

Heyser:  
Crescendo Test

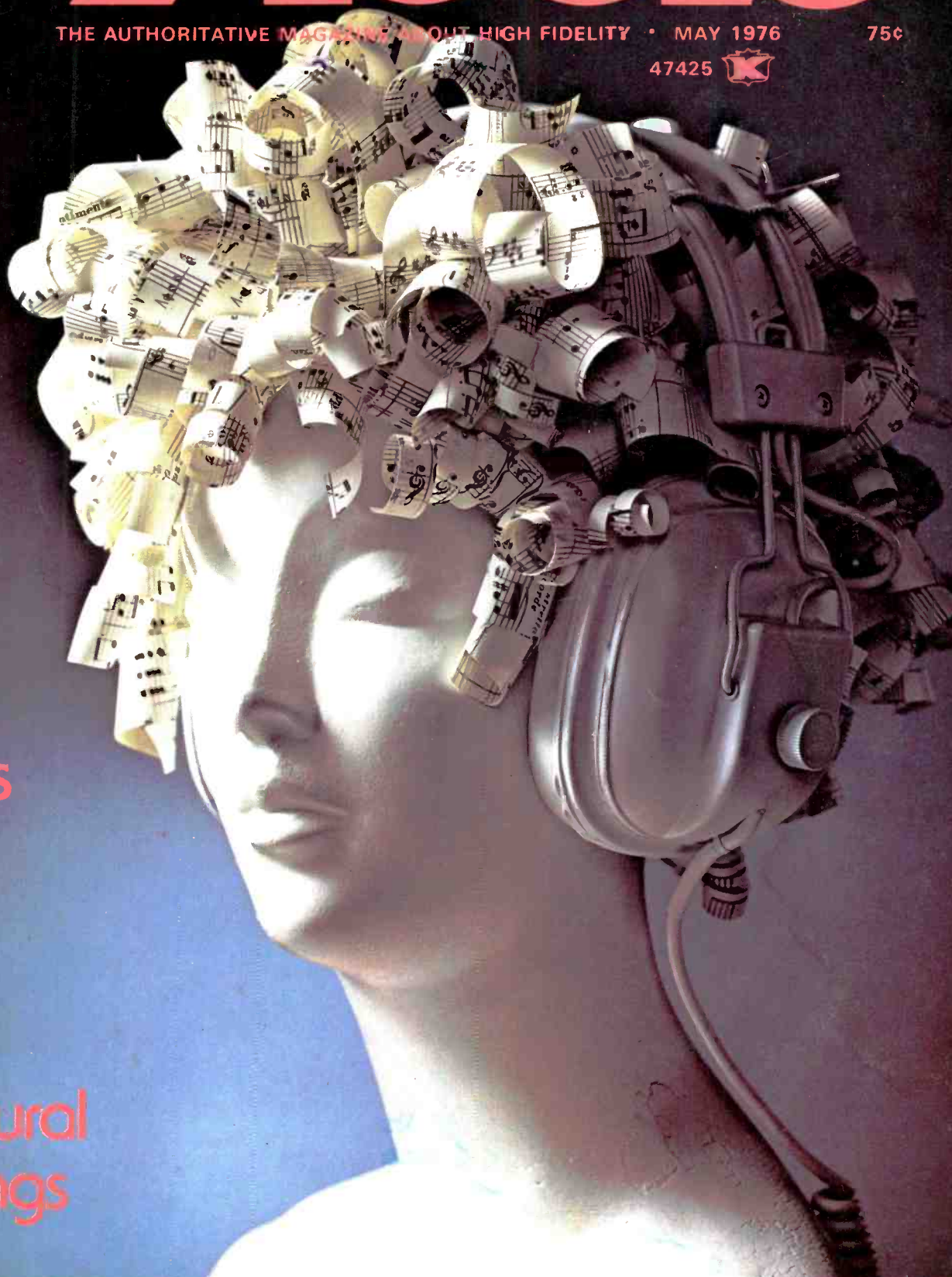
# Audio

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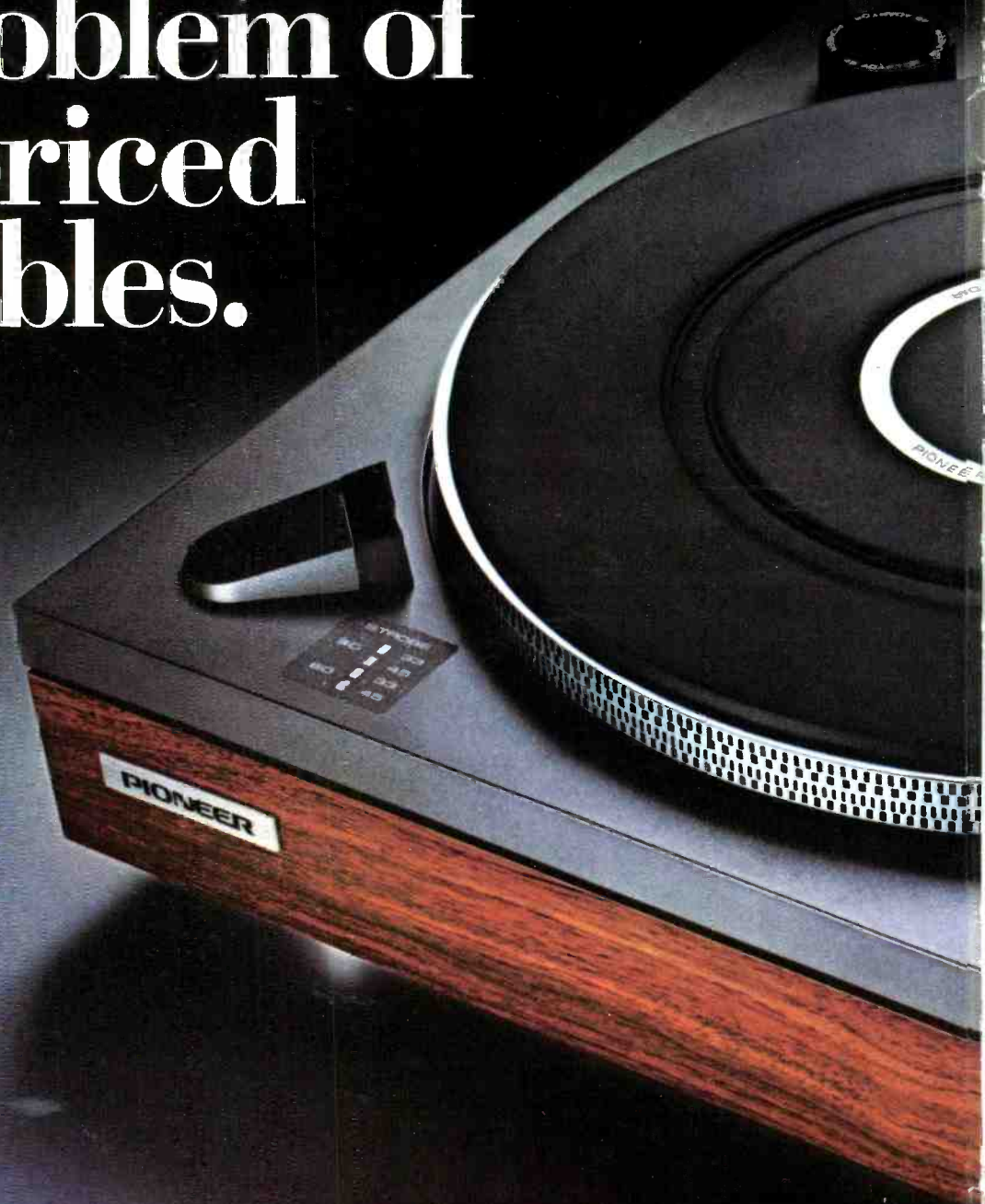
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# Audio

May 1976

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

Vol. 60, No. 5

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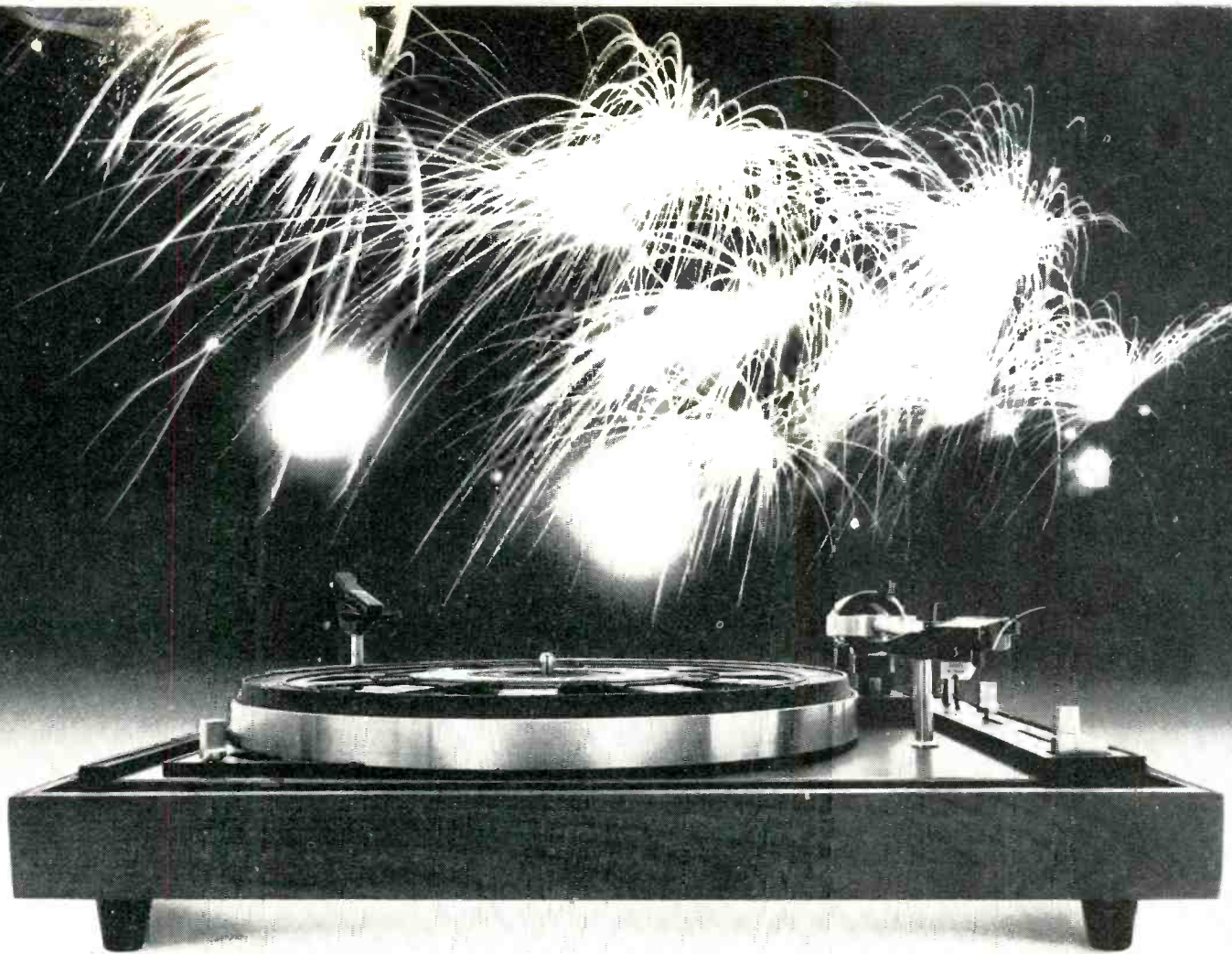
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# Audioclinic

Joseph Giovanelli

## Right Channel Lacks Bass

*Q. The right channel of my receiver does not have enough bass. On any material, the right channel will reproduce any low bass note correctly but it just does not give the proper sound of, say, a bass drum punch. Adjusting the balance does not help. The bass will be centered, but the "kick" will still be in the left side only. Repairmen state that there is nothing that they can do because the right side reproduces any bass note correctly. Please advise.*—Bob Powers, Brecksville, Ohio

A. It is not unusual to find an apparent lack of bass in one channel of a music system. Yet, that channel will measure just as well as the good channel. This apparent lack of bass is usually the result of nothing more than a room acoustics problem.

To determine whether this is the situation, interchange the speaker leads, that is to say, the lead connected to the left speaker should be reconnected to the right channel of the amplifier and vice versa. Use a monophonic program source and listen to the sound quality. If the deficiency of bass now occurs in the left channel, then you will know for sure that something is wrong with the amplifier. If, on the other hand, the bass is still deficient on the right channel, then the problem will be that of room acoustics. I doubt that loudspeakers will be the source of the problem, unless the speakers are not a matched pair.


In the event the amplifier is found to be lacking in bass on the right channel, despite the information supplied you by repairmen, obtain a service manual from the manufacturer of the receiver and make step by step checks, using the information supplied in that manual. Compare fre-

quency response stage by stage between the left (good) channel and the right (bad) channel. You will reach a stage which shows a lack of bass, and, of course, it is this stage which must be checked into further to disclose the exact cause of the low-frequency loss.

## Disc Rumble

*Q. I have a problem with intrusive rumble when I play stereo discs. This happens during quiet passages when I listen to stereo. When I switch to mono, the rumble often goes away. I have thought the turntable is not at fault. Can it be a defective cartridge? Maybe it's my records?*—Eugene E. Kucza, Westchester, Ill.

A. A turntable can produce rumble such that, when the system is switched to mono, it is somewhat lower. This is because the rumble component in the machine may be mostly vertical, and the response of the mono-connected pickup is purely lateral. Therefore, we cannot immediately rule out the turntable. However, if it happens only with certain discs, or to a markedly-differing degree with various records, we know that the discs are at fault, not the turntable. There is nothing you can do about faulty discs.

Some rumble can be introduced during the cutting process. Pressing problems having to do with the flatness of the bed holding the stampers in the press can also cause noise. Usually this sound is "roaring" rather than that of a low-pitched "rumble" though. 

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

# The new Sansui LM Loudspeakers that set the AES Convention on its ears.



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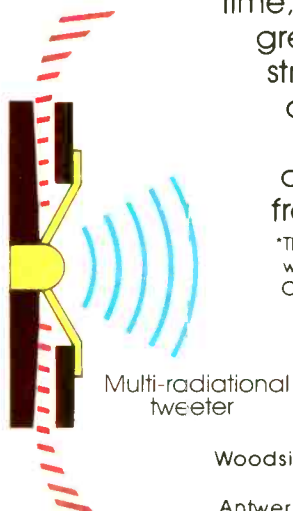
Unlike conventional speakers, the LM design incorporates a multi-radiational tweeter device. High frequencies instead of being lost through encapsulation, are diverted through three special exponential horns and recovered into sound energy that

adds a breathtaking sense of ambience, and realism. The LM speakers also display extremely stable and well-defined stereo images. At the same

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# Tape Guide

Herman Burstein

## How Often To Clean Heads

*Q. I have an Advent cassette recorder and am wondering and concerned about head wear. Advent's instruction manual tells you to clean the heads every 10 to 15 hours, whereas most tape recorders suggest every 50 hours—C. L. Moody, Virginia Beach, Va.*

*A. Usually the manufacturer knows his own machine best, and it is wise to follow his advice about cleaning and other maintenance procedures for his product. From what I have seen, most tape recorder manufacturers recommend cleaning and demagnetizing the heads after about every 8 hours of use, i.e. after the equivalent of a normal working day.*

## Tape "Dust Bug"

*Q. I am quite happy with my tape machine except for one problem which I find frustrating: drop-outs. I believe there is nothing wrong with the machine, and since I only notice the drop-outs because of a combination of factors, this makes the fault more obvious. Maybe I am just very fussy! I record mostly steady, pure tones (solo flute) on which any defect is bound to be more noticeable. I use earphones, so that room reverb does not mask the drop out. My machine is quarter-track and uses no pressure pads. I am young and my hearing extends beyond 17 kHz; the problem is most obvious at higher frequencies.*

*Head cleaning was not enough, so I tried putting a piece of cloth in the tape path to wipe the surface of the tape, attaching it to the tape tension arm. This has essentially licked the problem. However, can this "dust bug" damage the tape?—Pierre Lewis, Edmonton, Alberta.*

*A. Tape imperfections—in the tape or on it in the form of dust, dirt, etc.—cause drop-outs. The wider the track, the more chance these im-*

perfections have to average out; that is, drop-outs are less likely to be noticeable. Some tapes are better than others with respect to this problem; they have fewer irregularities in the oxide. Your solution, provided it does not noticeably increase wow and flutter, sounds like a suitable one. It doesn't seem that your "dust bug" would have any more effect on tape wear than does a tape head and perhaps less. It also may be that tape tension has increased as the result of your attaching a cloth to the tension arm, and this may be helping to reduce drop out.

## S/N vs. Response

*Q. I have a TEAC tape deck and am interested in having it rebiased for low-noise tape. I recently had it tested at a local place, but they said frequency response would probably suffer although S/N would improve. Another dealer said this is untrue. I am interested in improving the S/N ratio, but not at the cost of reduced frequency response. Can you give me an objective opinion?—Shelby Remington, New Haven, Conn.*

*A. Without going into the matter of who said what, and how correctly, it should be possible, through an appropriate increase in bias, to adjust your tape deck so that when using low noise tape you will get an improvement in S/N along with treble response at least as good as and perhaps better than before. When having your machine rebiased by a competent technician, bring along a reel of the tape you plan to use. If the technician is conscientious as well as competent, the results should be satisfactory.*

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





You work hard when you're recording. It takes time and concentration. And a tape about to run out usually means stopping to interchange reels, rethread, and generally get the feeling that you're starting all over again. The 4070G lets you keep on recording because it records and plays in both directions. With full monitoring capabilities. And for the



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# What's New in Audio

## Epicure Loudspeaker



Epicure Five is a two-way air-suspension system, using a 6-in. low-mass woofer and a 1-in. air-spring tweeter with a balanced low-mass voice coil assembly. Each system has a tweeter level control for balancing the system. The 11 in. H. x 15 in. W. x 7 $\frac{1}{8}$  in. D. speaker has a dispersion of 180 degrees. Frequency response is 50 to 20,000 Hz.  $\pm 3$  dB. Weight is 36 lbs., and the system has a 10-year warranty. Price, \$70.00.

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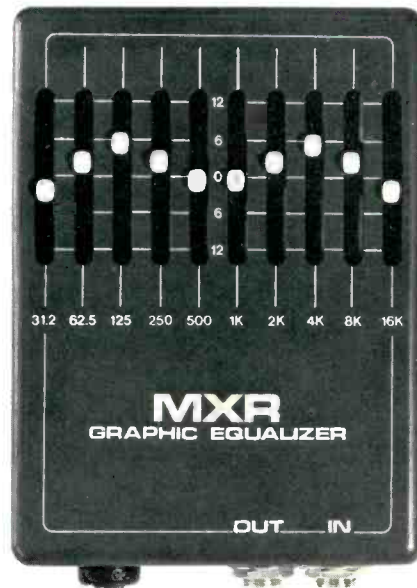
## Noise Suppressor



The Source Engineering Model DBM noise suppressor is an open-end design compatible with any audio source, with a specified 14-to-20 dB improvement in apparent S/N ratio and a -60 to -20 dB independently adjustable suppression range for each channel. The suppressor has a stated reference level of 0.775 V rms (0 dBm from a 600-ohm line) suitable for professional systems and with an overload factor of 16 dB. Price: \$250.00.

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## Graphic Equalizer



The MXR Ten-Band Graphic Equalizer is a portable tone-control unit which divides the frequency spectrum into ten one-octave bands. Inputs are through 1/4-inch phone jacks, and the unit's slide controls permit modifying the instrument frequency to create a desired sound or the control feedback in PA systems. The dynamic range is 30 Hz—20 kHz  $\pm 1$  dBm. The unit is ruggedly and compactly housed for traveling and a.c. powered for permanent installation. Price: \$139.95.

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## E-V Wheel & Belt Finder



SBW-1 wheel and belt finder is a plastic-coated slide-rule caliper-type device that enables the user to measure any dimension of a phonograph or tape wheel or belt including inside and outside circumferences, widths, thicknesses, diameters and cut lengths. Either the decimal or metric system may be used for measurement.

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★ **STEREOPHONIC FREQUENCY TEST RECORD STR 100** Designed for the evaluation of pickups and systems. Provides a constant amplitude characteristic below 500 Hz and a constant velocity characteristic above 500 Hz. Tests include: Sweep Frequency—with the sweep rate synchronized for use with a graphic level recorder; Spot Frequency—with voice announcements; Channel Separation; Wavelength Loss and Stylus Wear—to pinpoint oversize or worn-out styli, and excessive pickup tracking force; Compliance; Phasing; Vertical and Lateral Tracking; Tone Arm Resonance—to check system performance at low and subaudible frequencies and thus reveal undamped resonance which may cause equipment overloading.

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

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

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

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

★ **QUADRAPHONIC TEST RECORD SQT 1100** Designed for calibration, verification, and adjustment of SQ™ decoding equipment. The record provides test bands for pickup measurements, for adjustment of decoder electronics and for channel identification and balance. Each band is described in terms of recorded characteristics and its intended use.

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

★ **RIAA PINK NOISE ACOUSTICAL TEST RECORD STR 140** Designed for acoustical testing of systems and loudspeakers and for psychoacoustic tests on reproduction equipment. With the STR 140 it becomes possible to test loudspeakers in the room in which they will be used. Spot frequency tones with voice announcements facilitate the testing procedure. Continuous glide-tones in 1/3-octave bands cover the frequency range from 30 to 15,000 Hz and are synchronized with a graphic level recorder.

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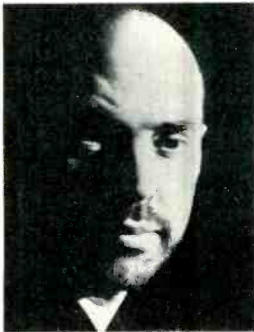
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# Bra Ljud means good sound. Read Then visit

Designing loudspeakers has been held to be something quite mystical, based more on belief than knowledge. Few people in America realize that nearly 25 years ago, a Swedish acoustical designer, Stig Carlsson, came to grips with the problem of reproducing good sound and conducted literally hundreds of studies, laboratory measurements and functional tests.

Carlsson's work resulted in new loudspeaker designs. Until this time, loudspeakers had been the weakest link in the chain of sound reproduction. But Sonab's multi-directional (patented Ortho-acoustical) loudspeakers changed that.

With the birth of Sonab, a Swedish owned company, people in Europe became acquainted with Carlsson's concept of designing stereo speakers with multi-directional sound distribution that utilizes the listening room to help communicate the music.



## Stig Carlsson developed speakers without speaker sounds.

Stig Carlsson's contributions to sound can not be over-emphasized. An unusual man, many who know him consider him to be a genius. He began his work during the early-fifties in his own acoustical laboratory at the Royal Institute of Technology in Stockholm, studying the properties of sound in close detail as well as how sounds are perceived by the human ear. From the sum of all his measurements and tests, he came to the conclusion that it was possible to make speakers without speaker sounds. "The shortcomings in the reproduction of sound that are usually called speaker sounds are really rather obvious consequences of the way speakers have been designed in the past," Carlsson said.

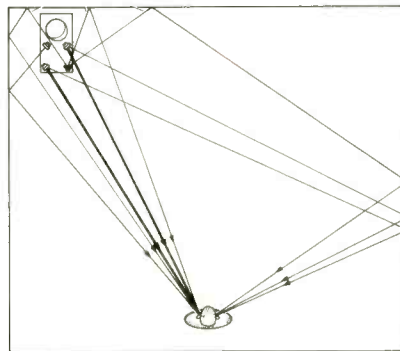
Conventional speakers suffer from a basic fault: they radiate the sound of a violin, for instance, with the directional properties of a trumpet. Carlsson feels it is important to have a speaker that radiates the entire audio spectrum more or less equally in all directions. This has a double advantage: the reproduction sounds the same in all parts of the room, and violins and other instruments with high overtones sound "right." This is successfully achieved with Sonab speakers by using several treble speaker elements mounted to face in completely different directions. Carlsson's speakers differ from other designs in the positioning of the speaker elements in the cabinet. And the resulting reproduction reflects flat frequency response, full, clean supple living sound that resembles the original performance.



## The benefits of multi-directional sound. Stand anywhere and listen.

Carlsson found that the position of the speaker elements in relation to the wall behind them is of considerable importance for the finer shades of reproduction quality. If the treble elements are situated 16-inches or more from the wall, reproduction of the high frequencies takes on an ethereal quality and these sounds become disassociated from the speaker enclosure.

Carlsson's studies in the way the low and middle register sounds reach the ear showed the clearest reproduction is obtained when the speaker element for this part of the audio spectrum is situated nearest to the wall. Carlsson measures the whole flood of sound, both direct sound and reflected. Only then can one know anything important about the loudspeaker's function. This is the essence of Carlsson's principle.



## Good sound fills the entire room.

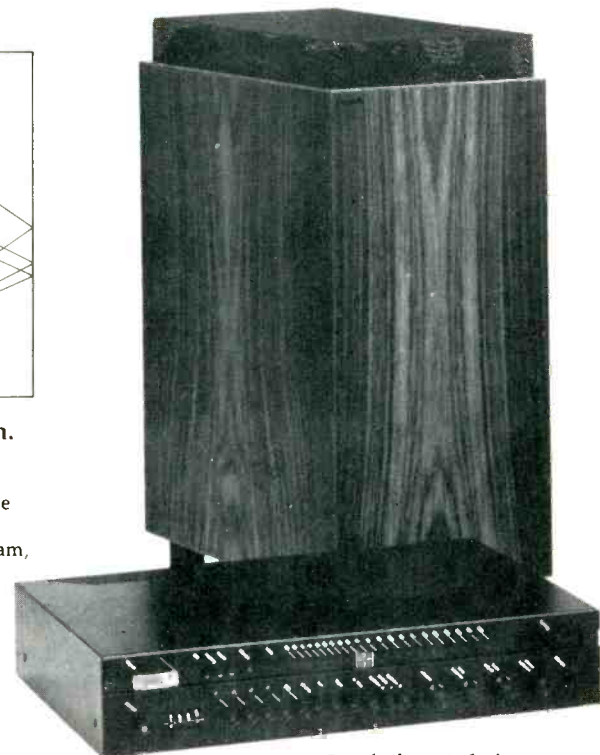
There is a technique you can use to compare Sonab speakers with ordinary speakers: The simplest way to obtain the stereo effect is to use ordinary speakers which direct their sound in a narrow beam, like the spotlight of a flashlight. If you have two speakers of this type, set them up so that the beams cross each other. If you sit where the beams cross you hear stereo music. But if you do not sit exactly where the beams cross, the stereo effect is out of balance. If you move about the room, to your

consternation, you sometimes hear stereo and sometimes not.

Sonab speakers work in a different way. By using both direct and reflected sound (multi-directional sound), the sound from them fills the entire room. Sten Broman, a leading Swedish composer, says about Sonab speakers: "They are designed in such a sophisticated way that they spread the sound in the room—regardless of its size and acoustic properties—with unusual uniformity."

There is another important difference to Sonab speakers: Take a look at the two compact OA-14 speakers shown below. For the sake of stereo effect, the bass and mid-register element and a couple of treble elements have been directed in the left-hand speaker to the right and in the right-hand speaker to the left. You can see this when you remove the top grilles (as shown in the cutaway photograph above). The left-hand speaker is a mirror image of the right-hand one. They are not mono speakers. They are a matched stereo pair. Built in pairs. Tested in pairs. Sold in pairs. Only in this way can Sonab speakers be a reflection of good sound.

The enclosures themselves are constructed in a technically interesting manner, solidly braced to remove any semblance of unwanted reverberation. That's what's inside. Visually pleasing, Sonab speakers are available in various speaker configurations incorporating the Stig Carlsson Ortho-acoustical principle and in a choice of walnut, rosewood or black lacquer finishes.



Sonab doesn't feel your

# how we accomplish it in Sweden. a Sonab dealer to listen.

## Sonab doesn't stop at speakers.

All electronics at Sonab, for example, are built in the finest tradition of Swedish craftsmanship, including the professional communications equipment which we build in our modern factory in Lovanger village in Northern Sweden. As everyone knows, in Sweden we are very meticulous about the way we do things and every loudspeaker must pass through five quality control stations before it is shipped to this country.

Stig Carlsson's presence at Sonab is as integral to the success of our company as were his earlier investigations of loudspeaker design. With Carlsson striving for sensible measuring methods, the prime task at Sonab is to make equipment which sounds good. Not which just gives accurate measurement results. The methods of measuring at Sonab do have a decisive significance for sound. You can compare it, for example, with what happened to Swedish tennis star Bjorn Borg in one of the matches at Wimbledon. There sat the judges with their light meters which said that the light was sufficient to continue the match. But none of the players could see the ball. They wanted to stop playing and were criticized for demonstrating against the judges.

Sound must be measured in such a way that you can enjoy the result of the measurements when you are listening at home. Stig Carlsson has recognized this and all tests are conducted recognizing this principle. Sonab loudspeakers and electronics are not tested in some echo-free

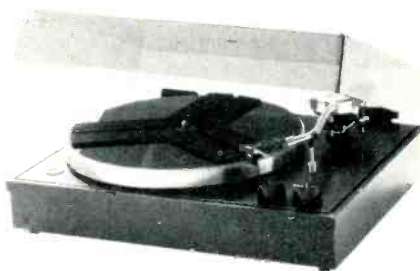
anechoic chamber which does not in any way resemble reality, but each is measured in typical rooms very similar to yours.



## Our Swedish receiver tunes in American stations.

At Sonab, we consider the audio industry to be on the wrong road when they supply electronics which have 20 to 30 control knobs and buttons. Pleasant toys for the technically interested, and maybe necessary in some professional circles. But for in-home use, you should get pleasure out of the stereo equipment which has taken such a large part of your budget. The more thought out the design, the fewer controls the design demands for its own sake.

Sonab's R4000-3 is an FM stereo receiver which boasts convincing simplicity both of function and design. It has a minimum number of knobs and an easy-to-work combination of push and turn controls. The listener can rapidly select four FM stations with pushbuttons, and with a convenience output socket connect a turntable or a tape recorder or even a lamp to read by. Another unusual feature of this receiver is an active volume control which provides perfect sound over the entire register, even when volume is reduced. Instead of merely reducing the signal which is fed to the amplifier, inherent noise is also reduced. With ordinary receivers, music can easily be drowned in amplifier hiss when the volume is lowered. But not with Sonab's R4000-3. Another example of Sonab workmanship is reflected in the R3000, an FM stereo receiver shown in the group product photo.



