable for maintenance and adjustment of tape recordings?—Edward B. Harmon, Los Altos, Calif.

A. Such equipment should include an a.c. VTVM, an oscilloscope, a harmonic distortion meter, an audio signal generator, an ohmmeter, a standard test tape, and if possible (but expensive) a wow-and-flutter meter.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped, self-addressed envelope.

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2. The most expensive turntable and amplifier connected to any other speakers.

CONCLUSION

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For those interested in the twelve years of research that led to the design of the 901, copies of the Audio Engineering Society paper 'ON THE DESIGN, MEASUREMENT AND EVALUATION OF LOUDSPEAKERS', by Dr. A. G. Bose, are available from BOSE Corporation for fifty cents.



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BEHIND THE SCENES

BERT WHYTE

AS I WRITE this, the Consumer Electronics Show in Chicago has been over for about 10 days, and I am still trying to recover from its rigors. You know, we heavy types are not much on walking and when I saw the simply stupefying size of the McCormick Place exhibit hall, I was ready for roller skates, rickshas, bicycles . . . anything but "shanks mare." Would you believe a hall in which you can lose ten football fields?

Well, somehow I made it to all the exhibits I wanted to see. There were plenty of audio manufacturers in attendance, but about all you could do was see their products. Sound demonstrations were for the most part an impossibility, for once the show started, from hundreds of booths issued the most monumental cacophony, which echoed and re-echoed in the vast expanses of the hall. Most of the hi-fi products on display were pretty much what I had described in my show preview last month, with a few surprises here and there. There was no question whatever that the dominant themes were Dolby and four-channel stereo. There were Dolby cassette machines from 3M/Wollensak, Teac, and Concord, all newcomers to the Dolby fold. There were Dolby open-reel tape decks from Revox, Ferrograph, and Concord. In the Dolby "black box" department there were units from Concord and Teac, with Teac featuring the most elaborate and expensive box now on the market, as well as a surprise unit . . . a record and play Dolby black box to be used in connection with Teac cassette machines at an astonishing \$49.95. To underline the point that open-reel tape is alive and well, there was a profusion of new or upgraded tape decks from Teac, Sony, Concord, Roberts, Akai, and Ampex among others. Four-channel stereo open reel decks were on display at Sony, Teac, Astrocom, and Wollensak. Four-channel cassette decks were shown by JVC using the four-channels-in-each-direction concept, and by Astrocom espousing the four-channels-in-line concept similar to the open reel four-channel format. The JVC four-channel-discrete disc was opposed by the Electro-Voice matrix disc. Four-channel matrix systems were all over the place with hardware from Sansui, Toshiba and many others. Harman Kardon was on

hand with an experimental four-channel synthesizer which I found quite interesting because it features a true delay system. The expected four-channel stereo amplifiers and receivers were shown by Fisher and Scott with some others germinating in company laboratories. The eight-track four-channel cartridge decks were a prominent feature of the Show, appearing at Ampex, RCA, Motorola, Toyo, Fisher, and Wollensak among others. The Dolbyized receivers due from Kenwood, Hitachi, Fisher, and Harman Kardon were "no shows," but they are definitely slated for production. There was an absolute plethora of other audio gear, far too much to mention.

I have noted the Dolby and four-channel stereo trends at the show, and taking a long hard look and going a bit out on a limb, it would appear that the biggest impetus to four-channel at present is the four-channel cartridge. I base this on the fact that there are inexpensive complete four-channel stereo playback systems aimed at the mass market. There are audiophile-quality four-channel stereo cartridge decks. Most importantly, there are numerous four-channel cartridge systems for automobiles. Now add the quite substantial quantity of four-channel stereo cartridges released by RCA, with other companies announcing they will be issuing products in this format. The youth market simply eats up the pop "surround" type of four-channel sound. They will put it in their cars first, and then they're going to want to play four-channel stereo at home. All this will get the overall four-channel stereo ball rolling and I predict rapid progress in getting a four-channel stereo disc on the market, with subsequent FM broadcasting. Four-channel cassettes will be very big before long, and of course the best sound of all . . . four-channel open-reel stereo . . . will flourish as well. One fact was certainly made apparent at the CES . . . four-channel stereo is a reality. It is here to stay and those retailers who have been bad-mouthing it may as well resign themselves to the fact that it won't be very long before it is a major factor in their businesses.

That splendid bastion of classical programming, WFMT in Chicago, was kept busy during the show. In a

2 matching 2-way air suspension high-fidelity speakers

Acrylic dust cover
4-speed record changer
Sleep switch turns off entire system when last record is finished
Speaker selector switch



Mechanical cuing lever that allows manual lowering or raising of the tone arm

Ceramic cartridge and diamond stylus

Exclusive SEA tone control system

"Galaxy" indicator which glows red when a stereo broadcast signal is received

Illuminated round dial AM/FM radio with "Bull's eye" tuner that glows orange when tuner is locked in on an FM station

Tape recording and tape monitoring terminals

\$229⁹⁵*

*ALL PRICES SUGGESTED RETAIL.

When was the last time you felt you were getting more than you paid for?

Or for that matter, when was the last time you remember just getting what you paid for in the first place?

The bargain, unfortunately, is something people don't see too much of anymore.

This JVC compact stereo is the rare exception.

You're not only getting all the features you'd expect to get on a compact, you're also getting one you wouldn't expect to get.

That's JVC's exclusive SEA sound control system. SEA is a sound effect amplifier system that allows you to do a lot more than merely adjust

for bass and treble. It's made up of a series of sound control levers. By adjusting them you can bring up the strings in a symphony, bring down the drums in a rock group, or create all new sounds. SEA even allows you to compensate for variations in room acoustics.

We were the first people to develop it. And the first people to put it in a compact.

That feature, plus all the other features we've built into this set, make it an unusual compact.

At an unheard of price. In fact no matter what your price

range is, you'll be able to find something in JVC's complete line of compacts.

We've got everything from a solid state AM/FM radio 4-speed phonograph at \$149.95* to a powerful 80 watt SEA system at \$299.95*.

No matter what you choose, you'll be getting a lot more than you expected to get.

At a lot less than you expected to pay.

JVC

JVC America, Inc.
50-35 56th Road, Maspeth, N.Y. 11378

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HEAD STRONG



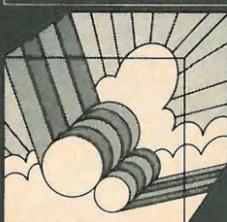
The Ampex AX-50 stereo tape deck has three of the strongest heads money can buy. Deep-Gap heads made to last 10,000 hours, without variance in gap or frequency response. Which is about 10 times longer than regular heads. That's strong!

The AX-50 is also strong on capabilities. With a heavy-duty hysteresis synchronous motor. Direct tape monitor. Pause/edit control. Echo effect. Function programmer for sound-on-sound and sound-with-sound. Stereo headphone jack. Plus many more features you must see... and hear.

You need a strong deck to pick up today's heavy sounds. And the AX-50 is the strongest in its price range.

\$249.95
(Suggested retail price)

AMPEX



THE SOUND IDEA PEOPLE

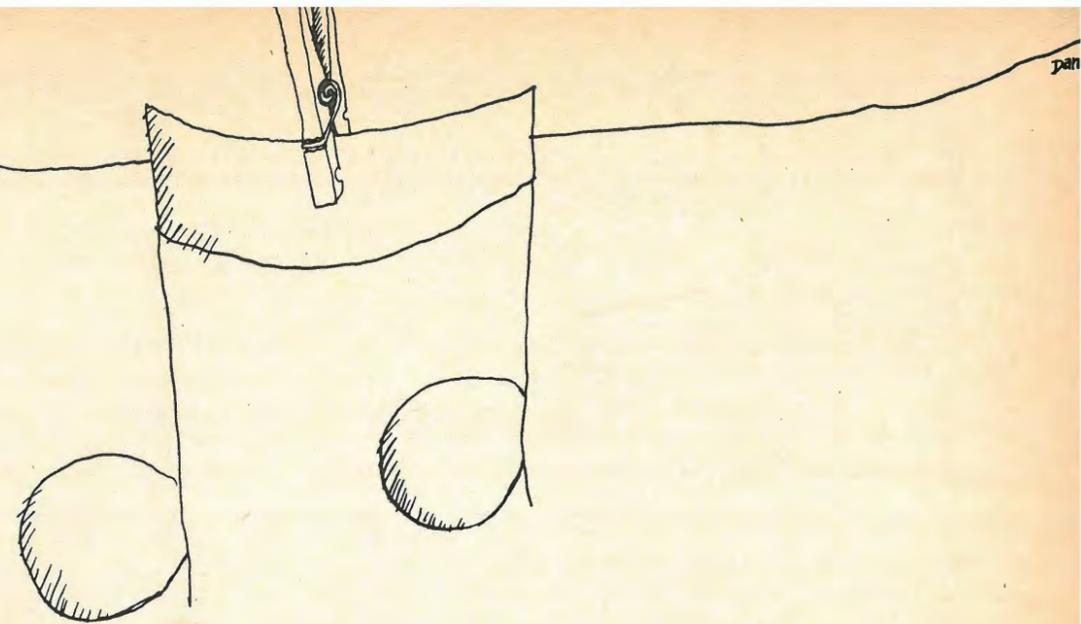
historic broadcast, WFMT presented the first Dolbyized FM transmission. Members of the press and interested Dolby licensees gathered at a suite in the Drake Hotel. A typical stereo system was set up with a tube-type tuner and a Dolby black box. The reason for the tube tuner was that the receiving antenna was literally in the shadow of the WFMT transmitter tower, and of course the signal was very strong. By removing some of the tubes it was hoped to attenuate the signal sufficiently to demonstrate the Dolby noise reduction. As it turned out, even fairly extreme measures failed to give the required attenuation, so the effect of 10 dB noise reduction had to be simulated. However, WFMT and Dolby had set up some excellent experimental procedures for the test broadcast. Six musical selections were to be broadcast at 4:30 and repeated at 9:30. Half of the selections were to be transmitted in the Dolby mode, the other half in normal fashion. Not until the conclusion of the second program was there to be an announcement as to which selections were transmitted with Dolby and which were normal. Listeners in all areas out to the fringes were asked to give their reactions to the broadcast. They were specifically asked if they thought their reception was improved or impaired. The listeners were told about the possible added "brightness" of the sound at the beginning of the broadcast and advised to turn down their treble controls if so desired. It is important to remember that these listeners were *not equipped* with Dolby "B" black boxes. There was a selected group of WFMT listeners in all areas out to the fringes who were furnished with Dolby "B" black boxes and instructed to their use.

The broadcast began and as far as we listening in the Drake were concerned, we heard a nice, clean, virtually noiseless transmission. One of the works broadcast was an excerpt of the opening passages of the Mahler 5th Symphony by the Chicago Symphony Orch. furnished by London Records. (That is what I call smart PR!) The same passage was broadcast twice in each program, once Dolbyized and once normal. I've listened to so much Dolby material I could tell which was which, but most of the others were straining to make their decision.

Well, the broadcasts were over and the calls from listeners started to come into WFMT. And the letters and postcards. Here was the real test... the reactions of listeners fairly close in, at middle distances and on the

fringes. Most without Dolby "B" boxes, a small group with them. Returns as yet are not complete, but a few days after the broadcast I talked to genial Ray Nordstrand, general manager of WFMT, and he was enthused by the results. He noted that the station had received over 50 letters from non-Dolby equipped listeners, who greatly preferred the Dolby transmission, stating that they liked the added "brightness" and that it increased intelligibility. In contrast, there were but 3 or 4 objections to the "brightness." On the basis of this initial evidence, it would seem safe to assume that the "brightness" of Dolby FM transmissions is not detrimental and is in fact a "plus." The listeners equipped with Dolby "B" boxes had the expected results. Those living in the so-called metropolitan area, heard a virtually noise-free signal. Those listening at greater distances observed improvement in their signal-to-noise ratio, and finally, what was formerly fringe area, with marginal reception, became an acceptable signal area. This the result of the ten dB improvement in signal-to-noise ratio and the equivalent of a ten-fold increase in transmitter power. In short the acceptable listening area of WFMT was increased by a factor of three. Mr. Nordstrand summed up the Dolby FM transmission as "very gratifying" and "most successful." Since the Dolbyizing of FM transmissions in no way subverts any normal FCC FM performance parameters, the pioneering effort of WFMT clears the way for other transmissions in other cities. In fact shortly after you receive this issue there will be a Dolby FM broadcast in New York. New Yorkers... watch your papers for details.

It should also be mentioned that enterprising WFMT, on the same day as the Dolby program, also broadcast a four-channel stereo program utilizing the Sansui system with a new encoder just developed by Sansui. On questioning the engineers of their opinion of the system, they said they felt the Sansui was a very symmetrical system which was probably the most compatible of all existing four-channel matrix systems. It is a bit complicated, but it was pointed out that in addition to those who listened to the four-channel broadcast through Sansui QS-1 units, there were probably quite a bit more who decoded the broadcast through Electro-Voice units. In any case, the Sansui broadcast was also considered very successful. Boy, I'll be glad when this four-channel stereo matrix system is finally resolved!



This new receiver cleans your signal, without cleaning out your bank account

It's a dirty world out there. And even though an FM station transmits a clean signal, by the time it reaches your house, it may be mixed up with 20 or so other signals, and some interference sources, many of them strong enough to swamp the signal you want to hear. The new Sony 6045 FM stereo/FM-AM receiver spares no detail to deliver a clean signal to your speakers.

Its FM front end uses *passive* r.f. circuitry, so that those strong, but undesired signals can't overload the input, to swamp your station or to pop up at several random places on the dial. (The passive input stage can't generate any hiss, either). By the time the signal does reach an active stage, most of the undesired signals have been shorn away—and since that stage is an FET, it's virtually immune to overloading anyway.

Six solid-state i.f. filters clean the signal even further. They combine uniform response over the entire FM channel with almost complete attenuation everywhere else. You can pluck the station from a host of stronger ones or adjacent frequencies. And solid-state i.f.'s never need realignment. Together, these ideally-matched FM circuits provide:

2.6 uV (IHF) sensitivity, 70 dB signal-to-noise ratio, 80 dB of selectivity, 100 dB of spurious signal rejection, and a capture ratio of 1.5 dB—all at a total harmonic distortion of only 0.4%. AM performance is equally outstanding.

Cleanliness doesn't stop at the 6045's tuner stage. Its amplifier uses the same dual-power-supply, direct-coupled approach as our more expensive amplifiers and receivers, so there's no coupling capacitor to stand between you and the music. The 6045 gives you the best sound your speaker is capable of, because you get the full damping factor at all frequencies, and perfect transfer of all 75 watts dynamic power output* at only 0.5% distortion. Noise at full output is a miniscule 0.13 millionths of a watt, virtually inaudible. Still, no matter how clean the receiver's circuits, some stations still put out a dirty signal, some records are worn or scratched and some tapes have hiss. The 6045 has an answer for that one, too: a high filter that cleans such signals up.

Price is not a dirty word either, \$229.50** which, in this day of rising prices, is just clean miraculous. Sony Corporation of America, 47-47 Van Dam St., Long Island City, New York 11101.

SONY 6045

*IHF standard constant supply method at 8 ohms. **Suggested retail price.



Check No. 11 on Reader Service Card

Editor's Review

IT'S SEPTEMBER AGAIN, and so we bring you the usual Annual Hi-Fi Directory. Our thanks go to all the people who spent time painstakingly filling in these forms—and especially to those who sent them in early! Observant readers will notice some changes from last year's listings. First, no misleading Music Power figures are given—just solid, honest watts. Second, there is a great increase in four-channel equipment now available. For instance, last year we had only one quadraphonic receiver—the Fisher 701. Now the number has gone up to 13. Another interesting (but not surprising) trend is the switch to Dolby systems for cassette units with no less than 6 listed and several more are in prototype stages.

Unquestionably the big attraction at the Chicago Consumer Electronics Show was four-channel sound, and almost every exhibitor boasted some kind of demonstration room or had four speakers playing away in a roped-off section of the carpeting. Not an ideal way to demonstrate, but enough good demonstrations were to be heard, convincing the skeptics and showing them what could be achieved. Electro-Voice was playing some of the new Ovation records made by Dick Schory who is one of the pioneers in this field. His "Re-Percussion" disc, made in 1957, was one of the first stereo records, and this was followed by "Music for Bang, Barroom and Harp," which became a bestseller. Not only did it have a wide dynamic range but it had a remarkably "clean" sound, even by today's standards.

Some dealers I spoke to were committed to the E-V system, some liked the simplicity of the Dyna, while others backed Sansui or JVC. Those who heard the new CBS SQ disc system were most impressed but the big question was "When are we going to get standardization?" It is true that meetings have been held between those concerned but agreement seems as far off as ever. I was impressed with one feature of the CBS demonstration: the fact that the SQ disc was compared with the original four-channel 15 ips master tape. Many synthetic quadraphonic systems, using artificial reverb or time delays, etc., sound exciting enough—but they do not attempt to create the original performance. If the object of quadraphonic sound is to bring the listener closer to the real thing, then the CBS comparison—which came off remarkably well—is the only valid test.

Watts Watts (Continued)

At a seminar held during the Show, one of the items discussed was the proposed FCC rms power rating standards. An executive (who shall remain nameless, as he may have had second thoughts) of a company making inexpensive record players, radio-phonographs, etc., said "... a wattage rating would make the package merchandisers look bad. It would be difficult to explain to the customer why the largest segment of the industry is downgrading its ratings. *No doubt there is some deception, but it is necessary to keep up the growth rate of the industry.*"

Congratulations

To the British *Wireless World* on the occasion of its 60th anniversary and to *Schwann Record and Tape Guide* which has printed the 25-millionth copy—listing more than 35,000 records and 10,000 tapes.

Miniature Tape Cartridge

I am not in favor of a multiplicity of standards, but I believe there is a future for the new miniature stereo tape format announced by Pioneer. Called Hipac, it is smaller than a cassette and only quarter the size of an 8-track cartridge. Obviously, it is ideal for car systems but it may well have other applications. Hipac was developed by a consortium of 10 Japanese manufacturers and Pioneer says a four-channel version will be available later this year.

De Koven

Back on the air after an absence of some months is the inimitable De Koven (he never uses his first name). His program will consist of "Barcoco" music seasoned with the usual shrewd and often acid comments. De Koven's Hour can be heard over station WFUV, New York, on Friday evenings at 9:00 p.m.

Humor in Advertising

From Denon: "Tchaikovsky would've if he could've listened to his 1812 Overture on Denon's Dual Triphonic, the sexiest sound in stereo." From Metrosound: "The new 8-track car stereo with channel indicator lights that spell *LOVE*. Several other four-letter words are available." What comment can I make about *that* one? *G.W.T.*

Playing records with some cartridges is like listening to Isaac Stern play half a violin.



The trouble with some stereo cartridges is that they don't offer even reproduction across the entire musical spectrum. In the important upper audio frequencies, some cartridges suffer as much as a 50% loss in music power.

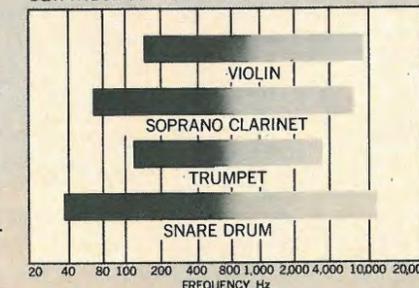
So, there's a lack of definition in the reproduction of violins, as well as clarinets, oboes, pianos, the organ and other instruments which depend on the overtones and harmonics in the upper frequency range for a complete tonal picture.

The Pickering XV-15 cartridge delivers 100% music power 100% of the time. Which is why we call it "The 100% Music Power Cartridge." At 100% music power, all the instruments are distinct and clear, because the XV-15's

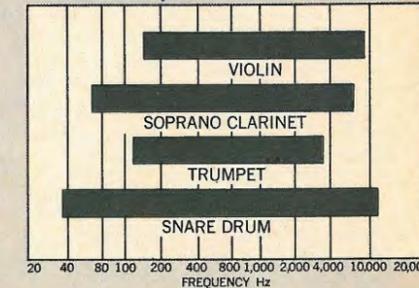
have no music-robbing output drop anywhere in the entire audio spectrum.

Pickering XV-15 stereo cartridges are priced from \$29.95 to \$65.00, and there's one to fit anything you play records with. For more information write: Pickering & Co., Inc., 101 Sunnyside Boulevard, Plainview, N.Y. 11803.

A 50% music power cartridge can mask some musical instruments



The Pickering XV-15 gives you 100% music power 100% of the time.



Pickering. The 100% music power cartridge.

"for those who can hear the difference"

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video recording

Gilbert P. Wyland*

*Director of Engineering & Development, CBS Electronic Video Recording Division, Rockleigh, N.J.

UNDER ONE rather large roof in Rockleigh, New Jersey, is a combination of ingredients, some familiar, many innovative and futuristic, for creating EVR cassettes. With roughly 60 percent of a 104,000 square-foot structure occupied by a series of electronic and photographic operations, EVR cassettes are being processed and delivered to customers. In another plant in Quincy, Ill., Motorola, Inc. is turning out Motorola EVR Teleplayers for these same customers.

CBS has made video cassettes a reality. Up to this point, the so-called video cassette revolution is EVR. AUDIO's readers will be interested in how it's happening, how it's coming, and where it's headed.

The chain of processes in the making of EVR cassettes begins when a customer's 16 or 35mm film or 1 or 2" videotape is received at Rockleigh for conversion to cassettes.

The first step is careful monitoring of the program to determine if quality is acceptable for conversion. At the same time, detailed notes are made of individual points where electronic improvements and adjustments can be made during mastering.

When the product has been accepted and gets its turn in mastering, these notes are followed rigorously. Within certain specified limits, the master can eliminate noise and other flaws in the customer print.

The first processing step involves playback of the customer material on either a telecine, Ampex 2-in. quad broadcast type machine, or one of a variety of 1-in. playbacks, Sony, Ampex, or IVC. A series of rooms houses these units. All rooms interconnect with the electron beam recorder, where mastering takes place, through a computer-run central control.

Central control has many functioning banks found in a television studio control room, some that are not. When a

film or videotape is ready for mastering, through a number of preparatory interlocks and exchanges of signals, the computer takes over the entire operation.

A number of things happen at once. The sound track is taken off on two Sangamo multi-track ATR's. This gives us an extra in case of trouble. While the sound is being recorded, an electron beam recorder is creating a master negative of the video portion of the film or videotape.

Rockleigh has a huge monochrome electron beam recorder (EBR) which operates at real time. This EBR was built for us at CBS Laboratories. Another like it is operating in Basildon, England, where the EVR Partnership has its processing facility.

Rockleigh also has a color EBR, a commercial model adapted for mastering color films by CBS Laboratories to meet the need for color cassettes that gained a full year when the EVR player advanced a year in color play capability. This EBR operated on an interim basis and is slower than the monochrome model. It is now used for back-up. A real-time EBR designed by CBS Laboratories for color conversions of both film and videotape became operative in August.

The monochrome EBR creates a 40mm master negative film, and the real-time EBR coming this summer will also make a 40mm master.

To understand why a 40mm master is made, you should first know that the finished EBR cassette film is 8.75mm wide. This is exactly 1/4 of a 35mm film. Each 40mm master uses 5mm for perforations and 35mm for reproducing through a series of EBR passes four widths side by side. The finished product contains both optical picture tracks and magnetic sound stripes.

The perforations used to guide the master with critical care are the only sprocketing used in EVR. The finished print has none and consequently is noiseless in playback.

The 40mm master negative is created in the two-gun electron beam recorder by moving silver-halide film under the two beams. In monochrome pro-

grams, image frames 0.1 in. high and 0.123 in. wide are formed on the film, in two image channels side by side. Each film channel has a capacity of up to 25 minutes, giving monochrome EVR cassettes a present maximum capacity of 50 minutes.

In color programs, half of this time is available in the finished product. The color process appears on monochrome film, too. But instead of two sets of picture channels side by side, each with its own magnetic sound track, there is one luminance picture track. The area that contains the second picture channel in monochrome EVR contains instead the encoded color information.

The EVR player, in order to "read" monochrome, looks at one picture channel at a time together with its corresponding magnetic sound stripe. A position on the player ("Color") enables the machine to look at both channels at once. The luminance (image) plus the chrominance (color information) "read" together, produce a color picture on any color television set.

Bypassing the complicated steps that make up the various parts of the EBR process, we wind up with our master which, in Rockleigh, is moved under clean-room conditions to a master preparation room. Here, signals are added which will make possible high-speed printing after more or less conventional developing of the master.

Workers operate under laminar flow hoods which produce a clean two-miles-per-hour airflow from the work to the worker. All handling of the negative is followed by ultrasonic cleaning.

Anyone familiar with photographic developing has seen equipment like the banks of developers. One is used for masters, three more are in present operation for prints. Chemicals mixed at the rear of the plant and stored there in huge tanks are fed in to the developers by pipe. There is never any accidental contamination from broken bags of chemicals.

A painstaking quality control operation assesses the master before developing. After developing, comparator and microdensitometer checks are made on the negative for exact conformity to

standards, before printing takes place.

High-quantity printing is done on a huge four-head printer. There are only two of these in the world, both made by Ilford. One's at Rockleigh, the other at Basildon.

AIL and Peterson printers, presently used for low-run orders, are turning out a good percentage of present production.

The Ilford four-head printer is a wet gate process capable of reproducing from the 40mm master on four separate heads at once. Since each printing head runs special 35mm film stock, the four programs on the master are being reproduced simultaneously on each of the four heads. In other words, the four-head printer turns out 16 prints at a time, at high speed.

Another factor in the four-head process is that the Sangamo sound equipment feeds back the sound tracks and they are printed at the same time as the picture. It's all one process.

When the AIL or Peterson printers are used, sound dubbing is separate, requiring a second operation.

After the four-head or single-head printers produce their prints, and sound dubbing is performed when needed, the next step is slitting and reeling. This is done rapidly on equipment developed

for EVR. The process, like many at Rockleigh, is under laminar flow hoods to keep the finished product dust-free. The 35mm prints are slit four ways into four sets of 8.75mm EVR widths. Reeling is high-speed. A separate operation puts leaders on and seals the cassettes.

Another quality control reading takes place. This is final inspection. If cassettes being spot-checked by playback on EVR players at the back of the plant pass muster, they are labelled and packed for shipment to customers. Final inspection is one of the most critical steps in a cassette's movement through Rockleigh.

CBS hasn't made public the size of its investment in Rockleigh but it is plainly in the millions. This is mentioned to give perspective to CBS's claim that EVR is piracy-proof. This point, so much a problem in audio recording, might be worth explaining in detail.

The EVR cassette is seven inches in diameter and about 1/2" thick. It looks like nothing else in the world except an EVR cassette. The only way that one can be replicated is under strict CBS or EVR Partnership control. You can't set up your own EVR cassette counterfeiting operation, the way it's possible to set one up in audio or VTR, in a

garage or attic, with a few thousand dollars worth of equipment. Pirates thrive on quick profit from minimum investment. EVR will be too rich for their blood—millions to rich.

This is not to say that it will be impossible for someone to make a VTR copy from an EVR playback. But here's the rub: what will anyone do with that VTR? It doesn't look a bit like an EVR cassette. It can't be sold in public—because the first one that appeared would itself be evidence of piracy. Since a pirate can't make his product so cleverly that it can't be told from the original, he can't get in the EVR game.

Consequently, producers and rights holders of properties of value, like Twentieth Century Fox, are looking to EVR not only as a new profit center for films, but one that will prevent the illegal operator from getting in on the act.

Before we leave Rockleigh, a few other points are interesting to mention. One is the fact that Rockleigh, as a new photoelectronic operation, gave CBS an opportunity to avoid an ecology hazard going in. By installing elaborate

Fig. 1—This prototype EVR player from CBS Labs plays either black and white or color and links up to any standard TV set.

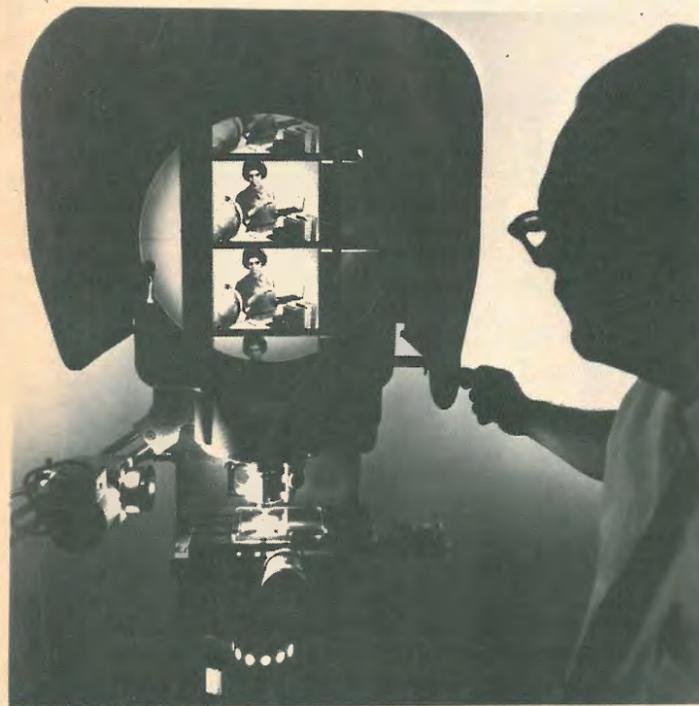
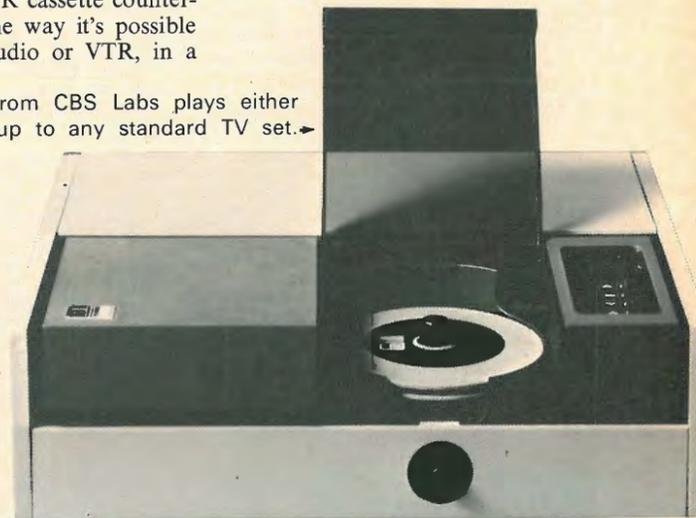


Fig. 2—Magnifying the EVR master negative 100 times, the Nikon profile projector permits minute examination of the negative for quality control before printing is authorized.



Fig. 3—The electron beam recorder.



WHAT'S IN AN ENCLOSURE?

Over forty years of knowledge and experience in loudspeaker design and manufacture, when it's the new TANNOY omni-directional speaker system, the "ORBITUS I".

This system embodies an entirely new version of the famous 12" Monitor Gold Dual Concentric loudspeaker, specifically designed for orbital sound reproduction. The enormous advantages of the integrated sound source of the Tannoy Dual Concentric loudspeaker are put to full use when used with an acoustically designed orbital deflector. The resultant sound pattern is completely omni-directional providing absolute spectrum integration between the high and low frequency systems of the Dual Concentric unit, thus producing a special effect unobtainable in any other system: ideal for stereo and quadraphonic applications.

Write for details:

TANNOY (AMERICA) LIMITED
1756 Ocean Avenue, Bohemia, N.Y.
TANNOY (CANADA) LIMITED
36 Bentley Avenue, Ottawa, Ont., Canada

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Left to right:
TRIDENT 50 Speaker
Low Distortion Oscillator
SC24 and SPA50

Arthur Radford produces laboratory instruments and high fidelity components which are accepted around the World as standards. In fact, Radford Laboratory audio measuring instruments are considered the finest units of their types available—anywhere! The new SC24 preamplifier, SPA50 power amplifier, and FMT-4 stereo tuner continue the Radford tradition of providing outstanding performance, reliability and quality combined with advanced engineering. The SC24 is an immensely flexible control center with graphic controls, while the SPA50 offers unconditional stability and a power bandwidth from 10 HZ to 1/2 million HZ. The distortion in these units is so low that Radford laboratory instruments are required to effectively measure it. The FMT-4 IHF sensitivity is 1.2 microvolts and incorporates circuitry with advanced features including a quadrature coincidence gate detector, phase lock loop stereo decoding and ceramic ladder IF filters.

While we can't possibly begin to provide you with all the technical information about Radford products in this space, we will give you all the details at no charge. Write or circle our reader service number, and we'll see that you receive with the technical literature, a list of dealers in the United States plus an unbiased test report by one of England's leading high fidelity publications. One final word—don't expect to find Radford products everywhere. Arthur Radford manufactures only a few thousand units each year. There are only a dozen dealers in England; less than thirty in the U. S. After all, you can only produce so many reference standards.



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Portland, Oregon 97220

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tanks and purification equipment at the beginning, CBS is able to boast (and I herewith do) that the wash water released as sewage at the end of our processing operation is clean enough to swim in and pure enough (though not very tasty) to drink.

This is accomplished by pumping the wastes into storage tanks where they are treated until the highest standard of purity is achieved. Only when the reading is perfect is the tank of wash water released to community sewers.

Another Rockleigh plus is a small private theatre which enables us to play, side by side, our finished cassettes and the original customer material simultaneously. The purpose is obvious.

Minute by minute, in fact, second by second, we can compare what the customer gave us with what we're giving him. In the case of good clean product on film or videotape we're having excellent results. With marginal customer material, we have a number of special steps we take before mastering which may, within measurable limits, actually improve the customer material. However, the better the input the better the output.

Probably the most important of these steps is conversion of 1-in. VTR to 2-in. VTR before mastering. This is done on Ampex AVR 1. It's not a miracle maker but it is an excellent tool for its purpose.

Cassettes have gone to such customers as Equitable Life Assurance Society of the United States, Ayerst Laboratories, Videorecord Corporation of America, American Program Bureau, Motorola, Inc. whose Teleprogram Center makes them our largest software customer, Davis & Geck, Shell, A.T.&T., Province of Ontario, and many more. The flow of cassettes is picking up rapidly, although we are still far from capacity. We are beyond the stage of running in our equipment and advancing towards our goal of full production this year.

Full production can be from two to three million cassettes, depending on the speed with which we realize our plan and another factor harder to measure, actual depth of new customer cassette orders. We are satisfied that we are close to original projections and expect to have gone from one-shift to two-shift operation by the time this is read.

On days when equipment malfunction plagued us, we had a great consolation to support our efforts. Everyone else aspiring to a position in the "video cassette revolution" has all these problems still ahead of them. They're behind us. And with EVR production gaining every day, our lead looks better every day.

AE

16 AUDIO • SEPTEMBER 1971



They sound a lot like our speakers.

KLH?
In the headphone business?
That probably comes as a surprise to you.
But ask yourself this question: what could be more logical than for a major loudspeaker company to also have headphones?
That's the question we asked ourselves. And we think you'll love our answer.
The KLH Model Eighty Professional Headphones.
We call them "professional"

because you can actually plug them into a 600 ohm studio line, as well as use them with practically any home music system. Also, you can wear them for hours without any strain because they are much lighter and sleeker than conventional headphones.
But what really makes our Model Eighty Professional Headphones so unique is their sound. If you can imagine headphones that sound more musical than electronic, you've got a pretty good idea of what ours are all about. Stated simply, they sound like

our loudspeakers. And that has got to make them the most unique headphones you've ever heard.
The Model Eighty Professional Headphones cost \$49.95.† They're at your KLH dealer now. Hear them soon. We think you'll be as excited about them as we are.
For more technical information on the Model Eighty, write to KLH Research and Development, 30 Cross St., Cambridge, Mass. 02139. Or visit your KLH dealer.



KLH RESEARCH AND DEVELOPMENT
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†Suggested retail price.
*A trademark of The Singer Company

Check No. 17 on Reader Service Card

Testing High Quality Loudspeakers

Part two H. D. Harwood*

Distortion and Overload

This is a subject on which most authors are silent, though not without reason. Total harmonic distortion figures of small fractions of one percent are gaily quoted by amplifier and equipment manufacturers and are expected by the customers, but figures as to the distortion generated by the loudspeaker and therefore actually heard, are few and far between. The problem divides itself into two parts, the difficulty of making meaningful measurements and the interpretation of the results.

A loudspeaker has a number of sources of distortion, viz. voice coil amplitude, spider, surround, and of course, the cone. The latter can be regarded as a transmission line, open circuited at one end and only roughly terminated at the other, having differing velocities of propagation in the radial and circumferential directions. In the latter case the fundamental frequency for a straight sided 12 in. cone will be between 50 and 100 Hz with frequent overtones above this. Radial modes do not usually set in before 400 Hz but the surround can cause trouble in this frequency region too. Even the spider will resonate and have standing waves causing an irregular frequency distortion curve, and the only item which has a smooth curve in this respect is the voice coil-magnetic field system.

It is therefore not surprising that the frequency distortion curves are extremely irregular, much more so than those of the fundamental. In order to obtain meaningful results, therefore, it is even more essential than it is for the fundamental to employ a method of measurement giving the various orders of distortion as a continuous function of frequency.

There are three such methods of measurement available. One due to Olsen and Pennie [9] employs a series of high pass filters which are switched in automatically as the test frequency is increased so removing the fundamental and allowing the sum of all harmonics and noise to be measured. Although better than nothing, it will be shown later that this measurement of total harmonic distortion is not very meaningful.

The second method is due to Bruel and Kjaer who use their 1/3rd octave band-pass filters, again switched in automatically, to measure the second and third harmonics as a function of frequency. This is better but of course we would very much like information on the higher harmonics, which is not possible with this set-up owing to the comparatively wide bandwidth of the filters. What we really need is an

*BBC, London, England.

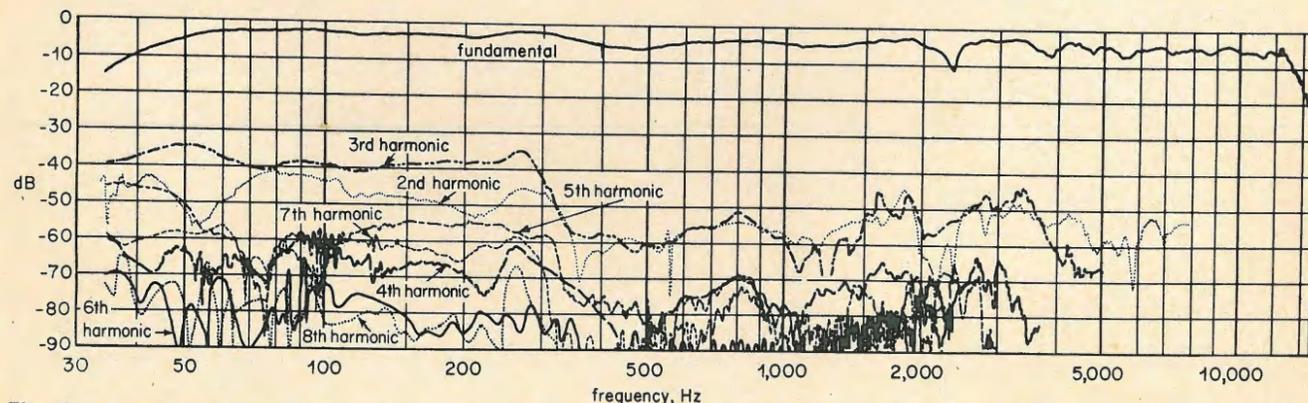


Fig. 6—Harmonic distortion curves of three-unit monitoring loudspeaker in free-field room. Sound level $1N \pm m^2$ at five feet from loudspeaker.

instrument which measures harmonic distortion up to about the eighth order as a continuous function of frequency. Since, by definition, this order harmonic cannot be measured at a higher fundamental frequency than three octaves below the upper cut-off frequency of the loudspeaker, these curves should be supplemented by intermodulation tests, again as a continuous function of frequency, which of course can extend right up to the cut-off frequency itself. Since no such instrument was available one was designed by the author for use at the BBC [10]. This is not the place to enter into details of its design, which is described in the reference given, but by means of heterodyne methods, this versatile instrument enables both harmonic and intermodulation distortion curves to be taken as described above. It is a pity that although the patent is available for exploitation, no instrument firm has produced it for use by other organizations. A typical set of curves is given in Figs. 6 and 7 for a high quality monitoring loudspeaker taken at a sound level of $1N \pm m^2$ at five feet in a free-field room. Note not only how low the average distortion is but also that the higher order distortion curves are very irregular and that the frequency at which one harmonic is a maximum may even be a minimum for another. For example, if we look at the difference between the sixth and the eighth harmonics at 55 and 59 Hz, at the lower frequency the eighth is at least 22 dB above the sixth, whilst at the higher frequency it is 19 dB below, a relative change of at least 40 dB in 4 Hz! Between 250 and 260 Hz, there is a corresponding difference of over 25 dB. In fact the figures are even greater than these but the curves have been cut off at -90 dB as they cannot be guaranteed below this level.

The intermodulation curves are comparatively smooth in this case as they largely relate to the tweeter which in this design moves almost as a rigid piston up to the highest frequencies, and therefore does not break up into resonance modes.

The interpretation of these curves needs some care. In the first place, although we can see that the general trend of the curves for such a high quality loudspeaker is smooth, on the other hand, because of the irregular detail as described above, it is not possible to get the average separation of the curves by means of measurement at a few spot frequencies. The next most important point is that a simple rms sum of the levels is

quite inadequate. No one would seriously dispute that one percent of seventh harmonic is far more objectionable than the same level of second harmonic. As long ago as 1937 it was demonstrated by the R.M.A. [11] that to get a reasonable subjective assessment, the level of the harmonics should be weighted at least according to their order. Since then two papers [12, 13] have clearly indicated that the weighting should be according to the square of the order, that is, instead of using the rms sum of the harmonics, each harmonic level is multiplied by n^2+4 , where n is the order of the harmonic, before taking the rms sum. In this way the level of the second harmonic remains unchanged. It is the need for this type of weighting which shows the inadequacy of the simple rms figure measured by the first of the tests described earlier.

It should be noted here that some nonlinearities can be highly nonlinear, that is to say that they may even increase rapidly with input level and then decrease again as a percentage of the fundamental. The surround is particularly susceptible to this, both near the half wave resonance point and in the bass. In the first case owing to resonance, the amplitude may increase rapidly with increasing input until the highly nonlinear region is reached. Distortion is then at a maximum and cannot increase. However, as the input voltage is increased, the output from the cone will still increase and the total percentage distortion will therefore be reduced. A similar case occurs at the bass end, particularly at the vent resonance frequency of a vented cabinet. Here, when the cone moves, say, inwards there is a very high back pressure in the cabinet

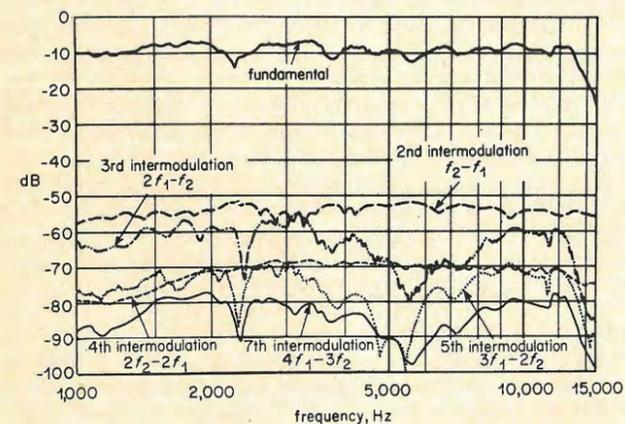


Fig. 7—Intermodulation distortion curves of three-unit monitoring loudspeaker in free-field room. Sound level $1N \pm m^2$ at five feet from loudspeaker.

pushing the surround outwards and, if it is very compliant, the surround may actually move in the opposite direction to the cone until the elastic limit is reached. Thus it will execute almost a square wave in antiphase with the cone, but again as the input power is increased the total distortion will reach a peak and then be reduced. Note that in each case high orders of harmonics may well be produced in the process and that the maximum distortion may actually be at low or medium sound levels.

The overload level is related to the distortion level in a complex way. The two variables are the peak to rms ratio of the program and the spectrum concerned, as in practice amplifier/loudspeaker systems overload on peaks well before they burn out. For example solo piano will overload loudspeaker systems at much lower loudness than will an orchestra, and organ pedal notes will show up any excessive bass equalization. Thus to arrive at a stable figure, we use bands of pink noise. It may seem surprising that the overload point of noise can be heard in view of the nature of the spectrum but in practice it can be determined by ear within ± 1 dB.

Transient Response

The transient response of a loudspeaker can be measured by placing it in a free-field room and determining the response to a sudden impulse such as a square wave or by the response to bursts of tone. In theory the former test contains all the desired information but in practice it is difficult to analyze, particularly because, as will be shown later, it is necessary to measure transients well below the steady state level.

In practice therefore only the chopped tone method is useful. In this test the input to the loudspeaker is gradually changed in frequency whilst the amplitude is chopped at the input of the power amplifier (so maintaining the correct damping at the terminals of the loudspeaker) at a rate of about five times per second, so that the burst of tone lasts for about 100 mS and the off period for similar length of time. The repetition rate is a cross between a high value allowing a rapid frequency glide and a slow enough rate to allow steady state conditions to be established. For very high Qs even slower repetition rates are necessary. During the off period the output of the loudspeaker is examined for resonance which will show up as a "tail" on an oscilloscope. The degree to which the level of the commencement of the tail is below the steady state is measured; this is known as the dilution of the resonance. The Q and the frequency of resonance are also noted. At one time it was customary, at the BBC, to take delayed response curves, that is curves of the output from the loudspeaker at intervals of 5, 10, 20, 30, etc. mS after the tone had been cut off. This gives a very good picture of the transient response

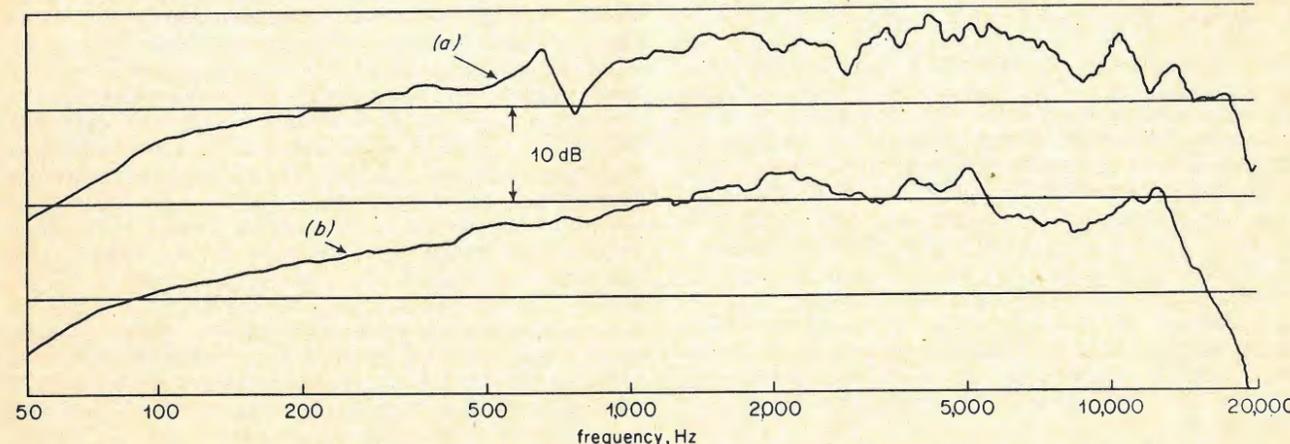


Fig. 8—Axial frequency response curves of two small two-unit loudspeakers; (a) first design, (b) second design. (Curves arbitrarily displaced.)

but is a rather lengthy procedure and the present practice is merely to glide throughout the frequency range noting the parameters given above.

