AUDIO

MAY, 1960
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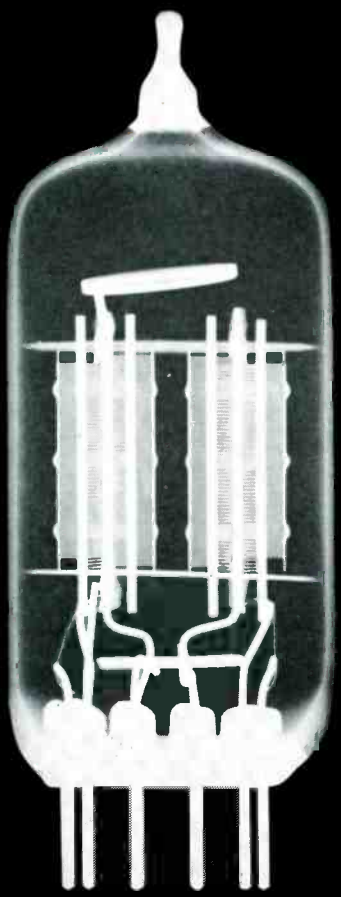

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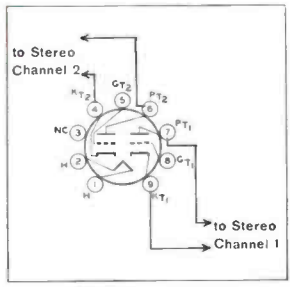

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MAY, 1960 VOL. 44, No. 5

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AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

CONTENTS

COVER PHOTO—Photographed in the Ardsley, New York, home of illustration photographer Mort Weldon, this installation is housed in a BSA Sound Systems, Inc. cabinet, and consists of a Magnecord 728 tape recorder, McIntosh MR-55 tuner, C-20 preamplifier, and two MC-60 amplifiers, Pickering Gyropoise turntable with 380 stereo ridge, Zenith 23-in. Palladium television console, and two Bi-Phonic Coupler loudspeaker systems.

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AUDIO clinic

JOSEPH GIOVANELLI*

Note

Last month we began a discussion of measurements, and we covered the subject of measuring equipment and measurements which are used for servicing sound equipment used in the home. In this column we shall continue this general discussion of measurements, devoting ourselves to a discussion of the measurements and equipment used when evaluating the performance of high fidelity equipment. Although much of this discussion embraces amplifiers, the techniques shown here can be used, with some modifications, to measure the performance of preamplifiers, tape recorders, and complete installations.

Performance Measurements

If you are evaluating the performance of an amplifier, there are other types of measurements in which you should be interested. One such measurement is the power output of the amplifier. This is a subject in itself, but I'll try my best to condense it. There are several ways to determine power output. The method used is in part dependent on the definition of power output employed at the time of measurement. Do we mean the maximum power you can obtain regardless of distortion? If not, what percentage of distortion should we consider as the maximum permissible amount? Do we mean peak power output at that percentage of distortion or do we mean equivalent sine-wave power? Regardless how you arrive at it, power is measured in the same way.

Use a resistor whose value is equal to that of the impedance of one of the taps on your output transformer. Connect this resistor between that tap and common. Be sure that its power-handling capacity is greater than the maximum power provided by the amplifier. A signal of appropriate voltage from an audio-frequency oscillator is fed into the input of the power amplifier. (The oscillator is indispensable in taking performance data.) Now measure the voltage appearing across the resistor. (When connecting your voltmeter, remember that the voltage to be measured is a.c. and at audio frequencies. The power can be found directly from the formula: W equals E^2/R. One final thing should be mentioned regarding wattage: Remember that wattage can be figured on the basis of peak and of equivalent sine-wave power. If the voltmeter used in the measurement of power is of the peak-reading type, you will have your answer in peak power automatically; if the meter is designed to read effective, or rms, voltages, the power will automatically be expressed in terms of sine-wave power. It is, of course, possible to convert from one form of power to another.

Since power is linked with distortion, we must make distortion measurements before making power measurements. For this purpose a wave analyzer or distortion analyzer is utilized. Let us assume we are measuring *intermodulatior* distortion. To do this connect a resistor across the secondary of the output transformer as previously outlined. In addition to the resistor, connect the appropriate terminals of the distortion analyzer to this point. Now feed two tones into the amplifier's input circuit. One is a high-frequency tone of 6000 cps; the other is a low tone of about 60 cps. This low tone is fed into the amplifier at a volume four times that of the high tone. (These tones can be obtained in three different ways: (A), from circuitry within the distortion analyzer; (B), by an external oscillator in combination with a one provided by the analyzer; or (C), by two external audio oscillators whose outputs are connected to the amplifier by suitable mixer circuitry.) The analyzer filters out the low tone and leaves the high tone. However, this high tone will not be as pure as that originally fed into the amplifier. It will be modulated by the low tone, and the extent to which this modulation occurs is expressed as percentage of intermodulation distortion. This modulation process can be considered as the low note taking a piggy-back ride on the high note. (In other words, the amplitude of the high note varies in accordance with the amplitude of the low note. As if this is not sufficiently confusing, the high and low tones combine to form what are known as *beat* tones. The beating gives rise to several other tones in addition to the two original tones with which this discussion began. As can be imagined, these extra tones will impair the reproduction of music when their strength is sufficiently great.) To get a true picture of the intermodulation distortion several combinations are often used. The frequencies stated herein, however, are those most commonly employed.

Another type of distortion is called *harmonic* distortion. A single tone is fed into the amplifier, and the output is connected to a load resistor and to a harmonic-distortion analyzer. Let us assume that the frequency fed into the amplifier is 1000 cps. We adjust the filter in the analyzer to eliminate all of the 1000-cps tone. The voltage remaining after filtering is the *harmonic* content of the amplifier at that frequency and at a given power level. (Both harmonic and intermodulation distortion increase with each increase of power level. This harmonic content is expressed as a per cent of the total voltage which appeared at the output of the amplifier be-

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fore the 1000-cps tone was filtered. (Perhaps I should state here that harmonics are frequencies other than the one fed into the amplifier. They are always multiples of the original, or fundamental, frequency. The first harmonic, or fundamental, is considered to be the frequency in which we are interested—1000 cps in this case. The second harmonic is 2000 cps, the third harmonic is 3000 cps, and so on. In describing the test I could have said that all the first harmouic conteut of the signal appearing at the output of the amplifier is removed. All other harmonics are distortion since the note fed into the amplifier did not contain harmonics or at least we hope that it didn't. In practice we can never get a source of tone which is *completely* free from harmonics, although oscillator distortions of less than 0.1 per cent are readily obtainable. I do not wish to give the impression here that all harmonics are bad and unwanted. Musical instruments produce harmonics in addition to their fundamental tones to a greater or lesser degree, and it is in part, at least, by harmouic content that we can distinguish one musical instrument frou another.)

Probably the measurement about which we have heard the most is that of *frequency response* determination. We feed in a series of tones, all of which are at the same intensity. The output of the amplifier should reproduce these with the same relative intensity if we are to say that the frequency response of the amplifier is perfectly flat. To determine if this is true we connect our same old resistor to the amplifier; we also connect a good a.f. voltmeter whose characteristics are good to the lowest and to the highest tones in which we are interested. In other words, the meter itself must have a good frequency response. Meters for this purpose often carry a decibel (db) scale so that we can read the response directly in terms of db without having to convert voltage ratios into db. If the output of the amplifier is truly a reflection of the signal being fed into the input, the meter will not change reading regardless of the tone being fed in. In other words, the intensity of the tone can vary and cause a change in meter indication, but the frequency of the tone can change over a very wide range and should produce no great change in meter indication.

Another type of distortion measurement in which we are interested is the *square-wave* response of an amplifier. A square wave, because of its shape, is rich in harmonics. If we fed a 1000-cps square wave into our amplifier, we could see many harmonics. This measurement consists in determining how many of the harmonics contained in the square wave the amplifier is capable of reproducing. These are harmonics which are introduced into the *input* of the amplifier and are not produced by the amplifier itself. Note this fact in order to differentiate between this type of distortion and harmonic distortion. (Here harmonics are intentionally introduced, and we are concerned with the amplifier's ability to reproduce them in the same strength as they are contained in the original square wave. The amount by which the amplifier does not reproduce these square waves is a measure of this type of distortion. No standards have been set regarding transient performance of amplifiers and other audio equipment) 10,000- and 20,000-cps square waves are commonly used. The output of the amplifier is loaded with the same resistor and with an oscilloscope. This last instrument gives us a picture of the waves which are being reproduced by the

(Continued on page 65)

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LETTERS

Loudspeaker Linearity

SIR:

I am indebted to Mr. Novak (LETTERS, March, 1960) for pointing out an error of mathematical interpretation in my article in the January issue. While this error, outside of itself, in no way affects any of the article's conclusions, it should be corrected.

The gas equation $P = K/V^{1.4}$ shows a non-linear relationship between air pressure and volume on two counts—the exponent 1.4, and the reciprocal relationship between pressure and volume. When the exponent becomes 1, as in the isothermal case, non-linearity due to the first cause disappears, but that due to the second remains.

My mathematical explanation, while correct as it applies to adiabatic *vs.* isothermal changes, covered only the first of these causes. On the other hand, the graphical explanation of the same conclusion, which employed successive blow-ups of Beranek's graph of air non-linearity took both causes into consideration.

The statement from my article quoted by Mr. Novak, that with fiberglass "even the tiny amount of distortion associated with air non-linearity is not present," should be corrected by changing "is not present" to "is reduced." Perhaps it was the lack of practical significance of the vestigial distortion (no discernible changes in performance result from it) that allowed me to slip on this point.

In any case, in the matter of vestigial distortion due to the air in an acoustic suspension system, I stand corrected. It has no significance, but neither is it zero.

EDGAR VILLCHUR,
Acoustic Research, Inc.,
24 Thorndike St.,
Cambridge 41, Mass.

Many-Small-Speaker System

SIR:

I read with interest the article, "Hi-Fi Performance from Small Speakers" by Charles F. Mahler in the December issue, particularly since it suggested to me a possible solution to my problem of obtaining a speaker system of higher impedance than is normally available. I am using an O.T.L. amplifier which would seem to work better into an impedance of slightly more than 16 ohms.

I question, however, the reasoning of the author in his statement:

"We know that a lot of air must be moved before we can hear these desirable low frequencies. Even though each speaker in itself is moving only a fraction of air mass, the total air mass moved by all 32 six-inch speakers is quite impressive. A rough idea of how much air we are moving might be obtained by calculating the piston surface of the whole moving system. . . . It would take five 15-in. speakers to equal the piston area of our 32 six-in. speakers."

I think this would indeed be a very "rough idea" of the performance of the "total air mass" since the calculation is based on area alone. Air mass to me would seem to be a function of volume. When the third dimension is added, the comparison could be a very different one.

Mr. Mahler states that the cone excursions must be "well within the linear portion of the magnetic gap or flux." If the cone excursion of a single 15-in. speaker were five times that of each of the 32 six-in. speakers (as it might easily be), then it would result in about a tie as far as air volume or air mass is concerned.

I merely bring up this point of mathematics. As with most reports on speakers, the hearing of the system is the test that is most positive. Mr. Mahler states that this system is a "remarkable performer." Perhaps it is indeed, but it doesn't seem sound to compare it to five 15-in. speakers.

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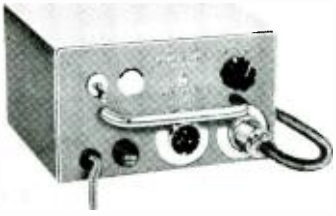

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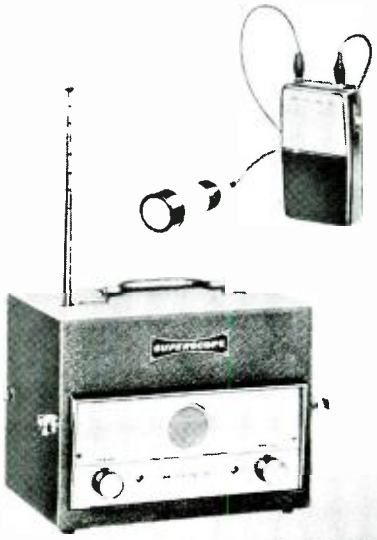

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LONDON RECORDS, reversing a long-standing position on the question of tape vs. disc, decided a few months ago to make its top recordings available on 7.5 ips, four-track reels. News of London's agreement with United Stereo Tapes repolished the morale of everyone interested in the future of tape as a home medium. A few days before the word reached the secondary circle of insiders, tape dealers in New York City were already tallying their future profits in Mantovani tapes. The prospect of more symphonies, concertos, and operas by top artists could be the shot in the arm that reel-to-reel has needed in the classical market. Pop fans, who have never been starved for stereo releases from the earliest days of two-track tape, can now roam in greener pastures.

STEREOPHONIC

Mantovani Film Encores, Vol. 1 and 2
✪ LPK 70003; London 124 and 164

Originally promised for release in the early weeks of 1960, the first London tapes arrived in time for review in this issue. Several questions occupied my mind when I unpacked the first shipment. Would a four-track tape recording by London make possible a closer approximation in the home of the sound contained in their master tapes? The answers began to tumble forth after the first dozen revolutions of the reel. On a wide-range system, the characteristic London sound is very much in evidence. A moderately experienced listener will probably be able to spot a London tape blindfolded even when the artist is not so well known as this one. My first move in playback was a reduction of treble similar to that dictated by mono London LP's of pre-RIAA days. (But then, my new ultra-narrow gap playback head still gleams with a gem-like flame.) Definition of the upper strings is slightly better than that found in the disc version of these film hits. Particularly in high-level passages, the eighteen violins used in a typical Mantovani arrangement show less tendency to coalesce or "bleed" together on stereo tape. With the banks of strings mostly in the left channel, many listeners may obtain a more pleasing balance through use of dissimilar rolloff of treble in the two channels. I found that a smaller amount of treble rolloff in the right channel acted somewhat in the manner of a balance control. It helped to bring up the presence of the right channel to that of the left. Adjustment of levels alone does not restore complete balance in this case. Later stereo recordings by London exhibit better channel balance. When relegated to usage as background music, this reel's length should prove quite welcome: One of the complaints against two-track stereo was the playing time. Items short enough for the average budget provided a relatively brief period of uninterrupted music. This reel holds the contents of two discs, giving side one the duration of two sides of a record. The twenty-four movie tunes offer few surprises, unless you're one of the rare mortals still unfamiliar with Mantovani's treatment of *Three Coins in the Fountain*. The tape really spotlights the actual plunk of objects that could be coins as they strike the water in three locations—dead center and then at each side of the stereo area.

Stanley Black: Cash Box Instrumental Hits ✪ LPM 70011; London 158
Ted Heath: Hits I Missed ✪ LPM 70007; London 116

If the initial release is an example, it will be some time before London artists of only average popularity appear on their tapes. These best sellers are logical candidates to lead the parade. In all probability, disc sales will continue to be an important factor in the choice of material selected for release on tape. Neither of these gentlemen (nor Edmundo Ros who is also prominent in the first release) can be classified as unknown in the field of popular music.

Close miking brings out blazing detail in the Stanley Black orchestrations. *Holiday for Strings, April in Portugal, Blue Tango,* and other top hits sound fresh all over again. The harp is more prominent in the shimmering arrangement of *Ebb Tide*. If you take the trouble to memorize the topmost layer of sound that issues from the Latin percussion section in *Delicado*, you'll have a handy reference indicating that all is well in the response of a stereo playback head. Other four-track tapes may have the range covered in this particular selection but very few of them have the cleanliness of sound.

Tape does little to enhance the appeal of the Ted Heath album. The sound is no better than average. A good likeness of the ranks of a large dance band is preserved in the stereo layout but some of the arrangements are not up to par for the Heath folio. The *Twelfth Street Rag*, with its overtones of Spike Jones, is still rather hard to believe.

Roger Williams: Songs of the Fabulous Century ✪ KT 45006; Kapp 5005-S (2)
Jane Morgan: Jane in Spain ✪ KT 41016; Kapp 3014

The next time you're looking for "music to solder by," investigate this reel starring the quiet pianist, Roger Williams. This twin-album is so bland in nature you can play it all evening during the connections of the trickiest circuits. By the time you've finished the eight hundred tunes on the reel (six hundred is probably a more accurate count—they just sound like eight hundred) you may discover that you no longer remember what the first one sounds like and you can start all over again. In his most headlong passages at the keyboard, Mr. Williams remains noncommittal but the blend of piano and orchestra is very easy to take. Recorded during more than one session, the orchestra is led by a succession of conductors—Hal Kanner and Marty Gold. This may explain why the piano is heard in the right channel during some selections, in the left during others.

Listening to Jane Morgan—but only when you have finished soldering—you may note that tape has a way of smoothing out her vowel sounds in a manner that reminds one of the British songstress, Vera Lynn. These predominantly Latin love songs are sung in English and Spanish but the listener seldom is able to forget that Miss Morgan remains, throughout the undertaking, an interestingly normal American girl. If you're willing to place glamour above a search for authenticity, you'll like this engaging collection of songs in which the vocalist, fortunately, was not allowed to crowd the mike.

Ray Conniff: Concert in Rhythm Vol. 2
Columbia CS 8212

Flexibility in a stereo preamp is not a luxury when dealing with some of Columbia's pop releases. Engineering in Ray Conniff's best selling stereo albums—this is his eighth in the last two years—appears to be veering toward the low-price console market. This Concert in Rhythm was geared to the assumption that playback in the home was going to be effective only to the vicinity of 10,000 cps. I took shelter in the NARTB position. Other major labels, apparently more optimistic about current playback conditions, manage quite nicely with a reasonably flat curve throughout a greater part of the hearing range. In that way, they have little or no need for the echo Columbia introduces here in order to obtain presence. The rhythm section takes on a ghostly ring when the chorus and orchestra have their quiet moments. If you've heard Vol. 1 of this series, you're partially prepared for the new and urbane designs that Conniff fashions with a wordless chorus as he raids the opera house and concert hall. Mixing voices and instruments in the writings of Puccini, Coward, and Lehar, he has evolved a homogenized sound that is unique in the industry.

How The West Was Won
RCA Victor LSO 6070

RCA has farmed out the western half of the country to an ouside producer—Project Records, Inc. This is a West Coast outfit in which Bing Crosby has been taking more than a fatherly interest. A wedding of popular and folk talent, this recording is tied in with the series of articles on the Old West that appeared not too long ago in *Life* magazine. The plan of the producer, Simon Rady, calls for a collection of songs actually used by the pioneers. This two-record album, in its nine sections, covers the days of the first explorers, the ranchers and Indian raiders, the Gold Rush and the railroads in addition to the inevitable desperadoes and cowboys. The cast has quite a contingent of Hollywood folk—Bing Crosby, Rosemary Clooney, the John Halloran Singers and conductor Bob Thompson. However, with the aid of Jimmy Driftwood (can you top that name for a folk singer?) and Sam Hinton, who bring a more direct authority to the old songs, minimum requirements are met for home-spun atmosphere. Perhaps the most valuable contribution is the scholarship of John and Alan Lomax who adapted and edited many of the songs. A lavish booklet, in color, offers paintings of pioneer life. The producers deserve credit for the measure of authenticity maintained in an item aimed at the widest audience.

Music From Million Dollar Movies
RCA Victor LSC 2380

If the last word exists in big-orchestra recordings of current movie music, this may well be it. There are several impressive factors "going" for us in this Boston Pops release. The newest of these is the one that will

(*Continued on page 69*)

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Edward Tatnall Canby

1. COMPATIBLE PRICING

I take a dim view of the new move towards a "compatible" LP record, that will play both stereo and mono, which is now agitating the inner circles of the record business.

It's not that I am skeptical of its success, purely technically. I don't doubt that with a very small compromise in stereo effect a record can be cut that will play on a mono machine with reasonable safety. This is water under the bridge; it has been done before. But at a time when confusion and misunderstanding of the value of stereo itself are at a maximum, this new injection of more potential confusion seems to me unfortunate. I also feel that it opens the way for a host of marginal, irresponsible, semi-stereo records that will merely add more doubts to those so dismally evident already. For stereo's own sake, I say no.

There is a much more important alternative step that is by now almost screaming for a trial. Compatible pricing. That is, *equal pricing of stereo and mono records.* Get rid of the crippling stereo surcharge!

This is the big thing we need most, I think. It should be put into effect even if it means a modest rise in the price of some or all mono discs, to meet the stereo price halfway. Competition, fair, open and equal, will eventually take care of that rise if sales justify it. But above all, and quickly, let's put stereo recording into the "standard" category, take it out of that deadly de luxe area, where it has no business at this late date.

The plain fact is that stereo was introduced deliberately to supercede mono, as the 45 and LP were intended to supercede the 78. Compatibility, as always, is basically a holding action, to help the transition *in the initial stage.* The transition was never meant to go on indefinitely—or receive a belated shot in the arm, too late. That's what a "compatible" record will do now.

The continued stereo disc surcharge says clearly just the opposite, and says it where it hurts, in terms of cash. Stereo, says this extra charge, is still a de luxe specialty, an "extra" (and for most people of unproved value). The mono disc is still clearly "standard."

How can stereo ever replace mono as the intended new standard, as long as this artificial price barrier, this class distinction, continues to block the transition?

Compatible Playback

The plain fact is, emphatically, that stereo compatibility stems not from the record but from the pickup cartridge.

Virtually all new phonograph equipment, of all grades except the very bottom, is already fully compatible—both stereo and mono records may be played interchangeably, via the stereo-type cartridge.

Virtually every phono cartridge line on the market a few years ago has now been redesigned for stereo playing. The entire complex field of pickup manufacture has "converted" to the new standard, and with a technical success that would have seemed beyond belief only two years ago. Model for model, the new stereo pickups equal or exceed playback standards of the late mono period.

Virtually every existing older phonograph that is capable of playing an LP record can be made compatible via a replacement cartridge—and will probably be improved in the process. You can have a compatible cartridge for as little as a dollar or so, if you want a bargain. You may not get super-sound, but you will get compatibility.

In effect, the phonograph cartridge, and hence the phonograph itself, in all its forms hi and low, is now already compatible to all intents and purposes. Only the sluggish confusion of stereo itself, the mess occasioned by speaker compromises, ignorance, false and faulty exaggerations, holds back this compatibility process from completion—aided, of course, by the stereo disc surcharge, a heavy drag.

The 78 Bow-Out

Let's look backward, for enlightenment, at another recent major transition, that from the 78 rpm "standard" disc to the new microgroove speeds and groove. That transition is now safely accomplished, though the 78 is still with us. How was the all-important "compatibility" managed in that situation?

A compatible LP-78 *record* was obviously out of the question. So compatibility was achieved—as now—via playback equipment, not via the record itself. We had a really terrible problem then, what with two quite different stylus points and three different speeds. There was, even then, some oversimplification (and resulting confussion)—the "all-groove" needle, for example. But fortunately, wiser procedures prevailed in the main; the equipment sold to the public fitted the needs of the time, however zany we may have thought it at first. Three-speed changers and turnover pickups seemed grotesque, but they did provide the vital *playback compatibility* that made possible the steady and assured retirement of the 78 as "standard." The old record made a gracefully slow exit and has been retiring ever since with admirable decorum, though to this day it is still alive in a modest way. We still, to this day, have 78-LP *playback* compatibility. To this moment, most home machines provide for 78 playing, thrown in, so to speak, on the house; and you can play 78's on any grade of component hi fi you may choose, if you so desire.

But the 78 is no longer "standard." The problem of compatibility is no longer a problem. It was beautifully managed, considering the mess back in 1949 and 1950!

Note the retirement steps that are similar to those involved in our new changeover, from mono to stereo:

(1). New equipment that would play both 78 and microgroove records very quickly became standard and ordinary, at a minimum increase in cost (even though prices of everything were going up). Same thing today with stereo equipment: it is now generally available in all lines, top to bottom. Even without actual dual speaker outlets, the essential element of compatibility, the stereo cartridge itself, is already virtually standard from top to near-bottom. Also stereo-designed motors, arms, and the rest.

(2) When the LP and 45 arrived, new recordings were issued in alternative releases, first in LP and 78, then later in three forms—LP, 45 and 78. The availabilities varied according to need; as the relationship of the 45 to the LP was clarified, classicals were mostly on 78 and LP, pops 78 and 45. Speaking generally, the same is true today in respect to mono and stereo. The dual release is widely prevalent, with emphasis on one or the other type according to the situation.

Note again that in both of these periods of multiple-form release, *compatibility has been achieved basically through the playback equipment, not through the records themselves.*

But now look at some striking differences.

(3) LP and 45 recordings were issued from the beginning at prices equal to or below that of the old 78, and this in spite of a painfully high expense involved in the dual and triple processing—three sets of masters, three types of album and packaging. The assumption was, of course, that this would not last long—and it didn't. During the period of alternative releases, however, public confidence in the new-type discs grew steadily, in spite of violent LP-45 competition. First, the machines were compatible, would play anything. And, second, the new records were *favorably priced.* What else could you ask for?

—Whereas the stereo disc from the very beginning has been saddled with a grossly unfavorable surcharge, publicly justifiable only in the period of immediate innovation. Worse, where the LP and 45 had immediate and dramatic advantages to offer—remember the huge pile of 78 albums standing beside the tiny stack of equivalent music on LP?—the stereo disc looks just like the ordinary LP, comes in the same package and, alas, too often through bungling and misunderstanding, sounds just like an ordinary record.

Do It Now

It seems to me only too evident, right now, that the *stereo-mono price difference should have disappeared after a few months at the most.* Say, by early 1959. Hindsight is better than no sight!

Then, with compatible playing equipment on sale everywhere, the new-type disc would have had a solid basis for the precious growth of public confidence. If the two types cost the same—people should have been saying, all this time—then why not try stereo? Might just as well. And this is just what people would have done, in droves, I assure you.

Considering the surcharge on stereo records and the public's extreme doubt as to stereo's true value, I think it's amazing

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HF85 Stereo Preamplifier: Complete master stereo preamplifier-control unit, self-powered. Distortion borders on unmeasurable. Level, bass, & treble controls independent for each channel or ganged for both channels. Inputs for phono, tape head, mike, AM, FM, & FM-multiplex. One each auxiliary A & B input in each channel. "Extreme flexibility . . . a bargain." — HI-FI REVIEW. **Kit $39.95. Wired $64.95.** Incl. cover.

New HF89 100-Watt Stereo Power Amplifier: Dual 50W highest quality power amplifiers. 200W peak power output. Uses superlative ultra-linear connected output transformers for undistorted response across the entire audio range at full power, assuring utmost clarity on full orchestra & organ. 60 db channel separation. IM distortion 0.5% at 100W; harmonic distortion less than 1% from 20-20,000 cps within 1 db of 100W. **Kit $99.50. Wired $139.50.**

HF87 70-Watt Stereo Power Amplifier. Dual 35W power amplifiers identical circuit-wise to the superb HF89, differing only in rating of the output transformers. IM distortion 1% at 70W; harmonic distortion less than 1% from 20-20,000 cps within 1 db of 70W. **Kit $74.95. Wired $114.95.**

HF86 28-Watt Stereo Power Amp. Flawless reproduction at modest price. **Kit $43.95. Wired $74.95.**

FM Tuner HFT90: Prewired, prealigned, temperature-compensated "front end" is drift-free. Prewired exclusive precision eye-tronic® traveling tuning indicator. Sensitivity: 1.5 uv for 20 db quieting; 2.5 uv for 30 db quieting, full limiting from 25 uv. IF bandwidth 260 kc at 6 db points. Both cathode follower & FM-multiplex stereo outputs, prevent obsolescence. Very low distortion. "One of the best buys in high fidelity kits." — AUDIOCRAFT. **Kit $39.95*. Wired $65.95*. Cover $3.95.** *Less cover, F.E.T. incl.

AM Tuner HFT94: Matches HFT 90. Selects "hi-fi" wide (20-9000 cps @ −3 db) or weak-station narrow (20-5000 cps @ −3 db) bandpass. Tuned RF stage for high selectivity & sensitivity. Precision eye-tronic® tuning. "One of the best available." —HI-FI SYSTEMS. **Kit $39.95. Wired $65.95.** Incl. cover & F.E.T.

New FM/AM Tuner HFT92 combines renowned EICO HFT90 FM Tuner with excellent AM tuning facilities. **Kit $59.95. Wired $94.95.** Incl. cover & F.E.T.

New AF-4 Economy Stereo Integrated Amplifier provides clean 4W per channel or 8W total output. **Kit $38.95. Wired $64.95.** Incl. cover & F.E.T

HF12 Mono Integrated Amplifier (not illus.): Complete "front end" facilities & true hi-fi performance. 12W continuous, 25W peak. **Kit $34.95. Wired $57.95.** Incl. cover.

New HFS3 3-Way Speaker System Semi-Kit complete with factory-built ¾" veneered plywood (4 sides) cabinet. Bellows-suspension, full-inch excursion 12" woofer (22 cps res.) 8" mid-range speaker with high internal damping cone for smooth response, 3½" cone tweeter. 2¼ cu. ft. ducted-port enclosure. System Q of ½ for smoothest frequency & best transient response. 32-14,000 cps clean, useful response. 16 ohms impedance. HWD: 26½", 13⅞", 14⅜". Unfinished birch **$72.50.** Walnut, mahogany or teak **$87.50.**

New HFS5 2-Way Speaker System Semi-Kit complete with factory-built ¾" veneered plywood (4 sides) cabinet. Bellows-suspension, ⅛" excursion. 8" woofer (45 cps. res.), & 3½" cone tweeter. 1¼" cu. ft. ducted-port enclosure. System Q of ½ for smoothest freq. & best transient resp. 45-14,000 cps clean, useful resp. 16 ohms. HWD: 24", 12½", 10½". Unfinished birch **$47.50.** Walnut, mahogany or teak **$59.50.**

HFS1 Bookshelf Speaker System complete with factory-built cabinet. Jensen 8" woofer, matching Jensen compression-driver exponential horn tweeter. Smooth clean bass; crisp extended highs. 70-12,000 cps range, 8 ohms. HWD: 23" x 11" x 9". Price **$39.95.**

HFS2 Omni-Directional Speaker System (not illus.) HWD: 36", 15¼", 11½". "Fine for stereo" — MODERN HI-FI. Completely factory-built. Mahogany or walnut **$139.95.** Blond **$144.95.**

New Stereo Automatic Changer/Player: The first & only **LUXURY** unit at a popular price! New unique engineering advances no other unit can offer regardless of price: overall integrated design, published frequency response, stylus pressure precision-adjusted by factory, advanced design cartridge. Compact: 10¾" x 13". **Model 1007D:** 0.7 mil diamond. 3 mil sapphire dual stylus — **$59.75. Model 1007S:** 0.7 mil & 3 mil sapphire — **$49.75.** Includes F.E.T.

†Shown in optional Furniture Wood Cabinet **WE71:** Unfinished Birch, **$9.95**; Walnut or Mahogany, **$13.95.**

††Shown in optional Furniture Wood Cabinet **WE70:** Unfinished Birch, **$8.95**; Walnut or Mahogany, **$12.50.**

A-5

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that stereo discs have sold as well as they have so far.

An immediate price-equalizing can still pump life and enthusiasm into stereo, and you may forget all about the "compatible" record. As described in this column before the stereo disc was even marketed, the free price interchangeability between the two types, given all-stereo pickups, would render the whole question of compatibility meaningless.