## Our turntable is not a piece of furniture.

Technique must not be camouflaged. A turntable is not a piece of furniture. Why try to make it look like one, then? The Sonab 67S turntable has all the necessary technical features as well as highly distinctive styling. It is easy to work with only two controls and is effectively isolated from jolts and vibrations.

With the suspension in the 67S, the chassis moves, but the platter and tone arm do not. In this way we also eliminate another difficult problem: acoustical feedback. Its balanced tone arm is supplied with a precision, adjustable antiskating device.

The belt-driven, two-speed turntable produces low wow and flutter through the use of a 24-pole synchronous motor with a constant speed, low rumble factor. It has a built-in spirit level and is supplied with a cover.



## A cassette deck that sets Sonab apart from the rest.

The Sonab C-500 is constructed in such a way that makes it simple to handle, to play and above all, to record. To help the listener and recordist, Sonab equipped this stereo cassette deck with Dolby\* noise reduction system, tape selector for standard and chrome tapes (which changes both bias and equalization), quasi-peak value recording level meters, mixing facilities between left and right channels plus a center microphone, memory rewind and built-in amplifier for headphones which enables record monitoring at an acceptable level to the user.

Frequency response of the C-500 is 30 to 16,000 Hz with chrome tape and all other specifications are in keeping with the Sonab reputation for excellence.

## The warranty is transferable.

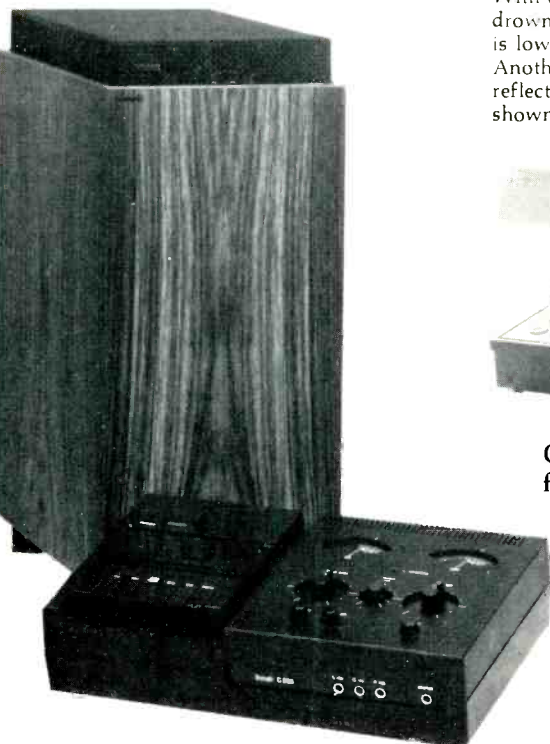
Since Sonab takes pride in building speakers and electronics, it warrants the product—not the purchaser.

Ingmar Bergman once said that every person has a saboteur inside. We think that every audio listener hears the same voice from inside that tells us to shrug off preconceptions about sound and styling. To be different, to strive for perfection and good sound.

For the name of the Sonab dealer near you, write to us. Sonab Electronics Corp., 1185 Chess Drive, Foster City, Calif. 94404. (415) 574-2591.

A reflection of good sound  
from Sweden.

# Sonab



speakers should be lonely.

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# Audio ETC

Edward Tatnall Canby

**F**OR SOME TIME now I have been trying to put down in words, so far unpublished, my own personal evaluation of the musical values to be derived from our current quadrasonic systems, each of them, so to speak, lined up in my living room (and yours), each pitted against the others, AB, ABC, maybe even ABCD. By this late date, you can be sure, I am clear in my own mind as to those values. I know pretty well what each system is likely to do or has done for me. By inference—since I am a writer—I am clear in general as to what each can do for you, whose musical tastes are unlike mine. All this, of course, via first hand experience, with the sound itself and with people who have made that sound.

But the writing of one's thoughts in this situation isn't easy. We are dealing with a lot more than mere money, power, vested interests, corporate forces in opposition, though these things are intimidating enough—who wants to get caught between those grinding millstones, RCA and Columbia? Not to mention Sansui with QS and Duane Cooper's UD-4 system. What counts, I feel, is more honorable and more genuine than all the corporate pushing around. It is people. Creative people, leaders in audio engineering, who have been heavily, even passionately, involved in the development of these rival approaches to what seems outwardly, at least, to be one technical problem—a disc record which can produce four different signals out of a single groove and via a single stylus, which will produce stereo sound compatibly and, when and if necessary, also produce an acceptable mono.

Some of the very best minds in audio have worked their hardest towards this end, and these best minds are by no means all in one camp. We have lots of camps.

Now stop a minute. First, I am not speaking here of the thousands of worthy souls who direct the publicity and the advertising which we mainly see and hear, concerning each of the

quadrasonic systems. Useful as it may be for sales, vast as is its aggregate size and heft, this is no more than the trickling-down from the top, third hand, tenth hand, the end product of endless passings-along. Remember Harry Truman's buck? Advertising and sales pass the buck straight along, because that's what they are supposed to do. But the buck starts with the real people, the ones who do the thinking and the creating. Such a person, at the engineering top, has a lot more at stake than simple promotion of a product. He believes. This thing is his spiritual child, his audio offspring! He is deeply persuaded—and often it is himself that he has persuaded. How different, this, from an assigned job of straight publicity.

## Audio Bias

Next. Can we expect such people, the originators, the prime movers, to be other than, shall I say, *biased*, in favor of their own particular system? ("Biased" means, literally, "leaning.") Of course not. If it is a bias, then it is an admirably honest one, if you ask me, and quite inevitable. This is the sort of bias that keeps the world going 'round, if with a few creaks and groans, science not quite having achieved perfection yet, not even in audio engineering.

Far too much of our energy, it seems to me, goes towards accusing this and that quadrasonic promoter of being less than impartial. Crazy! How do you expect the creative mind to get its work done if it is wholly *objective*? Nobody works that way, and least of all a top leader. Our first job in evaluating any new system, quadrasonic or what have you, is to assume that the people behind it are partial to their own work, enthusiastic about it, indeed; and that they will be literate and persuasive when it comes to explaining it. Every professional writer knows this from personal experience. How could it be otherwise? But pure objectivity—that we do not expect, nor should we.

(Hey, am I going to evaluate each of the quadrasonic systems? Later. I am going to move slowly in this dis-

cussion. I want to say what I really believe, and wish to do so constructively and helpfully if it is within my power. So bear with me a bit further.)

To continue, about those real people, our top engineering designers. I prize every moment of my occasional contacts with them. As a writer, I know that what they have to say is possibly the second most important input I have on hand. The first, of course, is the music itself, speaking its own language of persuasion directly to my ears in the neutrality of my own listening space.

One goes out and listens to the real people enthuse about their very real products. One hears *their* demonstrations, *their* presentation of music, to *their* best choice, in *their* style. One immerses one's self, so to speak, in their argument (knowing that it is biased! and admiring that bias). And because I respect these people and thus respect, too, what they have to show me and tell me, I find myself really *trying* to be persuaded, to go along honestly and freely just as far as I can. It's worth the effort. One learns new things. The real people are generally good. At the drop of a hat they'll spiel at you with all sorts of technical background material (some of which is hopelessly beyond me); but they are also extremely good at simplification. By this I mean, putting technical matters into terms understandable by the intelligent layman. (After all, who in the end is the judge of their products, whether professional writer or hi-fi hobbyist?) Indeed, their respect for the intelligent person who may not know the algebra but catches onto the fundamentals matches my own respect for them as professional creators. A happy combination and over the years I have learned most of what I know from such pleasant first-hand encounters. Quadrasonics is decidedly no exception.

One must experience what it is like to be, say, a top CD-4 leader, right at the creative source, before one can write informatively on that system. The same goes for a whole working

# Disco use challenges a cartridge... that's why Stanton is the first choice of disco pros, as it is of broadcast pros



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Discotheques represent one of the most grueling professional situations for a pickup that can be imagined. Not only must the cartridge achieve a particular high level of sound excellence, it must do so in the "live" environment of back cueing, slip cueing, heavy tracking forces, vibration and potential mishandling... where a damaged stylus means much more than lost music; it means lost business.

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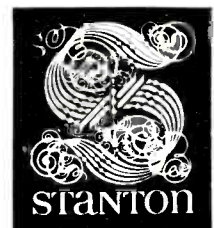
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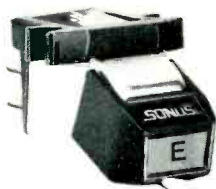
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were designed for the audiophile who, while demanding an extremely high standard of sound reproduction, is not prepared to sacrifice the convenience of his automatic turntable, or who finds it impracticable to invest the time and money in associated equipment which may be necessary to achieve the maximum benefits from the SONUS Blue, Red or Green Label cartridges.

We believe these latter units have set a new standard of sonic definition and accuracy. They are highly compliant, lightly damped devices that take a great deal of time and enormous care to build; consequently, they are expensive.

We think the Silver Label cartridges are a very attractive compromise. While retaining nearly all of the sonic qualities of our other cartridges, they offer a much greater degree of compatibility with other components and at a considerable reduction in cost to boot. Indeed, at \$70.00 for the Silver Label "P" model with a Pathemax stylus for both stereo and CD-4 recordings and at \$60.00 for the Silver Label "E" model with a conventional elliptical stylus, we think they're quite a bargain!

Blue Label - \$125

Red Label - \$104      Green Label - \$88

Write for further information

## SONIC RESEARCH INC.

27 Sugar Hollow Rd., Danbury, Ct. 06810

team as well, since a great deal of our engineering, as in other areas, is done in team fashion. There is in that case a sort of average point of view, a collective enthusiasm, which is not really different from that of the individual creator.

### Leading the Fray

Thus, on the one hand I throw myself into the spirit of one of those vast CD-4 press parties, with all the top people on hand to explain things, which JVC, RCA and Associates sometimes put on for our benefit. Yes, Publicity is there in force. One must discount a lot of hoopla from that source! But the real people are there, too, and never forget it. It is those people that one gets off into a corner, for the genuine poop straight from the original horse's mouth. Some horses! It is CD-4 all the way and every one of us in the "audience" just loves it. Why not? But the underlying intent is very serious, on both sides, and we all know it. There is always something to be learned, new facets, a new light on the new sounds. So much, too, can be read between the lines, if you keep your eyes peeled and your ears tuned.

Also, I must admit, there is no better place to find the weak points of any system than at a session with the opposition! A part of the understandable bias, of course, you might say the negatively positive side. The weaknesses of the local system, naturally, are not going to be very evident. That's the positively negative. Again, why expect anything else? People act like people, especially the brilliant ones, those who are dedicated. And are the rough spots in the opposition system made clear! They never had it so bad. But this is good, because there is usually a solid kernel of truth to be derived, somewhere down there. And the same, the other way around, when you visit the other camps.

Between them all, if you give yourself wholly on each occasion but, inside, keep fingers crossed (if you see what I mean, anatomically), your mind in balance, you will have accumulated some valuable material.

Then, perhaps, off we go to visit Stamford and Ben Bauer, the prime mover for SQ. The SQ people don't generally go for big press demos; they seem to prefer smaller, more casual set-ups and Bauer himself tends to invite a half dozen or so writers, no more, for a wholly informal session of give and take. His style. Or even a one-to-one. I have thus often found myself at the very center of the SQ

operation, which is unofficially located in the Bauer living room, for hours of record playing and discussion on into the wee hours; but I am by no means the only journalist to enjoy this challenging, if exhausting, experience. It is simply one alternative means by which these real people make contact with those who must understand their work in direct terms.

Believe me, for some remarkable reason, the SQ system has never sounded so astonishingly good as it does there in the Bauer living room. (Official SQ development headquarters, down at the CBS Technology Center, doesn't do quite as well. Those simulated living rooms they set up in office spaces just don't quite convince.) And believe you me, too, I have heard chillingly convincing faults in the other systems chez Bauer, enough to make their people squirm. Whoa—don't take my argument wrongly. This is exactly what I am talking about. Strange, too, that at those CD-4 demo parties the "discrete" sound also is most convincing, and if by any chance another system is AB'd, you know exactly how it will sound. I am not being cynical. At some lower press level, down in public relations, that sort of thing doesn't go over. But at the top, it must be respected, and one only wonders how they do it so well. Not by trickery! Merely by first-hand enthusiasm for the home product, an informed and skilled enthusiasm.

Ah, yes, systems C and D. No question, they too can sound terrific under, shall I say, optimum conditions. Both have much to offer. As for D, however, it isn't truly in the running for lack of commercial hardware and software, though this UD-4 idea seems excellent, combining as it does some of the elements of both matrix and discrete approaches. QS, whose time has come in truth, as there is both hardware and software, has been emphasizing broadcast quadraphonics via FM, with QS decoding in the home receiver. I have a good, little pile of QS classical discs on hand from VOX; already they sound remarkable fine via a QS decoder minus the logic-assist function (Variomatrix), which gives a fair comparison to SQ advanced-logic decoding. I am sending distress signals to QS headquarters—Pliz, help me catch up!—and hope to attend at least one optimum QS demo to make up for the one I missed a while back (it had closed). Given a good show, I ought to be persuaded to the hilt. Rightly so!



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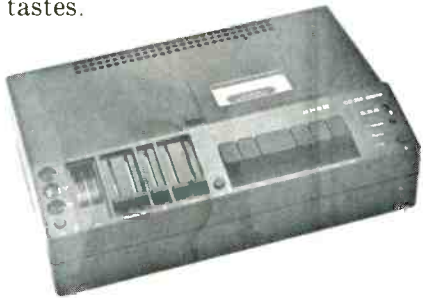
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OK, be cynical if you must. I've shot my bolt and made my argument. Let's go one step further. As I say, we will not understand the present quadrasonic rivalry if we look for engineering faults, even though they certainly exist, those questionable aspects, at least on a purely technical basis. I think that every real engineer concerned with these various systems knows exactly where these problems are, and every one of them has done his best to ameliorate, to improve his own, without compromising other elements that seem to him essential. Ah, there's the point. Priorities again. It is the ordering of the priorities that counts. And here I make my one further point.

The entire audio world now goes around arguing technical parameters as between the rival quadrasonic systems, including the real people, the prime movers up at the top. Nobody seems willing to understand that the *first* priorities, before any of the technical decisions, are always *musical*. It is music, in every case, which stimulates the thinking that sets up the engineering parameters.

#### Musical Basis

The laws of physics are indeed unchanging. But the values in music reproduction are something else again. Every engineer who promotes his own (or his team's) solution for the quadrasonic disc is *necessarily* a music listener. His work in engineering actually must thus represent a musical point of view. Music is where it all begins. Music is the basic source for every quadrasonic parameter. The audio physics of the system, in all their detail, are the consequences, not the source.


And yet—how much do we hear about this musical genesis? All too little. Indeed, you'd think it wasn't there. All the talk is of the physical, the audio engineering aspects of each system. I think that this, too, is easily understandable. You would do the same and probably with conviction; being an audio man, you will assume that significant differences between two audio systems are technical. They are. But not in the primary sense. Look elsewhere, if you want to know *why*. Look to music.

In the same way, very few of our audio prime movers are practicing musicians, though in our field they have dedicated much of their lives to that art. Like any good pro, they speak their own audio language by preference. They are reticent when it comes to music, even in their own minds.

(They discount the vast quantities of listening that they inevitably do, which is a musical education, after all.) Very few will admit to knowing much about the music profession, or its history and literature. A modest bunch! I suspect that as a group they hide even from themselves how very thoroughly they are in fact influenced by their own concepts of music and music listening. They take all this for granted and act as though *their* music, miniscule as it is, really isn't much different from the man's next door. How wrong.

A few weeks ago, I heard a healthy violin sound, *live*, coming out of the Bauer living room. Guess who was playing to my astonishment? Do you think that sound has nothing to do with the thinking of the man who developed the SQ matrix concept? And suppose somebody over at QS just happens to be a rock/pop fan or maybe loves that discreet (!) background mood music he hears all day out of the fancy home system he keeps on all the time, turned down to a polite murmur. Lots of people live that way. No influence on an engineering mind? Don't be silly. An enormous influence.

Now my own special interest is classical music in its broadest array but I can see beyond the end of my nose. I am *not* implying here any right or wrong, good or bad, high or low; for by music I mean any and all music subject to home reproduction (or auto or what have you). It is *some* sort of music, always, that lurks in the background of every development of quadrasonic technique. But which music? Since there are so many kinds, and so many different habits of listening and choosing and using, there are just bound to be quite widely differing viewpoints from which our modest engineer-musicians—often without really realizing it—take off into their audio. Surely they overlap by a lot. No exclusive 100 per cent differences of viewpoint, or rarely. We live in the same over-all culture. But within that culture, *differences in musical lifestyle are unerringly reflected in purely engineering parameters*. And so we have differing systems. That's the message.

No, I can't read minds. But I am going to try an evaluation of the major quadrasonic systems with all this in mind. Easy enough, after so long—if I can just find the right words. In public print this is a bit like going for a casual stroll inside a volcano in your stocking feet. If I'm not around next month you'll know I fell in. 

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In the pursuit of good sound, a new alternative has arrived—the SAE 2200. Our design goal; to offer the sound quality and reliability of our 2500 in a more modest power and price package. The realization of this goal is an amplifier whose specifications become the standard by which others are judged:

—100 Watts RMS/Channel (both channels driven) from 20Hz to 20kHz into 8 Ohms.

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 Transient Response of any Square Wave . . . . . 2.5usec. rise and fall time  
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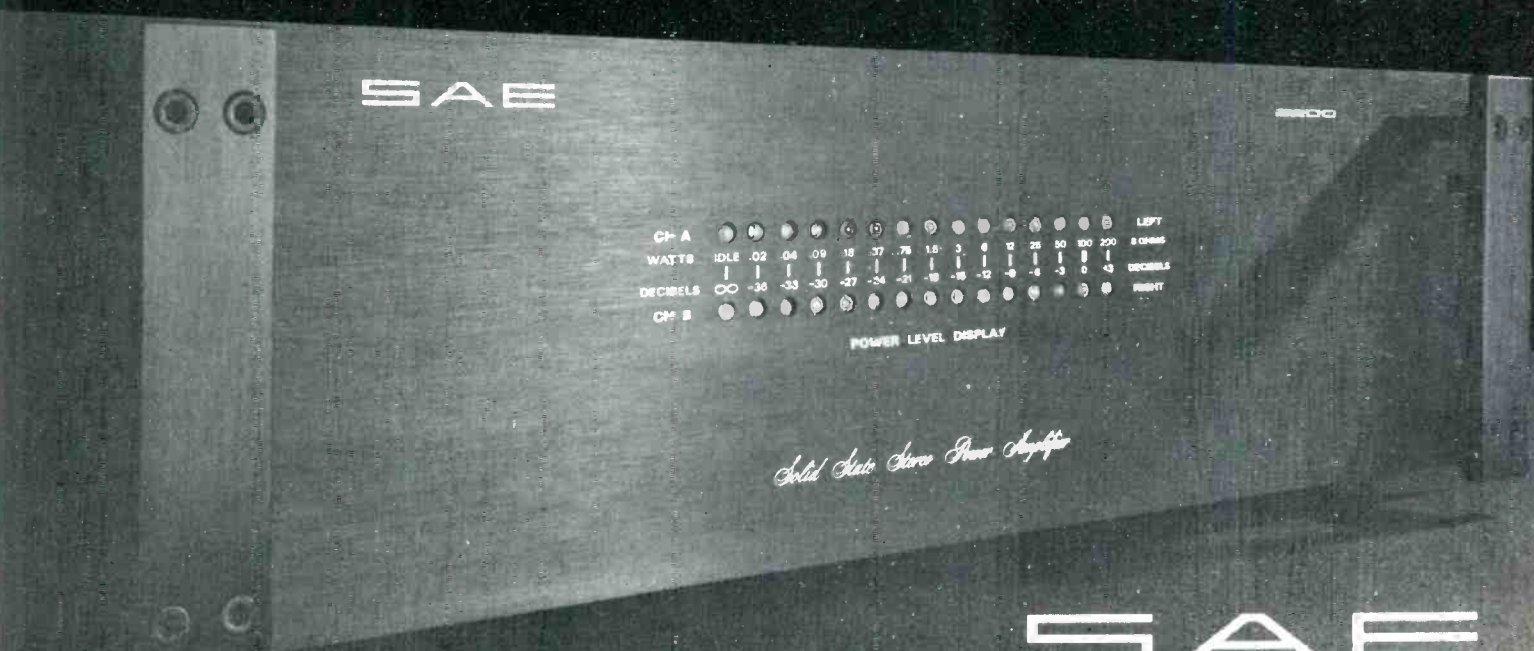
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# Dear Editor:

## Side Tuning Helps

Dear Sir:

As Director of Engineering for a major radio outlet in this area and as a Consulting Engineer for a number of other stations both here and abroad, I am most aware of the quality (or lack thereof) in the vast majority of radio receivers on the market today. Many radio engineers are getting wise to this fact and are doing something about it by "pre-equalizing" their audio before it is fed into the stations transmitter.

The high-frequency response of many receivers (especially automobile and lower priced home units) can be improved somewhat merely by side-tuning slightly. To do this, it is necessary to tune the receiver in the normal fashion and then slightly mis-tune it either towards the higher end of the band or towards the lower end of the band. Choose which ever sideband gives you the least distortion. This type of tuning takes advantage of the high frequency energy which is concentrated in the station's sidebands. (Side tuning is most effective on receivers which lack selectivity.)

Many receivers that incorporate ceramic filters or sharply tuned i.f. strips to increase the selectivity are subject to severe high-frequency distortion when tuned to the sidebands. This is due to the steep tuning slope of circuits within the receiver and obviously the only answer for these receivers is a reduction of the selectivity (or Q) of the i.f. and/or r.f. amplifiers within the set.

It is also interesting to note that many engineers feel that since receiver manufacturers have reduced their high frequency response to insignificant amounts, the broadcasting stations need not exceed these very poor specs. I feel that the practice of reducing the high-frequency energy within the broadcast station is extremely unwise because it deprives those few owners of truly find receiving equipment of the quality that they (the broadcasters) are required by law to uphold.

If you suspect that there is a problem with the frequency response of

the station to which you listen, you might try side-tuning. This will allow you to hear the sidebands more easily and thereby determine if the response deviation is within the station or within your receiver.

I would like to hear more from other Broadcast Engineers regarding the practice of pre-equalizing the signal at the station and would be more than happy to be of help in solving audio problems either within the stations or with receiving systems in general.

Frank L. Berry  
Frank Berry and Assoc.  
Highway 540 West  
Winter Haven, Fla. 33880

## Construction Articles

Dear Sir:

I wish to commend and thank *Audio* for your publication of the article "Transient IM Distortion In Power Amplifiers" in February, 1975, and for your subsequent construction article "Build A Low TIM Amplifier" in your current (Feb., 1976) issue.

These articles appear to be a departure from the type of material *Audio* has published in recent years. I hope they signify a trend to return *Audio* to its previous status of a pioneering publication in its field, such as it was under C.G. McProud.

Jack L. Boyle  
Phila., Pa.

## Critic's Comparison

Dear Sir:

It was an interesting move to contrast the differing viewpoints of critics Jon Tiven and Michael Tearson and their ideas concerning Joni Mitchell's **The Hissing of Summer Lawns** in your March, 1976 issue.

As a professional recordist and musician, having spent years in radio broadcasting, I feel that a major point was brought out very plainly and uniquely. Why is some music labeled "progressive" over and above other music? Why are some artists constantly turning out new and fresh ideas whereas others seem to release the same album time and again with modified lyrics and chord patterns?

The answer lies in their approach to rock music; their overall concept of the ideas they're putting on their recordings. The answer also lies in the subjective response of the listener, or in this case, the critic.

Please look back into the March, 1976 issue and compare the two critiques. Note the major differences in the performance ratings: Tiven gave her a C; Tearson gave her an A+. Given the fact that the evaluation of a performance is a purely subjective phenomenon, this writer is drawn into the texts of the articles to discover the reasoning behind the discrepancy.

The Tiven review is written entirely from the viewpoint of "What should a woman sound like when singing 'pop/rock'?" He *already knows* what he wants to hear. This predisposition is understandable. Since the dawn of music prior to the rise of jazz, music has been evaluated from the standpoint of convention (with the exception of those innovators who, though breaking convention, were so strong they changed the direction of music, thereby allowing evolution).

On the other hand, the Tearson review was written from what the critic *heard*, not what he expected to hear. His performance rating reflected what Joni Mitchell *did*, not what she was expected to do. This, in my estimation, is not only more realistic, but it more closely parallels the ideals of "Progressive" music. The artists perform what they feel.

I have betrayed my own subjective position. I dearly love Joni Mitchell's music. But I certainly do not condemn a man who doesn't appreciate her style; that is for him to decide. But I greatly resent the insinuation that music must follow pre-established developmental guidelines. It is this approach that precludes many people's enjoyment of music like that of Bob Dylan: he doesn't seem to sound like other artists.

Thank you. Your magazine is excellent.

John P. Fiksdal  
Media One, Inc.  
Sioux Falls, S.D.

# Charles Barker on the Bose Model 301 Direct Energy Control.



"When the Model 301 project came into the engineering department, our goal was to design a bookshelf speaker with minimal placement constraints, that sold for less than \$100, yet had the unique spatial qualities characteristic of the Bose 901® and 501 Direct/Reflecting® speakers.

"Initially, two quite unconventional design concepts evolved. First, we deliberately operated the woofer and tweeter simultaneously over a significant portion of the midrange. This Dual Frequency Crossover™ network gave us very smooth midrange response and an open spatial quality.

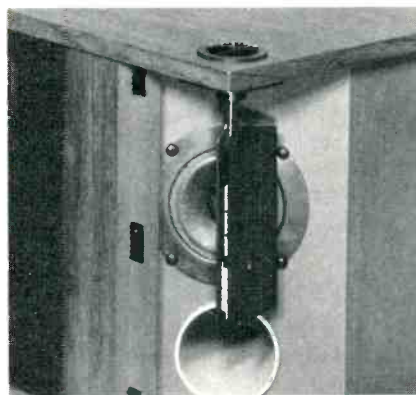
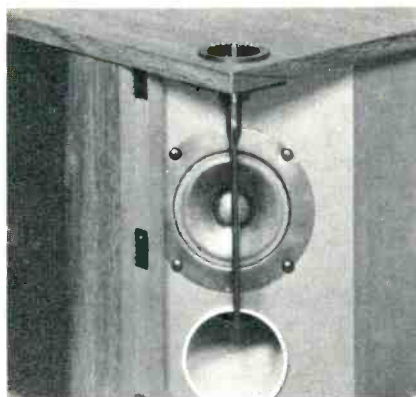
"Second, we perfected a very precise asymmetrical configuration, with the woofer radiating straight ahead, and the tweeter angled to the side, to reflect sound off the room's side wall and into the listening area. From our experience with the Bose 901 and 501 speakers, we knew that this combination of direct and reflected sound would give us the open, spacious sound we wanted.

"At this point, we felt we had an extraordinarily fine loudspeaker. But we were also

aware of a problem. Since this design relied on side wall reflections to maintain its spacious sound, what happens in a room with no convenient side wall?

"We felt this was a crucial problem, since we wanted this speaker to sound very good in any listening room.

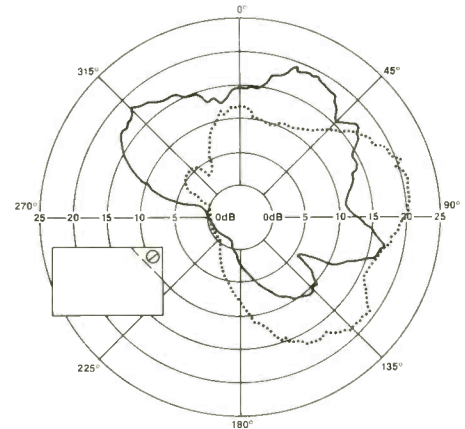
"The solution was the Direct Energy Control — an adjustable deflector in front of the tweeter and hidden behind the grille. The Control can be set to reflect sound off a side wall, or, if there is no side wall, it can deflect high frequency



sound back toward the center of the room, so energy balance is maintained in the listening area.

"Beyond that, the Control lets the listener adjust the spatial qualities of the speaker

for different types of music: very spacious for an orchestra, or a much more intimate sound for a soloist.



The solid line is the polar characteristic for the Model 301 with the Direct Energy Control set for maximum direct energy and a more intimate sound. The broken line is the polar characteristic with the Control set for maximum reflected energy and a more spacious sound. Frequency is 8 kHz, bandwidth is 1/3 octave.

"The Direct Energy Control is deceptively simple: of all the things we did in the Model 301, it's the one I get most excited about, because I've seen how people react when they hear the unique dimension it produces in a speaker priced under \$100."



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# Behind The Scenes

Bert Whyte

ONE OF THE more interesting and provocative papers given at the 52nd convention of the Audio Engineering Society in New York was entitled, "Towards a More Natural Sound System," by Leslie Hay of Westinghouse Airbrake Co. and Dr. John V. Hanson, Electrical Engineering Dept., University of Waterloo, Ontario, Canada.

In essence, what the authors proposed was a new configuration of quadraphonic sound, in which three channels would be used for the front "sound stage"—a left, center, and right loudspeaker—and the fourth channel would be in the rear, rather than the left and right front, and left and right rear channels as in the conventional quadraphonic layout.

In the introduction, the authors presented some well-documented facts pertaining to the perception of direct and reflected sound in the concert hall environment. In the listening room, under normal stereo playback conditions, the accurate spatial location of sound sources is possible only if the auditor is on a line equidistant from both loudspeakers, and subtends an angle to the loudspeakers of approximately 60 degrees. At angles greater than 60 degrees, they contend that a *hole in the middle effect* occurs, and sound sources tend to be localized at the loudspeakers. While this is basically true, the condition has

been somewhat alleviated for some years now by the practice of mixing the output of a center stage microphone into the left and right channels, which on playback provides us with the so-called *phantom center channel*.

Getting back to concert hall listening, the authors note that "reflected sound is delayed with respect to direct sound, is of lower intensity, and impinges from all directions. It contains ambience or depth information relative to the acoustics of the concert hall, but no directional information. Also, the perception of distance to the sound source is a function of the ratio of intensity of reverberant sound to the direct sound. This ratio may be defined as the sound quality *depth*. In normal stereo reproduction, the ambient sounds that contribute to depth are perceived to come from in front of the listener, whereas in the live situation, ambient sounds impinge from all directions." The authors state that standard stereo reproduction thus suffers from three major shortcomings when compared to natural concert hall sound—poor source location stability and accuracy, limited listening area, and incorrect ambience.