The measurement of transients is another aspect of loudspeaker testing which reveals our ignorance on the subjective side. The importance of the transient response generally seems to be badly underestimated for it is no exaggeration to say that with modern high quality units the coloration caused by a poor transient response is the main factor in determining the sound quality of the loudspeaker. A good example is shown in Fig. 8. This shows the axial response of two loudspeakers of similar size, and as a matter of interest, designed by the same engineer when he was at two different firms. The top curve shows the axial frequency response curve of his first design and the lower curve his second, both curves taken by the present author. The progress made in smoothing out the axial response is commendable but the awful fact is that the first loudspeaker sounds very much better than the second. This latter has severe coloration centered around 500 Hz just where it will be seen that the axial response curve is specially smooth, whereas the irregularity in the upper curve near this frequency is relatively innocuous. This amount can be capped by the behavior of a middle frequency unit designed by us for a three-way monitoring system [14] and which also had a nicely smooth axial frequency response characteristic. On completion of the loudspeaker, listening tests showed a marked coloration in the 1500 Hz region even though the middle frequency unit had passed our usual tests. Still more careful measurement with chopped tone, however, showed up three resonances close together in frequency which had a dilution of no less than 40 dB, but a Q of about 500! Two things are noteworthy here. Firstly the effect of such resonances on the steady state is only 0.1 dB peak if they are in phase with the steady state response and very much less still if they are in quadrature. Secondly it is rather surprising that a material which in flat sheet form has a Q of much less than 1 should, when formed into a hyperbolic cone, have such a high Q. It is clear that a smooth steady state curve, whilst obviously desirable, is not in itself a guarantee of absence of coloration. It is here that the German DIN standard No. 45 500 falls down. In an attempt to define conditions necessary for a good loudspeaker from the transient aspect, a maximum slope is laid down of 12 dB per octave over any portion of the axial frequency response curve. Whilst, incidentally, this rules out a vented cabinet with its bass slope of 18 dB per octave, it is quite impossible to cope with the case cited above, of a maximum disturbance of 0.1 dB, in these terms. Whilst theoretically the information is indeed in the steady state curve, in fact it is too oblique a measurement of this parameter to be useful and the chopped tone technique is the only possible approach.

Several attempts have been made to record automatically the energy in the tail of the transient but in practice the required parameter is by no means clear. Experiments to determine the subjective correlation between frequency, Q, phase, and dilution are at present being conducted here but an indication of the difficulties in the way of instrumentation lies in the fact that subjectively a suppressed zero seems to be involved and preliminary results suggest that two resonances close together in frequency may add, not on an rms basis, i.e. 3 dB as do pure tones, or even arithmetically, i.e. 6 dB, but possibly to the tune of 10 dB. At the moment therefore we cannot predict the effect of a resonance; all we can do is to listen to program material or to pink noise through the loudspeaker, measure with chopped tone those resonances in the vicinity of a coloration, and increase either the dilution or damping or both until the resonance is inaudible. In the meantime it is clear we must examine at least 50 dB below the steady state and look for Qs up to 500 or more. This calls for

refined conditions of measurement, particularly in terms of standing waves in the free-field room.

Phase Frequency Response Characteristics

With few exceptions [15] the phase frequency response characteristics of loudspeakers are usually regarded as unimportant, and this accords with our experience. Measurements of phase response have been made here with the test loudspeaker in the free-field room by employing a wide range capacitor test microphone, a delay line and a phase meter of the zero crossing type connected to a level recorder. Except in the region of crossover such measurements have not been found to provide useful data and even in this restricted case equally useful information can be obtained by observing the individual contribution of the two units concerned and the way they add together.

One organization does go as far as to displace the various loudspeaker units one behind the other in order to be able to reproduce a square wave well, but it should be noted that this will only apply on the axis and leads to a complicated expensive cabinet system. We have found that by approximately adjusting the crossover network, the outputs can be made to add simply even when the units are in the same plane so that it is impossible to detect from the axial frequency response curve at what frequency the crossover is. Furthermore this will hold over the whole horizontal plane containing the axis. We have not found any further attention to phase to be necessary.

Doppler Effect

This falls into a similar category to the effects of phase in that while it must exist, we have never been able in practice to attribute any ill effects to this cause. This may partly be due to the fact that all serious listening at the BBC is done on loudspeakers with at least two units, and this of course will greatly reduce the Doppler effect. Even however with such wide range single-unit loudspeakers as the author has examined, it can be said that other faults have at least been far more important, but it is of course possible that with further progress the Doppler effect will become noticeable on program material as a small residual. No tests are therefore made for this effect.

Subjective Testing

This is the touchstone and none of our previous work is adequate if this test fails. It may be asked how this is possible in view of all the measurements we have taken, and some indications have been given in the sections concerned but it will not hurt to repeat them here. To start with, for a monitoring loudspeaker the quality of reproduction must be that of the original in all its stark reality, with no pandering to a "pleasant sound." In this it is assumed that we start with a microphone having a perfectly flat frequency response curve. But in spite of this we are still not sure what the optimum frequency response characteristic of the loudspeaker is, how much coloration we can stand, or what the best directivity is. Since the final result is subjective, we can only determine these conditions by subjective experiments and then lay down the objective results. Finally for a monitoring loudspeaker the results must hold for any type of program material. Thus a loudspeaker which obtains a very high degree of diffusion pleasant for reproducing an orchestra will not do for speech if a commentator appears to have a mouth six feet wide! The desired listening conditions must also be laid down. For a broadcasting organization it is assumed that the majority of listeners will be in their own homes, probably, for serious listening, in a living room. To this end a very large number of measurements have been made in listeners' homes and an average reverberation time of 0.4 seconds arrived at [15]. Listening rooms are therefore made to have this value of reverberation whenever possible.

One of the best forms of test material is also, strangely enough, the easiest to obtain, that of well known male voices speaking from dead surroundings. It is a fact that we are particularly sensitive to nuances in the human voice, a vast number of differing voices can be distinguished, and a well known voice is excellent test material. It has often been observed here that a loudspeaker which is balanced to reproduce the male voice is also excellent, over this frequency range, on music and other types of program material while the reverse does not necessarily hold at all. A further advantage of the speech test is that the person whose voice is being reproduced can stand behind the loudspeaker concerned and alternate live with reproduced speech.

For music tests it is necessary to have a studio at one's disposal together with an adjacent listening room, and to listen to a wide range of instruments, solo as well as in a full orchestra. Furthermore it is essential to use a single microphone pickup rather than multimike technique, or else it is not possible to listen directly to what the microphone is picking up. Recordings are a poor second best to a real performance as it is not possible to know the microphone characteristic, the reverberation, or even how the orchestra was playing that day. The latter point is quite important, as on one occasion, for example, the author thought the sound of the violins rather harsh over an experimental loudspeaker and was very relieved on entering the studio to find that harshly was exactly how they were playing at that moment.

Finally for outside broadcasts the listening conditions are often far from ideal and the loudspeaker has to be able to cope with these too. Generally the fault with such conditions is that there is not enough acoustic treatment present, a trend which is also becoming apparent in some modern homes, where the old type of deeply cushioned furniture is replaced with more sparsely upholstered types. In such circumstances the sound tends to be harsh and so will emphasize any such tendency in the loudspeaker. It is a truism to say that any excess is objected to more than a corresponding degree of deficiency. The experimental loudspeaker is therefore sent on a field trial under differing listening conditions and with differing studios.

It should be mentioned under this heading that one very convenient form of subjective test when an alteration is to be carried out is to make an instantaneous changeover between the two conditions. Now this is not always possible directly, as for example when the amount of damping compound on the cone is to be changed. It is not usually satisfactory to have one loudspeaker in one condition and one in another, as generally the difference between loudspeakers even of the same type is audible. The method we have employed is to record test material such as pink noise on the axis at a specified distance in the free-field room under each condition, one on either track of a two-track tape recorder. On replay on a monitor, switching between the two tracks can be instantaneous and the effect of even small changes can be made quite obvious and a record of them held.

Tolerances

When the design of a loudspeaker is fixed the only three parameters likely to change in production are the frequency response characteristic, the crossover network, and the coloration. Other factors such as the directivity, overload, etc., are usually constant. For a monitoring loudspeaker one essential goal is that all units should sound alike, so that if a producer records program material in one studio using one loudspeaker and edits the tape elsewhere, the balance should be identical. As all makers of loudspeakers know only too well, such a condition is extremely hard to achieve and until recently would have been thought impossible. The tolerances which the user will fix will therefore be tight as possible but at the same time must be realistic or no loudspeakers will pass the test. The response of paper pulp cones has been notoriously

difficult to control in the past, particularly the thinner cones, for after all they are merely an exercise in statistics with the pulp fibers as the variable! The position has been radically improved with the use of vacuum-formed thermoplastic materials. With the right materials these can be exceptionally free from coloration and give repeatable frequency response characteristics.

This leaves the crossover network components as the remaining variable. In order to obtain the sort of frequency response required of monitoring loudspeakers, crossover networks for the last quarter of a century in BBC designs also act as equalizers for the units themselves. The tolerance on components for these two purposes is fixed at ± 2 percent to maintain monitoring standards, and for this reason paper dielectric capacitors and gapped mu metal-cored inductors must be used to maintain the required stability over a long period.

For the studio monitoring loudspeaker type LS 5/5 the tolerance over the whole frequency band for the general trend of the frequency response characteristic is ± 1 dB with respect to the standard laid down. A further small allowance is made for minor local deviations from this standard. It is found to be much more satisfactory to divide the tolerance in this manner than if, for example, the two tolerances were added to give, say ± 2 dB overall instead. This would allow larger deviations in the general trend, which is not desirable.

As may be expected from these tolerances, the degree of uniformity of performance is very good. It is rarely possible to be able to detect differences between loudspeakers even on a direct changeover and certainly not by walking between differing studios. It also means that any two loudspeakers can be used as a stereo pair and provide an excellent sharp image.

It is of some satisfaction that we can state that the first production batch of these loudspeakers all passed this stringent test without any failures thus indicating the degree of precision now possible in the loudspeaker field. For comparison it should be noted that the tolerances on the frequency response characteristic of the best grade of capacitor microphones is 5 dB at the middle and high frequencies and 7 dB at the bass. With careful design, monitoring loudspeakers can at last be regarded as precision instruments.

Conclusions

It has been shown that many objective measurements are necessary during the design and testing of loudspeakers and it is true to say that the time has passed when a high quality loudspeaker could be constructed without their aid. On the other hand there is still a good deal of ignorance as to the exact design goal defined in objective terms, and further research should be carried out to elucidate these items, especially in the field of coloration. In the absence of such information we still have to fall back on a subjective test as the final assessment.

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11. *Radio Manufacturers Assn. Specification for Testing and Expressing Overall Performance of Radio Broadcast Receivers, Part 2, Acoustic Tests*, Dec., 1937, p. 5.
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1972 HI-FI PREVIEW DIRECTORY

THE THIRTEENTH annual product directory follows, as is the usual custom in the September issue. The specifications presented are the tabular form which was first used in 1965 to facilitate comparisons.

Note that letter codes are employed in some instances for purposes of clarity or to simplify listings. For instance, the symbol (B) preceding an amplifier listing indicates that it is a basic power amplifier, (K) indicates a kit, and tape speeds are similarly indicated by letter codes which are shown on the respective charts.

Note also that amplifier power measurements are given in rms or continuous power figures only as this rating is more realistic than fictitious music power and peak power figures.

Readers should also bear in mind that the specifications are those supplied by the manufacturers—they are not the result of our tests or measurements. Measurement methods may differ from manufacturer to manufacturer, but in general the performance may be considered to be as shown.

For more information on any product, or on any other products which are not listed, the reader may write the manufacturer directly at the company addresses listed on pages 26 and 27.

Obviously, not all the products of every manufacturer are listed, due to space limitations, and no listings of microphones are included as a comprehensive five-page listing was published in our July issue.

AMPLIFIERS---BASIC AND INTEGRATED



AR amplifier



Fisher TX-420



JBL SA-660

MODEL	MODEL	RMS Power/Chan., W	THD at Rated Power, %	THD at 1 Watt, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz-kHz	Freq. Resp. at 1 Watt, Hz	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	Tape Head Input, mV	High Level Input, V	Output Z, Ohms	Damping Factor	Dimensions, W x D x H, in.	Weights, Lbs.	Price	SPECIAL FEATURES
ACOUSTIC RESEARCH	AR	50	<0.5	<0.15	<0.25	<0.1	14-44K	20-20K ±1	57	2-5 (adj.)	100	0.2	4-16	16-40	15 1/4 x 10 x 4 1/2	19	\$250.00	Wood case opt., \$15.00.	
AKAI	AA6100 4-Chan.	15	0.5	-	-	-	20-22K ±5	70	3	-	500	150 mV	8	-	16 3/4 x 4 x 9 1/2	19	-	2 and 4-channel operation, universal A.C. selector, 29 silicon transistors.	
BIC LUX	71/4A	75	0.3	0.15	0.4	0.4	15-10K	10-50K	80	2.0	100	1.8	0.1	8	50	18 1/2 x 12 1/2 x 5	-	337.00	Var. tone-contr., turnovers, lo and hi filt., 2-pos; 2 spd. tape-head inputs.
ALLIED RADIO SHACK	SA-900	22	1	0.2	0.4	0.25	20-20K	30-20K ±3	55	2.5	-	0.2	8	-	3 1/2 x 14 1/2 x 11	17	129.95	IC; inputs for 2 recorders; walnut case.	
CROWN	D-40	80	0.05	0.05	0.25	0.12	5-40K ±1	5-100K ±0.5	105	-	-	0.68	4-16	400	19 x 7 1/4 x 1 1/2	8 1/2	229.00	Front panel headphone jack.	
	D-150	200	0.04	0.01	0.1	0.1	5-20K ±1	4-100K ±1	115	-	-	1.2	4-16	400	17 x 9 x 5 1/2	16	429.00	Only A.C. fuses; opt. 5-D cabinet, \$33.00.	
	DC-300	400	0.03	0.008	0.05	0.02	1-20K ±0.1	0-100K ±0.5	115	-	-	1.75	4-16	400	19 x 9 1/4 x 7	40	685.00	Direct couples; short and mismatch prof.	
DUNLAP CLARKE ELECTRONICS	DREAD-NAUGHT B1600	450	<0.075	<0.075	<0.1	<0.1	-	5-100K ±0.6	100	-	-	1.65	-	-	17 x 15 x 6	45	850.00	Model 500 similar but with 200 watts rms/chan., \$499.00.	
DYNACO	(B) Stereo 120	60	0.5	-	0.5	-	5-50K	5-100K ±0.5	-	-	-	1.5	8	40	13 x 10.5 x 4	20	(K) 159.95 (W) 199.95	Basic Power Amplifier	
	SCA-80 4-Chan.	40	0.5	-	0.5	-	8-50K	15-50K ±0.5	60	3.0	80	-	0.13	8	40	13 1/2 x 10 x 4 1/4	16	(K) 169.95 (W) 249.95	Special input may be wired for several choices of extra functions. SCA-80Q, 4-Chan., \$169.95(K), \$249.95(W).
	SCA-35(T)	17.5	1.0	0.2	1.0	0.2	-	20-20K ±0.5	60	4	100+	2.5	1.0	8-16	10	13 1/2 x 10 x 4 1/4	20	(K) 99.95 (W)W/A	
EICO	3070	20	0.7	0.15	2	0.6	20-30K	10-50K ±2	60	4.2	90	-	0.27	4-16	30	12 x 7 1/4 x 3 1/2	7 1/2	-	
	3150	50	0.15	0.1	0.6	0.2	20-30K	12-40K ±2	65	4.2	90	-	0.28	4-16	50	14 1/2 x 8 1/4 x 3 1/2	16 1/4	-	

AMPLIFIERS---BASIC AND INTEGRATED



Kenwood KA-7002



Phase Linear



JVC Model 5107



Rolecor RA-314

MODEL	MODEL	RMS Power/Chan., W	THD at Rated Power, %	THD at 1 Watt, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz-kHz	Freq. Resp. at 1 Watt, Hz	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	Tape Head Input, mV	High Level Input, V	Output Z, Ohms	Damping Factor	Dimensions, W x D x H, in.	Weights, Lbs.	Price	SPECIAL FEATURES
ELECTRO-VOICE	EV-1244	18	1.0	-	-	-	20-20K	20-30K ±1.5	70	3.0	-	0.25	4,8,16	-	8 3/4 x 10 1/4 x 3 3/8	18	132.30		
	EV-1244X 4-Chan.	12	<1.0	-	-	-	20-20K	20-30K ±1.5	-	-	-	-	4,8,16	-	8 3/4 x 10 1/4 x 3 3/8	18	149.95	4-channel; using E-V Stereo-4 circuitry.	
FISHER	TX-2000	50	0.5	0.2	0.8	0.2	22-24K	20-40K ±1.5	90	2.0	40	1.8	0.2	4	>10	15 1/2 x 12 1/2 x 4 1/4	24	349.95	Mic., tape hd. inputs; Hi filter 1 & 2; low filter.
	TX-420 4-Chan.	15	0.5	0.2	0.8	0.3	30-20K	20-25K ±2	65	-	-	0.2	-	>10	16 1/4 x 11 1/2 x 4 1/4	17 1/2	299.95	Includes 4-chan. 8-track player, matrix decoder.	
HARMAN-KARDON	Citation B12	60	0.2	0.01	0.1	0.009	10-40K	1-100K ±0.5	105	-	-	1.5	4,8,16	50	5 1/2 x 12 1/2 x 12 1/2	30	295.00 W 225.00 K	Overload protection; thermal mechanical, fuse; twin power supplies.	
	AA-15	50	0.5	0.2	0.5	0.2	6-30K	8-40K ±1	60	2.2	155	-	0.2	4,8,16	45	16 1/2 x 14 1/2 x 4 1/4	21.5	(K) 179.95	
HEATH	AA-29	35	0.25	0.1	0.2	0.1	5-30K	7-60K ±1	65	2.2	155	-	0.18	4,8,16	50	16 1/4 x 14 1/2 x 5 1/4	22	(K) 149.95	
	IA-1000	55	0.1	-	-	-	-	10-100K ±1	65	0.25	HIZ	-	2	0.9	8	50	17 1/2 x 13 x 5 1/2	27 1/2	319.95
HITACHI	IA-1200 4-Chan.	30	0.1	-	-	-	-	20-50K ±1	90	1.5, 5	-	1.5	1.0	8	40	16 1/2 x 12 1/2 x 5 1/2	26 1/2	595.00	Quasi complementary SEPP ITL-OTL; 3-way channel selector.
	B-1000 4-Chan.	500	0.1	0.05	0.1	0.05	8-60K	5-100K ±1	100	-	-	1.5	4-16	150	19 x 18 x 8	55	1000.00	Provides either 2 or 4 independent channels of amplification; electronic power level display.	
JBL	SA660	60	<0.2	<0.1	<0.2	<0.15	10-30K	20-20K ±0.75	72	4.0	250	-	0.25	4,8,16	32	17 x 14 x 5	27	435.00	
JVC	5012B	60	0.5	0.3	0.5	0.5	10-100K	15-50K ±1	-	-	-	-	8	80	19 x 13 1/2 x 6	36	599.95	Built-in VU meters, SEPP-OTL circuit.	
	5111B	50	0.5	0.4	0.15	0.15	20-30K	18-45K ±0.5	-	-	-	-	8	0.5, 5, or 50	8 1/2 x 12 1/2 x 6	16 1/2	249.95	Built-in VU meters, variable damping.	
	MCAV7E 4-Chan.	12.5	0.2	-	-	-	30-30K	25-35K ±3	75	1	-	-	8	50	17 x 12 x 5 1/2	22	199.95	Complete 4-channel control amp. with 4 meters and phase inverter scatter circuit.	
KENWOOD	KA-7002	50	0.5	0.1	0.3	0.1	2-50K	20-50K ±1	77	0.06 or 2.5	90	-	0.2	4-16	45	16 1/4 x 11 x 5 1/2	22	299.95	Direct coupling main amp and 2-stage differential amps, 3 spkr. sys.
	KA-5002	30	0.5	0.1	0.3	0.1	5-50K	20-50K ±1	77	0.06 or 2.5	90	-	0.2	4-16	45	16 1/4 x 11 x 5 1/2	20	219.95	Direct coupling main amp and 2 stage differential amp.
LAFAYETTE	LA-44 4-Chan.	25	0.8	0.07	<1	-	15-30K	20-20K ±1.5	60	3	-	-	0.25	4,8	-	20	219.95	Discrete 4-chan. amp w. circuit for 4-chan. derived sound from stereo sources.	

AMPLIFIERS --- BASIC AND INTEGRATED



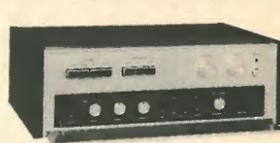
Marantz Model 250



Scott 499



Sony 1130



TEAC AS-201

MODEL	MODEL	RMS Power/Chan., W	THD at Rated Power, %	THD at 1 Watt, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz-kHz	Freq. Resp. at 1 Watt, Hz	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	Tape Head Input, mV	High Level Input, mV	Output Z, Ohms	Damping Factor	Dimensions, W x D x H, In.	Weights, Lbs.	Price	SPECIAL FEATURES
MARANTZ	1200	100	.15	.04	.15	.15	10-40K	20-20K ±1	100	1.3	100	—	0.1	8	100	15 1/4 x 14 x 5	37	595.00	Half power switch, automatic protective circuitry, direct coupled outputs, isolated preamp/amp inputs/outputs.
	1060	30	0.5	0.2	0.5	0.5	15-40K	15-40K ±2	67	1.8	100	—	.18	8	50	14 1/4 x 12 x 4 1/4	22	189.00	Front Mic/aux inputs, isolated pre-amp/amp outputs/inputs, quick terminals, 3 zone tone controls.
	(B)250	125	0.1	.03	0.1	0.1	5-45K	20-20K ±1	106	—	—	—	1.5	8	100	15 1/4 x 9 1/2 x 6 1/4	34	495.00	Two output meters/range switching, automatic protective circuitry and current limiting, direct coupled outputs.
	(B) 500	250	0.1	.03	0.1	0.1	3-60K	20-20K ±1	110	—	—	—	1.5	8	500	17 1/4 x 16 x 7	78	1200.00	Power monitoring meters/range switching, automatic protective/current limiting circuitry direct coupled, instant overload recovery.
NIKKO	TRM-1200	45	0.3	0.1	0.3	0.1	15-30K	13-50K	85	2.0	—	220	0.2	—	30	15 1/4 x 12 1/4 x 4 1/2	20	249.95	2 ICs; 2 Mic jacks; 2 spkr. sw.; tone flat sw.; time-delay muting.
PIONEER	SA-1000	57	0.3	0.5	0.2	0.2	5-50K	5-80K ±1	80	2.9	80	—	0.2	4-16	65	17 x 13 1/4 x 5 1/4	29	229.95	Direct-coupled output; 2-tape mtr.; pre-amp and amp separable; includes wood cabinet.
	SA-800	34	0.5	0.1	0.5	0.2	5-50K	5-80K ±1	80	3.0	80	—	0.23	4-16	65	17 x 13 1/4 x 5 1/4	23	239.95	Direct-coupled output; 2-tape mtr.; pre-amp and amp separable; includes wood cabinet.
PANASONIC	SU-3604 4-Chan.	50	0.2	—	0.2	—	5-50K	5-100K ±1 dB	73	15	—	—	0.1	4-16	100	16 1/2 x 14 1/4 x 5 1/4	27 1/2	309.95	Direct coupling amp; built-in 4 Ch. decoder; pre-set volume; 3-step bass and treble turnover; walnut cabinet included.
PHASE LINEAR	(B)700	350	<0.1	<0.1	<0.1	<0.1	0-40K	0-250K ±0.1	100	—	—	—	—	0.008	1000	19 x 10 x 7 1/2	45	749.00	Direct coupled; illum. VU meters; turn-on time delay.
REVOX	A50	40	0.1	0.1	0.3	—	10-40K	20-20K ±1	80	2.0	—	—	0.25	4-16	20	16 1/4 x 9 1/4 x 6 1/2	18	—	Stepped tone controls, separately adjustable inputs.
	ROTEL RA-610	32	0.1	0.1	0.15	0.15	3-55K	3-100K ±3	80	2.5	100	—	0.12	4, 8, 16	35	16 1/4 x 8 1/4 x 4 1/4	13.2	179.95	Split power supply; direct coupling; pre-main amplifier.
	ROTEL RA-214 4-Chan.	10	0.5	0.4	0.7	0.5	30-30K	20-70K ±3	60	2.5	30	—	0.12	4, 8, 16	—	—	—	159.95	4-chan. discrete and matrix system; pre-main amplifier.
SAE	(B) Mark III	120	0.1	0.1	0.1	0.1	8-50K	20-20K ±0.1	100	—	—	—	1.0	4-16	150+	17 x 15 x 5 1/4	45	700.00	Separate power supplies, 2 meters, 2 level controls, 12 output transistors.
SANSUI	AU999	70	<0.4	0.1	<0.4	0.1	10-30K	5-100K ±1	>100	2.0	—	2.0	0.2	4-16	45	18 x 11 1/4 x 6	38 1/2	299.95	Triple tone controls; step controls; 3 spkr. sys.; 11 inputs; 7 outputs.
	AU555A	33	<0.5	0.2	<0.5	0.2	20-40K	20-40K ±1	>100	2.0	—	1.5	—	4-16	50	15 1/4 x 11 x 5	17 1/2	169.95	Triple tone controls; step controls; NF amp. cir.; 7 inputs; 5 outputs.
SCOTT	490	70	0.5	—	—	—	15-40K	—	65	4.0	—	—	0.55	4, 8, 16	30	17 1/4 x 15 x 6	34	299.90	
	495 4-Chan.	25/50	0.5	—	—	—	15-40K	—	65	3.0	—	—	0.55	4, 8, 16	30	17 1/4 x 17 x 6	32	349.90	Discrete or matrixed 4-chan.
	499 4-Chan.	40	0.5	—	—	—	15-40K	—	65	3.0	—	1.0	0.55	8	30	18 1/2 x 12 x 6	36	459.90	Discrete or matrixed 4-chan.

THE SANSUI QS-1 QUADPHONIC SYNTHESIZER®



SANSUI QS-1

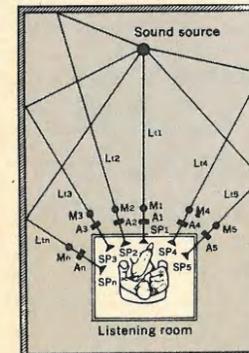
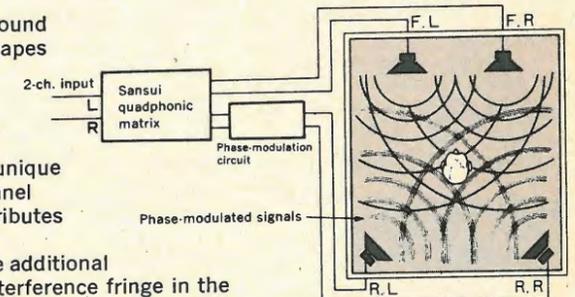
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After having discovered that the ambient components of the original total sound field are already contained in hidden form, in conventional stereo records, tapes and broadcasts, Sansui engineers developed a method for sensing and recovering them. These subtle shifts and modulations, if re-introduced, breathtakingly recreate the total of the original sound as it existed in the recording or broadcast studio.

The heart of the Sansui Quadphonic Synthesizer* is a combination of a unique reproducing matrix and a phase modulator. The matrix analyzes the 2-channel information to obtain separate direct and indirect components, then redistributes these signals into a sound field consisting of four distinct sources.

This type of phase modulation of the indirect components, applied to the additional speakers, adds another important element. It sets up a complex phase interference fringe in the listening room that duplicates the multiple indirect-wave effects of the original field. The result is parallel to what would be obtained by using an infinite number of microphones in the studio (M1 through Mn in the accompanying illustration) and reproducing them through a corresponding number of channels and speakers.



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*Patents Pending

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AMPLIFIERS		MODEL	MODEL	RMS Power/Chan., W	THD at Rated Power, %	THD at 1 Watt, %	THD at 1 Watt, %	THD at 1 Watt, %	Power Bandwidth, Hz-kHz	Freq. Resp. at 1 Watt, Hz	Rated Output S.N. Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	Tape Head Input, mV	High Level Input, V	Output Z, Ohms	Damping Factor	Dimensions, W x D x H, in.	Weights, Lbs.	Price	SPECIAL FEATURES
SHERWOOD	S9500C	45	0.9	0.15	0.6	0.2	8-35K	20-20K ±0.5	65	1.8	100	-	0.18	4-16	30	14 x 10 1/2 x 4	16	199.95	Wal. case, \$28.00; metal case, \$9.00; two aux. inputs.		
SONY	TA-1130	65	0.1	0.05	0.1	0.05	7-30K	10-200K ±0.2	110	1.2	90	-	0.13	-	100	15 1/4 x 12 7/8 x 5 7/8	28 1/4	359.50			
	TA-1144	30	0.2	0.05	0.2	0.05	15-35K	10-100K ±0.2	90	1.2	90	-	0.15	-	70	16 5/8 x 12 5/8 x 5 1/4	17 1/4	219.50			
	TA-3200F (B)	100	0.1	0.03	0.1	0.03	5-35K	5-200K ±0.2	110	-	-	-	-	-	-	15 1/2 x 12 1/2 x 5 7/8	30 3/8	349.50	Basic amp.		
STANDARD	PM403	15	0.8	0.2	0.5	0.6	30-30K	20-40K ±3	60	2.5	-	-	0.1	8	30	13 1/2 x 7 7/8 x 3 1/16	8	94.95	Speaker sys. A & B; ldrns. and tape monitor control; mag. and Xtal sw.; includes wood cabinet.		
TEAC	AE-201	50	0.1	0.1	0.2	0.1	10-40K	8-120K ±0-1	N/A	-	-	-	0.7	4-16	-	8 1/4 x 13 x 5 1/4	15	199.50	Differential, direct coupled output circuit; thermal overload breakers; speaker phasing switches; L-R stereo balancing switch.		
	AS-201	50	0.5	0.1	0.5	0.1	20-30K	20-80K ±0-1	70	2.0	-	-	0.13	4-16	30	16 1/2 x 11 1/2 x 6	21	349.50	Differential, direct coupled output circuit; FET preamp; 2 tape monitors; tape copy function; thermal overload breakers.		
YAMAHA	CA500	22	0.5	0.05	0.8	0.1	20-30K	20-40K ±0.3	95	3.0	90	-	0.2	8	40	-	-	-	-		
	CA700	60	0.1	0.05	0.3	0.1	20-50K	15-50K ±1-3	95	3.0	90	-	0.2	8	50	-	-	-	-		

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Anaheim, Calif. 92803

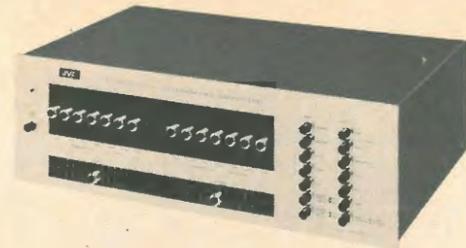
Utah Electronics
1124 E. Franklin St.
Huntington, Ind. 46750

V-M Corp.
375 Main St.
Benton Harbor, Mich. 49022

WHARFEDALE (See British Industries)

Yamaha
7733 Telegraph Road
Montebello, Calif. 90640

PREAMPLIFIERS



JVC Model 5011



Marantz Model 33



Harman Kardon Citation 11



Sony 2000F

MANUFACTURER (Circled numbers indicate adv. page)	MODEL	Frequency Response, Hz ±1 dB	Rated Output, V	TMD at Rated Output, %	IM at Rated Output, %	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	Tape/Head Sens., mV	High Level Sens., V	Tape-Monitor Z _i , Ohms	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
CROWN	IC-150	3-100K ±0.6	2.5	—	0.01	80	0.8-8*	33-330*	—	0.22	600	17 x 8 1/2 x 5 1/4	10	269.00	Cascade; remote control muting; panorama control reverses sound; wal. cab. \$33.00. *Adjustable.
DYNACO	(T) PAS-3X	10-40K ±0.5	2.0	<0.5	<0.5	—	1.5	200*	1.5	0.15	—	13 1/2 x 9 x 4 1/4	11	(K) 79.95 (W) N/A	
	PAT-4	10-100K ±0.5	2.0	<0.5	<0.5	—	3.0	80	1.5	0.15	—	13 1/2 x 9 x 4 1/4	10	(K) 89.95 (W) 159.95	
ELECTRA AMPLIDYNE	HSP-1	20-20K ±0.25	5.0	<0.01	<0.01	85	5	100	—	0.5	—	16 1/2 x 10 1/2 x 4 1/4	16	299.95	All IC construction with low noise, high accuracy phono section.
HARMAN KARDON	Citation II	1-125K ±0.5	6	0.01	0.01	85	1.5	115	—	0.2	—	16 1/2 x 4 1/2 x 12	—	295.00	Audio equalizer tone controls, two low-end headphone receptacles, speaker selector switch, two tape monitors.
INFINITY	SPC	1-230K ±1.5	7.0	0.002	0.005	74	—	—	—	—	—	13 x 8 1/2 x 4.5	—	650.00	9 octave filters, separately variable per channel; all IC amps throughout.
INTEGRAL SYSTEMS	10	10-100K ±0.25	2.5	0.05	0.05	75	2.0	200	—	0.2	600 100K	17 x 10 x 6	18	300.00	Three section active tone controls can be switched into tape record circuits.
JVC	5011	10-100K ±0.5	3	—	—	84	3+ 1	—	—	170 mV	—	19 x 13 1/2 x 6	24	599.95	7 pos. SEA tone controls.
	5110	18-50K ±0.5	1	0.3	0.1	80	1.2	120	—	120 mV	—	17 x 11 1/2 x 5 1/4	18 1/2	249.95	Built-in pink noise generator, 7 pos. SEA tone controls.
MARANTZ	33	5-100K ±0.5	3	0.02	0.02	100	1	100	1	0.2	600	15 1/2 x 8 1/2 x 5 1/4	17	395.00	Integral headphone amp/control; graphic controls; four switchable filters; variable center channel output; 1 dB tracking.
PIONEER	SC-100	5-50K ±1	5.0	0.2	0.2	70	1.5	80	1.2	0.08	1K	17 x 12 x 7	14	375.00	Stepped tone and volume controls; muting switch.
	SC-700	10-60K ±1	4.0	0.5	0.2	80	4.0	90	—	0.25	1K	12 x 10 x 4 1/2	13	129.95	Stepped tone control; muting switch; headphone output.
QRK ELECTRONIC	Ultimate I	25-15K ±3	0.8	0.1	—	75	—	50	—	—	—	3 x 9 x 3	2 1/2	—	For monophono applications. Ultimate II, stereo.
RADFORD (AUDIONICS)	SC-24	15-50K ±1	2.0	<0.02	<0.02	>70	2	200	—	80 mV	150	16 1/2 x 4 1/2 x 8 1/2	17	345.00	Graphic controls, midrange controls, graphic sensitivity controls on rear.
SAE	MARK I	10-100K ±0.25	2.5	0.02	0.02	75	2.0	240	2.0	0.25	600	17 x 10.5 x 5 1/4	18	550.00	Step type controls; tape copy facility; equalizers.
SINCLAIR (AUDIONICS)	ST 60	20-25K ±1	250 mV	<0.05	<0.1	—	3	50 mV	—	3 mV	HiZ	8 x 1 1/2 x 4	1	29.95	RIAA input; tape output; 2 high level inputs; module form; 15-35 V d.c. or Sinclair power supply.
SONY	TA-2000F	10-100K +0-2	4.5	0.03	0.05	90	1.2	300	—	0.11	—	15 1/2 x 12 1/2 x 5 1/4	19	549.50	Solid state, 2 VU meters, simultaneous recording on two tape recorders.

AR COMPONENTS ARE USED BY EXECUTIVES AT ANGEL RECORDS TO HEAR FIRST PRESSINGS OF NEW RELEASES.



A new Angel record is the sum of the creative efforts of many individuals. Orchestra, soloists, and engineers must be scheduled many months in advance and are frequently brought together over great distances to make the recording. Engineering at the recording session and during the transfer from tape to disc requires great care and precision. Each stage of the process, and the way in which it is carried out, influences the musical values in the recording finally released.

As responsible executives at one of the world's largest recording organizations, the men who conduct Angel's operations can afford any equipment except that which distorts or falsifies the quality and content of a recording. The executive conference room at Angel Records is equipped with AR high fidelity components.

Suggested retail prices of the AR components shown: AR amplifier, \$250; AR turntable, \$87; AR-3a speaker systems, \$225-\$250, depending on cabinet finish.



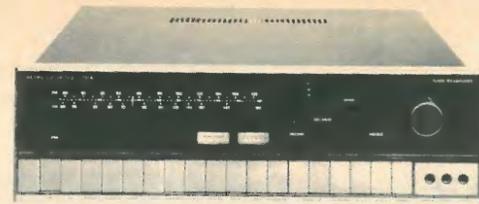
Acoustic Research, Inc.
24 Thorndike Street, Cambridge, Massachusetts 02141, Dept. AU-9

Please send a free copy of your illustrated catalog, as well as specifications of AR components, to

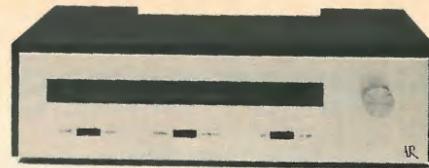
Name _____
Address _____

Check No. 29 on Reader Service Card

TUNERS



Altec Lansing 724A



AR tuner



Kenwood KT-7001



Dynaco tuner

MANUFACTURER	MODEL	IHF Sensitivity, μ V		Capture Ratio, dB	Alt. Chann. Selectivity, dB	AM Suppression, dB	Frequency Response, Hz	Stereo Separation, 1000 Hz, dB	Stereo Separation, 10 kHz, dB	THD, Mono, 100% Mod., %	THD, Stereo, 100% Mod., %	Tuning Indicator	S/N, dB	AM Band?†	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
		>2.0	2.0															
ACOUSTIC RESEARCH	AR	>2.0	2.0	>55	55	20-15K ± 1	>40	>30	<0.5	<0.5	Mtr.	65	No	15 $\frac{1}{2}$ x 9 $\frac{7}{8}$ x 4 $\frac{1}{2}$	7.5	210.00		
	UNIV	Same as above, but for 120 or 220V., 50-60 Hz; switchable de-emphasis 50-75 μ sec.																
ALLIED RADIO SHACK	Realistic TM-175	5				20-20K ± 2	>40	25	0.25	0.3	Mtr.	48	No	7 x 10 x 4	6	59.95	FET front-end; wood case.	
	Realistic TM-90	4	3.5			20-20K ± 2	>40	20	0.25	0.3	Mtr.	55	Yes	3 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 11	11	99.95	FET front-end; black-out panel; wood case.	
ALTEC LANSING	724A	1.8	1.3	-	-	20-15K ± 1	>40	-	0.03	0.03	2 Mtrs.	48	Yes	17 $\frac{3}{4}$ x 16 $\frac{1}{2}$ x 5		550.00	Wal. cab. opt.; varilock tuning with 4 FETs; vol. range switch.	
BIC LUX	71/5T	1.2*	2.5	-	80	20-15K ± 1	40	-	0.2	0.5	Mtr.	60	Yes	18 $\frac{1}{2}$ x 12 $\frac{1}{2}$ x 6	-	332.00	*30 dB S/N; center-tune ind. light; 3 FM pre-sets.	
	71/7T	2.2*	4.0	-	70	20-15K ± 1	30	-	0.5	0.7	Mtr.	50	Yes	16 $\frac{1}{2}$ x 9 x 5	-	179.00	*30 dB S/N; Hi & Lo Z phone jack.	
DYNACO	FM-5	1.75	1.5	65	-	50-15K ± 1	40	30	0.5	0.5	Mtr.	65	No	13 $\frac{1}{2}$ x 9 x 4 $\frac{1}{4}$	11	149.95K 249.95W	Lighted 7 in. slide rule dial, muting -60 dB.	
EICO	3300	3.5	4	20	40	40-15K ± 1	33	25	1.75		Mtr.	60	Yes	12 x 7 x 3 $\frac{3}{8}$				
GRUNDIG	RT-100	1.4	2		58		35					Yes		20 x 6 x 12			Includes shortwave bands.	
HEATH	AJ-15	1.8	1.5	70	50	20-15K ± 1	40	25	0.5	1.0	Mtr.	65	No	16 $\frac{3}{4}$ x 12 $\frac{1}{2}$ x 4 $\frac{3}{4}$	11.5	189.95K		
	AJ-29	1.8	1.5	70	50	20-15K ± 1	40	30	0.5	0.5	Mtr.	60	Yes	16 $\frac{3}{4}$ x 13 x 5 $\frac{1}{2}$	14.5	169.95K		
	AJ-14	5.0	3.0		40	20-15K -3+0	30		1.0			50	No	12 x 9 $\frac{3}{4}$ x 3 $\frac{3}{4}$	4.25	57.95K		
HITACHI	FT-600	2.5	3	40	38		30	22	1.0	1.5	2 Mtrs.	60	Yes	16 $\frac{3}{4}$ x 12 $\frac{1}{2}$ x 4 $\frac{3}{4}$			FET front-end.	
JVC	MCT-V7	1.7	0.8	100	55	20-15K ± 1	38	22	0.3	0.6	2	65	Yes			229.95	4 dual filters, linear dial scale tape output.	
KLH	18	2	0.5	3.0	35	20-15K ± 1	50	35	20	0.8	Mtr.	55	No	9 x 5 $\frac{1}{2}$ x 4 $\frac{1}{4}$	4	129.95	FET front end; 5 i.f.'s; zero-ctr tuning mtr; planetary tuning contr.; mx noise fltr; incl. cab.	
KENWOOD	KT-7001	1.5	1	90	60	20-15K +0, -2	40	40	0.25	0.5	2 Mtrs.	75	Yes	16 $\frac{1}{2}$ x 11 x 5	18	279.95	3 FETs; 4 crystal fltrs; multipath and zero-centr. meters; muting; noise filter.	
	KT-2001	2.0	4.0	45	50	20-15K +0, -2	30	20	0.5	0.7	Mtr.	60	Yes	13 x 9 $\frac{1}{2}$ x 5	9.5	99.95	FET front-end; IC; i.f. stage stereo noise filter.	
LAFAYETTE	LT-725	1.7	1.5	50			40			0.25	Mtr.	75	Yes	12 x 3 $\frac{3}{4}$ x 9 $\frac{1}{2}$	12 $\frac{1}{2}$	99.95	Auto stereo switching.	
	LT-670	3.5	5	35			30				Lt.	50	Yes	10 $\frac{1}{2}$ x 8 $\frac{3}{8}$ x 3 $\frac{1}{2}$	12	69.95	AFC; front panel tape output.	
MARANTZ	20	1.8	1.9	50	50	20-15K ± 5	45	35	.15	.15	Scope	73	No	15 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 5 $\frac{1}{2}$	24	695.00	Built in oscilloscope indicates center of channel, signal strength, multipath, audio display, stereo separation, phasing.	
	120	2.3	1.6	80	65	50-15K ± 1	42	26	.15	0.3	Scope	65	Yes	15 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 5 $\frac{1}{2}$	22	395.00	As above.	
	110	3.0	3.0	50	45	50-15K ± 1	40	24	0.3	0.3	Mtr.	60	Yes	15 $\frac{1}{2}$ x 12 x 5 $\frac{1}{2}$	18	159.00	Hi blend stereo filter, variable muting, quadradial output, 300/75 ohm antenna inputs, variable output control.	
NIKKO	FAM-14	1.8	1.5	60	60	50-15K ± 1	38	20			1	Mtr.	60		13 x 9 $\frac{1}{2}$ x 3 $\frac{3}{4}$	8 $\frac{1}{2}$	139.95	Dual-gate FET; cer. filters; plug-in modules; circuit breakers.
	FAM-12	1.8	3.0	55	50	50-15K ± 1	40	30			1	Mtr.	60	Yes	12 x 10 x 3 $\frac{3}{4}$	7 $\frac{1}{2}$	119.95	FETs in FM and AM front-end; noise filter; SFC; muting control.

All models solid-state except when model number is preceded by "T". "K" indicated kit price; "W" wired.

SPECIAL FEATURES

IT'S THE FINEST WE'VE EVER BUILT We've been known to build our share of excellent tuners. But the SEL-300 Digital Readout Tuner is clearly a standout. Even for us.

The SEL-300 is designed with every advanced technique of engineering and circuitry we consider reliable. Our exclusive "Le Gendre" 12 pole toroid filter yields an alternate channel selectivity in excess of -85dB, with negligible distortion.

And we eliminate tuning thumps with our exclusive FET sideband variable hush control. The headphone jack has its own built-in amp. So you can use the phones while someone else uses another component. And there are inputs to let you monitor tapes through your headphones, and outputs for direct recording to two recorders.

The logic circuitry uses 17 integrated circuits, the equivalent of over 600 semi-conductors. We put them on an exclusive double-sided glass epoxy logic board. And our FM sensitivity is an outstanding 1.5 μ V (IHF).

Then there's the digital readout, crystal controlled for absolute tuning accuracy. The 7 element readout tubes have an estimated life of 100,000 hours.

We've even included multipath outputs for your oscilloscope. A pushbutton to blank the readout in between stations. Illuminated indicators. "Stereo only" switch. And a three year factory parts and labor warranty. If you're the kind of person who is really serious about listening to FM, you have to consider the SEL-300. It's designed for the finest, most sophisticated stereo systems. Ask your dealer for a demonstration.

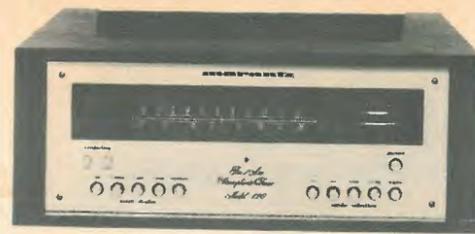
Or write us for specifications. Sherwood Electronic Laboratories, 4300 N. California Ave., Chicago, Ill. 60618.