Equalize the price of stereo and mono records, and compatibility will come of its own accord and in its own way. You may build any degree of stereo difference-signal into your record that you may see fit—from none at all to the maximum—and the product will sell legitimately at the one standard price.

In the end, as suggested by me 'way back, the mono-and-stereo dual release will simply fade away. Remember my mock-up ad, suggesting how a record company might introduce a great, new advance in recording technique, Variable Stereo? (See AUDIO, October, 1958, p. 97).

Now I'll admit that I've simplified some aspects of the situation, in favor of the broad viewpoint. The conversion to stereo did cost plenty and that cost must be paid off somehow. Reducing stereo prices isn't as simple as lowering the price of, say, a ball-point pen. That amazing innovation, that sold for $13 or so at first, was inherently inexpensive to produce and inherently a mass seller; the price could come down fast, and did. I don't mean to suggest that re-pricing the stereo record is as easy as rolling off a ball point pen.

Nevertheless, the time has come to forget the higher price and look to larger horizons. How many ball point pens would you sell now at $13 apiece?

I would not dare guess whether the conversion to dual stereo-mono releasing has been more costly than our earlier conversion to 78-45-LP simultaneous release. At this point I can't see that it matters. If something isn't done about the stereo record's present cost *vs.* the mono, the entire investment will have gone down the drain. For a while, the public can be expected to understand and tolerate an extra surcharge on a new and special product such as the stereo disc. But not now, not after so long!

Everybody knows that now almost any recording is "available in both stereo and mono," everybody knows that both types can be had at all sorts of devastating discounts, and that many a stereo demo special is sold, apparently with profit, at the low, low prices printed right on the label. We are all aware, especially, that the two types are now part of one operation, one continuing production overhead, and anybody with common sense realizes that the cost could just as well be split evenly as not. Why not?

Maybe people don't think this consciously, but you can bet that it floats around in their brains, ready to pop out at any time with a great whoosh of approval, the very moment stereo discs are priced with mono discs. That will do it!

So I suggest that right now is the crucial time for something dramatic, a major breakthrough in simplifying the stereo picture—and the breakthrough is EQUAL PRICING. It is *not* the "compatible record," which has been tried at least twice before and is guaranteed to add confusion to confusion, still further to undermine confidence in stereo sound (by suggesting even more devastatingly that there really isn't any difference), and, in the end, open legitimate stereo to every imaginable degree of modification, dishonest or no.

Is a "compatible" stereo-mono record a source for potential confusion and for dishonesty, yet an all-over "Variable Stereo" disc, as I've suggested for the future, quite OK? Yes, for there is a vital difference.

The "compatible disc" as now understood is a compromise, variably so, intended to make stereo records *playable via mono pickups*. That means a compromise in the vertical response that is basically determined by the old-type pickup. It ties the "compatible" record not only to an obsolete type of pickup, but also to a mechanical consideration that is entirely extra-musical. At its very best, it is bound to be a compromised record—though Columbia's ASRA "compatible" record of 1958 was, to my ears, virtually undetectibly compromised.

At worst, the compromise in favor of the mono stylus can be seriously detrimental to the stereo effect. Still worse—the "compromise" record may be virtually non-stereo. Who is to say where the dividing line is? Who is to "police" the variably compatible discs, to weed out the fakes that are 100 per cent "compatible"—i.e., with no stereo component at all! Never forget that every mono record is a highly "compatible" disc. There are very serious dangers here that can't be put aside as long as stereos and monos carry different prices.

When Columbia first put forward its ASRA scheme, so quickly withdrawn when opposition to it became excessive, I was enthusiastic. I was convinced then, and remain convinced, that with real ingenuity, and with high-minded responsibility, a compatible stereo disc is quite feasible in which the vertical component is selectively reduced by enough to make the disc playable via most mono pickups, yet the essential stereo message is retained in full, or so nearly so as to be undetectibly reduced. I felt that Columbia's skill in just that sort of thing was a strong point in favor of a compromise of maximum usefulness—and I came out in favor of it, at that stage.

But not now. When ASRA was demonstrated, there were no stereo records at all on the market. There were very few stereo pickups commercially available and, at that point, the quality of their performance was much in doubt. Suppose that your old mono records sounded worse via the new pickups than via the old? Should you junk a perfectly good mono pickup and perhaps jeopardize the sound of a whole library of standard LP's in order to be able to play the handful of new stereo discs that would be available in the then near-future?

That, at least, was the buyer's point of view in the spring of 1958 and it wasn't any laughing matter, either. A "compatible" stereo disc would at least have softened the more painful aspects of the early stereo stage. Buy the new stereo discs as they appeared, play them on your old pickup for safe and secure sound—though mono. When and if the stereo pickup was developed to a point of real quality, matching the then mono units, you could retire your mono cartridge for good and play everything via the new cartridge. An excellent idea—at the time.

But things are utterly different now. The quality of the stereo pickup is entirely secure, as compared to the mono. No excuse at all now for any sort of major compromise in the disc itself.

So, I say, the "compatible" stereo disc would have been an excellent idea in 1958, if everyone had gone into it from the beginning. This is exactly what would have happened, indeed, except for two dismally unfortunate circumstances.

Columbia plugged compatibility but RCA

(*Continued on page 42*)

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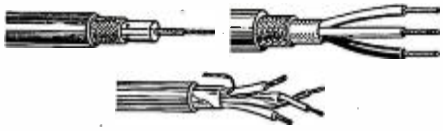

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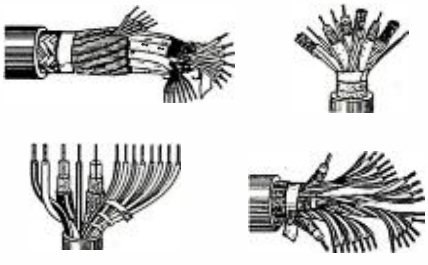

AUDIOMAN NO. 8

Beginning as a "ham" in 1918 and adding audio as a hobby in 1921, Fred W. Scholl, Jr. of Lancaster, Ohio, may be one of the earliest on record—but very little was "hi-fi" then.

WITH A "PLAYING DESK" that is actually a desk constructed for the purpose and a built in loudspeaker and TV set to a conveniently located door, Fred W. Scholl, Jr. likes comfort and accessibility. Even the phono turntable is built into a Chinese cabinet alongside his favorite armchair.

The playing desk—a common term in England, but rarely encountered in the U.S.—resembles an office fixture, but it is obvious that it was built for one specific purpose. The top accommodates two McIntosh preamps—C8 and C8S—a Fisher 90-X FM tuner and MPX-10 multiplex adapter, a Hammarlund amateur receiver, the remote control for the Fleetwood TV set, and a Concertone 1051-D tape recorder. For phono he uses a Pickering Gyropoise 800 turntable with a Weathers C-501 stereo pickup on a Weathers arm, and the loudspeakers are both Altec—an 604-C built into the door under the TV set, and a Monterey for the right channel. For recording he uses Shure microphones.

Since Lancaster is some 30 miles from Columbus and over a hundred from either Cleveland or Cincinnati, with all three at widely differing points of the compass, Mr. Scholl uses Yagi TV and FM antennas on a rotator—the control is to be seen under the lampshade. The high gain of the Yagi gives him excellent FM signals.

In the course of his normal life, Mr. Scholl is called on by friends, neighbors and relatives for advice and guidance with their high fidelity problems, and he willingly helps them in the selection of components for their own systems. He estimates that he has helped over a hundred this way, and he has been instrumental in the over-all design and planning for some forty others.

A long-time AUDIO reader—he was a subscriber to our predecessor *Radio* continuously since the early '30's—Mr. Scholl was kind enough to say that AUDIO's articles were contributory in widening his scope and background in high fidelity matters, and he is an avid reader of Edward Tatnall Canby. He is mechanically adept at all of the skills required for following audio as a hobby—cabinet work, wiring, trouble-shooting, and so on.

There are many hobbyists throughout the country whose interests in music reproduction lead them into high fidelity for the pleasure it provides for the entire family, and Fred's wife Jeanne and his 19-year-old Bennett college student daughter Martha Jeanne both derive considerable entertainment from his hobby. Why not start thinking about getting some recognition to your hobby for next year's group of Audiomen?

SUPERLATIVE

THE PEERLESS K-241-D (20-20 Plus) INPUT TRANSFORMER

The K-241-D is a 20-20 Plus transformer of comparatively small size in relation to its performance characteristics. Its primary balance places it in a class with repeating coils (See Chart C). It is magnetically shielded to 90 db. The following charts show its superb performance. They demonstrate the quality of Peerless which can help solve your input transformer problems.

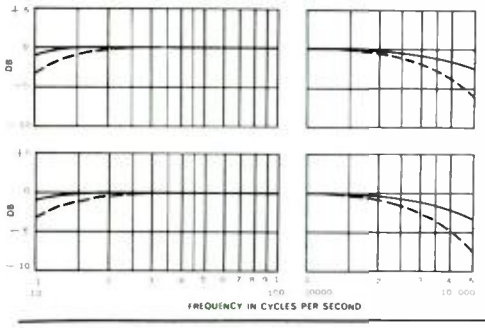

DIAGRAM A - Frequency Response K-241-D
Frequency response curves for four operating conditions, divided into two parts. The first shows response at maximum rated power level with the transformer terminated resistively and unterminated. The same conditions of operation are shown in the second part except for the −60 dbm level which is representative of microphone output. Extreme performance stability is illustrated by these frequency responses taken at widely different power levels and under two extremes of operations; that is, with open circuited secondary and with fully loaded secondary. Performances between these extremes are within the illustrated limiting curves.

——— TERMINATED - - - - - - UNTERMINATED

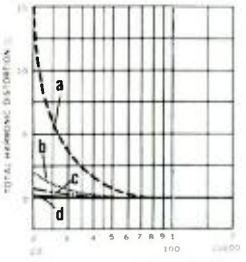

DIAGRAM B - Harmonic Distortion K-241-D
Distortion characteristics are shown under three conditions.

a. Input at +8 dbm, secondary open circuited
b. Input at +8 dbm, secondary resistively terminated
c. Input at 0 dbm, secondary resistively terminated
d. Oscillator residual distortion

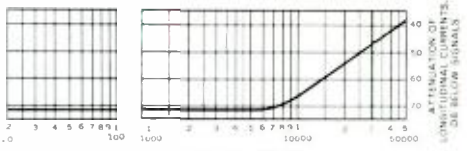

DIAGRAM C - Longitudinal Current Cancelling Characteristics of the K-241-D
The attenuation of longitudinal currents, measured on the 600 ohm input connection is shown in db below the relative steady-state transmission level.

Frequency response is guaranteed on all 20-20 plus transformers

Descriptive Data	**Max. Level	Impedance, Ohms Primary	Secondary	Primary DC Max.	MA Unbal.	Dimensions, Inches Height	Depth	Width	Weight Lbs.	Net Price
Frequency response, ±1 db: 10-25,000 cps. Primary balanced to attenuate longitudinal currents in excess of 50 db. Secondary may be used single ended or in push-pull. Has 2 secondary windings with balanced capacitance to ground. Electrostatic shield is provided between primary and secondary. Has 90 db electromagnetic shielding. Insertion loss 1¼ db. Transformer will operate into open circuit or resistive load. Frequency response down less than 1 db at 15 KC, when operated into resistive load shunted with 120 MMFD, capacitance. High power rating makes transformer suitable for use as output transformer.	+8 dbm	500-280-125-31 or 600-340-150-37.5	70,000*** or 84,000***	0	—	2¾	1½	2	1	$30.00

*This transformer may also be used as a bridging transformer. Complete application data in each packing box.

**Maximum operating level, 1 mw reference.
***Impedance is total of two separate windings.

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EDITOR'S REVIEW

LOW-SPEED TAPE SYSTEMS

THERE HAVE BEEN RUMORS and rumors of rumors about a new tape system which was being developed jointly by Minnesota Mining and Maufacturing and CBS Labs, and there have been several showings of the device to the trade within the past few months. Mr. Canby has hinted at it, and in the April issue he surmised that it would be announced soon, perhaps in June. Actually it was first presented to the public—to all intents and purposes, although it was at the IRE show—in the middle of March.

In order to present this information to AUDIO readers direct "from the horse's mouth," we have secured the article beginning on page 19 from CBS Labs. It is authored by Dr. Peter C. Goldmark and others of the Laboratory staff and is, we believe, a thorough and excellent description of the new system and the equipment used. There are many interesting innovations in the tape player, and the job has been most thorough. They have even developed a new reproducing curve for the slower and narrower tape. But it is not yet on the market, nor does Dr. Goldmark indicate that it is expected to be in much less than a year.

And now we come to the reason for this comment. While we feel it a duty to report on all new developments as soon as possible after they are "leaked" to the public, we feel that the confusion engendered by premature announcements of this nature is not good for the industry, and not good, actually, for the consumer.

The prime example of this sort of lack of foresight was the announcement of stereo discs several months before (1) there were any such records on the market and (2) before there were any stereo pickups to be had. What was the effect on the record and equipment markets? Practically everyone stopped buying anything at all—records *or* equipment. They seemed to think that suddenly there would be a flow of stereo records and equipment and until then they would just wait. This reminds us of the man who says he wouldn't buy a gas turbine automobile because they are not yet perfected and yet he won't buy a car with a conventional engine because they might perfect the turbine soon.

When announcements of this type are put before the public, the natural reaction is to wait until the new device is ready. No one knows for sure yet how well the system will work with production models, although it does appear to work perfectly with hand-built models. We do not mean to indicate that it is not capable of being perfected in the foreseeable future—only that it is not now here and that we do not know when it will be available. The four-track reel-to-reel cartridge introduced by RCA almost two years ago has not completely taken over the tape recorder/reproducer market yet, even though there are at least two manufacturers who make equipment for it, and some tapes—not a large catalog, to be sure—are available. In any case, the 7½-ips reel-to-reel system has already achieved a large degree of acceptance, and more and more tapes are being made available every month.

The Magnetic Recording Industry Association has taken the stand that its members will continue to provide 4-track reel-to-reel equipment and tapes "as long as there is a market." Just what this phrase means, we cannot be sure, but we hope it was just a poor choice of wording rather than a hedging statement. How many users does it take to constitute a "market"? Manufacturers cannot be expected to maintain a constant source of supply for a market of, say ten people, just as one doesn't expect to buy film for a camera type which has been obsolete for years or, more to the point, cylinder records for one's perfectly good Edison phonograph.

Ampex also came out with an announcement stating their position and pledging—both for itself and for its subsidiary, United Stereo Tapes—a "continuing flow of equipment and 4-track tape to serve" the still-growing 7½-ips reel-to-reel market. Furthermore, "Ampex will devote every effort to bring about industry-wide standardization on a cartridge concept, both through its own research and development and through close co-operation with the rest of the industry," and when the cartridge concept is standardized they will serve both markets on the assumption that the two concepts will serve basically separate markets. We can only agree with Ampex that "for the convenience-minded buyer, the cartridge holds great promise," and that "for the discriminating, quality-conscious listener, the reel-to-reel concept will continue to offer unparalleled superiority."

If a new tape is required to make the 1⅞-ips system work satisfactorily, why couldn't the same tape be used to still further improve the performance of the 7½-ips system? This would seem to be the logical step.

We do not hold that anything is automatically better because it is cheaper—or, in more elegant terms, more economical. We are, possibly, skeptical, but we do not presume to prejudge the new system this far in advance of its actual appearance. Nor was that the point of these lines—all we were trying to get across was that industry should keep quiet about its new products until they are actually ready for the public to buy. The automobile industry follows this precept religiously—no information is put out about next year's line until the official unveiling throughout the country.

And the automobile industry has been a *very* successful one in spite of the many abuses heaped upon it.

more

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HAROLD S. BLACK, LAMME MEDALIST

A MAN WINS A MEDAL...AND STRENGTHENS A PHILOSOPHY

The search for the "hitherto unattainable" sometimes ends in strange places.

For years Bell Laboratories engineer Harold S. Black pondered a problem: how to rid amplifiers of the distortion which unhappily accumulated as signal-transmission paths were made longer and amplifiers were added. There had been many approaches but all had failed to provide a practical answer.

Then one day in 1927 the answer came—not in a research laboratory, but as he traveled to work on the Lackawanna Ferry. On a newspaper, Mr. Black jotted down those first exciting calculations.

Years later, his *negative feedback principle* had revolutionized the art of signal amplification. It is a principal reason why telephone and TV networks can now blanket the country, the transoceanic cable is a reality, and military radar and missile-control systems are models of precision.

For this pioneer achievement, and for numerous other contributions to communications since then (some 60 U. S. patents are already credited to him), Mr. Black received the 1957 Lamme Medal from the American Institute of Electrical Engineers. He demonstrated that the seemingly "unattainable" often *can* be achieved, and thus strengthened a philosophy that is shared by all true researchers.

He is one of many Bell Telephone Laboratories scientists and engineers who have felt the challenge of telephony and have risen to it, ranging deeply into science and technology. Numerous medals and awards have thus been won. Two of these have been Nobel Prizes, a distinction without equal in any other industrial concern.

Much remains to be done. To create the communication systems of the future, we must probe deeper still for new knowledge of Nature's laws. We must continue to develop new techniques in switching, transmission and instrumentation for every kind of information-bearing signal. As never before, communications offer an inspiring challenge to creative men.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

A 1 7/8-ips Magnetic Recording System for Stereophonic Music

P. C. GOLDMARK,* C. D. MEE,* J. D. GOODELL,* W. P. GUCKENBURG*

Rumors about the new tape system have been rampant for several months, but little actual information was available. Here for the first time is a complete description of the tape, cartridges, and handling mechanisms from the best authorities—those who developed it.

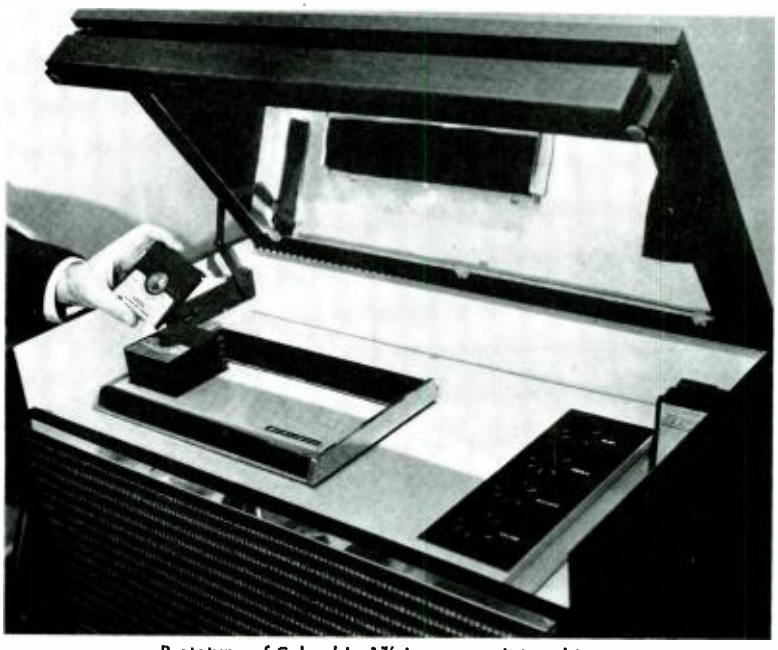
AS PART OF A LONG RANGE development program in the field of magnetic recording which CBS Laboratories undertook on behalf of Minnesota Mining and Manufacturing Company, recorded tape systems for the home have been under study over a period of several years.

In order that recorded tape can take an important place in the field of home entertainment, one must take into account a great many requirements, some of which are not easily met. For instance:

1. The tape must be contained in a compact cartridge in such a way that no part of the tape is exposed.
2. The amount of tape must be small and the cost of the cartridge low in order that the price of the final product can approach that of the disc record.
3. The sound should be stereophonic with provision for three tracks for maximum flexibility.
4. A complete musical composition should be played without interruptions; that is without reversing the cartridge or tape.
5. The quality of sound should be at least as good as the best of existing recorded media.
6. The durability of the tape and cartridge must be high enough so that after several hundred plays, the sound remains unchanged.
7. It should be possible to place a number of cartridges on a tape machine equipped with a changer-type mechanism so that one can provide music for several hours.

Here we will report on the outcome of these studies and subsequent developments which we believe will satisfy the preceding conditions and requirements.

It was clear from the outset that one was dealing with a system rather than just a few components. Thus intensive development work over a period of several years progressed simultaneously in such areas as methods of signal recording, magnetic transducers and playback heads, design of cartridges and tape transport mechanisms. The Laboratories' system work, in close cooperation with 3M, also included the development of a new tape with characteristics that provided optimum matching into the overall performance.



Prototype of Columbia 1⅞-in. tape unit in cabinet.

Late last fall the new recorded system was in a sufficiently advanced stage to demonstrate it to many members of this industry.

3M had, at that time, stated that the Zenith Radio Corporation had joined this effort and entered the design of commercial equipment based on these developments.

Some of the important features and parameters of the new tape cartridge system are as follows:

1. Tape speed is 1⅞ ips. The width of the tape is 150 mils; the thickness 1 mil, and there is provision for three tracks. Each track is 40 mils wide.
2. The cartridge is approximately 3½ in. square and 5/16 in. thick. The cartridge contains sufficient tape to play continuously for 64 minutes, and thus will carry more than 98 per cent of the music compositions available without interruptions. The space occupied by the cartridge in its container is approximately 4 cu. in. as compared with an LP record in its envelope with approximately 20 cu. in.
3. The tape machine can take five cartridges and play them automatically one after the other. A cartridge can be rejected during any part of its play similar to a record changer. The production versions of this machine now under development by Zenith will have fast forward and reverse speeds. The same instruments will also serve as a home recorder using the new cartridges with blank tape.

The Third Track

Earlier reference was made to a third track which is located in the center of the 150-mil tape.

Extended studies have been undertaken in the Laboratories to determine the optimum acoustic conditions desired by the listener in the average home while playing recorded music. Conventional stereophonic music, as now recorded, provides only a portion of the

* *CBS Laboratories, Stamford, Conn.*

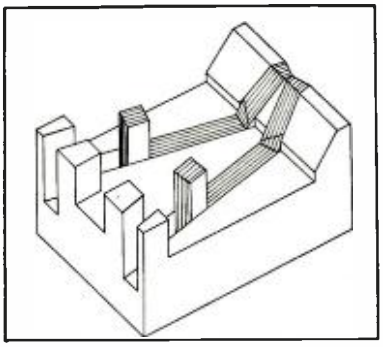


Fig. 1. Two-track playback head sub-assembly.

sounds that are perceived by the listener sitting in a concert hall. A large percentage of the total acoustic energy which reaches the listener's ears is reverberated and delayed sound which is considerably depleted of its original stereophonic character. Experiments in the Laboratories have shown that in a space simulating the average living room, a much more exciting and realistic sound can be produced giving an illusion of "being there." Thus, it is intended to record on the third track as an optional feature on the new recorded tape system, the stereophonic sum signal delayed and reverberated to an optimum degree.

The new medium will provide maximum flexibility and a new dimension in sound. The reproducing instruments can be manufactured for two or for three tracks.

Later some of the electrical and magnetic characteristics of the new system will be discussed. The data and curves shown are already based on the newly developed tape and represent the overall behavior of the entire system, that is, recording, tape, and playback. The new tape is now in pilot production at 3M, but the cartridges played in current demonstrations still use the older tape on which these programs were recorded last fall.

Following the section dealing with the magnetic aspects of the new system, some of the mechanical problems and their solutions as encountered will be described.

A comparison of the new tape system with the original 15-ips tape master from which both the stereo records as well as the new tape cartridges have been derived, has been demonstrated with success. For this purpose, some sections of music were alternately transcribed from the original master and the 1⅞-ips narrow track version onto a 15-ips half-track tape.

Magnetic and Electrical Characteristics

In order to achieve an adequate signal-to-noise ratio, frequency response, and dynamic range at a tape speed of 1⅞ ips, significant developments of most components used in magnetic recording are required. For instance, due to the shorter wavelengths encountered, developments have been aimed at reducing wavelength-dependent losses.

Among the losses in reproduction which have been minimized in the system at hand are those attending (1) separation of head and tape surface, (2) azimuth alignment of head and tape, and (3) playback-head efficiency. Losses minimized in the recording process are (1) tape-thickness loss, (2) recording-field configuration loss, and (3) loss caused by non uniformity of tape particles.

(A) *Losses in Reproduction*

1. There is an exponential reduction of the playback-head flux with decreasing recorded wavelength due to the finite separation between the surface of the tape and the playback-head pole pieces.

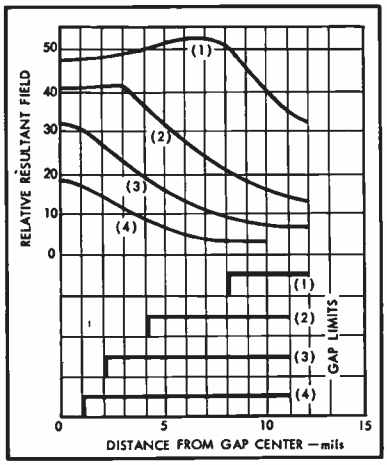


Fig. 2. Rate of recording-field extinction as a function of gap length.

At 15,000 cps and 1⅞ ips, this loss is almost 0.5 db per micro-inch separation.

2. Another important loss is associated with the azimuth alignment between the playback-head gap and the line of constant recorded magnetization across the track width. For a conventional 90-mil track a loss of 6 db occurs at 15,000 cps and 1⅞ ips. for a misalignment angle of 3 minutes.

3. The proportion of playback-head flux shunted by the gap will increase when using the narrow gaps necessary to resolve the shortest wavelengths recorded at a tape speed of 1⅞ ips. In order to maintain a high efficiency it is necessary to compensate for a reduction in gap length by a corresponding reduction in gap depth.

(B) *Losses in Recording*

1. A separation loss of the type described for reproduction occurs during recording due to the finite coating thickness. Those particles remote from the tape surface will thereby give an attenuated contribution to the tape-surface flux and so will contribute less to the playback-head flux.

2. The magnetization of a recorded tape will not be uniform throughout the coating thickness since it depends on the rate of extinction and the direction of the recording field when the critical value for recording is reached after the tape has passed the recording gap. In addition to this, a further loss can occur due to change in phase of the recorded signal through the coating thickness caused by the vertical curvature of the effective recording plane of the recording-head field.

3. For high resolution of the effective recording plane a sharp cutoff of the recording field must be accompanied by a high uniformity in the magnetization characteristics of the individual particles of the tape. Elimination of particles with low critical fields for switching will also reduce self-demagnetization effects. The separation loss has one advantage in slow speed tapes for audio, since, due to the shorter wavelengths involved, print through is correspondingly reduced allowing new thin tape backing materials to be used with safety.

New Developments in Magnetic Recording Components

Although the major loss component, called separation loss, is inherent in presently known magnetic recording systems, it has been possible by improvements of tape and heads to achieve performance characteristics approaching those presently obtained from 7.5-ips machines. Such performance is achieved with a track width of 40 mils. Having a narrow track reduces the alignment problem.

It has been found that a conventional laminated ring-type playback head can be constructed to be responsive up to 15,000 cps with a 1.5 mv output from a tape having ⅓ mil. coating thickness. A sub-assembly of the two-track version of such a head is shown in *Fig.* 1. The playback-head coils fit over the projecting laminations. Since the recorded wavelength at 15,000 cps is only ⅛ mil, it is necessary to form an effective magnetic gap of 1/16 mil (or 1.5 microns.). It has been found that a 1-micron spacer gives satisfactory head resolution in pro-

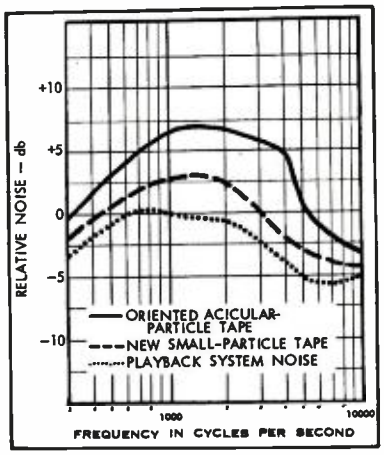


Fig. 3. Zero modulation noise curves with correct playback equalization plus the 40-phon ear characteristic.

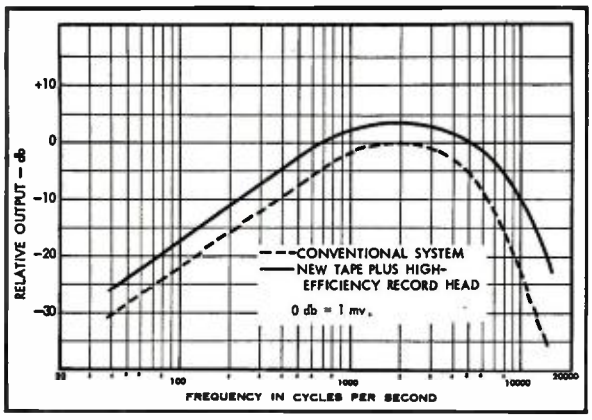


Fig. 4. Maximum output curves for 1⅞-ips tape.

longed use. By manufacturing the multitrack head in two halves, automatic colinearity of the gaps is assured and in practice the 10,000-cps sensitivity of the tracks differ by less than 4 db.

Similar mechanical refinement is necessary of course in the recording head. *Fig.* 2 shows a plot of the field distributions at 0.1-mil spacing for various gaps. It is seen that the field decrement increases somewhat with gaps which are large compared to the spacing. Thus a long gap might be thought advantageous especially since the vertical field decrement is also reduced. In practice, however, the expected improvement does not occur, probably due to the relatively greater vertical component of the effective recording field. Considerable development has been carried out to improve the recording-field configuration for the very short wavelengths involved in this system. This work will be reported at a later date.

Significant advances have been made by 3M in the recording media, leading to considerable reduction of the separation loss effects. Firstly, a tape lacquer formulation has been developed which is relatively soft, giving good head-to-tape contact. Particle rub-off on guides and heads has virtually been eliminated and the consequent amplitude variations considerably reduced at the shortest wavelengths. In addition, the Laboratories developed a higher-output and lower-noise tape as a result of changes in the magnetic material itself. Previous work has concluded that a reduction of effective particle size results in lower tape noise. The improvement achieved is shown in *Fig.* 3, where the weighted noise response for existing tape is compared with the new tape using optimum bias for each. A 4-db lower noise level is obtained in the mid-frequency range. Higher over-all output is also obtained from the new material. It is found that the short-wavelength efficiency is particularly improved. One reason for this is that a deliberate attempt was made to reduce the speed of critical fields required for magnetization change in the individual particles. For acicular particles better control of the size and shape is required and for effectively spherical or cubic particles it is necessary that the acicularity be kept low enough to make the crystal anisotropy dominant in all particles. *Figure* 4 shows the improvement resulting from recording with the new tape using one of the high-efficiency recording heads compared to that obtained with conventional 1⅞-ips recording.