Mr. Hay and Dr. Hanson go on to comment that although present quadraphonic recording techniques reproduce direct stage sounds from two

front loudspeakers (not entirely true, because there is some ambient or reflected energy in the front channel signals) and the two rear channels provide two ambience signals for subsequent improvement of depth perception, the other two reproduced stereo faults of poor source location stability and limited listening area remain.

The authors also argue the point that having two discrete rear signals permits the total *surround sound* type of quadraphonic reproduction, but this is not a *natural* sound environment. This is, of course, a controversial matter. As has been stated many times before, there are a few, very few, pieces of music scored for "rear of hall" sounds, e.g. the brass bands in the Berlioz *Requiem*, the children's chorus in the Mahler *3rd Symphony*, and the antiphonal music of Gabrielli and Monteverdi. To this we must add any modern works in which the composer is aware of surround sound quadraphony and deliberately scores his work to take advantage of the medium. There are also those works, such as *Carmina Burana*, which lend themselves to the surround sound quadraphonic treatment. Nonetheless, this music and any other *standard* work which has been recorded in surround quadraphony must be considered a contrived product. Multi-track surround sound pop music is, of course, a totally contrived

# PART TWO: THE END OF THE DOUBLE STANDARD.

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

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

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

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

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

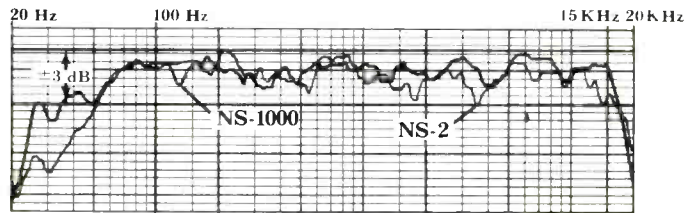
Yamaha's success in achieving a single standard of accuracy in all our speakers is confirmed in the chart above.

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

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

#### Yamaha's musical heritage.

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



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

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

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

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

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

#### Five different speakers, built to one standard.

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

At the top, the revolution-

ary beryllium dome NS-1000 Series, offering the ultimate in state-of-the-art performance. Following the NS-1000 are our other three-way types: the NS-690, NS-670, and NS-3. Our least expensive, but still highly accurate, is the two-way NS-2.

Since each is built to the same high quality standard, you're probably wondering what those extra dollars are buying.

It's very simple.

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

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

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

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

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

#### The End of the Double Standard.

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

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

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

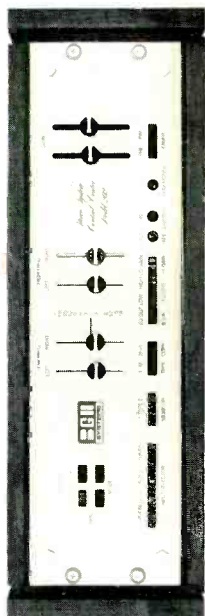


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*Phono stage:* Gain=42-dB, =25-dB of RIAA, S/N=82-dB, THD=.01%.

*Tone controls:* Active baxandall controls add virtually no distortion. ±18-dB at 50-Hz and 15-kHz in 3-dB steps.

*High and low pass filters:* Active 3-pole, 18-dB/OCT. Low frequency at 40-Hz, high frequency at 12-kHz.

*Maximum output voltage:* At line output, 8-volts RMS into 600-ohms (+20-dBm). Phono at tape output, 10-volts RMS into 5-kohms. Rated output, 4-volts RMS into 5-kohms.

*Total harmonic distortion:* Less than 0.1% at rated output, 20-Hz-20-kHz.

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product of the studio, with no counterpart in real time.

The authors state that in the quadrasonic listening tests they conducted, listeners found it difficult not to turn around to face a sound perceived to come from behind them, and they complained of unnaturalness when this occurred. I think what they meant here was that even when the rear channels are just used for ambience, if the amplitude of the rear signals is too high, *discrete* instruments are perceived, and this is *unnatural*. This is a situation which has occurred all too frequently in dealer listening room demonstrations of quadrasonic sound and is partially the result of high noise levels in the demo room, with the salesman turning up the rear channels to override the noise, along with desire to show that he really is playing four-channel material.

## New Quadrasonic Configuration

The authors, however, agree that the rear channels should be used only for the reproduction of hall ambience, but that in consideration of the non-coherent, non-directional nature of the ambient sound, that a *single* ambient signal delivered to two (or more) rear loudspeakers would suffice. With only a single rear signal, the remaining three channels can be used to form the optimum stage sound, including a discrete center channel, thus the three-plus-one system. Their contention is that this configuration of the four available channels should provide a better approximation of the concert hall acoustic environment than the *standard* quadrasonic system. The authors describe interesting experimental data to support their three-plus-one system.

Quoting from their paper, "Professional quality live recordings were made of the Kitchener-Waterloo Symphony Orchestra, using both standard quadrasonic and 'three-plus-one' arrangements. Five microphones were used . . . three directional microphones in front of the orchestra for left-front, center-front, and right-front signals, and two omnidirectional microphones near the rear of the hall for left-rear and right-rear signals. For the quadrasonic recording, the center-front microphone was not used, and for the three-plus-one recording, the two rear microphones were mixed to provide one rear channel signal.

"Listening tests were performed in

a carpeted living room 22 feet wide by 20 feet deep, with reasonably well-damped acoustics. Five loudspeakers were used to match the microphone placement. These were all wide-range direct radiators, the center-front unit having a wide dispersion angle. (Nothing is said about the dispersion characteristics of the other loudspeakers, but one presumes they are not dissimilar from the center front speaker.) A switching arrangement coupled to colored lamp indicators controlled the loudspeaker energization . . . quadrasonic using the four corner speakers and the three-plus-one system using the three front speakers plus the rear speakers driven in parallel. The switch enabled listeners to compare the *white* and *yellow* quadrasonic or three-plus-one systems. Seating for 18 listeners facing front was provided. Four groups participated in the tests, a total of 71 persons. The participants were largely from the university community, students, staff, and faculty. Thirty-three of these people claimed to be high-fidelity enthusiasts, however, no discernible difference was found between the response of the audio enthusiasts and others. Each listener was given a data book in which he recorded his seating position, answered some questions concerning his musical experience, and recorded his responses to other tests.

"The first part consisted of image location tests, for example, central image location, LF, RF channels only; test tone location, solo instrument location, and instrument location using quadrasonic and the three-plus-one recordings. The listener was asked to mark the apparent source locations on appropriate diagrams in his data booklet. These were checked later against the *known* locations and results tabulated. The second part of the test consisted of A/B comparison listening, and the participant was asked to answer the following questions:

"1. Which system most clearly defines the positions of the instruments?"

"2. Is there any noticeable change in the front sound between the two systems?"

"3. Is there any noticeable change in the rear sound between the two systems?"

"4. Is there any noticeable change in depth (ambience) between the two systems?"

## Image Localization

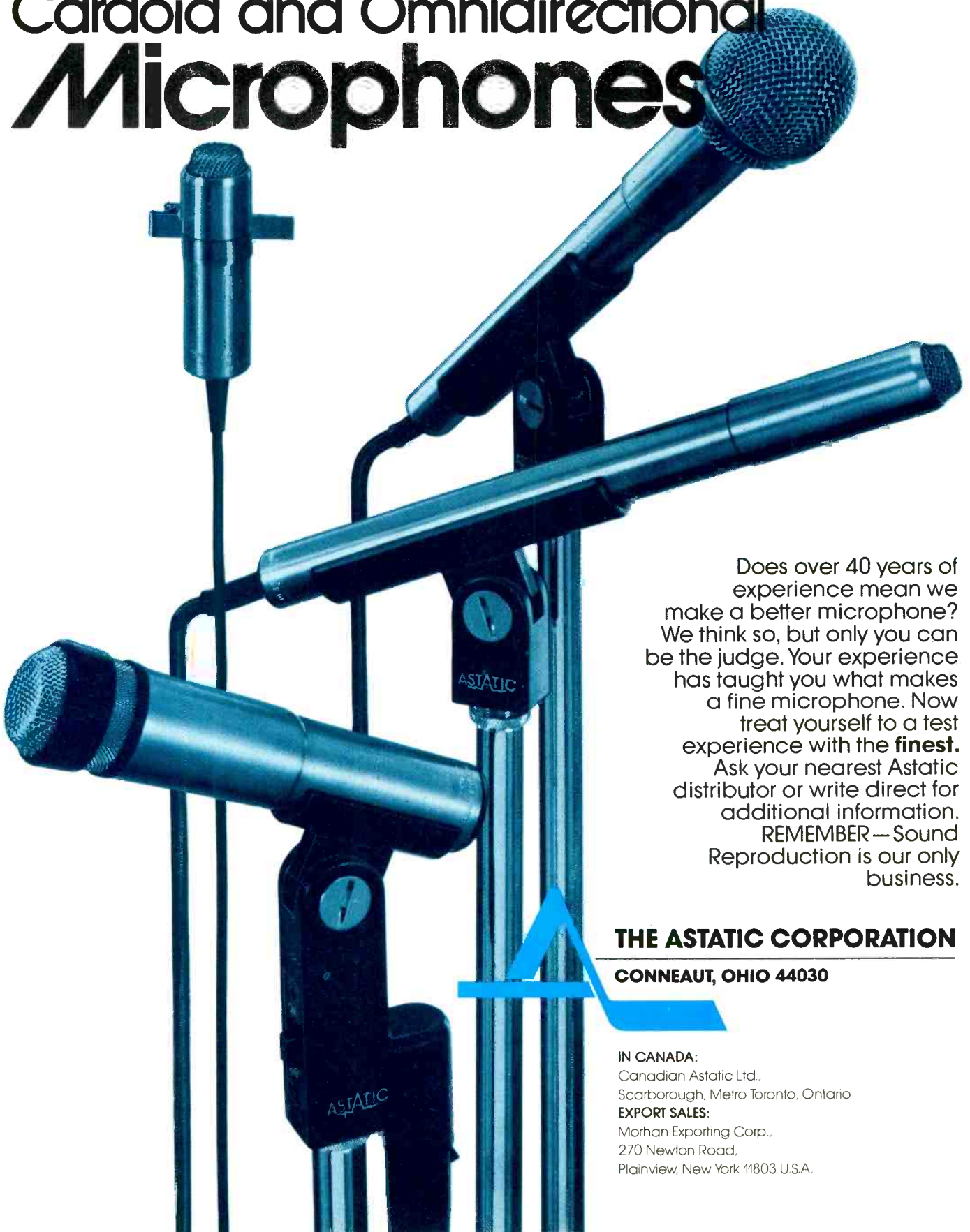
"Among the results of the tests are that center-stage sources are ac-



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curately located at any listening position when three front channels are in use, whether these sources are solo or in combination with the orchestra. Stereo location in the rear is 'focused,' resulting in a narrowing of the perceived rear sound stage. Most listeners were position conscious and preferred the ease of source location in the three-plus-one system, and many equated this with an increase in naturalness over quadrasonic sound. Depth here is equated to ambience and is the ratio of rear (ambient) to front (direct) sound. Some preferred

the quadrasonic system for this reason, although this characteristic is sensitive to listener front/back position in both systems. The listener near the back hears a stronger ambient signal than one near the front, in the concert hall there is no such gradient."


The authors conclude that a significant improvement in naturalness of sound in a living room can be obtained by the redistribution of the four channels available in quadrasonic systems to form the three-plus-one system. They suggest that the ambient sound level gradient can be sig-

nificantly reduced by employing a line of loudspeakers (possibly planar foam strip speakers) around the sides and rear of the listening room, driven by the single ambient signal.

The foregoing has outlined the experiments of Mr. Hay and Dr. Hanson. For the record, I agree absolutely with the findings and conclusions in this study. I have been an advocate of three-channel sound, in the sense of a left-front, center, and right-front loudspeaker set-up fed by three discrete signals, for many years and have made many recordings in this format. Older readers may recall that I almost got three-channel tapes on the market from Mercury in 1955 and Everest in 1960.

### Classical in Three-Plus-One

Like many other good things, the chances of the three-plus-one system being adopted by the recording companies is remote. Perhaps some venturesome small company might take a crack at it as an audiophile product. After all, it really is a very simple thing to do! However—try this one for size—there are thousands of fine three-channel recordings on half-inch tape in the record company vaults. For many years literally all classical recordings were made in this format. Now, take an outfit like the Barclay/Crocker Co. that I wrote about last month. They are going to issue their own prerecorded tapes. If they would lease some selected three-channel masters, get rid of 8-10 dB of noise by running them through a professional model of the Phase Linear autocorrelator (said to be forthcoming), then duplicating them with Dolby B, just as straight three-channel productions they would be sensational. Now, with the remaining channel on the four-channel tape head, by use of one of several devices for adding delay and reverberation (as outlined in my column some months ago), these tapes could be issued in what would essentially be the three-plus-one system. Alternatively, the audiophile could take the three-channel prerecorded tape, and utilizing some of the newer, less expensive delay and reverb equipment coming onto the market—and about which we will soon be reporting—create his own rear ambience channel. I have the tapes and the needed equipment, and I will let you know the outcome of my experiments very soon. In the meanwhile, are you listening Barclay/Crocker?



## Soundcraftsmen

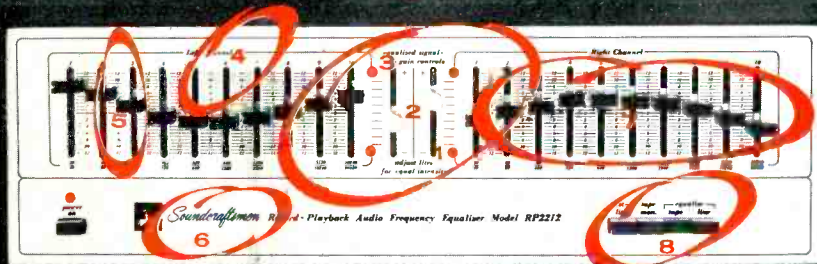
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24

AUDIO • MAY, 1976

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# The Garrard 990B. And the argument ends.

There are almost no limits to what you can spend for a turntable. Nor to the refinements that can be built in.

The argument has been whether you can find a turntable at a sensible price, that really performs—giving away nothing important. Now with the belt-driven 990B, the argument is over. The 990B gives nothing away in any vital area, yet is priced to make it eminently accessible.

We believe the 990B is the best value Garrard has ever offered in its quarter century of designing and manufacturing high fidelity turntables.

The 990B is a single-play/multiple-play turntable and is fully automatic in both modes. That is, its arm indexes, returns to its rest and shuts off automatically. All of which is more dependable than a hand . . . that can be shaky or careless. And the mechanism that does all of this is disengaged *during* play. You get the gentlest handling of records *plus* convenience.



But more. In the multiple-play mode, your records rest on a *two* point support. You don't have to balance them on a single center support. And pray.

And still more. A precision anti-skating device eliminates distortion and record wear caused when the stylus is forced against the inner wall of the groove by rotation of a record. Even cueing is viscous damped in *both* directions.

All well and good. But what about performance?

A glimpse at some specifications tells the story. Rumble: -64dB. Wow: 0.06%. Flutter: 0.04%. These are possible because your records are cushioned on a full size, 5 lb., die-cast, dynamically balanced platter—belt driven by a motor that *combines* an induction rotor for starting power and a synchronous section for constant speed. You can even solve the problem of off-pitch recordings with the variable speed control monitored by a strobe disc.

One final word. The S-shaped, lightweight, aluminum tonearm boasts low mass and low friction. But here's the thing. The 990B's tonearm can track as lightly as 1/2 gram. Protection and performance indeed.

There are other turntables in the price range of the 990B that offer *some* of these features and specifications. The 990B has them *all* and at a price that's sensible—under \$170!

Which clinches the argument.

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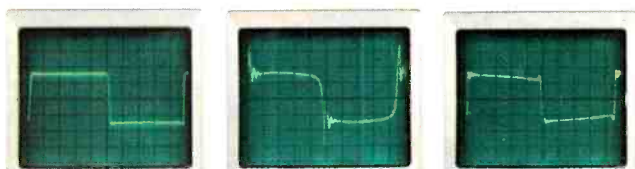
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# Crescendo Test

Richard C. Heyser

Sound is dynamic. And sound is what speaker reproduction is all about. One of the challenges which dynamic sounds place on a speaker is the presence of brief peak-energy components considerably above the average level. These bursts of sound can place enormous demands on any speaker. With the advent of super power amplifiers, it is not unusual to find cases where a listener can adjust the level high enough that several hundred watts of power are used on peaks. Yet the speaker doesn't go up in smoke because the average power may be low enough to prevent damage.

This condition is not solely the province of the sound freak or the person wishing to break a lease. Natural sound has very high peak energy, and as recording and reproducing methods get better the peaks begin to inevitably rise. A natural sound you may not consider loud, such as a typewriter or piano chord, may in fact have a very high peak sound pressure level.

We would like to test a speaker for its behavior under such dynamic conditions. *Audio can*, and does, observe the acoustic waveform for high power tone bursts. However, this doesn't get to the heart of at least one aspect of the subjective effect of peaks. The question we pose is, given a normal reproduced sound at moderate level, what is the affect on that sound of a suddenly applied signal much greater in level and incoherent with that sound? If you could imagine concentrating on an oboe in an orchestra, this is like asking whether the sound of the oboe is changed when the horns let go triple forte. If the oboe is modulated by these peaks, we know the sound will be unnatural. The test

we have developed for probing this condition we call the crescendo test.

## Sound Measurement

We use a musically based sine wave, such as 440 Hz, as our "inner voice" and use a very narrow bandwidth filter to measure the sound energy of that musical note. A wide band incoherent noise source is then added at an average electrical level 20 dB higher than that of the tone, and the level of the tone, with this added crescendo, is compared to its prior value. We say the speaker has reached a subjective crescendo limit when the inner voice is reduced 1 dB by the added crescendo. The instantaneous peaks of the complete signal are measured and used as the peak crescendo handling capability of the speaker.

Now, let's go back and take a look at why and how. If an incoherent signal crossmodulates a coherent signal, sidebands will be produced in a frequency about that coherent signal. The energy in these sidebands will itself be incoherent whether the process was pure amplitude modulation, angle modulation, or some combination thereof. By using a very narrow filter with a total noise bandwidth of 1 Hz centered on the frequency of the tone, we are measuring the energy of the "carrier" which is being noise modulated. When the carrier drops 1 dB, we know that 21 per cent of the carrier power has gone out of band due to modulation. We don't know where it's gone but we do know it shouldn't have left.

Our oboe is now spread out thin in the frequency spectrum. If you listen monaurally, this is similar to what is known in broadcast parlance as "ducking" and it may or may not be

unpleasant. If you listen in stereo, however, it can be quite a different effect. A phantom center-image oboe will have its energy shared in both channels. If the horns let go only in the left channel, the oboe component of that channel will be modified in a manner different than the component of the right channel. The result can be anything from the oboe sliding to stage right, to a ten-foot-wide oboe, to a "song and dance" oboe which glides around the stage keeping time with anything loud enough to shift it. Of course, all the other instruments of the orchestra are playing a similar game of musical chairs.

## Image Distortion

This seldom considered aspect of distortion in reproduction can lead to a blurring of the stereo or quadrasonic image. You're not quite sure what is wrong but the reproduction seems to lack sparkle as you raise the level. Actually, polar pattern characteristics, transient response, and non-minimum phase-response properties interact with this crescendo handling to provide a very complex behavior. There is not enough space in this brief correspondence, or 10 such articles, to go into those interactions which have been identified in speaker reproduction.

The tweeter and woofer may differ in crescendo handling. We therefore use tones which separately test different drivers. If a tweeter gives up before a woofer, this can lead to differential spreading of fundamentals and overtone structure in music.

Back to the "how." A Gaussian white noise source is used as the incoherent signal and its average level for a 20-kHz band is made 20 dB higher

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than the average test tone power. This means that peaks rise to 30 dB above the average tone level. A white noise signal is used because it has constant spectral energy density and the Gaussian distribution of amplitude is a good all-around model of many sound processes.

A Wiener matched filter is used since it will optimize the mean square difference between the coherent tone and incoherent noise. One second "chunks" of time are processed and average acoustic power divided by average electrical drive power is plotted as a function of average electrical drive power. Three superimposed plots are made. The tone without noise is run at reference level and a second run made at 1 dB below reference level. Then the tone at reference level is plotted when noise is added. This tells us three things. First, if the acoustic transfer gain is constant (and quite often it is not). Second, if adding noise at any level causes crossmodulation, and third, how the tone changes with increase in total level.

### Acoustic Patterns

If the acoustic gain decreases with drive level whether noise is present or not, the speaker will lack punch on the crescendos themselves. The acoustic gain is similarly monitored during the harmonic and intermodulation test, so there is not much chance of a speaker with this property getting past measurement without detection. If the gain increases with level, this gives, not surprisingly, a punchy sound, particularly if it occurs in a midrange and not in the woofer, since a vocal or musical crescendo will "bark" right out and the sound will tend to go bright. Some people like this sound, others do not.

If the crescendo test shows a drop of signal when noise is added regardless of level, it generally signifies a curvature of transfer characteristic at low level. This may give a "class B amplifier" type of sound at low levels and usually correlates with a low level harmonic or intermodulation distortion that doesn't go to zero with decreasing level.

After all of this analysis, the result may be the laconic phrase, "speaker X passed the crescendo test with flying colors." The one-liners we hang on this test seldom does complete justice to the amount of work expended to see how well the speaker performs in reproducing dynamic sound or to the fact that the system under test is behaving properly. We think it's worth it. After all, accurate sound is what this is all about.



# Before you buy your next turntable, consider why you want a new one.

In letters and warranty cards from new Dual owners, we find that some had owned manual turntables and came to prefer the convenience and safety of automatic start and stop. Others also wanted to be able to play records in uninterrupted sequence. And a few gave reasons that modesty makes us hesitate to quote: "I wanted the best!" or "Everyone recommends Dual!"

Whatever your reason may be for wanting a new turntable, consider your purchase carefully. Your record collection probably represents a bigger investment than all your other components combined. And your turntable is the only component that handles your records.

Although the overall appearance and feel of a turntable's controls can tell you something about its quality, appearances can be deceptive. For example, curved tonearms may appear interesting, but their unnecessary mass and increased resonance can only detract from the quality of music reproduction. All Dual tonearms follow a straight line from pivot to cartridge holder for maximum rigidity and lowest mass.

Some tonearms apply stylus pressure by unbalancing the tonearm. This results in tracking which is adversely affected by record-warp conditions and turntable level. In every Dual, stylus pressure is applied around the vertical pivot via a long coiled spring. This maintains tonearm balance throughout play, and tracking is unaffected even if the turntable is tilted substantially.

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Dual 1249.



Dual CS701.

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Dual 1226, with cast platter, rotating single-play spindle. Less than \$170.  
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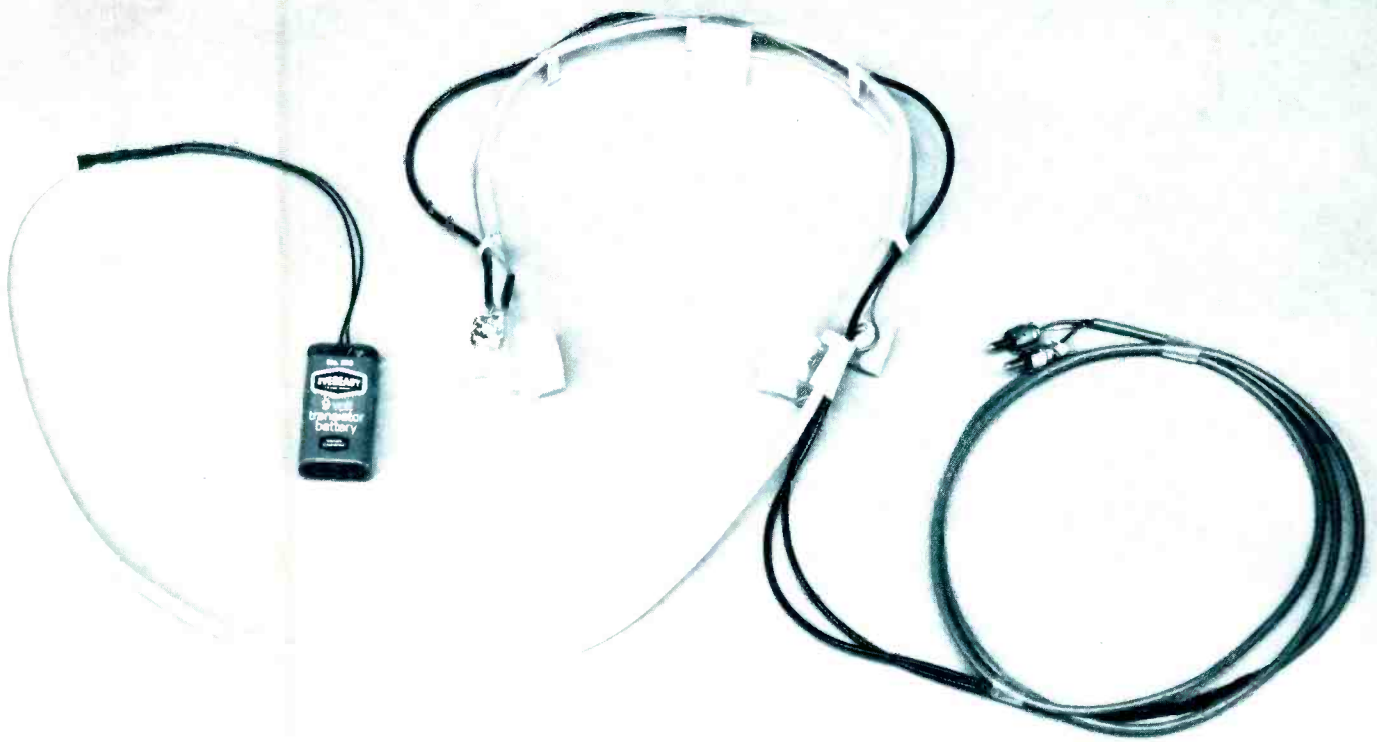
Dual CS701. Fully automatic, single-play. D.C. brushless, electronic direct drive motor; tuned anti-resonance filters. Less than \$400, including base and cover.

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# Build A Binaural Mike Set

Gene A. Nelson

**T**HIS ARTICLE describes the construction and use of a binaural recording microphone set. Previously, users had to spend upwards of \$1500.00 to purchase a model human head with capacitor microphones. Recently, Sennheiser introduced a lower cost binaural recording set, but it still retails at \$330.00. This project utilizes two high-quality electret condenser microphones, originally intended for use in portable cassette recorders. It has a price tag of approximately \$15.00. While its response above 15 kHz does not match the more expensive units, it will make this fascinating technique available to many more experimenters.

## Theory

Before we build the unit, it will be instructive to consider the hearing process. When you close your eyes, you can use your ears and brain to determine where sound sources are with respect to you, and whether or not they are moving. Now, if you place your finger gently over one ear, you will discover that the source placement becomes considerably more vague.

Your ears have access to frequency, amplitude, and timing information from the sound source. Two ears are necessary

for determining the placement of a source, as can be seen in Fig. 1, where it will take a slightly greater time for the sound to arrive at the listener's right ear. The time will be given by (the distance  $AB \div$  the speed of sound propagation, 335 meters-per-second). Your brain learns to interpret this time difference as directional information. Similarly, the inverse-square of decreasing intensity with distance is learned so that a listener can discriminate between near and far sources.

Also, the frequency spectrum of a source changes with

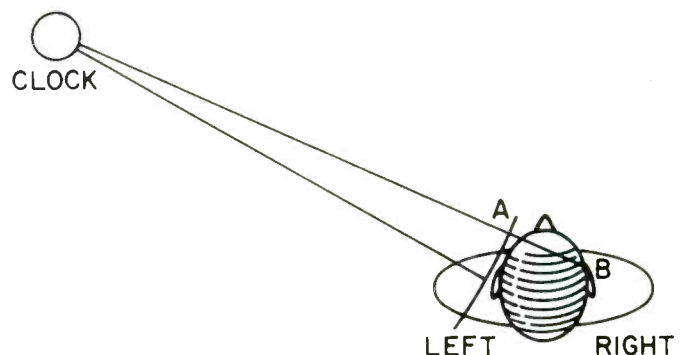


Fig. 1—Schematic of localization process.

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distance. The higher frequency components are not attenuated as quickly as the lower frequencies. These transmission differences are also useful in establishing whether a source is in front of or behind a listener. The pattern of channels, the shape of auricles, and the presence of hair produce changes in frequency spectra which aid in signal interpretation. Doppler shift, from a moving sound source, and complex patterns of interference can also be used to help localize sounds. Additional cues are provided by motion of the head and visual inputs.

The question becomes how to duplicate this process electronically at a reasonable cost. Stereophonic and quadraphonic systems provide good approximations, but producing the information for playback typically involves large quantities of microphones, mixers, and other complexities. Simplification could be accomplished by intercepting this information just before it entered a listener's ears with microphones, and then playing it back over a pair of stereo headphones, recreating that sound field. That is what a binaural record-playback system is intended to do.

### Construction

The two most important design considerations for a binaural microphone are having a lightweight, comfortable support for the microphones that will hold them in the vicinity of the ear opening and having a small, sensitive microphone. Both of these objectives are met in the design presented here. The support is made of Plexiglas, and the condenser microphones are about the size of cigarette filters. The whole unit weighs approximately two ounces, excluding cables.

The first step is preparing the Plexiglas strip. To determine its proper length, take a narrow strip of paper or a fabric tape measure, and measure the distance from your left ear opening to your right ear opening, measured over the top of your head. Add 6-cm. to this length and cut the Plexiglas strip to this length. The edges of the strip should then be smoothed with sandpaper.

Next, the strip is bent to the proper shape to match your head. Since Plexiglas becomes flexible when heated, we will heat and bend it. The easiest way to heat it is to use a gas stove (or an electric stove on *High*). This step requires some caution, since your hands may be burnt if they are not insulated. Since the Plexiglas is flammable (though less so than wood), you should also have a large pan of water available to immerse the plastic in, in case you accidentally overheat it to ignition. It usually does not continue burning when it is lifted above the flames. Bending takes some patience. First, remove the paper backing and all adhesive. Start by heating up the center 6 cm (easily found by balance) 3—6 cm above a low flame, turning the strip over about once a second. The plastic is pliable when it bends under its own weight. The bend is set by cooling the plastic in the previously prepared cold water. Avoid pulling the ends apart, which distorts the plastic. A bend about 5—7 cm from the center bend on each side yields an approximate "U" shape. A slight bend about 3 cm farther away from the center on each side should complete the bending. After the plastic is thoroughly cooled, it can be size checked for a comfortable, but not a snug fit. Reheat and rebend as necessary. If you are more artistically inclined, you may want to form a continuous bend, so that it looks like a headphone headband. You may also want to use a large can or pot as a guide for the proper curvature. The strip should lie flat on a table when completed.