SHERWOOD SOUNDS EXPENSIVE

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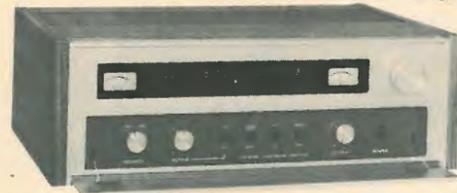
TUNERS



Marantz Model 120



Scott 433



TEAC AT-201



Sony 5100

MANUFACTURER	MODEL	IHF Sensitivity, μ V		Cap. Ratio, dB	Alt. Chm. Selectivity, dB	AM Selectivity, dB	Frequency Response, dB	Stere. Separation, Hz	Stere. Separation, 1000 Hz, dB	THD, Mono, 100% Mod., %	THD, Stereo, 100% Mod., %	Tuning Indicator	S/M, dB	AM Bandwidth	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
		30-15K ± 0.5	30-15K ± 1															
PANASONIC	ST-3600	1.7	1.5	65	50	30-15K ± 0.5	40	25	0.3	0.5	2	Mtrs.	70	Yes	16 $\frac{1}{2}$ x 14 $\frac{1}{4}$ x 5 $\frac{1}{2}$	21	249.95	Distortion-null tuning meter; 2 crystal filters; 4-pole MOS FET; FM linear dial; walnut cabinet included.
PIONEER	TX-1000	1.7	1.5	70	55	-	40	25	0.3	0.5	2	Mtrs.	70	Yes	17 x 13 $\frac{1}{4}$ x 5 $\frac{1}{16}$	19	279.95	FET; IC; crystal filter; linear dial scale; MPX noise filter; AM and FM level controls.
	TX-800	1.8	2	70	50	-	40	25	0.4	0.5	2	Mtrs.	70	Yes	17 x 13 $\frac{1}{4}$ x 5 $\frac{1}{16}$	16	199.95	FET; IC; ceramic filter; MPX noise filter; AM and FM level controls; linear dial scale.
	TX-600	2.2	3	70	50	-	40	25	0.6	0.8	2	Mtrs.	70	Yes	17 x 13 $\frac{1}{4}$ x 5 $\frac{1}{16}$	17	159.95	FET; ceramic filter; MPX noise filter; linear dial scale.
	TX-500	2.5	3	35	-	-	35	20	0.5	0.5	Mtr.	50	Yes	13 x 13 $\frac{1}{2}$ x 5	11	99.95	MPX noise filter.	
RADFORD (AUDIONICS)	FMT-4	1.2	1	100	50	40-15K ± 1	>45	>40	<0.7	<0.7	Mtrs.	75	No	16 $\frac{1}{2}$ x 4 $\frac{1}{2}$ x 8 $\frac{1}{16}$	20	320.00	Phase lock loop circuit; dual gate FET front-end; ceramic filters.	
REVOX	A76	1.0	1.0	80	54	30-15K ± 1	40	30		0.2	Mtr.	70	No	16 $\frac{1}{2}$ x 9 $\frac{1}{2}$ x 6 $\frac{1}{4}$	18			
ROLEOR	ROTEL RT-320	2.2	3	45	-		35	25	-	1.0	Mtr.	60	Yes	14 x 7 $\frac{1}{2}$ x 4 $\frac{1}{2}$	8.8	119.95	FET front end; automatic FM mono-stereo switching.	
	ROTEL RT-620	1.7	1.5	60	-		40	30	-	0.5	Mtr.	65	Yes	16 $\frac{1}{2}$ x 9 $\frac{1}{2}$ x 4 $\frac{1}{4}$	11	179.95	4-gang FET; ceramic filters + IC.	
SAE	Mark VI	1.6	1.9	75	60	20-15K ± 0.5	45	25	0.1	0.3	see special feature	70	No	17 x 10.5 x 5 $\frac{1}{4}$	25	950.00	3" oscilloscope, digital readout using Nixie tubes.	
SANSUI	TU-999	1.8	1.5	>70	>80		>38		<0.3	<0.5	2	Mtrs.	>65	Yes	17 x 13 x 6	22	279.95	FETs; ICs; Xtal filters; sig. str. metr.; zero ctr. tun. metr.; muting; noise fil.; 300 and 75 ohm antenna inputs.
	TU-666	2.5	3	>45			>35		<0.8		Mtr.	>65	Yes	13 $\frac{1}{4}$ x 10 $\frac{1}{4}$ x 5	11	159.95	4-stage IC i.f. amp.; FM muting switch; walnut cabinet.	
	TU-555	2.5	3	>45			>35		<0.8		Mtr.	>60	Yes	11 $\frac{1}{2}$ x 11 $\frac{1}{2}$ x 4 $\frac{1}{4}$	8 $\frac{1}{2}$	129.95	Muting switch.	
SCOTT	431	2.0	2.5	70	70	50-15K	35		0.8	0.8	2	Mtrs.	65	Yes	17 $\frac{1}{2}$ x 15 x 6	20	219.90	
	433	2.0	1.8	75	70	50-15K	35		0.25	0.25	*	67	No	17 $\frac{1}{2}$ x 15 x 6	24	549.90	*Digital readout, card programmed or manual selection.	
SHERWOOD	SEL 300	1.5	1.7	80	65	20-15K ± 1	40	30	0.15	0.25	2	Mtrs.	70	No	16 $\frac{1}{2}$ x 13 x 5 $\frac{1}{4}$	25	579.95	Digital read-out; scope outputs; tape monitoring and dubbing; headphone amp.
	S2300	1.8	2	55	45	20-15K ± 1	40	25	0.2	0.3	Mtr.	70	Yes	14 x 10 $\frac{1}{4}$ x 4	11	199.95	Available mounted on 19 in. commercial rack panel. S3300, less AM, \$169.95. S2500, mono with AM, \$159.95.	
SINCLAIR (AUDIONICS)	3000	3.0	1.5	50	40	10-15K ± 1.0	35	25	0.75	<1.5	Bulbs	65	No	8 x 1 $\frac{1}{2}$ x 4	2	74.95	PPL; IC; varicap tuning; also in module form, \$74.95.	
SONY	ST-5000F	1.8	1.5	90	65	20-15K ± 0.5	40	30	0.2	0.35	Mtr.	70	No	15 $\frac{1}{2}$ x 12 $\frac{1}{4}$ x 5 $\frac{1}{4}$	21	399.50	FET front end; 8 element solid state i.f. filters.	
	ST-5100	2.6	1.5	80	65	20-15K ± 1	40	30	0.3	0.5	Mtr.	70	Yes	16 $\frac{1}{2}$ x 13 $\frac{1}{4}$ x 5 $\frac{1}{4}$	20	219.50	Solid state i.f. filters.	
	ST-5600	3	2	50	60	30-15K ± 1	38	30	0.3	0.7	Mtr.	65	Yes	16 $\frac{1}{2}$ x 10 $\frac{1}{2}$ x 4 $\frac{1}{4}$	9	119.50	Solid state i.f. filters.	
STANDARD	108	5	6	35	35	50-15K ± 1	36	31	0.5	1.1	Mtr.	65	Yes	13 $\frac{1}{2}$ x 7 $\frac{1}{4}$ x 3 $\frac{1}{2}$	5.3	74.95	Solid state; wooden cabinet; vernier tuning; stereo beacon.	
TEAC	AT-201	1.8	1	70	55	20-15K ± 0.5	40	30	0.3	0.3	2	Mtrs.	70	Yes	16 $\frac{1}{2}$ x 12 $\frac{1}{4}$ x 6	20 $\frac{1}{4}$	349.50	5-gang tuning capacitor in all-FET FM front-end; crystal filters; variable muting; IC MPX circuit.
YAMAHA	CT700	1.7	1.5	70	55	20-15K ± 1.5	40	30		0.5	2	Mtrs.	70	Yes				Touch SW FET; IC; 4 solid state filters; noise filter.

All models solid-state except when model number is preceded by "T". "K" indicated kit price; "W" wired.

SPECIAL FEATURES

A violinmaker talks about the V-M Professionals.

Ken Warren of Ken Warren & Sons, Chicago, deals in treasured violins. At his workbenches are some of the few craftsmen whom the world's greatest violinists trust to restore and recondition a Stradivarius or Guarnerius, the world's more precious violins.

"The great crime of most equipment is distortion."

Our Model 1521 receiver delivers 40 watts a channel RMS, with extraordinarily low distortion and selectivity values, because we engineered it with 5-pole phase linear toroidal filters, ICs, printed board circuitry, MOSFETs, and more. It is awesomely powerful, dead quiet, and distortion-proof.

"Your automatic turntable is right in tune."

Ours not only play records perfectly but handle them beautifully.

Records are lowered, onto a motionless turntable. Counterbalanced, anti-skate tone arm is longer for indiscernible tracking error. Beautifully isolated motors make Wow, Flutter, Rumble undetectable to the ear. All push-button controlled.

"This sounds very near a live performance."

Exactly what components are all about. You hear sound as recorded, not as interpreted by speakers. Our Model 93 uses domed tweeter, half-roll surround, self-contained mid-range, and acoustic suspension woofer. Inductive-capacitive crossover delivers seamless transitions.

If the Professionals can please Mr. Warren, sound and recording engineers, and musicians, people whose business is sound, we're confident they can make you very happy, too.

For all the facts and figures, write: Professional Series, Dept. 74, P.O. Box 1247, Benton Harbor, Michigan 49022.

Made in Benton Harbor, Michigan by V-M Corporation.

V-M Corporation



Model 1521. Suggested retail, \$500.00.
Model 1585. (Automatic turntable.) Suggested retail, \$165.00.
Model 1555. (Automatic turntable, magnetic cartridge, base dust cover.) Suggested retail, \$220.00.
Model 93. Suggested retail, \$134.00.



RECEIVERS



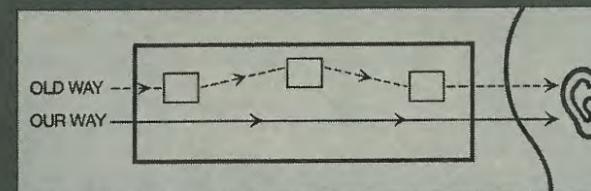
Fisher 401



Benjamin R4x40

MANUFACTURER	MODEL	SIGNAL TO NOISE RATIO (dB)										SIGNAL TO NOISE RATIO (dB)										SPECIAL FEATURES
		RMS Power/Chan., W	THD at Rated Power, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz-kHz	1-Watt Freq. Resp., Hz	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	IHF Sensitivity, μ V	Capture Ratio, dB	THD Mono, 100% Mod., %	THD Stereo, 100% Mod., %	Stereo Seps., 1000 Hz, dB	Tuning Indicator	Auto Chan. Selectivity, dB	AM Band?	Dimensions, W x D x H, in.	Weight, Lbs.	Price	
ACOUSTIC RESEARCH	AR 50	<0.5	<0.25	<0.1	14-44K	20-20K ± 1	57	2-5 (adj.)	100	2.0*	2.0	<0.5	<0.5	>40	Mtr.	>55	No	17 1/2 x 11 1/2 x 6	33	420.00	2-year guarantee; wood case opt., \$20.00	
	Univ.	Same as above except for 100, 120, 220, 240 V., 50-60 Hz;																		Switchable deemphasis 50-75 μ sec.		
AKAI	AA-6600	75	.8	-	20-30K	20-50K ± 3	65	3	-	2	2	-	.8	50	Mtr.	50	Yes	17 1/2 x 13 1/4 x 5 1/2	24.4			
	AA-8500	85	.5	-	20-30K	20-50K ± 3	70	3	-	2	1.5	.3	.8	60	Mtr.	65	Yes	19 1/2 x 14 1/2 x 7				
ALLIED RADIO SHACK	ARS 747 4-Chan.	36	0.5	0.8	25-22K	20-25K ± 2	66	2.7	-	1.8	-	-	0.4	35	Mtr.	-	Yes	5 1/2 x 17 x 16 1/2	35	598.00	Walnut case.	
	Realistic STA-180	60	1.0	0.5	15-25K	20-25K ± 1	62	1.5 3.5	-	2	-	-	-	35	Mtr.	-	Yes	19 1/2 x 14 1/4 x 6 1/2	35	399.95	Mag. and cer. phono inputs; midrange tone control; top access inputs; wal. case.	
ALTEC LANSING	714A	44	0.05	0.5	15-25K	-	75	2.0 5	-	1.8	2.0	0.03	0.03	40	2 Mtrs.	-	Yes	16 1/2 x 13 1/4 x 5 1/2	-	399.95	3 FETs; 2 crystal filters; slide controls; vol. range switch.	
	725A	60	0.03	0.03	15-25K	-	60	2.0 5	-	1.8	1.3	0.05	0.05	40	2 Mtrs.	-	Yes	17 1/2 x 16 1/2 x 5	-	550.00	Varitronik tuning; 4 FETs; Butterworth and crystal filters; vol. range switch.	
	911A	44	0.05	0.05	15-25K	-	60	5.0	-	1.9	2.0	0.05	0.05	40	Mtr.	-	Yes	19 1/2 x 19 1/2 x 6 1/2	-	499.00	Modular receiver with Garrard SL95B turntable and Shure N93E cartridge. 912A similar but has Starr tape recorder.	
AMPEX	ASR 100	18	0.8	-	20-25K	-	-	-	-	3	4	-	-	35	-	-	Yes	16 1/2 x 11 1/2 x 4 1/2	-	249.95		
BIC LUX	71/2R	75	0.2	0.4	15-30K	10-50K	80	2.0 8.0	100	1.2*	2.5	0.2	0.5	40	-	-	Yes	18 1/2 x 13 1/4 x 6	-	620.00	*30dB S/N, 3 FM pre-sets lo and hi filters, var. turnover.	
	71/3R	50	0.2	0.4	15-30K	10-50K	80	2.0 8.0	100	2.2*	4.0	0.2	0.5	40	-	-	Yes	18 1/2 x 13 1/4 x 6	-	550.00	As above.	
BSR McDONALD	R40A	15	1.0	1.0	20-20K	20-20K ± 2	55	25	-	2.9	2.5	0.8	1.0	35	Mtr.	40	Yes	17 1/2 x 14 x 7 1/2	20	179.95	Tape monitor; speaker selector.	
	Beomaster 3000	40	0.6	0.6	-	40-20K ± 1.5	65	4	10	2	3	0.8	1.0	40	Mtr. & Lgt.	65	No	22 1/2 x 10 1/2 x 3 1/2	20	300.00	FM diode tuning, 6 pretuned stations, short circuit protected output, reg. power supply.	
BELL & HOWELL	3600	18	1.0	-	20-20K	-	50	Mag. 1.0, Cer. 50.	90	2.0	3	3	Less than 1%	35	Mtr.	45	Yes	19.5 x 12.5 x	20	159.95	Push-button mode selection; FM muting; mono-stereo switch; Loudness switch; mag. and ceramic phono inputs; FET front end (FM)	
BENJAMIN	R2X40	40	0.5	0.5	17-30K	20-40K ± 1.5	65	2.5	100	1.7	2	0.3	0.8	35	Mtr. & Ptr.	55	Yes	17 1/2 x 15 1/2 x 6 1/2	30	300.00	Muting; "Glowlight" tuning.	
	R4X40 4-Chan.	40	0.5	0.5	17-30K	20-40K ± 1.5	65	2.5	-	1.7	2	0.3	0.8	35	Mtr. & Ptr.	55	Yes	17 1/2 x 15 1/2 x 6 1/2	40	450.00	As above, plus built-in 4-chan. decoder.	
BOGEN	BR360	40	0.5	0.7	0.35	20-20,000 Hz	20-35,000 Hz	83	3	60	2.7	1.9	0.3	0.4	35	Mtr.	60	Yes	16 1/2 x 4 1/2 x 15 1/2	20	299.95	"Crescendo Control" (Compressor-Expander); Hi and Lo Filters.
CONCORD	Mark 20	110	0.5	1.0	0.5	5-40K	10-35K ± 1	60	3	-	1.7	1	0.8	1.0	>35	Mtr.	47	Yes	17 1/2 x 14 x 5 1/2	26	349.95	Slide controls; scratch filter; sep. on/off switch.
	Mark 12	70	0.5	1.0	0.5	25-22K	20-25K ± 1	60	3	-	1.9	<2	0.8	1.0	>35	Mtr.	47	-	17 1/2 x 12 1/2 x 5 1/2	24	269.95	Muting; 75 and 300-ohm antenna inputs.
	Mark 10	50	0.5	1.0	0.5	25-20K	20-22K ± 1	60	3	-	2.0	<2	0.8	1.0	>35	Mtr.	47	Yes	17 1/2 x 12 1/2 x 5 1/2	21	229.95	
EICO	3770	20	0.7	2	0.6	20-30K	10-50K ± 2	60	4.2	90	3.5	4	0.75	0.75	40	Mtr.	45	Yes	16 x 9 x 4 1/2	14		
	3780	11	0.5	1	0.3	50-20K	20-40K ± 3	42	2.7	90	3.5	4	1.75	1.75	33	Mtr.	20	Yes	16 x 9 x 4	10		

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RECEIVERS



JVC Model 5444



Heathkit AR-15



Harman-Kardon 930

MANUFACTURER	MODEL	SIGNAL TO NOISE RATIO (dB)										Tuning Indicator	Alt. Chann. Selectivity, dB	All Bands?	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES				
		RMS Power (Chan., W)	THD at Rated Power, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz-MHz	1-Watt Tone Resp., Hz	Rated Output S/M, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	I/F Sensitivity, μ V								Capture Ratio, dB			
ELECTRO-VOICER	E-V-1382	40	0.8	-	-	10-40K	10-55K ± 1	75	2.5	140	2.5	3.0	0.8	-	32	Mtr.	40	Yes	18 x 17 x 5 1/2	23	299.95	Dual controls; muting; main-rem. spkr. sw.
	E-V-1282	19	0.8	-	-	20-20K	20-20K ± 1.5	70	3.0	-	2.2	2.0	0.8	-	25	Mtr.	-	Yes	14 1/2 x 10 1/2 x 3 1/2	15	249.30	E-V-1281, same less AM, \$229.50.
	EVR-4 4-Chan.	20	0.2	0.2	-	15-20K	10-50K ± 1	-	2.5	-	1.9	2.5	-	0.3	30	Ctr. Tun. Mtr.	-	Yes	17 1/4 x 11 x 5 1/2	-	399.95	4-chan.; FETs; ICs; ceramic filters; E-V Stereo-4 circuitry.
FISHER	701 4-chan.	40	0.5	0.8	0.15	20-25K	20-25K ± 1.5	90	2.7	50	1.7	1.5	0.35	0.35	36	Mtr.	65	Yes	17 x 16 1/2 x 5 1/2	35	699.95	4-chan., electronic tuning. Model 601, less electronic tuning, \$599.95.
	500TX	65	0.5	0.8	0.2	8-35K	20-25K ± 1.5	90	2.5	45	1.7	1.5	0.4	0.4	38	Mtr.	70	Yes	16 1/4 x 15 1/2 x 4 1/2	30	499.95	Pushbutton and electronic tuning. Model 450T, less pushbutton tuning, \$399.95.
	401	45	0.5	0.8	0.2	25-20K	20-20K ± 1.5	80	2.8	50	2.0	<2.8	0.5	0.5	>30	Mtr.	45	Yes	18 1/2 x 16 x 5 1/2	20 1/2	449.95	Wireless remote tuning. Model 301, less wireless tuning, \$349.95.
	202	28	0.5	0.8	0.2	25-20K	25-20K ± 2	92	2.5	50	2.5	3.0	0.6	0.6	35	Mtr.	60	Yes	15 1/2 x 14 1/2 x 4 1/2	18 1/2	269.95	2 AUX Inputs. Model 201, similar, 80 watts, \$219.95.
HARMAN-KARDON	330A	22 1/2	0.6	0.5	0.2	15-30K	8-55K ± 1	63	2.0	83	1.9	3.3	0.8	1.0	35	Mtr.	45	Yes	15 1/2 x 14 1/2 x 13	-	199.95	Quadraphonic patch on rear; two tape outputs inputs.
	930	45	0.2	0.1	0.05	10-40K	1-100K ± 1	65	2.0	90	1.8	2.0	0.4	0.5	40	2 Mtrs.	50	Yes	-	-	349.95	Twin power supplies; quadraphonic patch on rear; two tape monitors.
HEATH	AR-15	50	0.5	0.5	0.2	6-30K	8-40K ± 1	60	2.2	155	1.8	1.5	0.5	1.0	40	Mtr.	70	Yes	16 1/4 x 14 1/2 x 4 1/2	27	(K) 349.95	
	AR-29	35	0.25	0.2	0.1	5-30K	7-60K ± 1	65	2.2	155	1.8	1.5	0.5	0.5	40	Mtr.	70	Yes	16 1/4 x 14 1/2 x 5 1/2	26.5	(K) 299.95	
	AR-19	20	0.25	0.25	0.1	5-30K	6-35K ± 1	65	2.4	155	2.0	2.5	1.0	1.5	35	Mtr.	35	Yes	13 1/4 x 14 1/2 x 5 1/2	26.5	(K) 239.95	
	AR-14	10	1.0	1.0	-	15-50K	12-60K ± 1	60	4.5	-	5.0	3.0	1.0	-	30	-	-	No	15 1/2 x 12 x 3 1/4	14	(K) 119.95	
HITACHI	SR-300	15	0.8	-	-	20-30K	-	66	3	-	3	-	0.5	1.2	35	Mtr.	-	Yes	15 x 12 1/2 x 4 1/2	12	199.95	FET front-end.
	SR-600	35	0.5	-	-	20-30K	-	66	2	-	2.8	2.5	0.5	1.2	36	Mtr.	-	Yes	16 1/2 x 12 1/2 x 6	19	269.95	FET front-end.
	SR-1100	55	1.5	-	-	20-30K	-	70	2	-	2.8	2.5	-	-	2 Mtrs.	-	Yes	17 1/2 x 13 x 5 1/2	-	-	4-gang condenser.	
JVC	5550	75	0.5	0.8	0.5	15-30K	20-40K ± 0.5	67	2.3	100	1.6	0.7	0.3	0.4	40	2 Mtrs.	70	Yes	19 1/2 x 14 1/2 x 6	28 1/2	399.95	5-element tone controls; 2 mike inputs; 5 dual filter FM. 5540 similar but 50 watts, \$349.95.
	5020	28	0.5	0.8	0.5	30-30K	20-30K ± 2	65	1.5	80	2.5	2.0	0.6	0.8	35	Mtr.	50	Yes	20 x 13 1/2 x 4 1/2	28 1/2	249.95	5-element tone controls; walnut case. 5010 similar but 16 watts, \$199.95.
	5500	14	0.8	0.9	0.6	30-20K	20-40K ± 1.5	65	2	80	2.5	4.0	0.5	0.8	33	*	50	Yes	17 x 12 1/2 x 5 1/2	14 1/2	149.95	*Bull's eye tuning indicator.
	5444 4-Chan.	33 x 4	0.5	0.8	0.5	20-30K	20-50K ± 1	65	2	80	2.0	2.5	0.4	0.6	35	Mtr.	50	Yes	22 1/4 x 13 1/2 x 6	33	499.95	4 channel with front and rear 5-element tone controls.
KLH	51	25	<0.5	<0.5	<0.2	20-20K	10-35K ± 1	63	2.5	135	2.4	3	0.3	1	35	Mtr.	50	Yes	16 1/2 x 12 1/2 x 6 1/2	20 1/2	239.95	All silicon solid state; FET front-end; ceramic filters; ICs.
KENWOOD	KR-6160	70	0.5	0.5	0.1	12-30K	15-40K ± 1.5	65	2.5	100	1.6	1.5	0.5	0.7	35	2 Mtrs.	55	Yes	16 1/2 x 12 1/2 x 5 1/2	34	379.95	3 FETs, 2 ICs, mike mixing w/mike, 3 sets spkr. output, 3 tone conts.
	KR-5150	40	0.5	0.5	0.1	17-30K	20-40K ± 1.5	65	2.5	100	1.7	2.0	0.5	0.7	35	2 Mtrs.	55	Yes	16 1/2 x 12 1/2 x 5 1/2	28	319.95	2 FETs, 2 ICs, 3 sets spkr. output, step tone conts.

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RECEIVERS



Pioneer SX-9000



Rolecor RX-154



Marantz 2270

MANUFACTURER	MODEL	RMS Power/Chan., W		THD at Rated Power, %	IM at Rated Power, %	IM at 1 Watt, %	Power Bandwidth, Hz, kHz	1-Watt Freq. Resp., Hz	Rated Output S/N, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	IHF Sensitivity, μ V	Capture Ratio, dB	THD Mono, 100% Mod., %	THD Stereo, 100% Mod., %	Stereo Sep., 1000 Hz, dB	Tuning Indicator	Alt. Chn. Selectivity, dB	AM Band?	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES		
		1	2																						
LAFAYETTE	LR-1500 TA	70	0.8	<1	-	-	18-55K	20-20K ± 2	60	1.8	4.5	12.0	33	1.5	1.25	-	0.3	40	Mtr.	50	Yes	16 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 4 $\frac{1}{2}$	50	299.95	Overload protection; muting; "Acritune"; auto stereo switch.
MARANTZ	19	50	.15	.15	.15	-	10-40K	8-80K ± 1.5	70	1	100	1.8	1.9	.15	.15	45	Scope	50	No	-	18 $\frac{1}{2}$ x 16 x 5 $\frac{1}{2}$	46	1000.00	Built-in oscilloscope indicates center of channel signal strength, multipath, audio display, stereo separation, phasing.	
	2270	70	0.3	0.3	0.3	-	10-40K	10-50K ± 1	73	1.8	100	2.3	1.6	.15	0.3	42	2 Mtrs.	80	Yes	-	16 $\frac{1}{2}$ x 14 x 5	37	499.00	Multipath; 3 zone tone controls; dual tape monitoring; isolated preamp/amp inputs/outputs.	
	2245	45	0.3	0.3	0.3	-	10-40K	15-40K ± 1	70	1.8	100	2.5	1.8	0.2	0.4	40	2 Mtrs.	60	Yes	-	16 $\frac{1}{2}$ x 14 x 5	35	399.00	3 zone stepped tone controls; isolated preamp/amp inputs/outputs.	
	2230	30	0.5	0.5	0.5	-	15-40K	15-40K ± 2	67	1.8	100	2.5	1.8	0.2	0.4	40	Mtr.	60	Yes	-	16 $\frac{1}{2}$ x 14 x 5	33	299.00	3 zone stepped tone controls; front panel dubbing jacks; isolated preamp/amp inputs/outputs.	
	2215	15	0.5	0.5	0.5	-	15-40K	20-40K ± 2	64	1.8	100	3.0	3.0	0.3	0.5	40	Mtr.	50	Yes	-	16 $\frac{1}{2}$ x 14 x 5	32	199.00	Tape monitoring; muting; hi and low filters.	
MIKADO	2470	-	0.5	-	-	-	20-20K	-	-	3.0	-	2.0	2.5	-	0.6	38	Mtr.	-	Yes	-	19 $\frac{1}{2}$ x 15 x 5 $\frac{1}{2}$	21	-	Blackout dial; FETs.	
	2425	20	0.5	-	-	-	-	-	-	3.0	-	2.0	2.5	-	0.6	38	Mtr.	-	Yes	-	16 $\frac{1}{2}$ x 12 x 4 $\frac{1}{2}$	20	-	-	
NIKKO	STA-1101	40	0.3	0.6	-	-	20-30K	-	75	2	-	1.5	1.5	0.6	1.0	40	Mtr.	60	-	-	18 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 6 $\frac{1}{2}$	33	399.95	6 FETs; 12 ICs; w Xtal filters; 2 mic inputs; 2 phone jacks; sep. vol. controls for rem. spkrs.	
	STA-701B	25	0.8	1.0	-	-	20-20K	-	65	2.8	-	1.8	3.0	-	-	40	Mtr.	-	-	-	14 $\frac{1}{2}$ x 12 $\frac{1}{2}$ x 4 $\frac{1}{2}$	17	239.95	2 FETs; 3 ICs; AFC; muting; dual tone contrs; scratch and rumble filters; circuit breaker protect.	
	SA-5800	27	0.5	0.7	0.25	-	5-40K	10-50K +0 -1	70	2	100	1.8	1.5	0.4	0.7	35	Mtr.	80	Yes	-	16 x 14 x 5 $\frac{1}{2}$	24	259.95	Direct coupling amp; 4-pole MOS FET tuner; linear dial scale (FM); 2-tape monitor; Walnut cabinet included.	
	SA-6200	38	0.5	0.8	0.2	-	5-40K	10-70K +0 -1	70	3	100	1.8	1.5	0.4	0.5	40	Mtr.	60	Yes	-	16 $\frac{1}{2}$ x 14 $\frac{1}{2}$ x 5 $\frac{1}{2}$	30.6	319.95	Direct coupling amp; 4-pole MOS FET tuner; linear dial scale (FM); crystal filter; Walnut cabinet included.	
	SA-6500	50	0.5	0.7	0.16	-	5-65K	10-100K +0 -1	70	2	100	1.8	1.5	0.4	0.5	40	2 Mtrs.	60	Yes	-	16 $\frac{1}{2}$ x 15 $\frac{1}{2}$ x 5 $\frac{1}{2}$	34	369.95	Direct coupling amp; 4-pole MOS FET tuner; linear dial scale (FM); crystal filter; Walnut cabinet included.	
PIONEER	SX-2500	72	0.5	0.4	0.3	-	20-30K	20-70K ± 2	80	2.7	80	1.6	1.0	0.5	0.6	40	2 Mtrs.	70	Yes	-	19 x 15 x 6	33	549.95	Auto tune; 2 tape mon.; step tone cont.; rem. vol. and tune; 2 crystal filters; wal. cabinet.	
	SX-9000	50	0.5	0.4	0.3	-	10-35K	10-35K ± 1	80	2.5	80	1.6	1.0	0.5	0.8	40	2 Mtrs.	45	Yes	-	20 $\frac{1}{2}$ x 13 $\frac{1}{2}$ x 7 $\frac{1}{2}$	34	499.95	Built-in reverb amp; tone color con.; 2 tape mon.; mike mixing; 2 headset outs.	
	SX-1500 TD	38	0.5	0.4	0.3	-	15-40K	10-100K ± 3	80	3.3	80	1.7	1.0	0.5	0.8	40	2 Mtrs.	45	Yes	-	18 x 14 $\frac{1}{2}$ x 5 $\frac{1}{2}$	25	369.95	Mike; pre-amp & amp separable; wal. cab.; 3 spkr. sets.	
	SX-990	28	0.5	0.4	0.3	-	15-40K	10-100K ± 3	80	3.3	80	1.7	1.0	0.5	0.8	40	2 Mtrs.	45	Yes	-	18 x 14 $\frac{1}{2}$ x 5 $\frac{1}{2}$	25	269.95	Pre-amp and amp separable; walnut cabinet.	
ROLECOR	ROTEL RX-154 4-Chan.	10	0.3	1.1	1.2	-	30-30K	20-70K ± 3	60	2.8	30	4	5	-	1.0	32	Mtr.	25	Yes	-	-	-	229.95	4-channel discrete and matrix system.	
	ROTEL RX-200	10	0.2	0.5	0.5	-	30-20K	30-20K ± 1.5	60	2.0	30	3	5	-	1.0	32	Mtr.	25	Yes	-	14 $\frac{1}{2}$ x 8 $\frac{1}{2}$ x 4	11	169.95	-	
	ROTEL RX-300	20	0.3	0.2	0.3	-	20-70K	10-90K ± 3	65	2.0	60	2.2	3	-	1.0	35	Mtr.	45	Yes	-	17 $\frac{1}{2}$ x 14 x 5	19	229.95	Automatic tuning system.	
	ROTEL RX-600	42	0.1	0.2	0.1	-	12-80K	9-94K ± 3	80	3.0	75	1.9	2	-	0.5	40	2 Mtrs.	45	Yes	-	-	-	299.95	Split power supply; direct coupling.	

REAL 4-CHANNEL STEREO IS EXPENSIVE. BUT NOW IT DOESN'T HAVE TO BE VERY EXPENSIVE.



Introducing our expensive, but not very expensive, 4-channel receiver. The Fisher 601.

Last year, Fisher brought out the world's first true 4-channel receiver, the Fisher 701. The price was \$699.95.

Now, you have to understand that a true 4-channel receiver requires nearly twice the electronics of an equally good 2-channel receiver.

And since the 701 was to be the world's first 4-channel receiver, we pulled out all the stops when we designed it. Which resulted in a piece of equipment that was *very* expensive. Incredibly good, but very expensive.

But now we think it's time to bring out a top-quality 4-channel receiver that more people can afford. One that doesn't cost a lot more than the best 2-channel receivers. So we're introducing the Fisher 601 4-channel AM/FM receiver.

Meet the Fisher 601. \$599.95.

Even though the 601 is not the top of the Fisher 4-channel line, it's a no-compromise piece of equipment.

It's got everything: power, sensitivity, versatility, and wonderfully clean 4-channel sound.

200 watts is a lot of power.

The Fisher 601 has 200 watts of clean power. It's fully capable of driving two sets of speakers—four main, four remote. And it will drive them at concert levels with no sign of strain.

The FM tuner section has 1.8 microvolts sensitivity, which is on a par with the tuners in the finest 2-channel

receivers Fisher makes. You'll get clear reception on stations that non-Fisher tuners pick up as static.

A full complement of controls.

The new 601 receiver is equipped with bass and treble controls, of course. They're of the Baxandall variety, which is a little more expensive than the kind other makers like to use. But they're also better. (They leave the midrange alone while you adjust the bass or treble.)

A muting switch quiets the noise between FM stations. There's a high filter so you can cut out unwanted high frequencies on the front channels, if you choose. There's a balance control, loudness contour and tape monitoring switches for front and rear channels.

Of course, the 601 has controls for mode, selecting speakers, and selecting a sound source. And the front and rear-channel volume controls slide like professional sound-studio faders.

The Fisher 2+2 matrix system. 4 channels out of 2.

Not only does the Fisher 601 give you fantastic sound with true 4-channel program material, it also incorporates a switch to activate a special circuit that lets you create 4 channels out of 2-channel material. The circuit extracts ambiance information from the channels that you otherwise couldn't hear, and feeds it into the two rear channels. This information, which represents the

sum of the reflected signals from the original recording source, enhances the stereo effect. The result is as close as you can get to true 4-channel sound, without actually starting with four separate signals.

So now you can hear your entire library of stereo LP's, tapes, and even FM-stereo broadcasts in 4-channel. And even more important, Fisher's 2+2 matrix system will let you play the various different stereo records and tapes that have been encoded with 4-channel information for playback on a 4-channel system.

That's planned non-obsolence.

Only 25¢! \$2 value!
 Send for your copy of The Fisher Handbook, a fact-filled 80-page guide to high fidelity. This full-color reference book also includes complete information on all Fisher stereo components. Enclose 25¢ for handling and postage.

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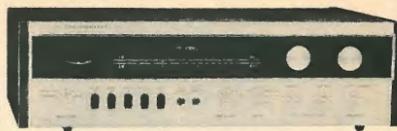
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Sansui Model 8



Scott 444



Sherwood S7300

MANUFACTURER	MODEL	RMS Power Chan., W		TMD at Rated Power, %		IM at Rated Power, %		IM at 1 Watt, %		Power Bandwidth, Hz-MHz	1-Watt Freq. Resp., Hz	Rated Output 5/8, Phono, dB	Phono Sensitivity, mV	Phono Overload, mV	IHF Sensitivity, μ V	Capture Ratio, dB	TMD Mono, 100% Mod., %	TMD Stereo, 100% Mod., %	Stereo Sep., 100% Hz, dB	Tuning Indicator	All Chan. Selectivity, dB	AM Band?	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
		1	2	1	2	1	2	1	2																	
SANSUI	Eight	80	<0.3	<0.4	-	10-40K	5-50K \pm 1	>70	2	-	1.7	1.5	<0.5	-	>35	2 Mtrs.	>60	Yes	17 1/2 x 12 1/2 x 5 1/2	37 1/2	499.95				3 FETs; 3ICs; muting switch and level cont.; NF control amp.; 3 spkr systems.	
	5000X	85	<0.5	<0.8	-	15-30K	20-30K \pm 1	>70	2.5	-	1.8	1.5	<0.8	-	>35	2 Mtrs.	>45	Yes	18 1/2 x 13 1/2 x 6 1/2	33 1/2	399.95				Linear tuning; 3 spkr. systems; 3-stage NF equalizer.	
	4000	65	<0.8	<0.8	-	20-30K	10-50K \pm 1	>70	2.5	-	1.8	1.0	-	<0.5	>35	Dual Mtr.	>50	Yes	17 1/2 x 13 1/2 x 5 1/2	31	349.95				As above. 2000A, similar but 43 watts, \$299.95.	
	QR-6500 4-Chan.	50	0.5	0.5	-	20-30K	20-30K \pm 1	60	2	-	1.8	1.5	0.8	-	35	2 Mtrs.	-	Yes	21 1/2 x 14 1/2 x 7 1/2	48 1/2					Built-in FM/phono decoder and synthesizer. QR-4500 similar but 38 watts; QR-1500, 20 watts; QR-500 11 watts.	
	MQ-2000 4-Chan.	14	1	1	-	30-30K	30-30K \pm 2	60	3	-	5	-	2.0	-	30	Mtr.	-	Yes	-	-						Built-in FM/phono decoder and synthesizer; PE auto turntable w. Shure M-75 cartridge.
SCOTT	444 4-Chan.	25	0.5	-	-	25-20K	-	65	3	-	1.9	2.5	0.5	-	44	2 Mtrs.	40	Yes	17 1/2 x 17 x 6	32	449.90				Discrete or matrixed four-channel.	
	443 4-Chan.	15	0.5	-	-	25-20K	-	65	3	-	2.5	2.5	0.5	-	44	2 Mtrs.	40	Yes	17 1/2 x 17 x 6	30	319.90				As above.	
	477	70	0.5	-	-	15-40K	-	65	4	-	1.9	2.5	0.5	0.5	35	2 Mtrs.	40	Yes	17 1/2 x 15 1/2 x 6	34	399.90				Front and rear tape inputs.	
	387	55	0.5	-	-	10-38K	-	65	4.2	-	1.9	2.5	0.6	0.6	35	Mtr.	-	Yes	17 x 15 x 5 1/2	30	359.90				FET tuner; complementary output stage. Model 377, similar but 40 watts, \$319.90.	
	367	32	0.5	-	-	25-20K	-	58	2.5	-	2.5	2.5	0.8	0.8	30	Mtr.	40	Yes	18 x 12 x 5 1/2	24	259.90				FET tuner. Model 357, similar but 25 watts, \$199.90.	
SHERWOOD	SEL-200	85	0.2	0.6	0.1	8-35K	20-20K \pm 0.5	65	1.6	100	1.5	1.7	0.15	0.25	40	2 Mtrs.	70	No	18 1/2 x 13 x 5 1/2	33	599.00				Torroid FM IF filter; FET hush circuit.	
	S-8900	70	0.35	0.6	0.15	12-30K	20-20K \pm 0.5	65	1.6	120	1.7	1.9	0.15	0.30	40	Zero Mtr.	65	No	16 1/2 x 14 x 5 1/2	28	399.95				Ceramic filter; FET hush circuit avail w/AM @ \$439.95.	
	S-7300	52	0.60	0.60	0.25	8-35K	20-20K \pm 0.5	65	1.7	60	1.8	1.9	0.30	0.50	40	Zero Mtr.	60	Yes	18 x 16 x 5 1/2	33	319.95				Walnut case included. 2 MIC inputs - hi and low filters - handles 4 tape decks.	
SONY	STR-6200	70	0.2	0.2	0.2	10-40K	12-100K +0-3	70	1.4	100	1.8	1	0.2	0.35	40	Mtr.	100	No	19 x 15 1/2 x 5 1/2	39	699.50					
	STR-6065	70	0.2	0.2	0.2	15-30K	12-100K +0-3	70	1.4	100	2.2	1.5	0.2	0.5	38	Mtr.	80	Yes	17 1/2 x 14 x 5 1/2	29	399.50					
	STR-6055	40	0.2	0.2	0.2	15-30K	10-60K +0-3	70	1.8	80	2.6	1.5	0.2	0.5	38	Mtr.	80	Yes	17 1/2 x 13 1/2 x 5 1/2	26	299.50					
	STR-6045	25	0.5	0.5	0.5	10-30K	10-50K +0-3	60	2.5	80	2.6	1.5	0.4	0.8	35	Mtr.	80	Yes	15 1/2 x 12 1/2 x 5 1/2	18	229.50					
STANDARD	SR-1500	40	0.5	0.03	0.06	10-40K	20-30K \pm 1	70	1.8	9.0	1.8	1.5	0.5	0.5	35	2 Mtrs.	45	Yes	17 x 6 1/2 x 13 1/2	24.2	309.95				Pre and main amp; direct coupled circuitry; wood case included.	
TELEX	814	5	1.0	-	-	40-15K	50	-	-	-	-	1.0	1.0	-	Mtr.	-	Yes	18 x 11 x 6	35	309.95						
TOYO	665	20	1.0	-	-	40-18K	-	3	-	-	-	-	-	34	-	-	Yes	-	-	209.95				Includes 8-track tape recorder/player and 2 mikes.		
	730 4-Chan.	5	1.0	1.2	1.5	40-18K	-	50	3	-	6	4	1.0	1.5	32	-	Mtr.	Yes	25 1/2 x 12 x 5	25	249.95				Includes 4-chan. and 2-chan. tape player.	
V-M	1521	40	0.5	0.5	-	9-30K	-	70	2/10 Mag.	-	1.9	1.8	-	0.5	40	Mtr.	80	Yes	18 1/2 x 13 x 6 1/2	25	500.00				4-section front-end with dual gate MOSFETs, 2.5-pole phase linear toroidal filters, short circuit protection.	
	1537 4-Chan.	12.5	1.0	-	-	40-25K \pm 3	-	-	-	-	1.9	-	-	30	Mtr.	-	Yes	17 x 15 x 4 1/2	16	179.95				4-channel.		
YAMAHA	CR-700	40	0.5	0.8	0.1	20-30K	15-50K	95	3	90	1.8	1.5	0.3	0.5	40	Mtr.	70	Yes	-	-					OCL, FET, IC solid state filter, includes wood cabinet.	
	CR-900	60	0.1	0.3	0.1	20-50K	15-50K +1-3	95	3	90	1.7	1.5	0.3	0.5	40	2 Mtrs.	70	Yes	-	-					FM electro tuning, FET, IC solid state filters, includes wood cabinet.	



Turn on whichever turns you on.

Among the "stereo set" it's pretty much a toss-up.

About half the audio enthusiasts to whom we've spoken say they still prefer their components separate.

The other half feel that if you don't sacrifice quality in either the receiver or the changer, why *not* wrap them up in one component package

Bogen, a leader in sound for just about 40 years, agrees. You should turn on whichever turns you on.

If you're a "separatist," we offer you the superb "best-buy" BR360 120 watt (IHF) AM/FM Stereo Receiver. Its many features include slides and push-buttons in place of conventional dials, handsome contemporary styling, and Crescendo Control . . . the exciting and exclusive Bogen feature that restores the dynamic range of music as it was originally performed. No other receiver has it!

For the compact lovers of togetherness, Bogen presents the BC360. Atop the exciting

BR360 we've mounted a deluxe BSR 4-speed automatic turntable . . . with anti-skating, cueing, automatic system shut-off, Pickering mag cartridge with diamond stylus, and the many other features you look for in a precision automatic table.

Suggested list prices: only \$299.95 for the receiver (walnut enclosure optional); \$379.95 for the compact, finished in handsome walnut.

To round out your stereo system, Bogen offers a choice of superb "Row 10" speaker systems, cassette and 8-track tape decks, precision turntable and headphones. For details, specs, and "where-to-buy" information, write us today.

BOGEN

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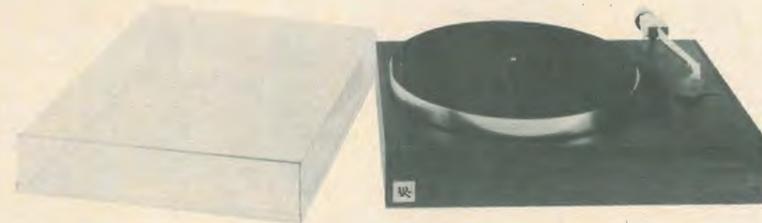
MANUAL TURNTABLES AND ARMS



Norelco 202



Pioneer PL-41D



AR turntable

MANUFACTURER	TURNTABLES														TONE ARMS										SPECIAL FEATURES	
	MODEL	Speeds (see letter code)	Wow and Flutter at 33 1/3 rpm	Run-in (NAB) db	Motor Type	Platter Diameter, in.	Platter Weight, Lbs.	Drive	Arm Mounting Provision	Dimensions, W x D x H, in.	Weight, Lbs.	MODEL	Overall Length, in.	Photo Stylus Dia., in.	Vertical Bearing	Lateral Bearing	Stylus Force Method	Max. Tracking Error, Deg.	Cart. Weight Range, Grams	Arm Resonance, Hz	Stylus Force Range, Grams	Weight, if Sep., Oz.	Price	SPEEDS (use letter code)		
ACOUSTIC RESEARCH	XA	B	0.1	-35	24-p Sync	11 3/4	4	Belt	Integ.	16 1/2 x 12 1/4 x 5 1/4	13.5	-	12	9	Cone point	Ball	Counter-balance	0.35/in	-	10-15	0-8	-	87.00	Includes dust cover, base, stylus force gauge, oil, overhang gauge.		
	TA	C	0.1	-35	24-p Sync	11 3/4	4	Belt	Integ.	16 1/2 x 12 1/4 x 5 1/4	13.5	-	12	9	Cone point	Ball	Counter-balance	0.35/in	-	10-15	0-8	-	84.00			
	XA Univ.	B																					87.00	Same as XA, except usable on 100-120 or 220-240 V., 50-60 Hz.		
BSR McDONALD	MP60X	D	0.12	-40	Sync	11	4	Idler	Integ.	17 x 16 1/4 x 11 1/2	16													82.50		
BANG AND OLUFSEN	Beogram 1200	B	0.07	-55	Ind.	12		Belt	Integ.	17 1/2 x 12 3/4 x 5 1/4	17		12	9	Ball	Ball	Bal.	1.2	6-14	9	0-3		130.00			
BOGEN	B-111	B	0.1	-45	Sync	12	2	Belt	Integ.	17 1/2 x 15 1/4 x 13 1/4	15		12	9			Counter Weight	±1	4-8	8	1-5		99.95			
EMPIRE	598	A	0.01	-55	Hys. Syn.	12	7	Belt	Integ.	17 1/2 x 15 1/4 x 8	30	990	12	9	Ball	Ball	Bal. & Spg.	0.7	5-15	6	0-6	20	249.95	990 arm alone is \$79.95.		
HITACHI	PS-77	B	0.05		Hys. Idler	12	5.6	Belt	Integ.	22 1/2 x 17 1/4 x 8 1/4	33		4 3/8	11	Jewel	Ball		1.5								
JVC	5250	B	0.05	-60	D.C. Servo	12		Belt	Integ.	19 1/2 x 15 1/2 x 7 1/4	19.8		12									0-5	199.95			
LENCO (BENJAMIN)	LENCO B-55	F, D	0.12	-37	4-pole Ind.	11.8	3.6	Idler	Integ.	17 1/2 x 13 1/2 x 5 1/4	24													85.00		
	LENCO L-75	F, D	0.06	-38	4-pole Ind.	12	8.8	Idler	Integ.	17 1/2 x 13 1/2 x 6 1/4	32														99.50	
NORELCO	GA-202	A	0.06	-38	D.C. Servo	12	3	Belt	Integ.	5 1/2 x 13 1/2 x 15 1/2	10 1/2		11	9	Ball	Pivot & Bushing	Bal.	-	4-18	7	0.5-4		129.50			
PANASONIC	SP-10	B	0.03	-65 (DIN-A)		12	7	Direct**	Sep.	14 x 14 x 4	20													299.95	*Brushless DC Servo-motor; **Direct-drive	
PIONEER	PL-410	B	0.08	-50	Sync Hys.	12	4	Belt	Integ.	19 1/2 x 15 1/2 x 7 1/4	24		12	9 1/2	Ball	Ball	Static	-	-	-	0-10			220.00		
	PL-A25	B	0.1	-46	Sync	12	2.9	Belt	Integ.	17 1/2 x 13 1/2 x 6 1/4	16		12	8 1/2	Ball	Ball	Static	-	-	-	0-10			129.95		
	PL-12A	B	0.12	-46	Sync	12	2.9	Belt	Integ.	17 x 13 1/2 x 6	13.5		12	8 1/2	Ball	Ball	Static	-	-	-	0-10			89.95		



JVC Model 5250



BSR McDonald MP 60/X



Empire 598

TD-150 MARK II INTEGRATED TRANSCRIPTION TURNTABLE

You pay for what Thorens leaves out.