Equalization Techniques and Performance of the System

The recording equalization adopted for the new 1⅞-ips record-replay system is shown in *Fig.* 5. This curve was derived by performing many listening tests on a variety of program material. It is the characteristic which meets the requirement to load the tape optimally at all frequencies without overload danger. Using this in conjunction with the playback equalization (also shown in *Fig.* 5) a flat response is obtained from 30 to 15,000 cps at −18 db relative to a level giving 3 per cent distortion at 1000 cps. Under these conditions the ratio of the maximum signal level at 1000 cps to the zero-modulation system noise is 54 db. The 10,000-cps signal response at this maximum signal level is −12 db relative to that at low frequencies. Typical equivalent signal-to-noise ratio for professional 7½-ips half-track systems is 54 db with a corresponding 10,000-cps signal response at −6 db. Thus the new system with its own recording and playback characteristics approaches the 7.5-ips performance available today and has been found to be entirely adequate for all types of musical programs.

Mechanical Design Problems and Solutions

One of the central problems in recorded tape systems is the design of the tape packaging. Obviously, it is necessary to satisfy requirements of convenience as well as to provide adequate protection for the tape. Naturally high-quality performance with respect to music reproduction is a prerequisite.

In order to popularize recorded tape it is essential to eliminate the process of manual threading between the reels. This requirement is dictated by the need for avoiding manual threading and also by the requirement to make the cartridge compatible with a practical automatic changer mechanism.

On first examination the notion of threading the tape permanently between two side-by-side reels contained in the cartridge is attractive. However, every practical design incorporating both the supply and take-up reels in the cartridge requires that sections of the tape be exposed through openings in the cartridge walls with consequent dangers of damage. Even in a single cartridge player there are many difficulties involved in coupling the tape of a dual-reel cartridge to the drive system and the heads, but when the design of an automated changer is considered, these problems increase rapidly in number and magnitude.

A basic consideration in any type of cartridge is the need for relatively high speed transport in so-called "search" operations. If flanges are used on the reels inside the cartridge, the bulk is considerably increased and many problems of stability are encountered. Thus,

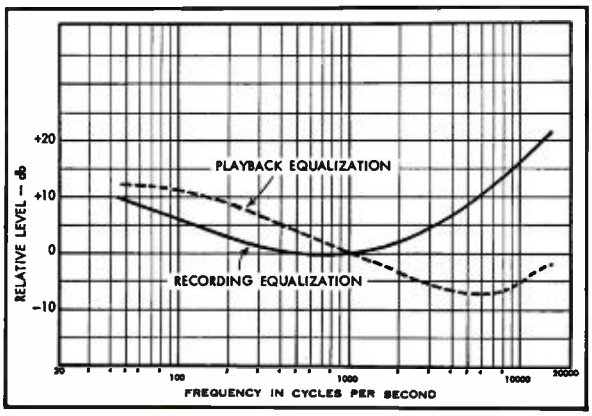


Fig. 5. Recording and playback equalization curves.

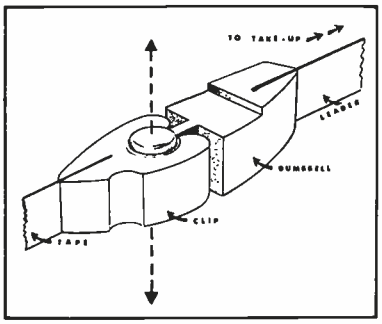


Fig. 6. Cartridge coupling members.

high-speed winding without flanges requires some method of maintaining a separation between the tape and the cartridge walls.

The three dimensional geometry of the reeled tape, the driving spindle in the transport mechanism, the walls of the cartridge and other components call for strictly orthogonal relationships or some automatic dynamic adjustment and an accurate system of tape guidance. Otherwise, the cumulative errors in repetitive reeling of the tape, even on the same machine, will lead to telescoping or angular displacement of the tape reel with respect to the cartridge walls. In brief laboratory experiments these problems may not be evident but in long-term field use the increasing friction produces instabilities in the tape speed and eventually may completely block the reel from rotating.

The problem of smooth reeling without any flanges was solved by introducing a novel guiding member in the cartridge with adequate compliance to insure a smooth rewind cycle. This arrangement allows a tape with an hour of playing time to be rewound in twenty seconds. (A five-second rewind time has been achieved in the laboratory.)

Threading of the tape is accomplished by means of a leader permanently attached to the takeup reel in the mechanism. The end of the rewind cycle leaves the permanent leader in the threading path of the machine.

A very simple and economic solution was used for the design of the coupling between the reeled tape and the permanent leader. This consists of a "U" shaped device attached to the end of the tape in the cartridge and so shaped that it seals off the only opening in the cartridge when the tape is fully rewound. The permanent leader terminates in a dumbbell-shaped element that readily mates with the "U" shaped clip. The dumbbell attached to the permanent leader can slip through the "U"-shaped clip in a vertical direction with only a light detenting restraint but provides an absolute coupling in terms of horizontal pull when the two members are engaged. (*Fig.* 6).

In order to eliminate variations in back tension with dynamic changes in effective reel diameter, a felt pad is

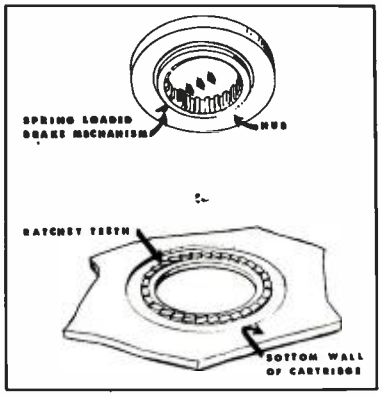


Fig. 8. Cartridge brake mechanism.

spring-loaded against the surface of the tape as it leaves the cartridge and the supply reel is operated in free-running bearings. This provides excellent tensioning characteristics and at the same time maintains the cartridge complexity cost at a minimum. *Figure* 7 shows the tape deck and the felt pad.

Some kind of braking mechanism is essential in order to avoid partial unreeling and fouling of the tape within the cartridge under normal conditions of handling. The brake must be positive,

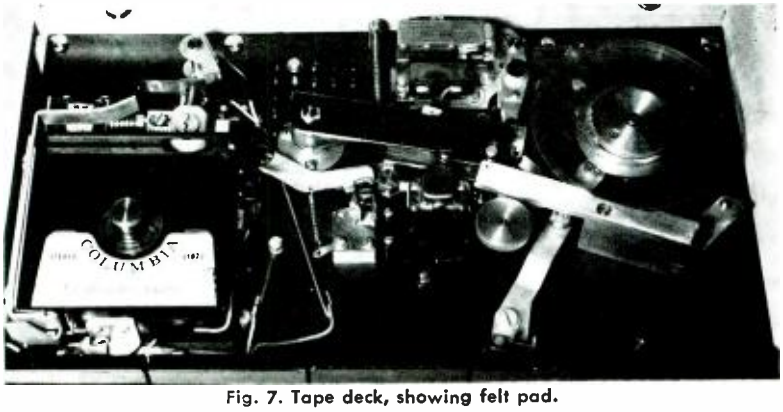


Fig. 7. Tape deck, showing felt pad.

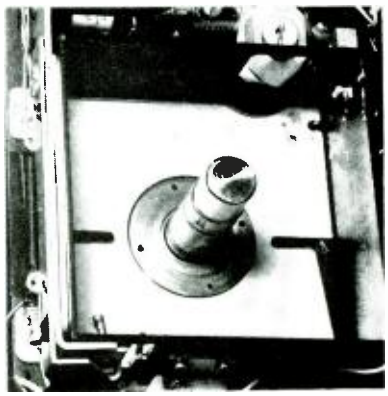


Fig. 9. Close-up of cartridge spindle and well.

reliable, and simple to assemble. The device selected consists of a linkage mounted in the cartridge hub and spring-loaded in a ratcheting relationship with teeth molded in the cartridge wall. When the cartridge is placed on the machine, the spindle releases the brake automatically. The brake is shown in *Fig.* 8.

The facility for driving the cartridge hub during the rewind cycle must be designed so as to permit random rotary orientations of the spindle with respect to the cartridge hub in the loading process. This is accomplished by means of radial slots around the inner periphery of the hub and a spring-loaded two-toothed drive in the spindle. See *Fig.* 9.

The cartridges are designed with mating surfaces that couple them (see *Fig.* 10) together in a stable vertical stack. This feature contributes considerably to the ease with which they may be handled and loaded in a changer mechanism. The patterns are unsymmetrical so that the cartridges must be correctly oriented or they cannot be fitted together. Other details of the mechanism make it impossible to load the cartridges in any way that results in improper operation.

The resulting cartridge design is compact, inexpensive and dependable. Actually, of course, the cartridge design was carried on in conjunction with the development of mechanisms capable of handling it in a fully automated changer so as to eliminate any mutually exclusive features. The actual changing mechanism consists simply of a spring-loaded platform in a well (*Fig.* 9) with which the supply spindle is coaxial, and an appropriate escapement. The latter is an essentially conventional device.

There are two escapement levers that operate in tandem on opposite sides of the cartridge well. One of the escapement levers is placed close to the corner from which the tape is fed in order to maintain accurate positioning between the clip terminal and the threading path.

The path for the tape is a straight

(*Continued on page 64*)

Polystyrene Foam Loudspeaker Cones

P. B. WILLIAMS*
JAMES F. NOVAK**

Good stiffness-to-mass ratio and controllable internal damping offer improved cone performance. Inherent high rigidity, moisture resistance and dimensional stability indicate more bass output for a given amount of distortion.

INTEREST IN LIGHT, rigid synthetic materials for speaker cones has stimulated many design efforts for at least 20 years. None of the resulting commercial products has enjoyed much success. In a business where even mere novelty of difference can be an important sales asset, this lack of success seems to be due to manufacturing problems or deficiencies in performance. The age-old paper cone still is dominant in direct radiator speakers, almost to the exclusion of other types.

In 1937, I. G. Farben of Germany applied for a British patent issued as 510,707, on a cone body of foamable condensation or polymerization resins. These were solidified in a mold to give a compact surface on drying. In 1937 also, Dr. Helmut Sell applied for a British patent, issued as 513,289, on cone bodies machined from solidified cellulose foam. Dr. Rudolf Bauer received, in 1949, a German patent, 863,084, for a cone made of glass fibers, lacquers, and resins. French patent 1,059,899 was granted to Emil Podzus in 1954. The Podzus plastic foam cone had cells filled with flakes, fibers, or wires, to increase elasticity. To increase solidity and conductability as described in this patent, light films of metal, paper or varnish were applied to the surfaces. Several years ago in this country, a large cone speaker using polystyrene foam was produced by DeMars. This used a flat sheet of prefoamed material joined to a short paper cone carrying the voice cell. No doubt other work was carried on to investigate low density plastics, aimed at combining rigidity and lightness in a practical loudspeaker.

Good single-cone speaker designs are, as is true of most good engineering practice, the result of skillful balancing of conflicting factors. Criteria for desirable performance characteristics call for design factors sometimes diametrically opposed. Woofer operation needs a sturdy moving system, which with most materials requires appreciable weight in the cone. Tweeters must have very light moving system which are not necessarily sturdy, because only small forces are involved.

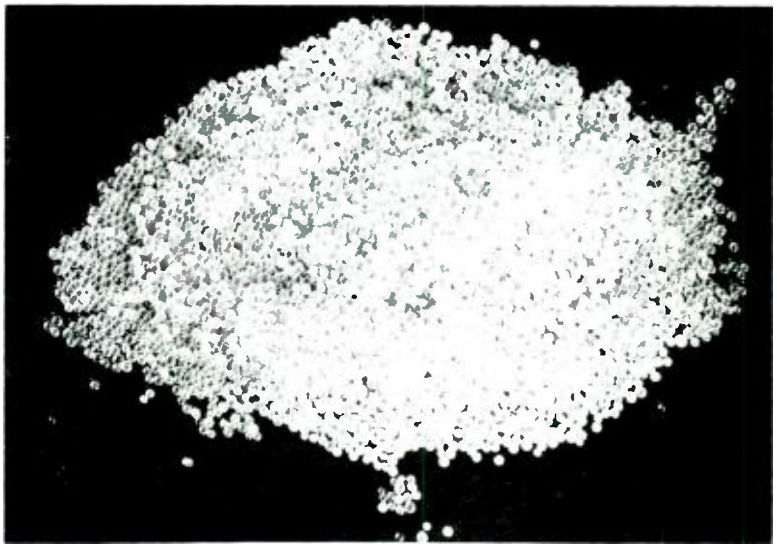


Fig. 1. Expandable polystyrene beads. *Courtesy of Koppers Company, Incorporated.*

Efficiency Considerations

Let us in this discussion concentrate as much as possible on only the cone, to see what may be done to minimize undesirable effects of compromises. A prime need is lightness, to retain as much efficiency as possible. Efficiency greater than absolutely necessary can always be swapped for other things, such as increased bass output or more high end, or something else. This demand for lightness assumes that dead-weight mass in the moving system is not decided on as the method of lowering resonant frequency. Non-working, efficiency-lowering mass can be added in the cone or at other places in the moving system, of course, at the expense of efficiency. At least two reproducer systems on the market now use metal weights attached to the cones to lower resonant frequency. Despite the current trend to lower efficiency speakers, let us recognize that low efficiency in itself is *not* a blessing; it is a penalty to be minimized as much as possible. Some small speaker systems need more than 20 watts for adequate loudness. Since few amplifiers will deliver anything like rated power output at minimum distortion levels over long periods of time because of changes in component values and tube characteristics, such low-efficiency speaker systems may need 30 or more watts of initially installed amplifier capacity to maintain the highest order of performance. It seems quite safe to say that any speaker design engineer would be quite happy with more efficiency than his speaker system now possesses; lighter cones do increase efficiency.

* *Chief Engineer, and* ** *Senior Engineer, Jensen Manufacturing Company, Division of the Muter Company, 6601 S. Laramie Avenue, Chicago 38, Ill.*

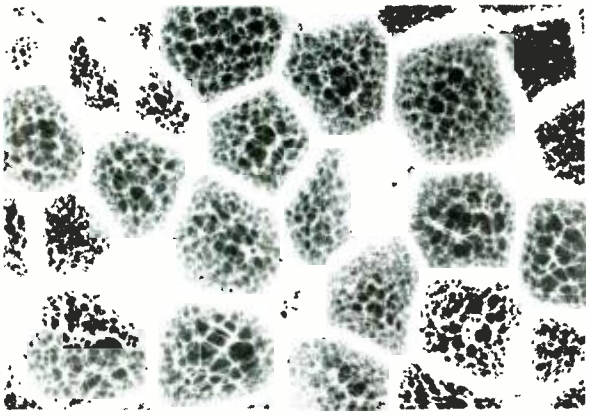


Fig. 2. Internal cross section of polystyrene foam (10x) from expandable *beads*. *(Courtesy of Koppers Company Incorporated.)*

At bass frequencies, we do not want bending of the cone during its travel. Bending loses power and increases distortion. For woofer operation, good rigidity is essential, and lightness is desirable for efficiency.

For high-frequency tweeters, the same two qualities of rigidity and low mass are paramount. High rigidity gives high suspension stiffness, in the case of single piece cones such as used almost universally for tweeters. High suspension stiffness and low mass of the whole cone result in high resonant frequency, allowing greater efficiency and higher cutoff frequency. Low mass is extremely important, high frequency extension being mostly limited by mass.

Cone Action

General-purpose and wide-range direct radiator speakers and woofers required to operate to high crossover frequencies, call for a peculiar cone action not yet fully understood. The gap between practical cone design and theoretical work on vibrations of conical shells still is so wide that cone speaker design cannot call on research results for much help. Cones must operate in curious ways to produce both low and high frequencies.[1] The two salient types of vibration pertaining to conical shells are (a) radial modes, as in a bell, and (b) symmetrical modes, as in a disk. Radial modes are associated with bending, while symmetrical modes depend upon bending and extension. Although vibrational modes of cylindrical and spherical shells and flat plates have lent themselves to mathematical analysis, those of conical shells still defy mathematical treatment and depend upon the experimental skills of the acoustical engineer.

The main groups of radial modes which would occur at frequencies considerably below 1000 cps are substantially suppressed in most cones, although there are tendencies for perturbations to occur between the edge and the apex when use is made of some of the soft wool stocks. Radial-mode activity evidences itself in the form of loud crinkles or rattles, especially during heavy transients.

The most important vibrational modes are the symmetrical modes which generally occur above 1000 cps. A cone operating as a rigid piston throughout the entire frequency spectrum would perform poorly at the higher frequencies. Symmetrical modes maintain uniform output above 1000 cps and in many cases are used to increase the sound output.

In testing cones, it is sometimes found that radial modes occur at half or even one-quarter the driving frequency. To obtain subharmonics from a cone, the driving force must exceed a certain critical value, and once excited, the subharmonics will persist even after the driving force is lowered below that critical point. These subharmonics usually occur at the symmetrical vibrational modes and particularly so in materials having low internal dissipation. They are usually called "breakup" or "cone cry."

It appears that a paradox exists here. The cone should operate as a rigid piston in the lower part of the frequency spectrum because bending subtracts from the output of the fundamental frequency. On the other hand, it is desirable to encourage "bending" at the higher frequencies, otherwise the output would fall off at 6 db per octave. And yet this "bending" can produce increased output in the form of alien frequencies which are undesirable.

Requirements of the Cone

The main requirements of a good cone material could be listed as low mass, high rigidity, and high internal damping. The art of paper cone making has given us materials which meet these requirements to various degrees. The high internal damping characteristic of good paper cones smooths the transitions from mode to mode, and subdues the unwanted noises emitted so freely from hard, brittle materials such as rigid polystyrene and vinyl sheet.

It became evident early in the development of different cone materials at Jensen that some easily determined criterion of suitability of materials was needed. Actually three criteria have been in use. Perhaps it will be possible to evolve a single criterion as experience and knowledge are gained through their use. At present each seems suitable for a special class of speaker, the woofer, a general purpose speaker, and the tweeter. Each is obtained from the equation for the frequencies of the purely flexural modes of a circular ring of rectangular section.

$$\omega = K \frac{t}{\sqrt{1-\sigma^2}} \sqrt{\frac{E^2}{\rho}} \qquad (1)$$

where

t = thickness
σ = Poisson's ratio
E = Young's Modulus of Elasticity
ρ = density

Since Poisson's ratio varies from 0.2 to 0.4, depending on the material, as a first approximation $\sqrt{1-\sigma^2}$ can be taken as unity. McLachlan has determined that the frequencies of the symmetrical modes of a conical shell do not increase directly as the thickness. For a

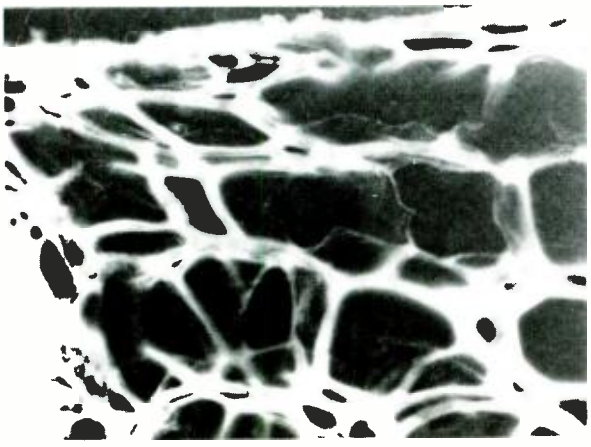


Fig. 3. Magnified (40x) cross section of experimental molded cone, showing compaction at the surface.

[1] M. S. Corrington, "Amplitude and phase measurements on loudspeaker cones." *Proc. I.R.E.*, 39: 1021–1026 (1951).

[2] N. M. McLachlan, *"Loudspeakers."* Oxford University Press, pg. 330, 1934.

"When we heard the Citations our immediate reaction was that one listened through the amplifier system clear back to the original performance, and that the finer nuances of tone shading stood out clearly and distinctly for the first time." **C. G. McProud, Editor, AUDIO Magazine**

We know you will be interested in these additional comments from Mr. McProud's report:

Performance: "The quality of reproduction reminds us of the solidity of Western Electric theatre amplifiers of some years ago . . . The bass is clean and firm and for the first time we noted that the low-frequency end appeared to be present even at low volumes without the need for the usual bass boost."

Specifications: "Our own measurements gave IM figures of 0.35 per cent at 60 watts; .08 per cent at 20 watts, and less than .05% (which is essentially unmeasurable) from 10 watts down."

Construction: "It is obvious that considerable thought has gone into the preparation of the Citation as a kit (and) when the amplifier is completed, the user may be assured of having a unit he can be proud of . . . The kit is a joy to construct."

For a copy of Mr. McProud's complete report and a Citation catalog, write Dept. A-5, Citation Kit Division, Harman-Kardon, Westbury, N. Y. The Citation I is a complete Stereophonic Preamplifier Control Center. Price, $159.95; Factory Wired, $249.95. The Citation II is a 120 Watt Stereophonic Power Amplifier. Price, $159.95; Factory Wired, $229.95. Prices slightly higher in the West.

Build the Very Best **CITATION KITS** *by* **harman kardon**

HK-30

TABLE I

CRITERIA FOR MATERIAL SUITABILITY

Material*	Criterion $\sqrt{\frac{E}{\rho}}$	Criterion $\sqrt{\frac{E}{\rho^{1.6}}}$	Criterion $\sqrt{\frac{E}{\rho^3}}$
Cellulose Acetate	1.36	1.26	1.05
Nylon Type 6/6	1.42	1.38	1.28
Polyethylene	.91	.93	.96
Polystyrene	1.71	1.69	1.62
Vinyl Butyral	1.51	1.45	1.33
Vinyl Chloride	1.36	1.23	.97
Aluminum	4.9	3.64	1.82
Magnesium	4.8	4.03	2.7
Soft Cone Paper	1.1	1.6	3.3
Hard Cone Paper	2.1	2.8	5.8
Epoxy Foam	.6	1.8	1.9
POLYSTYRENE FOAM	.78–1.2	1.5–2.5	7.1–12.9
Phenolic-cotton	2.1	1.9	1.6
* Best when	Low	High	High

given radius and apical angle it depends upon t^n, where n is governed by the thickness and coil mass. An average value for n seems to be about 0.3. The frequency is, therefore, given by

$$\omega \propto t^{0.3}\sqrt{\frac{E}{\rho}} \qquad (2)$$

If thickness and radius remain constant, the only remaining variable is the radical which is equal to the velocity of sound in the material. This velocity of sound has been used in the cone industry as a means of grading cone papers in order of hardness, the hardness varying directly with velocity. It is generally accepted that the softest papers, (those with lowest velocities of sound) usually make the best woofers. The velocity of sound through the material appears, therefore, to be worthy of consideration as a criterion by itself.

The thickness, $t = \rho_1/\rho$ where ρ_1 is the mass per unit area and ρ the density. Substituting this value of t into Eq. (2) we get

$$\omega \propto \rho^{0.3}\sqrt{\frac{E}{\rho^{1.6}}} \qquad (3)$$

In comparing the frequencies obtained from shells of different materials when the mass, ρ_1, is fixed, the value of n will doubtless vary from 0.3 if there is a wide difference in thickness. Experimental data seems to indicate that the frequency criterion $\sqrt{E/\rho^{1.6}}$ is sufficiently accurate to compare the frequencies of conical shells of equal radius, apical angle, and mass, driven by identical coils. This expression appears to yield more readily verifiable results for the general purpose type response than the velocity of sound alone.

In the case of a disk, where $n = 1$, the criterion is

$$\omega \propto \sqrt{\frac{E}{\rho^3}} \qquad (4)$$

The material with the largest $\sqrt{E/\rho^3}$ gives the disk of smallest mass for a given frequency and radius. This criterion appears to be the one best suited for tweeter cones which generally have a small radius and large apical angle.

Table 1 lists the relative values of these criteria for various materials. Looking at materials most familiar, we find the soft papers best suited for woofer use and the hard papers best suited for general purpose and tweeter use. It is interesting to observe that polystyrene foam appears equally well suited for all three applications.

Choice of Material

The figures of merit are only useful for indicating *probable* value of speaker cone materials. In early development work, prefoamed polystyrene looked promising, for lightness, rigidity and damping, but means were lacking to form it into cones accurately and economically. Machining leaves a rough surface devoid of continuity of structure which is needed for strength. Intuitively, it was felt that the surface should be more dense than the body of the material, to approximate the "sandwich" construction now used widely in structural materials. Further work created cones made by a molding process which is economical and which provides all the essential qualities and mechanical structure we have outlined as goals. These cones are made from polystyrene beads shown in *Fig.* 1 which contain an expansion agent activated by heat. Raw or partly expanded beads are compression molded by steam or other heating methods, the cone preferably being cooled in the mold for greatest accuracy of dimensions. Some back pressure is applied to the mold so that the cone surfaces are compacted to form thin skins. The expansion process somewhat resembles the popping of popcorn, differing in an important respect, however, in that the expanded foam cells coalesce to form a sturdy honeycomb-like mass. (See *Fig.* 2.) (*Figure* 3 shows the surface compaction.

As described in the patent[3] covering this development, many design features and parameters are possible, most of them not achievable in any other type of manufacture. Features most easily obtained in this process, or which are unique, include:

[3] U. S. Patent 2,905,260, issued Sept. 22, 1959. *"Loudspeaker Diaphragm,"* P. B. Williams, assigned to the Muter Company.

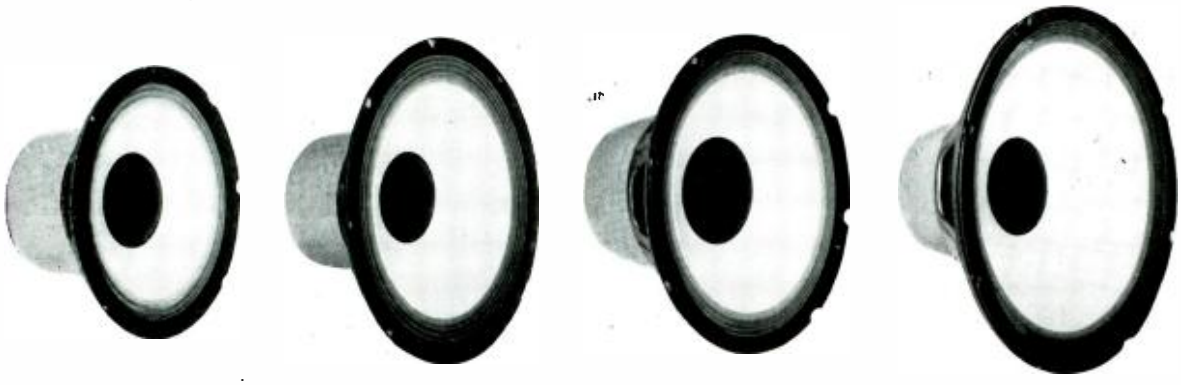


Fig. 4. (Left to right) 8, 10, 12, and 15-in. experimental speakers using molded foam cones.

Acoustic Research introduced the acoustic suspension* woofer to the audio field; the AR-1 and AR-2 speaker systems altered the course of loudspeaker design.

The tweeters of the AR-1 and AR-2 are conventional cone units, whose quality we consider outstanding in their respective price ranges. We have always taken the position that better tweeters existed, though at much higher prices.

Our second major research project was the development of the hemispherical tweeter**, two of which we combined with an AR-1 woofer in a new speaker model, the AR-3. These tweeters, like the AR-3 woofer, are no-compromise devices. They are the best musical reproducers that we were able to design and manufacture, regardless of cost.

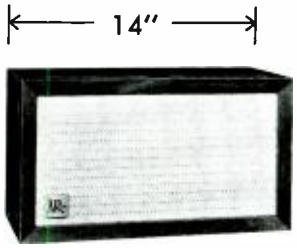
AR-3*st* and AR-3*t* SEPARATE TWEETER SYSTEMS

The tweeter system of the AR-3, including crossover and cabinet, is now available separately as the AR-3t. It will convert an AR-1 or AR-1W to the equivalent of an AR-3.

The super-tweeter of this system, also with crossover and cabinet, is available separately as the AR-3st. It converts an AR-2 to the equivalent of an AR-2a, or it may be added to an AR-1.

Literature on these units is available for the asking.

*U. S. Patent 2,775,309
**Patent applied for

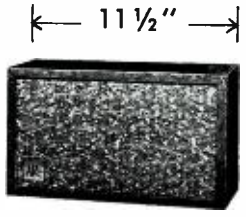


AR-3*t*

Mid-range unit and super-tweeter, ready to connect directly to an AR-1 or AR-1W — $87 to $96, depending on finish

AR-3*st*

Super-tweeter only, ready to connect directly to an AR-1 or AR-2 — $32 to $38, depending on finish.



ACOUSTIC RESEARCH, INC. 24 Thorndike St. Cambridge 41, Mass.

Variable Low-Pass Filter

RICHARD S. BURWEN*

A simple and easily constructed unit which can serve in a variety of applications, both professional and home.

NOISY OR DISTORTED program material can usually be cleaned up considerably by cutting off the high frequencies. Since the desirable cutoff frequency and rate of attenuation vary with the quality of the program material, a completely flexible variable electronic filter has been designed. The low-pass filter, Figs. 1 and 2, uses transistors and feedback to produce shutoff frequencies variable from 30,000 to 3000 cps with attenuation rates of either 6, 12, or 18 db per octave and continuously variable peaking.

Four transistors are used in a resistance-capacitance feedback filter circuit powered by mercury batteries. Estimated life for the six flashlight size cells is 4000 operating hours. Separate controls vary the turnover frequency of a 6-db-per-octave rolloff, *Fig.* 4; a 12-db-per-octave cutoff, *Fig.* 5; and the peaking of the 12-db-per-octave filter, *Fig.* 6. At minimum peaking the 12-db-per-octave curve is actually a gradual rolloff. At maximum peaking the response has a 7-db peak.

Combination of the 6- and 12-db-per-octave curves can produce a fast rolloff,

* *Minneapolis-Honeywell Regulator Company, Boston Division, 1400 Soldiers Field Road, Boston 35, Mass.*

Fig. 1. Continuously variable low-pass filter.

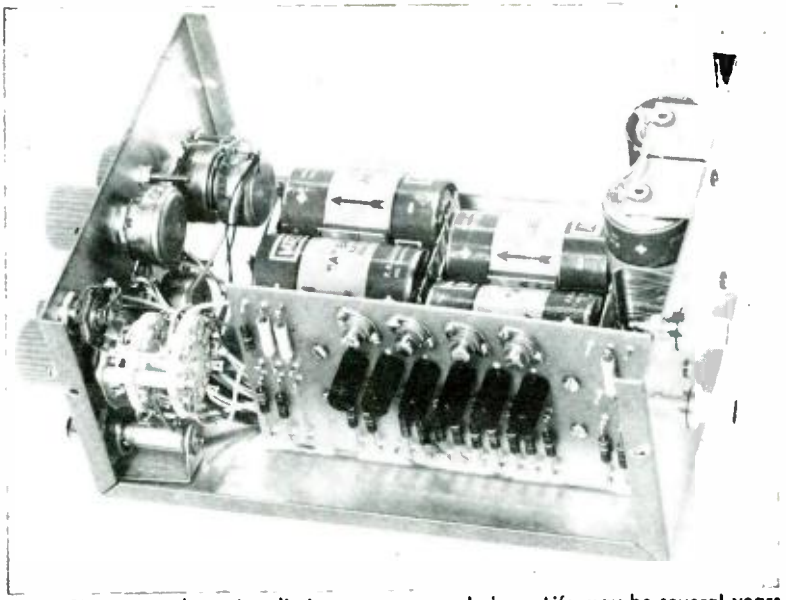


Fig. 2. Six mercury batteries eliminate power supply hum. Life may be several years in home use.