Next, the distance between the points where the microphones are to be mounted is measured along the strip. This distance will be referred to as the intermicrophone length.

One of the audio cables is cut to this length, *plus* the cable length to the recorder. It's important that a thin, flexible cable like RG-174/U be used for convenience and light weight. Don't skimp on the length of cable to your recorder. Two meters is a reasonable minimum length. Cut the other cable to this length. Solder the connecting plugs appropriate for your recorder to one end of each cable, taking care not to nick the wires or short between the shield and center wire. The center wire should connect to the tip of the connector. A small piece of heat shrinkable tubing should insulate the center wire. Solder the other end of each cable to the appropriate solder pads on each microphone. Use a small, isolated tip soldering iron, since the microphones are damaged by overheating and static charges.

Attach a 0.75-meter piece of No. 24 stranded wire to the (-) lead of the battery clip. Attach one of the 8.2-kOhm resistors to the other end, and also attach sufficient wire to reach

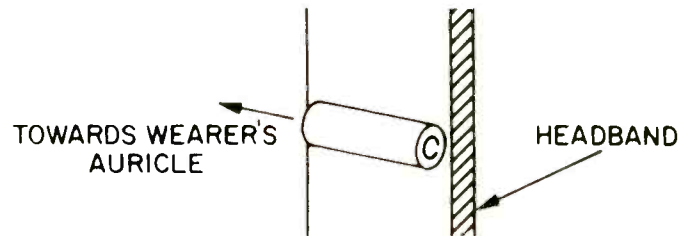


Fig. 2—Detail of microphone attachment.

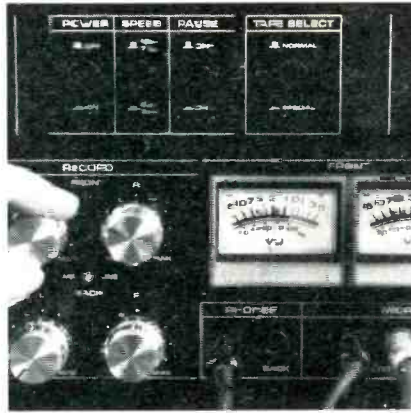
the mounting point for the other microphone. Attach the other end of the 8.2-kOhm resistor to the left microphone ungrounded solder pad. Insulate the lead and resistor with heat shrinkable tubing to prevent it from shorting to the case. Solder the other 8.2-kOhm resistor to the length of wire and right microphone in a similar fashion.

Carefully observing polarity, the anode + of the diode should be connected to the (+) lead of the battery clip, and the opposite side connected to a 0.75-meter length of No. 24 wire, which is also connected to the grounded solder pad of the left microphone. Place electrical tape over the ungrounded solder pad and lead of each microphone. A small piece of aluminum foil is secured over the connector end of each microphone and glued to the metal part of the capsule to serve as an electrostatic shield. The cable and wire passing over the headband are taped to the Plexiglas support. A small piece of acoustically transparent open-celled foam should be secured over the opening of each microphone to act as a windscreen and prevent dust from entering the microphone. The microphones are then glued with contact cement to the support as shown in Fig. 2. All four wires are then taped tightly to the headband at a point below the left microphone to prevent pulls on the wires from damaging the microphones. Three (or more) small pieces of foam are glued to the inside of the headband to make it more comfortable and prevent it from slipping off. Their placement is shown in the photo. Installing the battery completes the assembly.

An intermittent problem may be caused by poor contact with the battery. The Keystone connectors don't hold well without some remedial bending. It would be a good idea to tape the supply lead to the battery to prevent the contact from being disturbed.

### Using The Microphone

The microphone is designed for portable use, and with a portable stereo recorder, you can make recordings anywhere. The battery should last 200 hours under constant use. You should become familiar with the microphone's charac-



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teristics before you go into the Everglades to record alligators or what have you. So, with appropriate adapters, hook them up to the tape recorder you use at home, put them on your head, put the battery in your shirt pocket, and record music played through your speakers or sounds around your home. The microphones are rather sensitive, being rated at -58 dB (0 dB = 1V / dyne / cm<sup>2</sup> at 1 kHz). It may be necessary to use a 20-dB attenuator on some tape recorder inputs. One can be constructed simply and is shown in Fig. 3. It may be necessary that the good low-frequency response of the microphone will necessitate the use of a 50 Hz low-frequency roll-off filter, which is available commercially.

One very interesting and entertaining application is tape

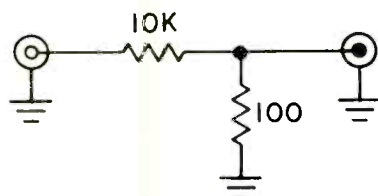


Fig. 3—Input attenuator (make two).

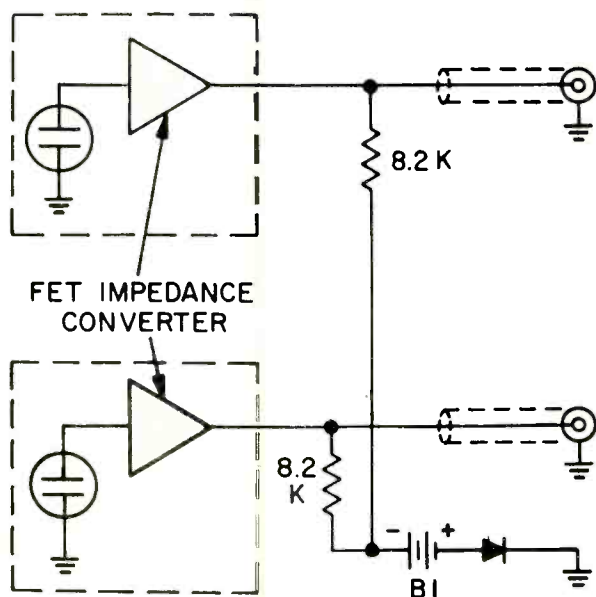


Fig. 4—Schematic. A diode is included to protect the unit from inadvertent polarity reversal. The output impedance of the microphone is low. A green dot indicates the grounded side of the microphone.

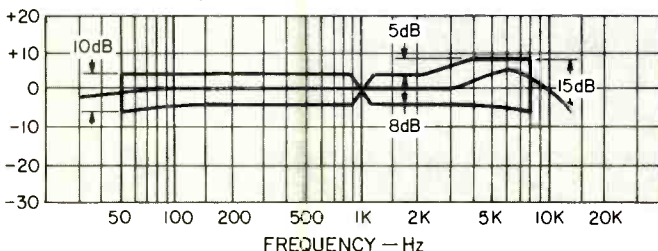


Fig. 5—Frequency response of one microphone capsule from the manufacturer's specifications.

recording parties or conferences. It is much easier to distinguish individual speakers using the binaural system than with a conventional stereo set-up. Sounds such as ringing telephone come through with a disconcerting authenticity.

When you are wearing the microphones, it is impossible to monitor with headphones. In this case, simply buy a styrofoam head (sold in department stores for storing wigs). Place the microphone on the head, and mount the head on an appropriate stand. If this is unavailable, you can always use your knee when sitting, with some loss of sounds behind you.

It's important to play your recordings back over headphones; otherwise, much of the directional information is lost. Non-isolating headphones like the Sennheiser HD-414 and HD-424 are ideal for this application. Incidentally, the microphones are so unobtrusive that while the author was recording a jam session, the performers were unaware they were being taped, since they didn't see any microphones. Be sure you have permission to record before you start!

Unfortunately, there are not too many portable stereo tape recorders on the market. Here is a tabulation of some of those available.

Brand and Model	Cassette	Reel-to-Reel	Cost
Superscope CS-200	X		150
Sony 124	X		170
JVC CD-1636	X		350
Yamaha TC-800 GL	X		390
Sony TC-152-SD	X		400
Uher CR-134	X		400
Uher Report 4000, 4200		X	500+
4400, 5000	X		500
Nakamichi 550		X	500
Nagra			1600

Other manufacturers include Telefunken, Tandberg, Grundig, Phillips, and Neal (Great Britain).

One advantage of the high output of these microphones is that they can drive an Advent Model 101 Dolby system directly, which can be fed into the *line input* of your tape machine. Noise seems less obtrusive than in conventional listening arrangements, but the Dolby will definitely improve cassette recordings. The Advent Model 101 can be adapted to portable use quite simply, since it only requires a 12-volt battery. The microphones will start distorting at 124-dB SPL, so in situations where you can hear comfortably, there will be no distortion.

Using this technique is quite fascinating, even when mundane sounds like passing cars are recorded. It makes possible radio dramas where the listener is right "on stage." I'm interested in what you discover and I invite you to write to me at the address above.

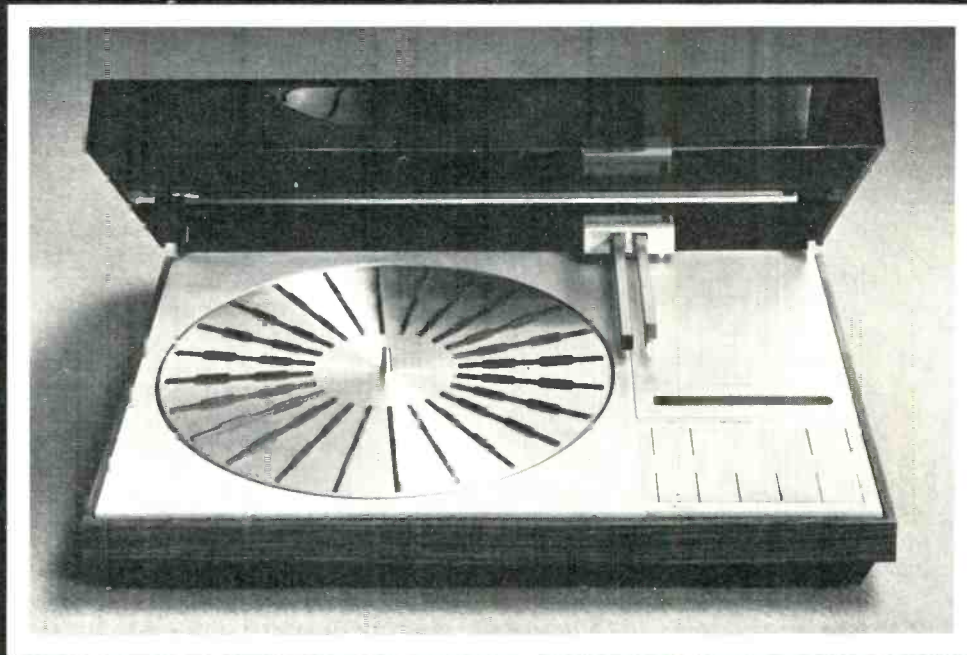
#### List of Materials

- 2—Panasonic WM-053 omnidirectional electret condenser microphones. Available from: Pace Electronics Products, P.O. Box 161, Ontario Center, N.Y. 14520. Price: \$10.00 per pair.
- 1—Strip Plexiglass, 55 x 1.5 x 0.4 cm (21.5 x 5/8 x 3/16 in.) available at hardware stores and lumber yards.
- 2—Miniature plugs or phone plugs, as appropriate for your equipment.
- 2—8.2-kOhm, 1/4-W resistors.
- 1—Diode, silicon or germanium, 1N914 or equivalent.
- 4.5 meters RG174-U or similar miniature shielded cable.
- 1—Battery clip, Keystone No. 72, or equivalent.
- 1—9-Volt battery, Eveready No. 216, or equivalent.
- Misc.: No. 24 stranded wire, contact cement, open-cell polyurethane foam and aluminum foil.

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As you and your audio system gain in sophistication, you begin to define high performance far more critically. You also become sensitive to the many details which separate the good products from those considered exceptional. It is at this point that Bang & Olufsen becomes more important, and components such as the Beogram 4002 turntable are worth your careful evaluation.



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**Complete stylus protection.** The raising and lowering of the tone arm is automatically controlled by a pneumatically damped, solenoid operated system which functions via independent electronic circuits.

**One touch music.**

A finely engineered control panel allows fully automatic operation (cuing cycle: 2 seconds) by depressing a single micro switch. Power assisted manual operation permits you to scan the entire record in either direction at fast or slow speed.

**An extraordinary cartridge.**

The Beogram 4002 comes with the MMC 600 cartridge, Bang & Olufsen's finest. It features an effective tip mass of only .22 mg., tracks at one gram, and has received critical acclaim throughout the world.

**CD-4 capability.** An optional CD-4 demodulator/phono preamplifier can be installed in the turntable housing, the optimum location for CD-4 reproduction.

**Stable, accurate drive system.** A high torque DC motor with integrated electronic speed control drives only the turntable platter via a precision ground, flat rubber belt.

**Elimination of warp wow.** An extremely short, low mass tone arm, which weighs only 8.4 grams with cartridge eliminates the distortion caused by warped records.

# Bang & Olufsen

Bang & Olufsen of America, Inc., 515 Buess Road, Elk Grove Village, Illinois 60007

Check No. 6 on Reader Service Card

# Record Cleaners

## Revisited

B. V. Pisha

Quite a number of record cleaners have appeared on the domestic market place since our last review of record cleaners in *Audio*, March, 1975. It is interesting to note that many of the record cleaners come from England where they either have a major dust problem or are more concerned with maintaining their records in a pristine condition. We are inclined to think the latter, inasmuch as records are quite expensive in England.

With the sensitivity of the present-day cartridges and their high compliance, any dust present in the grooves produces a sound not unlike a well-known breakfast cereal plus a background hiss. If the record surface is not cleaned before playing, the dust has a tendency to accumulate and is eventually ground into the plastic groove by the stylus with its concomitant pressure and heat, never to be removed again. For example, an elliptical stylus tracking at 1.1 grams generates about 16 tons of pressure per square inch on the groove wall, and stylus movement at such a pressure creates a good deal of heat. Reportedly, an elliptical stylus tracking at 1.3 grams generates about 42° C (107.6° F) in the groove. It has been reported that the lubricants used in record manufacturing frequently become annealed at these high groove wall pressures and temperatures.

Dust on records is generally not related to the cleanliness of a home. All air is dust laden, which may be readily seen in a shaft of sunlight, and all such dust collects on solid surfaces. Inasmuch as modern records are made from vinyl plastic, they can easily become electrostatically charged and attract dust from the air as well as nearby surfaces. This is particularly true in dry weather when the humidity is below about 50 per cent. Smoke, whether from cooking or tobacco, has a tendency to act like gum, causing the dirt particles to adhere tenaciously to the record. Another source of such gumminess is the breath, occurring when blowing dust from a record surface. Although the gross particles may be blown off, the near-invisible breath moisture gums up the record surface, causing the micro-dust deposits to really stick to the record. Another unrealized but very common source of dust is the actual record jacket meant to protect the record. We have examined record jackets for dust immediately upon opening them and found the jacket and record surface to be full of dust. The original source is unknown, but this dust is probably in the ambient air at the time the records are placed in the jacket. Microscopic examination of the record grooves also revealed dust present

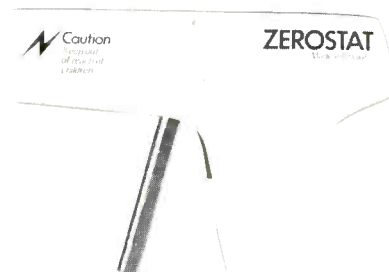
in the grooves. We believe that this dust was attracted to the record surface at the time the record was removed from the press and before being placed in the jacket. Of course, the jackets may come to the pressing plant already dust laden from the manufacturing process. We suggest that the interior of record jackets be cleaned with a *slightly* damp cloth the first time they're opened, particularly those made of plastic or plastic-lined.

Currently, the problem of micro-particles in the record groove has become more serious with the introduction of quadraphonic records with their four channels. Dust and dirt can cause drop-outs and distortion on these records, primarily in the rear channels where the 30-kHz carrier is used for the discrete CD-4 rear channels.

We would again like to state that, with modern cartridges tracking between one and two grams, we are unequivocally against the use of any type of chemically impregnated cloth or chemical sprays with their inherent ability to trap dirt on the record surface as well as in the grooves, thus forcing the stylus to push micro-chunks of concrete-like particles against the groove walls with attendant damage to both the walls and stylus tip. (The sole present exception to this is Ball Bros.' Sound Guard, reported on last month.)

### Static

Although dust and dirt can destroy both record groove and stylus, static destroys the listening pleasure derived from playing records. Since the advent of the vinyl record, static has been a major problem, although much attention and research has been directed towards its elimination. The





stylus reacts to a static charge not unlike your hand does when touching a door knob after walking across a rug—a spark is discharged, jarring the stylus, which is followed by a loud series of pops and crackles from the speakers, all most disconcerting when listening to music from records. Furthermore, the static charge attracts dust and dirt onto the record as nothing else does. Sometimes just removing a record from a plastic jacket will charge the record. The usual antistatic cleaners leave a chemical film on the record that automatically causes dust and dirt to be attracted, making it more difficult to clean. Until recently, there has been no truly effective means of removing static from the record, regardless of the numerous claims made. With the introduction of the Zerostat, the English have come through with a winner—an anti-static device that truly works, albeit temporarily. The device looks like a plastic toy pistol with a large metal trigger. In use, the Zerostat is aimed at the center of a record from a height of about 12 inches, the trigger is pulled slowly and released just as slowly and, presto, the static charge is dissipated. In normal use, we found it necessary to apply the treatment twice to ensure the removal of any measurable trace of static.

The Zerostat is not a radioactive device. Its activity is developed by a very efficient piezoelectric element which generates a high voltage, on the order of 15 to 20 thousand volts, when the trigger is slowly squeezed, thus twisting the element. Upon slowly releasing the trigger, the piezoelectric element is returned to its resting state. The generated voltage is discharged from the corona discharge needle in the center of the barrel, causing the air around the needle to become ionized in a wide arc that covers the entire record surface. On squeezing the trigger, positive ions emanate from the needle and on release, negative ions. The end result is a wholly neutralized record surface, truly free of static charge, the action taking no more than about 20 seconds to accomplish. The Zerostat treatment affects only the side of the record to be played. In our experience, we find it most advantageous to have the Zerostat next to the turntable and to apply it immediately after we clean a record. It is amazing how noise-free most records are when they're static and dust free.

We might add that the Zerostat treatment is also useful in eliminating static from the plastic turntable covers, in the photographic laboratory where it is essential to keep dust from the negatives and prints, and in the assembly of any optical elements in the make-up of lenses.

A word of caution is in order. The Zerostat is *not* a toy and should never be pointed and discharged at any human or animal, particularly in the region of the eyes, even though it is claimed to be safer than the static charges generated by walking across a rug. Above all, keep it away from children.

The Zerostat is available for about \$30.00. Considering the fact that its life expectancy is about ten years, it is not that expensive for the results that are obtained when properly used.

### Liquid Cleaners

As in our previous study of record cleaners, we left a good number of records exposed to the air in our laboratory as well as in the garage. Artificially dirty records were also produced with cigarette ashes and vacuum cleaner dust. Because of the nature of some of the record cleaners to be tested, we obtained about 100 records from the "peanut butter-and-jelly" set. Aside from the numerous scratches present, the records were smeared with an untold number of finger prints plus whatever else had adhered to the fingers during the course of any given day. It is doubtful that

any audiophile would have records this dirty. However, these records proved to be most useful in determining the ability of the various record cleaners to truly clean a record.

During the tests, all records were examined with a wide-field stereoscopic microscope just prior to being cleaned and immediately after. Before cleaning the record, it was treated with the Zerostat so as to facilitate the cleaning process. All records were tested for static charge immediately after cleaning and 15 minutes later. Most of the records cleaned with a liquid cleaner had only a small static charge left on them.

Record cleaning fluids are generally mild detergents such as Alconox or a formulation containing varying strengths of alcohol. From our experience, we question the use of these types of cleaners, particularly since it has been established that contact with alcohol, Alconox, and certain anionic detergents does, in effect, oxidize the surface of the vinyl disc after a period of time. Alcohol, in almost any strength, has been identified as one of the cleaning fluids that leech out from the vinyl surface the important stabilizers and lubricants necessary for the longevity of records. Stabilizers are needed to counteract the high-heat conditions created by the stylus and for subsequent vinyl integrity, while lubricants assist in good stylus/surface contact and slippage. Unfortunately, these important chemicals are extractable from the record surface by almost any solution, but in varying degrees. By way of comparison, on a 0-100 continuum, extractions of fatty acid chains and the polyolefin groups from vinyl records by three solutions are shown in the accompanying table.

**Fatty Acid and Olefin Extraction**  
(Volume/Volume GLC Quantification)

Solution	Contact Time	Relative % Extraction
60% Isopropyl Alcohol	10 min.	38%
	30 sec.	12%
DII Fluid	10 min.	8%
	30 sec.	1.4%
Distilled Water	10 min.	6.5%
	30 sec.	0.9%

Fortunately, the integrity of the vinyl compound is not damaged to the point of making a record unplayable until the cleaning solutions have been applied to the record surface over long periods of time. The process is insidious and eventually will cause damage. It appears that *any* liquid put on the surface of a vinyl record will exhibit some extraction characteristics, be it distilled water, alcohol, detergent, or the Discwasher DII solution; there just isn't a perfect record cleaner.

There is a great deal of data available on liquid record cleaners and their action on vinyl records and additional data is forthcoming from continued research in this field. At the moment, we seem to have raised more questions than answers. However, it is our intent to publish the results of these experimental findings in the near future.

A word of caution to collectors of acoustic and early electric shellac records is in order. Shellac is quite soluble in alcohol. Any strength of alcohol in a record cleaning solution will cause some damage to the shellac record surface, and it can also totally destroy the record.

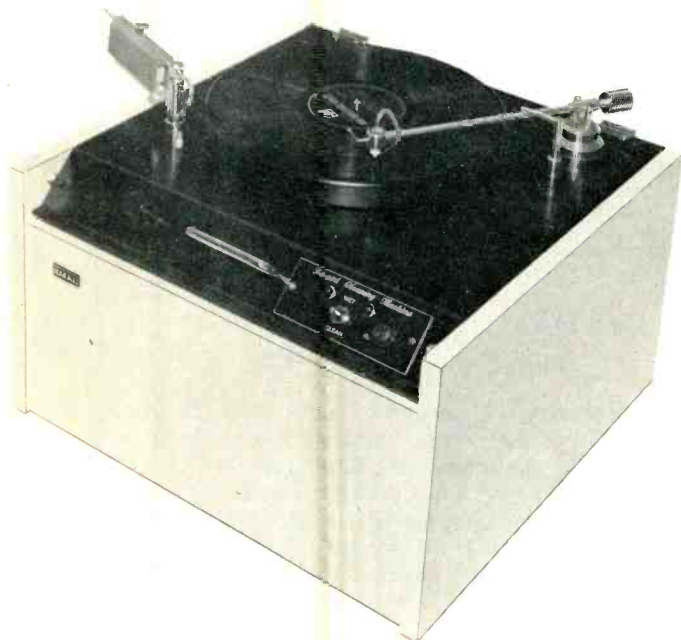
## Brushes

There are numerous brushes available for removing dust from the record surface. Unfortunately, the brushes generally remove only a small portion of the dust that collects on a record exposed to room air for a 24-hour period. Microscopic examination of record surfaces after cleaning with a brush show that although some brushes do reach the bottom of the groove, they simply push most of the dust into a pile at the point where the brush was removed, leaving a line across the record that is not generally visible with the naked eye. Some brushes, when held at a slight angle, do remove a good deal of the dust, and those that are wetted ever so slightly with a cleaning agent and held at an angle do a much better job of removing dust. Only two of the available brushes, when used as directed, were capable of cleaning truly dirty records to a really satisfactory level of cleanliness. No brush currently available has been able to remove more than about 90-95 percent of dirt found on the records we borrowed from the "peanut butter-and-jelly" set.

In spite of our experimental findings, we are of the opinion that some form of brush "dusting" of records should be employed by everyone. It is far better to remove some of the dust from a record each time it is played than to permit the dust to build-up to the point where the record simply becomes unplayable due to the noise generated by collected dust.

## Record Cleaning Devices

The monarch of record cleaners, without a doubt, is the Keith Monks Record Cleaning Machine, Mark 2, imported from England, and retailing for the princely sum of \$1350.00. There is also a dual device (Mark 3) available for \$1835.70.



As the photographs show, the Keith Monks unit is larger than a normal turntable, weighing 68 pounds. The unit uses a 50 per cent alcohol (methanol) solution to clean the records, which, subsequently, is removed along with any debris on the record surface by the suction arm as it "plays" across the record. The vacuum is developed by a 1/12th hp motor-vacuum pump combination.

The Keith Monks Record Cleaning Machine would rarely be used more than once a year to clean a record, since it is

not meant to be used simply for the removal of surface dust. The effects of using the 50 per cent methanol solution would, accordingly, not be noticeable until a few years had passed. This device is most useful when terribly dirty vinyl records are to be cleaned, like those we borrowed from the "peanut butter-and-jelly" set. Without a doubt, it is the most efficient record cleaner available, as microscopic examination of the cleaned records showed that all the debris and fingerprints had been removed. Some static developed on the record surface as the vacuum arm traversed the record, but this was easily remedied by applying the Zerostat anti-static treatment.

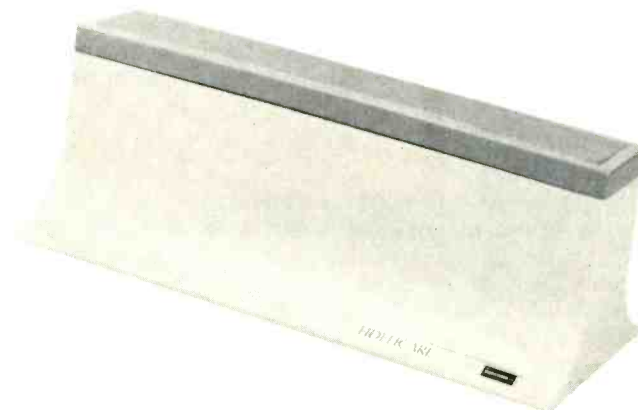
Despite the efficiency of the alcohol cleaning solution in removing all the "dirt" from the record grooves, we cannot recommend the Monks machine for routine use because of the solution's potential destructiveness. In view of our misgivings, we examined a few other record cleaning solutions in order to find an efficient substitute for the alcohol solution. Experimental findings indicated that the most efficient solution to use with this device is the Discwasher DII cleaning solution, diluted one part of DII plus three parts of distilled water, stabilized at a pH of 6.8¼ the same pH as the DII solution. This dilute solution produced results similar to or better than those obtained with the 50 per cent alcohol, but at a lesser risk of extracting essential record components. The DII solution also extracts stabilizers and lubricants from the records, but only slightly more than distilled water, which is very little. A DII solution this dilute would be relatively ineffective with the Discwasher pad.

After using the Keith Monks machine for awhile, with the dilute DII solution, we were convinced that it is the only way to convert really "dirty" records to a pristine condition. Because of the cleaning results obtained, the Keith Monks Record Cleaning Machine, Mark 2, became one of our two reference standards for this study.

Another excellent record cleaning device is the Fidelicare Spin and Clean Record Washer, selling for \$19.95. The Fidelicare washer consists of a plastic tank filled with the cleaning solution, with roller guides to restrict the record insertion depth so as to keep the label dry. The record is placed between two cleaning pads and rotated by hand first in one direction and then in the reverse direction. Subsequently, the record is removed and dried with a lint-free cloth supplied with the unit.

The cleaning solution used with this device is a dilute solution of Alconox. Checking a dilute solution of DII against the dilute Alconox solution, we found the DII to be the better cleaning agent.

Although we found this unit to be one of the most efficient record cleaners for dirty records, we had some small



## Introducing the Aristocrat of Loudspeakers—Celestion Ditton 66.

Are you the rare audiophile who seeks to step above the mundane and into the realm of the exceptional? Then Celestion Ditton 66 deserves your careful scrutiny. We are not examining an ordinary speaker—but Britain's most refined distillation of 50 years of loudspeaker expertise.

Starting with the exterior, Ditton 66 appears not as a precision musical reproducer but as an elegant piece of hand-crafted furniture. Its slim, classical proportions and angled front corners provide an unobtrusive appearance which belies the sophisticated array of drivers within.

We now examine the interior of the Ditton 66. Removing the front grille panel, we immediately notice that the four drive units are all flush mounted for complete absence of tunnel or diffraction effects.

High flute notes must be clean, smooth, and avoid ringing. Celestion's HF 2000 tweeter reproduces these flawlessly from 5000 to 40,000 Hz. There is nothing like it for exceptionally smooth, extended frequency response, tight transients and outstanding dispersion for matchless stereo definition. The HF 2000 is renowned for its complete absence of listener fatigue.

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

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

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

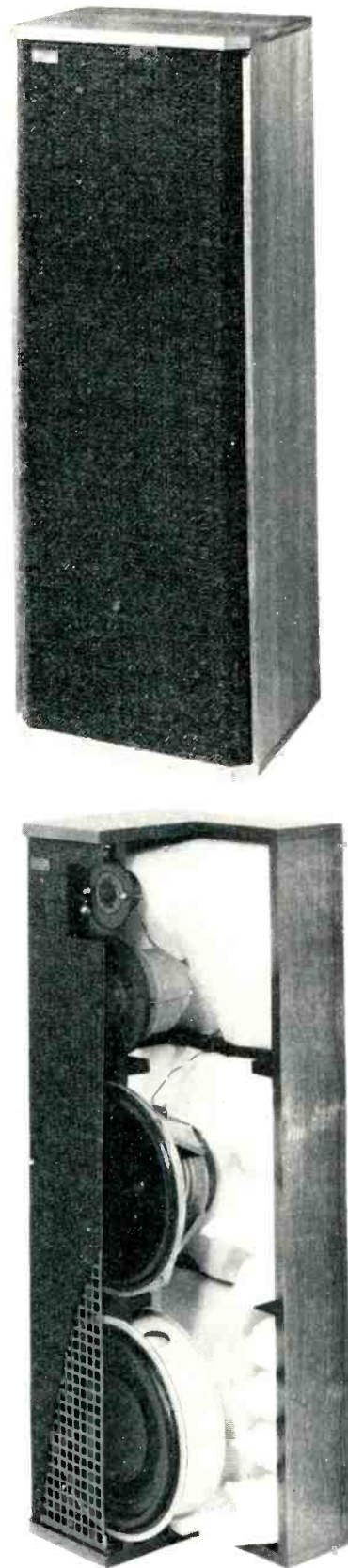
Listen to and become a discriminating owner of a pair of Celestion Ditton 66's—as enduring in their excellence as the company which built them.