And you'll never miss them. Like rumble. Or wow and flutter. Irregular turntable speed. Damaged records, chipped stylus.

The Thorens TD-150 Mark II is for people who refuse to accept the many imperfections of ordinary sound reproduction.

Record wear reduced... Stylus life extended

Several Thorens features provide this. Positioned at the front is the Cueing Synchronizer. It lowers the tonearm gently and precisely into the groove. The Anti-Skate Control then makes certain the stylus is positioned exactly on both walls of the groove. And when you change turntable speeds (33 1/3 and 45 rpm) the Speed Glide Adjustment does it rapidly and smoothly.

Rumble, wow and flutter are eliminated

The flywheel action of the 12-inch, precision balanced, non-magnetic platter absorbs the slightest variations in speed and eliminates wow and flutter. The long and resilient drive belt system of the synchronous motor in combination with a unified suspension system routs rumble effectively.

Constant Turntable Speed

A 16-pole synchronous motor always maintains its speed regular-

ity, providing constant, smooth, in-phase precise speed.

Plays records the way they were recorded

Records are cut at a 15° tracking angle. The best performance is achieved when they're played back at this angle. The low-mass plug-in shell permits you to adjust the tracking angle of a cartridge accordingly. The tonearm can be adjusted to track as low as 1/2 gram.

So you see, when you pay for what Thorens leaves out, you receive superb performance and reliability. But then you expect unexcelled quality from Thorens. And you get it.

TD-150 Mark II, complete with tonearm and walnut base — \$140. See your Thorens dealer, or send coupon for further details.

Elpa Marketing Industries, Inc. New Hyde Park, N.Y. 11040

Please send additional information on the complete line of Thorens Transcription Turntables and the name of my nearest dealer.

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Address _____

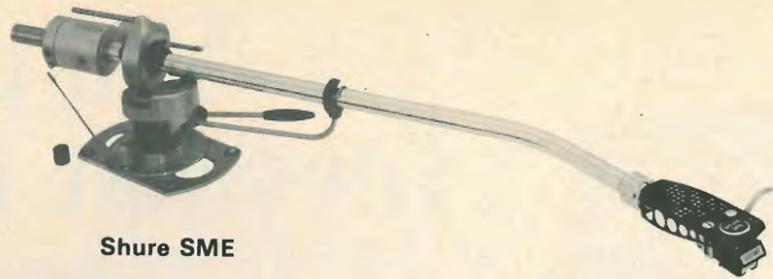
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THORENS

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MANUAL TURNTABLES AND ARMS



Shure SME



Sansui SR-2050E



Rabco ST-4

MANUFACTURER	TURNTABLES										TONE ARMS										SPECIAL FEATURES			
	MODEL	Speeds (Use letter code)	Wow and flutter @ 33 1/3	Residual (WAB) dB	Motor Type	Platter Diameter, in.	Platter Weight, Lbs.	Drive	Arm Mounting Provision	Dimensions, W x D x H, in.	Weight, Lbs.	MODEL	Overall Length, in.	Photo-Synch. Dist., in.	Vertical Bearing	Lateral Bearing	Stylus Force Method	Max. Tracking Error, Ddb	Anti-Resonance, Hz	Stylus Force Range, Gms.	Weight, 1.5 Lbs. or less	Price	SPEEDS (use letter code)	
RABCO	ST4	B	-32	Sync.	11 1/2	5	Belt	Integ.	15 x 18 x 6	16												159.00	A - 33, 45, 78	D - 16, 33, 45, 78
REK-O-KUT	B-12H	A	0.09	-39	Hys.			Idler	15 1/4 x 14 x 5 1/4	14												169.00	B - 33, 45	E - 16, 33, 45
	CVS-12	F	0.098	-35					15 x 16 x 5	15													C - 33 only	F - Cont. variable
ROLECOR	ROTEL RP-1100	B	0.1	-45	4-pole Sync. Hys.	12	2	Belt	Integ.	17 1/2 x 13 1/4 x 6 3/4	15											149.95		
SANSUI	2050	B	0.07	-40	Sync.	12	2.9	Belt	Integ.	17 1/2 x 13 1/4 x 7 1/2	26											149.95	Auto shut-off; damped cueing; includes base, dust cover.	
	1050	B	0.07	-40	Syn.	12	2.9	Belt	Integ.	17 1/4 x 13 1/4 x 7 1/2	21 1/2											119.95	As above without auto shut-off.	
SHURE																								
SONY	TTS-3000A	B	0.05	-47	D.C. Servo	12	3	Belt		14 1/4 x 15 x 5 1/4	14											149.50		
	PS-1800A	B	0.08	-41	D.C. Servo	12	3	Belt		19 1/4 x 16 1/4 x 7 1/2												199.50		
THORENS	TD-150 MK II	B	0.09 (DIN)	-37	Sync.	12	7 1/2	Belt	Integ.	15 1/2 x 12 1/4 x 5	14 1/4											140.00	Solid state; wein bridge oscillator; tone arm and drive system isolated; interchg. tone arm mounting brd. (TD-125); 16-pole syn. motor; reduced motor spd.	
	TD-125 AB	E	0.08	-48	Sync	12	7 1/2	Belt	Integ.	18 x 14 x 5	32											321.00	Same as above.	
	TD-125 E	E	0.08	-48	Sync	12	7 1/2	Belt	Indep.	18 x 14 x 5	32											215.00	Same as above.	
YAMAHA	YP500	B	0.08		4-pole Sync	12	3	Belt	Integ.	17 1/2 x 14 1/4 x 6												189.50		

RABCO

Gives you a choice —

TWO straight line servo-driven phono arms.



The moderately priced ST-4 turntable and mechanical servo arm

- Synchronous motor at the turntable for constant speed
- Electric-motor cueing and end-of-record arm lift

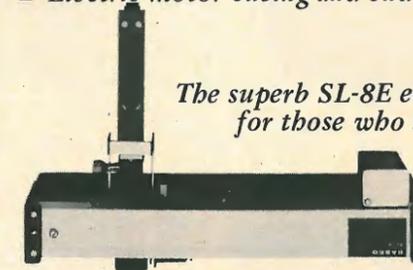


Sony PS-1800



Panasonic Model SP-10

The superb SL-8E electric servo arm for those who seek the ultimate



ST-4 Combination \$159.00
Optional Two-Piece Cover \$15.00
SL-8E arm \$169.00

MAKERS OF THE ONLY SERVO DRIVEN STRAIGHT LINE ARM

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AUTOMATIC TURNTABLES



PE-2040



JVC Model 5202



Sherwood SEL-100

MANUFACTURER	MODEL	SPECIAL FEATURES													SPEEDS				
		Speeds (See Letter Code)	Platter Diameter, In.	Wow and Flutter at 33 1/3 %	Rumble (MAB) dB	Max. Tracking Error, Deg.	Phono Stylus Dist., In.	Arm Type	Cart. Weight Range, Grams	Arm Resonance, Hz	Max. Stack Records	Change Cycle at 33 1/3 %	Clearance Below Record, In.	Clearance Above Record, In.	Overall W x D, In.	Overall Weight, In.	Price	A - 33, 45, 78	D - 16, 33, 45, 78
ALLIED RADIO SHACK	Realistic/Miracord 45	D	11%	0.1	-50	-	Bal. & Spg.	-	-	6	-	-	-	16 1/4 x 14 1/4	4%	20	149.95	With base and cartridge.	
	Realistic/Miracord 40A	D	11%	-	-	-	Bal. & Spg.	-	-	6	-	-	-	16 1/4 x 14 1/4	4%	20	119.95	With base and cartridge.	
	Realistic LAB-36	D	11	-	-	-	Bal. & Spg.	-	-	6	-	-	-	15 1/4 x 13 1/4	6 1/2%	10 1/2	79.50	With base & cartridge.	
	Realistic LAB-24A	D	11	-	-	-	Bal. & Spg.	-	-	6	-	-	-	15 1/4 x 13 1/4	6 1/2%	8	64.50	Synchronous motor; with base and cartridge.	
BELL & HOWELL	3850	D	7	-	-	-	-	-	-	6	10	-	-	13 x 9	6	9	49.95	Includes base and dust cover.	
	3875	D	11	-	-	-	-	-	-	8	10	-	-	15 1/2 x 15 1/2	8.5	11	59.95	Includes base and dust cover; cue control; anti-skate.	
BSR McDONALD	610X	D	11	0.12	-40	0.75	7.5	Bal.	0-6	15	8	7	3	4	17 x 16	6 3/4%	17	141.45	W. base, dust cover, and Shure M93E cart.; sync. mtr.; viscous cueing.
	510X	D	11	0.12	-40	0.75	7.5	Bal.	0-6	15	8	7	3	4	17 x 16	6 3/4%	14	100.00	W. base, dust cover, and Shure M75 cart.; sync. mtr.; viscous cueing.
	310X	D	10 3/4	0.15	-38	1.0	7.5	Spg.	0-9	20	7	7	3	4	13 x 11	6 3/4%	14	80.00	W. base, dust cover, and Shure M75 cart.
ELAC (BENJAMIN)	Miracord 770H	A	12	0.06 0.025	-40	0.5 Deg. In.	7%	Bal. & Spg.	0-15	<8	10	10	3%	5%	14 1/2 x 12 1/2	10	18	225.00	Hysteresis-synchronous motor, variable speed control, digital readout ill. strobe, ionic stylus wear indicator, vert. track angl. adjust.
	Miracord 50H	D	12	0.06 0.025	-40	0.5 Deg. In.	7%	Bal. & Spg.	0-15	<8	10	10	3%	5%	14 1/2 x 12 1/2	10	18	175.00	Hysteresis-synchronous motor.
	Miracord 750	D	12	0.06 0.025	-40	0.5 Deg. In.	7%	Bal. & Spg.	0-15	<8	10	10	3%	5%	14 1/2 x 12 1/2	10	18	149.50	
	Miracord 650	D	10 3/4	0.07 0.03	-39	0.5 Deg. In.	7%	Bal. & Spg.	0-11	<10	10	12	2%	5%	13 3/4 x 11 1/4	9	17	99.95	
	Miracord 660H	D	10 3/4	0.06 0.025	-39	0.5 Deg. In.	7%	Bal. & Spg.	0-11	<10	10	12	2%	5%	13 3/4 x 11 1/4	9	17	139.95	Hysteresis-synchronous motor, overhang adj., calibration marker.
FISHER	502	A	11 1/2	<0.1	-43	1.8	8	Bal. & Spg.	3-15	10	8	3 1/4	3 1/4	4 1/2	14 1/4 x 12 1/4	8 1/2%	15 1/4	159.95	Stylus protection system; vert. track angl. adjust.; anti-skating control.
	402	A	10 3/4	<0.15	-40	1.8	8	Bal. & Spg.	3-15	10	8	3 1/4	3 1/4	5 1/2	13 x 10 3/4	8 1/2%	12 1/4	129.95	Anti-skating control; viscous damped cueing.
	302	A	10 3/4	<0.15	-37	1.8	8	Bal. & Spg.	3-15	10	8	3 1/4	3 1/4	5 1/2	13 x 10 3/4	8 1/2%	11 1/4	99.95	Anti-skating control; viscous damped cueing.

When four-channel records are a reality, you may finally need all of Dual's precision.

Dual turntables have always been designed with "more precision than you may ever need." This is as it should be.

A turntable is a long-range investment, whereas cartridges tend to be replaced from time to time. Thus, the tonearm should be capable of tracking at less than the optimum recommended force of the best cartridge available at the time.

Flawless tracking calls for near-absolute accuracy in all tonearm settings: balance, tracking force and anti-skating. It also calls for near-frictionless bearings, for the stylus can't tolerate any drag from the pivot system.

All these requirements have been met by Dual for years. In fact, they have been invariably exceeded by comfortable margins.

Now that the four-channel record is a near-reality, and although it is not decided which of the possible recording techniques might become the standard, one thing is certain. The demands on tonearm and turntable performance will be more exacting. Which will simply mean that Dual precision is no longer a luxury, but a necessity.

A few examples of Dual precision engineering are shown in the photo above. If you would like to know what several

independent test labs say about it, we'll send you complete reprints of their reports. Plus an article from a leading music magazine that tells you what to look for in record playing equipment.



Precision features of the 1218 and 1219 tonearms: **A)** Twin-ring gyroscopic gimbal centers and balances tonearm within both axes of movement. Horizontal bearing friction less than 0.015 gram. **B)** Setting to provide perfect vertical tracking in single play and at center of stack in multiple play. In 1218, this feature provided within cartridge housing. **C)** Tracking force applied at pivot, maintaining perfect dynamic balance. **D)** Anti-skating separately calibrated for elliptical and conical styli, as each type skates differently. **E)** Damped counterbalance has vernier adjust plus click-stops for convenience in changing cartridges.



1215, \$99.50

1219, \$175.00

1218, \$139.50

United Audio Products, Inc., 120 So. Columbus Ave., Mt. Vernon, N.Y. 10553.

Exclusive U.S. Distribution Agency.

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AUTOMATIC TURNTABLES



United Audio Dual 1219



Garrard Zero 100



V-M Synchro-Matic 1555

MANUFACTURER	MODEL	SPEEDS										SPECIAL FEATURES							
		A - 33, 45, 78		B - 33, 45		C - 33 only		D - 16, 33, 45, 78		E - 16, 33, 45			F - Cont. variable						
		Platter Diameter, In.	Wow and Flutter at 33 1/3, %	Rumble (WAB) dB	Max. Tracking Error, Deg.	Pivot-to-Styleus Dist., In.	Arm Type	Cart. Weight Range, Gms.	Arm Resonance, Hz	Max. Stack Records	Change Cycle at 33 1/3, Secs.	Clearance Below Board, In.	Clearance Above Board, In.	Overall W x D, In.	Overall Height, In.	Weight, Lbs.	Price		
GARRARD	Zero 100	B	11 1/2	0.06/0.025	-	*	7 1/2	Bal.	0-15	<8	6	10	3	4 1/2	15 3/8 x 14 1/2	6 1/2	12	189.50	*Not measurable; pivoting cartridge head.
	SL-95B	A	11 1/2	0.07/0.025	-	0.75	8 1/4	Bal.	0-15	8	6	10	3	4 1/2	16 1/8 x 14 1/8	7 3/8	11	139.50	Synchro-lab motor, low mass viscous-damped tone arm; 2 point record support; oversized platter, anti-skating control; slide-in cartridge clip.
	SL-72B	A	10 1/2	0.08/0.025	-	0.75	7 1/2	Bal.	0-15	8	6	10	3	4 1/2	15 3/8 x 14 1/2	7 1/2	10 1/2	99.50	Synchro-lab motor, viscous damped arm, anti-skating control; cartridge clip.
	SL-65B	D	10 1/2	0.09/0.025	-	0.85	7 1/2	Bal.	0-18	10	8	12	2 1/2	4	15 3/8 x 13 1/2	6 1/2	9	74.50	As above.
	SL-55B	D	10 1/2	0.12/0.025	-	0.85	7 1/2	Bal. & Spg.	0-12	12	8	12	2 1/2	4	15 3/8 x 13 1/2	6 1/2	9	59.90	As above.
	40B	D	10 1/2	0.14/0.03	-	0.85	7 1/2	Bal. & Spg.	0-12	12	8	12	2 1/2	4	14 1/2 x 12 1/2	6 1/2	9	44.50	Viscous-damped cueing lever; cart. clip; tubular tone arm; super-sensitive trip.
JVC	5202	D	11 1/2	0.1	-45	-	-	Spg.	3-10	18	6	-	-	-	16 1/2 x 14 1/2	7 1/4	14 1/2	79.95	Includes mag. cart., base, and dust cover.
PE (ELPA)	PE 2010	D	10 1/2	0.17	-37	2.0	8 1/2	Bal. & Spg.	6-14	10	8	16	3 1/2	6 1/2	13 x 11	8 1/2	9 1/2	80.00	Vertical tracking angle (VTA) adjustment, stylus protection system, continuous record repeat, automatic record scanner, 2-way viscous damped cueing.
	PE 2035	A	10 1/2	0.15	-38	1.8	8 1/4	Bal. & Spg.	3-15	10	8	16	3 1/2	6 1/2	13 x 11	8 1/2	10 1/2	99.95	As above.
	PE 2038	A	10 1/2	0.15	-38	1.8	8 1/2	Bal. & Spg.	3-15	10	8	16	3 1/2	6 1/2	13 x 11	8 1/2	12 1/2	125.00	As above.
	PE 2040	A	11 1/2	0.1	-43	1.8	8 3/8	Bal. & Spg.	3-15	10	10	16	3 1/2	6 1/2	14 x 12	8 1/2	15 1/2	155.00	As above.
SHERWOOD	SEL 100	B	11 1/2	0.06	-58	1 1/2	9 1/2	Dynamic Weight	3-9	8	6	14	2	3 1/2	17 x 13	5 1/2	16 1/2	155.00	Aluminum base included; dust cover \$12.95; Walnut base \$9.50.
UNITED AUDIO (DUAL)	1219	A	12	0.05	-45	0.4	8 1/4	Bal.	1-12	8-14	6	13	3	5	14 1/2 x 12 1/2	8	15 1/2	175.00	Gimbal suspension; adjust. vert. track. angle; 6% pitch control; syn. motor; cueing.
	1218	A	10 1/2	0.08	-45	0.5	8 1/4	Bal.	1-12	8-14	6	11	2 1/2	5	13 x 10 1/2	7 1/2	10	139.50	As above.
	1215	A	10 1/2	0.08	-45	0.5	8 1/4	Bal.	1-10	8-14	6	11	2 1/2	5	13 x 10 1/2	7 1/2	9 1/4	99.50	Cueing; 6% pitch cont.; synch. tracking force and anti-skating. CS16 similar w. base, cover, shure cart. \$119.50.
V-M	1555	B	11	0.3	-52	1.5	9 1/2	Bal. & Spg.	3-9	9-11	6	-	2	3 1/2	18 1/2 x 14 1/2	6 1/2	16 1/2	220.00	2 syn. motors. Photo cell sync. change sensor. Includes cartridge.
	1542	D	11	0.28	-35	-	-	Bal. & Spg.	3	-	6	-	-	-	14 1/2 x 13 1/2	6	10 1/2	105.00	Syn. 4-pole motor, includes magnetic cartridge.

Introducing the BSR McDonald 810 Transcription Series automatic turntable.

Sequential Cam System

Replaces conventional cam gear and swinging plate used in every other automatic turntable. This revolutionary engineering breakthrough results in a smoothness and quietness of operation and an overall reliability never before achieved. The utilization of eight independent pre-programmed cams eliminates the multiplicity of light stampings and noisy moving parts required in every other automatic turntable mechanism.

Transcription Tone Arm System

The longer the tone arm the less the tracking error. 8.562" pivot-to-stylus length reduces tracking error to less than 0.5° per inch. Resiliently mounted gliding one-piece counterweight provides precise "zero-balance" adjustment over full range of cartridge and stylus masses. A precision micrometer wheel allows continuous infinite stylus pressure settings between 0 and 6.0 grams. Low-mass aluminum tone-arm assuring extremely low resonance is counterbalanced in both horizontal and vertical planes.

Synchronous Power Unit

As one of the world's largest designers and manufacturers of sub-fractional horsepower motors, BSR set its resources to develop a motor to match the performance of the Sequential Cam System. The results is the new high torque ultra-quiet synchronous induction power unit, which achieves an unwavering constancy of speed independent of voltage input or record load.

Automatic Tone Arm Lock

Exclusive feature automatically locks tone arm to rest post whenever unit is in the off position to eliminate possibility of accidental damage to stylus or record. Automatically unlocks in any operational mode.

Viscous-damped Cue and Pause Control

Provides gentle silicone oil-damped tone arm descent. In all other automatic turntables, the anti-skate system tends to move the tone arm outwards while it descends. BSR designed an

exclusive positive friction Cue-Clutch that prevents this. After pause, the 810's tone arm returns to the very same groove, every time. Also, the cueing control is operative in both automatic and manual modes.

Viscous-damped Tone Arm Descent

The identical gentle viscous controlled descent provided in the cueing operation also functions during automatic and semi-automatic play.

Dual-Range Anti-Skate Control

Adjustable, dynamic.

anti-skate control system provides settings for the substantially different requirements of elliptical or conical styli. Unfailingly applies a continuously corrected degree of compensation regardless of where the stylus is on the record.

Concentric Gimbal Arm Mount

Gyroscopically pivoted on four pre-loaded ball-bearing races to assure virtually no friction in either the horizontal or vertical planes. This design gives the 810 a tracking capability of 1/4 gram.

Stylus Overhang Adjustment

An important added feature of the slide-in cartridge head. Provision is made on the cartridge slide for a ± 1/8" range of stylus overhang which can be quickly and accurately set by means of the removable locating gauge. Once the stylus overhang is set, the locating gauge can be replaced by a soft stylus whisking brush, which is also provided.

Push-Button Operation

A series of featherweight push-buttons provides unexcelled operational flexibility: Settings for manual play, semi-automatic play, infinite repeat of one record, or fully automatic play. The push-button feature assures jar-free function selection even at extremely light stylus forces.

What price glory?

\$149.50. Yes, \$149.50.



BSR (USA) Ltd. Blauvelt, N.Y. 10913



12" Dynamically Balanced Turntable Platter

Full 12" diameter provides maximum record support. Cast, non-ferrous 7-pound platter is machined and precision-balanced to provide optimum performance. Platter mat is deep-ribbed rubber for maximum record protection.

Integral Strobe Disc

Platter-mounted strobe disc enables precise adjustment of turntable speed when pitch control is utilized. Markings for

both 33-1/3 and 45 RPM. Rotating Manual Sub Spindle

Rotates with platter, eliminating center-hole wear. Interchanges with umbrella-type spindle for automatic play.

Variable Pitch Control

Provides an infinitely variable 6% range of speed adjustment (for the 810's 33-1/3 and 45 RPM speeds) to match the pitch of a record to a live instrument or other playback device.

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STEREO PHONO CARTRIDGES



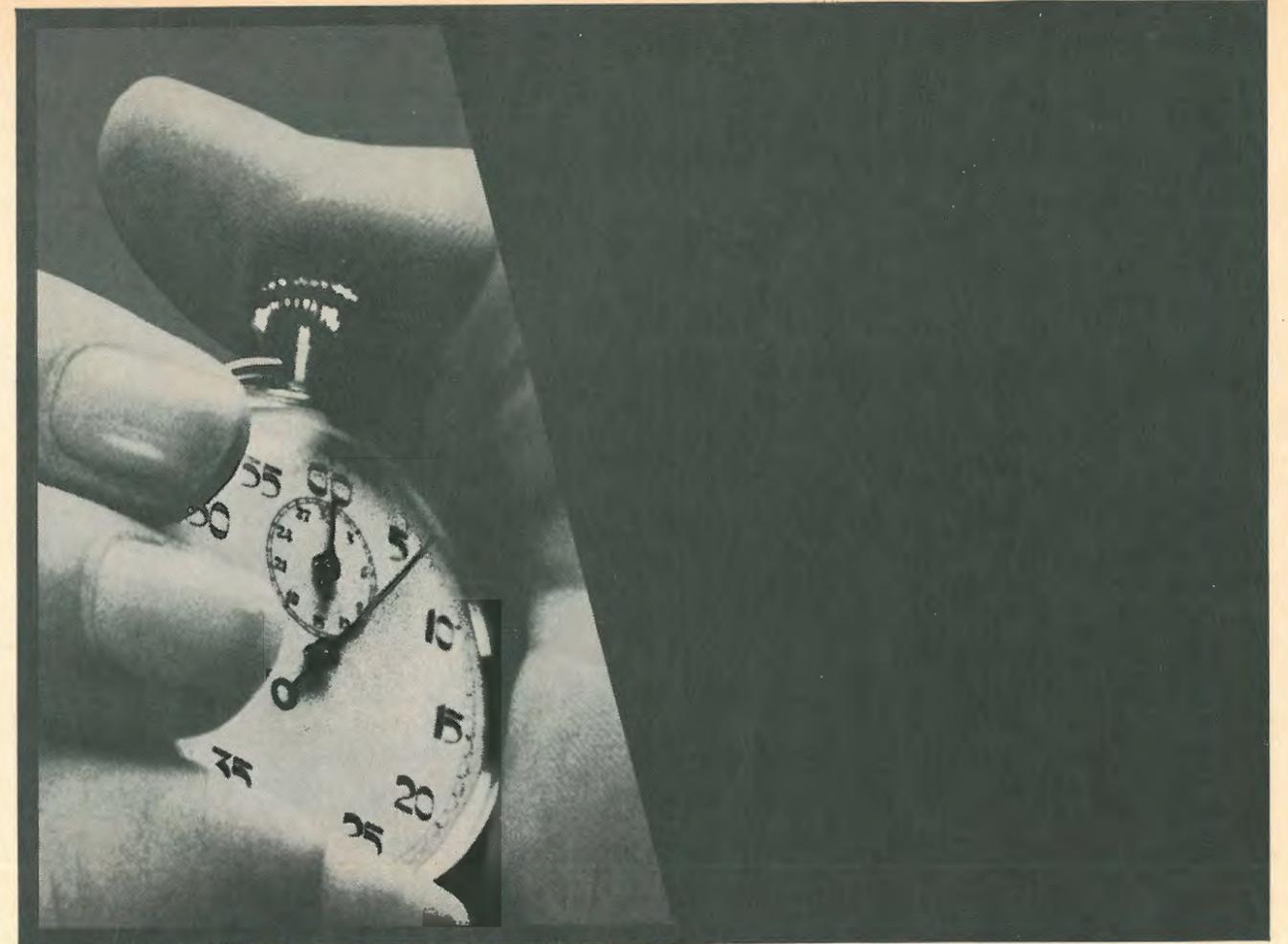
Stylus Type
E - Elliptical
C - Conical

ADC 25

Empire 1000 ZE/X

Grado F-2

MANUFACTURER	MODEL	Frequency Response, Hz		Separation, 1000 Hz, dB	Separation, 10 kHz, dB	Output, mV/cm/sec.	Tracking Force Range, Gms.	Load Resistance, Ohms	Stylus Type (See Letter Code)	Stylus Radius (Radial) Mils	Replacement	Weight, Gms.	Price	SPECIAL FEATURES
		±2 dB	±2 dB											
ADC	25	10-24K	30	30	0.73	½-1¼	47K	E	0.3 x 0.7 0.3 x 0.9 0.6	User		100.00	With 3 styli. ADC 26 with 0.3 x 0.7 stylus, \$75.00. ADC 27, similar to 26 but 10-22K resp., \$65.00.	
	10E MK II	10-20K	30	30	0.73	½-1½	47K	E	0.3 x 0.7	User		59.50		
	550XE	10-20K	20	20	0.92	¾-2	47K	E	0.3 x 0.7	User		44.95	All styli in "X" series are interchangeable.	
	990XE	10-20K	20	20	0.92	1-2	47K	E	0.3 x 0.7	User		29.95		
	220	10-18K	20	20	0.92	2-5	47K	C	0.7	User		9.95	220XE, with elliptical stylus, \$22.00.	
ALLIED RADIO SHACK	R700E	20-20K	25		6.2*	¾-1½		E	0.2 x 0.7	User		49.95	*Per 5 cm. By Shure.	
	R27E	20-20K	25		6.2*	¾-1½		E	0.2 x 0.7	User		24.95	As above.	
BANG AND OLUFSEN	SP-12	15-25K	25	20	1	1-1.5	47K	E	0.2 x 0.7	User	8.5	69.95	Naked diamond stylus; micro cross construction.	
	SP-10	15-25K	25	20	1	1-1.5	47K	C	0.6	User	8.5	59.95	As above.	
	SP-14	20-16K	20	18	1	1.5-2.5	47K	C	0.6	User	8.5	29.95	Micro cross construction; aluminum framed diamond stylus.	
DECCA	ARC	30-16K	25	23	7.5	3-3½	47K	E	0.5 to 0.6			65.00		
ELAC (BENJAMIN)	STS-444E	10-24K	26	17	11	¾-1½	47K	E	0.2 x 0.8	User	6.5	80.00		
	STS-444-12	10-24K	26	17	11	¾-1½	47K	C	0.5	User	6.5	65.00		
	STS-344-E	20-22K	24		11	1-2	47K	E	0.2 x 0.5	User	6.5	60.00		
	STS-344-17	20-22K	24		11	1-2	47K	C	0.7	User	6.5	45.00		
	STS-244-E	20-20K	22		18	1½-3	47K	E	0.2 x 0.7	User	6.5	35.00		
E-V	STS-244-17	20-20K	22		18	1½-3	47K	C	0.7	User	6.5	25.00		
	V200EL	5-35K	>25	-	4.0	½-1¼	47K	E	0.2 x 0.7	User	8.5	150.00	Twin magnet construction, one for each channel.	
	V150E	5-30K	>25	-	4.0	½-1¼	47K	E	0.2 x 0.7	User	8.5	100.00	As above.	
	V140E	5-30K	25	-	4.2	¾-1½	47K	E	0.2 x 0.7	User	6.4	69.95	As above.	
EMPIRE	V130E	10-30K	25	-	4.3	1-1¼	47K	E	0.2 x 0.7	User	6.4	49.95	As above.	
	1000 ZE/X	4-40K	35	25	1.5	¼-1¼	47K	E	0.2 x 0.7	User	7	99.95		
	999VE/X	6-36K	35	25	1.5	¼-1¼	47K	E	0.2 x 0.7	User	7	79.95		
	999SE/X	8-32K	35	25	1.7	½-1½	47K	E	0.2 x 0.7	User	7	59.95		
	999E/X	10-30K	35	25	1.7	¾-2	47K	E	0.3 x 0.7	User	7	39.95		
	909E/X	12-25K	35	25	2.0	1-4	47K	E	0.4 x 0.7	User	7	29.95		
GOLDRING (IMF)	90EE/X	15-25K	35	25	2.0	1-4	47K	E	0.4 x 0.7	User	7	24.95		
	850	40-12K	20	10	1.5	2-5	47K	C	0.7	User	7	9.95		
	800E MK II	10-20K	25	20	1.0	¾-1½	47K	E	0.3 x 0.8	User	7.5	39.95		
	800 Super E	10-23K	25	20	0.8	½-1¼	47K	E	0.3 x 0.8	User	7.5	69.50	Frequency curve and calibration certificate supplied with each cartridge.	



Solve 7 problems...in seconds.



Something totally new to add to your bag of tricks! We call them **Plug-in Problem Solvers**. They're designed to provide seven common modifications in microphone and sound system setups without soldering or rewiring—just plug them in! The Model A15A Microphone Attenuator that prevents input overload; Model A15PR balanced line Phase Reverser; and A15HP High Pass and A15LP Low Pass Filters to modify low and high frequency response; A15PR Presence Adapter to add brilliance; A15RS Response Shaper to filter sibilance and flatten response; and the A15LA Line Adapter that converts low impedance microphone inputs to line level inputs. Carry them on every job. It's a lot easier than carrying a studio console with you!

Shure Brothers Inc.,
222 Hartrey Ave., Evanston, Ill. 60204.



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STEREO PHONO CARTRIDGES

Stylus Type
E - Elliptical
C - Conical



Pickering XV-15



Shure SV-15/11



Ortofon SL-15

MANUFACTURER	MODEL	Frequency Response, Hz		Separation, 1000 Hz, dB	Separation, 10 kHz, dB	Output, mV/cm, sec.	Tracking, Force Range, Gms.	Load Resistance, Ohms	Stylus Type (See Letter Code)	Stylus Radius (Radius) Mils	Replacement	Weight, Gms.	Price	SPECIAL FEATURES
		±2 dB	±2 dB											
GRADO	F-1	7-70K	30	30	0.9	1-2	>5K	*	0.3	User	5	75.00	*Twin tip stylus.	
	F-2	7-60K	30	30	0.9	1-2	>5K	E	0.3 x 0.6	User	5	60.00		
	FTE	10-40K	30	25	1.3	1½-3½	>5K	E	0.3 x 0.7	User	5	19.95		
	FTR	10-40K	30	35	1.3	1½-3½	>5K	C	0.6	User	5	9.95		
NORELCO	GP412	20-20K	30		7	¼-1½	47K	E	0.3 x 0.7	User	7	69.50		
	SL-15	20-20K	30	25	0.02	¼-1½	2	E	0.3 x 0.7	Fty.	7	90.00		
ORTOFON	SL-15/T	20-20K	30	25	0.6	¼-1½	47K	E	0.3 x 0.7	Fty.	7	105.00		
	S-15/T	20-20K	30	25	0.6	1-2	47K	E	0.3 x 0.7	Fty.	18.5	80.00		
	S-15M/T	20-20K	30	25	0.6	1-2	47K	E	0.3 x 0.7	Fty.	31	85.00		
	XV-15/750E	10-25K	35	25	0.8	1 ± ½	47K	E	0.2 x 0.7	User	5½	65.00		
PICKERING	XV-15/400E	10-25K	35	25	1.0	1½ ± ½	47K	E	0.3 x 0.7	User	5½	54.95		
	XV-15/350	10-25K	35	25	1.1	2 ± 1	47K	C	0.7	User	5½	39.95	XV-15/150 similar but 1.4 mV output, 3 gms. ±1 tracking, \$34.95. XV-15/100 as above but 10-20K resp., 5 gms. ±2 tracking, \$29.95.	
	XV-15/200E	10-25K	35	25	1.4	3 ± 1	47K	E	0.4 x 0.7	User	5½	49.95	XV-15/140E similar but 10-20K resp., 4 gms. ±1 tracking \$34.95.	
	V-15/Phase IV-AME	20-20K	30	20	1.0	1¼ ± ½	47K	E	0.3 x 0.7	User	5	49.95		
	V-15/Phase IV-AM	20-20K	30	20	1.1	2 ± 1	47K	C	0.7	User	5	34.95	V-15/Phase IV-AT similar but 20-18K resp., 3 gms. ±1 tracking, \$29.95.	
	V-15/Phase IV-ATE	20-18K	28	18	1.2	3 ± 1	47K	E	0.4 x 0.7	User	5	39.95		
	V-15 Type II Improved	20-25K	25+		0.7	¼-1½	47K	E	0.2 x 0.7	User	6.8	67.50	Analog-computer-designed for finest-quality TT's.	
SHURE	V-15 Type II-7 Improved	20-25K	25+		0.7	¼-1½	47K	C	0.7	User	6.8	62.50	As above, except with conical stylus.	
	M91E	20-20K	25+		1.0	¼-1½	47K	E	0.2 x 0.7	User	5	49.95	New series of high-trackability cartridges for good turntables.	
	M93E	20-20K	25+		1.2	1½-3	47K	E	0.4 x 0.7	User	5	39.95	As above.	
	M75E	20-20K	25+		1.2	¼-1½	47K	E	0.4 x 0.7	User	6	34.95	Lowest cost high-trackability cartridge for upgrading older turntables.	
	M-75-6	20-20K	25+		1.2	1½-3	47K	C	0.7	User	6	24.50	As above, conical stylus.	
	681A	10-20 kHz	35	25	1.1	1½-3	47K	C	0.7	User	5.5	66.00		
STANTON	681EE	10-20 kHz	35	25	0.8	¼-1½	47K	E	0.2 x 0.7	User	5.5	72.00	681SE similar but 2-4 gms. tracking, 0.4 x 0.8 radius, \$66.00.	
	500EE	20-20 kHz	35	20	1.0	1-2	47K	E	0.3 x 0.7	User	5	40.00	500E similar but 2-5 gms. tracking, 0.4 x 0.8-radius, \$35.00.	
	500AA	20-20 kHz	35	20	1.0	1-2½	47K	C	0.5	User	5	35.00	500A similar but 2-5 gms. tracking, 0.7 radius, \$30.00.	
	500AL	20-17 kHz	28	15	1.0	3-7	47K	C	0.7	User	5	30.00		
	CG5000	10-20K			4	2.5		C	0.7			14.95		

907-64

934-41

937-60

937-15

937-48

937-91

937-47

937-35

937-06

937-81

937-06

937-81

938-03

937-20

931-72

937-71

934-58

934-43

935-01

934-95

934-70

934-95

804-94

937-02

807-61

934-92

937-45

937-00

932-37

920-47

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Buy only the records YOU want! In each issue of the Club magazine, DISCOUNTS, sent FREE every 4 weeks, you will find a review of the Selection-of-the-Month in your musical division plus over 400 other albums from which you may choose. If you wish to take alternate or additional albums...or no album at all...simply mark the Selection Notice appropriately and return it by the date specified. From time to time, the Club will offer some special selections, which you may reject by returning the special dated form provided—or accept by doing nothing. The choice is always yours! All record purchases, with the exception of occasional money-saving clearance sales, will count toward fulfillment of your enrollment agreement.

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 Miss _____
Address _____

City _____ State _____

Zip _____ Tel. No. _____ 7G6A
APO, FPO addresses, please write for additional information.

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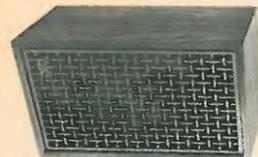
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Those are your actual costs, based on our unique free-records-plus-discount policy. After fulfilling commitment

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SPEAKER SYSTEMS



Altec Lansing 874A

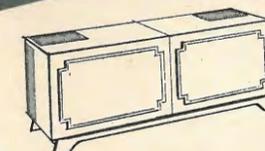
Allied Radio Shack
Optimus 5



AR-3a

MANUFACTURER	MODEL	WOOFER			MID-RANGE			TWEETER			Overall Price, Retail, Hz to kHz	Power, Pwr. for Avg. Room, W	Crossover Frequency (Hz), Hz	Impedance, Ohms	Enclosure Dimensions, W x D x H, in.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES
		Diameter, in.	Resonance (in system), Hz	Enclosure Type	Diameter, in.	Type	Diameter, in.	Type	Oval/Rect. Resp., Hz to kHz	Ampl. Pwr. for Avg. Room, W										
ACOUSTIC RESEARCH	AR-4x	8	65	Acous. sus.	—	—	2 1/2	Cone	*	15	**	1,200	8	19 x 9 x 10	Wal., unf.	Cloth beige	18 1/2	63.00	*Complete data available from AR on request.	
	AR-6	8	56	Acous. sus.	—	—	1 1/2	Cone	*	20	**	1,500	8	19 1/2 x 12 x 7	Wal., unf.	Cloth beige	20	81.00	**Depends on various factors; data available on request.	
	AR-2ax	10	56	Acous. sus.	3 1/2	Cone	3/4	Dome	*	20	**	1,400	8	24 x 11 1/2 x 13 1/2	***	Cloth beige	36 1/2	128.00	***Wal., ch., teak, mah., bir., unf.	
	AR-5	10	56	Acous. sus.	1 1/2	Hemi. dome	3/4	Dome	*	20	**	625	8	24 x 11 1/2 x 13 1/2	***	Cloth beige	39	175.00		
	AR-3a	12	42	Acous. sus.	1 1/2	Hemi. dome	3/4	Dome	*	25	**	575	4	25 x 11 1/2 x 14	***	Cloth beige	53	250.00		
ADC	450A	12	—	—	—	1/2	Dome	30-20K ±3	15	60	—	8	14 x 12 1/2 x 25	Wal.	Blk.	50	165.00	2-way sys. w. 12" rubber surround woofer.		
	303AX	10	—	Acous.	—	—	1 1/2	Dome	37-20K ±3	15	60	—	8	23 1/2 x 13 x 11 1/4	Wal.	Blk.	37	110.00	2-way; wide dispersion super tweeter; removable frame, 303B, same less controls, \$90.00.	
	404A	6	—	Acous.	—	—	1 1/2	Dome	45-20K ±3	15	50	—	8	11 1/4 x 7 1/4 x 8 3/4	Wal.	White	11	55.00	2-way; hi accuracy, wide dispersion tweeter.	
ADVENT	—	10	43	Acous. susp.	—	—	3/4	Dome	30-20K ±4	20	120	1,000	8	25 1/2 x 11 1/2 x 14 1/4	Oil wal.	Cloth light	44	120.00	Also available in walnut vinyl cabinet @ \$105.00.	
	—	9 1/2	43	Acous. susp.	—	—	3/4	Dome	30-20K ±4	15	60	1,400	4	20 x 9 1/4 x 11 1/2	Wal. vinyl	Cloth light	30	72.00		
AKAI	SW-155	12	—	Reflex	5	Cone	2 1/2	Horn Super Horn.	25-21K	50	—	1,200	8	25 x 16 x 11 1/4	Oil-finished	Black	38.9	—		
	SW-180A	12	—	Reflex	3 1/2	Horn	2	Horn (2)	23-22K	60	—	7,000	8	30 1/2 x 18 1/2 x 15 1/4	Oil-finished	Black charcoal	70.4	—		
ALLIED RADIO SHACK	Optimus 5	12	—	Acous.	—	—	4	—	20-20K	—	—	—	8	25 x 14 x 11 1/2	Wal.	Metal	35	99.95	3 tweeters.	
	Nova-Omni	8	—	Acous.	—	—	—	Dome	45-20K	—	50	—	8	19 1/2 x 11 1/2 x 11 1/2	Wal.	Metal	25	69.95	360° dispersion.	
ALTEC LANSING	Barcelona 2873A	15	—	Acous.	25	Sec. Horn	—	—	20-20K	—	60	500	—	29 1/4 x 38 1/2 x 24	Wal.	Fretwork	160	750.00	Includes 60 watts rms amp for bass; 30 watts rms for mids & highs.	
	Santana 879A	15	—	Acous.	—	—	—	Dir. Rad.	35-18K	—	45	2,500	8	25 1/2 x 20 1/2 x 17	Wal.	Beige Cloth	—	195.00	Simulated slate top.	
	Bolero 890C	10	—	Acous.	10	—	—	—	40-20K	—	50	2,000	8	14 1/2 x 25 1/2 x 12	Wal.	Fretwork	—	179.00		
	Segovia 874A	12	—	Acous.	4	—	—	Dome	20-20K	—	60	500	4	25 1/2 x 14 1/2 x 11 1/2	Wal.	Fretwork	58	250.00		
AZTEC	Gauguin III	12	25	Contr. duct.	3 x 9	Horn	2 x 6	Horn	25-20K ±3	10	20	2,000	8	20 x 27 1/2 x 15 1/2	Wal.	Wood	65	249.95		
	Petite 1,000	8	50	Acous.	—	—	3 1/2	Cone	50-15K ±3	15	30	2,000	8	20 x 10 x 9 1/2	Wal.	Tweed white	30	69.95		
BANG & OLUFSEN	3000	10	24	Acous.	—	—	2	Dome	28-20K ±5	—	60	2,000	4	25 x 12 x 11	Teak or Rose wood	Cloth Charcoal	27	100.00		
	3700	8	30	Acous.	—	—	1 1/2	Dome	40-20K ±5	—	40	2,000	40	9 1/2 x 9 1/2 x 19 1/4	Teak or Rose wood	Cloth Black	18	100.00		
BELL & HOWELL	610	6.5	—	Sealed	6	Cone	2	Cone (Concentric)	50-15K ±5	5	25	2.5 kHz	8	8 1/2 x 15 1/2 x 6 1/2	Wal.	Cloth Brown	12	33.00	Polymer coated walnut veneer finish.	
BENJAMIN	MS-5	8	62	Acous.	—	—	2 1/2	Cone	45-22K	10	25	2,000	8	10 1/2 x 8 x 19	Wal.	Cloth	13	55.00		
	MS-7	(2)8	58	Acous.	—	—	2 1/2	Cone	40-25K	10	35	2,000	8	11 1/2 x 10 x 23	Wal.	Cloth	30	75.00		
	MS-10	(2)8	50	Acous.	4	Cone	2 1/2	Cone	35-25K	10	40	800	8	13 1/2 x 11 x 24	Wal.	Cloth	38	100.00		
	MS-14	(2)8; (2)5	45	Acous.	4	Cone	2 1/2	Cone	30-18K	10	50	800	8	14 1/2 x 13 x 25 1/2	Wal.	Cloth	44	145.00		

Front view Rear view with decorative panels removed.



Two W80As on a single optional pedestal.

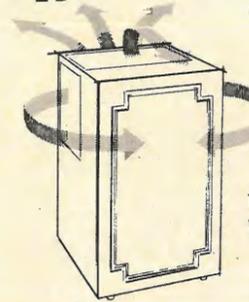
Driven by a good amplifier or receiver, they must be ranked with the best reproducers available today...

We auditioned a pair of W80As in various positions and liked what we heard in all instances. They project a broad, natural-sounding acoustic front with ample "air" and "space" that lend a convincing note of realism to stereo playback...the W80A is performing exactly as its designers intended it to.

-High Fidelity, June 1971

Unlike any other speaker system available today, two W80As can be placed anywhere in a room, any distance apart or from a wall...even together on an optional pedestal as a single-cabinet console...and still preserve stereo perception and original tonal balance no matter where in the room you are listening. Here's why:

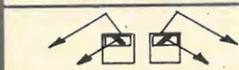
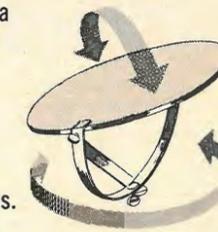
1.



The exclusive variplanular disc inside the cabinet provides a discreet amount of direct frontal energy which is projected from the top of the cabinet; omnidirectional energy from the sides and rear of the cabinet; and reflected sound, mostly from the rear and top of the enclosure. The W80A is therefore not just an "omni" or just a "reflecting" a forward-projecting speaker... it is all three.