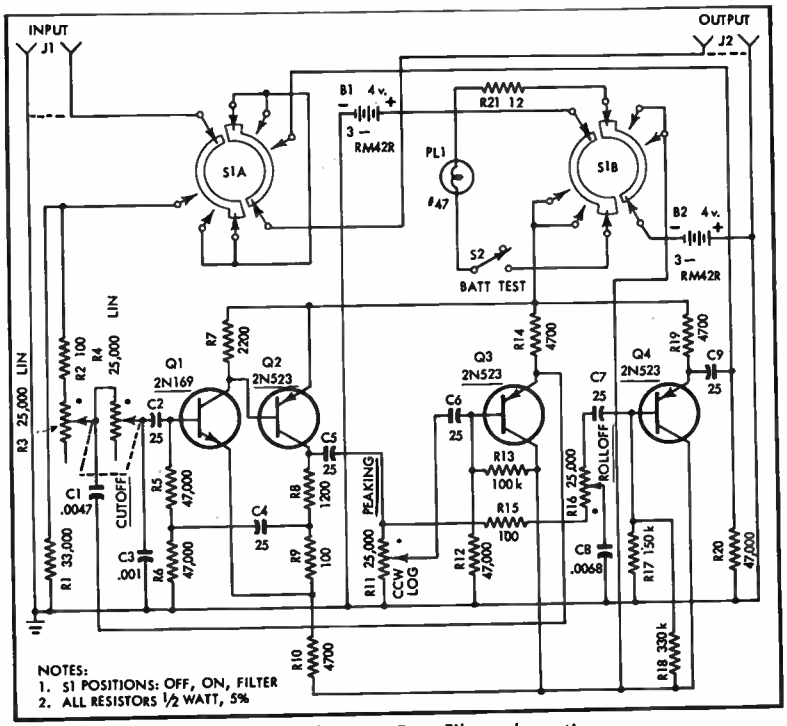


Fig. 3. Variable Low Pass Filter schematic.

• TAPE RECORDING PROBLEMS—AND HOW AUDIOTAPE HELPS YOU AVOID THEM

Listening to a recording with excessive print-through is like looking at a picture that has a faint double-exposure.

Reducing print-through is like eliminating the second exposure – and leaving a clear, sharp recording.

Killing the "double exposure" of print-through

HAS your enjoyment of a recorded tape ever been marred by an occasional, annoying "echo"? This so-called "print-through" is sometimes found in recorded tapes that have been stored for a long time. The longer the storage, the more magnetism is transferred from one layer of tape to another. Where recorded signals are unusually loud, print-through can become audible on conventional tapes after about two weeks of storage, but is seldom loud enough to be bothersome until stored for much longer periods. Up to about 18 months ago, professional recordists had found only one way to avoid print-through: reduce the recording level to the point where the print level dropped below the noise level inherent in the recorder. This meant sacrificing 6 to 8 db in signal-to-noise ratio.

Then Audio Devices introduced "Master Audiotape"– the solution to the print-through problem. By the use of specially developed magnetic oxides and special processing techniques, print-through has been reduced 8 db in Master Audiotape–without changing any other performance characteristics. Laboratory studies indicate that stored Master Audiotape will take decades to reach the same print-through level that now mars ordinary tape in one week! So print-through is "killed" for even the most critical ear.

Master Audiotape is available in 1200- and 2500-foot lengths in two types–on 1½-mil acetate and on 1½-mil "Mylar." These are part of the most complete line of professional-quality recording tapes in the industry. Ask your dealer for Audiotape–made *by* audio engineers *for* audio engineers–and backed by over 20 years of experience in sound-recording materials.

Take your recorder on vacation

It's almost second nature for a vacationing family to take their camera with them. Why not do the same with your tape recorder? Seaside sounds, church bells, barnyard noises, square dances, a sound track for your home movies—there are literally dozens of "priceless" sounds you'll hear, and want to record, on your vacation. Your best bet for tape recording of this kind is Audiotape on 1½-mil acetate, type 1251. This economical, dependable tape is the most popular type of Audiotape.

audiotape
TRADE MARK

AUDIO DEVICES, INC., 444 Madison Ave., N. Y. 22, N. Y.
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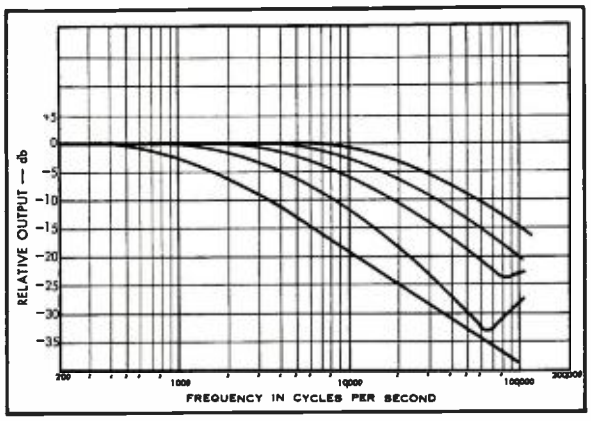


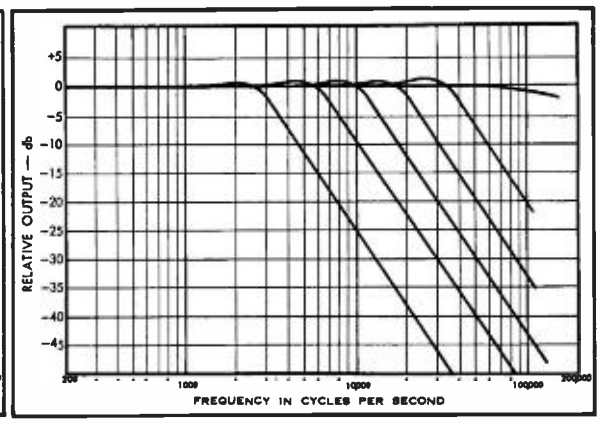


Fig. 4. (left). Response at successive positions of the ROLLOFF control. Fig. 5. (right). Response at successive positions of the 12 db per octave CUTOFF control.

an 18-db-per-octave sharp cutoff, or a rolloff with a peak, as shown in *Fig.* 7. Such flexibility makes this filter highly suitable for the low-pass section of an electronic crossover network.

The filter is intended for use with other transistor equipment delivering a maximum input signal of 1 volt r.m.s. from a source impedance of less than 500 ohms. The input impedance is 33,000 ohms in parallel with 0.006 μf. For use with a high-impedance source an emitter-follower input stage could be added.

The filter has unity voltage gain and a low output impedance of approximately 50 ohms. It can deliver 1 volt r.m.s. at 400 cps with only 0.15 per cent total harmonic distortion to a load of 4700 ohms or higher. Output cables as long as 500 feet can be used.

Noise at the output is less than 10 μv r.m.s. or 100 db below 1 volt at any setting of the controls. The response at low frequencies is flat within ±0.1 db down to 10 cps.

A three-position power switch having one shorting wafer and one non-shorting wafer provides a direct signal path from output to input when the filter is switched off. Thumps during turn-on are eliminated by pausing at the second OFF position where power is applied and the coupling capacitors are allowed to charge. A pushbutton and pilot light permit a visual battery check.

Circuit Description

In the schematic, *Fig.* 3, a two-section low-pass RC network at the input, consisting of R_3, R_4, C_1, and C_3, produces a 12-db-per-octave rolloff. The cutoff frequency is varied by means of a two-gang potentiometer R_3 and R_4. This network feeds an amplifier consisting of two common-emitter stages having a total voltage gain of 1.2 determined by local negative feedback. To prevent a change in gain due to loading as R_3 and R_4 are varied, the input impedance of this amplifier is made infinite by means of positive or regenerative feedback through C_2 to the bias circuit R_5 and R_6.

Regenerative feedback, from the collector of Q_2 through the PEAKING control R_{11} and emitter follower Q_3 to the network capacitor C_1, causes the resonant peak near the cutoff frequency. The response, Figs. 5 and 6, is exactly the same as that of a simple inductance capacitance-resistance low pass filter. The PEAKING control R_{11} adjusts the Q of the resonance by varying the loop gain.

Following this 12-db-per-octave variable low-pass filter, the collector signal from Q_2 passes through a 6-db-per-octave rolloff filter, R_{16} and C_8, which produces the curves in *Fig.* 4. Emitter follower Q_4 isolates this filter from the external load and provides the low output impedance.

All the stages are temperature stabilized by a large amount of d.c. feedback. Direct currents in the potentiometers are eliminated by coupling capacitors in order to minimize control noise. The unit is constructed complete with mercury batteries in an 8 × 6 × 3½ inch aluminum box, as shown in *Fig.* 2.

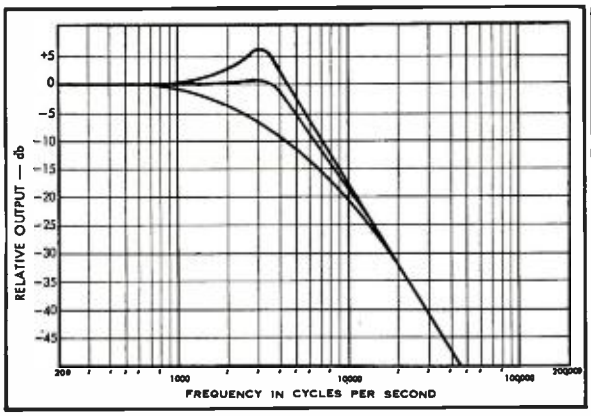
The combined gain G versus frequency f for the 6- and 12-db-per-octave filters may be expressed by the equation.

$$G = \frac{1}{\left[1+\frac{jf}{f_1}\right]\left[1+\frac{jf}{Qf_2}-\left(\frac{f}{f_2}\right)^2\right]}$$

where f_1 = the 3-db-down frequency of the 6-db-per-octave filter

f_2 = the asymptotic cutoff frequency of the 12-db-per-octave filter

(*Continued on page 70*)



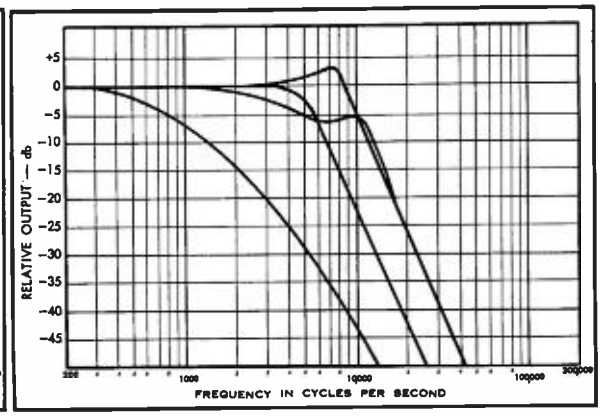
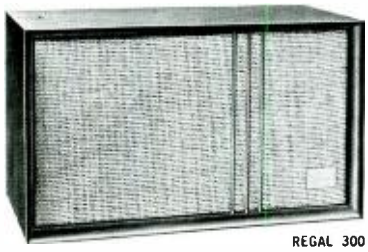


Fig. 6. (left). Response at three positions of the PEAKING control. CUTOFF at 4 kc. Fig. 7. (right). A few of the numerous combinations of the 6 and 12 db per octave cutoffs with variable peaking.

Cutaway of ESQUIRE 200



REGAL 300

ESQUIRE 200

LEYTON

When Electro-Voice engineers set out to create a new series of ultra-compact speaker systems, they recognized that it was impossible to end with an instrument capable of satisfying the audio perception of everyone. Thus, their primary aim became (as always) the most natural reproduction of sound possible. The theory behind such an obvious objective is to let the musical acuity of the customer judge the performance of a speaker system — to let the customer listen to the music rather than the speaker.

That such a fundamental approach to design and engineering was successful has recently been verified by a series of listening tests conducted among three groups of the most severe critics in the high fidelity field. In New York, Boston and Los Angeles nearly 300 sound room personnel of top high fidelity dealers were given the opportunity to spend an afternoon listening to and rating the "sound" produced by three of Electro-Voice's new ultra-compact systems (Regal, Esquire, Leyton) and six other currently popular ultra-compact systems. All nine systems were placed behind an opaque curtain and each listener's selector switch was coded but unmarked so he had no way of knowing which system he was hearing.

More than 80% of the listeners ranked Electro-Voice Esquire and Regal units either first or second. And, Electro-Voice's economical Leyton was ranked third by over 50% of the listeners — thus, out-scoring units at double its price.

We suggest that recognition such as this could not be earned by merely "another" speaker system — but must result from our earnest effort to create an instrument that takes nothing away from nor adds anything to the music you want to hear.

SERIES OF COMPARISON TESTS BEFORE WORLD'S TOUGHEST AUDIENCE PROVES VALUE OF NEW E-V SPEAKER SYSTEMS

We urge you to spend the time necessary to conduct your own comparative listening test. Visit your own dealer and ask for a demonstration of these remarkable new Electro-Voice instruments. Write directly to the factory for a complete description of these new units contained in High Fidelity Catalog No. 137.

CONSUMER PRODUCTS DIVISION

Electro-Voice® INC. DEPT. 50A, BUCHANAN, MICHIGAN

Distortion in Tape Recording

HERMAN BURSTEIN*

Types and causes of distortion should be understood by the recordist if he is to obtain the best results. Various compromises are shown to be effective under different conditions.

IN TWO PARTS—PART ONE

FROM TIME TO TIME the writer visits some friends who have in their living room a pre-war radio console, which cost over $500 and was considered one of the finest units of its day. It receives good care and enough service to maintain it in "as good as new" condition. To one whose ears have become attuned to modern high fidelity equipment, this console falls noticeably short of the mark in terms of frequency response and noise characteristics. But its most obvious deficiency, the greatest deterrent to pleasurable listening, concerns distortion. The instrument just does not have the smoothness and ease of reproduction afforded by modern equipment.

The foregoing illustrates the point that one of the most noteworthy developments in the audio art in the high fidelity era, at least to the ears of this writer, has been the reduction of distortion. While the power amplifier has come in for a great share of attention, it is also true that designers of control amplifiers, tuners, cartridges, speakers, and other components have concentrated on reducing distortion to imperceptible amounts.

In these days when most audio equipment is built to exacting standards with respect to clean reproduction—i.e. low distortion—one looks for comparable refinement in the tape recorder. The meticulous recordist will wish to preserve the original quality of the sound so far as possible. While satisfactorily low distortion can be achieved in tape machines, this is far from a simple matter. Overcoming distortion remains considerably more of a challenge in tape machines than, say, amplifiers. When used with today's better amplifiers, tuners, and speakers, a tape recorder must indeed be of high quality, and must be properly used, in order not to add noticeable distortion.

In tape recording, distortion is inextricably linked with several other aspects of the process—signal-to-noise ratio, frequency response, equalization, bias current, and tape speed. Therefore in the following discussion we shall discuss distortion in terms of its relationship to these factors. First, however, it would appear profitable to devote some space to a review of what is meant by distortion. Such an understanding can prove useful in various ways; for example, it enables one to appreciate why a given recording level results in no noticeable distortion for some kinds of sound and quite perceptible distortion for other kinds.

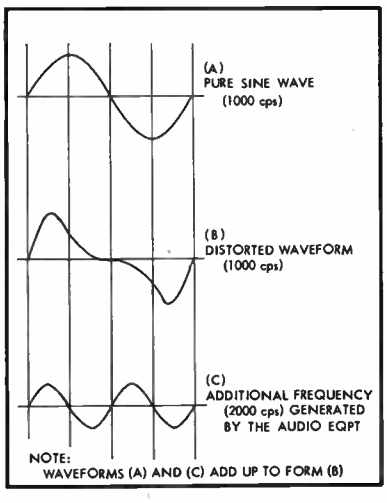


Fig. 1. Example of harmonic distortion.

Meaning of Distortion

Reproduced sound is never totally devoid of distortion. But in the present state of the art it can be kept so small in most audio components as to be unnoticeable, permitting the reproduced sound to retain the ease and naturalness of the original. In somewhat larger quantity, it may still not be immediately discernible but instead may produce a consciousness of aural fatigue after one has been listening for a moderate period of time. In successively larger quantities, distortion causes the sound to become grainy, gritty, coarse, and finally so broken up as to be partially or completely unintelligible.

Distortion consists of a change in the original waveform, due to improper functioning of one or more audio components. Such improper functioning is called non-linearity; that is, the waveform turned out by the component is not an exact replica of the incoming signal.

It can be demonstrated, mathematically and by suitable test equipment, that the change in the waveform actually consists of the addition of new frequencies to those that were originally produced by the sound source. This is illustrated in *Fig.* 1. At (A) we see the original waveform, a pure sine wave; (B) shows a distorted version of the original. The distortion consists of the waveform

* *280 Twin Lane E., Wantagh, N. Y.*

UHER

Stereo Record III

does best!

From the moment you hear its incomparable high fidelity performance—from the instant you realize the wide range of capabilities the versatile controls put at your command — you know that the Uher Stereo Record III is an exciting new experience in stereo tape recording. Its performance is the sum total of superb engineering . . . but let the specifications speak for themselves.

Here's what the Stereo Record III does . . . and why it does it best!

High Fidelity Performance, Unsurpassed– Broad 40 to 20,000 cps frequency response; negligible wow and flutter 0.1%; high –55 db signal-to-noise ratio and constant speed hysteresis-synchronous motor assure the highest possible performance standards.

Versatility, Unlimited — Sound-on-sound! Play back on one track, record on the other — simultaneously. It plays either 2 or 4-track pre-recorded tape. 4-tracks of ½ mil tape, on a 7-inch reel, played at 1⅞ ips provide more than 17 hours of play. The optional AKUSTOMAT automatically operates the tape transport only when voice or program material reaches the microphone. The Stereo Record III is adaptable for synchronizing automatic slide projectors.

Flexibility, Unequalled — Fool-proof and jam-proof controls provide individual adjustments of each channel: volume, tone, fade-in and fade-out, channel and speaker selection. Fingertip control of pause, stop, rewind, fast rewind, forward, fast forward, speed selections of 7½, 3¾, or 1⅞ ips, and a recording safety lock. Has an accurate digital cueing meter.

Monitoring facilities, plus dual recording level indicators, simplify making stereo or mono recordings. High and low impedance inputs accommodate any type of program source. Outputs for external speakers and for direct connection to external high fidelity amplifiers are provided. The simple flip of a switch will allow the program to come forth from its self-contained high quality stereo amplifier and stereo speaker system. Truly portable—weighs only 33 pounds. *Complete with 2 Dynamic High Impedance Microphones, Amplifiers and Carrying Case*.....**$399.50**

FAMOUS UHER UNIVERSAL—High fidelity performance — a most remarkable dictating/playback instrument — 3 speeds from 15/16 ips—voice activated—automatic continuous playback. With Remote Control Microphone, Carrying Case, Reel, Dust Cover.....**$299.95** plus f.e.t.

Your dealer invites you to take the controls of the exciting Uher Stereo Record III.

For further details write: Dept. A-5, WARREN WEISS ASSOCIATES, Sole U. S. Agents, 346 West 44th Street, New York, New York

shown at (C). If the distortion frequency in (C) is added to the original frequency (A), the result is the distorted waveform of (B).

The new and undesired frequencies, which are termed distortion products, are produced by the audio equipment. Unlike noise and hum, which are also undesired frequencies produced by (some) audio components, distortion products appear only in the presence of an audio signal.

The principal kinds of distortion, those most offensive to the ear, are harmonic and intermodulation distortion. Harmonic distortion denotes the generation of frequencies that are multiples of the original frequency. To illustrate, in the course of reproducing a 1000 cps tone the audio equipment may, as the result of its non-linear behavior, also generate frequencies of 2000, 3000, 4000, etc. cps.

To an extent, the ear is not unduly offended by extraneous frequencies if they are harmonically related to—exact multiples of—the original note. As a rough rule, harmonic distortion products are compatible with pleasant listening when, in total, they constitute no more than about 1 to 2 per cent of the total sound; generally, 3 per cent is considered too great.

At the same time, the amount of harmonic distortion which is tolerable depends upon whether the distortion products are even or odd multiples of the original frequency. Even multiples tend to be less offensive. Furthermore, the "order" of the harmonic products is a determining factor. High-order products are many times the original frequency; low-order products are a few times the original frequency. High-order products tend to be more offensive. Thus if the original frequency is 1000 cps, distortion products of 8000 and 9000 cps would be more disagreeable than 2000 and 3000 cps. (It is appropriate to intersperse here that a tape recorder which cuts off sharply above 9000 or 10,000 cps may offer cleaner sound than one which goes out to 15,000 cps because the former eliminates high-order distortion products to a greater extent.)

Intermodulation distortion—IM for short—occurs only when two or more frequencies are simultaneously reproduced by the audio equipment. Deformation in the waveform of one frequency results in deformation of a second frequency, although it could well be that the second frequency, if reproduced alone, would not have been distorted by the equipment in question. Thus IM distortion refers to interaction among frequencies, with new frequencies being born out of this interaction. When a substantial number of frequencies are reproduced at once, as is often the case with music, the interaction, namely IM distortion, becomes very complex.

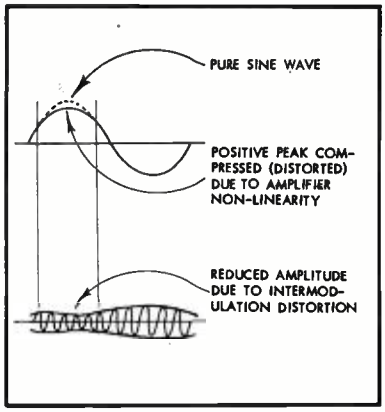


Fig. 2. Example of intermodulation distortion.

Figure 2 illustrates the process of intermodulation distortion. For simplicity, it is assumed that only two tones, 100 and 1000 cps, are present and that they are fed through an amplifier. Let us assume that the 100-cps signal is of substantially greater magnitude than the other, so that it causes the amplifier to operate in non-linear fashion at the positive peaks of the waveform. During these moments of non-linear operation of the amplifier the 1000 cps signal is also being treated in non-linear manner, despite the fact that this signal in itself is of too small magnitude to cause the amplifier to behave in non-linear fashion. At (A) we see the effect of amplifier non-linearity upon the 100 cps waveform. (B) shows the resulting effect upon the 1000-cps waveform due to the fact that the amplifier is periodically operating in non-linear manner. The 1000-cps waveform is compressed 100 times per second by the 100 cps signal. In other words, the 100-cps frequency is now present in the 1000-cps one.

Unfortunately the new frequencies created by IM distortion are not multiples of the original frequencies. The distortion products consist of various multiples of one frequency plus or minus multiples of the other frequency. For example, 100 and 1000 cps will form IM products of 1100 cps (sum of the original signals) and 900 cps (difference between the original signals). They will form 1200 cps (twice 100 cps plus 1000 cps) and 2100 cps (twice 1000 cps plus 100 cps). They will form 1900 cps (twice 1000 cps minus 100 cps) and 800 cps (1000 cps minus twice 100 cps). And so on and so forth. If there were more than two original frequencies involved, the distortion products would be still more complex.

IM distortion not exceeding 1 to 2 per cent is often considered compatible with high fidelity. On the other hand, it has been found that the ability to reduce IM to as low as 0.1 per cent in voltage amplifiers and power amplifiers has produced noticeable improvement.

Distortion Ratings for Tape Recorders

Extremely seldom does one find the specifications for a tape machine having anything to say about IM distortion. The reason will appear later, when we compare harmonic and IM distortion produced by tape recorders. The nigh-universal practice instead is to rate tape machines in terms of harmonic distortion at a stated signal-to-noise ratio, for example 50 db in moderate-quality machines or 55 db in high-quality machines. The record-level indicator is adjusted to provide an indication of maximum permissible recording level when the level is such as to produce anywhere from as low as 1 per cent to as high as 5 per cent harmonic distortion (at a frequency of 400 cps or so). The low-priced machines typically use 5 per cent harmonic distortion as maximum permissible recording level, while the top quality ones use 1 or 2 per cent. Many machines, of varying quality, use 3 per cent harmonic distortion as the reference. The official standard, applicable to 15 ips recording, considers 2 per cent harmonic distortion to be the maximum permissible quantity.

Distortion and Signal-to-Noise Ratio

In the process of recording and playing back a tape, there are two principal sources of noise to contend with: tape noise and amplifier noise. Tape noise is of two kinds. One, known as tape hiss, is due to incomplete cancellation of magnetic fields when the tape is erased. These magnetic fields are of random character and therefore produce random frequencies with a characteristic "hissy" quality. The other kind of tape noise is known as modulation noise, which appears only in the presence of an audio signal on the tape. Modulation noise is due to imperfections in the base and/or magnetic coating of the tape. When an audio signal is recorded, corresponding imperfections appear in the recorded signal and are manifest as noise. As the result of the improvements that have taken place in tape manufacture, modulation noise is less serious a problem than tape hiss.

Tape-amplifier noise occurs both in recording and playback. However, the signal fed to the tape amplifier is generally of much smaller magnitude in playback—the tape delivers but a fraction of a millivolt at many frequencies—so that it is principally noise of the tape playback amplifier which presents a problem.

In sum, the principal obstacles to a good signal-to-noise ratio are tape hiss and the noise (including hum) produced by the tape playback amplifier.

To achieve an adequate signal-to-noise ratio it therefore becomes vital to record as much signal as *practical* upon the tape. But the practical amount of signal that can be impressed on the tape is determined by the distortion characteristics of the tape, the tape head, and the

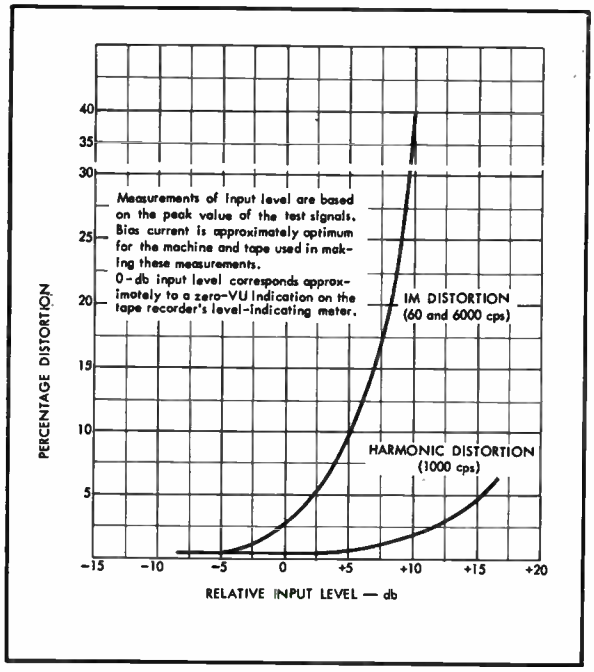


Fig. 3. Variation of tape distortion with changes in input level.

record amplifier. Ordinarily, the tape sets the bounds to how much signal can be recorded. That is, the tape overloads, or should do so, before the tape head and the tape amplifier go into serious distortion.

However, there have been instances where a poorly designed head has produced significant distortion in recording, particularly at low frequencies, although the signal level was not such as to produce appreciable distortion on the tape. Laminated heads, which contain a greater amount of magnetic material, are generally apt to have superior distortion characteristics compared with those of nonlaminar construction.

There have also been instances where an improperly designed recording amplifier has gone into serious distortion at too low a recording level. For example, one instance of this kind involved a machine of professional calibre. Although the amplifier did not produce appreciable distortion when conventional tape was employed, it went into excessive distortion when the recording level was increased to a point consistent with the use of high-output tape, which can accept several db more signal for the same amount of distortion.

For the most part, however, we can assume that it is the tape which sets the limit to the recording level by overloading before any of the other components do.

Figure 3 indicates the variation of harmonic distortion and of IM distortion with changes in input signal. The measurements were taken on a professional-quality tape machine operating at 15 ips. While the results doubtless would be different with other machines, tapes, and speeds, nevertheless these curves can be viewed as representative.

It may be seen in *Fig.* 3 that distortion, either harmonic or IM, increases quite slowly for a while as signal level is increased, but that the rise in distortion becomes precipitous after a point. Severe IM distortion occurs much earlier than harmonic distortion. Hence at recording levels which breed innocuous amounts of harmonic distortion the IM distortion will have risen to unacceptable levels. It is understandable, therefore, why a recording may sound grating if made under conditions where the record level indicator permits 5 per cent maximum harmonic distortion.

On the other hand, a recording that permits IM distortion to reach 20 per cent or more is not always unacceptable. Sounds recorded at such distortion levels are tolerable if their duration is sufficiently brief. Characteristically, many sounds have peak levels 10 db, 20 db, or even more above their average level. While the peaks may be severely distorted, the major part of the sound may be at a level that escapes significant distortion. Whether the distortion in the peaks is tolerable depends upon their duration and how frequently they come along. If the peaks are occasional and very brief, large amounts of IM distortion in the reproduction of these peaks may escape attention.

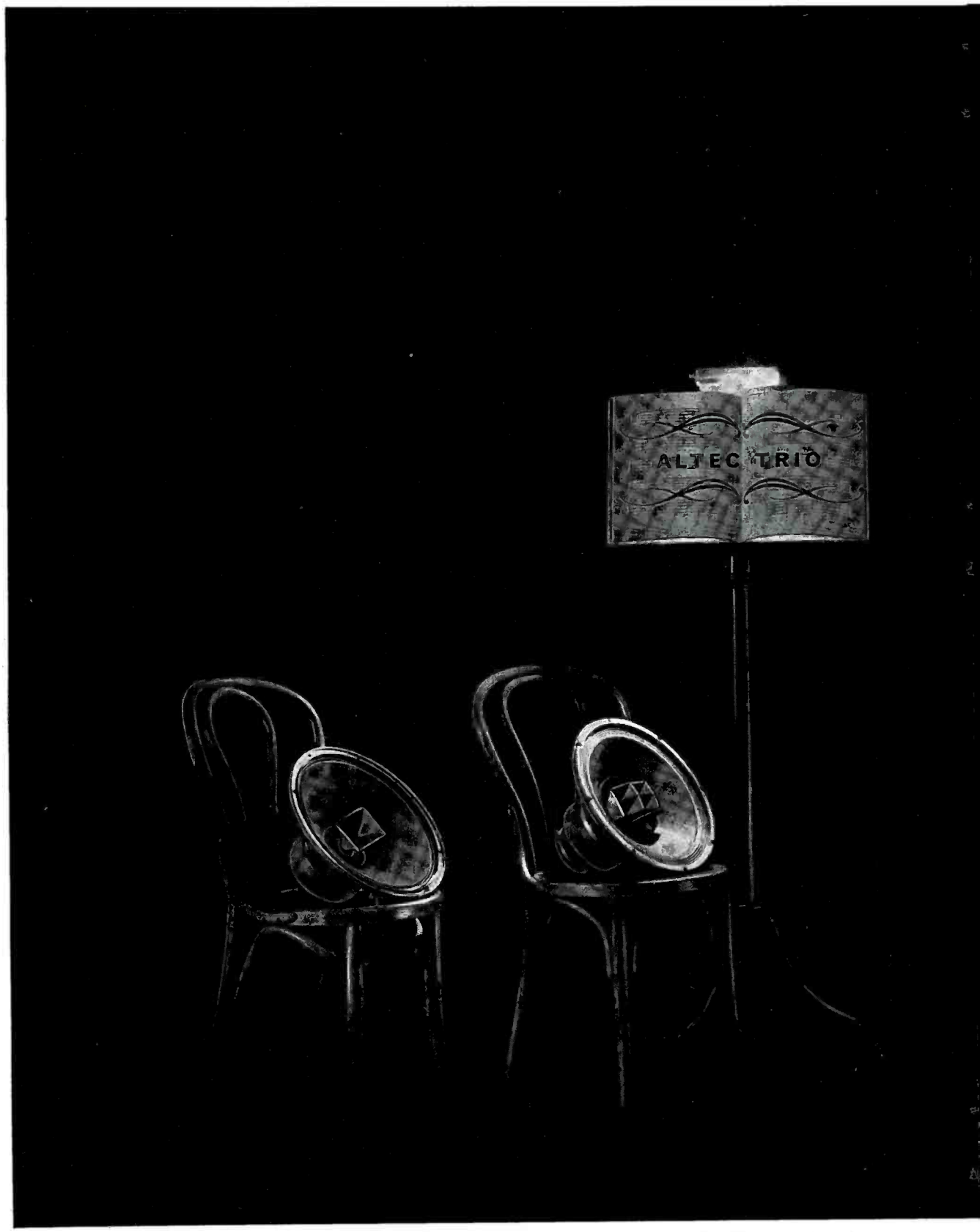
The extent to which distortion is acceptable also depends upon the nature of the sound being recorded. Certain kinds of music must be recorded at lower levels than other kinds in order to maintain clean reproduction. Generally, higher levels of distortion are acceptable in reproducing speech than music. In recording a solo voice or a solo instrument, IM distortion is less apt to be serious than when recording a group of voices or instruments, because there will be fewer intermodulation products when there are fewer frequencies reproduced at one time.