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*Also Distributors for Decca Cartridges and Record Cleaning Devices*



misgivings about the cleaning pads. When the cleaning solution was left in the tank overnight, the pads became soft and lost their ability to reach to the bottom of the grooves. We believe that the efficiency could be substantially improved if the pads were replaced with proper size brushes, and present users should store the unit only when empty.

The efficiency of this record cleaning device, used with the dilute DII solution, compared rather favorably with our two reference standards. Collectors of shellac records should find it most useful.

The Discwasher, retailing for \$15.00, is now available in a slightly improved version, with the backing made with a long-fiber, highly absorbent cotton, while the slanted cleaning fibers are made of very fine nylon. The DII solution is applied to the edge as before, but when the brush is rotated towards the opposite edge, the very fine nylon fibers act in a capillary manner whereby the liquid on the record rides up the nylon fibers along with the debris, to be absorbed onto the backing material. Eventually, the backing takes on a brownish-white color, indicating that it is full of dust particles and should be cleaned and vacuumed per the enclosed instructions if the dust particles are not to be redeposited on subsequent records.



We found the new version of the Discwasher to be more efficient in cleaning truly dirty records than the previous model. This is probably due to the specific slant of the nylon fibers and the improved capillary action of the pile. Daily use of the Discwasher did maintain records in a dust-free condition. Any static generated was easily removed with the Zerostat. The Discwasher was our other reference standard for this review of record cleaners.

The Lencoclean "L" record cleaner is unique in that the stylus continuously travels in a wet record groove. The device, selling for \$13.25, looks like a tonearm, with the small brush at one end of a tube containing the dilute alcohol solution and a counterweight and fluid reservoir at the other end. The arm rests on a pin located on the turntable. When the brush is placed on the record, the cleaning solution comes out of the brush base, over the bristles, and onto the record. In principle, a track of dilute alcohol is placed on the record just ahead of the stylus, causing the stylus to ride a wet groove. The bristles of the brush appeared too large to

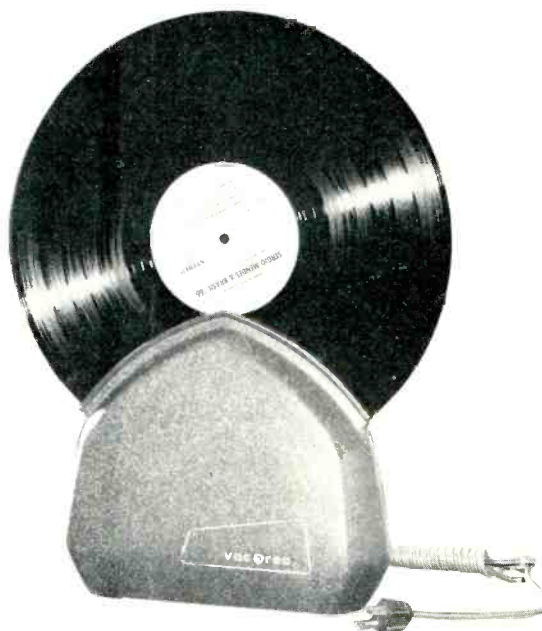
effectively reach to the bottom of the groove, and their purpose seems to be mainly a means of dispensing the cleaning solution on the record and to pickup any larger particles on the record. Microscopic examination of the record grooves

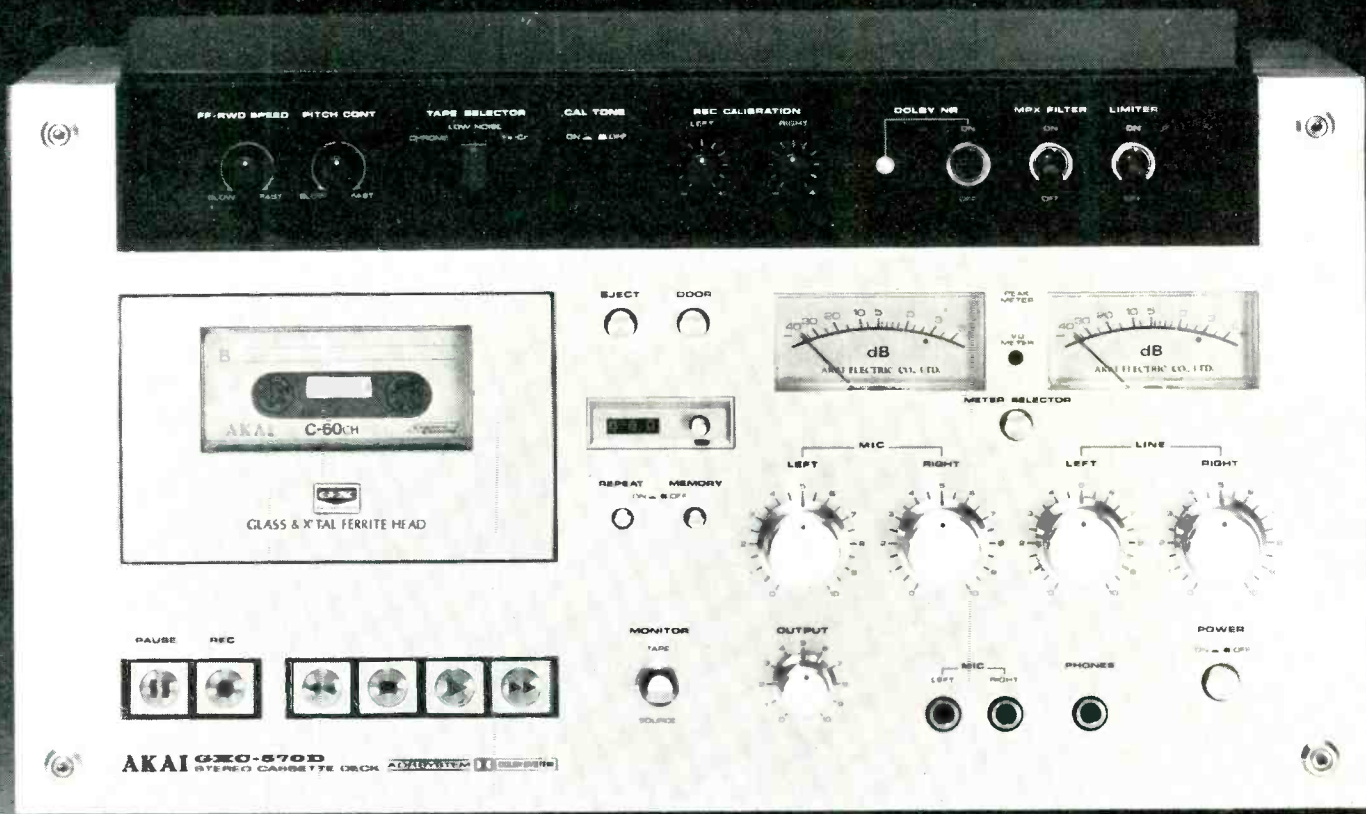


after using the Lencoclean "L" brush and solution showed that little or no debris was removed from the very bottom of the groove, though particulate matter on the surface was picked up. The alcohol solution did not evaporate quite as readily as claimed, and the test records had to be thoroughly dried with a lint-free cloth or tissue paper before being returned to their jackets for storage. Dust on the record surface was either removed by the brush or pushed towards the center of the record where it can be removed when the record is dried.

Although we did not investigate the claim that the stylus tip has less wear when playing a wet record, the report published in the *Journal of the Audio Engineering Society*, Vol. 22, No. 10, p. 800, December, 1974 discusses this claim and presents some interesting photomicrographs showing the wear on a stylus tip by the normal dry technique and by the wet technique.

The Vac-O-Rec cleaning device, \$29.95, has been somewhat improved during the past year. It now comes with a





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The new Akai GXC-570D is our top-of-the-line stereo cassette deck. And it's loaded.

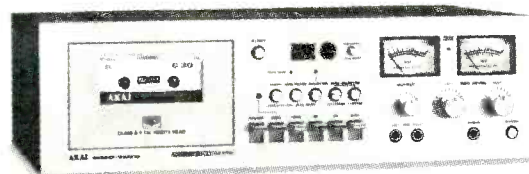
It utilizes a 3 head recording system — a GX glass and crystal combination head so you can source monitor when recording and, if you don't like what you've got, an erase head.

It has a closed loop dual capstan drive system which not only pulls, but feeds the tape across the heads, smoothly. That's the best drive system there is.

It has Akai's exclusive Sensi-touch® control system so you can go from one mode to another without ever pushing a button. You just touch them, lightly.



GXC-39D. GX glass and crystal head. Dolby® memory rewind. full release auto-stop



GXC-710D. GX glass and crystal head. Dolby® memory rewind. full release auto-stop, pause with lock

It has 3 motors, dual process Dolby,\* remote control (optional) and as many switches and features as cassette decks costing a lot more. Plus something brand new — an electrically operated control panel cover. Just so you can impress people.

Plug in our GXC-570D and you'll know you're playing with a loaded deck. That's the strength of the Akai line. Quality. Performance. Loaded. From top to bottom.

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**AKAI™**  
**COMIN' ON STRONG!**

# The \$900 Sony Turntable.



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

It would be a shame.

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

People captivated by price, not performance.

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

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

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

## Total speed accuracy is our speed.

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

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

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

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

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

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

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

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

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

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

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

Chart A dramatically illustrates the dramatic difference.

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

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

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

Sony wrestled with the arm problem and

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

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

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

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

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

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

## Does your turntable give you bad vibrations?

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

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

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

Sony, however, deals resonance a resounding blow.

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

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

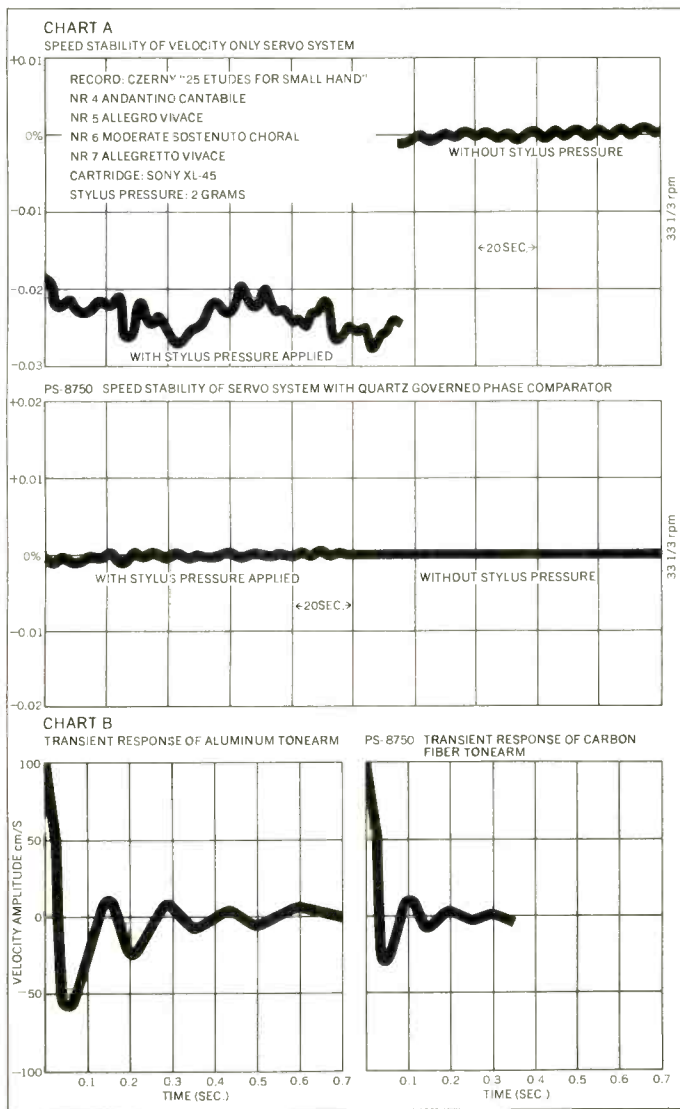
And we cut down on record resonance by pumping a silicone damping material into the record mat itself. By having contact with the entire record surface, it offers more support.

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

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

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

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



\*Cartridge sold separately.

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# SONY®

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small brush, similar to those used with electric razors, for cleaning the mohair pads, and more detailed instructions on the best way to use the unit accompany it. There is a plastic wrap on the brush handle, which is inserted into the record-cleaning slot, so that the unit will accept 45-rpm records for cleaning. Thus, the Vac-O-Rec can now be used for cleaning of all standard size records.

The new Vac-O-Rec performed better than the original unit, though some dust particles still remained in the bottom of the record grooves. When the mohair pads are cleaned regularly with the supplied brush and vacuumed from time to time, the dust streak left by the pads of the original unit when the record was removed is no longer visible to the naked eye. A fan in the unit acts as an exhaust, drawing in air through the record-cleaning slot and expelling it from the bottom of the unit. Records with large amounts of static have their charges reduced to almost non-existent levels while in the unit. Though some static is built up when the disc is removed from the unit because of friction by the mohair brushes, this is at a low charge level and is easily removed, if bothersome, by treatment by the Zerostat. The Vac-O-Rec was judged effective in removing surface dust in day-to-day record maintenance and appeared particularly quick to use.



The Metrocare Hi-Fi Kit/3, \$9.95, comes from England, and contains a 5 by 7/8 by 1-1/4-in. velvet pad, an ounce of non-alcoholic record cleaning fluid, a 7-1/2 cc bottle of alcohol-based cleaning fluid for styli, and a stylus brush with two tufts of bristles. The pad, which is called an "ioniser," is claimed to direct ions on the record in one direction, thus eliminating static, and to pick up dust and dirt. Three or four drops of the fluid are placed in each of two holes on top of the pad housing, bringing the pad to a humid dampness. The unit was effective in diminishing the static charge on a record and removing surface dust accumulation, acting somewhat like the well-established Watts Preener. However, it does not remove particulate matter from the bottom of the groove or fingerprints.

The Memorex Record Care Kit, \$5.95, contains a plush roller brush, a bottle of dilute alcohol cleaning solution, and a stylus brush, all in a plastic case that is essential to the operation of the record cleaner. On the bottom of this storage case is a foam pad that must be moistened with the cleaning fluid. The plush cleaning brush is placed on the moist foam pad and the case lid is closed tightly to allow proper humidification of the brush. In use, the humidified brush is applied to the surface of a rotating record. Like all record care units of this type, its usefulness is limited to removing dust from the record surface, which it does quite well. It does not remove fingerprints or dust from the bottom of the record



grooves. Although no anti-static claim is made for the device, static present on the record surface was diminished after using the plush brush as directed.

The Decca Record Cleaner, \$15.00, consists of an arm with a 5/8-in. wide brush on one end and a counterweight on the opposite end. The unit may be adjusted vertically to accommodate various turntable heights. Provision is made to ground the unit to the turntable, thus creating a pathway for the discharge of any static charge present on the record through the bristles which are conductive. The unit is used without any fluids, and its specially designed bristle tips do reach the bottom of the record groove. The unit operates on a tonearm principle just ahead of the stylus, somewhat



like the Dust Bug. It does remove dust and static charge, as claimed. Microscopic examination of the record grooves after treatment with this unit revealed dust particles to be present, but to a lesser degree than with many similar types of add-on brush cleaners. Surface dust was effectively removed with this cleaning brush.

The Decca Record Brush, \$15.00, is a hand-held unit which comes with an aluminum stand on which the brush is stored. To use the unit, the brush is slid on its track so that the bristles rub across two rods which remove any accumulated dust from the bristles. There are no fluids used with this brush, although the brush was quite effective in removing surface dust particles. Dust particles were not re-



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The top of the Lafayette line, the LR-3500 AM/FM stereo FM receiver has all the features you've come to expect as the trappings of power. It has state-of-the-art electronics, complete power controls to personalize the sound. And many convenience features like dual tape monitors and FM mute.

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moved from the very bottom of the groove, but appeared to have been shifted from one spot to another. A minimal static charge was on the record after use of this brush, but was easily removed with the Zerostat.



The Keith Monks Record Sweeper, \$18.95, is unique in that it does not have to be physically attached to the turntable. It consists of a heavy metal base and an arm with a brush at the end of it, the arm riding on lateral pivots. To eliminate static or static build-up, the unit is grounded. It is used in a manner similar to the Dust Bug. Microscope examination of the record grooves reveals dust particles at the


bottom of the record grooves. The unit is effective in removing surface dust that is attracted to the record. Static build-up is easily dispersed with the Zerostat.

### Conclusions

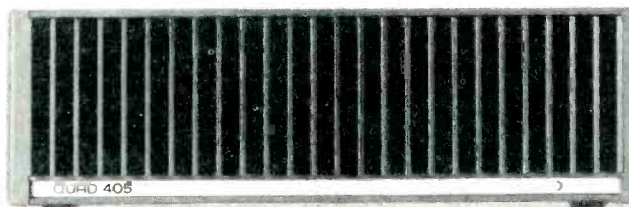
To conclude, it is most important that records be kept clean of surface dust before and after each play. Although alcohol is detrimental to the surface of vinyl compound records, its effects are noted only after a period of time. All of the record care devices examined in this study will keep records free of surface dust.

The outstanding cleaning device for truly soiled records is the Keith Monks Record Cleaning Machine used with the dilute DII fluid. Needless to say, only the most affluent of audiophiles can afford such a record cleaner in their home. It would be nice if our high-quality domestic record shops would follow the English and install in their store a Keith Monks Record Cleaning Machine and clean their customers' soiled records for a nominal fee. Another good location for this cleaning device would be the libraries which loan records, such records to be cleaned before being returned to the stacks. Repositories of valuable shellac records as well as LPs, e.g., the Rodgers and Hammerstein Library and the Library of Congress, would seem likely candidates for this cleaning machine to maintain their collections in a pristine condition.

As far as cleaning deeply soiled records is concerned, the Fidelicare Spin and Clean Record Washer, when used with the DII solution, will do a commendable job.

For the daily care of records, to wit, the ounce of prevention that can assure your records of reasonable longevity and noise-free plays, the Discwasher with DII solution and the Zerostat should do the best job of keeping your records clean with a minimum of noise problem. 

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If you're a real stereo buff, you know that flat frequency response means flat, uncolored sound.

Like several other manufacturers, we too try to build the flattest, most linear frequency response we can into our speakers.

But we don't stop there. Because we know that great sound depends on more than just frequency response.

Transient response, for instance.

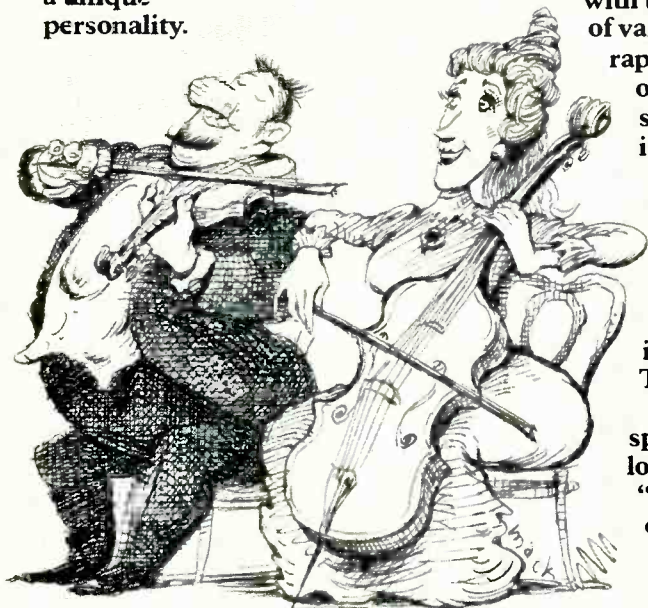
## It's all in your head

To understand transient response, it's important to understand how you hear.

You see, you don't really hear with your ears. You hear with your brain.

For instance, it's the brain that helps you identify what you're listening to. The direction it's coming from. And that re-creates that illusion of "being there."

The thing is, every musical note is really a complex tone. A basic tone — the fundamental — plus subtle musical overtones — harmonics — that give every instrument a unique personality.



Not only that, musical notes are constantly starting and stopping. When they do, the number and intensity of the harmonics change.

This basic tone, together with all those changing harmonics, is called a transient. The brain takes all of them into account in interpreting any sound the ear receives.

## On making things imperfectly clear

It's when a speaker can't react quickly or accurately enough to all those changing musical notes, all those transients, that distortion can occur.

And distortion means muddy-sounding music. With little definition or clarity.

A bad situation made worse when a speaker over-reacts to all those changing tones. The speaker actually adds tones of its own. And that's bad.

Most experts feel the best way to measure transient response is with tone bursts. Pure tones of various frequencies are rapidly switched on and off to simulate the transient nature of voice and instrument signals.

In Pattern A, the speaker hasn't reproduced accurately. It's completely overshoot the level of the input signal. And the result is a sizzling, hot sound. Totally colored.

In Pattern B, the speaker has taken too long to react. This "hangover" can cause considerable blurring. So what you hear is dull and lifeless.

Now look at Pattern C. The speaker here has reacted both quickly and accurately. And the result is exceptional clarity and definition. The kind that Avid builds into all of its speakers.

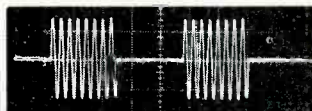
## The proof is in the hearing

Now you know there's a lot more to a speaker than just flat frequency response. Like good transient response.

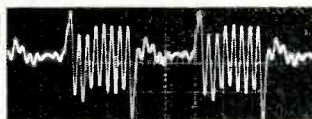
But even the best, most accurate transient response in the world isn't the be-all and end-all of a superb speaker. There's more.

The point is, we're a company that is committed to one thing and one thing only. The design and construction of the clearest, best-sounding stereo speaker systems in their price range.

But you've got to hear for yourself. So go to your hi-fi store and listen to an Avid.



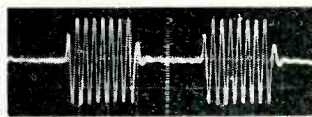
Input Signal



Pattern A



Pattern B



Pattern C

Then some other speaker in the same price category.

Then decide. We don't think you're going to have any trouble at all.

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# Equipment Profiles

## Technics by Panasonic SA-5550 Stereo Receiver



### MANUFACTURER'S SPECIFICATIONS

#### FM Tuner Section

**Sensitivity:** 1.8  $\mu\text{V}$  (10.5 dBf). **S/N Ratio:** Mono, 70 dB. **THD:** Mono, 0.2%; Stereo, 0.4%. **Alternate Channel Selectivity:** 70 dB. **Capture Ratio:** 1.6 dB. **Image Rejection:** 50 dB. **I.F. Rejection:** 70 dB. **Spurious Rejection:** 65 dB. **AM Suppression:** 50 dB. **Frequency Response:** 20 Hz to 15 kHz,  $\pm 1$  dB. **Stereo Separation:** 1 kHz, 40 dB; 10 kHz, 30 dB. **Leak Carrier:** 55 dB.

#### AM Tuner Section

**Sensitivity:** 30  $\mu\text{V}$ , external antenna; 230  $\mu\text{V}/\text{M}$ , internal antenna. **Selectivity:** 25 dB. **Image Rejection:** 45 dB. **I.F. Rejection:** 40 dB.

#### Amplifier Section

**Power Output:** 58 watts per channel, 8-ohm loads, continuous power from 20 Hz to 20 kHz, both channels driven; 72 watts/channel into 4 ohms. **Rated THD:** 0.3%. **IM Distortion:** 0.4%. **Damping Factor:** 40 at 8 ohms. **Input Sensitivity:** Phono, 2 mV; AUX, tape 1 & 2, 180 mV. **S/N, A Weighted:** Phono, 70 dB; AUX, 90 dB. **Frequency Response:** Phono, RIAA within 0.5 dB; AUX, 5 Hz to 90 kHz, +1, -3 dB. **Tone Control Range:** Bass,  $\pm 10$  dB @ 50 Hz; Treble,  $\pm 10$  @ 10 kHz. **High Filter:** 7 kHz, -6 dB/octave. **Low Filter:** 150 Hz, -6 dB/octave. **Tape Output Level:** 180 mV.

#### General Specifications

**Power Requirements:** 120 volts, 60 Hz, 189 watts maximum. **Dimensions:** 18-1/6 in. W by 5-1/2 in. H by 15-3/4 in. D. **Weight:** 28.2 lbs. **Retail Price:** \$479.95.

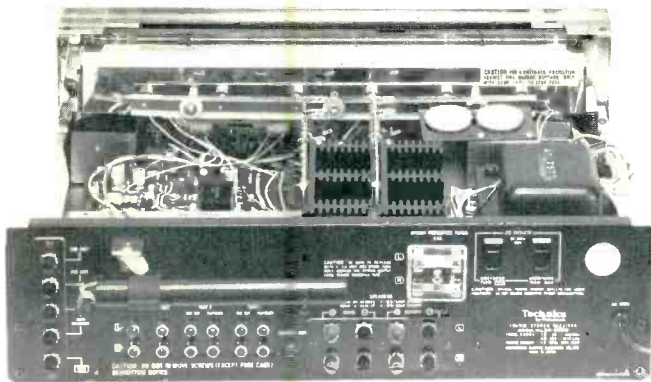


Fig. 1—Back panel.

Technics by Panasonic, one of several companies which has, in recent years, concentrated heavily on four-channel receiver design, has now turned its attention towards broadening its stereo receiver product line. The new family of receivers departs from the traditional "black-out" dial styling and offers, instead, a highly visible, light-colored, illuminated dial scale area with extra-long dial pointer travel and accurate calibration marks every half MHz over the linearly calibrated FM frequency scale. The SA-5550 is the top-priced receiver of this new line and, unlike the lower powered, lower costs models, features two tuning meters, positioned below the dial scale. The lower priced models employ only a single tuning-strength meter and lack the center-of-channel tuning meter found on the SA-5550.

All operating controls, including the large tuning knob, are located along the lower portion of the control panel. These include rotary controls for bass, treble, volume and balance adjustment, a speaker selector switch (the SA-5550 handles main and remote pairs of speakers singly or together, at any impedance from 4 ohms to 16 ohms, but the manual cautions against using lower than 8-ohm speakers if both pairs are to be operated simultaneously), and a program or input selector switch. Power on/off pushbutton switch and headphone jack are located at the extreme left of the panel. Pushbutton switches are used to activate low- and high-cut filters, loudness compensation, FM muting, tape 1 or tape 2 monitor circuits, and selection of mono or stereo operation. Reception of stereo signals is indicated by the usual illuminated inscription located just to the right of the two tuning meters.

The rear panel of the SA-5550, pictured in Fig. 1, contains screw terminals for connection of 75-ohm or 300-ohm balanced FM antenna transmission lines, an external AM antenna, and a ground connection. In addition to the usual

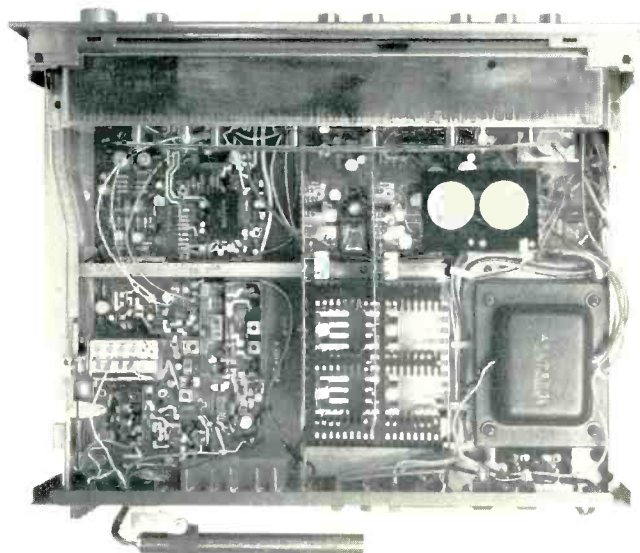


Fig. 2—Interior view.

phono, AUX and tape input and output jacks, there is a four-channel "MPX" output jack intended for future connection of a four-channel FM adaptor. Color-coded speaker terminals are of the screw type, but are widely separated to prevent possible shorts between adjacent exposed speaker wires. Individual speaker-line fuses are accessible from the rear panel by removing a transparent plastic cover which is retained in place by means of a single screw. The back panel also has a pair of convenience a.c. receptacles, one switched, and one unswitched, as well as the usual pivotable AM ferrite bar antenna.

### Circuit Highlights

An internal view of the chassis of the SA-5550 is pictured in Fig. 2. The front-end features a 4-pole MOS-FET in the r.f. amplifier stage and uses a frequency-linear variable capacitor for both FM and AM tuning. The i.f. section of the receiver features six-stage construction, including three differential amplifier stages and three two-element ceramic filters. A phase-lock-loop circuit is used in the stereo multiplex section. Stereo detection or switching circuitry includes a double differential switching arrangement which is all part of the high density integrated circuitry used in this section.

A ceramic filter is also used in the i.f. section of the AM circuitry of the SA-5550. The preamp-equalizer stages of the receiver take the form of a PNP-NPN, 2-stage, direct-coupled circuit with direct-current, negative feedback applied from the emitter of the second stage to the base of the first stage. As for the SA-5550's main amplifier section, it is completely direct coupled with a differential amplifier input stage. The output stages are pure complementary symmetry type which use PNP and NPN transistors in combination. The power supply of the receiver is filtered by means of a pair (one for each polarity) of 10,000  $\mu\text{F}$  electrolytic capacitors.

### FM Performance Measurements

We measured usable sensitivity of 1.7 microvolts (10 dBf) for the SA-5550 FM tuner section, better than the 1.8  $\mu\text{V}$  specified. The 50-dB quieting mark in mono was reached with a signal input of 3.0  $\mu\text{V}$  (14.9 dBf), and maximum quieting or signal-to-noise ratio reached 73 dB with strong (65 dBf) signals. In stereo operation, usable sensitivity was 10  $\mu\text{V}$  (24.5 dBf) and is governed by the threshold for switching into stereo operation. Some 36 microvolts (36.5 dBf) were required in stereo for 50-dB of quieting.