2.

Furthermore, the W80A is a "VARIFLEX", because the variplanular disc is also adjustable. The disc is easily set just once while the system is being installed, without tools or special instruments. There are numerous possibilities, to meet virtually every decor or physical requirement.

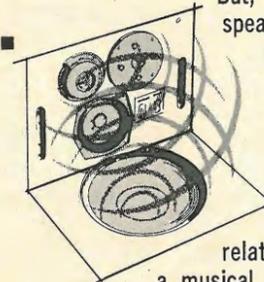


For example, setting the discs outboard widens the stereo sound, if you need to keep the two W80As close together.



Setting the discs toe-in prevents the hole-in-center problem, if the room requires placing the two W80As far apart.

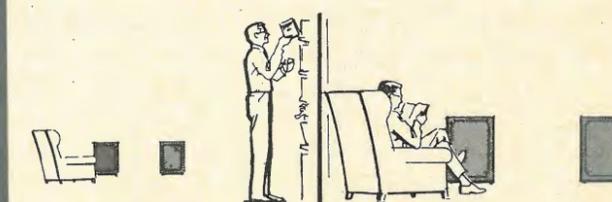
3.



But, unlike most other multi-speaker systems, the bass reproducer does not splatter its sound downward onto the floor, and the mid and treble speakers do not project in other directions. In the W80A, the fundamental tones and related harmonics, which give a musical instrument its identifying timbre and natural, realistic qualities, are reconstituted within a "mixing chamber" which contains the variplanular disc, so that the sounds of musical instruments enter the room as a whole, retaining tonal balance and further abetting stereo perception.

4.

So startlingly effective is the combination of the mixing chamber and its adjustable variplanular disc, that you can freely walk about the room, even sit directly in front of one speaker, and you'll always hear both stereo channels. The music, always stereo, will literally follow you!



The W80A VARIFLEX is a decorator's dream, and happily, practical in cost. At \$317.60 list each, it is more than a match for old fashioned speakers that are a lot bigger (the W80A is only 28" x 17 1/4" x 17" deep) and much more expensive.

For a complete catalog, write to Wharfedale Division, British Industries Co., Dept. U-11 Westbury, N.Y. 11590.

Wharfedale
VARIFLEX SPEAKER SYSTEM

Check No. 55 on Reader Service Card

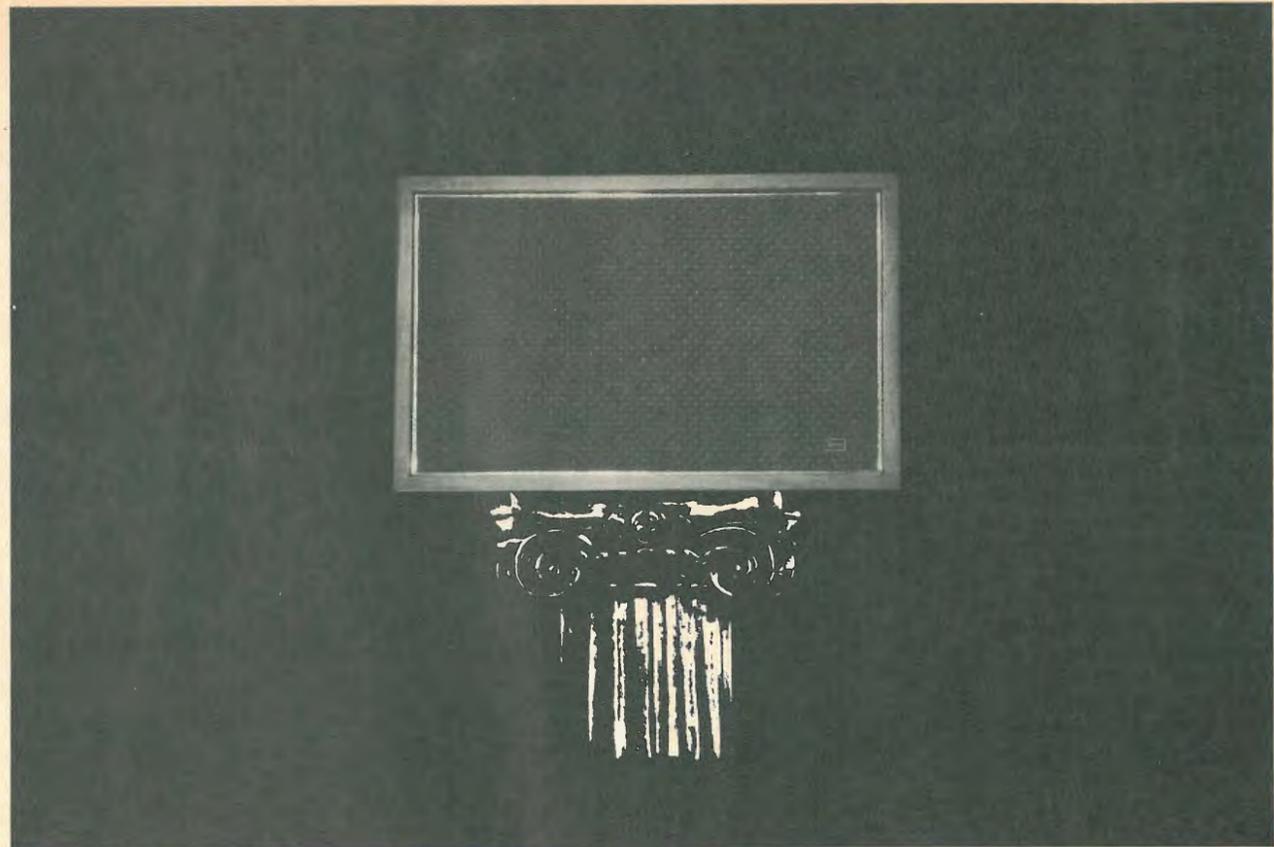
SPEAKER SYSTEMS

E-V Patrician 800

Dynaco A-25

Bose 901

MANUFACTURER	MODEL	WOOFER			MID-RANGE			TWEETER			Overall Resp. Hz to kHz	Ampl. Pwr. for Av. Room. W	Crossover Frequency (RMK Cont)	Impedance (ohms)	Enclosure Dimensions, W x D x H, in.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES
		Diameter, in.	Resonance (in system) Hz	Enclosure Type	Diameter, in.	Type	Diameter, in.	Type	Overall Resp. Hz to kHz	Ampl. Pwr. for Av. Room. W										
BOGEN	LSX	4	—	Port	—	—	—	100-15K ±5 dB	5	10	—	8	12 x 5 1/2 x 8 1/2	Wal.	Black	6	60.00 for pr.	Sold only as a pair.		
	LS20A	8	—	Acous.	—	—	2 1/2	Cone	60-20K ±5 dB	10	40	5,000	8	19 x 10 1/2 x 9	Wal.	Black	16 1/2	59.95		
	LS30A	10	—	Acous.	5	Cone	2 1/2	Cone	40-20K ±5	10	50	600 5000	8	22 x 11 x 14	Wal.	Black	32	99.95		
	LS50	12	—	Acous.	2	Dome	25-20K	Dome	25-20K ±5	10	60	600 5,000	8	18 x 13 x 20	Wal.	Black	22	200.00	Woofer enclosure separate from tweeter/midrange.	
BOSE	901	— Nine full-range 4 1/2 inch drivers			—	—	—	—	25	270	—	8	20 1/2 x 12 1/2 x 12 1/2	Wal.	White Dk. Brn.	33	476.00 pair*	Direct reflecting, dk. brn. grille or wal. facings opt. Bl. or Wh. ped. opt. *Incl. act. Eqlzr.		
	501	Integrated woofer—2 tweeter combination, balanced for direct and reflected sound.			—	—	—	—	15	100	—	4	14 1/2 x 14 1/2 x 24	Wal.	Dark Brown	35	124.80 each	Direct reflecting.		
BOZAK	B-301	12	30	Infin.	4 1/2	Cone	2	Cone	40-20K	4	40	1,200 3,600	8	23 1/2 x 11 1/2 x 14 1/2	Wal.	Cloth Brown	40	157.50	3 position hi-end environmental control.	
	B-302A Century	12	35	Infin.	6	Cone	2	Cone	40-20K	6	50	800 2,500	8	24 x 20 x 27 1/2	Wal.	Cloth brn. & blk.	—	316.25		
	B-4000A Modern	12	35	Infin.	6	Cone	2	Cone	35-20K	6	100	400 2,500	8	26 1/2 x 15 1/2 x 44 1/2	Wal.	Cloth brn. & Blk.	165	549.50	Line array tweeter; especially suitable for bi or tri amp operation.	
	B-1000	8	55	Infin.	—	—	—	—	50-10K	4	25	—	8	18 x 12 x 21	—	—	25	98.45	Weather proof, featuring aluminum cone & housing.	
BSR McDONALD	SS-2	8	45	Air Susp.	—	—	2 1/2	Cone	20-20K	4	18	—	8	14 x 8 x 7	Wal.	Cloth Brown	16*	70.00	*Pair.	
CRISMAN	Hefalump	15	30	Acous. laby.	10 x 7	Horn	2 x 5	Horn	30-18K	10	30	1,000 3,500	8	35 x 21 1/2 x 18 1/2	Wal.	Cloth Brown	90	193.00		
	Incredible Hulk	12	25	Acous. laby.	12 x 6	Horn	2 x 5	Horn	20-18K	10	50	800 3,500	8	35 x 21 1/2 x 18 1/2	Wal.	Cloth Gold	90	356.00		
DENON	VS-260	10	—	Base Reflex	4 1/2 + 4	Cone	2	Horn	40-20K	—	30	600 3,500	8	14 1/2 x 25 1/2 x 10 1/2	Wal.	Cloth Brn. & white	35 1/2	360.00 a pair	Variable level cont. for high & mid-range; multi. ch. selector.	
	VS-160	8	—	Base Reflex	4	Cone	2	Horn	40-20K	—	25	2,500 7,500	8	13 1/2 x 20 1/2 x 9 1/2	Wal.	Cloth Brn. & white	22	250.00 a pair	Variable level cont. for high & mid-range; multi. ch. selector.	
DELTA RET	500	(2)8	60	Acous.	—	—	(2)3	Cone	35-22K ±3	10	50	3,000	4	24 x 12 x 14	Wal.	Cloth Blk. & Beige	35	399.95	Separate equalizer; 20° angled spkr. mount gives flat resp. over 120° spread.	
DYNACO	A-25	10	—	Aperi-odic	—	—	1 1/2	Dome	—	20	30	1,500	8	20 x 11 1/2 x 10	Wal.	Linen Natl.	22	79.95	Teak & rosewood, \$10.00 additional.	
	A-50	(2)10	—	Aperi-odic	—	—	1 1/2	Dome	—	25	40	1,200	8	28 x 21 1/2 x 10	Wal.	Linen Natl.	47	179.95		
EASTMAN (MARTIN)	120 Super Max	10	50	Acous.	—	—	3	Cone	36-18K ±7	8	35	1,700	—	10 x 12 x 21	Wal.	Cloth Brown	30	89.95		
	430 Crescendo	12	42	Acous.	4	Cone	2	Dome	30-18K ±6	15	50	1,000 4,000	8	12 x 14 x 25	Wal.	Cloth Brown	45	169.95		
	830 Magnificat	(2)12	38	Acous.	7	Acous. Susp.	(2)2	Dome	28-20K ±5	10	60	750 4,000	4	14 x 8 x 38	Wal.	Cloth Brown	90	319.95		
ELECTROSTATIC SOUND	Transstatic	—	<15	Trans. line	—	Elec.	—	Elec.	25-20K ±1.5	30	—	300 1,350	—	18 x 15 x 42	Wal.	Cloth Black	139	1,095.00 pair	\$1,135, rosewood.	
ELECTRO-VOICE	Four A	12	47	Acous.	6	Cone	2 1/2	Cone	30-20K	10	35	400 1,500	8	25 x 13 1/2 x 14	Wal.	Cloth, Dk. Brn.	45	199.95		
	Nine	10	50	Acous.	5	Cone	3 1/2	Cone	30-20K	10	35	400 1,000	8	22 1/2 x 12 x 13 1/2	Wal.	Cloth Dk. Brn.	30	139.95		
	Patrician 800	30	—	—	—	—	—	—	15-23K	20	70	100, 800 5,000	16	33 x 26 1/2 x 51	Wal., Fruit-wood	Cloth Brown	315	1,400.00		
	Eight A	6	—	Acous.	—	—	2 1/2	Cone with Dome	60-20K	—	60 peak	—	8	15 1/2 x 6 1/2 x 8 1/2	Wal.	Cloth Brown	13	49.95		
EMI (BENJAMIN)	EMI 105	14 1/2 x 8 1/2	62	Acous.	5	Cone	3 1/2	Cone	35-20K	15	80	1,000-4,000	8	13 1/2 x 12 1/2 x 24 1/2	Wal.	Cloth Brown	50	169.50	Elliptical woofer, w. glass-paper cone.	
	EMI 205	14 x 9	55	Acous.	(2)5	Cone	3 1/2	Comp.	25-20K	20	90	1,500 5,000	8	14 1/2 x 13 1/2 x 24 1/2	Wal.	Brn	52	225.00	Elliptical woofer, w. glass-paper cone.	
	EMI 300	15	53	Acous.	(2)5	Cone	2-3 1/2	Comp.	10-30K	35	100	1,000 7,000	8	26 x 19 x 27 1/2	Wal.	Brown	90	350.00	Model 300C, contemporary. Model 300T, traditional.	



No need to Compromise

Bozak Quality Costs Very Little More

Of course you can always trade-in for a TEMPO 1, later. — But why?

When you buy a first-rate stereo system, you expect first-rate sound — rich, vibrant bass, smooth crystal-clear strings and voices, the open flow of all the music without tonal coloration.

For very little more you can have it to start with — in a Bozak TEMPO 1.

TEMPO 1 inherits the superior qualities of its larger ancestors. It is a true Bozak in every way. Every part that could make the slightest tonal difference is made only at the Bozak factory. Bozak, for example, is one of the very few manufacturers who make all of their own loudspeaker cones rather than settling for commercially-available units.

This three-way bookshelf loudspeaker has the same costly drivers found in the most luxurious Bozaks. The variable-density bass cone, developed by Bozak, is made from a unique highly-damped material processed into a lightweight but structurally-rigid piston that is free of coloration. In the midrange

speaker there is a critically-damped aluminum cone with excellent transient response. The entire diaphragm of the treble speaker, of thin spun aluminum, rests on a bed of soft resonance-damping foam. All cones, together with their generous ceramic magnets and precision-machined pole structures, are assembled on solid cast frames — not sheet-metal stampings.

Bozak's traditional excellence in craftsmanship is further apparent in the smart enclosure, where the warm beauty of select wood grain is brought out by careful hand finishing.

Quality tells. TEMPO 1 gives you rich big-Bozak sound from a superbly engineered bookshelf system. The longer you live with this fine speaker the more you will appreciate what a difference true quality makes.

Not every dealer is permitted to sell TEMPO 1. If you can't locate your authorized Bozak Dealer, write for our list of the fine audio showrooms in your area. The R. T. Bozak Manufacturing Company, Darien, Conn. 06820, USA. Overseas Export by Elpa Marketing Industries Inc., New Hyde Park, New York 11040, USA.



SPEAKER SYSTEMS



Frazier Model XX



Harman-Kardon Citation 13



Fairfax Model FE-8



EPI Model 601

MANUFACTURER	MODEL	WOOFER					MID-RANGE			TWEETER					SPECIAL FEATURES				
		Diameter, in.	Resonance (in system), Hz	Enclosure Type	Diameter, in.	Type	Diameter, in.	Type	Overall Freq. Resp., Hz to kHz	Angle, Pwr. for Avx Room, W	Crossover Frequency (RMS Cont), Hz	Impedance, Ohms	Enclosure Dimensions, W x D x H, in.	Wood Finish		Grille Material Color	Weight, Lbs.	Price	
EMPIRE	9000 M II	15	20	Inf. Baff.	5	Dome	1	Dome	20-20K ±3	10	100	450	8	22 dia. x 29	Wal.	None	120	329.95	Includes imported marble top.
	7500 M	15	25	Inf. Baff.	5	Dome	1	Dome	20-20K ±3	10	100	450	8	20 dia. x 27	Wal. Oak	None	75	184.95	Includes imported marble top.
	7000 M II	12	30	Reflex	5	Dome	1	Dome	25-20K ±3	10	100	450	8	19 dia. x 26	Wal.	None	90	229.95	Includes imported marble top.
	6000 M	10	40	Reflex	4	Cone	2	Cone	30-18k ±3	10	75	500	8	18 dia. x 24	Wal. Oak	None	60	119.95	Includes imported marble top.
EPI	100	8	43	Acous.	-	-	1	Invert. dome	43-18K ±1.5	20	50	1,800	8	9 x 11 x 21	Wal.	Black	25	89.00	
	601	(2)8 (1)6	40	Acous.	-	-	(3)1	Invert. dome	40-18K	30	100	1,800	8	15 x 24 x 16	Wal.	Black	60	249.00	Reflective system.
	201A	(2)8	40	Acous.	-	-	(2)1	Invert. dome	-	25	75	1,800	8-16	11 x 18 x 28	Wal.	Black	40	199.00	Dispersion up and forward with two modules.
FAIRFAX	FE-8	(2)8	-	Acous.	(2)8	Cone	(2)3 (2)3½	Cone Paper	30-22K ±3	17	40	1,800	8	11 x 15 x 24	Wal.	Black	80	249.50	1-in. particle board cabinet.
	FL-34A	(2)8	-	Layb. folded horn	3	Cone	3½	Dome	20-22K ±3	10	60	2,000	8	14 x 12 x 24	Wal.	Black	65	199.50	As above.
	Wall of Sound	(6)8	-	Bass reflex	(2)4	-	(2)4 (2)1	-	16-22K ±3	20	100	750	6.7	30½ x 6 x 48	Wal.	-	140	399.95	1-in. particle board cabinet.
FISHER	XP-9C	15	10	Acous.	(2)5	Cone	(2)1½	Dome	28-22K	20	30	500	8	27½ x 16½ x 13	Wal.	Cloth Brown	55	219.95	4-way with dome super tweeter.
	XP-7B	12	15	Acous.	(2)5½	Cone	(2)3	Cone	30-20K	20	25	350	8	24½ x 14 x 11½	Wal.	Cloth Brown	40	159.95	Model XP-66B, similar, \$99.95.
	WS-80	8	36	Omni.	5½	Cone	3	Cone	35-20K	10	20	400	8	18 x 18½ x 11	Wal.	Cloth Brown	24	99.95	Model WS-70 w. 6-in. woofer, 3-in. tweeter, \$79.95.
FRAZIER	Mark VI	12	25	Mod. Helm-holtz	8	Cone	3 x 7	Horn	25-14K ±5	5	50	800	8	25½ x 16½ x 29	Wal.	Brown & gold	90	295.00	Cone or dome tweeter opt.; 3-way adjust. network.
	Mark V	12	25	Acous.	(2)4	Cone	3 x 7	Horn	30-14K ±5	5	30	800	8	14 x 12 x 25½	Wal.	Brown	50	189.95	Bel. controls for Hi & mid freq. In black, \$159.95.
	Capsule	10	50	Acous.	-	-	2 x 3	Cone	30-15K ±5	5	25	1,500	8	16 x 16 x 19	Black	-	35	75.00	
	Mark IV	10	60	Helm-holtz	-	-	3 x 7	Horn	60-13K ±5	5	25	2,000	8	14 x 12 x 24	Wal.	Linen natl.	41	99.95	
HARMAN-KARDON	Citation 13	(3)7	32	Doub. Chamb. reflex	1½	Dome	1	Dome	27-22K ±3	15	60	1,500	6-8	20½ x 14½ x 29½	Wal.	Brown, Blue, Orange, Black	80	295.00	Omnidirectional type.
HARTLEY	Concert-master VI	24	13	Semi. Inf.	10	Cone	7	Cone with dome	16-25K ±3	20	50	250	12	39 x 29 x 18	Wal.	Cloth Gold Brown	150	795.00	Mag. susp.; cast alum. frames; cones of iden. matl.; x-overs, 12dB/oct.
	Concert-master Jr.	10	28	Inf.	5½	Cone	2	Dome	30-25K ±4	15	30	2,500	6	30 x 24 x 14	Wal.	Cloth Brown Gold	85	425.00	As above.
HEATH	AS-48	14	-	Duct. port	-	-	2	Cone	40-20K	8	50	2,000	8	23½ x 12 x 14	Pecan	Cloth Brown-Black	42	184.95	Kit, JBL components.
	AS-103	12	42	Acous.	1.5	Dome	0.75	Dome	30-20K	25	-	575	4	14 x 11½ x 25	Wal.	Cloth Brn.-Blk.	53	189.95	Kit, AR components.
	AS-101	15	-	Bass reflex	-	-	-	Compr. driver	35-20K	-	50	800	8	27½ x 19½ x 29½	Pecan	Cloth Gold-Blk.	101	259.95	Kit, ALTEC components.
	AS-102	12	-	Inf. Baffle	6	Cone	(2)2½	Cone	40-20K	-	50	800	8	27½ x 19½ x 25½	Pecan	Cloth Gold-Blk.	92	239.95	Kit, BOZAK components

Ask a cynic... if you want the facts about speaker quality!

Scratch below the surface of an audio dealer and you'll find a cynical, opinionated, always skeptical expert. He's got to be... his continued existence depends on his ability to pick and choose. When he coordinates a receiver, a record player and a couple of speaker systems, he is practicing the art and science of his craft in an attempt to produce great sound at competitive prices in a trouble-free music system.

The Creative Dealer conjures up systems with a mix of brands—often marrying a top receiver and record player with a speaker bearing his own name. This is partly pride, but also a striving for the best sound value and so he works with top designers and manufacturers in creating his signature system.

Maximus is the acknowledged master in this field and has come up with all the great "Private Label" signature systems.

The signature designs carry the dealers name, but all the great ones show the Maximus *Hallmark*—either printed label or evident by the sound alone.

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You probably think it's impossible to get the big sound of a 12-inch woofer and a mid-range tweeter from an enclosure measuring only 7¼ x 10½ x 5½ inches... that is, until you hear the mini-MAXIMUS!

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SPEAKER SYSTEMS



Jensen Model 6



JVC Model 5351



Infinity 2000A

JBL L2000 Studio 2



MANUFACTURER	MODEL	WOOFER			MID-RANGE			TWEETER			Overall Pkdg. Resp., Hz to kHz ± dB	Ampl. Pwr. for Av. Room W	Pwr. Handling Capacity (RMS Cont.)	Crossover Frequency (Hz), Hz	Impedance, Ohms	Enclosure Dimensions, W x D x H, In.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES
		Diameter, In.	Response (in system), Hz	Enclosure Type	Diameter, In.	Type	Diameter, In.	Type	Overall Pkdg. Resp., Hz to kHz ± dB	Ampl. Pwr. for Av. Room W											
HEGEMAN		8	Col.		1	Dome	30-20K	15	25	5,000	8	10 1/2 x 8 1/2 x 25	Teak Vinyl	Black	20	199.00*	*Pair.				
HILL	1000	12	Air susp.	3 1/2	1	Dome	35-19K	10	40	1,000 5,000	8		Wal.	Cloth Brn. or Blk.	40	100.00					
HITACHI	HS-250	10	Reflex	5	Cone	Horn	35-20K		40	500 5,000	8	25 1/2 x 11 1/2 x 14 1/2	Wal.	Cloth Brown	37 1/2	149.95	Detachable grille.				
	HS-350	8	Reflex			Horn	40-20K		50	3,500	8	14 1/2 x 9 1/2 x 23 1/2	Wal.	Cloth Beige	33		Woofer has gathered edge suspension.				
	HS-500	8	Reflex			Horn	40-20K		20	3,000	8	14 1/2 x 13 1/2 x 24	Wal.	Cloth Brown		269.95	Woofer has gathered edge suspension.				
IMF	Studio	8	Dual trans. line	4	Lam. cone	2 1/2	Dome	25-20K ±3	30-60	25	375 3,500 13K	8	15 x 14 x 35 1/2	Wal.	Cloth Black	70	300.00	Dual transmission line, laminated plastic, 4-way drive system.			
	Monitor II		Dual trans. line	5	Lam. cone	2 1/2	Dome	20-25K ±2	30-60	30	375 3,500 12K	8	20 x 17 x 43	Formica, Grey or Wal.	Cloth Black	125	800.00	*9 x 12 in. rectangular.			
INFINITY	2000A	12	Trans. line	4.5	Cone	Strip	Electro.	30-30K ±4	30	75	275 1,700	6	26 x 18 x 12	Wal., Rose-wood	Cloth Black	60	289.00	Electrostatic tweeters above 17K radiate from rear.			
	Servo Static I	18	Servo system		Electro.		Electro.	15-30K ±2	35 tweeters; 75 midrange		100 1,600		Wal.; Rose-wood	Cloth Black	147	1,995.00 2,094.00	2 electrostatic screens w. 110-watt bass amp and bass comode. Includes electronic crossover.				
JBL	L88 Nova	12	Bass reflex		2	Cone	50-15K ±5	1	25	3,000	8	23 1/2 x 11 1/2 x 14	Wal.	Wood & Cloth	46	198.00	Available with oiled walnut and cloth or brown fabric grille.				
	L100 Century	12	Bass reflex	5	Cone	2	Cone	40-15K ±3	1	25	2,500 7,000	8	23 1/2 x 13 1/2 x 14 1/2	Wal.	Foam, Blue Brown Orange	54	273.00	Acous. identical with JBL monitor.			
	L101 Lancer	14	Bass Reflex			Compression	50-15K ±5	1	25	1,200	8	17 1/2 x 12 1/2 x 23	Wal.	Carved wood	86	408.00	Adriatic marble top.				
	L200 Studio 2	15	Bass reflex			Compression	40-15K ±5	2	50	1,200	8	24 x 21 1/2 x 32 1/2	Wal.	Foam	95	597.00					
JVC	5351	15	Acous.	6 1/2	Horn	2	Cone Horn	20-20K ±2.5	8	50	400 1,000 5,000	8	17 1/2 x 15 1/2 x 29 1/2	Wal.	Cloth, Brown	57 1/2	299.95	Provision for elect. crossover; 2 level controls.			
	5306	12	Acous.	5	Dome	2	Dome Horn	20-20K ±3	20	30	600 4,000 8,000	8	14 1/2 x 12 1/2 x 26	Wal.	Cloth, Brn. & White	40 1/2	249.95	Provision for elect. crossover; 2 level controls.			
	5321	8	Air susp.	3 1/2	Cone	2	Cone	37-20K ±5	5	30	5,000 10,000	8	13 x 9 1/2 x 21 1/2	Wal.	Brown	21 1/2	89.95	Detachable grille.			
	5305	4 x 5	Acous.			4 x 2	Cone	20-20K ±5	12	40	5,000	8	13 1/2	Metal Black	Metal Black	26 1/2	169.95	Omnidirectional; includes stands.			
JANSZEN	Z-108	8				Electrostatic	35-20K ±3	20	100	2K	4	10 1/2 x 20 10 1/2	Wal. & Vinyl			99.95					
	Z-110	10				Electrostatic	25-20K ±3	20	100	2K	4	12 1/2 x 23 1/2 x 11 1/2	Wal. & Vinyl			129.95					
JENSEN	4	10	Closed baffle	5	Cone		Dome	35-20K	5		500 4K	8	24 x 13 x 12	Wal.	Cloth Char. Brown	46	99.00	Removeable grille.			
	5	12	Closed baffle	Two 5	Cone		Dome	32-30K	5		500 4K	8	26 x 15 x 13	Wal.	Cloth Blk. & Brown	52	147.00	Removeable grille.			
	6	15	Closed baffle	8	Cone	5	Cone & dome	27-30K	5		300 1,000 4K	8	27 x 20 1/2 x 15	Wal.	Cloth Black	74	198.00	Removeable grille.			
KARLSON	X-15	15	Spec.			Comp.	20-18K ±4	2	100	4,000	16	28 x 20 x 18	Wal.	Woven plastic	90	300.00	Sep. conn. for woofer for organ or instrument use; *Compression tweeter w. special Karlson X-over.				

PIONEER AM/FM receiver, w/reverb control, new; exc. cond. \$425. (21) 413-2151

FOR SALE: Two speakers, hardly used. In original carton. Just purchased two FAIRFAX L-34A Speaker Systems. Call IN 7-3407.

SANSUI 500, Wharfedale 60D, Garrard many extras, 2 extra spkrs, like

old; exc. cond. \$350. (21) 739-3306

STEREOPHONIC stereo system, AM/FM receiver mono, 8 track

SONY 1970 deck, \$51 SL-95 \$65

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Will trade two Speakers, excellent condition for two FAIRFAX FE-8—even exchange—no money. I'll take loss. Call VA 3-3530 days only.

SCOTT compact stereo system, access. turntable, amp; never used. \$350

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TWO Speakers used 3 months. For sale or swap for two FAIRFAX FX-100. Call PC 7-3453, ask for Bob.

STEREOPHONIC stereo system, AM/FM receiver mono, 8 track

LARGE tape recorder, tapes, hc \$165. (71

FISHER 500TX-AM FM stereo receiver 200 watts; never used. \$350.

KENWO FISHER changer; cond. \$2

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SCOTT 299, Fisher #KM60; 631-270

REALT

We must be doing something right!

AND IT'S NO ACCIDENT! What greater compliment can audiophiles pay us than by trading in their present speakers for FAIRFAX Speaker Systems? And why not? Today's sophisticated listeners know what quality sound is... and they want the best and most for their money!

Ads like the ones above have been appearing in newspapers and magazines from coast to coast. Although the publisher has requested us to censor the manufacturers' names, the implication is clear: Because of their superior performance FAIRFAX Speaker Systems are in more demand today than ever before by more stereophiles and by more knowledgeable pro's for studio playback and other commercial applications.

WHAT MAKES FAIRFAX SUPERIOR?†

First they have the DIFFERENTIAL CIRCUITRY GATE*... an advanced and sophisticated engineering feature. Differential Circuitry Gate, a function of computer design technology, results in the only speaker systems in the industry to provide TRUE PITCH and ZERO OVERLAP. This means that there is a complete separation of all musical tones, subtle nuances, and timbre originally recorded and reproducing each individual sound in true undistorted fidelity. No other speaker manufacturer can make this statement!

In addition to the beautiful cabinetry of the high density acoustic board covered in genuine walnut veneer (not vinyl or plastic imitation) FAIRFAX Speaker Systems will deliver more realistic sound, dollar for dollar, than any speaker on the market today. FAIRFAX Speaker Systems are recognized not only to reproduce with superb open sound classical, symphony and operatic works, but popular, jazz and rock too!

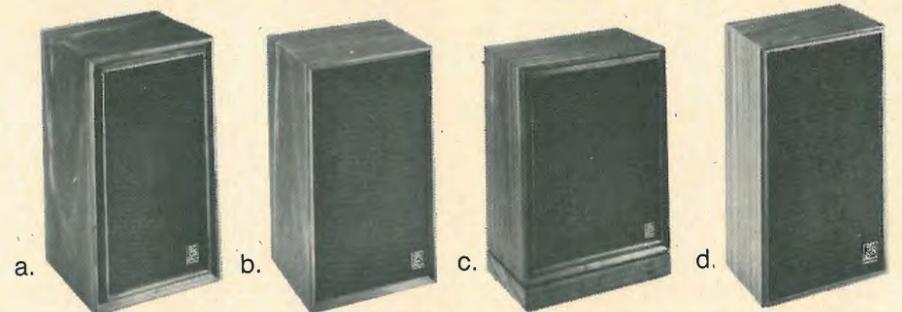
If you're really "on" to quality sound, and want to be ahead, know the difference in loudspeaker performance and are conscious of how to spend your money—insist on listening to and comparing FAIRFAX Speaker Systems for yourself. Then make your decision! And if you want to avoid making a trade-in make the correct purchasing decision the first time. Don't buy any speaker until you compare it to FAIRFAX. We promise you you'll never forget it!

FAIRFAX Speaker Systems are available at leading tuned in audio dealers only. If your dealer does not stock FAIRFAX Speaker Systems—let us know and we'll arrange for a demonstration.

Write for complete details and colorful brochure on the complete FAIRFAX line of Speaker Systems from \$39.95 to \$399.50.

*Patent being applied for.

† Comprehensive testing report by independent audio testing laboratory of actual listening comparison tests of FAIRFAX Speaker Systems against other well-known speakers is available upon request. This unbiased report is vitally important in helping you to make your purchasing decision.



a. FAIRFAX L-34A: Shelf-type; Differential Circuitry Gate; two 8" heavy-duty base drivers; one 4" mid-range driver; one 1" spherically-domed ultra-high tweeter; F/R: 20 Hz to beyond audible hearing range ±3 db; 24"H x 14"W x 12"D; \$199.50. b. FAIRFAX FTA: Shelf-type; Differential Circuitry Gate; high frequency 3-way, 4-speakers—two specially-designed 8" drivers; two 4" spherically-domed high dispersion tweeters; F/R: 24-20,000 Hz; 24"H x 14"W x 12"D; \$139.50. c. FAIRFAX FE-8: Floor-type; Differential Circuitry Gate; four 8" wide range bass drivers; four 4" spherically-domed tweeters; 28 3/4"H x 20"W x 12"D; \$249.50. d. FAIRFAX FX-100: Differential Circuitry Gate; one 8" bass mid-range driver; one plastic-domed tweeter; 21"H x 12"W x 7 7/8"D; \$89.50. (prices are suggested retail).

FAIRFAX INDUSTRIES INC.

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SPEAKER SYSTEMS



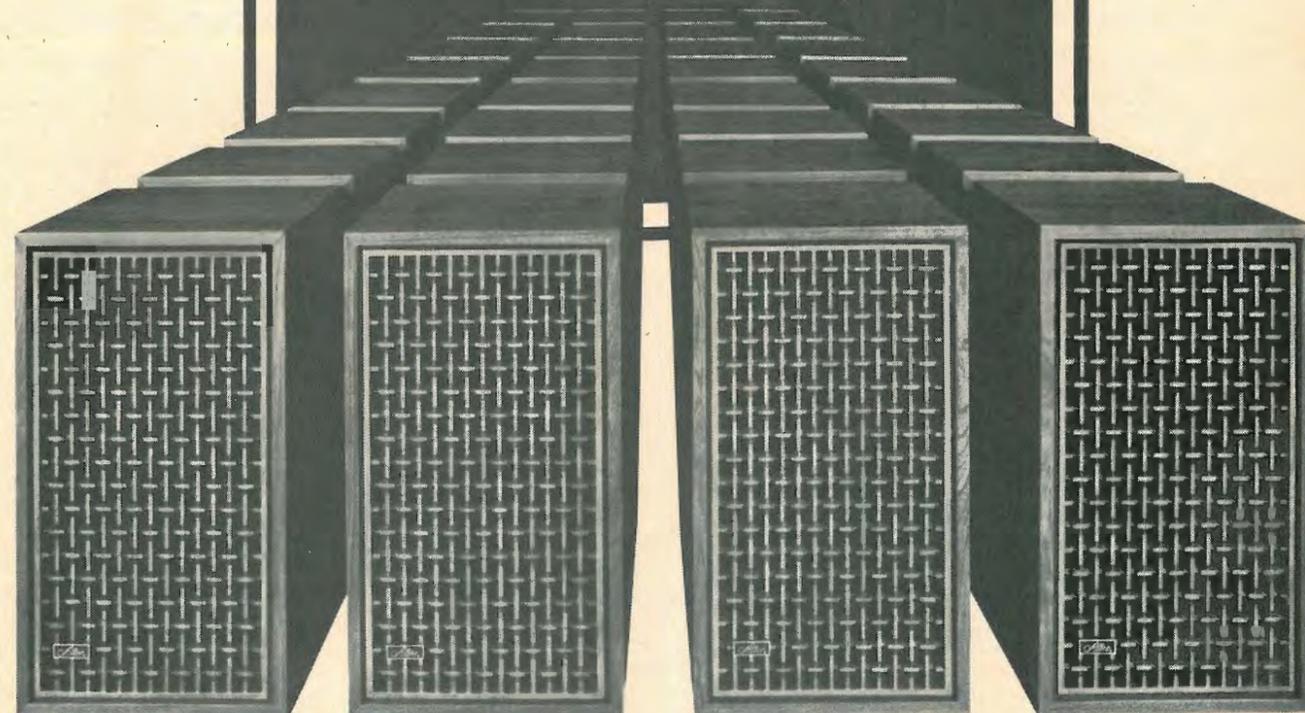
LWE VI



Belle Klipsch

MANUFACTURER	MODEL	WOOFER			MID-RANGE			TWEETER			SPECIAL FEATURES										
		Diameter, In.	Resonance (in system), Hz	Enclosure Type	Diameter, In.	Type	Diameter, In.	Type	Overall Frnt. Resp., Hz to kHz	App. Pwr. for Av. Room W	Crossover Frequency (Hz) ± Hz	Impedance, Ohms	Enclosure Dimensions, W x D x H, In.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES			
KENWOOD	KL-5060	12	45	Ducted Reflex	6 1/2	Cone	2	Horn	40-20K	10	40	600	8	15 x 11 1/2 x 25 1/2	Wal.	Metal Dk. Brn.	48	279.95	2 level controls; free-edge woofer; 2 horn tweeter.		
	KL-3080	10	55	Ducted Reflex	5	Cone	1 1/2	Cone	45-20K	8	25	800	8	13 x 11 1/2 x 22 1/2	Wal.	Metal Dk. Brn.	18 1/2	199.95	Free-edge woofer.		
KLEIN & HUMMEL	OY	10	20	Acous.	(2) 4	Cone	-	Horn	40-16K ±2	-	-	500	8,000	4,700	19 x 9 x 12	Wal.	Metal Silver	44	566.50	Contains 2 30-watt amps & x-over; takes input direct from preamp.	
KLH	5	12	44	Acous.	(2) 3	Cone	1 1/4	Cone	-	25	-	600	2500	8	26 x 11 1/2 x 13 1/2	Oil Wal.	Cloth, lt. brn.	54	189.95	2 3-pos level contrs; fin on 4 sides; changeable grille cloth.	
	33	10	56	CAC*	-	-	1 1/4	Dir. rad.	-	15	-	1500	8	23 1/4 x 10 1/4 x 12 1/4	Oil Wal.	Cloth, lt. brn.	33	99.95	*Contr. acous. compliance 3-pos h.f. level contr; fin 4 sides; changeable grille.		
	17	10	60	Acous.	-	-	1 1/4	Cone	-	12	-	1500	8	23 1/2 x 9 x 11 1/4	Oil Wal.	Cloth, off white	27	74.95	3-pos tweeter level contr; fin 4 sides; changeable grille.		
	32	8	59	Acous.	-	-	2	Cone	-	12	-	1800	8	19 1/4 x 7 1/4 x 10 1/4	Oil Wal.	Brown	16 ea.	93.00	Available only in double pack.		
KLIPSCH	Klipschorn K-437	15	-	Horn	2	Horn	1	Horn	35-17K ±5	30	100	400	6000	16	52 x 31 x 28	Wal., Mah., others	Several	180	571.00	1,202.00	
	Belle Klipsch	15	-	Horn	2	Horn	1	Horn	40-17.5K ±3	30	100	400	6000	16	30 x 18 x 36	Wal.	Several	120	815.00		
	La Scala K447	15	-	Horn	2	Horn	1	Horn	40-17.5K	30	100	400	6000	16	34 x 24 x 24	Fir	None	120	566.00		
	Corwall II	15	-	Ducted part	2	Horn	1	Horn	38-17K ±5	30	60	600	6000	16	25 x 36 x 15	Wal., Mah., others	Several	55	469.00	342.00	
	Heresy	12	-	Total encl.	2	Horn	1	Horn	70-17K ±5	25	50	700	6000	16	21 x 15 x 13	Wal., Mah., others	Several	55	258.00	209.00	
LAFAYETTE	Criterion 5XB	12	-	Acous.	6 1/2	Cone	3 1/2	Cone	18-25K	5	75	800	4,500	10,000	23 1/2 x 14 1/2 x 11 1/2	Oil Wal.	Cloth, dk. brn.	46	129.95	4-way, 4 speaker system - 2 level controls.	
LWE	I-A	15	-	Acous.	6	Cone	5 1/2	Horn	20-20K ±4	20	40	2,000	4,500	4	25 x 17 x 12	Wal. or kit	Cloth, dk. brn.	61	290.00	250.00	Electronic suspension; inverse feedback.
	II	Two 15	-	Acous.	Two 6	Cone	5 1/2	Horn	20-20K ±4	40	80	2,000	4,500	4 or 8	34 x 24 x 16	Wal. or kit	Cloth, dk. brn.	141	500.00	400.00	Electronic suspension.
	VI	8	85	Acous.	-	-	3 1/2	Cone	29-15K ±5	10	20	3,000	8	19 x 10 x 9	Wal. or kit	Cloth, dk. brn.	23	94.50	74.50	Electronic suspension.	
MAXIMUS	1	5	55	Acous.	-	Cone	1	Dome	45-20K ±5	-	-	1900	8	7 1/2 x 5 1/2 x 10 1/2	Wal.		10	87.50			
	5	12	40	Acous.	6/3	Cone	1	Dome	20-35K ±5	-	-	1000	5K	8K	8	14 x 12 x 30	Wal.		52	187.50	
	44	10	45	Acous.	-	Cone	3		30-18K ±5	-	-	2000	8	12 1/4 x 9 1/2 x 22	Wal.		28	105.95			
	55	12	45	Acous.	6	Cone	3 1/2	Cone	20-20K ±5	-	-	2,000	5,000	8	24 x 14 x 12	Wal.		30	137.50		
MICRO/ACOUSTICS							Two 1 1/4; Two 1 1/4	Dyn.	3.5-18K ±2	10	60	3.5K & 7K*	16	9 1/4 x 5 1/4 x 3 1/4	Wal.	Cloth, beige	2 1/4	57.00	*Switchable. For use with full range system.		
NIKKO	SS-83	8	-	Acous.	-	-	2 1/4	Cone	40-21K	-	15	4,000	8	9 x 9 x 14 1/4	Wal.	Cloth, blk.	10 1/4	89.95	Constant RLF network (12 dB/oct); High compl. woofer; interchang. grille.		
OHM	B	12	32	Acous.	5 1/4	Cone	1	Cone	30-20K ±5	20	60	250	5,000	8	26 x 15 x 10 1/4	Wal.	Cloth, brn.		240.00	Quasi 18 dB/oct. phase linear cross-over.	
	C	10	32	Acous.	-	-	1	Cone	34-20K ±5	20	50	1,750	8	25 x 14 x 9 1/4	Wal.	Cloth, brn.		115.00	Quasi 18 dB/oct. phase linear cross-over.		

Sousa lives in the new Altec Segovia



If you're going to listen to Sousa, it should sound like Sousa. Oom-pa, oom-pa, oom-pa-pa. It should be so real that you can reach over and nudge the tuba player when he gets out of step.

The new Altec Segovia is the first bookshelf speaker system that lets you hear every sound clearly and distinctly and naturally. Oom-pa. From bass drum to triangle. There's nothing added and there's nothing taken out. Oom-pa. All you hear is what Sousa wanted you to hear. Oom-pa-pa.

Ask your dealer to put on some Sousa when you listen to the new Altec Segovia speaker system. You've never heard him so good.



The new Altec Dynamic Force Segovia sells for \$250.00. It's the culmination of years of building professional sound equipment and working with room acoustics and equalization while developing the proven Altec Acousa-Voicette Stereo Equalizer. Hear it at your local Altec dealer today. He's in the Yellow Pages under "High Fidelity & Stereo Sound Equipment" under Altec Lansing.