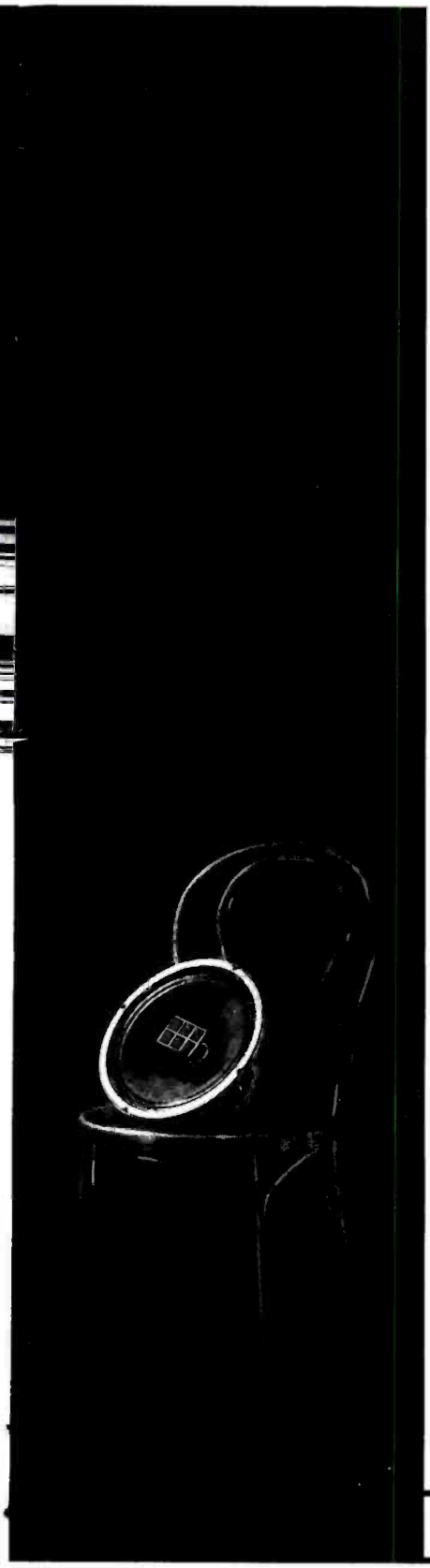
In deciding how high a recording level one may employ for different source material, there is no substitute for experience. The neophyte recordist does well to invest a certain amount of time in experimenting with various recording levels for various kinds of material. In any event, he should remember that the desire for a slight improvement in signal-to-noise ratio—i.e., by raising the recording level just a few db—may bring with it a great increase in distortion if one happens to be at the point where distortion rises rapidly with a slight increase in recording level.

All in all, the recordist has three choices. First, he may be willing to accept occasional noticeable distortion, principally on signal peaks, for the sake of a relatively high recording level and therefore a superior signal-to-noise ratio. Second, he may be unwilling to accept any noticeable distortion whatsoever, but at the cost of a significant reduction in recording level and therefore in signal-to-noise ratio. Third, it is possible in a sense to eat one's cake and have it too by "riding gain." That is, one can record at a moderately high level, well below the point of noticeable distortion, during normal and quiet passages, then reduce the recording level just before loud passages come along. The last alternative requires one to be prepared with a score or other means of knowing when loud passages are about to occur. Also it implies that one is willing to compress the dynamic range (difference between the softest and loudest passages) in exchange for an improvement with respect to distortion.

It must be taken into account that the need to exchange signal-to-noise ratio, or possibly dynamic range, for a reduction in distortion depends upon the tape machine one is using. If the playback amplifier has superior characteristics in terms of low noise and hum, and if the head is specifically designed for playback and therefore has higher output than one intended for both recording and playback, the recordist's task of achieving a satisfactory compromise between the conflicting considerations of noise and distortion is lightened. On the other hand, if amplifier noise is relatively high and head output low, the recordist might conceivably decide he is willing to accept a fair amount of distortion in order to keep noise down relative to the audio signal.

To Be Continued





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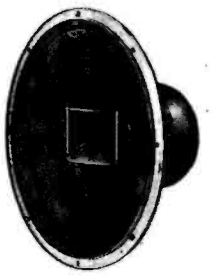
602B DUPLEX



Like the model 605A this unit is another member of the famous ALTEC Duplex family. The 602B is a 15" speaker having the same general characteristics as the 605A. This model has a continuous power handling capacity of 25 watts and a sensitivity rating of 54 db (EIA) distributed over the same wide angle as the 605A type. The high efficiency of the 602B Duplex, with a flux density of 13,500 gauss, together with its guaranteed frequency response of 30-22,000 cycles, is reason for the great popularity of this model. The loudspeaker complete with 3000 cycle network and variable shelving control weighs 25 pounds. **$143.00**

601B DUPLEX

The 601B Duplex is recommended for the finest of high fidelity reproduction in systems where speaker enclosure space is limited. This model being 12" in size does not require an enclosure quite as large as best suited for the 15" size. This example of outstanding craftsmanship is a speaker having the same high frequency response as the models 602B and 605A, and with low frequency reproduction to 40 cycles, and continuous power handling capacity of 20 watts. The Altec design and precision workmanship in this model has created a loudspeaker with a sensitivity of 53 db (EIA). High frequency sound is distributed over the same wide angle of 90° x 40° by means of an exponential horn. The high efficiency of the 601B Duplex, the magnetic field of 11,400 gauss derived from a 1.8 pound magnet, its guaranteed frequency response—is emblematic of perfection and quality. Model 601B complete with 3000 cycle network weighs 17 pounds. Here, too, a shelving control is provided as part of the network for high frequency attenuation. **$120.00**

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Converting the Grundig to Stereo

WILLIAM G. DILLEY*

The method of converting one type of monophonic recorder can be varied to accommodate almost any variety of machine.

THE ADVENT of stereophonic sound, while provding greater musical enjoyment for many, has also rendered obsolete much of the equipment now owned by many others. Monophonic recorders, of course, fall into this category. One must either purchase another recorder possessing both stereo and mono capability, or convert the mono to stereo. The least expensive course of action is to retain the monophonic recorder, but most manufacturers do not provide for such a conversion.

This article outlines such a conversion for the Grundig 800 series recorders, but the principles apply equally well to any monophonic recorder.

Since most owners of tape recorders possess tapes recorded on their machines, and desire to play these, as well as prerecorded stereo tapes, it is imperative that no part of the normal monophonic operation be compromised. This requirement dictates that a separate stereo playback system be used, since the tape equalization provided by this model Grundig is not compatible with American tape curves.

The addition of a stereo palyback head connected to two separate preamplifiers is the best and easiest solution to this problem. It allows playback of either mono or stereo without switching within the recorder itself.

Since the Grundig is equipped with two erase heads (one for each direction), one of these heads can be removed without losing any capability. The playback will remain unchanged, and the tape can be turned over to record the second track in the same direction. Recording can be accomplished in either direction, of course, with new or bulk erased tape.

The advantages of mounting the stereo record/playback in place of the existing erase head are:

1. An adjustable leveling plate is provided to facilitate head alignment.
2. Location insures good contact of the tape with the stereo head.
3. No evidence of the modification is visible, since this is a professional-looking job.

Installing the Stereo Head

Removal of the knobs and four screws on the face of the cover plate will expose the tape heads, as seen in *Fig.* 1. Loosen the leveling plate of either erase head (the erase heads are both located outboard, and the record/playback heads are located on either side of the main drive capstan in the center) and cut the three attaching wires to allow removal of the complete head assembly. Tape the ends of the wires. This operation does nothing except eliminate the erase function in the opposite direction.

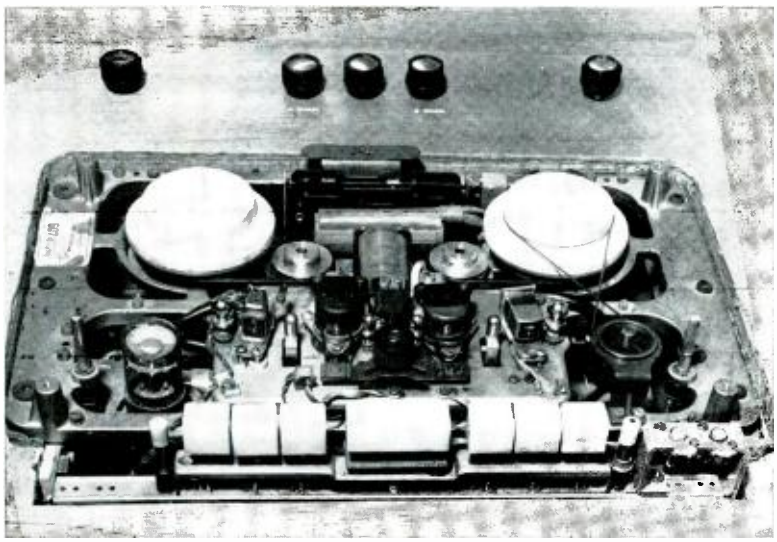

Fig. 1. Top view of Grundig tape recorder showing mounting of stereo heads. Left to right, the four heads shown are the Dynamu stereo record playback unit, the next two are the Grundig R/P heads, and the last is the Nortronics head. The two stereo heads replace the original erase units.

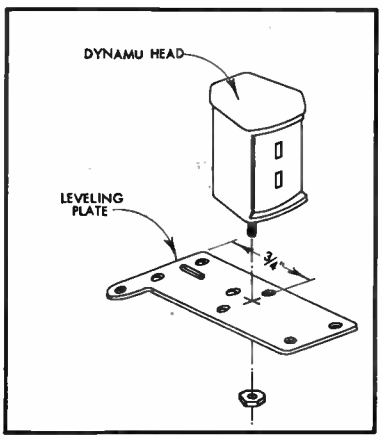

Fig. 2. Details of mounting for Dynamu heads.

The head is then unplugged from the bakelite socket and the socket removed from the leveling plate. If it is desirable to retain the sockets, the rivets may be drilled out.

Figure 2 indicates dimensions for drilling the screw hole for a base-mounting head and *Fig.* 3 illustrates method and dimensions for a rear-mounted head. The dimensions given are for heads normally used in Viking Tape Decks: *Fig.* 2 is a Dynamu head and *Fig.* 3 is Nortronics. Other heads may be installed with only slight placement changes.

For base mounted heads, the hole is drilled to accommodate the head mounting screw. For rear mounted heads, the existing oval hole is used to connect an "L" bracket to the leveling plate, and any small size machine screw or bolt may be used. Flat head types should be used, however, to allow the tape head to center in the proper position without striking the screw head.

After mounting the head on the leveling plate, the plate is attached to the deck by the three leveling screws.

The head leads are then connected to a double phono jack mounted in any

* *577 E. Avery St., San Bernardino, Calif.*

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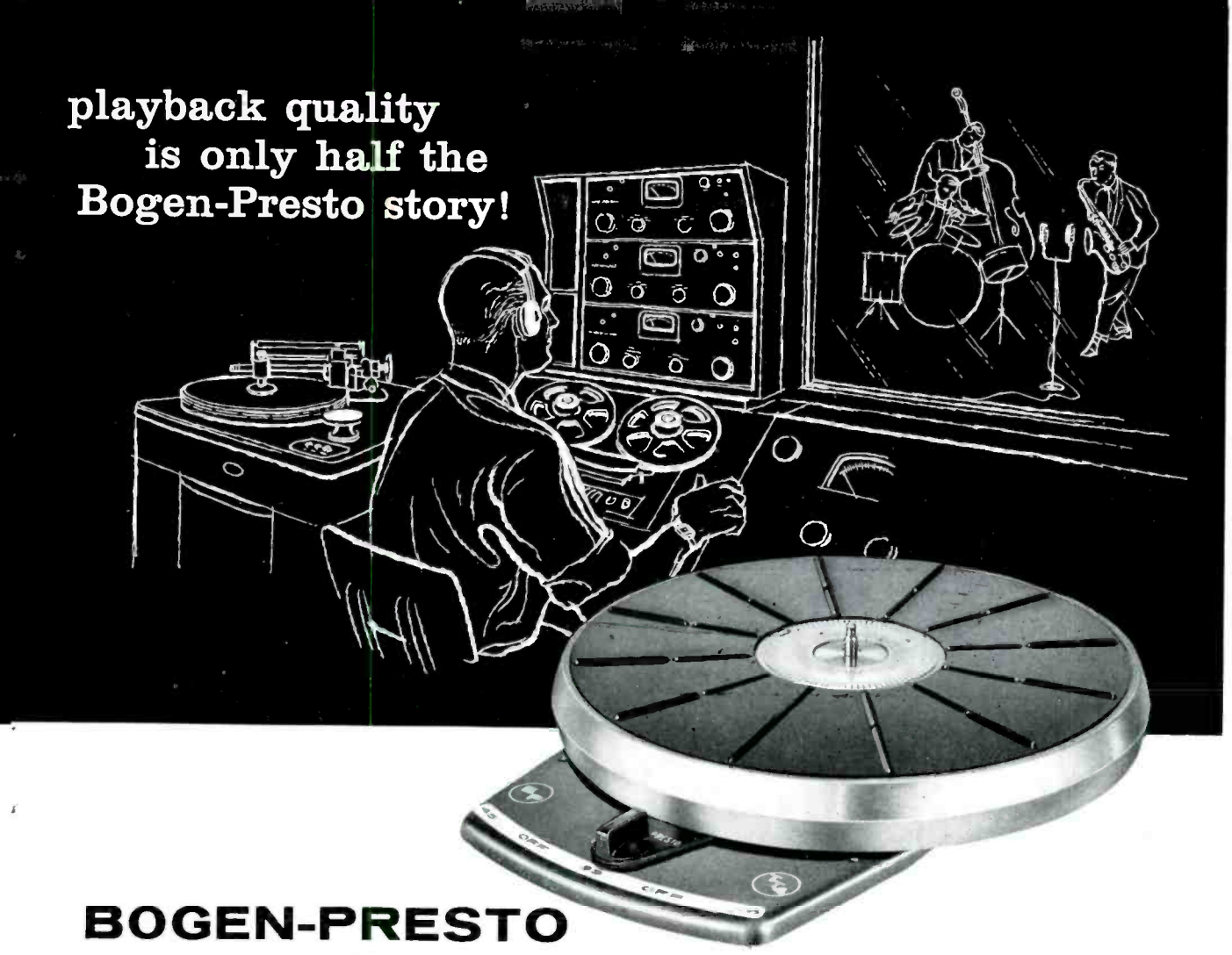

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MODEL TT3 Single speed (33⅓ rpm)—belt-driven by hysteresis-synchronous motor—same turntable material and shaft-bearing design as TT4 and TT5. *Less arm,* $59.95.

MODEL PA1 Professional Tone-Arm, $24.95.

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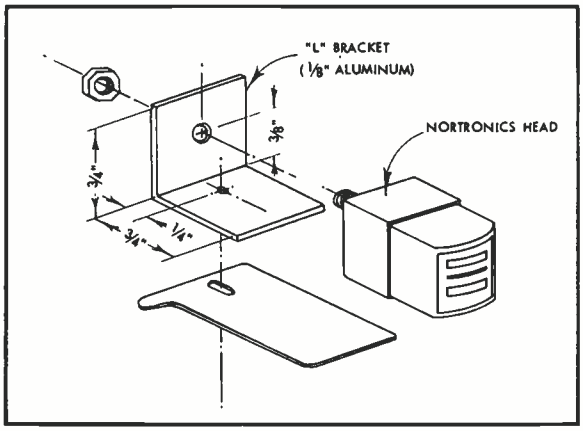

Fig. 3. Mounting details for the Nortronics heads.

convenient position. Two examples are shown in the photographs. The right head (Nortronics) is connected for access from the top of the cover plate for outboard use, and the left head is connected to the side of the chassis for internal use. *Figure* 4 shows the completed unit.

Shielded cable patch cords then connect from the phono jack to the input of two tape preamplifiers. Almost all commercial preamps have a "tape head" position for this purpose.

Since both heads are of high impedance, short leads are desirable for maximum high-frequency output (18-in. patch cords are satisfactory—if longer leads are required, low capacitance cable should be used).

Alignment and Operation

Head alignment is quite simple with the leveling plate, and all that is required is a standard alignment tape containing a high-frequency signal. Demagnetize a small screw driver by placing it close to an a.c. magnetic field and slowly withdrawing it to a distance of approximately three feet. A bulk eraser or coil-type soldering iron will provide the necessary field. Using the screwdriver, adjust the head to a perpendicular position, centered in height by visual means. Play the alignment tape and adjust the leveling screws to obtain maximum signal output, while keeping the tape centered, in height, across the head. If no alignment tape is available, select a tape containing the most continuous high-frequency sound, such as percussion instruments, and adjust the head as described until maximum clarity is achieved. Inspect the head position from the side to insure that face of the head is parallel to the tape or high-frequency losses may occur on one track.

Fig. 4. View of modified recorder. Knobs at top control switching for the stereo heads.

Final head placement should allow at least 15 degrees tape "wrap around" for adequate contact. The Nortronics head allows much more than this and is no problem, but the Dynamu head has a metal outside case with sharp edges which limits this condition. Care should be exercised to assure maximum tape-to-head contact without the tape touching the metal edges of the head. Too much "wrap around" will cause tape damage or a path for static electricity discharge. Not enough "wrap around" will result in uneven tape travel and cause erratic sound reproduction. If hum is encountered, one or both of the following actions should eleminate it:

1. Ground the Grundig tape deck to the tape head input or chassis ground of the external preamplifiers.

2. Ground the shielded leads from the stereo head to the tape deck.

3. The a.c. power plugs of all units should be reversed in power outlets until lowest hum level is attained.

The only required change in operating procedure is during fast forward or fast reverse operation. Since the position (of the newly installed heads) does not allow the mechanism the mechanism to pull the tape away from the heads, the fast moving tape causes excessive head wear and static electricity build-up which may discharge upon the tape. This action is avoided by removing either the selector knob or the volume (depending upon which side the head is installed) and using the shaft as a tape guide or capstan. The rewind or fast forward operation is then smooth and trouble free.

Installation of *two* additional heads, instead of one allows simultaneous record and playback capability. The unit described, has the left head permanently connected to playback preamplifiers for playback only. The right head is used for an outboard recorder which is plugged into the jacks on the face of the recorder. This arangement allows stereo tapes to be played back while they are being recorded (new or bulk-erased tape must be used). Monophonic recordings may be made in either direction with the stereo head, but may be monitored only in one direction.

The approximate expenditure of the two hours of time required to install a stereo head in your recorder is more than amply repaid by the increased value and enjoyment as the result of this simple modification. Æ

MEETING NOTICE

The Tri-City Hi-Fidelity Association will present at its regular monthly meeting on May 23, 1960, a lecture-demonstration entitled "The Bi-phonic Coupler" by Abraham B. Cohen. This meeting will be held at 8:00 p.m. at Yates School Auditorium, Salina Street, Schenectady, New York.

Mr. Cohen is president of Advanced Acoustics, Inc., which manufactures the Bi-phonic Coupler, a new transducer which is attracting widespread interest among audiofans. He is a noted inventor, lecturer, and author of several articles and books on audio subjects.

Our meetings are open to the general public, and area audio groups are especially welcome.

NEW LITERATURE

• **James B. Lansing Sound, Inc.,** 3249 Casitas Ave., Los Angeles 39, Calif., is distributing a new catalog sheet which covers the company's Model LE30 "linear-efficiency" high-frequency driver and Type LX3 matching network. The LE30 is completely sealed and self-contained, and may be mounted in the same enclosure with a low-frequency driver with no special precautions. Ask for Bulletin SB-1018. **E-12**

• **Audiotex Mfg. Co.,** 400 S. Wyman St., Rockford, Ill., lists more than 150 stereo-audio accessories in its just-released 1960 catalog. Detailed descriptions and photographs of each item are included in the 2-color 16-page booklet. List prices are shown. The comprehensive Audiotex line includes accessories for all types of sound reproducing equipment. These range from durable plastic changer covers to gauges and microscopes for measuring and observing record and stylus wear. A full selection of interconnecting cables, adapters, and jacks are illustrated in a variety of lengths for all connections. This catalog is available without cost. In Canada it may be obtained by writing to Atlas Radio Corporation, Ltd., Toronto 19. **E-13**

• **Robins Industries Corp.,** 36-27 Prince St., Flushing 54, N. Y., has just published a 48-page soft-cover book under the title, "Television Tape Recording." Written by George B. Goodall, it is an informative, easy-reading publication which covers the technicalities of video tape recording and playback in practical language. The non-mathematical and formula-free treatment of the Ampex Videotape[1] machine and its operation makes it possible for the layman as well as the expert to gain an insight into the use of magnetic tape recording for both video and audio applications, with emphasis on video. The book is priced at one dollar.

[1] T. M. Ampex Corp.

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(*from page 12*)

was agin it. AND the stereo disc was priced above the mono, leaving compatibility in a sort of price limbo. So the "compatible" disc died before it was born.

The idea was born again, on a relatively small scale, in at least one later instance, the "compatible" recordings on the Counterpoint label (ex-Esoteric). Counterpoint discs were stated to be playable on both mono and stereo equipment—but whether this was a case of semantics I could not say. It has been possible to argue all along, of course, that a straight, non-compromise stereo disc can be played safely via enough mono pickups to call it compatible. The GE mono cartridges, for instance, will play most stereo discs without undue trouble. They provide enough vertical compliance cushion to prevent major damage.

Not wise, you'll say, to count on this sort of accidental compatibility. Indeed, you may think it highly unwise to suggest that there is any compatibility at all. But the fact remains that the argument is not black and white. A stereo disc may be flatly termed compatible, in so many words, and the statement is not 100 per cent untrue by any means.

Whether Counterpoint depended on this somewhat doubtful use of language, or actually cut with reduced vertical excursion is an interesting question. You ask them. Nor do I know whether the stereo aspect of the records was in any way compromised in favor of compatibility. But the discs were, indubitably, *called* compatible. And surely there have been others claiming the same which haven't reached my notice.

Price-Compatibility AND Unigroove?

Now we have the "compatible" record all over again, not from Columbia but from Fairchild, and the story is essentially no different as I see it. I don't even feel that this is the place to argue whether the new process "works" or not. I'm quite sure it does (And if some Unigroove discs turn out to have "blended" the two stereo tracks into each other a bit, there's no saying it might not be a good thing. Too much stereo separation can be a pain, and a bit of compatible blending, especially in Pops music, might be very healthy. I've heard one such Unigroove disc already and it sounds just fine—blended or no.) See p. ??

Unigroove may for all I know provide the very paragon of compatibility, nevertheless. I still must go on record as feeling that the whole thing is an unfortunate development at this time, UNLESS . . .

Unless we have, first, the much more dramatic compatibility that would come with equal pricing of "standard" mono and "standard" stereo discs.

Then, by golly, the "compatible" record might be a reasonable bet.

Look at it this way. If stereo and mono prices were the same everywhere, a compatible disc would have no special price advantage *or* disadvantage. It would not have to make the painful choice of attaching itself to one price level or the other. Therefore it would sell strictly on its own merits. Chiselers would not find it easy, then, to muscle in on the confusion.

If you had your choice of three types of disc, all of the same performance *at the same price*, a stereo, a "compatible" stereo, and a mono—which would you choose?

Whatever your choice, it would be realistic, practical and painless.

And the chances are, I'll bet, that it would be the full stereo disc.

* * *

I rather doubt if compatible pricing will come in via a sober, industry-wide conference and subsequent agreement. In our competitive field it isn't likely to happen that way. Remember the pre-war $1.00 disc and the more recent LP price slashes? All such price cuts that I can remember have been strictly unilateral and with a maximum of drama. The idea is to get a beat on your rivals. Especially if you are big and so are they.

So—go to it, somebody! Somebody plenty big. Get the publicity for yourself, grab the initiative and take the credit. Act big, be dramatic.

Price your monos and stereos the same across the board.

Only the biggest record companies can swing this sort of thing, but any one of them might try it with success. Or any two. Which ones? I wouldn't know. But somebody'd better do it pretty darned soon if stereo is to be put on the rails for good.

FLASH! Since this was written, Everest has advertised both at the same price. Good for them!

2. THAT NEW TAPE CARTRIDGE

A big heading and not much to say—yet. My article in the April issue probably looked a bit silly to you, considering that it appeared only a week or so after the public announcement of the new Columbia cartridge system at the New York IRE meetings in March and slyly prophesied that the cartridge might, perhaps, be announced in June! Natch, I had written the piece long before and, natch, the IRE announcement came just after we were safely and irrevocably "in bed," gone to press. By being a bit too forehanded, I missed the boat beautifully.

No matter, for the new device is not scheduled to be put on sale until 1961, as had been previously hinted in one of our worthy rival magazines by Dr. Goldmark himself, head of CBS Labs. The project is being carried on in conjunction with "3M," Minnesota Mining, and it seems that at this point the tape itself, quite reasonably and logically, is the biggest bottleneck. This strikes me as both an honest and a hopeful explanation. We all know of the really amazing progress in head gap construction and manufacture these last few years, and we all are aware now that pitch stability at the very low speeds is decidedly attainable, even in relatively low-cost equipment. (Remember when the 33 LP record was much too slow for steady speed?)

Other factors in slow-speed hi-fi on tape have been improving right along; the apparent fact is that now the tape itself is the major bottleneck. Reminds me of the problems of fine-grain film when the miniature camera first came out. But there is precious little doubt that with the right impetus, tape manufacturing standards can be raised and tolerances narrowed until the needs of 1⅞ ips recording can be met. That, evidently, is Columbia's target along with 3M, before a major launching of the new tape record.

Why the announcement now, then? Aha—there we run into politics, no doubt. Never forget that there is still officially on the books a rival tape cartridge launched by our friends at RCA and not, at this point, an outstanding success. Perhaps an announcement at this delicate point might give it a polite *coup de grâce*. From CBS to RCA with love? My own idea—strictly speculation.

I did suggest, last month, that this was a year of decision for tape. The new announcement proves it handily. We still have four-track 7½ ips tape and this excellent medium has a year's grace in which to organize itself for its own best values or, alternatively, to modify its aims towards the inevitable slower speeds. Four-track 7½ ips is fortunately not too expensive now and it has the major advantage of being in production—and playable on most present new machines. Make hay while . . .

3. DON'T THROW IT OUT—CONT.

In our March issue we inadvertently put my discussion of the new Dyna-Empire stereo arm under the general heading of "Don't Throw It Out" and I hereby bow an apology to Dyna-Empire, in case that company thought I had ever had such an intention! (*Apparently they didn't, for they didn't mention it.* ED.) At this point I would not even think of the possibility of throwing out my Empire 98, and I suspect I'll feel the same way for quite awhile to come. What happened was simply that two other items under that heading had to be postponed due to space limitations. Then the boldface typography in our leads somehow slipped a joint and found itself in the wrong place. The culprit was myself—my copy was very late.

The postponed items will follow, and I'll add more from time to time, since I think it's interesting to follow up on older equipment now and then as a sort of perspective on the new.

Those Mono Tables

I am still using no less than three old mono-intended turntables, built before the stereo era, and two of them are playing stereo records very nicely. The third continues as a superb table for mono broadcast tapings of both stereo and mono discs—my radio program is still, of course, inescapably mono throughout and will continue so until the F.C.C. comes to some decision as to stereo broadcasting.

The best table I've ever had, if you take the product of the equation time/quality, is also my oldest table, the Rek-O-Kut (now Rondine) T-12H, with hysteresis motor. This really superb old machine just plays on and on and on, year after year. And the best thing of all is that it turns out to be a very acceptable stereo table, with vertical rumble low enough so that there is only a slight difference between mono and stereo playback, reasonably acceptable for my listening purposes.

I think this T-12H is an excellent illustration of the important distinction between professional and . . . well, consumer quality. Professional equipment is generally better in performance but its real superiority is in the simple matter of quality, of strength, durability, reliability. The "T" lines of Rek-O-Kut tables were originally designed as professional equipment, or modified from it. The table was basically a recording table, the 12-inch model adapted, if I'm right, from the fully "pro" 16-inch job. It is enormously massive, the bearings

(*Continued on page 67*)

MONAURAL CONSOLE OWNER—WHY DON'T YOU RELEGATE THAT ANTIQUE RELIC TO THE ATTIC AND GET INTO STEREO THE EASY WAY WITH THE PILOT "602"?

MONAURAL COMPONENT OWNER—YOU'LL NEVER BE ABLE TO PERFECTLY MATCH YOUR PRESENT EQUIPMENT. GET INTO TRUE STEREO WITH THE PILOT "602".

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GET INTO STEREO THE EASY WAY WITH THE AMAZING NEW PILOT "602" ■ IT'S A STEREO FM/AM TUNER ■ IT'S A STEREO PRE-AMPLIFIER ■ IT'S A 30-WATT STEREO AMPLIFIER ■ IT REPRODUCES STEREO OR MONOPHONIC SOUND ■ IT FEATURES PILOT'S NEW SIMPLIMATIC TEST PANEL—BALANCE OUTPUT TUBES USING YOUR SPEAKER SYSTEM—WITHOUT EXTERNAL METERS ■ IT FEATURES PILOT STEREO-PLUS FOR CENTER FILL ■ IT'S ONLY 239.95 ■ IT'S THE

PILOT 602

Controls: Master Volume/Power, Automatic Shutoff, Loudness, Stereo Balance, Dual TroLok Controls (Bass Channels A & B, Treble Channels A & B), 8 position Selector, FM tuning, AM tuning. Inputs: 2 pair non-shorting for permanent simultaneous connection of multiplex adapter, tape recorder or TV—1 pair for turntable or changer. Outputs: 4—Channel A & B tape, Multiplex 1 & 2. Sensitivity: FM—2uv for 20 db of quieting on 300 ohm antenna; AM—3uv for 1 volt DC at detector; Phono—3 millivolts; Multiplex—110 millivolts; Tape recorder 110 millivolts. Tube complement: 16 tubes, 1 tuning indicator, 4 silicon diode power rectifiers, 3 germanium diodes. Speaker impedances: 4, 8 and 16 ohms. Weight: 26 lbs. Write for complete specifications.