The distortion measurements were considerably lower than claimed, with readings of just under 0.1% for mono (at

1 kHz) and 0.2% for the same test frequency in stereo operation. Quieting and distortion characteristics with increasing signal strength for both mono and stereo reception are plotted in Fig. 3. Alternate channel selectivity and i.f. rejection measured 70 dB, exactly as claimed, while capture ratio was a bit better than claimed at 1.4. Although the image rejection measured 52 dB (better than the 50 dB claimed), we expected somewhat better performance, with dB figures at least as good as those for selectivity and i.f. rejection, in view of the other measured characteristics of the tuner section. This low image-rejection capability may cause problems for some listeners who are too close to airport control towers or other sources of transmission in bands above the FM frequencies.

Stereo separation, plotted against audio frequency in Fig. 4, was excellent, reaching the unusually high figure of 52 dB at midfrequencies and remaining above 35 dB from 50 Hz to 10 kHz. Distortion in both mono and stereo, also plotted in Fig. 4, is consistently low at all audible frequencies, even at the high end where stereo distortion is less than 0.5% all the way up to 10 kHz (only 0.4% at the required test frequency of 6 kHz).

Muting threshold is set at 13 microvolts (27.7 dBf), by which time quieting has reached nearly 60 dB in mono and almost 40 dB in stereo operation. Use of the muting feature to define listenable stereo stations is therefore not particularly effective in this receiver and a user will have to judge listenability on the basis of background noise since the muting feature is not customer adjustable. Sub-carrier (19 kHz and 38 kHz) rejection was extremely effective, with carrier products fully 65 dB below 100% modulation in the stereo mode. Frequency response from 30 Hz to 15 kHz was within 0.6 dB of the prescribed 75-microsecond de-emphasis characteristic. No 25-microsecond de-emphasis is provided on this receiver and listeners wishing to use it for

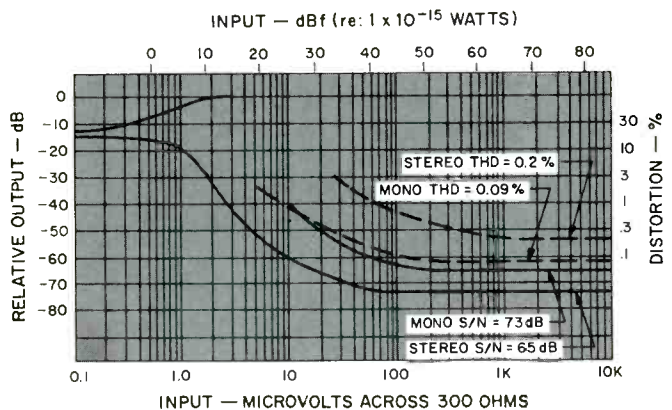


Fig. 3—FM quieting and distortion characteristics.

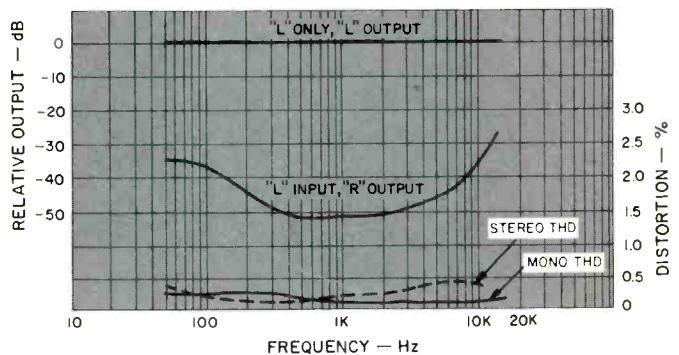


Fig. 4—Separation and distortion versus frequency.

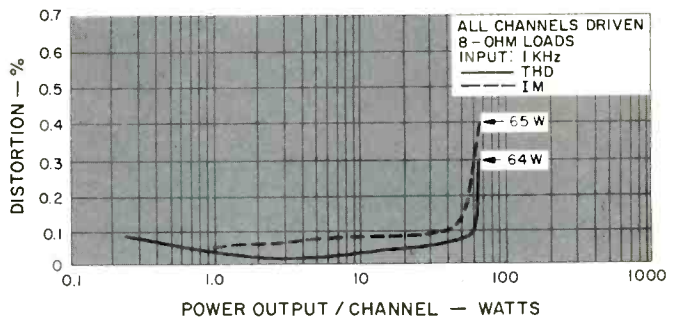


Fig. 5—Harmonic and intermodulation distortion characteristics.

Dolby FM broadcast reception would have to add an out-board adaptor (in addition to a Dolby adaptor) to convert the response to that required during reception of such programs.

### Amplifier Section Measurements

The amplifier section of the receiver delivered 64 watts per channel into 8-ohm loads, with both channels driven at 1000 Hz before reaching the rated harmonic distortion figure of 0.3%. Technics by Panasonic also provides a 4-ohm rating for this model (very few manufacturers have been supplying such ratings of late, because of problems created by the new pre-conditioning rule of the Federal Trade Commission audio amplifier power rule), and we were therefore especially interested in checking out performance at this lower load impedance. With 4-ohm loads, power delivered at mid-band frequencies was 77 watts per channel, as opposed to 72 watts claimed. All output measurements were made after first preconditioning the receiver for the required one hour at one-third of full rated output. At rated power output, THD measured 0.091% under 8-ohm load conditions and 0.14% when driving 4-ohm loads with a 1-kHz signal applied. Distortion (harmonic and IM) versus power output is plotted in Fig. 5 for the 8-ohm load condition only. The power band claimed for this receiver (20 Hz to 20 kHz) is also conservatively stated, as can be seen by examining Fig. 7. Even at 20 Hz, THD measured only 0.2%. On the basis of a 0.3% THD rating, power band could have been listed as extending from 12 Hz to 40 kHz, or the power output rating might have been increased safely to 64 watts per channel and would still conform to FTC requirements from 20 Hz to 20 kHz.

Figure 6 is a 'scope photo of the spectrum analysis of a 1-kHz signal when the amplifier section is delivering full

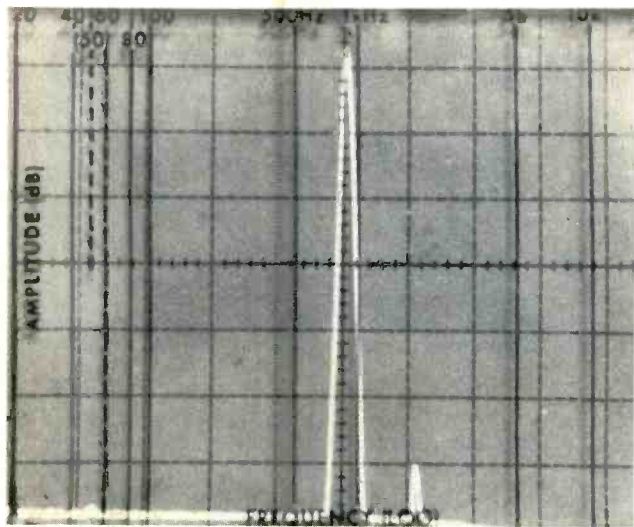


Fig. 6—Spectrum analysis of harmonic output with 1-kHz input at 58 watts per channel.

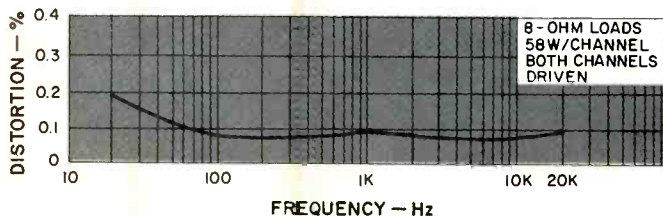


Fig. 7—Distortion versus frequency.

rated output (58 watts per channel at 8 ohms) and shows the presence of a minute amount of second-order harmonic content (2 kHz) with no evidence of higher order harmonics within the 70 dB range of the analyzer as it was set up for this display.

Frequency response for the phono preamp-equalizer section was within 0.8 dB of the RIAA curve from 30 Hz to 15 kHz, and input sensitivity was exactly 2.0 mV as claimed. A signal input level of 115 mV at 1 kHz was handled by the phono input circuits before 0.3% THD was observed. Overall frequency response through the high level inputs was flat within 1 dB from 8 Hz to 40 kHz, and the -3 dB roll-off point was reached at a frequency of 75 kHz. Hum and noise in phono was a very good -71 dB without using a weighting network (Technics claims only -70 dB with "A" weighting), while in high level operation, the S/N ratio was -87 dB—also unweighted.

Range of bass and treble tone controls is shown graphically in the 'scope photo of Fig. 8, with extra traces superimposed to compare the action of the low- and high-cut filters. Note that the filter action is moderate and slopes are at a rate of only 6 dB per octave, so that little is accomplished by these circuits that could not have been done by use of the bass and treble controls in less than their extreme cut positions.

Action of the loudness control circuitry is shown in the 'scope photo of Fig. 9 for different settings of the volume control and only bass compensation is afforded by this circuit at low listening levels (as opposed to some loudness circuits which accentuate both bass and treble frequencies when the volume control settings are reduced).

### Listening and Use Tests

The amplifier section of the SA-5550 performed nicely for us during our extended listening tests and delivered enough power to drive two sets of low-efficiency speaker systems to good listening levels. Under normal listening conditions, heat sinks remained comfortably cool even after extended "on" time, and the amplifier seemed stable and well protected even when driven to clipping for short periods. We appreciated the click-stop action of the tone controls when enable us to repeat favored settings of these controls exactly. In addition to being able to record onto two tape

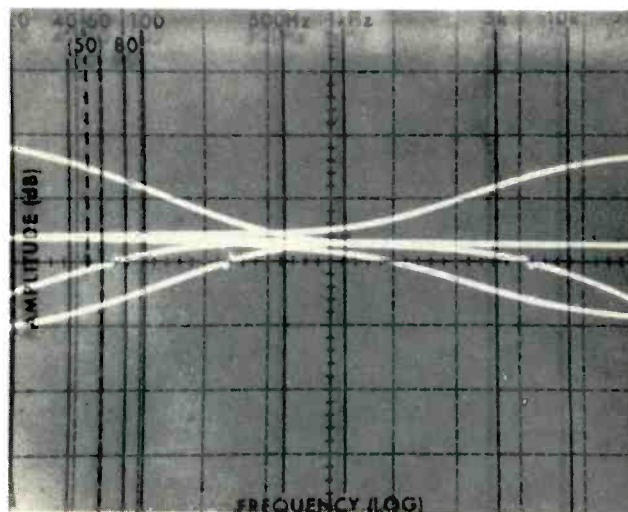


Fig. 8—Bass and treble control and high- and low-filter characteristics.

decks, the SA-5550 makes provision for recording from the tape 1 outputs to the tape 2 inputs, or, from deck "1" to deck "2." Monitoring of either tape deck's output is possible by choosing the right combination of front panel tape buttons, a feature which will no doubt find favor with recording enthusiasts.

If one were asked to judge between the amplifier and the tuner sections of this well-executed receiver, picking a clear-cut winner would be a difficult matter. The tuner section has good sensitivity in both mono and stereo, and the 50-dB quieting mark is reached with fairly low signal levels. In addition, the distortion, ultimate quieting, and selectivity performance figures are all rather good for a receiver in this price class. The amplifier section delivers a good deal of power over a fairly wide band with quite reasonably low distortion, and it is one of the few units these days which is specifically rated for 4-Ohm operation. All in all, this receiver from Technics is an all-around winner, regardless of whether you live close to stations or in the deep fringes. With a suggested price tag of \$479.95, judging the SA-5550 as a superior receiver isn't hard at all. *Leonard Feldman*

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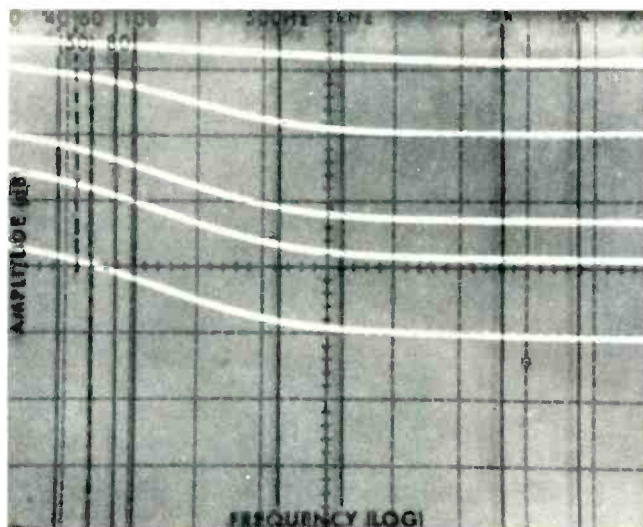
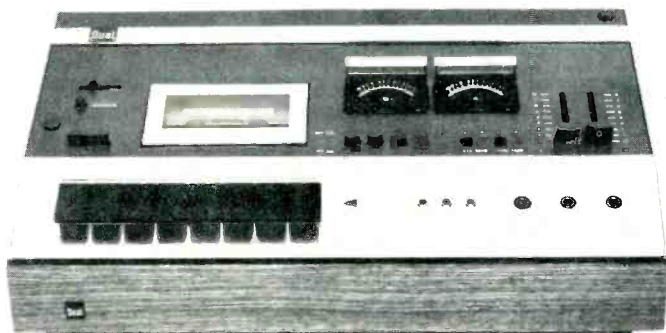


Fig. 9—Loudness control action.

### Dual Auto/Reverse Cassette Deck



#### MANUFACTURER'S SPECIFICATIONS

**Frequency Response:** Standard Tape, 20 Hz to 14,000 Hz  $\pm$  2.5 dB; Cr02, 20 Hz to 16,000 Hz  $\pm$  2.5 dB. **Wow and Flutter:** Less than 0.07%. **Dynamic Range:** IEC curve "A", Better than 51 dB; with Dolby, better than 60 dB. **Harmonic Distortion:** Less than 2.0% at 1 kHz. **Tape Speed Accuracy:**  $\pm$  0.5%. **Erasure:** 70 dB. **Channel Separation:** 60 dB in opposite direction; 30 dB or better between stereo channels. **Bias Frequency:** 85 kHz. **Input Level:** 0.22 mV, mike inputs; 65 mV, line. **Output Level:** 0.75 volts. **Fast Wind Time:** 60 seconds for C-60 cassette. **Headphone Impedance:** 8—16 ohms. **Power Requirements:** 120/240 V 50/60 Hz. **Dimensions:** 16 1/2 in. W x 4-13/16 in. H x 11-13/16 in. D. **Weight:** 15 1/4 lbs. **Price:** \$450.00.



Fig. 1—Back view of the Dual Cassette Deck.

It is no great surprise to find that the people who produce one of the most popular lines of automatic and manual turntables in the world should have come up with a cassette deck which incorporates one of the most sophisticated tape transport systems to be found in any cassette deck. The standard features one has come to expect from a high quality cassette deck are all there, but there is much that is new and different. The first thing we noticed upon unpacking this smartly styled unit is the absence of any power on/off switch. Depressing any one of the four transport motion keys both turns on power and causes the appropriate tape motion to begin. Why four transport keys, instead of the usual three (*Play*, *Rewind* and *Fast Forward*)? Simply because this machine can play and record in either direction of tape travel, so that a *Play-left* and a *Play-right* transport key are necessary. Other keys along the lower edge of the front panel include a *Stop* key, a *Continuous Play* key, the usual record key (colored with a red warning stripe), and a pause key. When the *Continuous Play* key is depressed, a cassette will first play one side, then play in reverse (picking up the appropriate alternate pair of tracks) and then play all over again, continuing until the key is released. Even without the *Continuous Play* button depressed, a cassette will be played

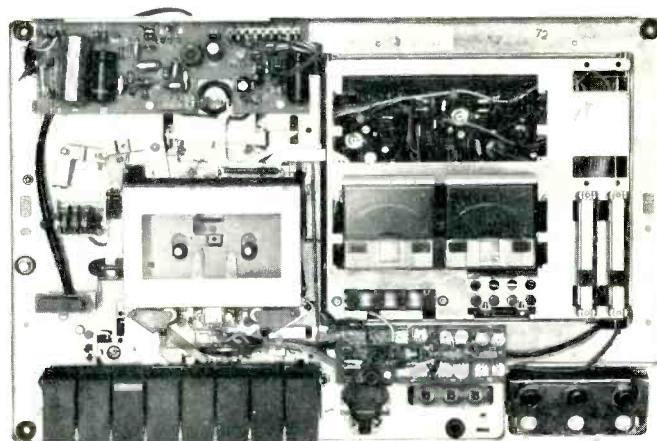


Fig. 2—Top view without protective cover.

in both directions and the mechanism will shut off after both sides have been completed. The automatic reversing feature will not occur during recording, though it is possible to record in either direction by manually depressing the appropriate "play" key together with the Record key. A pair of arrow-shaped indicator lights denote direction of tape travel at all times.

Just to the right of the transport buttons and tape-direction lights are three more indicator lights. The first of these is a peak level indicator which flashes whenever signal levels exceed the +3 dB point, relative to 0 VU on the record level meters. The other two lights indicate that recording is in process or that Dolby circuitry is turned on. At the lower right of the panel are headphone and left and right microphone input jacks. An eject button at the left of the cassette compartment raises the cassette holder smoothly and slowly, permitting insertion of the cassette along guide rails at a convenient angle, and when this door-holder is snapped shut, the cassette is perfectly positioned for record or playback. A three digit counter is located above the eject button and above the counter is a tape bias switch with settings for standard and CrO<sub>2</sub> tape. While this switch can be operated manually, its mechanism is also arranged to sense the extra notch in newer CrO<sub>2</sub> cassettes and will switch automatically from STD to CrO<sub>2</sub> setting when such tapes are inserted. Subsequent insertion of any standard tape (or non-notched CrO<sub>2</sub> tape) causes the switch to pop back to the STD position.

The two illuminated VU meters at the right of the cassette compartment are calibrated from -20 dB to +5 dB and can be tilted up to an angle of 30 degrees for easy viewing when the machine is operated in the horizontal plane. This deck, by the way, is one of the few we have tested that can be operated either horizontally or vertically, and a pair of mounting brackets are supplied should you want to mount the entire unit vertically on a wall surface. Below the meters are four more buttons. Three of these are two-position switches for mono/stereo selection, activation of an automatic level control circuit, and activation of the Dolby noise reduction circuitry. The fourth button is a momentary switch that introduces a 400-Hz test tone used for calibrating bias for proper Dolby calibration. Alongside the buttons are four screwdriver adjustment controls for calibrating Dolby (left and right channels) when standard tape or CrO<sub>2</sub> tape is used. At the extreme right of the panel are a pair of slider input level controls which affect only recording level. Playback output is not adjustable on the deck itself but must be controlled by the volume control on your amplifier or receiver. When the *Automatic Level Control* button is depressed, the slide level controls are bypassed and all record level adjustments are performed automatically.

Line input and output connections are made on the rear apron of the unit, which also houses a record/playback DIN

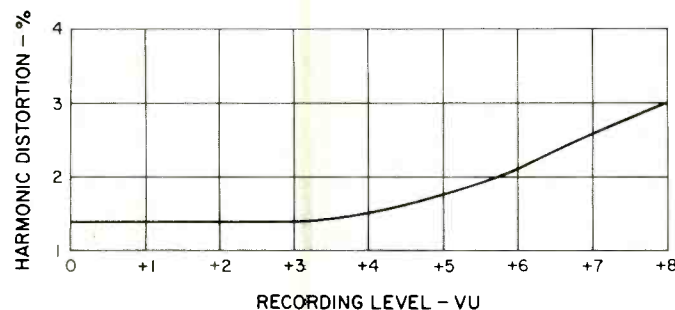


Fig. 3—THD versus recording level.

connector. While line and microphone inputs may be used simultaneously, there are no provisions on the Dual deck for separately adjusting the gain of each such input with respect to the other.

### Circuitry and Mechanical Features

Separate circuit board modules are employed for the input amplifiers, bias oscillator, automatic level control circuitry, Dolby circuits, output amplifiers, recording amplifiers, meter and indicator amplifiers, test-tone generator, tape-end limit switch circuitry, and power supply. The solid-state complement of the Dual cassette deck includes 4 ICs, 3 FETs, 31 transistors, and 38 diodes.

The record/play head of the unit is a Permalloy type which Dual believes is superior in its characteristics to Ferrite types and for which a life-expectancy of 3000 hours is claimed by the manufacturer. Because of the unique reverse-play-and-record arrangement of this deck, two erase heads are required, mounted on either side of the record/play head. When the deck is put in the play (or record) mode, the entire head assembly swings in toward the cassette so that only the record/play head and one erase head, corresponding to the direction of tape motion, contact the tape. A continuous-pole/synchronous motor (similar to the motor used in Dual's better turntables) provides power to a flywheel and capstan through a precision ground belt. Tape takeup drive is provided separately by a second belt also attached to the motor shaft pulley. Two capstans are used in the tape-drive system. One is centered on the flywheel. The other is driven via a pulley and belt. It is this dual capstan arrangement which, according to the maker, results in the low wow and flutter figure claimed for this machine.

### Laboratory Measurements

In measuring the performance of the Dual cassette deck, we elected to use Maxell UD-XL tape for all tests in the "standard" bias position and Nakamichi CrO<sub>2</sub> tape for tests of performance with bias switch set to the Chrome position. (Editor's Note: We understand that Nakamichi no longer has the chrome tape in its line.) Dolby circuits were individually calibrated for these two types of cassette tapes, as per instructions supplied in the owner's manual. We did note one discrepancy here. Whereas the booklet suggests calibrating the Dolby circuitry for "0 dB" playback of the test tone recorded at "0 dB," the VU meters themselves have a Dolby trademark symbol inscribed at about the +3 dB point which would seem to contradict the manual instructions. Nevertheless, we went by the written instructions. If these are incorrect, we urge Dual to amend the booklet. If they are correct, rescreening of the built-in-meters would help the user.

Using our Maxell tape and recording at 0 VU, we read a total harmonic distortion during playback (at 1 kHz) of 1.4%, well below the 2.0% claimed by the manufacturer. At +3 (the point at which the peak indicator light begins to flash), THD remained constant at 1.4%. At +5 VU, THD increased to 1.7%. The 3% THD point was not reached until we recorded signals at a +8 VU. Referring to the 3% THD recording level, we measured a signal-to-noise ratio of 53 dB without Dolby (using an "A" weighting network) and just over 60 dB when Dolby was introduced into the recording and playback. Frequency response for the complete record-play cycle was measured at -20 dB recording levels as well as at 0 dB. Readers may take issue with the first of these techniques, since saturation of tape occurs at the high, pre-emphasized frequencies, but we think that this set of read-



ings is useful if only in that it describes the available headroom of the machine and the tape being tested. The upper curve of Fig. 4 should therefore not be interpreted as an indication of frequency response capability (the -20 dB curve serves for that purpose), but rather as a measure of relative headroom of the machine (based on its 0 VU settings) and of the tape being tested. The more meaningful lower curve exhibited a peak of around 4 dB at 15 kHz and rolled off sharply beyond that frequency to -7 dB at 17 kHz. It is obvious that bias and equalization are not precisely set for this variety of tape (which has excellent high-frequency characteristics), but unfortunately, the Dual owner's manual does not specify the tape brand or type for which the machine was specifically calibrated. A note or phone call to United Audio (the people who distribute Dual products) would probably elicit that information, since many manufacturer's are beginning to name brands in their owners' manuals for just this reason. In any case, most users will probably be happy with the slight rise in response at around 15 kHz since the problem is usually one of not getting enough output at these frequencies.

Figure 5 shows frequency response measured using the Nakamichi CrO<sub>2</sub> tape. Again, a rising characteristic was noted for this tape at the high frequency end, but this time, response extended to 17 kHz and was down some 6 dB at 18.5 kHz, referred to a -20 dB recording level. As was to be expected, there was less "headroom" available using the CrO<sub>2</sub> tape. At 0 VU recording level, THD measured just a fraction below 2.0%, while at +3 VU, distortion had already exceeded 3.0%. Signal-to-noise ratio referred to the 3% THD point measured 57 dB without Dolby, and 62 dB with Dolby, both readings taken with an "A" weighting network. In terms of available dynamic range, therefore, the CrO<sub>2</sub>

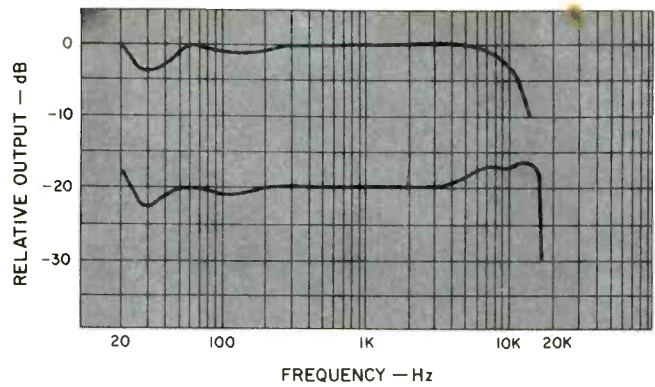


Fig. 4—Record/playback response using Maxell tape.

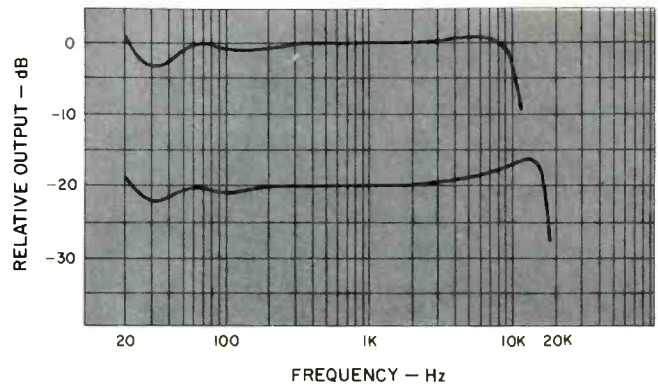


Fig. 5—Record/playback response with CrO<sub>2</sub> tape.

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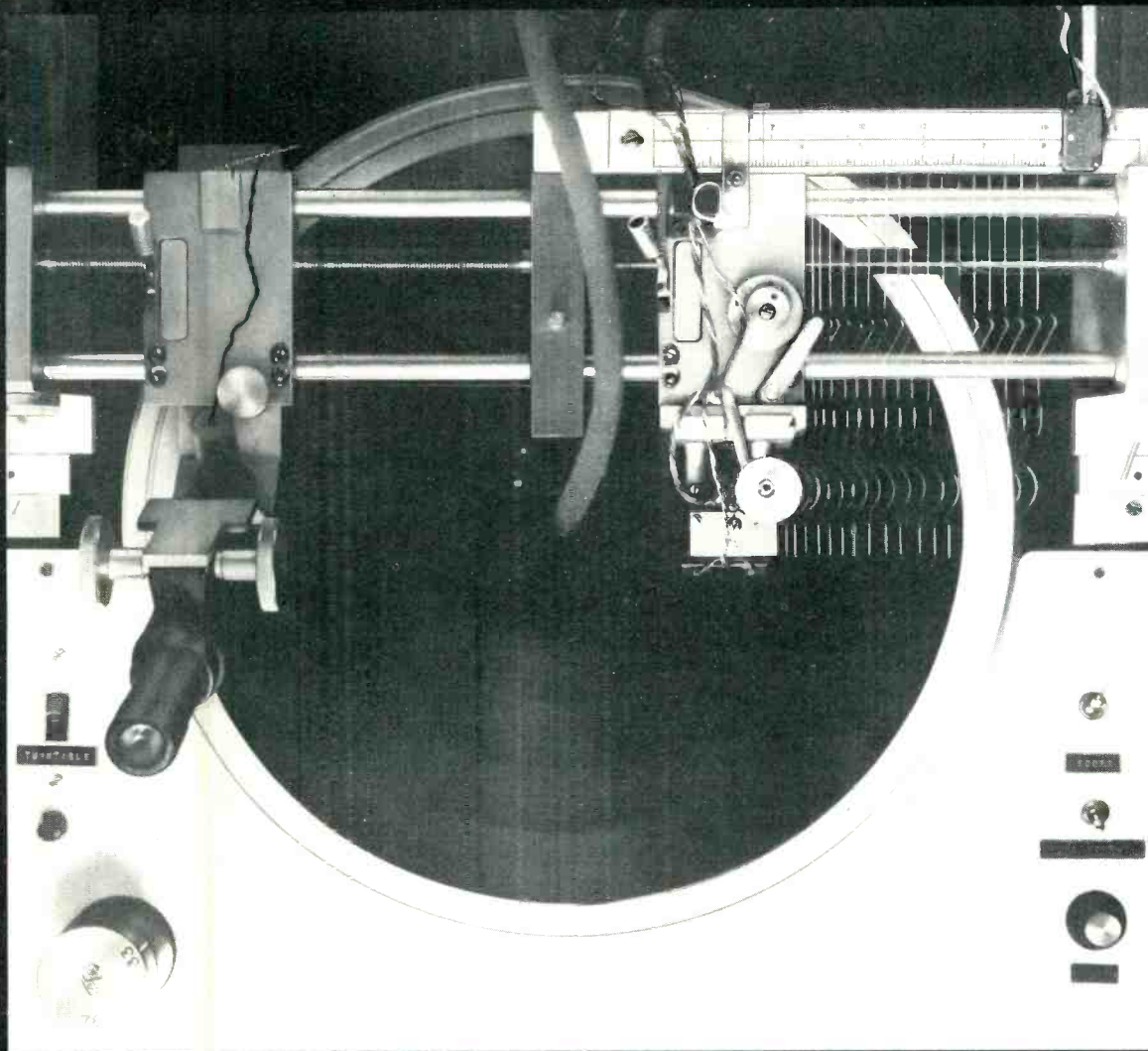
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## This is how discs are made.

A master disc is cut on a special lathe. The cutting head moves across the master in a straight line from the edge to the center. The special stylus inscribes a groove in the surface of the disc.

Ideally, a turntable system should enable the stylus in your cartridge to meticulously follow the "path" inscribed during the cutting process. That is, it should play your record precisely as the master disc was originally cut.

A "straight line tracking" turntable system, properly designed, engineered and manufactured, could eliminate problems such as skating force, tracking error, and the resulting excessive record wear, all of which are *inherent* in pivoted arm systems in all their forms and modifications.



## This is how the ST-7 plays them.

The Rabco ST-7 is a *straight line tracking turntable*. Your stylus precisely follows the original path cut into the master record. The result is the total elimination of *both* tracking error and skating force.

The ST-7 begins with straight line tracking. In every other respect — motor, suspension, bearings, drive, controls — it is exemplary of a professional instrument designed for home use.