IMF Studio



Scott S-11C

MANUFACTURER	MODEL	WOOFER			MID-RANGE		TWEETER		Overall Freq. Resp., Hz to kHz	Appl. Pwr. for Av. Room W	Pwr. Handling Capacity (RMS Cont)	Crossover Frequency (Hz) Hz	Impedance, Ohms	Enclosure Dimensions, W x D x H, In.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES
		Diameter, In.	Resonance (in system), Hz	Enclosure Type	Diameter, In.	Type	Diameter, In.	Type											
PANASONIC	SB-750	12	50	Acous.	(2) 6	Dome	(2) 4	Dome	20-20K	60	600	5,000	8	19 1/2 x 11 1/4 x 29 1/2	Wal.	Wood Lattice	55.1	219.95	Front level controls; provision for electronic crossover.
	SB-550	12	60	Acous.	6	Dome	4	Dome	30-20K	45	500	5,000	8	15 1/2 x 11 1/4 x 25 1/2	Wal.	Wood Lattice	41.9	169.95	Front level controls; provision for electronic crossover.
	SB-300	10	75	Acous.	5	Cone	3 1/2	Dome	35-20K	30	800	5,000	10,000	13 1/2 x 11 1/2 x 22 1/2	Wal.	Cloth, Black	22 lb. 13 oz.	99.95	4-spr., 4-way; provision for electronic crossover.
PIONEER	CS-63DX	15	60	Acous.	(2) 5	Cone	3	Horn	25-20K	10	30	700	3.3 12K	18 1/2 x 13 1/4 x 28 1/2	Wal.	Wood Lattice	63	259.00	Level control for mid-range and high range.
	CS-A700	12	60	Acous.	4 1/2	Cone	1	Multi-cell Horn	35-20K	10	25	500	4,500	12 1/2 x 15 x 26	Wal.	Wood Lattice	37	189.00	Level control for mid range and high range; provision for elect. crossover.
	CS-A500	10	60	Acous.	4 1/2	Cone	2 1/2	Cone	42-20K	10	15	800	6,000	13 x 12 1/2 x 22 1/2	Wal.	Wood Lattice	32	149.00	As above.
QUAD (HARMONY HOUSE)									45-18K	30	60			34 1/2 x 31 x 10 1/2	Wal.	Anod. al., bronze		260.00	Full-range doublet; electrostatic; dispersion 70 deg. hor., 15 deg. vert.
RADFORD (AUDIONICS)	Monitor 270	12	40	Tran. Line	5	Cone	1	Dome	35-20K ±3	10	100	450	4,500	60 x 20 x 15	Wal.	Dark	110	450.00	Transmission line, 270° dispersion, cardioid pattern.
	Trident Three	12	55	Air Sus.	5	Cone	1	Dome	50-20K ±3	5	60	500	4,500	22 x 13 x 10	Wal.	Dark	45	170.00	
RECTILINEAR	III	12	40	Ducted Port	5	Cone	(2) 2 1/2 (2) 2	Cone	22-18.5K ±4	20	100	500	8K, 11K	18 x 12 x 35	Wal.	Cloth, brn.	70	279.00	Low-mass drivers.
	XII	10	45	Ducted Port	5	Cone	3	Cone	35-17K ±4	10	85	350	7,500	25 x 14 x 10 1/2	Wal.	Cloth, brn.	40	139.00	High efficiency phase-linear X-over.
	Mini III	8	50	Acous.	5	Cone	2	Cone	50-18.5K ±4	20	70	400	8,000	19 x 12 x 9 1/2	Wal.	Cloth, brn.	25	99.50	Low-mass driver, e/c. bass resp.
ROLECOR	ROTEL RS-900	10	-	Acous.	6 1/2	Cone	1.5	Dome	30-20K	-	25	700	8,000	15 1/2 x 10 1/2 x 22 1/2	Wal.	Cloth, black or white	31	129.95	Mid-high range level control.
RTR	1200E				(6) 8		(9)	Elec.	200-30K	30	100	200	1,750	16 1/2 x 16 1/2 x 25	Wal.		65	360.00	Rosewood, \$375.00, Magnum 12 and 15 woofers, resp. to 30 or 25 Hz, \$160 or \$240.00.
SANSUI	AS-100	10		Air Sus.	-	-	1	Dome	40-20K	40		8		12 1/2 x 10 21 1/2	Wal.	Cloth, Beige	25		Level-balance cont. for tweeter.
	AS-200	10		Air sus.	6	Cone	3	Cone	40-20K	50		8		12 x 12 x 23 1/2	Wal.	Cloth, Beige	34		Level-balance cont. for tweeter and midrange.
	AS-300	12		Air sus.	6	Dome	1	Dome	35-20K	60		8		14 1/2 x 12 x 26 1/2	Wal.	Cloth, Beige	45		Level-balance cont. for tweeter and midrange.
SCHOBBER	LSS-100	(2) 12	32	Reflex	8	Cone	(2)	Horns	30-18K	1	100	150	1, 3, & 5K	32 x 16 x 54	Wal.	Cane Beige	150	499.50	4-way system.
	LSS-10A	12	32	Reflex	8	Cone	1 treb. 1 tweet.	horn horn	30-18K	2	40	250	3,500	24 x 16 x 34	Wal.	Cane Beige	60	180.00	Tweeter horn opt.; kit.
SCOTT	S-41	8	52	Acous. Susp.				Cone	35-20K	10	35	1700	8	10 1/2 x 9 1/2 x 19	Wal.	Cloth, gray	25	69.90	
	S-51	10	37	Acous. Susp.			3 1/2	Cone	30-20K	18	60	1200	8	14 1/2 x 11 1/4 x 24	Wal.	Cloth, gray	45	89.90	
	S-11C	10		Acous. Susp.	3 1/2	Cone	3	Cone	35-20K	10	50	900	3,500	14 1/2 x 11 1/4 x 24	Wal.	Cloth, Brn.	40	99.90	
SHERWOOD	Woodstock	8		Acous.	-	-	3 1/2	Cone	40-18K	5	25	4,000	8	18 x 9 x 11	Wal.	Cloth, brn.	18	59.95	
	Berkshire III	12	21	Acous.	5	Cone	3 1/2	Cone	28-22K	10	60	600	5,000	24 x 9 x 19	Wal.	Cloth, brn.	40	129.95	Removeable grille; midrange and tweeter controls.
	Ravinia III	15	19	Acous.	5	Cone	3 1/2	Cone	24-22K	10	70	600	5,000	25 x 11 1/2 x 17	Wal.	Cloth, brn.	54	169.95	As above.
SONY	SS-4200	8	85	Acous.	8	Cone	3	Cone	50-20K ±5	6	30	600	10K	13 1/2 x 11 1/2 x 23 1/2	Wal.	Cloth, Black	30 1/2	95.00	
	SS-9500			Omnidir.					50-18K	6	30	-	6	16 dia. 23 1/2 high	Wal.	Cloth, Brn.	30 1/2	149.50	Uses six full range 4-in. cone type speakers.

For \$279 we give you engineering. For an extra \$20 we throw in some furniture.

To call the **Rectilinear III** a piece of engineering is a rather vigorous understatement.

The equipment reviewers of leading hi-fi and other technical publications have gone on record that there's nothing better than this \$279 floor-standing speaker system, regardless of type, size or price. (Reprints on request.)

But engineering is all you should expect when you buy this

original version of the **Rectilinear III**. Its cabinet is 35" by 18" by 12" deep, handsome but utterly simple. For \$279, you get quality and taste but no frills.

However, if you're the last of the big-time spenders, you can now escape this austerity for an extra \$20. Because, for \$299, there's the stunning new lowboy version of the **Rectilinear III**, 28" by 22" by 12 1/4" deep, with a magnificent fretwork grille.

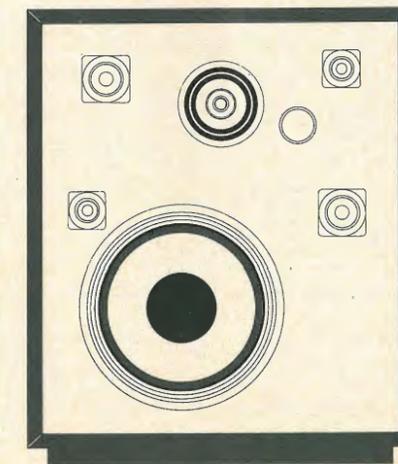
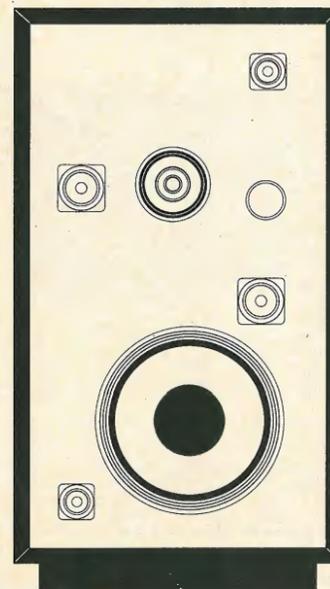
Mind you, the actual internal volume of the enclosure is the same in both versions. So are the

drivers and the crossover network. Only the cabinet styles and the dimensions are different. In the dark, you can't tell which **Rectilinear III** is which. They sound identical.

That's engineering.

(For more information, including detailed literature, see your audio dealer or write to Rectilinear Research Corp., 107 Bruckner Blvd., Bronx, N.Y. 10454. Canada: H. Roy Gray Co. Ltd., Markham, Ont. Overseas: Royal Sound Co., 409 N. Main St., Freeport, N.Y. 11520.)

Rectilinear III



SPEAKER SYSTEMS

MANUFACTURER	MODEL	WOOFER			MID-RANGE			TWEETER			Overall Freq. Resp., Hz to kHz	Ampl. Pwr. for Avg. Room, W	Pwr. Handling Capacity (RMS Cont)	Crossover Frequency (Hz)	Impedance, Ohms	Enclosure Dimensions, W x D x H, in.	Wood Finish	Grille Material Color	Weight, Lbs.	Price	SPECIAL FEATURES
		Diameter, in.	Resonance (in system), Hz	Enclosure Type	Diameter, in.	Type	Diameter, in.	Type	Overall Freq. Resp., Hz to kHz	Ampl. Pwr. for Avg. Room, W											
SOUND INDUSTRIES	Quatre 8000	8		Ducted Port	5	Cone	2 1/2	Cone	35-20K ±5	10	60	400	8	14 1/2 x 11 1/4 x 2 5/8	Veneers	Various	48	85.00			
SOUNDCRAFTSMEN	Lancer SC-6	12		Bass energ.		Diffuser		Flared Horn	18-22K	10	60	1,000	8	27 x 16 x 14 1/2	Oil Wal.	Cloth, dk. red, consumer changeable	57	249.50	4-way system, aerodynamic bass-energized; 12-in. passive radiator; cont. var. h.f. level control.		
	Lancer SC-3X	12		Reflex res. loaded		Diffuser		Flared Horn	26-22K	10	60	1,000	8	23 1/2 x 15 1/2 x 12 1/2	Oil Wal.	Cloth, dk. red, consumer changeable	45	199.50	3-way system; ducted-port reflex, resistance loaded.		
	Lancer SC-5	12		Reflex		Diffuser		Flared Horn	28-20K	5	40	1,000	8	23 1/2 x 15 1/2 x 12 1/2	Oil Wal.	Cloth, Beige	38	149.50	3-way system; dual ducted port reflex; tuned ports.		
TANNOY	Windsor GRF	15	35	Rear horn loaded			2 1/2	Horn	35-20K ±4	15	50	1,000	8	23 1/2 x 17 x 42	Wal.	Carv. wood & white cloth	120	477.00	Dyn. and freq. bal. control; integ. sound source. Non-carved Model, \$420.00.		
	Lancaster	15	48	Ducted port reflex			2 1/2	Horn	40-20K	15	40	1,000	8	26 x 19 1/2 x 29	Wal.	Carv. wood & white cloth	80	366.00	Dyn. and freq. bal. control.		
	Orbitus I	12	40	Omni.			2 1/2	Horn	35-20K	20	30	1,000	8	17 x 17 x 29	Wal.		50	255.00	Omni. Dyn. and freq. bal. control.		
TEAC	LS-350	12	35	Acous.	4	Cone	2	Com-pression	50-20K ±5	25	30	700	8	16 x 11 1/2 x 25 1/2	Oil Wal.	Cloth	41	134.50	Brightness control for mid and hi range; LC crossover.		
	LS-400	12	30	Ducted Reflex	4	Cone	2	Com-pression	50-20K ±5	25	40	500	8	17 1/2 x 14 1/2 x 27 1/2	Oil Wal.	Cloth	58	179.50	Separate mid and hi balance controls; LC crossover.		
	LC-80M	12	40	Acous.	5	Cone	2	Com-pression	50-20K ±5	25	40	450	8	16 x 11 1/2 x 26 1/2	Oil Wal.	Sculptured Rhombic pattern	42	199.50	Built-in crossover, or for tri-amp use.		
3M/WOLLENSAK	A1000	4	100	Acous.					80-12K	10	14		8	8 x 9 x 13	Wal.	Cloth, Beige		49.95 (pr.)			
	A1050	4	100	Acous.					80-12K	10	14		8	7 1/2 cube	Wal.	Cloth, Beige		79.95 (pr.)			
UNIVERSITY	Presidio 12	12		Acous.		Cone		Cone	20-40K	5	40	1,000	8	24 x 15 x 23	Wal.	Cloth, Brn.	70	199.95			
	Project M	11		Acous.			2 1/2	Cone	30-20K	5	60	1,000	8	12 1/2 x 11 1/2 x 23 1/2	Wal.	Cloth, Beige	30	109.95			
	Ultra D	10		Acous.	4	Cone	3 1/2	Cone	30-30K	3	32	1,000	8	11 1/2 x 9 1/2 x 23	Wal.	Cloth, Beige	24	89.95			
	Laredo	12		Acous.	8	Cone		Cone	30-30K	5	40	600	8	15 1/2 x 12 1/2 x 24	Wal.	Cloth, Beige	47 1/2	129.95			
V-M	85	8		Acous.			3 1/2	Cone	35-20K		40	2,000	8	20 1/2 x 26 x 26	Pecan	Cloth, gold	65	210.00			
	84	8		Acous.			3 1/2	Cone	35-20K		40	2,000	8	20 x 19 1/2 x 19 1/2	Pecan	Cloth, brn.	41	145.00			
WHARFEDALE	W80A	12 1/2		Acous.	4 1/2	Cone	1	Dome Dome	20-inaud.	25	100		8	17 1/2 x 28 x 17	Oil Wal.	Cloth, Brn.	83	317.60	Indiv. midrange and treble contrs.; opt. pedestal (adds 4 in. to height); variflex system.		
	W70E	15		Acous.	5	Cone	1	Dome	25-20K	15	75		8	22 1/2 x 24 x 13 1/2	Oil Wal.	Cloth, Brn./gold	63	223.00	Cont. var. treble and midrange contr.; vert. or horz. mtng.		
	W60E	12 1/2		Acous.	6	Cone	1	Dome	30-20K	15	60		8	14 x 15 x 12	Oil Wal.	Cloth, Brn.	52	153.00	Cont. var. treble and midrange contr.		
	W45	10		Acous.	3 1/4	Cone	2 1/2	Ultra Curv. Cone	30-18.5K	10	45		8	12 x 22 x 10	Oil Wal.	Cloth, Brn.	35	117.00	As above.		
YAMAHA	NS-230	12 1/2 x 18	50				2	Cone	40-18K ±5		10	5,000	8	16 1/2 x 7 x 20	Wal.	Cloth	15 1/2	69.50	Piano shaped woofer.		
	NS-20B	20 x 27	60		8	Cone	2 1/2	Horn	30-20K		20	200	8	36 x 13 1/2 x 26	Wal.	Cloth	62	199.50	As above.		
	NS-30B	25 x 35	50		12	Cone	2 1/2	Horn	30-20K ±5		30	200	8	42 1/2 x 13 1/2 x 29 1/2	Wal.	Cloth	81	299.50	As above.		



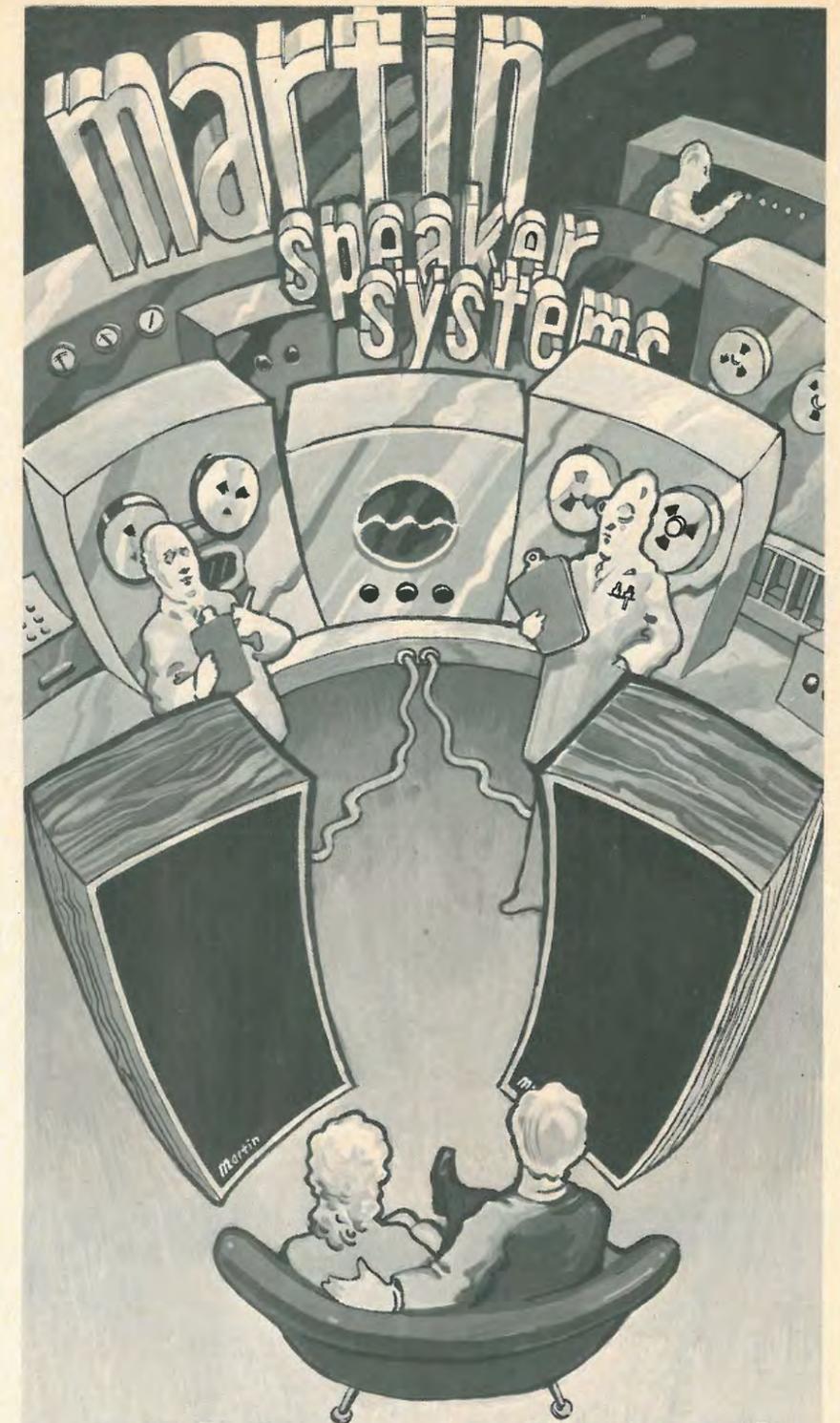
TEAC LS-350



V-M Model 93



Yamaha NS-30



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Designing a speaker by instruments ALONE is not the answer. Every test article written about loudspeaker systems clearly states that the final and true test is the LISTENER'S evaluation. At Martin we use the most advanced techniques and equipment to design each system, but our final and most critical test is the tuning stage. Experts from all over the country listen and help us adjust crossovers and enclosures so that when you listen to a Martin you listen to the finest. Go to your favorite hi-fi dealer today and discover that all speaker systems do not sound alike.

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OPEN-REEL TAPE RECORDERS

Speeds Indicated by letter code:

	A	B	C	D	E	F	G	H
15	X	X	X	X	X	X	X	X
7½	X	X	X	X	X	X	X	X
3¾	X	X	X	X	X	X	X	X
1½	X	X	X	X	X	X	X	X
¾	X	X	X	X	X	X	X	X

*at the highest speed of the machine



Hitachi TRQ-7400D



Crown 700



Astrocom-Marlux 407



Ferrograph Series Seven

MANUFACTURER	MODEL	SPECIAL FEATURES																	
		Speeds (See Letter Code)	Power Amp(s) Built-in?	Mks. Reel Size, In.	No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response * Hz to kHz, ± dB	Wow and Flutter, %	Signal-to-Noise Ratio, dB	Fast Wind - 1200 Ft., Sec.	Mic Input Z, Ohms	Rec. and Level Indicator Type	Dimensions W x D x H, In.	Weight, Lbs.	Price	
AKAI	X330	A	Yes	10½	4	4	3	Hys.	Belt	30-25K ±3	0.04	50	60	10K	2 Mtrs.	17¼ x 14¼ x 9¼	48.4		
	GX-365-D	G	No	7	3	4	3	Hys.	Belt	30-28K ±3	0.04	55	60	10K	2 Mtrs.	16¼ x 18½ x 11¼	56		
	1730-55	B	No	7	4	4	1	Hys.		30-22K ±3	0.12	50	75	30K	4 Mtrs.	16½ x 18 x 9½	33		
ALLIED RADIO SHACK	Realistic 909A	A	Yes	7	2	4	1	Ind.	Belt	50-18K	0.2	40			2 Mtrs.	24¼ x 14 x 7½	25	169.95	With 2 mikes.
	Allied TD-1099	A	No	7	3	4	1	Ind.	Belt	30-22K	0.1				2 Mtrs.	12¼ x 16 x 6½	19	179.95	Wood case.
AMPEX	AX-300	A	No	7	6	4	3	Hys.	Idler	20-20K ±3	0.09	57	55	Hi	2 Mtrs.	16½ x 14½ x 6	45	899.95	Speed logic circuit; outside tape bias and VU mtr. calibra. ports; heads-2 rec.; 2 play; 2 erase.
	AX-50	A	No	7	3	4	1	Hys.	Idler	20-20K ±3	0.12	55		Hi	2 Mtrs.	16½ x 15¼ x 8½	23	249.95	Auto tape lifter; deep-gap rec. and play heads.
ASTROCOM	407	B	No	7	4	4	3	Hys.	Belt	30-20K	0.07	50	60	10K	Dual Mtr.	21 x 14½ x 10½	27	459.95	Auto-rev. pb; sws; s-o-s; sol. contrs.
BANG AND OLUFSEN	Beocord 1800	A	No	7	3	4	1	Hys.	Idler	30-18K ±2	0.07	65	120	200	2 VU Mtrs.	17¾ x 15 x 8¾	36	400.00	s-o-s, echo, synchro playback, PA facility, mixing.
	Beocord 2400	A	Yes	7	3	4	1	Hys.	Idler	30-18K ±2	0.07	65	120	200	2 VU Mtrs.	17¾ x 15 x 8¾	37	450.00	As above w. two 10-watt (rms) amps.
CONCORD	Mk IV	A	No	7	4	4	1	Hys.	Idler	20-23K ±4	0.08	52		50K	2 Mtrs.	17 x 17 x 8½	25¼	279.95	Auto rev PB; silent sensing; dual capstan.
	Mk III	A	No	7	3	4	1	Hys.	Idler	20-25K ±3	0.09	52		50K	2 Mtrs.	18½ x 13 x 6	25¼	229.95	Var. echo control; tape/source monitor; 4 preamps.
	Mk II	A	No	7	3	4	1	Hys.	Idler	20-20K ±4	0.09	52		50K	2 Mtrs.	18½ x 13 x 6	25¼	179.95	As above.
CROWN	SX724	B	Opt.	10½	3	4	3	Hys.	Belt	20-25K ±2	0.09	60	45	350K	2 Mtrs.	19 x 9 x 15¼	45	995.00	Dual mike, line mixing; 5-in. VU meters; also in half track.
	SX824	B, F	Opt.	10½	3	4	3	Hys.	Belt	20-20K ±2	0.09	60	45	350K	2 Mtrs.	19 x 9 x 15¼	48	1,495.00	Wal. cab., tape counter optional; also in half track.
	CX822	E	Opt.	10½	3	2	3	Hys.	Belt	30-30K ±2	0.06	45	250 (bal)	2 Mtrs.	19 x 9 x 17½	53	2,120.00	As above. Also in 4-chan., ¼ track.	
	SX744	B	Opt.	10½	3	4	3	Hys.	Belt	20-25K ±2	0.09	60	45	350K	4 Mtrs.	19 x 9 x 21	60	1,895.00	8 mike inputs.

SONY SUPEREVERSABILITY

Lets you play on and on.

ESP Continuous Automatic Tape Reverse. Special Electronic Sensory Perception circuitry indicates the absence of a recorded signal at the end of a tape and automatically reverses tape direction within ten seconds. Perfect for hours of continuous background music but also equipped to play both sides of the tape just once and then automatically shut off.

Three-speed ServoControl Motor. Automatically corrects for speed variations and maintains precise timing accuracy. Plus two outer-rotor torque motors for precise tape handling.

Scrape Flutter Filter. Special precision idler mechanism located between record and playback heads reduces tape modulation distortion.

Electro Bi-Lateral Six Head Function with Central Capstan Drive. Electro bi-lateral heads significantly reduce head alignment problems while still allowing six head versatility. Central capstan drive assures precise tape motion in either direction.

Relay and Solenoid Operation. Electronic relays and positive action solenoids activate the operating mechanisms with precision and ease.

Other Features: Four-track stereophonic recording and playback—in both directions. Three speeds. Two large illuminated VU meters. Stereo headphone jack.



Sony Model 580—\$449.95. Also Available: The Sony Model 440 tape system with foil activated auto-reverse, roto bi-lateral heads with six head function and three speeds for only \$369.95.

See either of these outstanding automatic reversing reel-to-reel decks at your Sony/Superscope dealer or write for full details to Mr. Richard Linda, Sony/Superscope, Inc., 8144 Vineland Ave., Sun Valley, Calif. 91352.

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OPEN-REEL TAPE RECORDERS

Speeds Indicated by letter code:

	A	B	C	D	E	F	G	H
15					X	X	X	X
7½	X	X	X	X	X	X	X	X
3¾	X	X	X	X	X	X	X	X
1½	X	X	X	X	X	X	X	X
¾	X	X	X	X	X	X	X	X

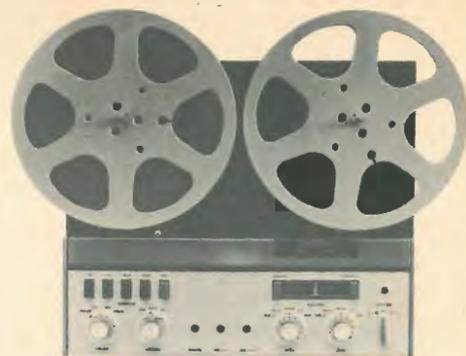
*At the highest speed of the machine



Kenwood KW-6044



Roberts Model 333X



Revox A-77



Tapesonic (Premier) 70A

MANUFACTURER	MODEL	Speeds (See Letter Code)	Power Amp(s) Built-in?	Max. Reel Size, in.	Nbr. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response Hz to kHz, ± dB	Wow and Flutter, %	Signal-to-Noise Ratio, dB	Fast Wind, 1200 Ft., Sec.	Mic Input, Z, Ohms	Rec'g Level Indicator Type	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
FERROGRAPH	704 A-S	G or E	No	8¼	3	2 or 4	3	Ind.	Idler	30-17K ±2	0.08	60	60	10K	2 Mtrs.	14¼ x 16 x 8½	37½	649.00	Chassis model 724 A-W, in wal. case, \$699.00. 724 A-P, port., \$699.00. Also avail. with or without amps. or spkrs. in wal. case or port. case.
GRUNDIG	TK-600	B	No	7	4					30-18K ±2	0.15	50		100K	2 Mtrs.	16½ x 14¼ x 7¼			s-o-s, auto tape end stop, auto-manual record level.
HITACHI	TRQ-730	A	No	7	3	4	1	Sync	Idler	20-23K	0.12	52		10K	2 Mtrs.	16½ x 13¼ x 7½	24¼	189.95	
	TRQ-770	A	No	7	4	4	1	Cond.	Idler	20-23K	0.12	53		10K	2 Mtrs.	17¼ x 16½ x 7½	35¼	259.95	Auto repeat.
	TRQ-7400 4-chan.	A	No	7	3	4	3	Hys. Syn.	Idler		0.3	40		10K	4 Mtrs.	18¼ x 18 x 7			Auto rewind; memory control; bias switch.
JVC	1400 4-chan.	B	No	7	3	4	1		Idler	20-25K ±1.5	0.07	53		10K	4 Mtrs.	15¼ x 8½ x 12¾	20	399.95	4-channel PB and rec.
KLH	41	A	No	7	3	4	1	Ind.	Belt	50-15K ±3	0.15	60*	130	1K	2 Mtrs.	14¼ x 11½ x 5½	23	249.95	*Includes Dolby system; with Dolby in s/n is 68 dB.
KENWOOD	KW-4066A	A	No	7	3	4	1	Hys.	Idler	25-20K ±3	.15	50	150	10K	2 Mtrs.	16 x 12¼ x 7	22	149.95	Auto stop; slide vol. conts.; bias selector switch; tape mon. and mode switch.
	KW-4077	A	No	7	3	4	1	Hys.	Idler	20-20K ±3	.12	50	260	2K	2 Mtrs.	16 x 17¼ x 7¼	26.5	299.95	Auto reverse; auto repeat; slide vol. conts. for rec and play.
	KW-6044 4-chan.	A	No	7	3	4	1	Hys.	Idler	20-20K ±3	.12	50	150	50	4 Mtrs.	16 x 15½ x 7	22		4 channel playback; auto stop.
PANASONIC	RS-1030US 4-chan.	F		10½	4	4	3								2 Mtrs.	17 x 7¼ x 22		699.95	Lo noise/normal tape sw.; quadraphonic pb; 2-chan. rec.; ferrite heads.
	RS-740US 4-chan.	B		7	3	4									4 Mtrs.	16¼ x 8¾ x 15¼		399.95	Quadraphonic pb; 2-chan. rec.; ferrite heads.
PIONEER	T-8800	B	No	7	6 (4)	4	2	Hys.	Belt	40-15K ±2	.08	55	110	50K	2 Mtrs.	21¾ x 16½ x 9½	50	549.95	PB/Rec auto rev.; G head; bias selec.; s-o-s; easy load.
	T-6600	B	No	7	4	4	1	Hys.	Belt	50-15K ±2	.12	55	110	50K	2 Mtrs.	17¼ x 7½ x 17	28	299.95	PB/Rec. auto rev.; pause cont.; easy load.
	T-6100	B	No	7	4	4	1	Hys.	Belt	50-15K ±2	.12	55	110	50K	2 Mtrs.	15¾ x 6¾ x 14¾	26	249.95	PB auto rev.; pause cont.; easy load.
	QT-6600 4-chan.	B	No	7	5	4	1	Hys.	Belt	30-20K	.12	55	110	50K	4 Mtrs.			599.95	4-chan. rec./PB; 2-chan. rec./PB; auto rev.

We designed a receiver that gives you more control over Beethoven's Fifth than Beethoven had.



We call it our SEA. What it stands for is sound effect amplifier. What it does is nothing short of amazing.



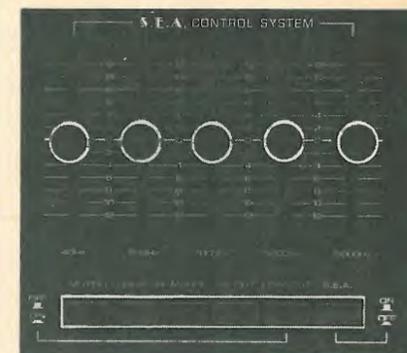
It lets you tailor sound to your own taste. So if you're crazy about a certain singer but not so crazy about the band that's playing with him, you can bring up the voice and push the music into the background.

And since there's not much point in having a perfect receiver with imperfect acoustics, the SEA lets you compensate for the shape of your room and the furniture in it.

But the nicest thing about the SEA system is its ability to create entirely new sounds by mixing and altering other recorded sounds.

This SEA receiver also has a linear dial scale, dual tuning meters, 2 microphone inputs with separate volume control, the capacity to handle up to 3 pairs of speakers and a 1.6 microvolts FM sensitivity.

The suggested retail price of this 220 watt FM/AM stereo receiver is \$399.95. This unit also provides facilities for the enjoyment of future 4-channel programming.



JVC also puts out 4 other SEA models ranging from 200 watts to 40 watts with suggested retail prices from \$499.95 to \$199.95.

We like to think it's the kind of equipment Beethoven would have been happy to pay a lot more for.

JVC

JVC America, Inc.
50-35 56th Road, Maspeth, New York 11378
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OPEN-REEL TAPE RECORDERS

MANUFACTURER	MODEL	SPECIAL FEATURES																	
		Speeds (See Letter Code)	Power Amp(s) Built-in?	Max. Reel Size, In.	No. of Heads	No. of Tracks	No. of Motors	Drive Motor Type	Drive to Capstan	Frequency Response, Hz to kHz, ± dB	Wow and Flutter, %	Signal-to-Noise Ratio, dB*	Fast Wind, 1200 Ft./Sec.	Mic Input, Z, Ohms	Rec'g Level Indicator Type	Dimensions, W x D x H, in.	Weight, Lbs.	Price	
PREMIER	70A-TRSH	E	No	10½	3	2	3	Hys.	Direct	35-26K ±2	0.08	56	60	50K	2 Mtrs.	19 x 8½ x 21	69	675.00	Solid state, modular plug-in boards. Portable case, \$37.00. 70A-TRSQ has 4 tracks.
REVOX	A77	B	Opt.	10½	3	2 or 4	3	Servo	Direct	20-20K +2-3	0.08	58	60	Hi/Lo	2 VU Mtrs.	16 x 8 x 14	34		
	A77 HS	F	Opt.	10½	3	2 or 4	3	Servo	Direct	30-20K ±1.5	0.04	60	60	Hi/Lo	2 VU Mtrs.	16 x 8 x 4	34		
ROBERTS	71X	A	Yes	7	3	4	1	Hys.	Belt	30-22K ±3	0.15	50	75	5K	2 Mtrs.	20 x 14 x 10	42	279.95	Crossfield head, s-o-s, 4-digit counter, separate tone and equalization controls.
	333X	G	Yes	7	7	4/8/4	1	Ind.	Belt	30-23K ±3	0.18	50	150	5K	2 Mtrs.	10½ x 14½ x 18½	49½	559.95	Crossfield head, auto shutoff index counter, tape lifter, speed equalizer, cassette and cart. play and rec.
	GH500D	G	No	7	4	4	3	Hys.	Belt	30-24K ±3	0.10	50	75	10K	2 Mtrs.	16¼ x 18½ x 11½	56	559.95	Glass and ferrite record and play heads, auto reverse, remote control.
	5050XD	A	No	10½	4	4	3	Hys.	Belt	25-22K ±3	0.18	48	75	5K	2 Mtrs.	14¼ x 17¼ x 9¾	48	559.95	Reverse play, remote control, auto timer, s-o-s, s-w-s, mixing.
SANSUI	SD7000	B	No	7	4	4	3	Hys.	Belt	15-25K ±2	0.06	>60	100		2 Mtrs.	21 x 17 x 10	60	679.95	Auto rev. w. 20-Hz sig. rec. built-in; auto rewind; opt. rem cont.; auto sleep sw.
SONY/SUPERSCOPE	366	A	No	7	3	4	1	Ind.	-	30-25K ±3	0.09	55	120	Lo	Dual Mtr.	16¼ x 14¼ x 8¼	30	239.95	Tape bias switch; slanted walnut base.
	440	A	No	7	4	4	1	A.C. Servo Cont.	-	30-25K ±3	0.06	56	100	Lo	Dual Mtr.	16¼ x 16¼ x 8½	36	369.95	6 function head assembly; auto rev.; s-o-s; echo.
	640	B	No	7	3	4	3	Hys. syn.	Idler	30-20K ±3	0.07	55	90	Lo	Dual Mtr.	14¼ x 9½ x 15½	40½	349.95	s-o-s; echo; mic-line mixing.
	854-4 4-chan.	E	No	10½	4	4	3	Servo	Belt	20-30K ±2	0.03	59	-	Lo*	4 Mtrs.	17¼ x 10 x 22¼	61½	1,395.00	*Bal. Cannon XLR mic inputs; dual capstan drive; 4-track, 4-chan. Rec. and PB.
	654-4 4-chan.	B	No	7	4	4	3	Hys.	Direct	30-22K ±2	0.04	57	60	Lo	4 Mtrs.	16¼ x 9¾ x 20	48¼	750.00	4-chan. rec. and PB.
	366-4 4-chan.	B	No	7	4	4	1	Ind.	Belt	20-25K ±2	0.09	55	120	Lo	4 Mtrs.	17 x 9¾ x 18¾	20¾	479.95	4-chan. rec. and PB.
STELLAVOX (GOTHAM)	SP-7	*	Yes	10½	4	3	1	D.C. Servo	Direct	30-15K ±2	<.12	60	120	200Ω	2 Mtrs.	10½ x 8½ x 3	7	1,725.00	HD assembly interchangeable for mono, mono w. film sync., stereo, stereo w. film sync. *spds. 3¼ to 30 ips.
TANDBERG	3000X	A	No	7	4	2 or 4	1	Asyn.	Idler	40-20K ±2	0.07	60	105	200	2 Mtrs.	15½ x 12½ x 6½	20	330.00	
	4000X	A	Yes	7	4	2 or 4	1	Asyn.	Idler	40-20K ±2	0.07	60	105	200-600	2 Mtrs.	15½ x 12½ x 6½	23	459.00	Crossfield bias; bass and treble ctnrs.; remote start/stop.
	6000X	A	No	7	4	2 or 4	1	Asyn.	Idler	40-20K ±2	0.07	60	105	200-600	2 Mtrs.	15½ x 12½ x 6½	21	499.00	Crossfield bias; limiter; synch. mic. input.
TEAC	7030 SL	F	No	10½	4	2	3	Hys. Sync	Belt	30-22K ±3	.04	60	90	600	2 VU Mtrs.	17½ x 8¼ x 20¾	62	799.50	Features high density ferrite head; dual bias switch control; meter sensitivity switch.
	4070	B	No	7	4	4	3	Hys. Sync	Belt	30-20K ±3	.06	58	90	600	2 VU Mtrs.	17½ x 9¾ x 17¾	51	599.50	Features high density ferrite heads; bi-directional record and playback, auto rev. cont. playback; pause-fader cont.
	3300-11	F	No	7	3	2	3	Hys. Sync	Belt	30-22K ±3	.04	60	90	600	2 VU Mtrs.	15½ x 9¾ x 15½	40½	529.50	Dual bias switch; available variety of track/speed configuration; pause control.
	1230	B	No	7	3	4	3	Hys. Sync	Belt	40-18K ±3	.08	55	90	600	Dual VU Mtr.	17½ x 8 x 15½	37½	349.50	Pause control; built-in dual bias switch control; adj. turntable height.
	TCA-40 4-chan.	B	No	7	3	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K	2 Mtrs.	12 x 17½ x 7	37	365.00	Compatible 4- and 2-chan stereo p.b. deck; 4 p.b. amps; auto reverse for 2-chan. operation.
	TCA-41 4-chan.	B	No	7	3	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K	2 Mtrs.	12 x 17½ x 7	37	535.00	4-chan p.b. and 2-chan rec. and p.b. incl. connectors to adapt to 4-chan. recording. Amp 4¼ x 17¼ x 7¼ in.
	TCA-42 4-chan.	B	No	7	4	4	3	Hys. 2 spd.	Belt	50-15K ±3	0.12	50	100	10K	4 Mtrs.	12 x 17½ x 7	37	695.00	4-chan rec. and p.b. deck; compatible with 2-chan, ¼-track stereo rec. and p.b. Amp. as above.
TELEX	2001	B	No	8¼	3	4	3	Hys. Sync	Belt	45-18K ±2	0.18	52		Hi 2	2 Mtrs.	19½ x 14½ x 8		799.95	Die cast mainplate, source-tape monitor, walnut base, push button solenoid operation.
	433	A	No	7	3	4	3	4-pole	Belt	40-18K ±3	0.2	54	70	50K	2 Mtrs.	15¼ x 8¼ x 14¼	34	374.95	Walnut base.
UHER (MARTEL)	10,000/4	C	Yes	7	4	4	1	Hys.	Idler	20-20K ±2	0.04	54	120	200	2 Mtrs.	13¼ x 7¼ x 17¼	30	560.00	
V-M	748	A	Yes	7	2	4		Hys.	Idler	50-15K ±2	0.25	45			2 Mtrs.	14 x 21¼ x 11½	31	239.95	Hinged spkrs.; extra speaker outputs.
	734	A	Yes	7	2	4		Hys.	Idler	50-15K ±2	0.25	46			2 Mtrs.	14 x 16 x 8	21	189.95	Extra speaker outputs.
	743	A	Yes	7	2	4		Hys.	Idler	50-15K ±2	0.25	50			1 Mtr.	7½ x 13 x 14¼	22	199.95	Pause control; mono.
	782	H	Yes	7	2	4		Hys.	Idler	120-7K ±2	0.4	40			Mtr.	4½ x 12 x 10¼	10	89.95	Operates on a.c. or D batteries.
JM/WOLLENSAK	6150	A	No	7	3	4	2	Hys.	Idler	35-20K ±2	0.12	54	90	2.2	2 Mtrs.	16½ x 13½ x 6½	18	199.95	Bias selector; tape-source monitoring.
	6250	A	Yes	7	3	4	2	Hys.	Idler	35-20K ±2	0.12	54	90	2.2	2 Mtrs.	20½ x 13½ x 7½	25	379.95	Built-in monitor speakers; record bias selector; tape-source monitoring.
	6154 4-chan.	A	Yes	7	3	4	2	Hys.	Idler	35-20K ±2	0.12	54	90	2.2	2 Mtrs.	16½ x 13½ x 6½	18	319.95	4-chan. pre-amp playback; 2-chan. record-play deck.
	6364 4-chan.	A	Yes	7	3	4	2	Hys.	Idler	35-20K ±2	0.12	54	10	2.2	2 Mtrs.	20½ x 11½ x 7½	30	399.95	Amplified 4-chan. play; 2-chan. record and play.

Speeds indicated by letter code:

	A	B	C	D	E	F	G	H
15	X	X	X	X	X	X	X	X
7½	X	X	X	X	X	X	X	X
3¾	X	X	X	X	X	X	X	X
1½	X	X	X	X	X	X	X	X
¾	X	X	X	X	X	X	X	X

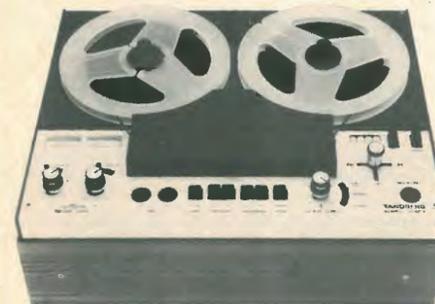
*at the highest speed of the machine



Sony Model 850



TEAC 7030SL



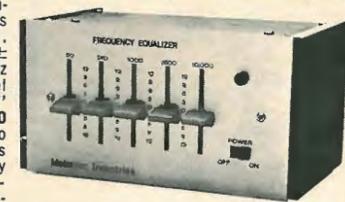
Tandberg Series 6000X

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program material, speakers, and individual preferences. In other words, it tailors sound to suit your personal listening requirements."



The Graphic Stereo Tone Control can be used with all preamp-basic combinations or receivers with a tape monitor switch. The system sells for \$99.95 with a 2-year guarantee or \$79.95 for an easy-to-assemble kit. See your dealer or write for name of dealer nearest you.

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CASSETTE AND CARTRIDGE MACHINES



Astrocom-Marlux 307

Fisher CP-100



MANUFACTURER	MODEL	Cassette	Cartridge, No. of Tracks	Type: Portable P; Home H; Car Mount, C	Power Amp. Built-in	Rated Power Output, W	Mode: Stereo, S; Mono, M	Frequency Response, Hz, ±1 dB	Wow and Flutter, %	S/N, dB	Supply Voltage	Speakers: Built-in or External	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
AKAI	CS-50	X	-	H	Yes	8	S	30-16K	0.2	45	A.C.	Ext.	15 x 11 1/4 x 6 1/4	19 1/2		Invert-O-Matic reversing, auto stop, auto shut-off.
	CS-60	X	-	H	Yes	16	S	30-16K ±3	0.2	45	A.C.	Ext.	11 1/4 x 11 1/2 x 7 1/4	22		Invert-O-Matic reversing, auto stop, auto shut-off.
	CR-80	-	8	H	Yes	24	S	50-16K ±3	0.25	47	A.C.	Ext.	13 1/2 x 10 x 5 1/2	19 1/2		
	CR-80D-SS	-	4	H	No	-	S	50-16K ±3	0.25	47	A.C.	Ext.	19 1/2 x 11 1/4 x 5 1/2	24		
ALLIED RADIO SHACK	Realistic SCT-5	X	-	H	No	-	S	40-14K ±2	0.2	-	A.C.	-	13 3/4 x 9 1/4 x 3 3/4	7	129.95	Records; bias switchable to low noise cassettes.
	Realistic TR-8	-	8	H	No	-	8	30-15K	0.3	-	A.C.	-	15 3/4 x 10 1/4 x 4 1/4	22	159.95	Records.
	Realistic SCT-2B	X	-	P	Yes	-	S	50-12K	-	-	A.C. 9V Batt.	Ext.	11 x 8 1/2 x 6 1/2	10	119.95	With detachable speakers; 2 mikes.
	Realistic TR-234 4-Chan.	-	8	H	Yes	-	4-Chan.	-	-	-	A.C.	4 Ext.	15 x 5 x 11 1/4	23	169.95	4-chan./2-chan. playback with 4 speakers.
AMPEX	Micro 155	X	-	H	No	-	S	40-15K ±3	0.2	45	A.C.	Ext.	17 1/4 x 9 1/2 x 5 1/4	-	299.95	Auto reverse; 4-source mixing; CrO ₂ bias sw.; noise filter; 6-element head.
	Micro 335	X	-	H	No	-	S	40-15K ±3	0.2	45	A.C.	Ext.	18 1/2 x 10 1/4 x 9	-	349.95	12-cassette changer, 2 direc. play/rec.; 6-element head.
ASTROCOM	307 4-Chan.	X	-	H	No	-	S	30-12K	0.14	46	A.C.	-	-	-	Under 500.00	4-Chan. rec./play; 4-chan. mix; auto reverse; 3-mtr. drive; pause con.; end signal w. auto pinch-roller retract and motor shutoff; opt. remote control.
BSR McDONALD	RD8S	-	8	H	No	-	S	30-15K	0.3	>40	A.C.	-	12 1/4 x 10 1/4 x 4 1/4	16	199.95	Records; 2 Mic inputs; Auto eject.
BELL & HOWELL	3120 4-chan.	-	8	H	Yes	35 I.P.P.	4 Ch. Stereo	50-10K	.25	45	117V A.C. 60 Hz	2 Ext.	17 1/2 x 10 1/2 x 4 1/4	20	189.95	4 Channel deck with built-in amps for rear channel, plus line outputs for all four ch. Auto 2 ch/4 ch switching. Master level control. Bass and treble controls.
BOGEN	CRP	X	-	H	No	-	S/M	30-12K	0.15	45	A.C.	-	10 1/2 x 8 1/2 x 3 3/4	7 1/2	149.95	2 mic input; pause, 2 meters; automatic shut-off; record lite push buttons.
	8-P	-	8	H	No	-	S	30-8K ±3	0.25	45	A.C.	-	9 1/4 x 8 1/2 x 4 1/4	8	79.95	Hys.-sync. motor; AUX input permits addition of 2nd deck.
CONCORD	F-106EB	X	-	H	No	-	S	40-12K	<0.2	46	A.C.	-	10 1/4 x 10 1/2 x 3 1/2	4 1/2	129.95	Bias switch; sep. chan. rec.; Hi freq. filter; auto off; pause control.
	F-107	X	-	H	No	-	S	30-13K	<0.2	47	A.C.	-	15 1/4 x 10 1/4 x 3 1/2	11	179.95	Hys. sync. mtr.; bias switch; auto off; sep. chan. rec. and output level controls.
	Mark IX	X	-	H	No	-	S	30-15K	<0.2	50	A.C.	-	16 x 10 1/2 x 4 1/2	13 1/2	299.95 D	Bias switch; 3 mike inputs; auto off; pop-up VU mtrs.; mono-stereo sw.
	F-120	X	-	H	No	-	S	30-10K	0.3	43	A.C.	-	14 x 11 1/4 x 6 1/4	16 1/2	229.95	Continuous play of up to 12 cass.; records; auto off; 2 VU mtrs.; phone jack.
	F-128	-	8	H	No	-	S	50-10K	<0.3	45	A.C.	-	16 1/2 x 9 x 4 1/4	13	159.95	Tape counter; 2 VU mtrs.; continuous play or auto reject.

Hisssss

The Concord Mark IX cassette deck starts with an extremely low signal-to-noise ratio — better than 50 dB down. The Dolby Noise Reduction system reduces hiss by another 10 dB, and that's just the beginning. The deluxe Concord Mark IX has switch selected bias for standard and chromium dioxide tape cassettes. The narrow head gap and better than 100 kHz bias frequency provide extended frequency response from 30 to 15,000 Hz.

The Mark IX looks like a studio console and performs like one too. With pop-up VU meters, studio type linear sliders for individual control of input and output levels, third mike input for mixing in a center channel microphone, a 3-digit tape counter and a stereo/mono switch for more effective mono record and playback. And this brilliant panel lights up for power on, record and for Dolby.

And when the cassette is finished, Endmatic, a Concord exclusive, disengages tape and transport and returns the pushbuttons to off. And best of all, it's now available at your Concord dealer at a fair price for all of this quality, \$249.79.

If you already have a cassette, open-reel or 8-track

deck, the Concord DBA-10 Dolby tape adaptor can reduce hiss and improve performance. It will also improve your receiver's performance in playing back Dolbyized FM programs, \$99.79.