ONLY PILOT COULD HAVE BUILT THE NEW "602"

FOUNDED 1919 ■ PILOT RADIO CORPORATION, 37-04 36 STREET, LONG ISLAND CITY 1, NEW YORK

EQUIPMENT PROFILE

SONY WIRELESS MICROPHONE, MODEL CR-4

Why any stage or night-club performer is content to drag around a microphone cable while he goes through his act when a device as effective as the Sony Wireless Microphone is available is almost beyond understanding. Shown in *Fig.* 1, the complete system consists of the transmitter, receiver, microphone, antennas, lavalier pouch, and the carrying case—the latter having a drawer above the receiver section to accommodate the transmitter, microphone, and cables in a neat fitted case.

The transmitter uses three transistors—one as audio amplifier, one as a frequency-modulated oscillator, and one as doubler-amplifier. The oscillator operates at 13.56 mc, resulting in an output signal at 27.12 mc, which is in the Citizens Band where no license is required. The transmitter is powered by two 9-volt batteries inside the case, and current drain on the unit tested was only 4.7 ma. The case is metal, to provide shielding against variation of frequency due to changes in body capacitance with the oscillator, and is 4⅛ in. high, 2¼ in. wide, and 1 in. thick. The dynamic microphone has a maximum diameter of 1 3/16 in. tapering down to ⅞ in. and is 2¾ in. long.

The receiver unit proper is 9⅝ in. wide, 7¼ in. deep over-all, and 4½ in. high, and fits snugly into the leatherette-covered carrying case which is 9 in. deep, 10½ in. long, and 8⅜ in. high. A hole in the top of the case permits operation with the receiver still in the case, although for permanent use it is more likely that it would be removed and used in its own metal housing. The receiver uses a fairly conventional FM circuit, with the r.f. and mixer circuits fixed-tuned and only the oscillator being variable over a narrow range. The output impedance is 50,000 ohms, and is available at two output jacks—one a standard phono jack and the other accommodating a telephone plug. The gain control affects only the loudspeaker level, and may be turned down without affecting the normal outputs. Both a.f.c. and squelch circuits are provided, and a rear-mounted switch permits the user to disable the squelch circuit when desired. Two neon pilot lights are mounted on the panel, along with the monitor speaker. One, adjacent to the monitor volume control indicates when power is on, and the other indicates the presence of a signal—thus serving as a tuning indicator. The squelch circuit silences the audio section of the receiver when no signal is present—this being necessary because of the use of a Foster-Seeley type of discriminator instead of a ratio detector. The receiver circuit uses a grounded-grid r.f. stage followed by the mixer and three i.f. amplifier stages, the third serving as a limiter.

Performance testing of this unit was carried out using a tape recorder to take down the signals as we walked away from the receiver, and indicated the distance as we walked. Reliable operation was observed up to 350 feet from the transmitter with the antenna draped over the shoulder and with the squelch on, and all the way to 900 feet with the squelch off. With the transmitter antenna held straight up, reliable operation extended 50 and 100 feet farther, respectively, even though specifications call for operation maxima of 300 and 800 feet respectively.

Using an oscillator to feed a signal into the transmitter at the microphone jack, frequency response was down 2 db from the midrange response at 32 and 11,500 cps, with 1.5 per cent distortion (1000 cps) at a receiver output of 1 volt. The microphone has an output impedance of 1500 ohms, and is claimed to be flat within ±3 db from 70 to 10,000 cps, which is about normal for the lavalier types.

While many applications for wireless microphones do not require broadcast quality, nothing short of this will suffice for the entertainment field. The principal application for a wireless microphone is in sound reinforcement where it is not convenient to employ a trailing microphone cable, and both the quality and performance of the Sony unit makes it ideal for this purpose. Many other applications could take advantage of the wireless feature, and at the comparatively low cost it would seem as though this device should enjoy wide acceptance. E-25

Fig. 1. The Sony Model CR-4 wireless microphone.

ALTEC MONTEREY AND MONTEREY JR. LOUDSPEAKERS

Describing the performance of any of the many "bookshelf" speakers now on the market is somewhat like trying to describe the taste of some culinary concoction to one who has never eaten it—there is too much subjectivity involved. Furthermore, the terminology used in describing loudspeakers is not sufficiently well established that it is possible for a reviewer to conjure up a facsimile of the performance in the mind of the reader. Altec's Monterey line does differ in sound, however, but the difference can only be described as being "subtle."

The smaller of the two models is the Monterey, Jr., which is shown in *Fig.* 2. This unit measures 23 in. high, 11¼ in. wide, and 11¼ in. deep, and is available in walnut, blond, and mahogany. It consists of a "controlled linear excursion" cone speaker for the low-frequency portion of the spectrum and a 3-in. direct-radiating tweeter for the highs, together with the necessary crossover network. The entire system has a power rating of 15 watts, and works at an input impedance of 16 ohms. The cabinet is finished on all four sides so it may be used on a room divider-bookshelf, set on the floor, or mounted on the wall in either vertical or horizontal positions as required without showing an un-

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the manufacturers of over 350 models of speakers presents :

HIGH EFFICIENCY STEREOPHONIC SPEAKER SYSTEMS

Highly efficient and with flat response, the brilliancy of Pioneer speakers are enhanced by the use of these compact, handsomely finished enclosures.

CS-12A....12″ coaxial speaker system
CS-8B .... 8″ coaxial speaker system
CS-8A .... 8″ mechanical 2-way speaker system
CS-6A ....6½″ mechanical 2-way speaker system

For particulars see below :

Model CS-12A

Type: Infinite baffle type
Speaker mounted: 12″ coaxial, 16 ohm
Frequency response: 45-16,000 cps
Power input: 20 watt
Sensitivity: 101 db/watt
Dimensions: 15¾″ (H) x 23⅜″ (W) x 10¼″ (D)
Color: Cherry

Model CS-8A (BOOKSHELF TYPE)

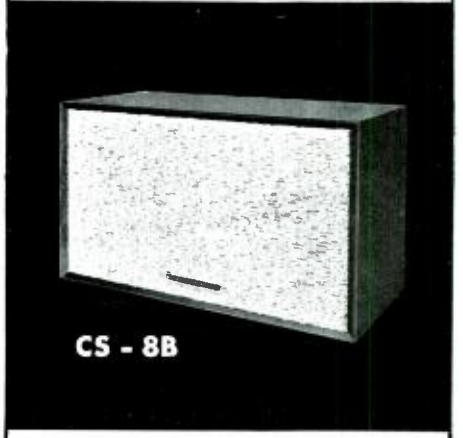
Type: Infinite baffle type
Speaker mounted: 8″ mechanical 2-way, 16 ohm
Frequency response: 50-16,000 cps
Power input: 6 watt
Sensitivity: 99 db/watt
Dimensions: 12⅝″ (H) x 20½″ (W) x 11″ (D)
Color: Cherry

Model CS-8B (BOOKSHELF TYPE)

Type: Infinite baffle type
Speaker mounted: 8″ coaxial, 16 ohm
Frequency response: 60-16,000 cps
Power input: 8 watt
Sensitivity: 99 db/watt
Dimensions: 11¾″ (H) x 22⅞″ (W) x 9⅞″ (D)
Color: Cherry

Model CS-6A (BOOKSHELF TYPE)

Type: Bass-Reflex type
Speaker maunted: 6½″ mechanical 2-way, 16 ohm
Frequency response: 80-16,000 cps
Power input: 3 watt
Sensitivity: 96 db/watt
Dimensions: 11″ (H) x 19″ (W) x 9″ (D)
Color: Cherry



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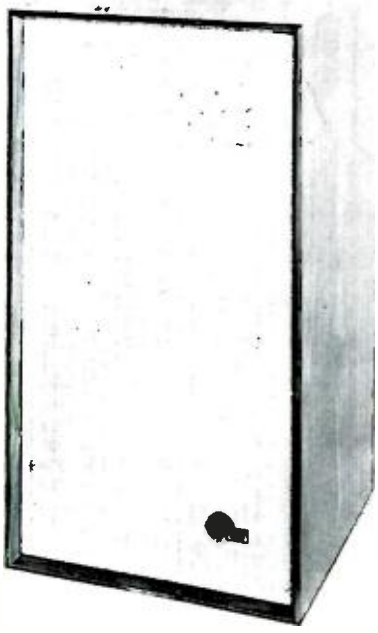


Fig. 2. Altec Monterey Jr. loudspeaker system.

finished surface anywhere. Altec gives this unit a guaranteed frequency range of 45 to 18,000 cps, and on test it covered the lower end of this range nicely—we don't hear up to 18,000, but the high end was perfectly adequate as far as we can hear, which is around 14,000 cps. At higher levels doubling was noted below 38 cps, but this was only at sound volumes that were painful for continuous listening. The general impression of the Monterey Jr. is that it is clean and crisp, and while the low end is not prepossessing, it is smooth enough that minor adjustments of the tone control will give excellent balance without introducing boominess. Used as an extra loudspeaker in another room from the normal listening area—and thus being supported by the bass response of the main system—the Junior was ideal.

The Monterey is somewhat larger, measuring 26 × 14 × 14½ deep, and consists of two low-frequency speakers and a sectoral high-frequency horn for the treble end. It is considerably richer on the low end, yet still exhibits the smoothness and cleanness of the smaller model. The top end is claimed to extend to 22,000 cps, but this becomes almost academic since it is doubtful if any practical source—short of a live orchestra pick-up in the next room—would provide such a range. This model is also finished on all four sides, and if it were to be hidden it is likely that the listener would take it to be a much larger unit than it is. Response is rich in the lower register, with no doubling noticed until the frequency reached 33 cps, again at a high volume. Power rating for this model is 20 watts, and impedance is 8 ohms.

Both speakers are efficient, and a 100-mw transistor radio will drive them to a satisfactory room volume. Using the two units as a stereo system indicated some deficiency in the Junior model, but with control units capable of individual channel adjustment of bass response they could be set to provide a clean and well-balanced program. **E-26**

Fig. 3. The Altec Monterey, with two woofers and a horn-loaded high-frequency unit.

MADISON FIELDING SERIES 440 STEREOPHONIC RECEIVER

Incorporating the same circuitry in the amplifier section as in the Series 360, this new Madison Fielding stereo receiver adds what are essentially two separate tuners and combines the entire assembly in a single case at a considerable economy over separate amplifier-tuner set-ups. The Series 360 amplifier was described in the January issue, and consists of a pair of 20-watt amplifiers together with the necessary control facilities for mono or stereo operation. The new model also employs the "Aural Zero Null" method of balancing the two amplifier sections, described fully in the February issue.

In the stereo mode, the preamplifier permits feeding any of the six inputs—tuner, multiplex, auxiliary, microphone, tape head, and phono pickup—to either channel, with indicator lights showing the inputs which are connected. Normally, FM appears on Channel 1 and AM on Channel 2, although the mode switch permits reversal of this arrangement. In the mono position, any indicated input is fed to both channels. Noise (scratch), rumble, loudness, speaker phase, and monitor switches are provided, aud separate channel level controls on the front panel permit balancing and allow the user to select the operating point on the ganged master volume control so as to obtain suitable compensation when the loudness switch is turned on. Bass and trehle tone controls are separate for the two channels, allowing individual adjustment, but we would prefer to have both treble controls on one pair of knobs and both bass controls on the other so that changes in either bass or treble could be made by grasping both knobs and turning them together. As the unit is arranged, each pair of concentric controls serves one channel—the inner knob for treble and the outer for bass—so one needs two hands to change both channels simultaneously. However, the ability to feed separate sources into the two channels is one feature that we consider desirable—we even went so far as to change one amplifier over with a dual-concentric switch just to get this flexibility. Not everyone wishes to play phono or microphone on one channel and tape on the other, apparently, though it is convenient for comparisons sometimes. A jack is provided on the back for stereo headphones.

The FM tuner uses a grounded-grid r.f. stage and a triode mixer for low noise, three i.f. stages with the third acting as a limiter, and a wide-band ratio detector. The a.f.c. is quite effective, and holds a tuned-in station excellently through normal warm-up drift. Both FM and multiplex outputs are provided, in addition to the normal FM feed to the selector push buttons. The AM section uses a tuned r.f. stage following a large rotatable ferrite loopstick, and a single i.f. stage gives sufficient sensitivity for any stations close enough to give high-fidelity reception. The tuner sections have separate indicators, and since the slide-rule dials are not superimposed, tuning is clearly indicated.

The Series 440 is a handsome unit and offers practically any control function that the user might want. Since both tuners and control unit are in the same enclosure, it is a very easy instrument to use, and the sound it produces is in keeping with its impressive appearance. **E-27**

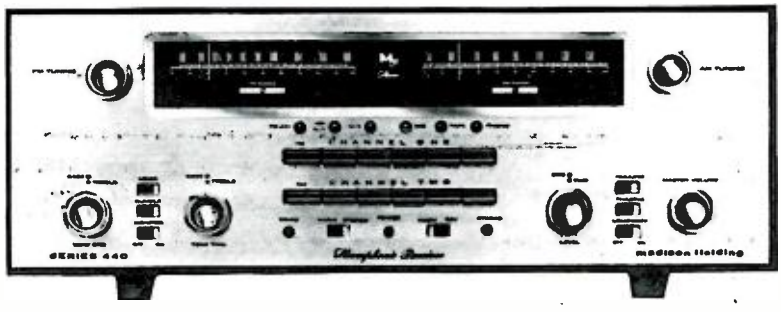
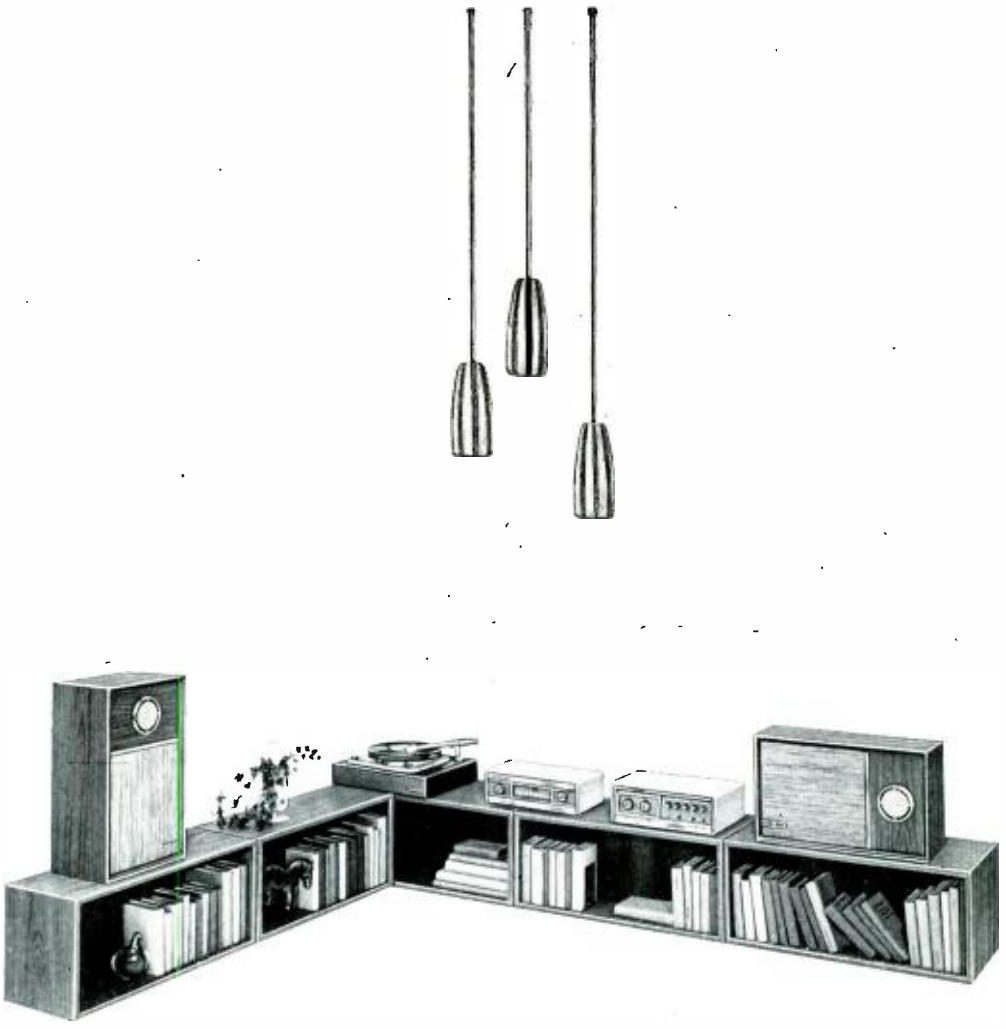


Fig. 4. Madison Fielding Series 440 Stereophonic receiver—two tuners, two preamps, and two power amplifiers all in one package.



General Electric Bookshelf Speaker System—Superior in the four vital areas

No matter how good your other components, what you ultimately hear from your stereo system will be no better than your speakers. For this reason, exceptional care should be exercised in speaker selection. The important things to watch for are **size** (remember, you'll need two), **bass sound power level, high frequency performance,** and **appearance.** Appearance is especially important in speakers because they form an integral part of your room decor.

Size: General Electric's Model G-501 Bookshelf Speaker System brings you G.E.'s famous Extended Bass performance in an ultra-compact one cubic foot enclosure ideal for stereo. It measures only 9¼" x 13" x 22".

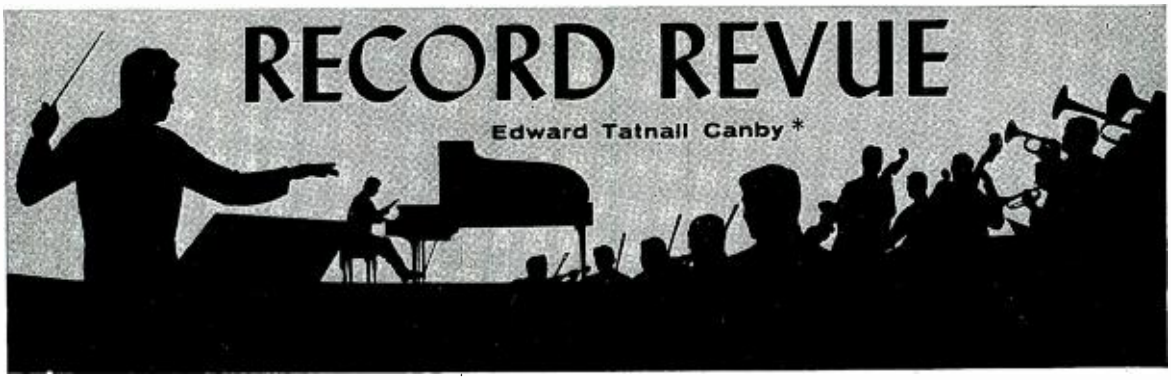
Bass: This dramatic new design provides up to four times the bass power output of conventional speakers in comparable enclosures. Low frequency response is unusually full and clean, thanks to the G-501's sealed enclosure and high-compliance woofer.

Treble: A new 3-inch tweeter achieves maximum dispersion of highs for full stereo effect. A special cone and voice coil extend response, while the dome improves reproduction at high volume levels.

Appearance: The compact, distinctively-styled enclosure is handsomely finished on all four sides so that it may be used on either end or either side to fit almost any room setting. Grille cloth designs are individually patterned for each of four genuine wood veneer finishes — walnut, ebony and walnut, mahogany, cherry. **$85.00** (manufacturer's suggested resale price, slightly higher in the West). Other complete speaker systems at **$57.95** and **$129.95.**

General Electric Company, Audio Products Section, Auburn, N. Y.

GENERAL ELECTRIC



NEW DIRECTIONS

The 25-Year Retrospective Concert of the Music of John Cage (May 15, 1958)

(George Avakian, 10 W. 33rd St. New York 1, N. Y.) (3) stereo

Now look—laugh your head off at this, but don't fail to take it seriously, even so. This famous New York concert brought to a head, so to speak, the works of one of the most flamboyantly, brilliantly eccentric musical minds of our time. Two minutes of its sound should show you that the man is no namby-pamby but a tremendous brain, zany or no. Dali is pallid by comparison.

Let me quote his words, as of no less than 23 years ago, from the inner fold of the brown wrapping paper contraption that is the booklet in this album:

"I believe that the use of noise will continue and increase until we reach a music produced through the aid of electrical instruments which will make available for musical purposes any and all sounds that can be heard. Photo-electric, film, and mechanical mediums for the synthetic production of music will be explored. (*Note: no tape in 1937.*) Whereas, in the past, the point of disagreement has been between dissonance and consonance, it will be, in the immediate future, between noise and so-called musical sounds. . . ."

I'd quote more if I had room; for this is an extraordinarily far-seeing prophesy out of a youth of 25, back in 1937. It's typical that these very words, in the present "booklet," are dispersed, in caps, over several pages of other text in the form of seemingly meaningless sub-heads; not even genuine prophecy can be set forth in ordinary fashion in this world of avant-garde experiment! But the prophecy *is* here, and so is the sound of Cage's work, taken down at the actual concert.

I've only sampled it so far—it'll take me weeks to absorb what I'd like to. I'm listening to the piano concerto, a whole side of amazing squawks, blats, wheezes, crashes, electronic bleeps, during which the audience applauds heartily at a point where (it says) the tuba player put the bell of one tuba up against another and blew hard. There are cats and mice and hippopotami in the music and it's very long, but I like it, definitely. Wild applause and catcalls for minutes, at the end.

The portfolio of reproduced samples of Cage's written scores is as interesting as the sound itself—indeed, they were exhibited as works of art and surely are just that. A fanatic with incredible persistence, patience, a canny sense of eccentric drama and, under the zaniness, a mind that may well turn out to know more about music than most of those around today.

The album has three LP records plus portfolio. Get it!

P.S. I note, belatedly, that the Concerto above does not exist in any given state; the pianist has his choice of 84 different bits of composition in a book, which he may play whenever and wherever he wants; the piece can be long or short to choice and is never in a final state though Mr. Cage suggests sublimely that he finds each performance definitive.

P.P.S. Just listened to a song for contralto and piano. John Cage is the pianist. He just thumps on the piano's wooden frame, bongo-style. The strings never even get touched. Nice.

P.P.P.S. Piece for twelve tom-toms . . . one for electronic carillon—some carillon, by golly. "Construction in Metal," just as it sounds, and super-hi-fi in stereo. "Williams Mix," an early (1952) tape mix, 600 or so sound snippets spliced into less than five minutes, the effect (calculated for nine months) superficially like random high-speed radio tuning. Took a further look at those scores—you engineers will find a kindred spirit there! Incredible.

New Directions in Music 2/ Morton Feldman Columbia MS 6090 stereo

Here is more of the advanced thinking in the art of organizing sound, from a younger, more sophisticated and less overtly dramatic thinker who has followed John Cage and other artists too—Jackson Pollock, Philip Guston—in his characteristically mathematically orientated music structures. This man graphs his music. He employs "unpredictability reinforced by spontaneity" (which in a very different musical area is also typical of folk music and jazz thinking) and sets out his work in precisely beautiful formulas, delimiting the "plus-or-minus" extent of permissible variation or randomness, both via conventional notation and via newly invented graphic systems. One piece for violin and piano looks, on paper, like a sketch for several small modern houses, floor plan only.

This preoccupation with probability, with precise areas of random variation, is, you see, highly typical of our day. It is as legitimate here as it is in jazz and in Jackson Pollock's inspired paint-dribblings. As always, there must be minds, generally eccentric, to develop the new lines of inquiry; as always there are creative geniuses (like Pollock) who will turn out good stuff whatever the theory, and maybe in spite of it.

You'll be more interested in the theories here than the music itself—but you can listen to it if you want, thanks to Columbia.

Scarcely room to credit all the live performers, seven of them, nor to give the titles of the works (11)—such as "Intersection 3 for Piano," "Structures for String Quartet," "Extensions 1 for Violin and Piano." It's all done with dedication and care, but John Cage is more exciting. Personality makes the difference.

Highlights of VORTEX Folkways FSS 6301 stereo

VORTEX is a dramatic sound-and-sight show that is put on at various times in a San Francisco planetarium, combining tape-created "musique concrète" with visual projections and fancy stereo sound. It has apparently been a huge success in that enthusiastic center of the uninhibited arts, and here is a two-dimensional sampling of the sound part of the show, in conventional stereo and a far cry from the all-around, multispeaker sound-blanket produced in the original. It's pretty solid, even so.

You've got to expect a certain display of advanced-type airs and graces in such presentations; it seems to be a necessary part of most artistic experimentation in public and it does focus attention and draw the crowd, for better or worse. The composers here look like a group of high school students, but the accounts of their music are grandiose enough to knock you for a loop of tape. "In this work," says a Mr. Longfellow, "I have endeavored to create musically the cycle of cosmic beginning and ending." Anybody who "endeavors" to do that is out for big game, but I found this particular cosmos mostly some rather pleasant twangs out of the inside of a piano, played frontwards and backwards and reverberated. Nothing very revolutionary about that, these days.

The sound, in other words, is more of that increasingly familiar sort that is being produced in many another place than San Francisco, and I'll admit that, once the airy accounts are absorbed, the techniques used turn out to be mostly competent and very professional, with some striking effects along with a good many that are by now commonplace—that eternal tape-echo "Dah-dah-dah-dah-dah," for example, fading away or building up to a jumble of noise. I was fussing with that stuff five years ago, but then I'm just an old graybeard.

The most impressive item to my ear was one of the simplest, a tape canon via the two stereo speakers. The two channels contain the same recording but spaced apart a couple of seconds or so, and the spatial-rhythmic play between them is the essence of a basic musical device, neatly brought up to date. ("Three Fifty Dash Two" is the title and all Ampex owners will catch, natch.)

The Two Pianos of Leonard Pennario Capitol SP 8517 stereo

For one man to record two pianos is nothing special these days, but nevertheless, this new recording does bring up interesting questions.

Is it artistically, aesthetically, right to have one pianist play both "parts" of a two-piano piece? Well, judging from results here I'd say yes in all situations where the two pianists are not treated as two individuals.

There is actually little two-piano music clearly for two protagonist players. Mostly, the pianists merge their efforts for a twenty-fingered piano "orchestra," like the players in an orchestral work. Mr. Pennario simply gives himself a double set of fingers here, plus a bigger sound and some incidental right-left effects that are pleasing though of no great importance one way or another. His teamwork with himself is, of course, excellent; the problem of playing to his own performance (via earphones?) is surely no greater than playing to that of another performer and, when you come down to it, not really any more artificial. Bartok, for instance, writes melodic lines in his two-piano music clear across the printed page from one piano to the other, as though the two pianists were actually one thinking person.

Note that there are other situations where this doubling-up technique is musically very wrong. The Bach Concerto for Two Violins, for instance, is seriously hurt in its intended impact when a single performer plays the two parts. As written, they are almost identical in musical content; the idea, of course, is that two different performers playing the very similar music provide life and contrast

* *780 Greenwich St., New York 14, N. Y.*

through their differing and even opposing personalities. A single performer on both parts removes the contrast and kills the piece. (Even a pair of twin violinists who once recorded this music together produced a similarly deadened impact.)

Try Pennario, then, and note how the musical interest varies from work to work according to the way the two pianos are used by the composer. You'll find Brahms and Dvorak dances as well as dances by Grieg, Arensky, Chopin, some of these in two-piano arrangements. The Chasins elaboration of the "Blue Danube" waltz is really a new piece, a sort of frothy finger-fantasy on the well-known music. You will enjoy it. Stereo is almost essential, of course, for any such recording as this, today.

TAPE MARCHES ON

Ezra Pound Reading His Poetry
Caedmon TC 1122

Ezra Pound is not exactly the audioman's poet, but his recording should be noted for a number of good reasons. Pound, you may remember, is the eccentric, now-elderly genius who wrote challenging, annoying poetry, influenced a generation of thinkers and writers, took up Fascism and Mussolini: with enthusiasm, generally managed to get himself in bad with just about everybody but the faithful, was locked up for a good many years in this country, then, at last released from his hospital, went sailing back to Italy again as testy as ever.

In other words, Pound is the classic example of the old saw that you have to take the bad with the good. He is high-power proof (and proud of it) that art and politics, art and ethics, art and any old thing, simply can't be sorted out from each other! A dreadful old man, maybe, but also a first-rate creative mind.

The two Caedmon partners — two girls, mind you—started visiting Pound with the idea of a recording when he was still locked up. To what ends, please note, will today's modern tape recordist go! It must have been hair-raising, and their first take was mostly in Provencal or something (to be issued later). Hoots of other hospital inmates heard in background.

But by sheer feminine persistence and via helpful friends, the man was caught in all his magnificent irascibility while en route from the hospital to Europe, and here he is. What a sound-portrait! Everything you've heard about Pound is right there, in two minutes of listening, though the material isn't particularly revolting (as it could well be). A marvelous self-portrait of a controversial figure, such as only our new audio art has ever made possible. Imagine Machiavelli, or the Marquis de Sade (Sadism to you) speaking blithely into Caedmon's mikes!

Side-note. Eccentric he may be, but Pound speaks very much out of his now-bygone generation. His sing-song poetry, fancy rolled R's, upturned phrase endings, his occasional dramatic slangisms, mixed in with highbrow Latin, Italian, French and what-have-you, are in manner straight out of the age of Churchill, James Joyce, T. S. Eliot, Carl Sandburg, Sean O'Casey. No deadpan modernism here.

MacLeish: J. B. (Elia Kazan Production)
RCA Victor LDS 6075 (2) stereo

Here's the Broadway play itself for those who have, or haven't seen it in the flesh (I haven't) and suffice it to say that this recording makes maximum use of imaginative stereo to translate the play into the recorded medium. There's even a spoken introduction by the playwright, MacLeish himself, which is more than you'll hear on Broadway every night.

Much is made of a strictly legitimate two-track technique that is not properly stereo at all but is enormously useful in recorded drama (and even in opera)—one actor in each speaker, close-up. I fussed with this technique myself, experimentally, back in 1952 and am delighted to see it put to such widespread use today. The opening section here, for instance, features the two old men in conversation, one on each side of your home stage; incidental effects occur in the stereo background. Much is made, too, of a cavernous sort of reverberation that is impressive in recorded drama though completely unrelated to any conceivable live-stage effect. Good stuff, and commendations to RCA for constructive stereo operations.

Breton: La Verbena de la Paloma (The Festival of the Dove). Iriarte, Ausensi, Rivadeneira; Coros Cantores de Madrid, Gran Orquesta Sinfonica, Argenta.
London OSA 1102 (2) stereo

The odd thing about this engagingly popular Spanish operetta (1894) is that it is so very much of the French school, both Bizet (as in the pseudo-Spanish "Carmen") and Offenbach. The light, colorful, showy style, the easy-going music, the slightly lecherous humor, are all out of France and pleasurably so. Yet the music itself is in the familiar Spanish style, including some astonishingly "authentic" Flamenco—for a time when real native-style music was not considered very elegant unless well dressed up.