The ST-7 offers a cascade of zeroes. Zero tracking error. Zero skating force. Zero stylus overhang. It plays music in the home in a way that makes conventional pivoted arm systems obsolete. For complete information write Harman/Kardon, 55 Ames Court, Plainview, N.Y. 11803.

**harman/kardon**

tape was better even though its 3% THD point was reached at a lower setting on the VU meters.

Wow and flutter was indeed extremely low, measuring 0.065% (W RMS), and the fast-wind mechanism of this deck is about the fastest and smoothest we have encountered. A C-60 cassette was fully rewound in 55 seconds. We also checked a couple of C-120 cassettes and found that the Dual deck was able to handle them smoothly. Some cassette decks have trouble with this longer, thinner tape and discourage its use.

### Use Tests

There is a distinct feeling of quality about the Dual cassette deck. All transport operations are extremely smooth, and very little finger pressure is required to operate the various transport keys. Meter ballistics are excellent and correspond very closely to true VU meter action (a rarity in cassette decks). We would have preferred to have mike/line mixing facilities to provide greater control flexibility in recording but, of course, the serious recordist can always purchase a suitable multi-channel mixer for use with this basic deck. Cueing up of a program before recording begins

is easily accomplished by first depressing the *pause* button (which remains in that position) and then simultaneously depressing the *record* button and the appropriate *left-play* or *right-play* buttons. The *record* button stays down, while the *play* button pops up, but the moment the *pause* button is released, recording begins in smooth fashion. Even though the unit provides automatic reverse in playback, it is just as well that in the record mode it is necessary to start the recording process all over again in the reverse direction at the end of the first tape pass. Otherwise a few seconds would be lost if reversal during recording took place, since there are several inches of "leader" tape at each end of nearly all cassettes. We detected no audible difference in response when playing tapes in either direction, indicating a high degree of precision in tape head alignment.

The Dual Cassette Deck is another outstanding example of the great strides that have been made in cassette deck technology in recent years. It is ruggedly constructed, uses high-grade components throughout, and seems well worth the price. A one-year warranty covering parts and labor is included in the purchase price.

Leonard Feldman

Check No. 91 on Reader Service Card

### Sansui Model SR-717 Direct-Drive Turntable



#### MANUFACTURER'S SPECIFICATIONS

**Speeds:** 33 $\frac{1}{3}$  and 45 rpm. **Fine Speed Adjust:**  $\pm 4\%$ . **Wow and Flutter:** 0.035% weighted rms. **Signal-To-Noise Ratio:** Better than 60 dB. **Tonearm:** Statically balanced, S-shaped tubular. **Features:** Oil-damped tonearm lifter, lateral balancer, direct-readout stylus-force dial, inside force cancellor. **Dimensions:** 20 in. W x 15 $\frac{1}{2}$  in. D x 7 $\frac{1}{2}$  in. H. **Approximate Nationally Advertised Value:** \$350.00.

There's no doubt about it, these modern turntables bear little resemblance to the old models of just a few years ago! A prime example is the SR-717, Sansui's new top-of-the-line direct-drive unit *par excellence*. It is rather larger than most turntables, measuring 20 inches wide by 15 $\frac{1}{2}$  inches deep. The top plate and in fact the whole unit is finished in a charcoal black with silver trim, making a nice contrast with the

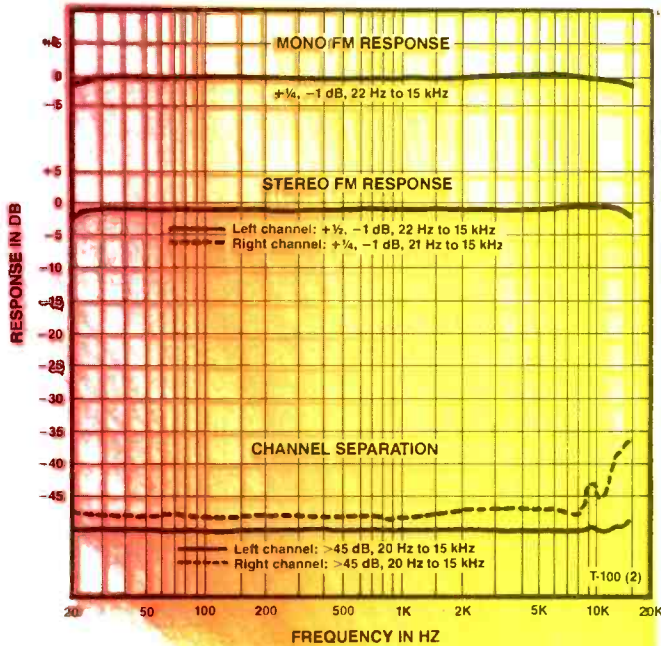
polished wooded endpieces. The 9 $\frac{1}{4}$ -in. arm is an S-type, and it has a gimbel suspension using knife-edge supports in the vertical plane. The rotatable counterbalance is calibrated in pressures from 0 to 2.5 grams, and there is provision for an additional weight if the cartridge is heavier than 11 grams. On the left of the arm pivot is a shaft for a lateral balance weight, and a suspended weight with calibrated spindle is used for the anti-skating adjustment—what Sansui calls the "inside force cancellor."

The controls are simplicity itself: a pressbutton for 33 $\frac{1}{3}$ , another for 45 rpm, each one having a small variable speed control next to it. There is a 3-position lever switch marked *Off*, *On* and *Play*, the last named position operating the arm lowering device. The strobe light is mounted at the front to the left, and the strobe speed markings (50 and 60 Hz) are on the turntable rim. The turntable is made of an aluminum alloy and turns the scales at just over 3 lbs. The motor is a 20-pole d.c. brushless servo type driven by an electronic supply unit that employs 20 transistors plus an IC. A voltage selector is underneath with the phono sockets at the rear, and the complete unit is mounted on four heavy-duty shock-absorber feet—a method of suspension I have always favored.

#### Measurements

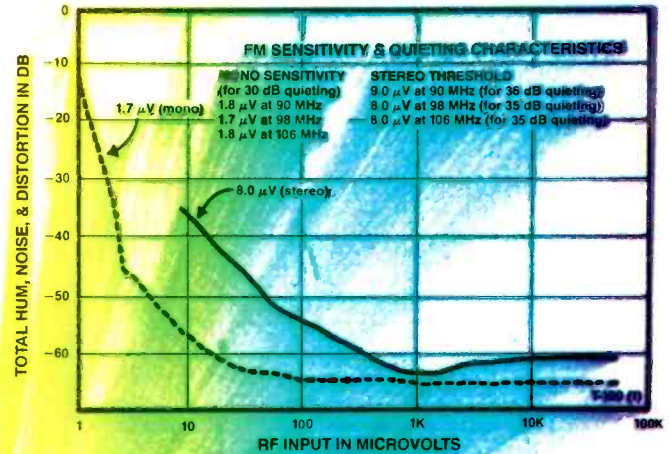
As the cables supplied were low-capacity types, a CD-4 phono cartridge (Audio-technica AT-20) was used for the tests—or most of them. Setting up took a little longer than usual due to the more complicated anti-skating arrangement and the cartridge needed that extra arm weight for correct balancing. Then there was the lateral balancing to be done, but the whole process only took a few minutes. The first test was for wow and flutter, and the measured figure was very low indeed at 0.04% using the DIN 45-507 standard.

I expected rumble to be low too, and I was not disappointed as it measured better than  $-67$  dB (ARLL), which is exceptionally good. The speed control gave a variation of  $+5$  and  $-3\%$  at 33 $\frac{1}{3}$  and  $\pm 4\%$  at 45 rpm. As with most modern arms, the vertical and lateral friction were too low to measure accurately although no figures are quoted by Sansui. Tracking error was within 0.5 degrees per inch, a good figure for this type of arm. Accuracy of the stylus-force dial was well within 5%, and the anti-skating calibration was



"The ultimate distortion of the T-100's FM section was unequivocally the lowest we have ever measured. To this can be added a really first-rate AM tuner section, the likes of which we have never before encountered in a product of this type."

"There is no doubt that its stereo channel separation and distortion characteristics surpass anything in our previous experience. Its AM frequency response was not only, by far, the flattest and widest we have ever measured on an AM tuner, it is sufficiently free of distortion and noise to make it a truly useful program source even for high fidelity listening."



## Spending more won't buy a better tuner.

The uncompromising quality of Accuphase makes the T-100 AM/FM Stereo Tuner one of the finest available. At any price. No qualifications.

From its unprecedented excellence in performance to its unusually effective multipath meter, the T-100 is truly superb.

Prove it yourself. We've assembled a free 36-page booklet of independent laboratory reports attesting to the superior performance of Accuphase. It's very convincing. But the best way to be convinced is to audition the T-100 yourself. Then you'll understand why the critical acclaim has been as impressive as the product itself.

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found to be very satisfactory. (It gives a choice of four positions: 0.5, 1, 1.5 and 2 grams.) As the motor is servo controlled from a stabilized power supply, speed accuracy is not determined by the line voltage or frequency. Once the speed control has been set, the speed remains rock steady and no further adjustment will be required.

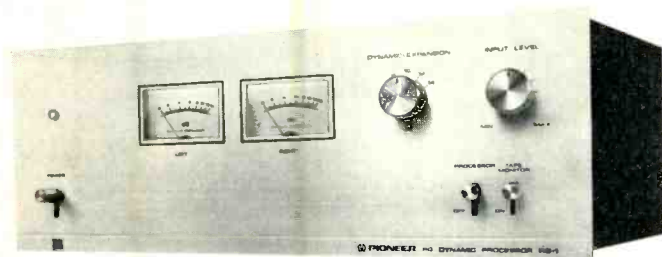
### Use Test

The SR-717 was on test over a period of several weeks—it was such an easy unit to use, I was reluctant to change it! After playing a number of CD-4 records, including ones made with the experimental RCA Quadralator, I changed the cartridge for a Shure V-15 Mk III to find the optimum tracking

force. As expected, this came out at 1¼ grams and the anti-skating device was also set at that force. As I have pointed out previously, CD-4 cartridges with a Shibata stylus need rather more force but the effective weight on the record is spread over a greater area. I ought to have mentioned earlier that the unit comes complete with a transparent, hinged plastic lid which adds the finishing touch to a very handsome piece of equipment. As we have seen, it is a top performer too—certainly one of the best half dozen units now available at any price. It's not particularly cheap but then products of this caliber rarely are. . . . *George W. Tillett*

Check No. 92 on Reader Service Card

## Pioneer RG-1 Dynamic Processor



### MANUFACTURER'S SPECIFICATIONS

**Maximum Output Voltage:** 6.5 V. **Expansion:** 6 to 14 dB. **Input Impedance:** 70 kOhms. **Output Impedance:** 300 Ohms. **Signal-to-Noise Ratio:** 100 dB re:6.5V. **Distortion:** 0.1% at 1 kHz, 1 Volt. **Dimensions:** 13¾ in. W x 5¾ in. H x 12½ in. D. **Price:** \$175.00.

During the past 30 years or so, a great deal of progress has been made in realistic sound reproduction in the home. First we had the LP record, then mono FM radio, followed by stereo FM with its added dimension and of course, loudspeakers have been getting better and better—so have amplifiers and all the other links in the chain, not forgetting tape recorders and the fantastic improvements in the tape itself! But two things still bother the perfectionist: The difficulties in eradicating the last trace of background noise and the dynamic range compression in just about every program source. For example, a symphony orchestra has a range of well over 70 dB but it is necessary to compress it down to 60 dB or less in the recording process. In fact, the average record might only have 45 dB! This is bad enough, but broadcast stations resort to an even greater compression to

increase their effective signal in the fringe areas and so come up with a bigger audience to charm potential advertisers. Although the resulting sound quality is passably acceptable on car radios and the like, it is far below true high-fidelity standards—hence the number of expanders, such as those from dbx, Phase Linear and IAD, now on the market. As the name implies, they expand the dynamic range by increasing the level of the loudest signals in an effort to restore the original balance. Some can stretch the signal by as much as 20 dB but it is rare that such a high amount of expansion can be used without the electronic action being audible.

The Pioneer RG-1 is a relative newcomer to the field, and the initials refer to Robert Grodinsky, its inventor. The unit is housed in a neat metal cabinet with a satin silver-finished panel and knobs to match. There is a meter for each channel, a level control and a five-position switch giving expansion rates of 6 to 14 dB in 2 dB steps. Under these, to the right are two lever switches, one to switch the signal direct to the output, thus bypassing the expander, and the other to switch in a tape recorder, decoder or whatever. The RG-1 has to be connected to the tape in/out sockets of the receiver or amplifier, so if there is only one pair of tape sockets, anything else has to be plugged into the expander. The

(Continued on page 75)



Fig. 1—Back panel view.

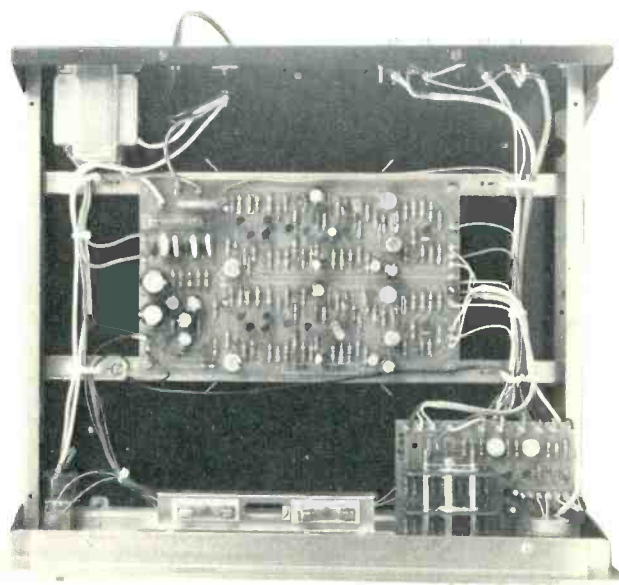


Fig. 2—Interior view.

# Introducing an evolutionary idea. The New Empire 698 Turntable

Great ideas never change radically.

Instead, they are constantly being refined to become more relevant with time.

So it has been with Empire turntables. Our latest model, 698, is no exception. Basically, it's still the uncomplicated, belt-driven turntable we've been making for 15 years. A classic.

What we're introducing is improved performance.

The lower mass tone arm, electronic cueing, quieting circuitry and automatic arm lift are all very new.

The rest is history.

## **The Tonearm**

The new 698 arm moves effortlessly on 32 jeweled, sapphire bearings. Vertical and horizontal bearing friction is a mere 0.001 gram, 4 times less than it would be on conventional steel bearings. It is impervious to drag. Only the calibrated anti-skating and tracking force you select control its movement.

The new aluminum tubular arm, dramatically reduced in mass, responds instantly to the slightest variation of a record's movement. Even the abrupt changes of a warped disc are quickly absorbed.

## **The Motor**

A self-cooling, hysteresis synchronous motor drives the platter with

enough torque to reach full speed in one third of a revolution. It contributes to the almost immeasurable 0.04% average wow and flutter value in our specifications. More important, it's built to last.

## **The Drive Belt**

Every turntable is approved only when zero error is achieved in its speed accuracy. To prevent any variations of speed we grind each belt to within one ten thousandth of an inch thickness.

## **The Platter**

Every two piece, 7 lb., 3 inch thick, die cast aluminum platter is dynamically balanced. Once in motion, it acts as a massive flywheel to assure specified wow and flutter value even with the voltage varied from 105 to 127 volts AC.

## **The Main Bearing**

The stainless steel shaft extending from the platter is aged, by alternate exposures to extreme high and low temperatures preventing it from ever warping. The tip is

then precision ground and polished before lapping it into two oilite, self-lubricating bearings, reducing friction and reducing rumble to one of the lowest figures ever measured in a professional turntable; -68 dB CBS ARLL.

## **The Controls**

Electronic cueing has been added to the 698 to raise and lower the tone arm at your slightest touch. Simple plug-in integrated circuitry raises the tone arm automatically when power is turned off.

A see-through anti skating adjustment provides the necessary force for the horizontal plane. It is micrometer calibrated to eliminate channel imbalance and unnecessary record wear.

Stylus force is dialed using a see-through calibrated clock mainspring more accurate than any commercially available stylus pressure gauge.

A new silicon photocell sensor has been added to automatically lift the arm at the end of a record.

New quieting circuitry has also been added. Now, even with the amplifier volume turned up, you can switch the 698 on or off without a "pop" sound to blow out your woofers.

At Empire we make only one model turntable, the 698. With proper maintenance and care the chances are very good it will be the only one you'll ever need.

# EMPIRE



*The Empire 698 Turntable*

Suggested retail price \$400.00

For more information write:  
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Garden City, New York, 11530.

**M**AC REBENNECK is Dr. John, but you'd never know it to look at him today. Dressed in jeans and a work shirt, Rebenneck's appearance doesn't hint in the least of feathers, voodoo trappings, and the rest of Dr. John's colorful regalia. In fact, Dr. John—the gris-gris patriarch who stirs the herbs, speaks to spiders, and thrives on voodoo incantations—has been stored away with his magical smoke machine until the next tour, leaving Rebenneck free to be his street self.

Although the Doctor John persona tends to obscure his other accomplishments, Rebenneck has been an active force in New Orleans music for two era-spanning decades. His first job in the industry was as an A&R man for Johnny Vincent's Ace Records, a seminal influence on all rock-and-roll. Multi-instrumental, Rebenneck has contributed his talents to sessions ranging from Professor Longhair (aka Henry R. Byrd) and Huey Smith to the Rolling Stones, Bob Dylan, Maria Muldaur, and Kate Smith.

This conversation began when I asked him about *The Right Place At The Wrong Time*, Dr. John's hit single. For the next three hours Rebenneck's slow, sleepy drawl rambled wildly, but never failed to come home to the point.

"I got with Allen Toussaint an' took d'Meters into rehearsal. I took 'em out on d'road an' we got together while we were on d'road for rehearsal. We went out on d'road an' worked out all d'tunes we were gonna do, jus' went in d'studio an' cut 'em wit dat in mind o' what we were gonna do. Actually we cut dat whole **Right Place** album in two sessions, two three-hour sessions. Only thing dat had t'be done afterward was put on d'girls an' d'horns an' dat was it.

"It was not d'way I rather do albums, like jus' go in dere an' cut live things. It was more on d'idea o' jus' d'way records are bein' made today,



# Dr. John: The Gris-Gris Man

Andy Doherty



d'Memphis Tradition, d'Willie Mitchell Tradition, d'whole idea o' cuttin' d'rhythm track an' then layin' in d'horns an' d'verses, which you get maybe a cleaner record an' you get more professional or sumptin' like dat, but you don' get no spontaneity out o' it.

### Naturalness Passé

"In d'old days ya used t'cut one track. Ev'rybody had to sing on it—d'band, ev'rybody had to play d'thing together. It was no dubbin' in, which made records a lot truer. Now records you can cut one guy at a time all d'way til ya finish a record an' maybe you get things dat way t'do 'em more perfect an' ya don' have t'worry 'bout ev'rybody playin' d'same song at d'same time together an' do perfect tapes. But if ya really get down t'it, it's kinda jive, man. People is not hearin' d'whole band playin' sumptin' together like they do at a gig. They not gettin' d'real reality thing.

"Like there was a new school of producers, Phil Spector a' all d'cats dat came after him, all d'way to d'Motown cats. I calls 'em New School producers that cuts 16, 32 track. It look t'me like dey're tryin' t'fill out all o' dose tracks. Ev'ry one o' dose tracks has got t'have sumptin' on it. Dey couldn't never cut a record on four-track or two-track, like Motown did when dey started, or Atlantic did when dey started, or any o' d'record companies did—specially if you go's back t'when dey was one track. Singer's gonna sing d'tune, d'band's gonna play d'tune, an' all d'horns an' d'voices an' ev'rythin's gonna do one take all d'way together right an' not have nobody dat's gonna be able t'dub in dere parts or sumptin'. But dat's d'way I would like t'see recordin' get back t' a similar thing like dat. At least have all d'rhythm section play dere thing together, an all d'horns together, an' not overdub. Jus' t'be able t'get dat natural beat, even wid mis-



takes an' ev'rythin' dat would be involved. Jus' 'cause t'get dat little naturalness on d'records dat's lost in d'picture now, dat's jus' 'bout a forgotten art.

"I can't say I been cuttin' any real natural records d'las' few records I been doin'. I started out cuttin' dat way, but in d'las' few years all d'technology an' all d'stuff's been thrown at me in d'ways o' cuttin' records in shorter times. Up to my las' record we was rehearsin' records an' den goin' into d'studio an' tryin' to cut 'em basic'ly all as much as we could at once. Wid my newest album we wasn't even able to rehearse it before. We jus' had t'go into d'studio an' do it on d'spot. An' although d'record can come out okay wid d'overdubbin', it don' come out wid dat little natural innocent thing dat happens when ev'rybody play dat ting all together at once."

So much for the present. Flashing back twenty years we find Mac Rebennack working for \$30.00 a week at Ace Records. His duties? Find the artist, secure material for the artist, hire musicians, arrange the song, master the record—today the same jobs would be delegated to three or four people, each one of them earning \$30.00 an hour.

"I thought it was an honor to produce sumptin' if they hadn't paid me at all. Ev'rythin' we did, man, nobody had no business smarts among any one of us. Huey Smith—I think d'reason Huey has gotten out o' d'business an' become a Jehova's Witness is d'fact dat all d'hit records—he must've made, what, *Rockin' Pneumonia* was a hit when he did it, it's been a hit again now Johnny Rivers did it. *Sea Cruise* was a hit when he wrote it for Frankie Ford, it's been a hit now when Johnny Rivers did it. All dem songs—*Don't You Just Know It* an' *High Blood Pressure*. Ev'ry record, damn near, Huey wrote was a hit. But d'fact was dat he didn't get nothin' out o' it. I think Johnny (Vincent) gave him a house when he was with d'company an' took it back when Huey left d'label to get wit Imperial. An' things like dat—I can u'erstan' why Huey Smith has a bad attitude toward d'record business 'cause all dat he has contributed t' dis business he shoulda been able t' retire 10 years ago from it. An' at dis stage o' d'game t' still have t'be scufflin' an' still goin' through changes—it's ridiculous. I'll say of all d'people dat was connected wit Ace Records durin' d'Fifties, nobody contributed more dan Huey Smith.

"At dat time, though, Johnny Vincent was gung-ho over white acts 'cause Jimmy Clanton had jus' broke out with *Just A Dream*. Jimmy Clanton was an off-shoot o' Earl King. An' like instead o' still pushin' Earl King, Johnny jumped on his white acts, figurin' he was gonna sell more records t' a

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bigger audience. It did work as far as dat was concerned, but it caused a lotta bad vibes 'tween all d'black acts dat had started an' made his company. It also caused a little split 'tween all d'black cats dat was responsible for makin' all d'hits up t'dis point with d'white cats comin' into d'picture an' reapin' d'benefits."

Dr. John reminisced about a benefit for Professor Longhair, whose home had burned down.

### Longhair's Influence

"I couldn't say dere was any bigger influence on myself an' New Orleans Music dan Professor Longhair, Huey Smith, and Allen Toussaint. Although Huey Smith an' Allen Toussaint are both off-shoots o' Professor Longhair dey're hairs dat was derived from Longhair dat became a thing o' itself. Same wit Fats Domino, Antoine's records all o' dem up t' a point came from styles o' Longhair's.

"I think we all realize what a big debt we owe Longhair for what all d'music dat he instigated. Jus' like I'd say dat 90 per cent o' my piano stylin' is directly attributed to Professor Longhair. An' I think dat goes for; Allen Toussaint, Huey Smith, Fats Domino, ev'rybody from New Orleans. I think we all have t'agree at some point dat Longhair has a big, big portion o' our styles directly derive from his thing. Also, I always try t'give him credit for bein' d' grandfather o' funk music. Which all d'bands 'cross d'world is playin' which is dat syncopated music on d'drums that's syncopated 'tween the bass drum an' d'snare drum wit dat real alternated syncopation. Dis was directly started by Longhair's form o' piano playin'. His instrument really is d'drums. . . . Somebody said, yeah, well, he's good but he could never do what Count Basie does. My idea is dat you could get Duke Ellington, Count Basie, Dave Brubeck, Art Tatum, any o' d'greats an' dey couldn't play what Longhair does. Partially 'cause his thing is so unorthodox. But also 'cause his thing is so intricately related t' his whole thing an' it's so dif'rent from any other style o' music. Unless somebody jus' studied his thing for their whole life, I don't think he could do what Longhair does. Although his style maybe at one time was a boogie-woogie piano player, it evolved t' what he calls overboogie but I jus' consider it a new form o' music. Like his way o' playin' a Latin beat, a rumba, a mambo, a tango, Afro-Cuban. It's so dif'rent from any other piano player . . . what John Coltrane did for d'saxophone, or what Charlie Parker did, or what Jimi Hen-

drix did for d'guitar, well, Longhair did for d' piano world."

Longhair's descendants swept out of New Orleans in the 50s. America was conquered by that funky, syncopated rock and roll. How did it happen, and why?

### Rock Genesis


"New Orleans musicians were much more advanced in what we call funk music an' were playin' it way back then in d'Fifties. What has only reached d'rest o' d'country in d'late Sixties an' early Seventies has been a common thing down dere all along. New Orleans started changin' dat famous shuffle rhythm an' usin' a two-four rhythm which was like a dixieland rhythm but with a backbeat an' what later became called funk. Dis whole thing came up an' started formulatin' itself at dat time an' became trend-settin' instead o' music dat was up t'pot wit d'rest o' d'country.

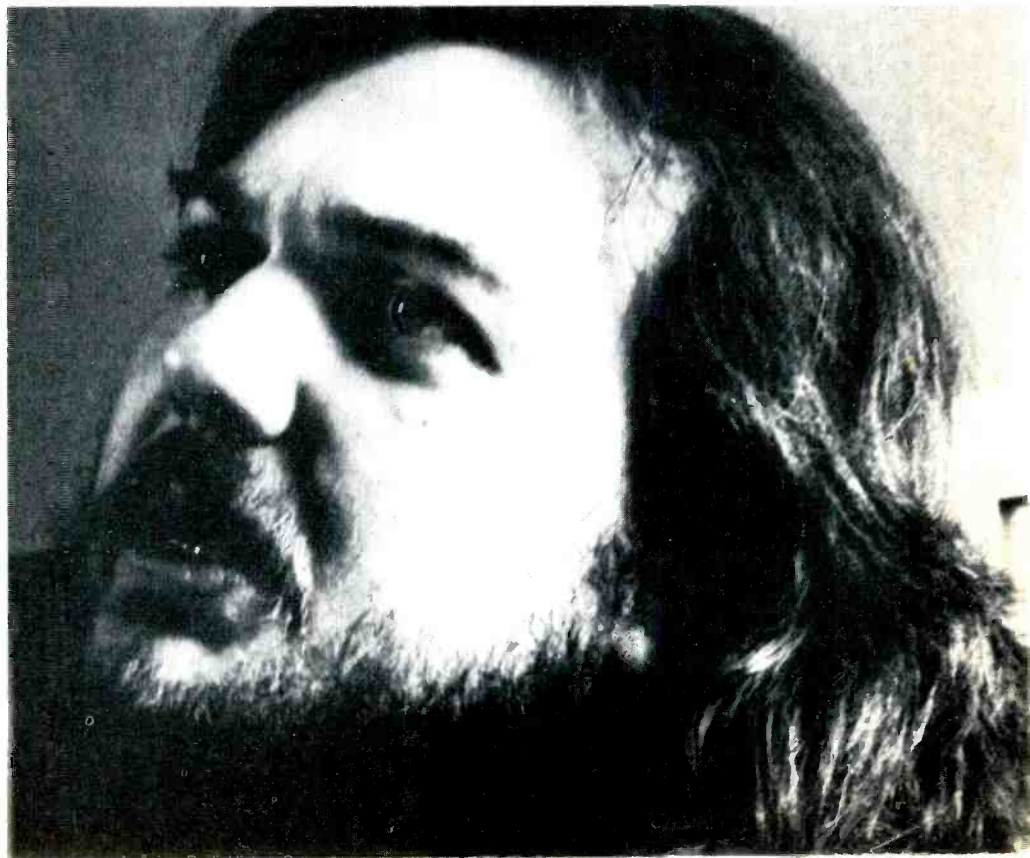
"It was right from dat moment on we were ahead o' d'rest o' d'music. Ev'rybody from ev'ry major label—from Atlantic Records, Chess Records, Specialty, Duke—all dose labels started comin' to New Orleans 'cause dis was d'only city dey could make good records wit dis new beat dat was becomin' popular otta New Orleans. So many udder places were copyin' it an' wasn't able t'do so. Instead o' jus' stayin' on dis one level, d' New Orleans thing was steadily progressin', too, even through d'time when Berry Gordy sent t' New Orleans when he first started Motown Records. He sent t' New Orleans an'

brought up d'New Orleans rhythm section. . . .

"I don't think dat most people realize dat d'original Motown Sound was directly d'New Orleans Sound brought t' Detroit. From gettin' his Detroit musicians aware o' what d' New Orleans thing was by listenin' to dis rhythm section, Berry released a few o' d'records he did on d'other o' his artists—but like he ran a game on d'cats by sayin' I'm gonna record Earl King an' dese various New Orleans artists. What he did though was t'listen t'dose tapes an' have his musicians listen t'dose tapes an' got d'idea for how t'play funk music. An'dis was d'way New Orleans fell apart.

"When ev'ry udder city started bein' able t'do what was happenin' in New Orleans, there was nothin' unusual 'bout a New Orleans sound. But ya can still go t'jus' 'bout any record center in d'country right now, an' you'll still find a New Orleans drummer is d'top drummer—in LA, Earl Palmer an' his student, Hal Blaine. In New York, Leo Morrissey under his Islamic name o' Idris Muhammad.

"D'main thing o' it was dat it was all New Orleans based music. D'cats knew dey could get New Orleans rhythm musicians an' dey would be able t'cut any type o' session d'guy was doin' whether it was a jazz date, a rock date, blues date, or whatever. As long as dey had dat New Orleans rhythm section, d'thing would have dat ahead-o'-time groove t' it. D'basic thing o' New Orleans music is always been rhythm. If it ain't got rhythm, it ain't ready." 