Your Concord dealer also has a complete line of 8-track and open-reel decks, stereo receivers and cassette portables. Concord Electronics Corporation, 1935 Armacost Avenue, Los Angeles, California 90025. A subsid./Ehrenreich Photo-Optical Industries, Inc. 



Concord Mark IX

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CASSETTE AND CARTRIDGE MACHINES



JVC Model 1660-2



Harman-Kardon CAD5

MANUFACTURER	MODEL	Cassette	Cartridge No. of Tracks	Type: Portable, P; Home R; Car Mount, C	Power Amp. Built-in	Rated Power Output, W	Mode: Stereo, S; Mono, M	Frequency Response, Hz	Wow and Flutter, %	S/N, dB	Supply Voltage	Speakers-Built-in or External	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
CRAIG	2709	X	-	H	Yes	6	S	50-10K ±5	<0.3	>40	A.C.	Two Ext.	13 1/4 x 5 1/2 x 9 1/4	20%	229.95	Records; auto reverse and stop; slide vol., bal., and tone controls.
	3127	-	8	C	Yes	12	S	100-8K ±5	<0.3	>40	12 D.C.	Two Ext.	7 1/2 x 7 1/2 x 2 1/4	5%	119.95	Includes AM radio; auto or manual program changes.
	3129 4-chan.	-	8	C	Yes	24	*	50-10K ±5	<0.25	>40	12 D.C.	Four Ext.	7 1/2 x 9 1/2 x 2 1/4	7	139.95	*Quadraphonic cartridge player, also stereo; 2 vol., bal., tone controls.
	3303	-	8	H	Yes	12	S	50-10K ±5	<0.25	>40	A.C.	Two Ext.	19 x 10 1/2 x 4 1/4	21%	249.95	AM/FM radio; AFC; ALC; auto program change, repeat, stop; slide vol., bal., tone controls.
DENON	TRC-798	-	4	H*	No	-	S	50-10K ±6dB	0.20	45	120V 60 Hz	No	13 3/4 x 8 1/2 x 6 1/2	13%	199.95	*12 cassettes play contin.; pause sw.; meters; auto off; 2 mics; w. C60 cassette.
EICO	TD-8	-	8	H	No	-	S	30-12K	0.2	45	A.C.	Ext.	3 1/2 x 7 1/2 x 9 1/4	5 1/2	49.95	Auto track switching and selection.
FISHER	RC-80B	X	-	H	No	-	S	30-14K	0.2	43 50	A.C.	None	7 1/2 x 11 1/2 x 3 1/2	6	229.95 D	Dolby system; CrO ₂ bias switch; 2 VU meters; dual rec. level control; blank C60 tape.
	CP-100 4-Chan.	-	8	H	No	-	4-Ch. S	50-12K	-	-	A.C.	None	10 1/2 x 10 1/2 x 4 1/2	10	169.95	2 and 4-chan.; repeat, change, consec. modes; includes wal. cabinet.
HARMAN-KARDON	CAD-5	X	-	H	No	-	S	30-15K ±2	0.15	55	A.C.	-	12 1/2 x 9 x 3 1/4	-	229.95 D	Dolby B processor built-in; overload indicator light; 2 meters; bias selector.
HEATH	AD-110	X	-	H	No	-	S	30-14K ±3	<.25	47	120 V.A.C.	-	13 1/4 x 11 x 3 1/4	7.5	119.95	Records; 2 mic inputs; hi-level input with control; 2 meters; record light; counter; 2 rec. level controls; end of tape sensing.
	GD-28	-	8	H	No	-	S	50-10K ±6	<.3	40	120V A.C.	-	10 1/2 x 4 1/2 x 8 1/4	6%	59.95	
HITACHI	TPQ-1444 4-Chan.	-	8	H	No	-	S	50-10K	0.3	40	A.C.	Ext.	11 1/4 x 10 x 4	8%	109.95	4-chan., 2-chan. PB.
	TPQ-124	-	8	H	No	-	S	-	-	-	A.C.	Ext.	11 1/4 x 10 x 4	-	79.95	
	TRQ-242	X	-	H	No	-	S	40-12K	-	45	A.C.	Ext.	7 1/2 x 10 1/4 x 3 1/4	6%	99.95	2 VU meters.
	TRQ-262	X	-	H	No	-	S	20-18K	0.15	50	A.C.	Ext.	13 1/2 x 9 1/2 x 3 1/4	9%	129.95	2 VU meters.
JVC	1660-2	X	-	H	No	-	S	30-18K ±3	0.2	45	A.C.	-	11 1/4 x 9 x 3 1/2	7	119.95	Records; auto eject; noise switch.
	1690	X	-	P	Yes	3	M	50-13K ±3	0.3	40	A.C. & Batt.	Built-in	11 x 3 x 8	7	99.95	Manual reverse; tape counter; end alarm signal.
	1250	-	8	H	No	-	S	30-17K ±4	0.2	48	A.C.	-	15 x 10 x 4	13%	149.95	Auto eject; records; 2 mike inputs.
	1202 4-Chan.	-	8	H	No	-	*	30-15K	0.25	45	A.C.	-	10 1/2 x 10 x 4	7 1/2	99.95	*4-chan. and 2-chan. playback deck.
	1100	-	8	H	No	-	S	40-12K	0.3	40	A.C.	-	6 1/2 x 9 1/2 x 4	6 1/2	49.95	
KENWOOD	KX-7010A	4	-	H	No	-	S	40-10K ±3	0.2	45	A.C.	-	10 1/2 x 9 x 4	7	129.95	Rec. bias selector switch, hysteresis synchronous motor, front panel head-phone jack, hi-filter switch.

1968

1969

1970

1971

DC300 POWER AMPLIFIER

THE STANDARD STANDARDS

In 1968, Crown introduced a laboratory power amplifier that set new standards for the audio equipment industry. It was so unique it was put in a class by itself. It became the "yardstick" against which many other types of equipment were measured, thus earning the title **LAB STANDARD**.

That was over three years ago. Today the DC300 amplifier is still acknowledged as The Standard. This is due to the unique combination of features made possible by its highly advanced patented circuitry. This circuitry provides for the exclusive combination of high power with complete protection and low distortion at low power levels.

So today, where does Crown's DC300 stand, when compared side-by-side with all major commercially available amplifiers? Here's the record:

(1) The DC300 delivers the **most continuous power** of any commercially available power amplifier -- guaranteed at 150 watts per channel rms with 8Ω loads; typically 300 watts per channel rms with 4Ω loads. In actual laboratory testing, it has produced over 900 watts rms continuously for four hours, with only a single whisper fan for cooling.

(2) The DC300 has the **lowest distortion level** of any commercially available power amplifier -- guaranteed at 0.1% IM distortion across the entire power spectrum; typically under 0.01%.

(3) The DC300 has the **most complete protection** of all commercially available power amplifiers. It is fully protected against shorts, mismatching, open circuits, RF overload and overheating.

(4) The DC300 has the **lowest noise level** of any commercially available power amplifier -- guaranteed

at 100db S/N below 150 watts output; typically better than 115db.

(5) The DC300 is backed by a **complete three-year warranty** covering all expenses -- parts, labor and round-trip shipping. This warranty covers every unit ever made and has been in effect from the initial unit, providing ample record of DC300 reliability.

That's the record, and what it all means is purer, more reliable sound for your system. Audio professionals have proved the DC300 in hundreds of applications, from recording studios to stadiums. Ask the men who use them.

We'll also be happy to send you detailed specifications, performance graphs and independent laboratory test reports. For an explanation of the DC300 design, send 25¢ for "Functional Protection of High-Power Amplifiers," a technical paper presented at the Audio Engineering Society 39th Convention.



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CASSETTE AND CARTRIDGE MACHINES



Kenwood KX-7010A



Roberts Model 808D



Sony Model 165

MANUFACTURER	MODEL	Cassette	8	H	No	S	30-12K	0.2	49	A.C.	-	12	129.95	Records; 2 mic inputs; auto rec. and stop.	
															Cartridge: No. of Tracks
LAFAYETTE	RK-890A	-	8	H	No	S	30-12K	0.2	-	A.C.	-	12	129.95	Records; 2 mic inputs; auto rec. and stop.	
	RK-D40	X	-	H	Phones Only	S	30-12K	0.25	49	A.C.	-	17	179.95	Records; Dolbyized; 2 mic and 2 ext. inputs; bias sw. for CrO ₂ .	
	RK-48 4-Chan.	-	8	H	No	S	30-10K	0.2	-	A.C.	-	10 1/4	79.95	4-chan. or 2-chan. PB; 4 PB preamps.	
LENCO (BENJAMIN)	RAC-10	X	-	H	No	S	40-10K ±1.5	0.3	48	A.C.	-	16	300.00	10-cassette auto changer; may be programmed.	
NIKKO	CR-301	-	8	H	Yes	S	40-12K ±3	0.3	45	120, 240 A.C.	Ext.	24	259.95	Includes AM/FM stereo rec and stereo ctg. player; ctg. ejector and chang. knob in door panel; chan. lock func.	
PANASONIC	RS-275US	X	-	H	Yes	S	30-15K	-	45	A.C.	-	-	249.95	Noise reduction system; auto off; memory rewind; bias switch; records.	
	RS-847US 4-Chan.	-	8	H	-	S	-	-	-	A.C.	-	-	-	Noise reduction system; 2 mtrs; Records; auto eject.	
PIONEER	T-3300	4	-	H	No	S	40-12K	0.2	45	120	-	10	149.95	Auto pop-up; auto-stop; pause control.	
	QT-2100 4-Chan.	-	8	H	No	S	30-12K	0.2	48	120	-	27	249.95	4-chan. PB (Quad 8); Auto 4-to-2-chan. switching; PB only.	
ROBERTS	808	-	8	H	Yes	S	50-15K ±3	0.35	44	-	Ext.	18 1/2 x 9 1/2 x 5 1/2	188	199.95	Records; headphone jack; linear level controls, 2 VU mtrs.; continuous play. 808D, less amps., \$159.95.
	95	X	-	H	No	S	-	0.35	40	-	-	7 3/4 x 10 x 3	4 1/2	99.95	2 VU mtrs.; 3 digit counter; pause switch; stereo mike and line inputs; stereo line output.
	55	X	-	P	Yes	M	-	-	-	-	Built-in	11 1/4 x 3 x 7 3/4	-	59.95	A.C., D.C.; slide vol. and tone conls. 55CM has built-in cond. mike, \$64.95. 55AM/FM has built-in AM/FM radio, \$79.95.
	111	X	-	P	Yes	M	-	-	-	-	Built-in	4 x 6 1/2 x 1 1/2	1 1/2	79.95	Built-in cond. mike; remote control play, record, stop.
SONY/ SUPERSCOPE	160	X	-	H	No	S	20-18K	0.1	49	A.C.	-	17 1/4	199.95	Dual capstan tape drive, peak limiter, tape select, high performance head.	
	165	X	-	H	No	S	30-17K	0.1	49	A.C.	-	20	259.95	Dual capstan tape drive, peak limiter, tape select, auto reverse.	
	TC8W	-	8	H	No	S	45-13K	0.17	52	A.C.	-	-	139.95	Auto record level, auto touch selectron, auto shutoff.	
	127	X	-	H	No	S	30-12K	0.2	48	A.C.	-	10 1/2	139.95	Peak limiter, tape select.	
	CF-300	X	-	P	Yes	M	50-10K	0.28	42	A.C. 6V Batt.	Built-in	11 1/4 x 8 1/2 x 2 1/2	7	119.95	Built-in AM/FM radio, built-in cond. mike, end-of-tape alarm.
	CF-200	X	-	P	Yes	M	50-10K	0.4	40	A.C. 6V Batt.	Built-in	10 x 2 3/4 x 6 1/2	4 1/2	99.95	Built-in AM/FM radio.
	122	X	-	H	No	S	30-12K	0.2	48	A.C.	-	3 1/2	94.95	Sonomatic recording tape pilot.	
STANDARD	T180DK	X	-	H	No	S	30-15K	0.2	50	A.C.	-	8 1/2	199.95	Noise suppression system; CrO ₂ bias switch; AGC in/out; auto off or change.	

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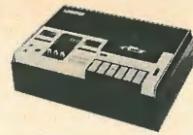


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CASSETTE AND CARTRIDGE MACHINES



Standard T-180DK

TEAC Model 350

3M/Wollensak 4760

MANUFACTURER	MODEL	Cassette	Cartridge No. or Tracks	Type: Portable P, Home H, Car Mount, C	Power Amp. Built-in	Rated Power Output, W	Motor: Stereo, S; Mono, M	Frequency Response, Hz, ±1 dB	Wow and Flutter, %	S/N, dB	Supply Voltage	Speakers-Built-in or External	Dimensions, W x D x H, in.	Weight, Lbs.	Price	SPECIAL FEATURES
3M/WOLLENSAK	8050	-	8	H	No	-	S	30-15K ±2	0.25	52	A.C.	Deck	16 1/2 x 11 1/2 x 5 1/2	15	149.95	Record/player, auto stop, record volume controls for each channel.
	4760	X	-	H	No	0.5 Pre-Amp	S	35-15K ±2	0.15	54	A.C.	Deck	13 3/4 x 9 1/4 x 4 1/2	15	299.95	Auto shut off, heavy duty flywheel, capstan, motor.
	4755	X	-	H	No	0.5 Pre-Amp	S	35-15K ±2	0.15	49	A.C.	Deck	13 3/4 x 9 1/4 x 4 1/2	13	199.95	As above.
	4860	X	-	H	Yes	16	S	35-15K ±2	0.15	49	A.C.	Ext.	13 3/4 x 9 1/4 x 4 1/2	15	219.95	As above.
TEAC	A-23	X	-	H	No	-	S	60-10K ±3	0.23	43	117V A.C.	None	10 x 9 1/4 x 4 1/2	10	139.50	Hys. sync. outer rotor motor; dual VU meters; pop-up cassette loading tray.
	A-24	X	-	H	No	-	S	40-12K ±3	0.2	45	117V A.C.	None	13 3/4 x 9 1/4 x 4 1/2	11	179.50	Auto stop and pinchroller disengage; hys. sync. motor; dual controls; 3 inputs; dual VU meters.
	350	X	-	H	No	-	S	40-16K ±3	0.13	58	117V A.C.	None	16 1/4 x 9 1/4 x 4 1/2	11 1/2	279.50 D	CrO ₂ bias switch; auto stop; peak record level indicator.
	AC-7	X	-	C	Yes	6	S	40-8K	0.3	45	12V Bat.	Ext.	9 x 7 1/2 x 2 3/4	6.6	129.50	Auto reverse PB; servo motor; OTL circuits; ICs.
TELEX	811R	-	8	H	No	-	S	40-15K	0.3	50	-	-	15 x 11 x 4 1/2	-	189.95	HiZ mic. input; channel selector; VU meter; recorder/player.
	811P	-	8	P	Yes	-	S	40-15K	0.3	50	-	Ext.	15 x 11 x 4 1/2	-	159.95	Player; channel selector.
	812-S	-	8	H	Yes	10	S	40-15K	0.3	50	-	Ext.	18 x 11 x 6	-	299.95	Dual VU meter; channel selector; 2 mic. inputs; headphone jack; slide controls; recorder/player.
	814-S	-	8	H	Yes	10	S	40-15K	0.3	50	-	Ext.	18 x 11 x 6	-	349.95	AM/FM/FM Stereo tuner; slide controls; 2 VU meters; pause control; channel selector; recorder/player.
TOYO	335	-	8	H	No	150 MV	S	100-10K	0.3	50	A.C.	None	12 1/4 x 5 x 11 1/2	13 1/4	99.95	Two level meters; headphone jack; includes 2 dyn. mikes; records.
	665	-	8	H	Yes	80	S	40-18K	0.3	50	A.C.	None	-	-	209.95	Records; has AM/FM receiver; includes 2 dyn. mikes.
	404	-	8	P	Yes	5 1/2	S	100-10K	0.3	45	A.C. 12V D.C.	Built-in	14 x 7 x 11 1/2	17	159.95	Records.
	304	-	8	C	Yes	4	S	60-10K	0.3	45	12 D.C.	None	8 1/2 x 3 1/4 x 8 1/2	7 1/2	159.95	FM/FM stereo receiver with auto tuning.
	707 4-Chan.	-	8	H	Yes	20	4-Chan.	60-12K	0.3	50	A.C.	None	18 3/4 x 5 1/2 x 10 1/4	17 1/2	174.95	4-chan./2-chan. player-amp.; inputs for 4-chan. decoder, AUX. phono, phase switch.
	722 4-Chan.	-	8	C	Yes	5	4-Chan.	200-8K	0.35	50	12V D.C.	None	12 1/4 x 4 x 11 1/2	9 1/4	129.95	4-chan./2-chan. player-amp.
V-M	766	X	-	P	Yes	0.8	M	70-7K	0.4	40	A.C. or "C" Bats	Built-in	3 1/2 x 12 x 8 1/2	6 1/2	99.95	Built-in A.C. adaptor; outputs for ext. speaker or earphone; mike input; AM/FM radio; records.
	767	X	-	P	Yes	0.6	M	90-8K	0.4	40	"C" Bats	Built-in	3 1/2 x 8 1/2 x 9 1/2	4	49.95	Outputs for ext. speaker or earphone; AM radio, records.
	762	X	-	P	Yes	0.8	M	80-10K	0.3	45	"C" Bats	Built-in	9 1/4 x 4 1/2 x 2 1/4	4	69.95	Optional telephone pick-up, A.C. adaptor, records.
	761	X	-	P	Yes	0.5	M	60-8K	0.4	43	"C" Bats	Built-in	9 1/4 x 5 1/4 x 2 1/4	2	29.95	Plays only.

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STEREO HEADPHONES

MANUFACTURER	MODEL	Type	Frequency Response, Hz		Impedance, Ohms	Sensitivity mW Input for 100 dBm out	Maximum Input, mW	Distortion, %	Cord Length, Ft.	Weight, Oz.	Price	SPECIAL FEATURES
			±1 dB									
AKAI	ASE-95	Dyn.	25-15K	8	—	—	—	6	16			
	ASE-20	Dyn.	20-18K	8	—	—	—	6	16			
	ASE-22	Dyn.	20-20K	8	1	500	0.1 (1 mW)	6	20			
AKG (NORELCO)	K-120	Dyn.	20-20K	600	1 mW/ 125 dB	20	1.0	9	12	22.50		
	K-60	Dyn.	20-20K	600	1 mW/ 125 dB	20	1.0	9	11	39.50		
	K-180	Dyn.	20-20K	600	1 mW/ 125 dB	20	1.0	9	17	69.00	Subjectively controllable sound.	
ALLIED RADIO SHACK	PRO-1	Dyn.	10-24K	8	—	—	—	10	16	49.95	Volume controls in each earcup.	
	Nova-Pro	Dyn.	20-20K	4-16	—	—	—	10	16	29.95	Volume controls in each earcup.	
	Custom Pro	Dyn.	20-20K	4-16	—	—	—	10	16	22.95	Bassport design.	
	Air-cushioned	Dyn.	40-15K	4-16	—	—	—	10	16	12.95		
ASTROCOM		Dyn.	30-18K	8	1 mW	500	1.0	6	15	39.95	Headpad, earcushions, and cord readily replaceable.	
AUDIOTEX DIV., GC ELECTRONICS	30-5206	Dyn.	40-50K	8	—	60,000	1	12	—	59.95		
BELL & HOWELL	87797	Dyn.	20-12K	8	1 mW	200	1.0	8	10	19.95		
	87796	Dyn.	20-18K	8	1 mW	500	1.0	10	8	9.95	Coiled Cord.	
BEYER (GOTHAM)	DT485	Dyn.	16-18K	5	0.063	200	0.3	10	17	102.50		
BEYER (REVOX)	DT900	Dyn.	30-18K	5-2000	*	200	0.5	6½	9	29.95	*At 1 mW = 114 dB over 2 x 10 ⁻⁴ ybar.	
	DT100	Dyn.	30-18K	5-2000	*	200	0.2	7	9	57.50	*110 dB/mW over 2 x 10 ⁻⁴ ybar. at 400 Hz.	
	DT480	Dyn.	20-18K	25 or 200	*	200	0.1	7	16	75.00	*155 dB/mW over 2 x 10 ⁻⁴ ybar. at 400 Hz.	
BOGEN	EP-10	Dyn.	20-15K ±5	8	1	200	0.5	9	20	29.95	Soft, washable vinyl ear cushions.	
BSR McDONALD	EP-1	Dyn.	20-20K	8	—	—	—	10	5	34.95		
CALECTRO DIV., GC ELECTRONICS	Q4-132	Dyn.	20-20K	8	—	3000	—	6.5	—	17.95	Individual Volume Controls.	
DAVID CLARK	100A	Dyn.	20-18K ±6	17	105	1000	1.2	9	16	50.00	Also available in 300 and 600 ohms.	
	200	Dyn.	30-16K	8	100	500	1.5	9	16	29.00		
	250	Dyn.	30-16K	8	100	500	1.5	9	16	34.00	With vol. control.	
	300	Dyn.	40-14K	8	100	500	2.0	9	16	21.00		
FISHER	HP-100	Dyn.	18-22K	50	2.0	700	0.1	8	10	49.95	Foam cushions; slot-loaded, reverse-driven microphone elements.	
	HP-70	Dyn.	30-18K	16	2.5	500	0.1	8	12	29.95	Foam-filled cushions; easy adjust headband; coiled cord.	
HITACHI	HD-66	Dyn.	20-18K	8	—	500	1.0	6½	12½	23.95		
KLH	80	Dyn.	20-20K ±4	600	0.06	1.66	<1.0	10	11¼	49.95	Coiled cord; headband conforms to head; can be used w. any amp impeded. 0 to 600Ω.	
KOSS	PRO/4AA	Dyn.	10-20K ±12	2.0	150 @ 1 kHz	—	<0.5 @ 110 dB SPL	10	19	60.00	Prof. use, oversize diaphragm compliance ring, 1 in. voice coil	
	KO/727B	Dyn.	10-18K ±12	3.2	5 @ 1 kHz	—	—	10	19	34.95	3½ in. diameter driver units.	
	KRD/711	Dyn.	10-17K ±12	300	35 @ 1 kHz	—	—	10	12	29.95	Lightweight; flexible, high strength polypropylene headband; PVC earcushions.	
	ESP/9	Electro- static	10-19K ±5	8-50	3000 @ 1 kHz	—	<0.2 @ 110 dB SPL	6	19	150.00	Wide-range response, for critical monitoring, delivers all 10 audible octaves.	
LAFAYETTE	F2001	Elect.	5-35K	8-16	—	—	—	10	21	59.95	4½ x 5 in. earcushions; comes w. self-energizer.	
	F1000	Dyn.	20-20K	8	—	—	—	6	15	39.95	Two 2½-in., 2-way woofer-tweeters; left and right vol. controls.	
	F990	Dyn.	20-20K	8	—	—	—	6½	14	29.95	Two 3½-in. speakers.	
	SP55	Dyn.	30-15K	8	—	—	—	5	15	11.95	Two 2½-in. speakers; air-cushioned headband.	



Sharpe 770



Stanton 5750



Beyer (Revox) DT 900



Koss 2+2 Quadrafone



Fisher HP-100

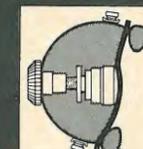
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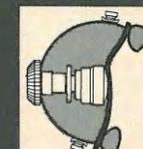
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MAXIMUS	HP-1	Dyn.	25-18K	8	1.0	1000	1.0	10	12	12.95	Adjust. padded headbands; vinyl-covered foam earcushions.
	HP-2	Dyn.	25-18K	8	1.0	1000	1.0	10	13	19.95	Adjust. padded headbands; vinyl-covered foam earcushions; vol. cont. on each earpiece.
	HP-3	Dyn.	18-20K	8	1.0	1000	1.0	10	15	29.95	Adjust. headband; vinyl-leather foam earcushions, indiv. vol. cont.; stereo-mono selector.
MB (STANFORD)	K 600	Dyn.	16-20K	16	0.2	400	0.3	8	21	69.95	
	K 66	Dyn.	20-17K	16	0.15	100	-	8	6	21.95	
PIONEER	SE-50	Dyn.	20-20K	4-16	-	500	-	16	24	49.95	Vol. and treble controls; w. storage box, padded band and cups.
	SE-30A	Dyn.	20-20K	4-16	-	500	-	8	14	34.95	Padded band and cups; w. storage box.
	SE-L20	Open Air	20-20K	4-16	-	500	-	-	-	39.95	Open air type.
	SE-L40	Open Air	20-20K	4-16	-	500	-	-	-	29.95	Open air type.
PML (ERCONA)	D42 Deluxe	Dyn.	30-20 kHz	200	0.3	-	2.0	6	9½	29.95	
	RDF224	Dyn.	20-18 kHz	8	1.0	100	1	8	12	24.95	
ROLECOR	Rotel RH-700	Dyn.	20-20K	8-16	-	500	1.0	12	12	25.00	
SANSUI	SS10	Dyn.	20-20K	8	-	500	-	9%	22	29.95	Sep. vol. conts.; coiled main cord plus extension cord with Y adaptor for 2 headset connection.
	SS2	Dyn.	20-18K	8	-	1000	<1.0	6	12½	19.95	
SENNHEISER	HD414	Dyn.	20-20K	2K	1 mW for 102 dB	-	1 at 122 dB	10	5	33.95	Detachable.
SHARPE	770	Dyn.	20-20K ±3	4-16	0.82	1K	0.6	14	19	100.00	Response tracings; vol. controls; fused; coiled cord; liquid-filled earcushions.
	660	Dyn.	20-20K ±3	11	0.82	1K	0.6	14	19	60.00	Fused; coiled cord; liquid-filled earcushions.
	Mk II	Dyn.	30-15K ±3	8	0.23	2K	0.3	14	18	45.00	Coiled cord; liquid filled earcushions.
	10B	Dyn.	30-14K ±3	8	0.28	2K	0.4	14	18	39.95	Coiled cord; liquid-filled earcushions.
	7	Dyn.	15-20K ±5	8	0.34	1K	0.9	14	7	19.95	Liquid-filled earcushions.
SONY/ SUPERSCOPE	DR-7A	Dyn.	25-18K	8	-	500	-	10	8	14.95	Coil cable.
	DR-6A	Dyn.	20-20K	8	-	110	.5	6	13.5	29.95	
STANTON	5700	Electrostatic	20-20 kHz ±6 dB	4, 8, 16	2v/100 dB SPL	5000	>1%	11	15	159.95	Level-sensitive circuit passes 130 dB peaks, but disconnects when level exceeds 110 dB for extended periods. Reset buttons restore operation.
	5750	Dyn.	30-18 kHz ±6 dB	12	.11v/100 dB SPL	500	>1%	10	28	59.95	Two-way, separate dynamic woofer and tweeter with individual L-C crossover.
SUPEREX	PEP-71	Elec.	10-22K	4-16	5 W.	20 W.	0.02	15	12	99.00	Separate console cont. w. vol. conts.; Polarization self-energized or 1 mV a.c.; can accept two phones.
	ST-PRO B-V	Dyn.	16-22K	4-16	-	2000	0.05	15	23	59.95	Dynamic woofer; ceramic tweeter; replaceable cushions. Z, 600, 2000, or 15K avail.
	ST-PRO B	Dyn.	16-22K	4-16	-	2000	0.7	15	20	50.00	As above.
	SST	Dyn.	20-20K	4-16	-	2000	0.85	15	18	39.95	Dynamic woofer; ceramic tweeter; vol. and tweeter conts.
	SW-2	Dyn.	40-15K	4-16	-	2000	0.85	15	15	24.95	
ST-F	Dyn.	30-18K	4-16	-	1000	0.7	15	10	24.95		
TEAC	HP-101	Dyn.	18-20K	8	1	500	-	6½	13.7	25.00	Mylar diaphragm; adjustable headband.
	HP-102	Dyn.	18-20K	10K	1	500	-	6½	13.7	25.00	As above.
TELEX	Studio I	Dyn.	20-22K	3-16	105 dB SPL/mW	1000	1.0	25	24	99.95	Slide tone and vol. controls for each channel; surgical silicone earcushions and headband; padded carrying case.
	Studio II	Dyn.	20-22K	3-16	105 dB SPL/mW	1000	1.0	25	24	84.95	Surgical silicone earcushions and headband; padded carrying case.
	Serenata	Dyn.	20-20K	3-16	-	2000	0.5	8	16	59.95	Liquid-filled earcushions; padded carrying case.
	Encore	Dyn.	50-18K	4-8	-	5000	1.0	8	11	9.95	Lightweight; adjustable.

Canby's Capsules...

Nicolas Slonimsky: Studies in Black and White, Suite for Cello and Pf., Vars. on a Brazilian Tune, Gravestones of Hancock, N.H. N. Slonimsky, pf., Nancy Bramlage, sopr., Jerome Kessler, cello. Orion ORS 7145, stereo, \$5.98

Slonimsky, Russian-Am. writer, pianist, lecturer now in his 70s, was pronounced genius at six—by mother. A colossal ego, his boasting is tempered by good sense of fun—see his liner notes on this disc! His music is “old fashioned,” out of the naughty late 20s in style, a florid Poulenc or late Satie, full of tricks. Once outrageous, it now is merely amusing for its good style and solid construction, easy on the ears. His earlier music is best; the musical gravestones from N.H. are pretty mannered. Slonimsky’s still-potent piano dominates the recording—cello and soprano are pushed into background. A personality, all right! Cowed the engineer?

Rheinberger: Piano Sonata in F Sharp mi., Op. 185 (“Romantic”). Jensen: Sonata in F Sharp mi., Op. 25. Adrian Ruiz. Genesis GS 1005, stereo, \$5.98.

Two “rediscovered” Romantics, their two piano sonatas very much worth hearing if not first-line material. Born in the 1830s, both were top musicians in their day in Germany. Rheinberger’s big, handsomely poetic work reminds strongly of Brahms, but more relaxed and easy-going-nice. Jensen took Schumann and Chopin as models with bits of Liszt; he is more didactic but his slow movement equals plenty of Schumann, a real beauty for Romantic effect. Pianist Ruiz is superb in this Romantic music, highly communicative and natural. Good piano sound too.

Village Music of Bulgaria. Collected and produced by Ethel Raim and Martin Koenig. Nonesuch Explorer H-72034, stereo, \$2.98.

Extraordinary! That such primitively sophisticated music as this should still exist for collection in an almost-Western country. Wierd nasal voices, incredibly elaborate vocal ornament, strange non-harmony and dissonance, exotic instruments, all in excellent stereo and, in many selections, at length—long enough to enjoy. Typical of this remarkable series of recordings. Compare with the state-produced “folk” recordings. Some difference!

Schütz: The Resurrection (Historia der Auferstehung Jesu Christi). Peter Pears, Robt. Tear, J. Shirley-Quirk, et al. Eliz. Consort of Viols, London Cornett & Sackbut Ensemble, Heinrich Schütz Choir, Norrington. Argo ZRG 639, stereo, \$5.98.

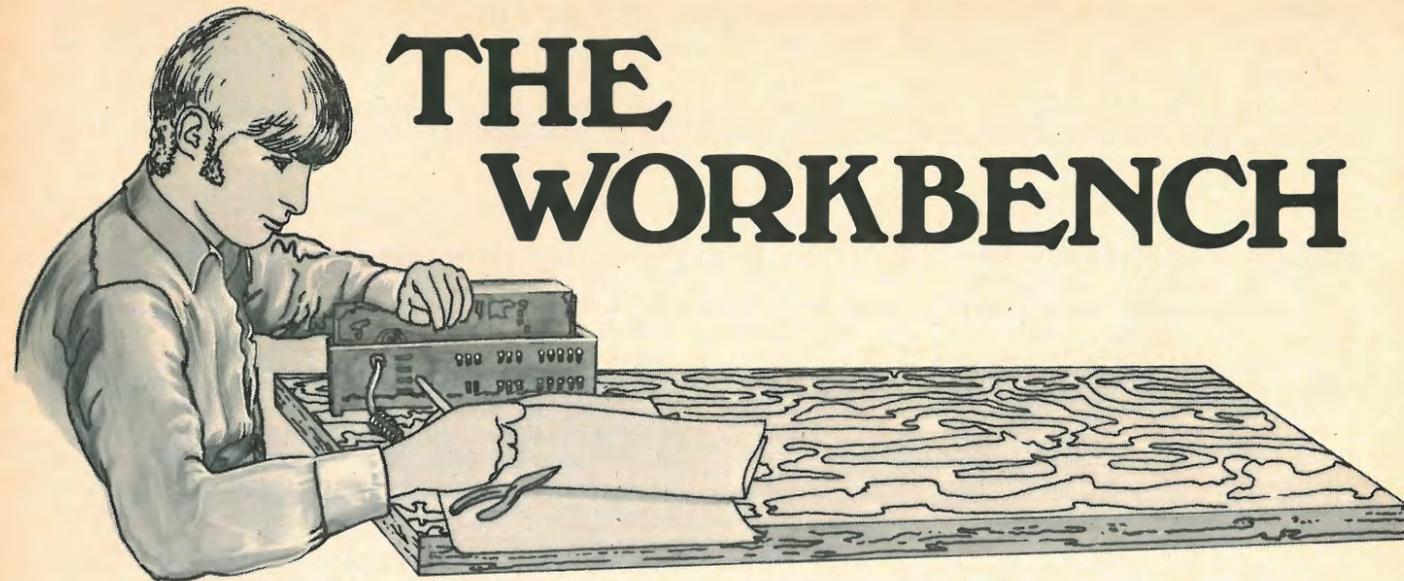
A very British performance of Schütz—you could tell in a moment: big, eloquent voices full of rich vibrato, the drama understated and hushed. If you enjoy these big voices, mostly singing in pairs and groups, this is an effective job—the music, a halfway type, with each name-part sung by two or more voices, is not easy to put over. Much “authentic” extra ornamenting in the viols, etc. is good idea and helps. Peter Pears, now a baritone, sings a controlled narrator but can’t suppress his distractingly wide tremolo. Grand noisy ending with boy sopranos, sackbuts, the works.

John Field: Concerto No. 1; Johann Hummel: Rondo Brilliant on a Russian Folk Theme. Felicia Blumental, piano; Vienna, Prague Ch. Orchs., Froschauer. RCA Victorla VICS 1533, stereo, \$2.98.

These two near-contemporaries of Beethoven were truly great—but soon forgotten. Irishman Field was apprentice to Clementi and a superb pianist; this Concerto from age 17 is charming combination (for our ears) of Mozart, Beethoven, and a piano technique like Chopin. Hummel was a bigger, more solid composer; his big Rondo also sounds Chopin (who was 12), and Weber in the tuneful main theme. Blumental is good if occasionally edgy-hard in tone; her two orchs. are OK in spirit but the flesh is occasionally weak.

Piano Music of Erik Satie, Vol. 4. Aldo Ciccolini. Angel S 36714, stereo, \$5.98.

There’s only ONE pianist for Erik Satie, that humorous old goatbeard Frenchman whose outrageous musical titles (one set here: “New Cold Cuts”) are now all the rage: Ciccolini is miraculous—no better word for it. The stuff can be banal (it is underplayed in the writing) but this man makes it positively poetic. Some items here were not published until after WW II and are hardly known. Get this quick!



THE WORKBENCH

Eico Model 902 IM/HD Distortion Meter

MANUFACTURER'S SPECIFICATIONS

VTVM: Ranges, 0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30, 100, 300 volts rms. **Frequency:** 0 dB from 10 Hz to 100 kHz, 3 dB down at 300 kHz. **dB range:** -20 to +2. **Impedance:** 2 megohms shunted by 15 mmf. **Accuracy:** ±4% of full scale. **Harmonic distortion ranges:** 20 to 20,000 in 3 bands. **Impedance at input terminals:** 500 kilohms. **Distortion ranges:** 0.3, 1, 3, 10, 30 and 100%. **Accuracy:** ±5% of full scale. **IM distortion:** Ratios of HF to LF: 4:1 and 1:1. **Output termination:** 600 ohms internal or external. **Distortion ranges:** 0.3, 1, 3, 10, and 30%. **Accuracy:** ±5% of full scale. **Price:** \$250.00 (not sold as kit).

Test equipment for measuring distortion is not particularly cheap but the EICO 902 helps to bring it within the reach of many audio enthusiasts. It consists of a harmonic distortion bridge, an IM analyzer, and a valve voltmeter all in one package, and of course this makes it a most useful instrument for the service engineer as well as for in-line factory testing. The only extra equipment required for comprehensive amplifier distortion measurements is a scope and an output meter, plus the appropriate load resistors.

Reading from left to right are the input terminals, meter range switch with concentric level control, and the operation switch which is combined with a concentric LF level control. Then follows the IM output level control and output terminals. Underneath are the external generator input jacks and slide switches for IM ratios and 600 ohm output termination. The meter has a large, clear 4½ in. scale and in the middle of the panel are the HD balance controls and range selector which is combined with the power on-off switch. The frequency dial on the right has a slow motion drive and it covers the band from 20 to 20,000 Hz in three ranges. The hole just discernible on the left side of the case gives access to the meter calibration control.

The voltmeter circuit is fairly conventional with a cathode-follower input stage connected to a pentode-triode combination via the meter range switch. The meter itself has a 200 micro-amp movement and it is connected to the anode of the triode. Four rectifiers are used in the normal bridge arrangement and a calibration control is wired into a feedback loop from the meter to the cathode of the pentode. Specifications claim an accuracy of 4% FSD and this was confirmed. The average error was less than 3%—a very creditable performance and even these figures could be improved by adjusting the calibrating control to give a larger minus deviation. Figure 2 shows the

actual a.c. test figures compared with a Western lab standard, and it will be noted that accuracy is well maintained down to the lower end of the ranges not normally used. (A 20 mV measurement should be taken with the 30 mV scale—not with the 100 mV.) The d.c. ranges were almost identical with an average maximum error of less than 2.5%. Frequency range was -0.5 dB at 100Hz and reached the -3 dB level at 320 kHz. At the low end, response was 0.5 dB down at 20 Hz and 2 dB at 10 Hz. The dB scale is referred to 600 ohms impedance with 0 dB at 0.775 volts.



Fig. 1—EICO Model 902 IM/HD Distortion Meter.

Harmonic Distortion

Figure 3 shows a block diagram of the circuit used. The Wien bridge in the center rejects the fundamental frequency and the various harmonics are then measured as a whole and expressed as a percentage of the input (see "Amplifiers: A Look at Requirements and Specifications," AUDIO, April, 1971). In operation, the signal from the amplifier under test (usually 1000 Hz) is applied to the appropriate load resistor and to the input of the 902. The dial is set to the frequency used, function switch to "CAL" position, and the meter range to "HD." Then the level control is adjusted for full-scale meter reading, and then the function switch turned to "% DISTORTION." Finally, the frequency dial, balance control, and meter switch

SCALE	Bold face listing is input voltage light face is Eico reading					Max. error (F.S.D.) %
10mV	2 1.97	4 3.95	6 5.95	8 8	10 10.2	2
30mV	6 6	12 12.5	20 20.5	25 25.3	30 31	3.3
100mV	20 19.5	40 40	60 61	80 82	100 103	3
300mV	60 59.5	120 120	200 202	250 253	300 305	2
1V	0.2 0.197	0.4 0.4	0.6 0.6	0.8 0.81	1.0 1.04	4
3V	0.6 0.58	1.2 1.2	2.0 2.0	2.5 2.6	3.0 3.1	3.3
10V	2.0 1.98	4.0 3.9	6.0 6.0	8.0 8.1	10.0 10.25	2.5
30V	6.0 5.8	12.0 12.0	20.0 20.1	25.0 25.2	30.0 30.7	2.3
100V	20 19	40 38.5	60 60	80 81	100 102.5	2.5
300V	60 59.5	120 120	200 203	250 255	300 307	2.3

Fig. 2—Tests of the a.c. voltmeter section.

are all adjusted and readjusted for minimum meter reading—which is then read off directly as a percentage. Sounds a little complicated, but in practice it is quite easy and measurements can be taken in two or three minutes. Now, if the balance and frequency controls are not positive and free from backlash, it will be difficult to get a proper "null" but the 902 is commendably free from these defects and operation is simplicity

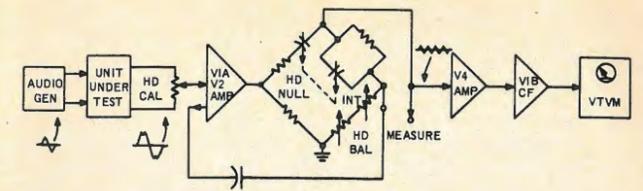


Fig. 3—Showing configuration for HD measurements.

itself. Drift was negligible although the instrument must be switched on at least five minutes before using. The signal generator must be stable too! How about accuracy? Well, ±5% (FSD) is claimed and this means that a 1% reading could indicate a true figure of 0.95% to 1.05%—not very significant for most purposes. These figures were confirmed by a comparison with a Radford lab standard which costs a great deal more than the 902. Where the lab instrument scores is in extreme accuracy and the ability to measure distortion down to something like 0.005%. The 902's lowest readable figure is about 0.075% where the residual hum and noise become apparent.

Intermodulation Distortion

This is a two-frequency test using a 60 Hz signal derived from the a.c. power line in conjunction with a 7000 Hz signal from a Colpitts oscillator. A switch gives a choice of 1:1 or 1:4 mixing ratios. This 7000-60 Hz combination conforms to the SMPTE and other standards but jacks are provided for the use of other frequencies from external sources if so desired. Again, an accuracy of +5% is claimed and this was borne out in our tests. The lowest readable distortion was found to be about 0.1%.

All in all, the 902 is a very versatile piece of equipment offering excellent value for the money. It is well-made and should give years of trouble-free service. The instruction manual contains much useful information such as output voltage-power tables, load impedance nomographs for dB correlations, DBM figures, and so on. T.A.

Check No. 86 on Reader Service Card



Logiclock

Makers: Logiconcept, Inc., Torrance, Calif. 90501. \$99.95

Digital clocks are now pretty common although most of them are mechanical (drum digital), and many of the cheaper ones are surprisingly noisy in operation. However, the Logiclock kit under review is completely electronic as it uses IC logic units with Numitron read-out tubes. These give a large, bright display that can easily be read from a distance of several feet. The Logiclock is not cheap but it is accurate (assuming the power line frequency does not vary), and it does provide experience with ICs and counter circuits. Then there is the domestic prestige value—not to be ignored. I don't know whether it is due to the association with clocks with gears, springs, and exotic items like pinwheels and escapements but—take it from me—a clock builder gets a respect not normally given to those who make simple things like receivers or amplifiers!

Be that as it may, let's take a brief look at the circuit. Basically, the operation is dependent on the 60 Hz power line

frequency (normally controlled to a high degree of accuracy) which is taken to a divide-by-60 counter circuit which gives the second pulses. These are fed to an IC which drives the Numitron read-out. The second pulses are then taken to other counters that divide by 60 for the minutes and 12 for the hours. There is a provision for 24 hour indication which has to be determined when building the kit as it depends on the position of an IC. A total of 15 ICs are used, plus three transistors for the stabilized power supply. Push-button switches allow the counts to be stopped so the clock can be started at the correct time. Although the instructions are written for the novice—especially in regard to soldering—a certain amount of technical knowledge is necessary as the directions are not as clear as they should be. Then too, mounting of the ICs to the board was a little difficult as the holes (14 of them) give inadequate clearance. On a production line a jig would be used but it is a fiddling job for the home constructor. These criticisms aside, I must say I was impressed with the kit. The circuit board is computer-grade fiberglass and the components are of excellent quality. Considering that the voltages used are relatively low—only about 5 volts—the Logiclock should function for years without any trouble. The metal case is covered with a walnut finish plastic and measures 10 in. wide by 6 in. deep and 3 in. high overall. Allow 3 hours for assembly—less if you have had experience in putting ICs on printed boards! G.T.

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Heath 5 in. Oscilloscope Model IO-102

MANUFACTURER'S SPECIFICATIONS

Tube Size: 5 in.; 6 × 10 cm viewing area. **Sweep generator:** Recurrent, automatic sync. **Range:** 10 Hz to 500 kHz in five ranges. **Vertical channel, Input impedance:** 1 megohm shunted by 35 pF. **Sensitivity:** 30 mV peak to peak. **Frequency:** D. C. to 5 MHz ± 3 dB. **Attenuator:** 3 position, compensated, X1, X10, X100. **Horizontal channel, Input impedance:** 1 megohm shunted by 50 pF. **Sensitivity:** 0.1 volt/cm. **Power requirements:** 110 to 130 V a.c. or 220 to 260 V a.c., 50 to 60 Hz, 70 watts. **Dimensions:** 12¾ in. H, 9¼ W, 16¼ D, inclusive. **Weight:** 27 lbs. **Price:** \$119.95 (kit).

The best way to save money on test equipment is to do-it-yourself, and as far as oscilloscopes are concerned, Eico, Knight, and Heathkit offer a wide range of models, from \$60.00 up. The Heathkit IO-102 reviewed costs rather more at \$119.95, but it is a d.c. scope and many will find this facility well worth the extra cost. Vertical bandwidth is 5 Mcs and the rise time is 80 nanoseconds—fine for square wave testing. Operating controls are: vertical attenuator (a.c. and d.c.), gain control, horizontal gain, and frequency selection with vernier. At the top are controls for intensity, focus, and both horizontal and vertical positions. The power switch is combined with the

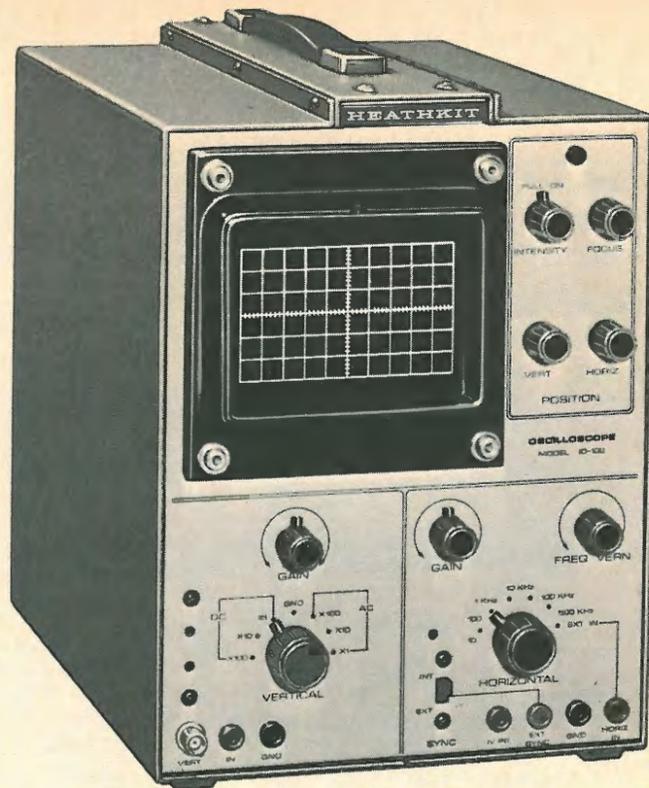


Fig. 1—Heath 5 in. Oscilloscope, Model IO-102

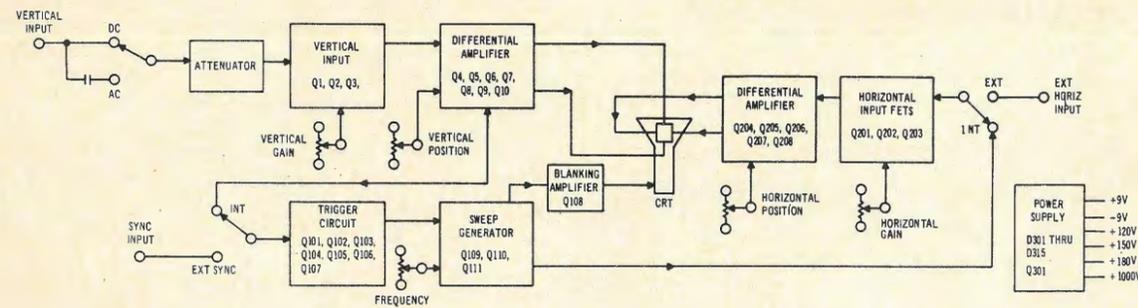


Fig. 2—Block diagram of the circuit.