Two old Spanish hypochondriacs, talking medical shop in cracked voices (one of them has two lovely chicks after him and his money, set the light satirical tone here and the "cafe" scenes, including the Flamenco, carry it onward brilliantly. The singing and playing are both top-quality and the over-all earnestness and enthusiasm might set an example for our own sometimes unspontaneous show biz. The stereo is superb; London's opera stereo can't be beat.

Delius: Florida Suite; Dance Rhapsody #2; Over The Hills and Far Away. Royal Philharmonic, Beecham.
Capitol SG 7193 stereo

The early and youthful "Florida" suite by Delius is an unexpected pleasure, throwing a somewhat odd new light upon the Delius output, from the American viewpoint. The later Delius, assiduously championed by Sir Thomas, seems to most of us over here pretty turgid stuff, all in all, though far from unlistenable. Granted that the early "Florida" music is much lighter in content and specific gravity, it does, however, have a sprightly and unselfconscious verve, even an innocence,

that is likely to please a lot of Americans.

And the music is, to my surprise, really American, genuinely out of that period before 1900 when our musical kings were Stephen Foster and the like.

Delius was obliged to live on his family's Florida orange estate for some time. He began his music study there on the side; evidently he also picked up some musical local flavor there and in New York before he took off for Europe, where this music was turned out in 1888 and 1890. Slight stuff, but a real period flavor.

The later Delius is as might be expected here under Sir Thomas' direction. It's a lot more important, but I don't like it as much, myself.

Hindemith: Symphonia Serena for Orchestra; Horn Concerto. Dennis Brain, horn; Philharmonia Orch., Hindemith.
Angel S 35491 stereo

The distinguished and interesting Angel Hindemith series continues here, bringing two more of the many big, important pieces turned out by the beefy, smiling German in recent years. Dennis Brain ran into a tree in 1957, but he got the Horn Concerto down in stereo form before his death.

It strikes me as astonishing the way Hindemith's music resembles the man himself, as we see him in frequent pictures. He is big, beefy, bald, round, on the Krushchev model but heftier by a lot. His face is round but strong—that curious anomaly, the strong fat man—and though we can see in it every evidence of decision and power, there is almost always a faint but friendly smile and a sense of relaxation, a lack of pretentiousness.

That is precisely what you will hear (in general terms, of course) in his music for large orchestra. It is indeed heavy, ponderous music, and yet oddly, it is also full of quick movement, dexterous and light; it is uncompromising, long, enormously thick in texture (as opposed to so much stark, thin contemporary music) and yet, again, there is much graciousness and a smile, not to mention outright humor, lurking just around the listening corner. Definitely, music for the man who will listen twice. The first time, it'll weigh you down but the second playing will hook you.

I'll say no more except to note an interesting device in the Horn Concerto. Hindemith writes a short poem, in German, having to do with the quality of the horn in music—then he sets it into a kind of song for the horn solo—not the words (like a wah-wah trumpet) but their rhythms and phrasing. You can actually follow the poem as the horn "speaks" it in music. Interesting.

Mahler: Symphony #9. London Symphony, Ludwig.
Everest SDBR 3050-2 (2) stereo

Ooof. I hadn't previously got to know this piece and, since I find Mahler one of music's real geniuses, I played straight through it here. Took an evening off to do it—it's a bit like tackling "Hamlet," "Romeo and Juliet," and "Macbeth" all at once. I'd hardly say I had the music by memory at this point, but I got a once-over impression, at least, subject to later modification. Don't think that Mahler is diffuse and dilute just because he's long—far from it.

The Ninth strikes me as a somewhat unfocused step towards a new and almost atonal expression that shows to marvelous advantage in the unfinished Tenth. In this one, the constant emphasis on whole-tone relationships — major-chord harmonies succeeding each other—is a bit dated and unexciting for our jaundiced ears. Mahler went on from here, but he died too soon to launch into what might in theory have been a stupendous new era of composition. There's too much "formula" in the Ninth, considering the vastness of the symphony's emotional concepts.

For those accustomed to the fiercely profound Mahler readings of Bruno Walter and even Mitropoulos, this one is relatively low in voltage, though plenty musical. Maybe that's the best thing for such a mammoth work of death-passion. Everest's clean, non-

echo recording (not a groove echo in the whole piece, in spite of long sides) is a great pleasure.

ORGAN AND BRASS

Music for Organ and Brass. E. Power Biggs, Boston Brass Ensemble, Burgin.
Columbia MS 6117 stereo

Listeners to the long-lived Sunday morning CBS broadcasts of his organ program will find this Biggs record familiar in sound, though the brand new organ in the Busch-Reisinger Museum at Harvard was installed after the broadcasts were over.

The music is the familiar sort for old-type organ, with brass fanfares: Roger Voisin, of many Biggs broadcasts, is here represented by a choir of two trumpets and two trombones and an almost inaudible harpsichord. One side of the record is Gabrieli, the other Frescobaldi, who came a generation later.

I like the record but I'm not enthusiastic. The over-all effect is somehow rather lukewarm and perhaps a bit too much like Sunday morning. I played it in mid-week.

The new Flentrop organ itself is fine; it is the latest model in "old" organs, even to a complete tracker action, dispensing with the modern electrical relay system. This is roughly like reconverting a modern railroad to hand signalling, but the results are musically worth it in variety of rhythmic and tonal impact, the player's fingers directly connected to the organ's air valve via mechanical means.

The trouble here, I suspect, is in the building. At least in the recorded sound, there is the same incipient dullness, a slightly stuffy quality, that I remember well in the older broadcasts and recordings out of this very same hall. (The recordings issued by RCA over a number of years.) The organ sounds sanctimonious, not glorious.

Ideally, this antiphonal music, tossed from trumpet to trumpet, from brass to organ, should make marvelously alive stereo. Actually, though the brass is imaginatively picked up by the mikes at a distance, the organ itself seems much closer, with a curiously lifeless quality and a somewhat disturbingly unreal spatial effect. The organ, I'd say, should seem even further away than the brass for a natural impact.

The Frescobaldi makes the best effect. There are too many short fanfares on the Gabrieli side for sustained interest—he did not, after all, write them for playing in succession, one right after the other. Each was for its own separate occasion, and should so be heard today, LP records or no.

Marcel Dupré at Saint Sulpice, Vol. 1: Bach. (Preludes and Fugues in D, A Minor, E Minor).
Mercury SR 90227 stereo

Marcel Dupré is the "dean" of great French organists and his records can command a hearing whatever he plays—especially on this characteristically French Saint Sulpice instrument, Dupré's own for a quarter century. However, if French organists of his school reserve the right, so to speak, to play Bach in their own manner on their own instruments (so do most organists), then I reserve the equivalent right to dissent in the listening. A good many of us are now "spoiled" by hearing Bach on the smaller, brighter instruments of the Bach period. The colossal powerhouse sound of the French organ, substituting volume and reverberation for color and clarity, just seems plain unstylish. So, too, are certain familiar rhythmic anachronisms that will jar on the purists' ears, though most organists do the same.

This is not to suggest unmusicality on Dupré's part. Within the style and the instrumental sound, his playing is all that it is supposed to be. But better to try him on French music—and wait until Mercury records this organ playing the music intended for it. That'll be something.

The stereo recording feat is a brave one, with vast technical difficulties overcome. It's safe to say that Bach never sounded so good at Saint Sulpice, and especially in the live performance. From Mercury's precariously hung mikes (roped across the upper regions of the huge space) the sound is both big and intelligible. To those mortals who merely sit down below, most of the Bach would be grand and glorious but musically an uninspiring blur in the endless reverberation. Bach didn't write for this kind of situation.

The Organ Concertos of Handel, #13-#16. E. Power Biggs; London Philharmonic, Boult.
Columbia M2S 611 (2) stereo

This is merely to call attention to the final volume in this series, as above, and to note that in some ways it is the most interesting in the group, what with the "miscellaneous" concertos (no opus number assigned) that it includes, which are among the very best of the batch, notably the richer, fuller-bodied final Concerto, with horns and woodwinds galore.

The organ is the British instrument "unearthed" by Mr. Biggs for the job, on which Handel himself actually played. It had to be tuned upwards for the recording, then put back, a procedure which has caused some disturbance among lovers of the British organs. Probably didn't do any harm and at least we all could get to hear the music.

To get the fancy explanatory booklet you have to buy Volume One. I haven't yet seen it. There are adequate liner notes here, though no booklet.

"Fats" (Paul Curry Presents the Friends of Fats).
Golden Crest CR 3070
("compatible" stereo)

Here's one of those occasional discs clean out of my field that I like—and therefore like saying so. For more expert details, consult Colleague Robertson; I'm just passing it

on to you as a nice item for almost anybody's casual pleasure. There's a technical consideration here, too—compatibility.

Fats Waller's name is legitimately used, since these are old co-workers of his. Fats or Thins, these amiable boys turn out a leisurely, offhand, picturesque sort of conversational music that is really quite astonishing. Big space, a few players scattered here and there. Remarks from right front (Curry): nutty. Answer from somewhere left rear, even nuttier, zany variations on old-tune ideas ("Hey, got some gum, chum?"). A gorgeous wah-wah trumpet—I thought it was another nutty voice for a second. Real brass. And all this in the most friendly manner imaginable.

Ah yes—compatible stereo. Well, I haven't tried to ruin this unigroove disc via a mono pickup and so on that score I don't rightly know . . . but it'll play OK, I suspect, unless your mono needle is bent double. What really counts is that there is plenty of stereo, but definitely.

Now whether a pure (non-compatible) stereo disc of this same music would boast even more stereo I do not know. In music of this sort—where stereo is apt to be of the extreme, black-and-white, right-left sort, a bit of blending and blurring isn't going to do any harm. It surely doesn't here.

Yes, I'm against the introduction now, at this late date, of a so-called compatible record. The time for that was at the beginning, when it could have served a vital transitional purpose—now, it just means more confusion and misunderstandings, under the present stereo-mono price difference.

But I'm never averse to listening to any good record for its own values. This one's a honey.

New York Brass Quintet "In Concert." Golden Crest CR 4023 ("compatible" stereo)

This new "compatible" stereo disc seems to me distinctly lacking in stereo effect. But I have no way of knowing whether this is simply in the recording itself or is a by-product of the compatibility. I rather suspect this latter, but I can say no more than that.

You see, whereas in pops-style stereo, where left-right separation is often practically 100 percent, a bit of blending of the two channels (towards mono) can actually do a lot of good to the effect, in classical recording the situation is different. Stereo difference is much less crude, less obvious, more carefully calculated. A reduction in stereo difference can be serious—if there is a reduction—where the stereo impact is rightly a matter of subtlety and delicacy.

Anyhow, this brass group plays sturdily in a big liveness and sounds just fine—only there is precious little difference between stereo playing and mono via the same pair of speakers. Strictly circumstantial evidence.

The music, part "ancient" and part modern, is the sort favored by brass groups these days. The Gabrieli is just so-so; the less-known music by one Anthony Holborne (d. 1602) is really more interesting as played here. The modern pieces tend to be zippy, highly idiomatic, and very complex—they get fine performances but musically aren't quite out of this world.

STANDARDS

Rimsky-Korsakoff: Scheherazade. London Symphony, Goossens. Everest SDBR 3026 stereo

'Sfunny, the standard classics get recorded so often that many a record reviewer simply cringes at the sight of them and goes quickly elsewhere. I hadn't heard "Scheherazade" straight through, I realized, since stereo came along, and I was really delightfully surprised by this lovely recording.

The credit must go severally to the earnest, careful, sincere playing of the British orchestra under its British conductor, to the excellent solo players here and there, and to Everest for a superbly right over-all sound. The old warhorse gains an unexpected dignity

(*Continued on page 68*)

CHARLES A. ROBERTSON*

STEREOPHONIC

Dixieland All Stars: The Golden Era of Dixieland Jazz — Design DCF1010
The Science Of Sound — Folkways FX6007

If the stereo disc has accomplished nothing else during two years of existence, it has caused many persons to reexamine their thinking about sound with a frequency in direct proportion to the length of time they have listened to stereo in the home. The variety of techniques employed and the great advances made have kept the medium anything but moribund. The Dixieland album represents an improved method of cutting compatible stereo and is the center of a certain amount of controversy. Produced on two monophonic records by Bell Telephone Laboratries, the other set makes no mention of stereo in demonstrating basic phenomena of sound, knowledge of which the average audiofan may feel he acquired sometime in the dim past. As all the principles touched upon have their stereo application, paying them a return visit at this juncture is likely to clear the brain of any stray decibels left over from listening to the latest stereo opus.

The February meeting of the New York chapter of the Audio Engineering Society served as a forum for a panel discussion on the compatible disc being marketed under the Design label. Members who attended were presented with a specially prepared demonstration record and a covering memorandum signed by John Mosely, an audio consultant for the label. The record was played during the meeting and an A-B comparison made with the master tape. As the gathering filled the 1200 square feet of the main studio of the O-D-O recording Company, of 254 West 54th Street, and overflowed into the observation and control rooms, home listening conditions were hardly approximated. If for no other reason, it is just as well that no official conclusion was attempted by those assembled.

The cutting technique was developed at Beltone Recording Studios, where Les Cahan worked with representatives of Fairchild Recording Company to incorporate the necessary features into the 641 cutting system. One side of the test pressing was cut with Westrex 3C equipment, and the other with the Fairchild system. A frequency test band is included and each musical selection is heard three times—monophonic first, full stereo last, and compatible stereo in between. The compatible tracks are slightly limited in the vertical and horizontal components. In no case is the vertical limiting in excess of 3 db more than above the lateral. Vertical rolloff is inserted, being down 3 dbs at 100 cps; 7 dbs at 50 cps and 11 dbs at 30 cps, with reference to the RIAA curve.

Since the meeting was held, the RIAA is reported to have denied a request to approve this modification of the standard recording characteristic. The first twenty Design releases are on sale in record shops and supermarkets throughout the country, however, and all interested parties can satisfy their curiosity about the new product by conducting a listening test at home. A minimum outlay of less than two dollars will put the Dixieland All Stars on the turntable. Rex Stewart, Buster Bailey and Vic Dickenson are out in front, supported by Marty Napoleon, Arvell Shaw, and George Wettling. In addition to playing a half-dozen old favorites, the group stretches out on *Relaxation Blues*, and *Yellow Dog Blues*. Each side runs about twenty minutes, and few New York clubs let customers stand at the bar that long at the price.

Although large letters on the liner are used to quote Danton Walker, who is better known as a gossip columnist than an audio expert, as declaring this method to be "a revolution in recording," most experienced listeners are aware that many stereo discs sound reasonably good on monophonic equipment. Some even play back monophonically through a stereo system better than they do when the two speakers are out of phase in full stereo. This is not true of most operas and music featuring wide separation. Considerable pop mnterial and quite a few jazz groups can be handled in this fashion without particular damage. While the present example is no equal for the best monophonic reproduction, it is superior to many early stereo pressings and amply demonstrates the advances made in cutting processes during the past two years.

Component deniers may encounter an influx of inquiries from people who never heard of stereo before purchasing a Design record. A blank look or abrupt dismissal of the subject will not make customers. Instead, a few questions about the equipment used can result in an invitation to bring the record in and listen to it on a proper setup. Most audio salesmen are aware that a record the customer is familiar with often makes a greater impact than more spectacular demonstration material. That can come later, after the advantages of component stereo are compared to the shortcomings of monophonic boxes or stereo packaged with speakers less than four feet apart. As the Design product sounds much better in stereo, it makes an excellent base to start a neophyte's education by providing an incentive to buy stereo. A stamped, self-addressed envelope sent to Pickwick Sales Corporation, Pickwick Building, Long Island City 1, New York, will bring a technical brochure in return.

After attending the meeting, I emerged into the night clutching the test record and the firm conviction that the term psychoacoustics, which figured prominently in the discussion, has a different meaning for recording engineers, component manufacturers, audiofans, and record company officials, with the average home listener yet to be heard from. Listening to "The Science of Sound" set a few days later, I welcomed the plain recital of factual information like a breath of fresh air. Designed to aid instructors in schools and colleges, it furnishes vivid demonstrations of textbook terms and will make a valued addition to science classrooms. Thanks to a script prepared by Bruce E. Strasser of the Bell Telephone Laboratories Publications Department, the narrator avoids using dry definitions to describe the numerous phenomena covered in the nineteen sections. Technical consultants were Floyd K. Harvey and associates in the Acoustic Instruments Research Department.

A sequel planned to show how some of the same factors apply to stereo should clear the air even more. It might supply some adventurous record company with ideas for demonstrating stereo benefits not yet exploited. For instance, can a low tone, in stereo, be sounded at a greater intensity before it masks a higher frequency? Do two channels eliminate the need for artificial echo? Then there is the difference between the intensity of a sound and its loudness—an important consideration in determining whether bass is heard in natural balance or as something contrived on the control console. Perhaps General Electric can do the job, incorporating findings from its research on bass directionality. A shorter, one-record version is available on Folkways FX6136.

Wally Rose: Ragtime Classics — Good Time Jazz S10034

Half a century ago, this music would be in every home, piled in stacks on the parlor piano and whistled on the stairs. It belongs there today, especially as played by Wally Rose, a pianist who has devoted more than half as many years to studying ragtime and perfecting a style that would make old Tom Turpin jump for joy. After a winter like the one just past, listen to the opening bars of *Springtime Rag*, a 1916 tune from the Indianapolis composer Paul Pratt, and feel the years drop away as the shoulders straighten in an irresistible urge to dance. Personally, I would rather buy a Wally Rose record than eat, so this review is definitely biased.

Ever since first appearing with Lu Watter's Yerba Buena Jazz Band in the early 40's, Rose has demonstrated a real affinity for ragtime and is now at the height of his powers. Few pianists have the ability or understnnding to match his performance on Henry Lodge's *Red Pepper Rag*. Under his ministrations much of the abuse heaped on ragtime is wiped away, and all the great composers are played—Scott Joplin, Tom Turpin, James Scott, Joseph Lamb, and Jelly Roll Morton. All in all, a choice bit of Americana that belongs in every collection. Mort Corb, bass, nnd drummer Nick Fatool are discreet accompanists, and stereo brings out the pianist's tone and dynamics,

Jim Timmens: Hallelujoh! Spirituals In Stereo Bross — RCA Victor LSP2029
The Guitar Choir: New Jozz Sound Of Show Boot — Columbia CS8216

If the arranger and conductor duo at work on these sets had been around during the swing era, every jazz fan would have sung their praises. The story is different today, and one reviewer in a highly respected jazz magazine, during remarks about a recent album credited to Jim Timmens, questioned the existence of such a person. Well, a glance at the arranger pages in the Local 802 blue book will find him listed, and not under a pseudonym. Let's hope audio enthusiasts appreciate the rich brass voicings on the current gathering of spirituals, and will encourage him to pen more of the same. Each of the studio groups involved is positioned so as to utilize stereo to the utmost, and the scores feature trumpet exchanges between Joe Wilder and Doc Severinson, Joe Ferrante and Mel Davis, followed by a drum battle between Don Lamond and Joe Venuto, with the latter on tympani. And there is room among the special effects for generous solos by *Joshua, It's Me* and *Go Tell It On The Mountain*. Ray Hall is responsible for the splendid engineering.

John Carisi is best known for *Israel*, a work written for the Miles Davis band of 1949, but his many arrangements for dance bands deserve more notice than they have received. The idea of a choir of five guitars belongs to Barry Galbraith, who plays a lead voice along with Jim Raney, and it is put to the test on the Jerome Kern musical. As distributed in stereo, the guitars form a wonderful background for imaginative and melodic solos by Phil Woods, alto sax, and trombonist Bob Brookmeyer. Three songs included were added during later revivals and may prove to be a new experience to some.

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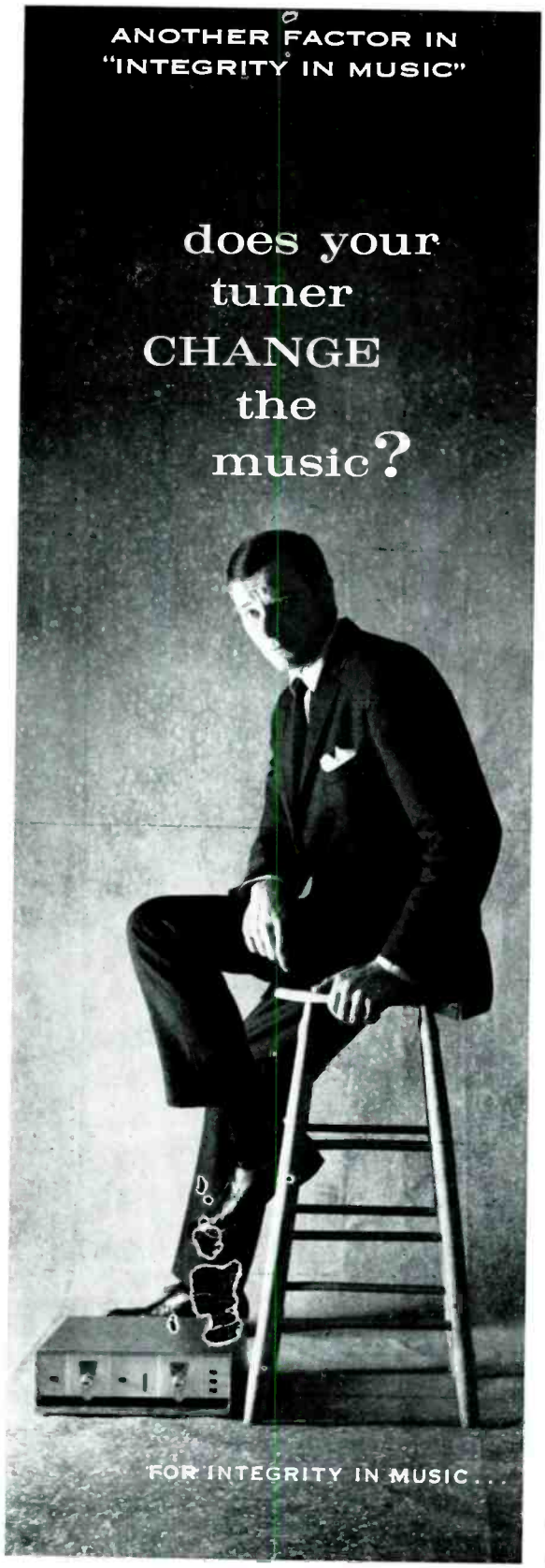

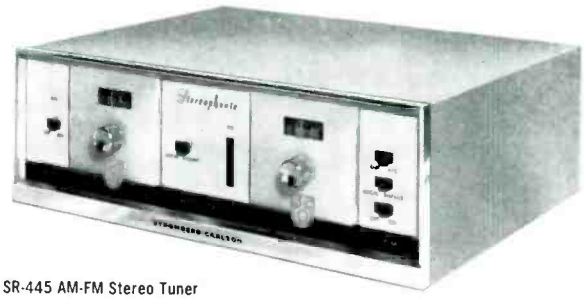

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Stromberg-Carlson now offers 16 equipment cabinets in a wide variety of styles and finishes. They are designed to house complete Stromberg-Carlson stereo component systems and are factory assembled. They reproduce as faithfully as separately mounted components because of a unique mounting method that isolates the speaker systems from the other sensitive components.

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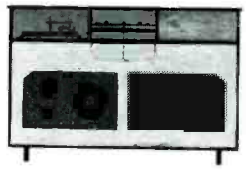

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"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

Phil Napoleon & His Memphis Five
Capitol ST1344

Jimmy McPartland: That Happy Dixieland Jazz
RCA Camden CAS549

Where is the jazz researcher who knows the number of bands Phil Napoleon has called the Memphis Five? If the maestro himself can tell, he boasts a better memory than most of us. This year's edition is one of the best, and it buckles right down to dispensing Dixieland from the leader's private stock. New York style was the way it used to be described, but today the label could just as well bear a Miami or Las Vegas imprint. Harry di Vito's tailgate trombone provides a solid bass for Ken Davern to launch lofty, agile solos on clarinet. Johnny Varro takes a syncopated piano chorus on *Creole Rag*. Anyone with as many records to his credit as Napoleon deserves to be able to point to one and say, "This is the way I sound." His new label affiliation does this for Napoleon, and owners of his previous recording will be agreeably surprised at his trumpet tone on *Come Back to Sorrento*, the one interloper among a dozen jazz tunes.

Jimmy McPartland, hardy survivor of Chicago's Austin High gang that he is, plays Dixieland standards in arrangements by Dick Cary, a man who has yet to be classified. Just about everything new happening in this music can be traced to Carey, or musicians he has worked beside. A few years ago, Bobby Hackett's band was enlivened by his ideas. They continue to be fresh and invigorating, with imaginative ensembles to give soloists the incentive to depart from stereotyped performances. Bob Wilber and Ernie Caceres team up for the clarinet parts on *High Society*, and Harvey Phillip's tuba dances roundly through *That's A-Plenty*. McPartland responds with his wonted drive on trumpet, even breaking into song on *Way Down Yonder In New Orleans*, and *The Saints*. Next time, why not a vocal duet with Eddie Condon? Cary turns up on piano, and other soloists are Cutty Cutshall and George Wettling. Good, low-priced stereo, in spite of an attempt to do too much with the tuba sound.

Horace Silver: Blowin' The Blues Away
Blue Note ST84017

The Mastersounds Play Horace Silver
World Pacific 1284

In addition to becoming jazz hits, several of Horace Silver's compositions, through no fault of his own, have attained greater popularity when set to lyrics. Both of these albums are devoted to his works in the before state, with nothing to impede the musicians other than the hands of the clock. But it is only natural to speculate as to just how long it will take someone to come up with words for one of the tunes introduced here by the pianist and his men. And will it be *Peace*, a balladic evocation of a tender mood, or that robust creature fervently shouting the glories of salvation, *Sister Sadie*? Portraying different aspects of Silver's personality, they rank high on the list and are bound to have a long career.

The stereo version was awaited because it is one of the first produced at Rudy Van Gelder's new studio in Englewood Cliffs, New Jersey. Excellent piano sound, particularly on two trio numbers, and it is held in good balance with the bass, played by Eugene Taylor, and drums. An explosive and driving drummer from the first, Louis Hayes is now completely acclimated to the leader's moods and responds accordingly. Blue Mitchell, trumpet, and Junior Cook, tenor sax, complete the quintet.

Since the release of their latest album, The Mastersouuds have disbanded after developing into a tightly integrated group during three years spent working together. Bubby Montgomery is now with Miles Davis, touring Europe, and the new association will undoubtedly increase his reputation as vibist, if not as arranger. It is to be hoped that pianist Richie Crabtree will find another outlet for his arranging talents because, for one reason, he is among the few who have attempted to do anything more than popularize Silver's tunes. All the composer's strictures for a spontaneous and highly charged performance are obeyed, while working his concepts into a quartet framework, and the group delivers with unflagging zest. Included are *Doodlin'*, *Nica's Dream*, and *Enchantment*. The vibes are clearly defined in the intimate stereo setting.

Annie Ross: A Gasser
World Pacific 1285

Joya Sherrill: Sugar & Spice
Columbia CS8207

Each of these lady vocalists possesses talent in such variety that it is almost certain neither will ever become typed. Annie Ross, aside from being the last named member of the Lambert, Hendricks, and Ross Trio, is equally at home on show tunes, ballads and jazz numbers, be they fast or slow. A generous sampling offered here allows her to range from a sultry, romantic *I Didn't Know About You*, to a breathless, pulsating *Everything I've Got Belongs To You*. She also reaches way back for *Nobody's Baby*, and *This Is My Lucky Day*. The accompanying quintet features Russ Freeman and Zoot Sims, whose tenor sax blends as closely with the voice as Gerry Mulligan's baritone sax did on one of her previous LP's. Better begin to collect Annie Ross now, before her early efforts are as hard to find as Billy Holliday's first records. Stereo frames the voice beautifully, with Jim Hall's guitar filling out the picture.

Joya Sherrill sang with Duke Ellington's orchestra at the age of fifteen, but a more pertinent bit of information is that she wrote the lyrics for *Take The "A" Train*, his theme song at the time. Her current project is a dozen nursery rhymes, reset in topical hip-style, and the words and music are all her own. As the album title implies, the seasoning is varied, not too cute and not too far out, but never as tasty as the Ellington dish. Luther Henderson, who did the arrangements, conducts with a beat just right for teenagers

and their elders to enjoy dancing to *Humpty Dumpty, Hickory Dickery Dock,* and *Little Boy Blue.* Henderson, incidentally, had a hand in training Miss Ross as well as a host of other singers.

Carlos Montoya: From St. Louis To Seville **RCA Victor LSP1986**

The Best Of Django Reinhardt **Capitol TB010226 (Mono)**

Flamenco, like jazz, is an improvised art and these two guitarists bring an ancient gypsy heritage to everything they play. In making his first excursion into the world of jazz, Carlos Montoya remains himself, in true virtuoso fashion, and from the start takes command of the rhythm section of New York jazzmen engaged to act as a guiding influence. So persuasive are his powers that it is easy to credit the report noted on the liner, which would have you believe everyone adjourned to the Montoya domicile and continued jamming after the session. Meeting jazz on his own terms, Montoya creates a mixture full of surprises and unexpected rhythms. He brings the contrasting mood and colors of Spanish music to *St. Louis Blues,* and *Blues In The Night.* He rhapsodizes with all the lyric yearning of a romantic gypsy on *Rain On The Roof,* and *Que Sera, Sera.* An interlude of free improvisation allows him to wander as his fancy dictates before the journey back to Seville begins. On the reverse side he plays the music usually expected from him, displaying on five numbers a technique which dazzles the audience and wins plaudits at concerts. But his admirers can find flamenco on the first side as well, with something else added for the jazz fans. Stereo lets all the excitement through, and engineer Ed Begley keeps the setting intimate.

Twenty-five years after his first records and eight years after his death, Django Reinhardt's playing is still an influence on American guitarists. The gypsy strain which runs through all his work was once thought to detract from his status in jazz. Since then it has defied imitation, and today is regarded as the piquant touch that spells Django. It is part of a rich tradition of improvisation which both he and Montoya represent with so much fire and brilliance. Most of the twenty-four performances on the two-volume set were first issued on the French Swing label. When imported into this country in the late '30's, they featured excellent sound and quiet surfaces, in comparison with domestic releases, and were well worth the premium price asked. They weather time well without stereo, and a rare treat is in store for anyone who meets the guitarist with his friends in Quintet of the Hot Club of France and such American visitors as Bill Coleman, Rex Stewart, Berney Bigard, Big Boy Goudie, and Dicky Wells.

MONOPHONIC

Willie Dixon: Willie's Blues **Prestige 1003**

Memphis Slim: At The Gate Of Horn **Vee Jay LP1012**

Prestige gets a new blues series off to a flying start by taking under its banner Willie Dixon, a true country blues man from Clarksdale, Mississippi, by way of Chicago's South Side. Dixon proves to be a match for any of his contemporaries, and the freedom he was allowed in making his debut results in one of the best examples of his brand of blues yet placed on LP. There is all the informality of one of Big Bill Broonzy's sessions of the late '30's, thanks to Bob Weinstock, with none of the exaggeration effects which other recording directors came to demand in the search for a juke-box hit. And due to Rudy Van Gelder's engineering, Dixon is among the few of his kind to be recorded with the care given Jimmy Rushing, Jimmy Witherspoon, and other blues singers who work with jazz groups. A former heavyweight boxer, Dixon usually thumps a bass fiddle in blues bands, often accompanying Memphis Slim for whom he has written many songs. This time the pianist returns the favor, supporting the singer with fertile blues phrases and turning in an original boogie-woogie instrumental. Dixon claims

credit for the eleven remaining tunes and they make a rich addition to blues literature.