# Newport/New York

Martha Sanders Gilmore



New York Bass Violin Choir



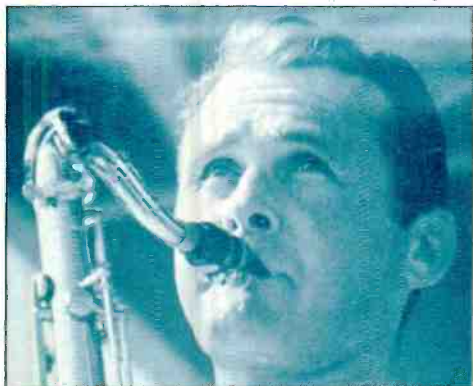
Chet Baker



Duke Ellington



Gato Barbieri



Stan Getz



Cy Coleman



Woody Herman

THE 1975 NEWPORT New York Festival was not like those of old, at beautiful Newport, R.I. which featured primarily "mainstream" jazz in concentrated doses over a single long weekend where one could usually listen to about six acts in an afternoon under the sun or during an evening under the stars. Granted that it often rained there, but somehow that was part and parcel of the fairly inexpensive ticket price. Now, however, the Festival has become mainly a stream of evening concerts, somewhat more expensive and usually with only two sets, and since concerts are presented simultaneously at two different locations, it is impossible to hear everything, which lead to some difficult selections for the buff. With this shortcoming in mind, let's look at as many of the New York concerts as possible.

This twenty-second annual Newport Jazz Festival blew into New York City on a Friday with the New York Jazz Repertory Company playing the music of Bix Beiderbecke and roared out nine days later with Papa French and The Original Tuxedo Jazz Band from New Orleans. Running alongside the Festival was the Institute in Jazz Criticism, sponsored by the Smithsonian Institute, The Music Critics Association, and The Rutgers Institute of Jazz Studies.

On Saturday, Benny Carter and his All-Star Band starred at Carnegie Hall, followed by Maria and Geoff Muldaur. Carter took off with *The Very Thought Of You* doing an alto sax solo with Milt Hinton on bass, followed by a very light rendition of *Green Dolphin Street* with Hank Jones on piano; Hinton on bass; Grady Tate, drums, and Bucky Pizzarelli on guitar. They ended the set with a slow, loping version of Johnny Mandel's *The Shadow Of Your Smile*.

The Carter Quintet then accompanied Maria Muldaur, who seemed out of place at the jazz festival. However, her virtuosity showed humor in *Waitress In A Donut Shop*, followed by earthiness in *Earl's Crab Shack*, and her sense of timing was displayed with *Gotta Penny Benny*. She then dedicated a song to all vegetarian cooks, *It Ain't The Meat, It's The Motion*, then got a bit serious with the transfixing *Lover Man*. Being from the South, she lit into Hoagy Carmichael's *Old Rockin' Chair*, with a finale of Duke Ellington's *Transblucency*.

Sunday ushered in "The Jazz on the Hudson River" boat ride with Bob Crosby and the Bobcats. This was fol-

lowed in the evening with the "big band" sounds of Buddy Rich, followed by the swing-era band of Harry James, and the Quartet of Ruby Braff, George Barnes, Michael Moore and Vinnie Carrao. They were in sharp contrast to Rich's band and in many ways out-played them, intertwining themselves around each other, yet leaving enough room for each other to breathe with such familiar tunes as *Them There Eyes*, *You Can't Take That Away From Me*, Gershwin's *Love Walked Right In*, and a slow *Young And Foolish* which was jewel-like in its perfection.

Harry James and his Orchestra put on a bit of a lackluster performance in comparison to Rich. They started off with their theme, *Ciribiribin*, then jumped into a medley of their seven most familiar tunes starting with *One'O'Clock Jump* and finishing with *The Shiek of Araby*.

---

‘While last year’s  
Newport/New York  
Jazz Festival wasn’t  
like those on the island,  
jazz is still  
alive and kicking  
in the Big Apple.’

---

The Roseland Ballroom hosted Count Basie's Orchestra, a Japanese Group, Miyami and The New Herd, and the unprogrammed Thad Jones Trio on Monday. Basie's Band was its old swinging self, inspiring people to dance or at least move to its pulsating rhythms. The prime soloists were Frank Foster, tenor sax; Curtis Fuller, trombone; and the Count himself, who played in his usual spare, funky piano style. They took *Li'l Darlin'* at an extremely calm pace, then gathered momentum as they swung into old favorites such as *Shiny Stockings* and

*What Are You Doing for the Rest of Your Life?* In comparison, Miyami played mechanically and without much feeling.

The Salute to Jazz and The American Song took place Tuesday night and performers included The Chet Baker Four, playing and singing the music of Rogers and Hart; composer Cy Coleman, playing his music; singer Johnny Hartman and pianist Ellis Larkins on Duke Ellington; Helen Humes singing the music of Fats Waller; tenor saxophonist Zoot Sims and guitarist Jim Hall on George Gershwin, and Maggie Whiting singing Harold Arlen.

On the Wednesday agenda were Dave Brubeck and Two Generations of Brubeck, Paul Desmond, Septem Tandem from Czechoslovakia, Chuck Mangione, The Gato Barbieri Ensemble, The Stan Getz Quartet, and Mabel Mercer.

An evening with Stan Getz and His Friends was a potpourri of sounds and styles. Pianist Jimmy Rowles made things sound simple by stripping *Poor Butterfly* down to the bare bones and emitting a peaceful Oriental sound, then in the same tempo going into *My One And Only Love*, sprinkling magnificent cathedral chords with single notes and doodling in the jagged mid-section. Rowles finished his set with a version of *My Buddy* that resembled a crossword puzzle.

Getz then strutted out his tenor sax and effortlessly played *What Am I Here For?* and *Lester Left Town*. Vibraphonist Gary Burton came on like tinkling bells and butterflies settling on flowers, accompanied by Billy Hart, drums; Ray Armando, percussion; Getz on tenor, and electric bassist Steve Swallow. They played *Here's That Rainy Day*.

Coming on last was British vocalist Mabel Mercer, who has probably influenced more singers than anyone else in the world. Accompanied by pianist Jimmy Lyons and Stan Getz, she started off with *I'll Remember April*. An actress, musically speaking, she almost "said" her words as she went into *These Foolish Things*, *Falling In Love with Love*, and *From This Moment On*.

Thursday's highlight was the Carnegie Hall concert with The George Benson Quintet; Benson displayed great technical facility on an amplified guitar in a wild treatment of Brubeck's *Take Five*, and then gave *Down Here On The Ground* a soulful rhythm and blues touch.

Making a spectacular entrance was Jamaican Cleo Lane bending notes

# Classical Reviews

Edward Tatnall Canby

## Mendelssohn: Piano Concertos 1, 2.

a. John Ogden; London Symphony, Ceccato. **Klavier KS-531**, stereo, \$6.98.

b. Murray Perahia; Academy of St. Martin-in-the-Fields, Marriner. **Columbia M 33207**, stereo, \$6.98.

Is there anything more difficult than comparing two similar recordings of the same music in terms of written words? If you think in blacks and whites, it's easy; you pick one for perfect and rate the other zero. But for the rest of us, it isn't likely to work that way.

The trouble with the Mendelssohn concertos is that the once-prized fluency of that composer, in the early nineteenth century, now tends to sound very old fashioned, dated, where for so long it seemed fresh and new; worse still, the music is pianistically "wordy"—a million notes in floods that never stop for a moment's rest. Very easily tiresome. Yet Mendelssohn wasn't really that bad; underneath, there is music for the finding. To get it out takes more than piano technique; it means imagination and a fluent musical ear that can hear what is behind the flooding finger

work and the old-fashioned harmonies. Given this, the music can be reconstituted, even today. Made listenable and enjoyable.

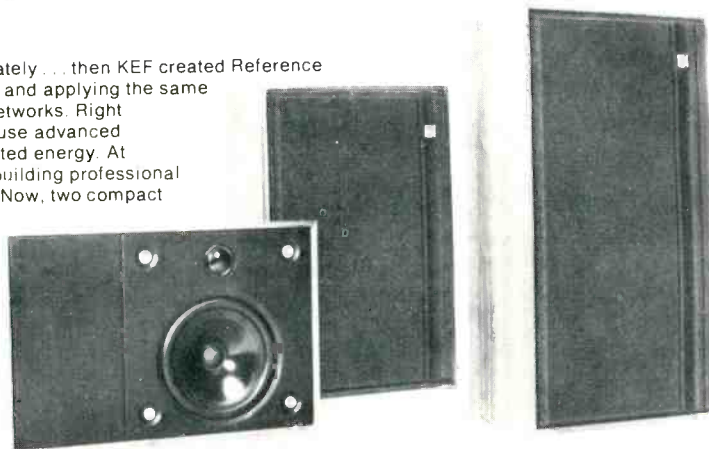
Both these recordings do it to an extent, with some drawbacks. In the over-all, I'd pick the Perahia version on Columbia, in spite of somewhat lifeless acoustics, because this man Perahia, still young, seems born to play this sort of music as it must be played—with musical awareness far beyond the mere finger work, modestly, to bring out the real flow of melodies and harmonies. Ogden, a flashier pianist, recorded closer and more

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clinically, is better than I could have imagined; but his resonant piano features more notes, by a trace, and less smoothness. The close-up recording, moreover, exaggerates the "wordiness" with too much attention; the Perahia recording puts the piano at a saner distance and a lower level, where the musical piano stuffing and filling can be blended into the orchestra as it should be.

For sheer sound, the Ogden recording from EMI, reissued here by Klavier, has a more dynamic effect, a better liveness by far and—with the above reservations—a more clinically accurate piano. If it weren't for the music itself, this would be the best of the two. Just goes to show. . . .



**Brahms: Piano Sonata No. 3 in F Minor, Op. 5; Rhapsody in G Minor, Op. 79 no. 2.** Bruno-Leonard Gelber, **Connoisseur CSQ 2084**, SQ quadraphonic, \$6.98.

Connoisseur has done it again! This is one of the finest and most idiomatic Brahms recordings I've heard for years, both in the splendidly sensitive piano playing and in the correspondingly big quadraphonic sound of the recording. The major work—most of the disc—is the early five-movement virtuoso Sonata, one of the first of the young genius' compositions to reach the equivalent of the big time. It is from the youthful beardless Brahms, not the old bear with the long beard of later years. And its exuberant youthfulness, when the music is rightly played, is absolutely delightful—it is



a pleasure to hear Brahms let go with such a joyous lack of musical economy! The older man became increas-

ingly circumspect, his music ever more dense and carefully shaped, as he approached old age.

Bruno-Leonard Gelber takes exactly the right youthful approach to this music. He fairly explodes in the virtuoso places—a thing Brahms quickly put aside in his maturity—and he positively gushes with sentiment in the fresh, almost naively Romantic melodies. A most wonderfully pas-

sionate and sincere performance, enough to make us wonder, in a way, whether Brahms' extraordinary genius was not to some extent lost in his later works, restricted at least. With such a spirit as this, and the advanced techniques of his late years, the man could have been overwhelming. A hint can be heard in the short, familiar *G Minor Rhapsody*, played in somewhat the same manner. S

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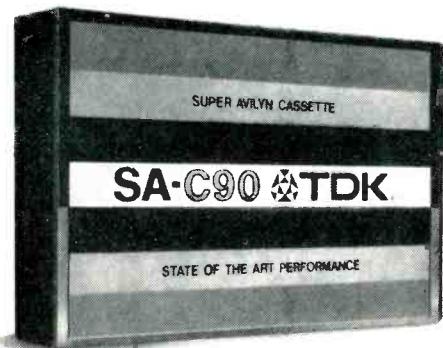
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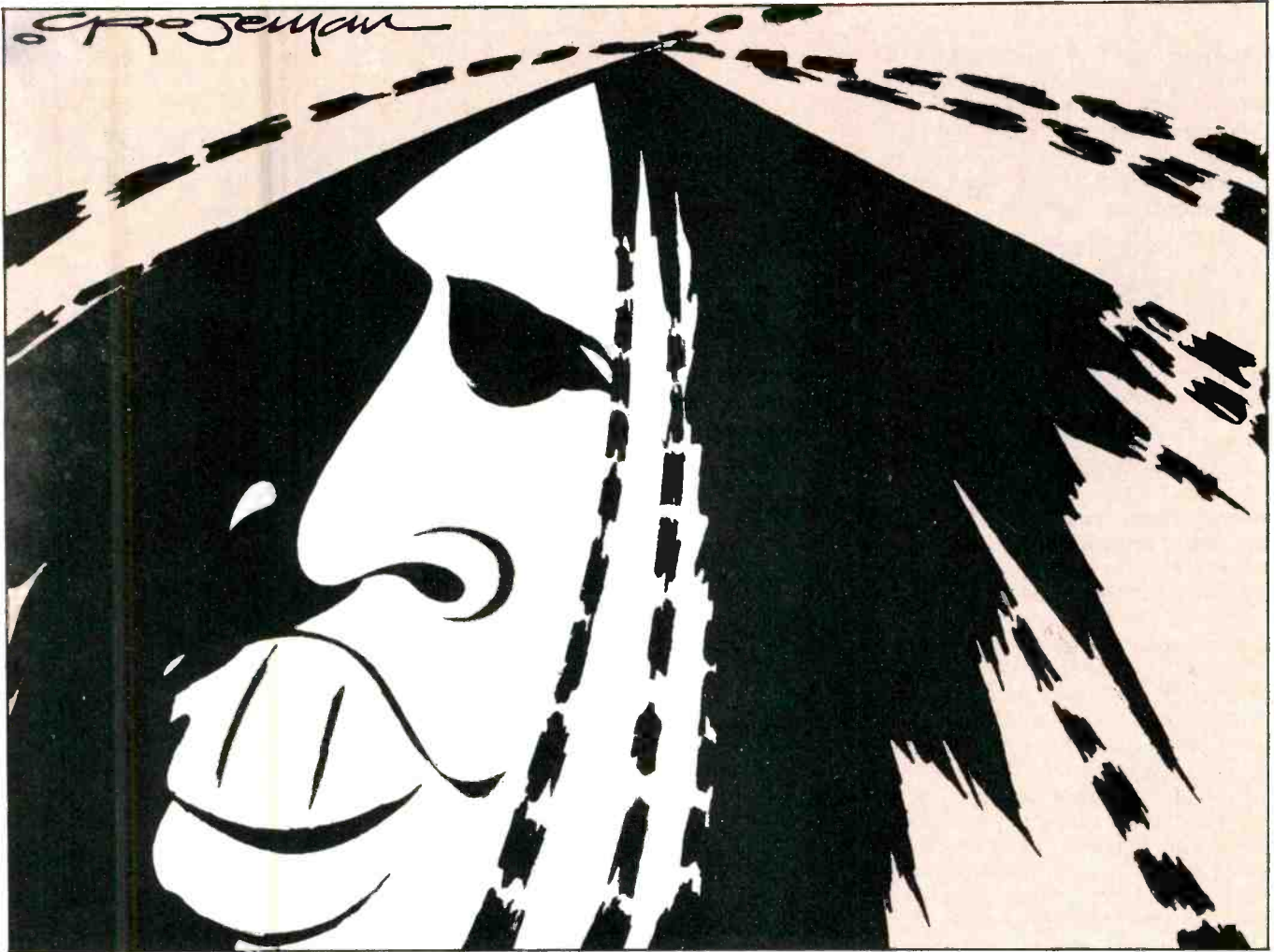
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# The Column



**Live:** Bob Marley and the Wailers  
**Island ILPS 9376** (British import), stereo.

This is it, quintessential reggae, and captured live at peak strength. An occasional critic complains that Wailer records, and reggae in general, made in the studio, don't capture the true feel of the music played live. If only in this case, the criticism is absolutely true.

Consider the scene. The Lyceum is an old, slightly seedy vaudeville hall with, for God knows what reason, a roof that opens. Since the Rastafarian faith, which is inextricably entwined with Bob Marley's music, opts for unenclosed spaces, Marley had the roof opened to let the stars in on that hot

July night. The crowd was electric, and the concert became the talk of the English music press all summer long. Miraculously, it was recorded.

The **Live** songs are a virtual "Best of Bob Marley and the Wailers," charged with an intensity they have not shown on record before. This is music made for summer heat: *Trenchtown Rock*, *Burnin' and Lootin'*, *Them Belly Full (but we hungry)*, an awesome *I Shot the Sheriff* with riveting back-up vocals by the I-Threes. *No Woman, No Cry* is revealed as a creation of Vernon Ford, not Marley as credited on earlier recordings; the version here is a killer.

As I write this, there are no plans for an American release of this album.

However, as an import, it has been an extremely heavy seller, and since money talks, anything could happen. It might even already be out by the time this is printed. Don't miss this one.  
*Michael Tearson*

Performance: A+      Sound: B+

**Live!** Bob Marley and the Wailers  
**Island ILPS 9376** (UK import), stereo, \$6.98.

**Hot Chocolate**

**Big Tree BT 89512**, stereo, \$6.98.

America's black music scene has pretty much exhausted itself—the Motown hitmakers are no more, The Sound of Philadelphia is just a wall of manufactured mush, and the only decent American R&B acts are Stevie



Wonder and Graham Central Station. But England's got a monster group in Hot Chocolate (already responsible for three hits in the U.S., also having written *Brother Louie* for Stories), and Jamaica's Wailers are starting to look like they might bring reggae to the American charts at last.

Bob Marley's group has changed personnel numerous times over the years, and the Wailers are whoever happens to be playing with Marley at any particular time. Marley is an incredible talent for a group to revolve around—his songwriting ability is simple and unpretentious, his voice resembles more of a spiritual release than any "musical experience," and his stage personality displays more charisma than most of his contemporaries, black or white. Recorded at London's Lyceum last summer, the *Live!* album is one of the most accurate recorded representations of where the Wailers are, and contains not only their "hits" (*I Shot the Sheriff* which was hitbound by Mr. Eric Clapton, *Lively Up Yourself*, and *No Woman No Cry*) but also features perhaps the best Wailer song ever, *Trenchtown Rock*.

Hot Chocolate are a British group of blacks and whites who play R&B music in a style similar in intensity to that of mid-Sixties Motown. They have a hip sense of humor, an acute social awareness, more than competent musicianship, and a vocalist (Errol Brown) with an incredible vinyl personality. They write their own material, which isn't always terrific, but when they're hot, they smoke. There are approximately five better-than-most tunes on the album, which is an average superior to most Motown albums of 10 years ago. When I heard Mickie Most producing Herman's Hermits and Animals records back then, I could hardly foresee him (of all people) producing a group like Hot Chocolate, but he does a fine job, especially with the vocal sound and Harvey Hinsley's guitar groans.

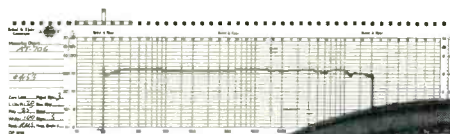
Jon Tiven

Sound: B+ Performance: A-

**Elite Hotel:** Emmylou Harris  
**Reprise MS 2236**, stereo, \$6.98.

*Amarillo*, which kicks things off, is co-written by Emmylou, her only one on the album, but it sounds as much a C&W standard as Buck Owens' *Together Again*, Don Gibson's *Sweet Dreams* or Earl Montgomery's *One of these Days*, all of which are done up with both class and love.

*Sin City* is one of three Gram Parsons songs on the album. *Wheels* was



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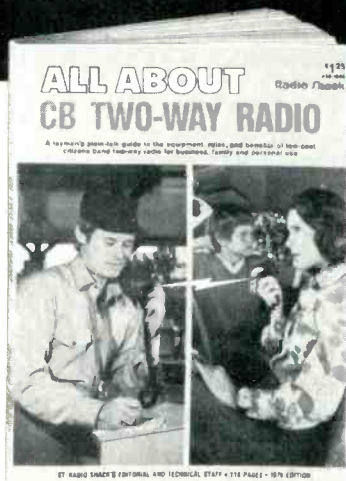
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also on the first Burrito Brothers album, while *Ooh Las Vegas* appeared on Gram's posthumous **Grievous Angel** album which featured Emmylou Harris harmony even more prominently than on the previous solo, **GP**. The tribute to Gram is notable and sincerely heartfelt, though, fortunately, nowhere pushes the album towards necrophilia.

Beginning to end, superlative spot-on performances are everywhere. Even Hank Williams *Jambalaya*, long

past cliché by now, sizzles anew as the third of a thrilling set of live performances. Of course, working with a band which includes the likes of Glen D. Hardin on piano, and James Burton on dobro and electric guitars, abetted by Emory Gordy and John Ware on bass and drums, plus Hank diVito's strong pedal steel guitar, doesn't hurt. Neither does Byron Berlin out in the wings with fiddle and mandolin when needed. Special kudos must also go to both Herb Pederson and Fayssoux

Starling for sparkling vocal harmonies.

But it is the ever-passionate heart singing of Emmylou Harris that makes **Elite Hotel**. She can be proud of this album.

Michael Tearson

Performance: A Sound: A

**Zuma:** Neil Young with Crazy Horse **Reprise MS 2242**, stereo, \$6.98.

His talents have been overrated and long worn out, but Neil Young's intentions seem to be honorable. A pained singer, crude guitarist, and better-than-average songwriter, Young delights in revolting against the record business by making records which sound like they were cut at home. His last release, **Tonight's the Night**, seemed the ultimate in no-polish recordings, and this album is only slightly more refined. But still the trashiness of the garage-band lingers on, and Young sounds more at home with it (and more likeable as well) than on earlier albums which cluttered the backing tracks with "pretty arrangements."

I've always had a theory that most artists can create (and do create) their most representative works on their first two albums, and if they aren't recognized at that time, it warps their career immensely. For Young, this is indeed the case, as his first two albums were veritable classics, yet it wasn't until his third, the vastly over-orchestrated and rather bland **Harvest**, that the public accepted him. Ever since Neil Young has been able to look at his career in retrospect, he has put out albums with rather twisted intent, often to confound the listener. It isn't great music, but I find the spirit behind it far more gratifying than, say, that behind the latest Steve Stills or Crosby & Nash product. *Jon Tiven*

Sound: C+ Performance: B+

**Swans Against the Sun:** Michael Murphey

**Epic PE 33851**, stereo, \$6.98.

After his hit with *Wildfire*, I really expected Michael Murphey to crawl quietly back into the woodwork in the best one-shot tradition. **Swans Against the Sun** proves me wrong. After the lush pop settings of the **Blue Sky-Night Thunder** album, Murphey has reverted to a more natural setting for his very personal songs, comfortably surrounded by some of his Colorado and Texas pickin' buddies, while the string section was off on vacation.

**Swans** is, quite simply, a lovely album. The sound is as clean as the air at

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A-2

the Caribou Ranch where it was recorded. Bob Johnston's production is restrained and concise, some of his best work ever, and the playing Murphey has coaxed from his band and friends is very strong. Especially pleasing are John Denver's high harmony on the title song and on Hank Williams' *Mansion on the Hill*. His singing here shows more gusto than almost all of his solo work since he left the Mitchell Trio years ago. *Rhythm of the Road* features Willie Nelson trading off lines with Murphey in fine fashion. John McEuen of the Nitty Gritty Dirt Band distinguishes every track he appears on, especially the kicking *Renegade* and *Dancing in the Meadow* with arrangements credited to him.

Murphey's lyric powers have never been stronger than on *Pink Lady*, which surely would have received a much more lush treatment had it been part of the **Blue Sky** album. Here the sparser treatment, showcasing Michael's cocktail guitar licks, sharpen the edge of some classy lines—"She's got a new teakwood stereo/Cause she's the stereo type"—where strings would have smothered the song.

The move from Texas to Colorado has done wonders for Michael Murphey. His writing, improving all the time, is muscular when dealing with

his twin favorite themes, unspoiled nature and the Old West, and simultaneously perceptive about civilization. He's not going to go away either.

Michael Tearson

Sound: A Performance: A

**Unicorn 2:** Unicorn  
Capitol ST-11453, stereo \$6.98.

In the latter part of 1974, Unicorn's first album for Capitol, **Blue Pine Trees**, appeared Stateside, produced as is the new one by David Gilmour, Pink Floyd's guitarist. On that U. S. debut, the band displayed a bouncy, chugging, very American, country-rock style remarkably good for a British band.

Alas, this time around the bounce just ain't there. The songs themselves are a lackluster bunch, which don't propel the band. Neither does the band salvage the set with an overpowering performance. Since I wasn't sure if it was me or the record, I went back to **Blue Pine Trees**, and, sure enough, the earlier disc sounds brighter and sharper, even occasionally inspired. *Unicorn 2* isn't a loss. It's only average.

Michael Tearson

Performance: C- Sound: C+

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(the Lepchas are the original inhabitants of Sikkim). The oboe-like *sorna* plays a strange, intriguing tune, which alternates long droning notes with quick spurts of melody. The *sorna* is accompanied by a clanging bell-like cymbal and two kettledrums, all three playing the same uneven rhythm.

The next four cuts are devoted to traditional folk singers. Biswa Karma Sukhbir is an itinerant, blind street-singer who performs in a gruff, dis-

tinctly Hindu folk style. He accompanies his rhythmically resilient singing on the hollow-sounding, two-headed *madel* drum. *Rong Punu-Yit Sa Lung-ten* is an excerpt from a chanted Lepcha narrative, sung a cappella by Mrs. Lekit Shipmo, whose subtly mellifluous singing may have been affected by Hindustani art music. So *Ama Le-Ho* is an attractive Tibetan folk song with a Chinese-flavored melody, sung in unison by Ishi Tarje and Tenzing Sampenla. The latter accompa-

nies on a sharp-toned lute called the *damnyan*, which strikes this listener as being a close relative of the Chinese *san hsien* (and its popular Japanese counterpart, the *shamisen*). Also included is a touching Sherpa folk song, sung by a lama-farmer. The most unexpected track alternates a couple of jew's harps, a humble instrument which seems to be known in nearly every corner of the globe. The iron *muchunga* has an eerie, almost electronic sound, while the bamboo *binaya* has a more familiar jew's harp ring to it.

Side two is devoted to Buddhist liturgical music. The first cut is a set of two instrumental humns which are intended to reverberate for miles through the Sikkimese Himalayas. Needless to say, powerful instruments and long-held tones are necessary for sonorities of such stentorian carrying power. The first hymn is performed on two 12-foot-long copper "trumpets" (*tunchen*) with what seem like contra-contrabass ranges, playing drone "melodies" with very few non-incident changes in pitch. The sound of these gigantic horns is so gloriously time-suspensive that their cosmic clamor isn't the least monotonous. The second hymn, played on two *gyalings*, oboes, follows the same basic pattern, except for more ornamentation and variation.

The longest track (at 14:46) is an excerpt from a private memorial prayer service, held by eleven lamas in a farmer's home. One of the finest Himalayan chant recordings I've heard, it's nowhere near as unchanging as, for instance, Nonesuch's Tibetan albums. Bursts of percussion (a bell, two cymbals, and a drum), *gyalings*, and shorter, higher-pitched trumpets break into the chanting (itself accompanied by a steady drum beat) with uncommon frequency. Thus, it is one of the least forbidding introductions to Buddhist chanting available to the novice listener. Devotees, on the other hand, will find it a transcendent and genuine combination of worshipful incantation and exciting displays of melodic-percussive coloration.

With its wide variety of little-known folk and religious music, **Music In Sikkim** is a fascinating and enjoyable survey with great appeal to both the ethno-musicological community and those members of the general public who appreciate rich, authentic, and provocative esoterica.

Tom Bingham

Sound: B Performance: A

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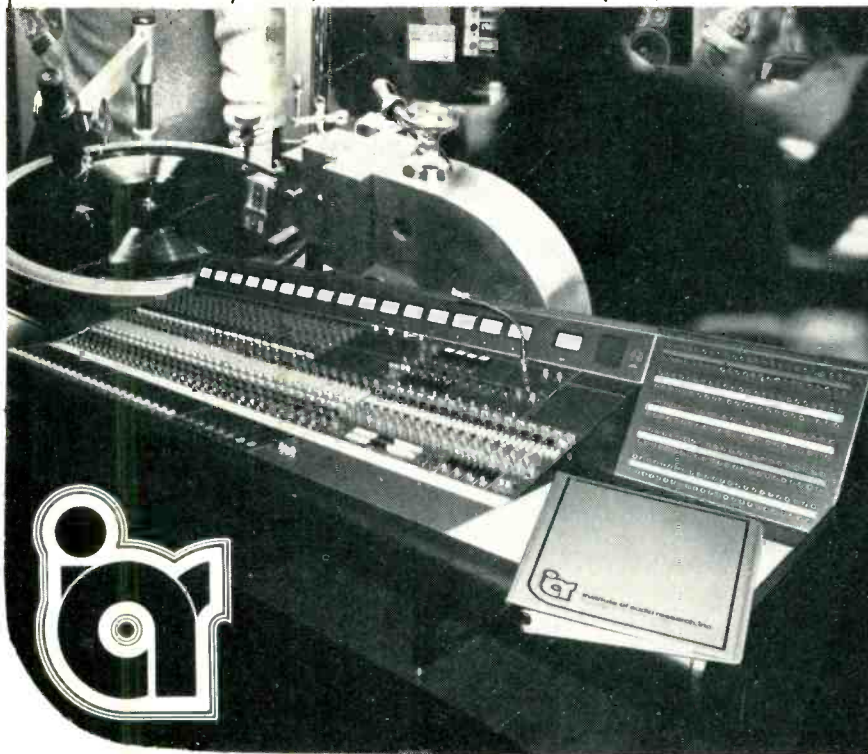
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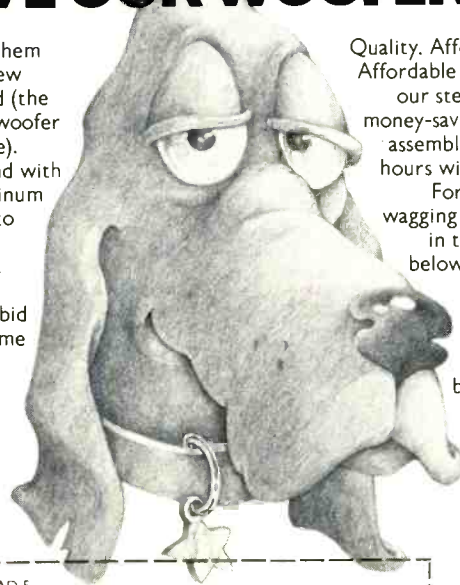
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"One major feature that I like in the 1070 is its ambience circuitry. Essentially it's a speaker matrix or pseudo 4-channel. This means you can get into simulated 4-channel sound by just adding a second pair of speakers"

"In addition to the step up in power to 35 watts minimum continuous power per channel with no more than 0.3% total harmonic distortion, 20 Hz to 20 kHz both channels driven into an 8 ohm load, the circuitry is direct coupled"

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## The 1040 Stereo Amp

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"It's an excellent performance component for a modest price"

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