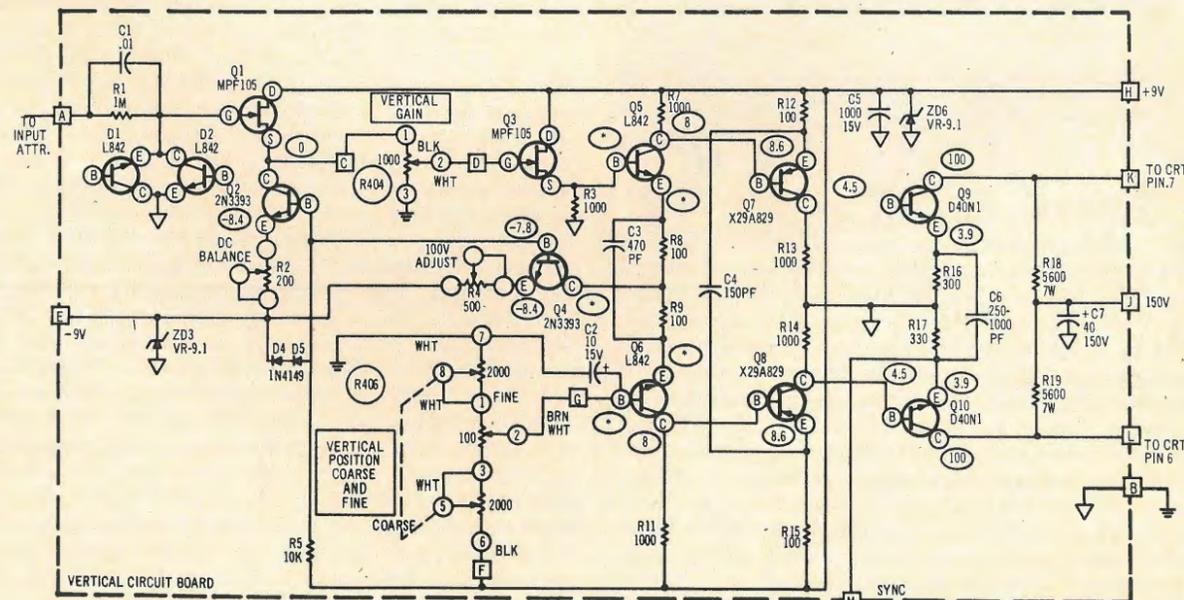


Fig. 3—Schematic of the vertical push-pull amplifier.

intensity control, and a slide switch located at the bottom allows the injection of an external sync signal. A one volt (pp) output is available from a socket on the front panel.

Figure 2 shows a block diagram of the circuit which uses 36 transistors including five FETs. The tube itself is a 5 DEPI, which gives a medium persistent, bright green trace. Figure 3 shows the schematic of the vertical push-pull amplifier, and it will be seen that both positive and negative voltages are used. Note also that the output transistors operate at 100 volts. The two transistors at the input are connected as diodes and their purpose is to prevent high transient peaks from reaching the first transistor Q1.

How It Went Together

The majority of the components are mounted on four circuit boards—vertical amplifier, horizontal amplifier, sweep, and power supply. No great problems were encountered here; the positions of all the components were clearly marked and the instructions written in easy-to-understand language. After all, Heathkit has had many years of experience in this field and they know where the possible sources of trouble are! The manual is lavishly illustrated with photographs and large pull-out diagrams as is the Heathkit custom, and it is very difficult to see how anyone could make a mistake. That is, providing they follow the instructions and resist the temptation to “jump steps!” I was impressed with the high quality of the metal work—all the pieces went together smoothly without using force or bending. The screw holes lined up beautifully and in fact, the kit as a whole was a pleasure to put together. How long did it take? Well, I took about 13 hours spread over three weekends, but I was in no hurry and I *did* have distractions, so I am sure it could be assembled in 10 hours or so. Figure 4 shows sample waveforms.

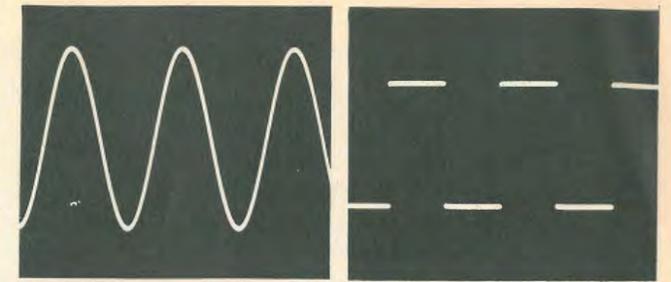


Fig. 4—Sample waveforms 1K Hz.

Many Heathkits can be made without test instruments of any kind but the IO-102 *does* need setting up, and here a VTVM or high resistance voltmeter is necessary. The d.c. amplifiers have to be balanced and voltages set for optimum operation, and if this is not done accurately the trace will not be stable and a large discrepancy could result in a distorted waveform. I used a Heath V7a (which has seen more than 12 years of faithful service and is still as good as new) and the whole setting up operation, balancing, trace centering, and so on took about 20 minutes. Since all relevant voltages are stabilized (no fewer than 11 zener diodes are used), stability was very good—although the instrument should be switched on at least five minutes before use if measurements are to be taken. Internal sync was excellent and spot size was good. No trace of hum was observed—partially due to the use of a Mu-metal screen. Summing up, the IO-102 is a very fine general purpose 'scope suitable for audio or TV applications and can be recommended. Incidentally, for those too lazy to assemble it, the price completely wired is \$179.95. But, of course, you miss the fun in building it! T.A.

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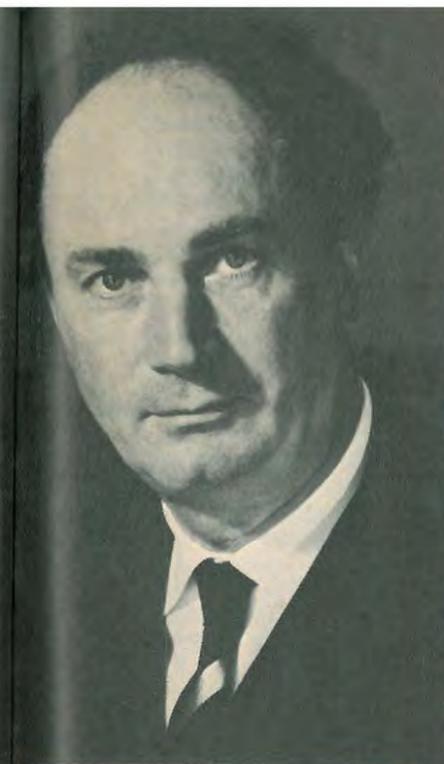
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RAFAEL KUBELIK: A Direct Line to Mahler

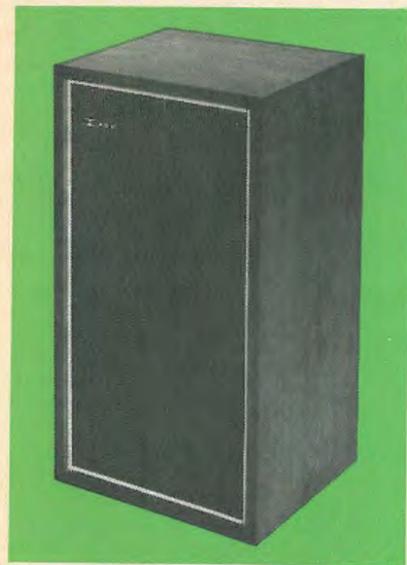


DURING THE final session for Rafael Kubelik's recording of Mahler's Seventh Symphony with the Bavarian Radio Symphony Orchestra in Munich last November, some of us present noticed for the first time that there were *two* telephones attached to the conductor's stand. One of them, we knew, enabled Kubelik to converse with Hans Weber, the "artistic supervisor" for the sessions, in the Deutsche Grammophon control room above the Herkules Saal, but what was the other for? The perceptive young woman sitting beside me had the answer at once: "It must be a direct line to Gustav Mahler!"

After six remarkably rich days of rehearsals (five), concerts (two) and recording sessions (five) devoted to the Seventh, that remark seemed eminently sound. A great many Mahler devotees who have never been in Munich, in fact, have felt the same way ever since DGG issued its first installment in Kubelik's recorded Mahler cycle, the Ninth Symphony, at the end of 1967, and that impression has deepened with each succeeding release (and, of course, with his live performances in this country during the last few years, both with his own splendid orchestra on its first U.S. tour and as guest conductor of the Boston, Chicago and Pittsburgh orchestras). The Seventh was the penultimate undertaking in that cycle, which was completed six weeks later with the taping of the Fifth. These two recordings and that of the Eighth, taped last June, will be issued in a fourteen-disc collective album (DGG 2720033) this fall; that set's other components—the other six symphonies and the *Adagio* of the uncompleted Tenth (packaged



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with No. 6)—have already appeared individually.

It may be noted that Kubelik has become the first conductor to record all the Mahler symphonies with a single orchestra, as well as the only one so far whose "complete cycle" includes the *Adagio* of No. 10. Leonard Bernstein, who completed his survey of the Mahler symphonies for Columbia in 1967, recorded eight of them with the New York Philharmonic and one (No. 8) with the London Symphony Orchestra; his set does not include any part of No. 10. Georg Solti conducts three orchestras—the LSO, the Chicago Symphony and Amsterdam's Concertgebouw Orchestra—in his Mahler cycle for London/Decca, which is also to be completed this year and may include the entire Tenth in Deryck Cooke's performing version. Maurice Abravanel and the Utah Symphony, on Vanguard, have given us six of the symphonies so far (all but Nos. 1, 5 and 6 of the standard nine), while Vanguard has issued a Fifth with Václav Neumann and the Leipzig Gewandhaus Orchestra and a First with the late Sir John Barbirolli and the Hallé Orchestra. Bernard Haitink and the Concertgebouw Orchestra, on Philips, have accounted for seven of the nine (leaving Nos. 5 and 8 to go). There is no word so far as to whether Abravanel or Haitink will record any part of No. 10. The Abravanel, Bernstein, Haitink and Solti cycles, incidentally, have all been spread over much more time than the four years in which Kubelik completed his.

As may be seen from the foregoing tabulation, such terms as "all" and "complete cycle" are somewhat flexible when applied to the Mahler symphonies. Eugene Ormandy and the Philadelphia Orchestra have recorded the entire Tenth on Columbia, in the Cooke version, and have also done the five-movement version of the First for RCA. Kubelik is against performing any part of the Tenth that was not actually completed by Mahler himself, and so limits himself to the *Adagio*; he also rejects the insertion of the recently revised "Blumine" movement in the First because Mahler himself deleted it and never reinstated it.

With or without the Tenth and "Blumine," the Mahler symphonies constitute one of the most fascinating sequences of works in a given form by any single composer, and one of the most exhausting—emotionally as well as technically—for both the listener and the performer. Heaven-storming, soul-searching, visionary, tragic, grotesque, sublime, ironic, exultant—Mahler is all of these and more, with all the paradox, too, that such an observation implies.

With less variety from one work to another than the symphonies of Beethoven but far more than those of Bruckner, Schubert or Dvořák (to mention only those who produced symphonies in sets of nine, ignoring the numerical complications of the Schubert and Bruckner series), those of Mahler are distinguished not merely by their length (Bruckner wrote long ones, too) or their demands in terms of performing personnel, but by their unremitting and often graphic *intensity*. The music is so obviously emotional in content that many consider it shamelessly self-indulgent, or even something like an aural narcotic, while others find a unique spiritual-philosophical quality in it. In any event, it is this quality, most of all, that makes it hard to be indifferent to Mahler: one either commits oneself to this music without reservation or finds it repellent and distasteful.

Kubelik, of course, is thoroughly committed. If that revelatory recording of the Ninth established an uncommon degree of identification between interpreter and material (reconfirmed in subsequent releases), it must be acknowledged that commitment of the sort that goes deeper than a mere study of the scores is by no means unusual on the part of musicians drawn to Mahler. Interpretations may vary from one conductor to the next, as they do in Brahms and Prokofiev, but what the great Mahler interpreters have in common is their passionate *involvement* with this extraordinary music. Talking with Kubelik last fall, I referred to Toscanini's celebrated remark about the first movement of the *Eroica* at the beginning of a rehearsal—"To some people this music is Napoleon, to others it is Bismarck; to me, it is *Allegro con brio!*"—and I asked if he thought it possible to take such an impersonal approach to the music of Mahler. His answer was not surprising, for many enthusiasts find finite moral and philosophical concepts in Mahler's scores, and Kubelik readily identified himself as one of them.

"Read Dostoevsky," he said; "compare Van Gogh, or Janáček. They're all like Mahler; they all went after ideas of human trouble, human tragedy. Today Mahler's music is understood at last, after two world wars. Why wasn't it understood before? Because before, those who listened heard only the bloody cowbells or the hammer-blow; they heard some superficial sounds of jubilation or the birdcalls in the First Symphony, but they didn't hear what these sounds *meant*."

"As for '*Allegro con brio*,' if you know the score beforehand and you are acquainted with the impact of Mahler's

music, then an indication of that sort is very valuable, because nobody was as controlled in his markings as Mahler. He was such a master in his approach to a score; his experience as a conductor was tremendous, and nobody ever had so many precise markings in a score as Mahler. But, of course, one cannot read the *meaning* of a work from a tempo marking, whether Mahler's or Beethoven's.

"I feel this way about Mahler: for me, his heart is one of the strongest hearts any artist or any writer or any philosopher has shown the world. His heart beats for mankind. His heart is like Beethoven's. One says Beethoven broke through boundaries, which is true, but he broke through those boundaries in an emotional sense, not a formalistic sense: he did not break the form itself, but enlarged it and expanded it through the emotional impact of his music. In the last string quartets, for example, he *had* to enlarge the existing form until he became almost rhapsodic. Given the seventy years of development between Beethoven's time and Mahler's the impact of Mahler's music is, proportionately, of the same nature as that of Beethoven's—also further expanding the boundaries of form through emotional content and emotional emphasis.

"Mahler went into regions which were not known to music before, and this is what some people in his own time didn't like. He was 'shameless,' to be sure, in his outspokenness. Everyone said one *shouldn't* be sometimes trivial, one *shouldn't* be sometimes vulgar, one *shouldn't* be sometimes brutal, one *shouldn't* be sentimental. *Why not?* Mahler said, '*Why not?* We are human beings, and human beings are all these things—and also sometimes hopeful, sometimes noble, sometimes glorious.' This is the same thing Beethoven said, but in Beethoven's time expressiveness of this kind in music had not gone so far. Both Mahler and Beethoven were bound to their times, remember. Mahler was one of the first expressionists; his color in his orchestration, his whole modification of certain dynamics and his tempo-changes are just details of a tremendous 'emotional quick-change.' It had to be like that, or he couldn't have said the things he wanted to say in his music.

"What was new in Mahler had nothing to do with form—it was a time of eccentricities, after all—what was new was his courage, his courage to say things people were afraid of, things they didn't want to hear: 'We are human, trivial sometimes, even ugly, but we should strive to find a better self.' And *he* did. In his symphonies the apotheosis is never an empty one, never just so much

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noise and self-congratulation; there is a real metamorphosis."

In speaking of "apotheosis," Kubelik cited various complaints about the finales of the Mahler symphonies, and about that of the Seventh in particular. One of the great pitfalls in conducting Mahler, he stressed, is the temptation to break up the music into unconnected episodes, and this temptation is strongest in such a movement: "It's like a circus, there is so much going on—fanfares, marches, and in come the ballerina and Pierrot in a little dance—but all these things must be tied together. In such a movement it is especially important that the conductor grasp the unbroken arch of its development; otherwise the elements of vulgarity and banality, which Mahler very consciously put in here, cannot be balanced by the nobler elements but will overwhelm them. That balance is unusually critical in this work; if it is off the slightest bit, it just doesn't work."

It worked beautifully for Kubelik, though. As in all his Mahler performances, the Seventh was brought off without wallowing, without any "traditional" fattening of the texture or contrived overemphasis, and, indeed, without the listener's being conscious of "interpretation" at all. Even in such a passage as the climax of the great final *Adagio* of the Ninth Symphony, Kubelik displays the same elegant clarity of line one hopes for in a Mozart performance, ensuring the recognition that it is an apotheosis, and a convincing one.

Kubelik's tempi are on the brisk side generally, and his handling of the first movement of the Sixth Symphony, in particular, has met with a good deal of criticism on this count. He has remarked that the question of tempo itself is one of the least important considerations in an interpretation, provided the interrelationship of tempi within each movement, and between movements, be in order, and that each movement unfold in a single great arch instead of episodically. There is room for a wide divergence of outlook on this point. Kubelik's own tempo for the finals of the Seventh Symphony is a bit faster than Bernstein's, and Klemperer's is astonishingly slow (his overall timing for the movement is half-again as long as Kubelik's), yet all three maintain the sense of continuity and *intensity* required to bring it off. A similar discrepancy may be observed between the Kubelik and Barbirolli approaches to the first movement of the Sixth, with Kubelik again very fast and Barbirolli terribly deliberate, but both, in their different ways, are more convincing than Bernard Haitink, whose tempo is ideal

(a bit slower than Kubelik's, but nothing like Barbirolli's), but who lacks some of his competitors' intensity. (Haitink is more successful with the finale of No. 7, in which his tempo stands at roughly the same point between those of Kubelik and Klemperer.)

It may be worth noting that most composers who have conducted their own music, from Wagner to Stravinsky, have favored a straight-forward approach, with brisker tempi than those of other interpreters. This was brought to mind in listening to Kubelik's recording of the Mahler second (the *Resurrection* Symphony), in which his pacing of the final movement is again among the fastest on records. His grasp of the score enables him to make every point without slowing down for artificial "spotlighting." There is nothing "ceremonial" about his presentation; instead, the music moves with an air of great spontaneity. The dozens of effects in the development section preceding the entrance of the chorus, effects so often either submerged under the weight of ponderous self-consciousness or thrown into grotesque relief by means of an agonizing shifting of gears, are all the more telling as they flash by in this continuous and evidently self-generating sweep—and definitely in no danger of being missed.

Although he was only thirty-three when he first conducted a Mahler symphony in 1947, he considers it "relatively late in my career." By that time he had been conducting the Czech Philharmonic for about a dozen years, following a period as accompanist to his father, the famous violinist Jan Kubelik. Mahler, of course, was *verboten* in Czechoslovakia during the Nazi annexation, but Kubelik pored over the scores during those years. He had been exposed to Mahler during his student years in Prague, in performances conducted by Bruno Walter, Erich Kleiber, Alexander von Zemlinsky, Otto Klemperer and his own great predecessor with the CPO, Václav Talich. He was sixteen when he first heard the First Symphony (under Walter), and he recalls that, while he was fascinated by the other three movements, he found the finale "too extrovert" then. The following year he heard the Fourth under Zemlinsky, a musician whose name is virtually unknown to most of us now.

"Zemlinsky was a pupil of Mahler, and a great Mahler interpreter. He was not a famous conductor, but he was a great conductor, and a wonderful composer. I'll never forget his Fourth. He was not an attractive man—almost a dwarf, with a profile like a crow—but when he conducted this music his face became angelic and I saw something like

levitation, as if he grew taller and would simply rise into the air over the orchestra. After that concert I was so excited and exalted I had to walk hours and hours in the streets of Prague. I couldn't go home, I couldn't do anything, I was so charged by that experience."

In Kubelik's own superb recording of the Fourth, his soloist is his wife, the distinguished soprano Elsie Morison, who is as involved and articulate as her husband on the subject of Mahler. Both of them made the observation (separately) that the exaltation in Mahler's music, its uncompromising directness, the projection of tragic elements on an affirmative level (in the same sense in which Matthew Arnold's *Dover Beach* is an affirmative poem) and, most of all, the sheer intensity of its expression account for its strong appeal to young listeners. Free of the prejudices of tradition and propriety, the young have responded without embarrassment to the undisguised emotion and idealism of the Mahler symphonies, and have had much to do with the enormous increase in attention these works have received in the last quarter-century, during which they have moved dramatically from the "novelty" category to that of "standard repertory" (with no fewer than five "integral cycles" on records!). Today the music of Mahler may no longer be shockingly "anti-Establishment," but it still "tells it like it is."

Kubelik is a composer himself, with several major works to his credit, and last year DGG released his recording of his *Quattro forme per archi* with the English Chamber Orchestra. It is the only work of his on records so far, and he has no plans to record another. He is even reluctant to *discuss* his own music, except to state that his involvement with Mahler has not influenced his own writing. "I would never talk about my own music as much as I do about Mahler or Beethoven. As a conductor I have to be an extrovert, and able to explain my views and my wishes in words to an orchestra; as a composer I'm an introvert, and need only to put my music on paper."

He said he does not even care particularly to have his music performed. "I don't like to conduct my works. I wouldn't mind if others would perform them, but they don't. Once I've written it down, it's finished. I know how it would sound, so I don't need the confirmation of a performance, and I feel I'd conduct my music badly because I haven't the time for study: I'd have to learn how to conduct my works, in the technical sense. I don't see myself as a conductor in the service of myself-as-a-composer; I must put myself-as-a-

conductor in the service of other composers. I write music only because I have a need for it, as I have a need for eating and breathing. If I have a big session and no time for composing, then I suffer, but I don't need the sound once I've written a piece."

The reluctance of other conductors to perform Kubelik's music has not deterred him from performing theirs. On one of his recent Deutsche Grammophon records he conducts his orches-

tra in the Violin Concerto No. 2 of Jean Martinon, with Henryk Szeryng as soloist. Both Kubelik and Martinon are former music directors of the Chicago Symphony Orchestra, their terms in that position having been separated by the ten-year intendency of the late Fritz Reiner.

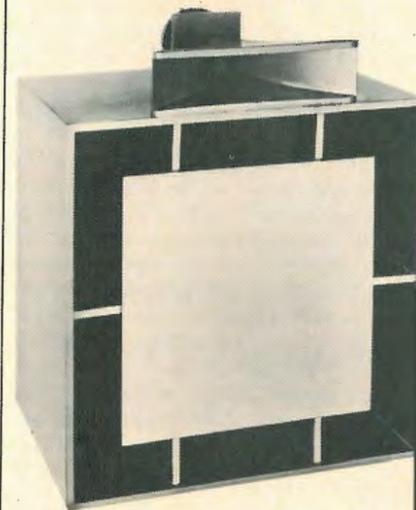
There have been rumors that Kubelik is in line to succeed the late George Szell as conductor of the Cleveland Orchestra. Earlier, in fact, there had

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been similar talk of his taking over the Boston Symphony or even returning to Chicago, where he was music director from 1950 to 1953. In the case of Cleveland, the rumors are a bit stronger: Szell had invited him personally to take over several of his own dates when he became ill, and he has conducted the Clevelanders both at home and on tour this year, with many more dates scheduled for 1972-73. It is extremely doubtful, however, that anything could persuade him to leave his post in Munich, where he is not only enormously respected, but enormously happy; his new appointment as musical director of the Metropolitan Opera (a position once held by Mahler) permits him to keep his orchestra and continue conducting a major portion of its season.

The Symphony Orchestra of the Bavarian Radio, founded just after the War by Eugen Jochum (who now conducts the Bamberg Symphony Orchestra), has been in Kubelik's hands for ten years now, and the atmosphere at rehearsals and recording sessions bespeaks a continuing love-feast. It is, of course, one of Europe's great orchestras, with many members known to American record collectors as soloists or chamber-music specialists. The personnel list includes the entire Koeckert Quartet, violist Georg Schmid, violinist Georg Retyi-Gazda, cellist Reinhold Buhl, flutists Kurt Redel (who is even better-known here as a conductor) and Karl Bobzien, oboists Kurt Kalmus and Wilhelm Grimm, and bassoonist Karl Kolbinger. Nobody would characterize these men or their colleagues as "hard-boiled." They get together to make music, and they seem awfully happy about it.

Kubelik, for his part, is utterly relaxed and invariably good-natured, with no need to remind anyone of his authority, and he saves the intensity for the music itself. Most of the rehearsals for the Mahler Seventh ended early, and the recording was completed with a full day to spare. After one take in which a horn solo in the second movement was played especially beautifully by the young American section leader Jack Meredith, the string players applauded by rapping their bows on their stands, a gesture most orchestras reserve for visiting soloists. The really loving smile that illumined Kubelik's face at the end of the last session was something beyond description: he had got exactly what he wanted, and they had all had a grand time making it happen.

Some musicians feel inhibited by microphones, or say they need the stimulus of a live audience to give their best, but Kubelik likes to make

recordings, and even feels they offer the listener at home certain advantages over listening in the concert hall. "Before, I did not feel this way, but since stereo came I feel terribly happy doing recordings. For the sound itself—especially for complex scores such as Mahler and Janáček and the great choral works—stereo brought a solution and new possibilities that are artistically and musically interesting. In the counterpoint in modern scores, the different groups in the orchestra are sometimes muddled in the hall, but these things come through in stereo—and the help of a little witchery at the technical end—with such reality and such wonderful proportion as one could never have in the hall itself." (He had not heard about four-channel stereo, but made a note to investigate. In the meantime, his two-channel recordings show the advantage, especially in Mahler, of his separating his violins to right and left.)

What distresses him about recordings is the growing trend during the last two decades to allow, or even compel, performers to record works they have never played in public. Before micro-groove, when fewer recordings were being made, musicians recorded only the music they had lived with, interpretations they had made famous on the concert stage and were ready to preserve for posterity. Now it is not at all unusual for an artist to record a work he has never performed in public—and in some cases has not even played through once from beginning to end, learning and recording a movement at a time and not necessarily in sequence. Kubelik feels this is "a scandal."

"Sometimes, in modern works," he said, "the players record two or three bars at a time and never play the thing through once. This is a crime against music; it is absolutely wrong. I would protest, and even condemn my colleagues who do this."

"I have always tried to have a record as a documentation of my work, of an interpretation I've worked on and molded to my satisfaction. If I did a good job in concert, please come and make a recording—but not the other way around. I believe a recording should be done only after a very well-rehearsed concert, when the orchestra knows the intentions of the conductor and knows what kind of dramatic impact the whole work should have... to confirm a mature interpretation, and not only that, but it should also then be possible to play through a whole movement almost without interruption."

When the technical problems can be managed, Kubelik feels recordings of certain works ought to be undertaken

in actual concert. His own DGG set of Schoenberg's *Gurre-Lieder* is an outstanding example of how well a "live" recording can be done.

The Mahler symphonies represent Kubelik's most ambitious recording project to date; now that they are all accounted for, there is still more Mahler to come. He has taped the *Lieder eines fahrenden Gesellen* with baritone Dietrich Fischer-Dieskau (who is also one of the soloists in his recording of the Eighth Symphony), and this will probably appear with the Fifth Symphony when it is issued separately. He also wants very much to record *Das Lied von der Erde*, and hopes DGG can arrange to borrow Janet Baker, with whom he performed the work two years ago (he is still looking for an ideal tenor).

In the meantime, several of Kubelik's non-Mahler recordings scheduled by DGG are of unusual interest. His remakes of Janáček's *Sinfonietta* and *Taras Bulba* were released on one disc last winter (2530 075), at the same time as the Berg and Martinon violin concertos with Szeryng (2530 033), and two operas are taped and awaiting release: Weber's *Oberon*, with Birgit Nilsson and Plácido Domingo, and Wagner's *Lohengrin*, with Gundula Janowitz, James King, Gwyneth Jones and Thomas Stewart. (Miss Jones, a soprano, sings Ortrud, a role usually assigned to a mezzo. She thus becomes the second singer to record both that role and that of Leonore in *Fidelio*, the first having been mezzo Christa Ludwig.)

All the new recordings mentioned above are with Kubelik's own orchestra. With the Boston Symphony, now in the DGG fold, he taped Smetana's *Má Vlast* in March (his third time around for that cycle of six tone poems, his fourth for its two best-known components) and is to record Beethoven's Fifth Symphony next season. Having given Kubelik the distinction of being the first conductor to record all the Mahler symphonies with a single orchestra, DGG now intends to make him the first to do the Beethoven symphonies with nine orchestras; he has already taped the Seventh with his own orchestra and the *Eroica* with the Berlin Philharmonic. The Berlin Philharmonic, with which Kubelik recorded all the Schumann symphonies a few years ago, is also the orchestra in his continuing cycle of the Dvořák symphonies for DGG.

Whether Rafael Kubelik's next recording project should be another "integral cycle" or a single work, one feels fairly confident it will be an "Event," and undertaking for which Beethoven's inscription on the *Missa solemnis* ("From the heart—may it go to the heart") would not be misplaced. **Æ**



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Bach: The Complete Concertos for Harpsichord and Orchestra. Igor Kipnis; other soloists, The London Strings, Neville Marriner. **Columbia M4 30540**, 4 discs, \$23.95.

Bach more or less invented the keyboard concerto (for harpsichord in his case)—why not? He was a performing keyboard man and he needed material for his own concerts. In those days you didn't just play the Tchaikovsky Piano Concerto No. 1. You made up your own. Bach transcribed most of his, out of other material rearranged, with a solo keyboard, often combined with other soloists. There are seven concerti here from the Leipzig Bach concerts (Collegium Musicum) plus one left incomplete in the manuscript copy—Igor Kipnis, taking the hint from the beginning, has finished the job of adapting the music from a Bach Cantata. Then we have the Brandenburg No. 5 and the Triple Concerto in A.

Unfortunately, in spite of his own performing, Bach tended to write solo parts that simply run on against steady ensemble music, hardly standing out at all—that was his preference. And so Igor Kipnis is somewhat lost in the musical shuffle for much of the span of these recordings. One hears, primarily, the orchestra and the other soloists, violin, a pair of recorders, oboe and so on. There is even a second harpsichord for the continuo accompaniment. But Kipnis suffers even more, I think, from a bad combination, a conductor who favors rather nervous, bumpy, bouncy Bach (which I do not like though you may) and an engineering-producing crew which has stuck all the soloists crudely close to the microphones, so they practically spit at their flutes and jab their violins in your face. With so much nearby playing (and, of course, the instrumentalists play in their normal "projecting" fashion, as for an audience much further away) there is not only distraction everywhere and an unmusical balance but the sound is too often edgy and metallic. Whether this is also due to processing or not I wouldn't know, but, alas, it is a sound I have heard before from Columbia discs. All too familiar. In this general gargle of sharp, hard noises Mr. Kipnis' smoothly fluent harpsichord performance is lost to the ear. Everybody's fault including Bach's—but things could surely have been done better.

Nevertheless, with so much variety in the concerto material from work to work and so many intrinsically interesting performers—the two grand-daughters of old Arnold Dolmetch, for instance, playing a pair of recorders—you are likely to find this album worthwhile.

Classical Record Reviews



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And there are no less than six different harpsichords involved, three for the soloist and three others for the accompaniments. It's a stimulating set, if not an ideal collection of performances.

Performances: B- to B+ Sound: C+

The Best of Haydn. Assorted artists. **Vanguard "Twofer" VSD 703/4**, stereo, 2 discs, \$5.98.

The technology of the disc record just asks for it. When times get tight, don't quit; *repackage!* One is tempted to squawk, as though it were all a big gyp scheme or something. It isn't, of course. The repackaged material is almost certain to be both better in the sound and cheaper in the pricing than the original release, and who can complain about that? In addition, why shouldn't we take advantage of tape's versatility to set up new combinations of material, new "programs" in the LP format? So, with all the logic imaginable, Vanguard has joined the repackaging forces with a new set of releases in the familiar "best of" vein. Instead of the half-price Everyman label, these sport the regular Vanguard designation. But the tab is half-price.

It's a series, of course. I picked this one because old Papa Haydn is one of my favorites and the least likely a composer to be degraded and commercialized by the "best of" category! He isn't. We have on these two discs a pair of symphonies, the Military (No. 100) and the Farewell (No. 45), the familiar Trumpet Concerto, a brief opera overture, some seldom heard but pleasant little gypsy dances (strange to hear the "Hungarian" style so far back in time) and a string Quartet, Op. 74, number 3, played by the excellent Grillier Quartet.

Antonio Janigro conducts three different orchestral groups, out of Vienna and Zagreb, in the Farewell Symphony and the Trumpet Concerto, plus the "Isola Disabitata" (Uninhabited Island) Overture, all in a musical but somewhat nervous and hurried fashion. Not bad. The Military Symphony comes from Vienna, with Mögens Wöldike, a much less hurried sound in the true Viennese manner; the famed "Turkish" episodes, ominous with drumbeats and crashing cymbals, are understandingly brought out as they should be. A musical fad of the time, but with serious overtones—the Turks, remember, once swallowed up territory almost to the gates of Vienna itself before they fell back. This makes a fine crown to the set.

Performances: B Sound: B

Berlioz: Complete Songs with Orchestra. Sheila Armstrong, Josephine Veasey, Frank Patterson, John Shirley-Quirk; London Symphony Orch., Colin Davis. **Phillips SAL 3789 (6500 009)**, stereo, \$5.98.

These big songs with orchestra are outwardly much like the more familiar songs of Mahler—but vast differences are immediately apparent. For a great orchestrator, these are curiously monotonous in the accompaniment, mostly quiet strings or cluttery rows of woodwind chords; the net effect—on discs—is of a batch of songs-with-piano transferred to orchestra, which is exactly what they are. In Mahler, the orchestra is marvelously a part of the whole, even more important than the voice.

Four excellent singers, soprano, contralto, tenor and bass, make for interesting variety though only Frank Patterson, the tenor, has the French-type nasal

brilliance of tone. But maybe they should have brought the orchestra forward a bit—that would have helped. Too much solo voice. It often happens!

Frankly, for records I would prefer to hear the piano-accompaniment originals of most of these songs. Much more incisive.

Performances: B+ Sound: B-

Bach: Musikalisches Opfer (Musical Offering). On original instruments. Concentus Musicus, Wien, Harnoncourt. **Telefunken SAWT 9565-B**, stereo, \$5.95.

Well! The Musical Offering had no direct indications for scoring; it was another of those "abstract" pieces, just written out in notes. It has thus been transcribed variously into a horrendous variety of different versions, from organ and chamber ensemble to Wagnerian Symphony Orchestra, two pianos and what have you. But the notes on this recording casually inform us that "to a great extent Bach's scoring can be determined from his markings and musical demands." And this version proceeds to play the music accordingly, on "original" instruments (i.e. of the period), harpsichord, strings, flute.

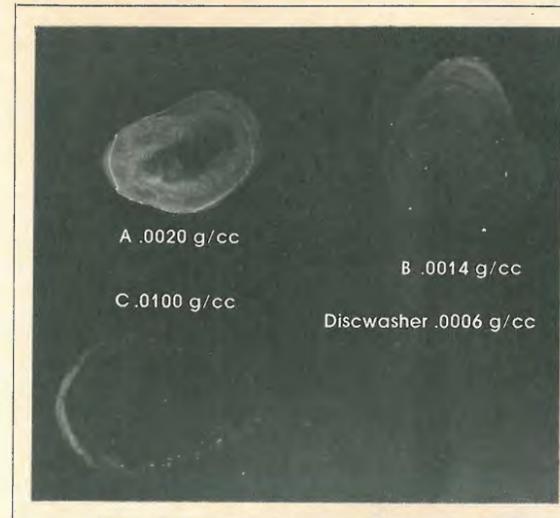
I'll have to admit that the Consentus Musicus proves its point handily. This is a highly satisfactory version in terms of the usage of Bach's day. Everything sounds as if it belonged.

The "Offering" was, of course, to the young Frederick the Great of Prussia, an ardently progressive musician and flutist at whose court Bach's son, K. P. E. Bach, was official keyboard man. In 1747 the old man was brought to Potsdam as a sort of fossil exhibit; the King tossed him a theme on which to improvise learned fugues. Bach, ever unsuccessfully on the make, did a few miracles, went home, wrote them all out and sent an engraved copy to the King. Didn't get him anywhere. Frederick preferred newer and lighter music. And so today we have a solid precursor of the later "Art of the Fugue," a batch of incredible canons, mathematical tour de force, which, being Bach, actually sound like music. You can play them upside down, inside out, backwards and so on. Through them runs the King's Theme, easily remembered, full of chromatics, and through the larger pieces, including a Trio Sonata in four movements.

Good, solid Viennese playing here, taking its time. Nice recording too, if with that inexplicable faint trace of edginess that seems to haunt these "Royalsound" Telefunken stereo discs. Never could figure what causes it.

Performances: A- Sound: B+

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Weingarten Looks At the CARPENTERS

AFOURSOME, The Beatles, history tells us, changed the face of pop music in the '60s; from quiet, folk-oriented tunes America shifted to the loud, brash, tribal-related outpourings that the nation's elders deplored. A youthful twosome, The Carpenters, has turned it around again in the '70s, being so successful at playing up the soft sound that the copyists are hard at work.

Karen and Richard's third album on A&M, succinctly entitled *CARPENTERS* (SP 3502), proves they're no flashes in the Tin Pan Alley. The LP is filled with changes-of-pace, resulting in a beautiful balance by the brother-sister team.

Richard is the often-sought, rarely-found musical triple-threat man. In addition to vocalizing, he plays keyboards and also arranged and orchestrated the songs. Come to think of it, he's actually a four-talent performer, for he also penned (with John Bettis) three of the vinyl's 10 tunes ("Saturday," a particularly bouncy entry; "One Love," and "Druscilla Penny").

Highlights of the album, naturally are two of The Carpenters' smash singles, "Rainy Days and Mondays" and "For All We Know." But other winners scream for acceptance, comparative newbies but goodies such as Randy Sparks' "Hideaway," Leon Russell and Bonnie Bramlett's "Superstar," and Henry Mancini's "Sometimes."

There is, incidentally, one low spot—a hodge-podge medley of Bacharach-David tunes that doesn't allow any individual song enough time to develop properly (included are "Always Something There to Remind Me," "I'll Never Fall in Love Again," "Walk On By," and "Do You Know the Way to San Jose").



Still there's plenty of harmonious music and good vibrations on the rest of the package to offset the lone negative point.

The Carpenters, not incidentally, are like most so-called "overnight successes"—there are years of work and struggle behind them, despite the fact that Karen's only 21 and Richard's four years older.

It all started, the publicists inform us, back in New Haven, Conn., where Richard listened as a child to his father's extensive record collection "every waking moment." By the time he was nine, he was playing piano; and his "sweet sixteen" sessions were not the usual—he was studying classical piano at Yale and playing in local jazz clubs. When the family moved to California, Richard continued his piano at USC and Cal. State College in Long Beach.

Karen, meanwhile, was growing up too. But her musical start was slightly different; she became a drummer, having earned a spot in a high school marching band.

In 1965 the pair, along with buddy Wes Jacobs, a tuba and bass player, formed the Carpenter Trio, a non-pro group that won a Hollywood battle-of-the-bands contest. Jacobs dropped out a bit later (to end up playing with the Detroit Symphony Orchestra), after some false hopes and a recording contract that led nowhere. So Richard added Cal. State compatriots Leslie Johnston, Danny Woodhams, Gary Sims, and John Bettis to the two Carpenters to form the short-lived sextet, Spectrum.

When Spectrum joined the long list of defunct pop groups, the Carpenter duo started toying with multi-track recording techniques to augment its vocals. Blending their voices into

four, six, and eight parts, they came up with a tape that eventually earned them their A&M contract.

Then came "Ticket to Ride" and "Close to You," both million-sellers. Later, prior to the release of the hits contained on the album, came a third gold record, one that probably could be used as their motto: "We've Only Just Begun."

Last year's Big Sur Folk Festival, held in Monterey, Calif., is etched in vinyl by Ode 70 Records via the talents of Joan Baez, The Beach Boys, Merry Clayton, Linda Ronstadt, Country Joe McDonald, and Kris Kristofferson. *CELEBRATION* (SPX 7708), distributed by A&M, proves the folk tag a misnomer, however, for the songs performed run the musical gamut, including blues, soul, and rock.

Royalties from the artists and producer, not incidentally, go the Institute for the Study of Nonviolence, Palo Alto, Calif., to be shared with the United Farm Workers and War Resisters International. It's the kind of peace project that those who are appalled by trouble in the streets can applaud.

Miss Baez, who coordinated the festival, is greeted by heavy applause (as are the other entertainers), after singing two pieces, "The Night They Drove Old Dixie Down" and "Let It Be." Her voice, as angelic as ever, is but one of the LP's highlights, however. Miss Clayton, formerly just a studio soul-background singer, comes into her own via Bob Dylan's "The Times They Are A-Changin'" and a rousing version of Paul Simon's "Bridge Over Troubled Water" that easily compares to the current soul hit by Aretha Franklin. And the deep tones of Kristofferson are a wonder as he sardonically sings that "The Law is for the Protection of the People," then adds "To Beat the Devil."

The Holy Modal Rounders, a sextet leaning heavily on country idioms (though there are weighty lacings of rock), offer superb variety and changes of pace on *GOOD TASTE IS TIMELESS* (Metromedia, MD 1039).

The Rounders, who seem to be doing their best to bring back the folk movement all by themselves, provide a dozen cuts which range from backwoods items to ballads to rock-oriented stuff to soft blues and boogie. And they add more than a dash of humor, especially irony.

Highlight of the LP is "Love is the Closest Thing," a simple, incisive, and harmonious work.

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JAZZ & BLUES



Martha Sanders Gilmore

Clifton Chenier: King of the Bayous. Musicians: Clifton Chenier, vocals and accordion; Cleveland Chenier, rubboard; Robert St. Judy, drums; Joe Morris, bass; Antoine Victor, guitar; Elmore Nixon, piano, and Raymond Monett, guitar.

Songs: Tu Le Ton Son Ton, Hard to Love Someone, Who Can Your Good Man Be, Zodico Two Step, Going La Maison, I Believe I'll Go Back Home, Release Me, Big Mamou, Ton Na Na, I Am Coming Home, Josephine Par Se Ma Femme, and It's Christmas Time.

Arhoolie 1052, \$5.98.

Story goes and we believe it, that no one in the medium of music captures so well the Cajun Character lurking amid the backwaters of the fertile bayou country of the Texas-Louisiana Gulf Coast country than Clifton Chenier, the most popular proponent of Swamp Blues of Zodico.

Known variously as Zedico, Zydeco, or "La-La" music (according to historian Paul Oliver), it is essentially the Cajun contribution to the blues, a music with the distinctive folk flavor of the Acadian French. The rhythm employs two-step and other dance tempos while the speech combines forms from the archaic French to English, German, Spanish, and Indian, and Negro derivatives. It is traditionally played on accordion, violin, and guitar.

Clifton Chenier was born in Opelousas, Louisiana in 1925 and comes out of this land of levees to present his fourth LP for Arhoolie. Here is a musical gumbo for the gourmet of old Cajun folk tunes—waltzes and two steps—as well as rhythm and blues, traditional blues, and one pop tune, the old saw "Release Me" which is the only track of twelve which was not composed by Chenier himself.

Chenier's voice has a soft cushioning effect, much like padding between the

ribs; overtones of a seemingly West Indian culture are subtly implanted among a melting pot of international nuances. At times his vocalizations remind us of musical inflections of the Portuguese.

"Tu Le Ton Son Ton" cheerfully catapults the group into action, a furious blues underpinned firmly by a boogie bass. Cleveland Chenier, Clifton's brother, plays a mean washboard which alternatively brings to mind the sounds of the roulette wheel and the luxury of sitting on a sunny river bank, winding a spinning reel. Although never straying from a certain tone, it is not tiring and blends in appropriately against Chenier's deliberate and authoritative notes on accordion. It is refreshing to hear the accordion employed by Chenier as a dignified solo instrument instead of receiving the usual rather whimsical and trite attentions of a cabaret musician.

"Hard To Love Someone" and "Who Can Your Good Man Be" are slow moving, low-down blues in which Chenier uses his accordion antiphonally as a chorus to bathe his blues-felt wounds. Antoine Victor delivers a pleasing array of broken chords on guitar and takes a deep-throated but brief solo in his stride. Joe Morris on electric bass provides prompt punctuation to the entire affair.

It is a pity that Chenier's voice does not receive more electronic assistance here. On side one, his voice sounds muffled and it is as though he is having to shout to be heard. However, the situation improves on side two which was recorded six months earlier in another Houston studio.

Otherwise, the engineering permits each individual instrument ample audibility and is good except for a couple of fadeouts and for a sizzling electrical noise toward the end of "I Am Coming Home," the most moving, straight-from-the-heart blues Chenier sings.

In my opinion, Chenier is at his best performing Cajun folk blues and two steps as exemplified in "Zodico Two Step" which suggests simultaneously a reel and a very fast march. At times, the accordion has all the fervor of a fiddle and we imagine we are at a convention of old time fiddlers. And does that rubboard *scratch*, while Chenier hollers, screeches, and yipes as though he's making the calls at a rural square dance.

"Ton Na Na" is bright as skirts of gingham, but "Big Mamou" grabs the honors in a purely delightful waltz time where the group, which is keenly attuned to one another, whirls us away to a street corner in the French Quarter, atop a carousel, and then on to a country dance. Strains of "Cielito Lindo" waft through the Louisiana breeze and the whole affair has a bump and grind to it.

Chenier's low-down blues, such as "I Am Coming Home," "It's Christmas Time," and the popular "Release Me," do not achieve the success of his more authentic Cajun caprices. "Release Me" is disappointingly flat with a tendency to be labored. But, Elmore Nixon on barroom piano fits in well in scene two, side two!

We suspect Clifton Chenier's group is one that should be seen and heard in person. They achieve a scintillatingly full sound for such a small band and betray a kind of circular, close-knit feeling in their arrangements.

Chenier's vocal style is a provocative mosaic in which he slurs his words, cuddles his phrases. He is a unique talent on accordion; his accomplishment is considerable.

If you are not already familiar with Chenier's brand of Cajun swamp blues, let Arhoolie do it for you. Want to delve even deeper into the genre? You might seek out Folkways FE 4438, "Cajun Songs from Louisiana."

Performance: B Sound: B

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