As befits a man weighing three hundred pounds, Dixon never seems to hurry, even when threatened by a grizzly bear on *I Got A Razor,* or on the rapid *Built For Comfort.* His baritone voice has an engaging trob, particularly when stammering through *Nervous.* He shows no compunction about slapping the bass, bouncing the strings against its neck for an afterbeat, and his powerful hands can make it sound like a big, deepthroated bullfrog. Al Ashby appears to be an ordinary rhythm and blues tenor saxist until he also throws convention to the wind ou *Sittin' And Cryin' The Blues,* the best number of the lot. Here in mournful, earthy fashion, he sighs like a creaky gate and then lows like a herd of cattle coming through. Wally Richardson slips in rare touches on guitar, and the drummer is Gus Johnson.

Memphis Slim is moving around the folk music circuit since Alan Lomax introduced him last year at Carnegie Hall (not Town Hall as both liner notes insist). Although he appeared at Chicago's Gate of Horn, there is every indication that his present set is a collection of sides designed for juke-boxes. No audience noises are heard, and from the sound it might easily have been recorded in the nearest empty store. The overly amplified guitar is well played, however, and the transfer to LP keeps echo within reasonable limits. As too little Memphis Slim is available, blues collectors can ill afford to ignore it.

Joseph Spence: Bahaman Folk Guitar
Folkways FS3844
Anthems, Work Songs, & Ballads From The Bahama Islands Folkways FS3845

Samuel B. Charters visited Andros Island, the largest of the Bahamas group, during the summer of 1958 to study and record the music found in its southernmost settlements, an area far removed from the beaten tourist track. So much so, in fact, that his account of the trip makes as fully engrossing a tale as his search in Texas for the blues singer Lightin' Hopkins. Anyone with a flair for adventure who reads the two booklets enclosed in these first volumes is bound to look forward to the release of the final chapter. It is due to appear shortly, along with a third volume devoted to hymns and dances. In the meantime, let Charters tell how he transferred his equipment from a small skiff to a mail boat in a heavy swell. Then listen to some of the musicians discovered in his quest for natives who remember older songs and the appropriate style of performing each one.

Joseph Spence, who has the first volume to himself, is an exceptional guitarist by any standards. Living in a community where music is the only creative expression and almost every young man plays the instrument, he is known as the best guitarist the inhabitants can remember hearing. Like many self-taught musicians, he essays simple tunes and states the theme in a style that is primitive and direct. But once the preliminaries are out of the way, he commences a succession of startling variations, returning to the melody only while pausing to gather his forces or reassure the audience. His ideas are shaped from knowledge gained in learning the capabilities of the instrument and many of them are highly original. His voice on the spiritual, *I'm Goin To Live That Life,* resembles the work of this country's early blues singers and the words are about as intelligible. Anthems and local dance tunes are treated with equal zest, and the one popular song, *Coming In On A Wing and A Prayer,* would indicate that he crossed paths with GI's during World War II. Spence makes his living as a stone mason, plays without a pick, and tunes his guitar a tone low—all of which makes for a powerful sound and no amplification is needed.

If the impulse to start packing a tape recorder is still dormant, then move on to the next volume and meet Frederick McQueen as he leads the singing at a boat launching. Harry Belafonte should be willing to pay good money to the person who gives him first chance at a work song like *Long Summer Days.* The boats are built on the beach and

the task of getting one into the water involves a unison response to the leader's chant. McQueen also sings original ballads, while several anthems are handled by a male trio. Students of folk mores will find much of interest in the unusual rhythmic patterns on both albums. They seem to stem from environment rather than any African heritage. And when preparing for your trip, consider the recording conditions met by Charters and A. R. Danberg, his technical assistant, and make sure of a power supply.

Dixie Anyone? Music Minus One 1009
Bob Wilber: Classic Dixie
Classic Editions CJ2
Joe Wilder: Fascinatin' Rhythm
Classic Editions CJ1

After meeting both the needs of fledgling jazz players and more experienced improvisers with a number of rhythm background folios, the Music Minus One series now provides all the basic ingredients for stimulating ensemble performances. Also, due to the fact that two albums were produced from each of these sessions, even those listeners who limit their participation to a bit of compulsive foot-tapping are accommodated. The Dixieland wing is invited to unlimber in the company of a septet headed by Bob Wilber, who learned this music the hard way until Sidney Bechet taught him the secrets of the trade. He uses the knowledge acquired then and later in his career to arrange old reliable tunes, six of which are transcribed and bound in the volume prepared for home cookers.

Either to avoid complications or on the theory that each aspirant must eventually fend for himself, the "missing parts" which MMO usually leaves unplayed are filled. Instead of working with rhythm accompaniment alone, fortunate owners are able to step on the stand and join a front line comprised of Buck Clayton, trumpet, Vic Dickenson, trombone, Bud Freeman, tenor sax, and the leader on clarinet. In keeping with the purpose of the date, the performers are careful to suppress eccentricties of style, leaving all such liberties to the guest artists. Ensemble passages are fully plotted and steer clear of the collisions likely to result during the customary free-for-all. Because of the meticulous playing, much of the classic purity which enabled them to endure the test of time is restored to such melodies as *Wolverine Blues, Keepin' Out Of Mischief Now,* and *Tin Roof Blues.* Vocalists will find no competition, however, and complete lyrics are supplied. The practice of limiting each side to three numbers should ensure that the grooves withstand rough usage.

Although somehow dropping *The Man That Got Away,* Classic Editions presents six additional titles from the same group to complete a normal LP. Meant for dancing and listening, the release is likely to prove quite adequate for many students as well. At least, rhythm players who have mastered the rudiments should be able to sharpen their wits, especially when seated in a section consisting of bassist Ahmed Abdul-Malik, drummer Panama Francis, and Dick Wellstood on piano. While aiming at a model performance, the soloists remain relaxed and the unit swings wholeheartedly on *Chimes Blues, High Society,* and *Wild Man Blues.* It would be possible to point out less restrained Dixieland sets, but certainly not one more perfectly played.

Joe Wilder lends lyric enchantment to eleven Gershwin themes, blowing trumpet improvisations over rhythmic backgrounds contained on previous MMO folios. Most of the titles listed were released on Volume Four in the series and such accomplished accompanists as Hank Jones, Mundell Lowe, Wilbur Ware, and Max Roach are featured. Also Oscar Pettiford and Kenny Clarke, who are now living in Europe as expatriates. Owners of the earlier set can complete their education by comparing their efforts to Wilder's, perhaps adding a chorus or two, while others will find enjoyable listening on *Someone To Watch Over Me, 'S Wonderful,* and *But Not For Me.* The value of each album as an aid to self-instruction is increased by Dave Hancock's engineering. Naturalness of balance is achieved and the separate parts are heard with clarity and definition. AE

ABOUT MUSIC

HAROLD LAWRENCE*

New Directions in Music—Let The Notes Fall Where They May

EVER SINCE Frank Lloyd Wright's beige mushroom sprouted on New York's upper Fifth Avenue, it has become the center of controversy. Many regard it as a sorely-needed reform of traditional museum architecture while others see in it another disturbing example of the late builder's radical philosophy. The new Guggenheim Art Museum is neither as tall as the Empire State Building nor as grand as Rockefeller Center, but it already ranks alongside these New York landmarks as one of the city's most popular attractions—as the daily queues will testify. The controversy, which no doubt helps to swell public attendance, also extends to the museum's exhibition.

Projecting from the milk-white walls of the spiral ramp is a collection of contemporary art that, in the main, makes pre-World War II modern art exhibitions seem mid-Victorian by comparison. The fact that abstract expressionism (or "action painting") is represented here in force underlines the almost universal acceptance of this movement on the part of museums throughout the Western World, although judging from the visitors' comments, the public is far from convinced that this is really an art form after all.

One of the pioneers of abstract expressionism, the late Jackson Pollock, leaped into prominence in the 1940's with his "horizontal" technique of painting. He would lay his canvas flat on the floor and walk around it, trickling, splashing, and slinging paint at it from a bucket. Following the barrage, he would stand the canvas on its side and allow gravity to take its course. Rorschach's famous inkblots indirectly affected another approach to abstract expressionism. The procedure here involves painting colors and forms at random, in a completely spontaneous and "thoughtless" manner, and then permitting the haphazard result to suggest to the artist the ultimate direction his work was to take.

The element of chance figures significantly in these approaches, regardless of whether the artist drips, spatters, blots, or smears. Chance, too, applies to the neo-Dadaists who place together commonly unrelated materials. A new abstract expressionist painting by Robert Rauschenberg, for example, has a real stuffed eagle projecting from the canvas, and a stuffed pillow suspended from the frame by a piece of string.

Musical Cousins

Close parallels can be drawn between the abstract expressionists and neo-Dadaists, and certain contemporary composers. The common ideals shared by these painters and composers revolve around the rejection of traditional concepts of art and music, and the belief that, in the words of Henry Cowell, "there should be more room . . . for improvisatory factors, for the elements of casual choice and chance."

In one of the most talked-about compositions of the Fifties—John Cage's *Imaginary Landscape*—twelve radios constituted the "instruments," and twenty-four operators the "performers" (two to a radio). One operator selected stations while the other manipulated the volume control. Wave-length was indicated by kilocycles, station-tuning by notes and rests, and dynamics by numbers. The first performance of *Imaginary Landscape* at Columbia University's MacMillan Theatre in 1951 was disappointing because the work was presented later in the program than originally planned, at a time when radio programs had less variety and contrast than at the height of the evening. Some of the performers felt that the rehearsals produced far more interesting results, but the composer was undisturbed: he was out to demonstrate a principle, not to conduct a "definitive" performance. Even so, Cage would have to admit that there are only a few radio-rich cities in America where his work could be given effectively.

A centuries-old Chinese game of chance called *I-Ching* (the Oriental equivalent of dice utilizing coins or marked sticks) supplied Cage with a compositional method. He devised an arithmetical system governing tempo, duration, dynamics, and wave-length tuning, and permitted coin-tossings to dictate the work's progress. If the ultimate result was of a certain contour and over-all character, it was not the composer's fault alone; in Madison-Avenue terminology, "That's the way the cookie crumbles."

"The artist is a receptacle for emotions that come from all over the place—from the sky, from the earth, from a scrap of paper, from a passing shape, from a spider's web. That is why we must not discriminate between things. Where things are concerned, there are no class distinctions." Pablo Picasso wrote this in 1923. Replace the word, "emotions" with "sounds," and you have an explanation of Cage's "orchestration" of his *Theatre Piece*. Heard for the first time at New York's Circle in the Square early in March, the work is scored for piano, tuba, trombone, plastic bags (filled with water), movie projector, alarm clock, broom, garbage-can lid, streamers,

* *26 W. 9th St., New York 11, N. Y.*

fireworks, and a dead fish. Apart from setting up a time schedule for the half-hour-long piece, Cage placed control of its destiny in the hands of the eight performers. Prior to the event, each participant wrote down on a series of cards "a noun or verb or combination of both with which [he] would care to associate [himself]." The cards were then mixed and the random juxtaposition of words formed the composition's basic outline.

In Cage's musical world, the composer abdicates his orthodox position vis-à-vis the performer. He hopes in this way to free his compositions of "individual taste and memory," and to achieve a state of "indeterminancy." This is where the similarity between Cage and the abstract expressionists ceases.

John Cage's best known adherent, Morton Feldman, applies the principle of performer freedom to standard musical instruments. In his work, traditional notation is abandoned since the executant, rather than the composer, supplies the actual notes. Using graph paper, Feldman blocks in the squares to indicate to the musicians in approximately what range they are to play (low, medium, or high), and to specify the duration of their "bits." From time to time, the composer provides instructions as to tonal production (i.e., "what is desired in the execution is a pure non-vibrating tone"), or treatment of specific squares (*H* for harmony, *PZ* for pizzicato). The rest is up to the performers. Under this form of controlled improvisation, an orchestra made up of "conservatives" will produce more or less conservative music, while an avant-garde group will turn out ultra-modern "sounds." Appropriately, Feldman titles his works *Intersections* and *Projections*.

Across the Atlantic, the Frenchman, Pierre Boulez, is also experimenting with chance. In his music, however, the score is still king. Like a chemist whose job is to break down and analyze the components of a material, Boulez has isolated what he believes to be the stuff music is made of: notes, dynamics, stresses and accents, and rhythmic figures (which he calls "cells"). To each of these components he has assigned numbers. In his system there are twelve notes, twelve dynamic levels ranging from *pppp* to *ffff*, twelve manners of sounding a note, and twelve rhythmic fragments. The possible changes which Boulez can ring on these elements are endless. Their variety can be illustrated by the mathematical permutations of English bellringing: the number of changes with twelve bells totals 479,001,600 and would take 37 years and 355 days to ring. With four sets of twelve "bells" each, not to mention various instrumental and vocal settings, Boulez need not fear of running out of combinations.

Cage, Boulez and Co. feel that traditional music has nothing more to offer our space age; we must wipe the slate clean, they say, and begin again. But, as Paul Henry Lang wrote so eloquently in the New York *Herald Tribune* (April 10, 1960), "The march of time gives a new physiognomy to style, but not a new heart; the heartbeat of culture remains the same."

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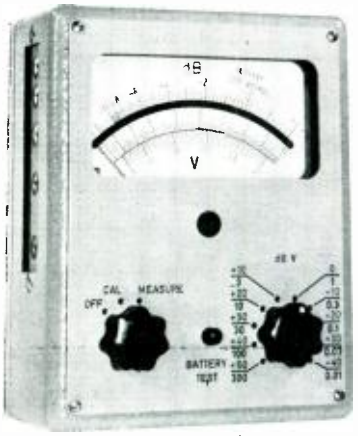
NEW PRODUCTS

● **Transistorized A-F Voltmeter.** This extremely small and handy instrument was developed to replace the bulky VTVM. Its dimensions are 3 1/16 × 5 × 2½ ins, and it weighs 28 ozs. The TVM-20 will measure voltages and voltage levels in the range of 30 to 20,000 cps, while at the same time encompassing a range of measurement of 1.0 mv to 300 volts, or −60 dbm to +52 dbm. It may also be used as an amplifier in a.c. bridge circuits. It indicates the r.m.s. or effective value of the input voltage; the wave shape, therefore, has little



influence on the accuracy of the measurement. Transistors are used throughout, and operating voltage is supplied by a hermetically-sealed, rechargeable, nickel-cadmium battery. Circuitry of the TVM-20 consists of a three-stage stabilized transistor amplifier with three p-n-p surface transistors. Both balanced and unbalanced voltages may be measured. The amplifier output is brought out to headphone jacks, permitting use of the instrument as a listening amplifier, or the signal may be fed to an oscilloscope. Gotham Audio Corporation, 2 W. 46th St., New York 36, N. Y. **E-1**

● **Knight Stereo Recorder.** Engineered to meet the exacting requirements of critical users, this recorder combines versatility and simplicity with excellent audio characteristics. A 3-speed machine equipped with built-in preamplifiers, the KN-4060 records and plays both 2- and 4-track stereo tapes. Designed for use with external amplifiers and speakers, it may be added to any home music system. Push-buttons control every function. Both

monophonic and stereo operation are provided at three speeds—7½, 3¾, and 1⅞ ips. Recording monophonically at the slowest speed affords up to 16 hours of recording time on a single 7-in. reel. By using the level-indicating meters mounted on the front panel, channels may be balanced in a matter of seconds. Also included is a digital counter for pin-pointing any specific portion of a recording. At 7½ ips, response is 50 to 15,000 for both record and play, wow and flutter content is below 0.25 per cent, and signal-to-noise ratio is 45 db. The KN-4060 is equipped with a solenoid which automatically shuts the unit off after a tape has been played. Complete information is available from Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. **E-2**

● **Reeves Magnetic Tape.** Developed to meet the intensified requirements of multi-track stereophonic sound, this new tape, which contains an exclusive oxide formulation called FA-4, meets the raised stand-

ards of performance required of recording heads, amplifiers, speakers, and tape itself. The increased efficiency of the new oxide is said to offer improved operation with new equipment, also to improve operating qualities of older tape recorders. FA-4, which stands for "frequency adjusted" oxide formulation, will be available without additional cost on all Soundcraft reels of Mylar and acetate tapes. Reeves Soundcraft Corporation, Great Pasture Road, Danbury, Conn. **E-3**

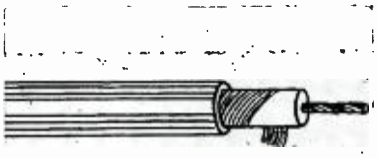
● **University Super Tweeter.** The Sphericon Model T-202 has a frequency range of 3000 to 22,000 cps ± 2.0 db, with output extending to 40,000 cps at −10 db. In construction it contains a number of interesting features. A domed phenolic diaphragm

is acoustically loaded by a conoidal ring to afford exceptionally smooth response. A diffractor sphere widens the dispersion pattern to 120 degrees in all planes. The unit incorporates a built-in network for 3000-cps crossover, and a volume (brilliance) control complete with a 36-in. cable for convenient location. Power rating of the Sphericon is 30 watts of integrated program material, and nominal impedance is 8 ohms. This is an excellent unit for use in the treble range of multi-speaker systems, and to extend the range of existing speakers. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. **E-4**

● **Homewood Enclosure Kit.** Made of full-grained white hardwood ply, the Model 1 encloses four-and-one-half cubic feet of baffle space, affording good bass response within a compact area. When assembled, the kit stands 29 in. high and 20 in. wide. It comes equipped with 5-in. legs. Weight

is only 25 lbs. Simple, exact instructions accompany each kit. Assembly time is only 30 minutes. The Model 1 is the latest item in a complete line of unfinished high-fidelity furniture and speaker-enclosure kits manufactured by Homewood Industries, Inc., 26 Court St., Brooklyn, N. Y. **E-5**

● **Belden Low-Loss Cable.** Ideal for connecting hi-fi components where a shielded low-loss cable is indicated, Belden 8421 has a cellular polyethylene insulation for low capacitance, and a spiral tinned-copper shield for easier and neater connection. In addition, for increased mechanical and tensile strength, the 25-AWG



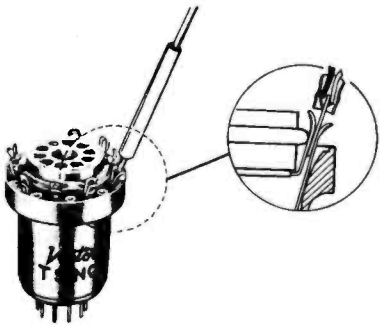
conductor consists of four strands of tinned Copperweld and three strands of tinned copper. The new cable is available on 15-, 25-, 50-, 100-, and 500-foot reels from Belden wire and cable distributors. Manufactured by Belden Manufacturing Company, Chicago 80, Ill. **E-6**

● **PACO AM/FM Stereo Tuner Kit.** All the builder need do is proceed through several minor wiring and assembly steps, and this tuner is complete and ready to operate. Being entirely pre-aligned and featuring printed-circuit boards, the Model

ST-45PA needs no additional minor alignment or "front-end" tracking adjustments to equal a factory-wired and aligned unit. Having separate FM and AM circuitry, the tuner can play simulcast stereo, FM

separate, and AM separate. A socket is provided on the chassis for a multiplex adapter. The FM tuner has a sensitivity of 2.0 microvolts for 30 db quieting. Bandwidth is over 200 kc, with harmonic distortion less than 1.0 per cent from 20 to 20,000 cps. The AM tuner has a tuned r.f. stage with a 3-gang tuning capacitor. The antenna is a special built-in ferrite unit which is rotatable as well as removable. The AM circuit includes a 10-kc whistle filter. Both AM and FM sections have separate flywheel tuning, cathode-follower outputs, and individual level controls on rear panel. Further information may be obtained by writing PACO Electronics Company, Inc., 70-31 84th St., Glendale 27, N. Y. **E-7**

● **Current Test Adapters.** These devices permit exact tube-circuit current measurement in operating equipment without computation or cutting leads. Supplied singly or in a set of 7-, 8-, and 9-pin types, the adapters are inserted in the tube socket between the chassis and the tube. Current readings are made by inserting a unique dual-sided test prod in the exposed test



tabs, as shown in the illustration. The adapters also provide means for adding resistors or capacitors in series with tube elements, for connecting leads to external circuits, and for making voltage and waveform measurements. Vector Electronic Company, 1100 Flower St., Glendale 1, Calif. **E-8**

● **Strobe Lamp.** Handily mounted on the end of a 6-ft. extension cord, the "Strobolamp" offers a convenient means for checking the speed of a turntable or record changer. A strobe disc supplied with the unit contains dots which correspond

with standard recording speeds. Operation is conventional—hold the Strobolamp over the dots which correspond with the speed at which the table is supposedly turning, and check for motion. Further information can be had by writing the manufacturer, Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill. **E-9**

1⅞-IPS MAGNETIC RECORDING SYSTEM

(*from page 22*)

line from the cartridge to the supply reel during the threading operation. When the tape has been pulled from the cartridge and starts to wind on the supply reel, the pressure pad that supplies the back tension and the pressure roller are automatically brought into position. (*Fig.* 13)

The takeup reel is operated with a conventional slipping clutch drive.

The successive cycles of operation are programmed by means of a multiposition rotary switch and several mechanical interlocks. The slipping clutches, brakes, speed-changing idlers, and the like are operated from the three-dimensional surfaces of a single complex cam which programs all pressure-pad, pressure-roller, and escapement operations. It is necessary to provide a number of mechanical and a few electrical interlocks to prevent improper manual interference with machine operations, but these are relatively simple and straightforward in design.

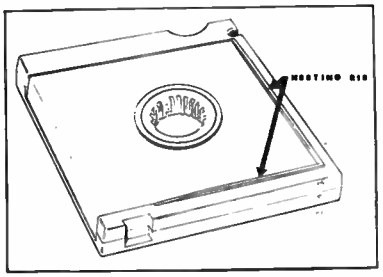


Fig. 10. Diagram showing cartridge nesting ribs.

The straight-line character of the tape path does not require intermediate idlers and consequently the guidance problems are minimized. However, as in all such drives, it is important to maintain the pressure roller axis parallel to the axis of the capstan. This is accomplished by introducing sufficient compliance in the mounting of the pressure roller so that it is self-adjusting within small limits. The spring loading provides a simple adjustment for correcting major pressure differentials across the idler surface. (*Fig.* 11).

Obviously, there must be some means for sensing the end of the tape and various other portions of the operating cycle. In this machine these results are obtained by means of a simple analog computing linkage that cannot be disclosed in detail at this time. However, the method is independent of the length of the tape in a given cartridge and has displayed a very high degree of reliability.

The authors wish to express their appreciation for the advice and assistance during the course of this work by B. B. Bauer, A. A. Goldberg, J. C. Jeschke, H. R. Sherman, E. L. Torick, and J. C. Wistrand of CBS Laboratories and Barbara Ivins, formerly with CBS Laboratories. We also wish to acknowledge whole-hearted cooperation of Dr. W. W. Wetzel and his associates of 3M's Magnetic Products Division. Æ

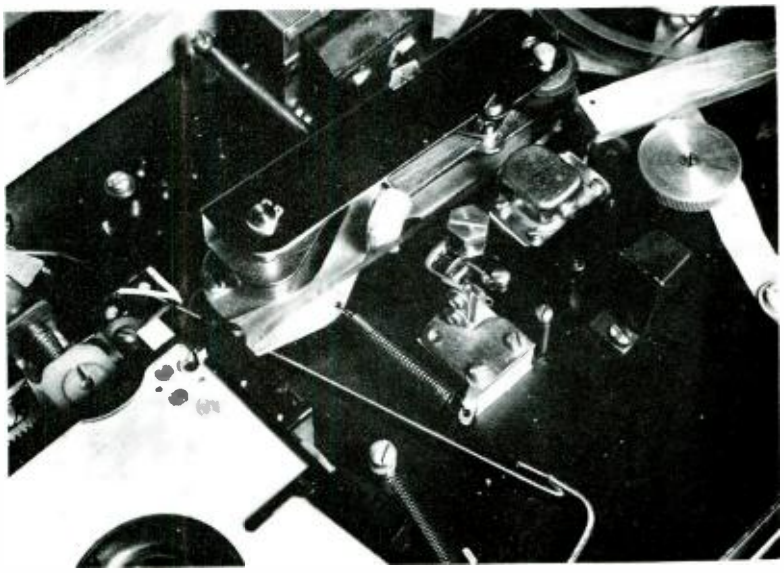


Fig. 11. Straight-line path for tape.

AUDIOCLINIC

(*from page 4*)

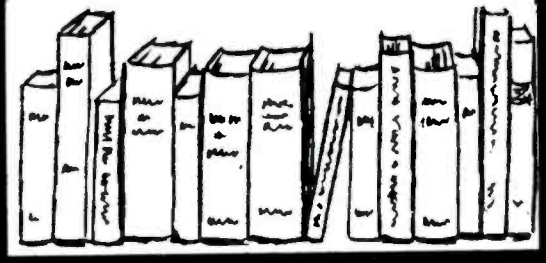
amplifier. The scope can also be connected to the output of the square wave generator (which is connected to the input of the amplifier) and a comparison made between the waves as they appear at the input of the amplifier and those waves which are recovered from the output of the amplifier.

The ability of the amplifier to respond to these square waves is a measure of the *transient response* of the amplifier. When it is said that an amplifier possesses excellent transient response, it means that the amplifier can reproduce steep wave fronts created by sudden stops and starts in program material.

The type of measurement just discussed can often tell you whether the feedback is adjusted properly. If there are wave shapes at output which differ appreciably from those of the square wave generator, it probably means that the amplifier is on the verge of oscillation. Further capacitance may be needed in the feedback loop of the amplifier in order to stabilize the high-end performance. If this remedy does not work, you probably will have to reduce the over-all feedback loop gain.

The last kind of measurement which I shall discuss here is that of the amount of feedback which an amplifier is using. This is a fairly simple measurement to make. Connect your audio generator to the input of the amplifier and connect our poor old load resistor to the output of the amplifier. Connect your a.f. voltmeter to the output—the same one which you used when measuring frequency response. Disconnect the feedback resistor and feed in a 1000-cps tone. Note the voltage which appears across the meter terminals. Adjust the input signal so it is somewhere near full scale. Next, connect the feedback resistor, and again take a reading. Be sure that no control settings have been changed. The difference between the indication with no feedback and the indication with feedback—expressed in db—represents the amount of feedback present. There is one slight complication to this: If the feedback resistor is small enough that it causes a change in cathode bias when it is removed, you must compensate for this change before making your measurements. When the bias changes, so does the gain of the amplifier. The gain of the amplifier also changes with varying amounts of feedback, and if the gain is changed by both of these factors, you won't know which is doing what.

Notice that all the measurements discussed in this month's column required the use of an *audio signal generator*, or *audio oscillator* to produce any frequency at will. Such a device must have a low impedance output, and should be capable of putting out very low voltages, from the millivolt range up to the vicinity of 10 volts. These instruments should be capable of producing all the tones of the audio spectrum, as well as some slightly below it and above it. Some instruments have meters built into them which register the voltage appearing at the output of the oscillator—which feeds into the amplifier. The oscillator should have as flat a response as possible, but there probably will be some deviation. This deviation can be read immediately on the meter and the needed correction can be made. The oscillator should also have a minimum amount of distortion, especially when it is to be used to make harmonic and intermodulation distortion measurements. Æ



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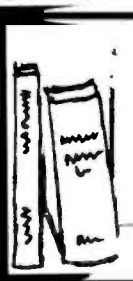

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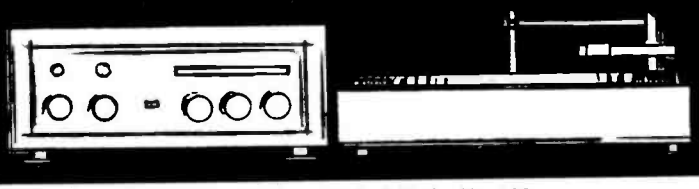

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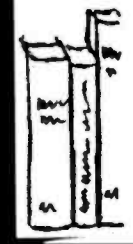

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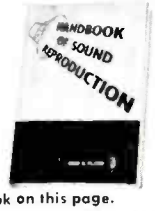

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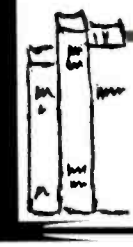

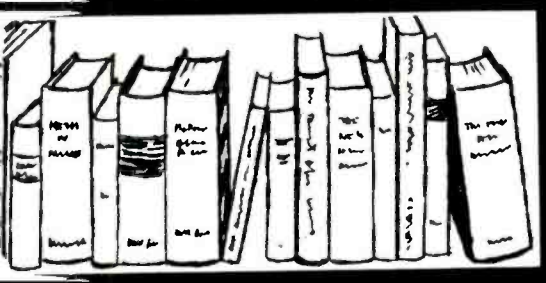

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AUDIO ETC.

(*from page 42*)

are heavy and big, the rubber idlers are immense; the whole thing is built like a battleship (but simpler) and was intended to last. It has.

I doubt if the old T-12H can match the very best of new stereo tables. But it's likely to outlast a few of them. The happy "extra" in this model, the hysteresis motor, is probably the best reason for acceptable stereo performance in this pre-stereo table though generally good design has plenty to do with it. The low vertical rumble might be a sheer happenstance—who cared about vertical vibrations in those days?—or it could also be a by-product of over-all care in the design.

The other high-quality table I'm still using is the D & R, the one that serves for my broadcast tapes. This table rated tops when it was first produced, maybe seven or eight years ago or more, and I've found few faults with it since then. It has an outside-drive rubber wheel, mounted free (you can lift the whole idler unit right out) and held against the rim by a simple spring; speed change is clumsily done via brass collars that fit over the motor spindle —but I don't have to change very often. A mercury switch that tips does the on-off job as the brass handle moves the idler against the rim.

Only two difficulties have ever cropped up with this machine. One is petty. The idler wheel doesn't always release from the rim when you turn the machine off, due to mechanical slippage. The other would be serious if it mattered in my case. Though the lateral rumble in the table is very low, vertical rumble is quite severe; I cannot use the table at all for stereo playing. Just goes to show what a tricky thing rumble can be. This, too, is a beautifully designed table; but its set of design parameters happened to involve the once-unimportant factor of vertical rumble, where the Rek-O-Kut design happened not to.

The third table is a far less expensive model, the original Components "Junior" single-speed table, later called the GI Special or some such name—I forget exactly. This was a modest version of the Components belt-driven table that had been highly praised; it uses a heavy ceramic weight for the table itself, covered by a soft aluminum shell (I had trouble with dents and bending at first) and the drive is fixed, via outside belt. The table has one extra advantage—it will fit into a changer box or the space where a changer ordinarily goes. That's where mine is right now (though I had to cut a hole in the box to give the manual arm room to move). And, wonder of wonders, this cheap little "Junior," selling 'way back for around $25, does an excellent stereo job, so good that I have had no special desire to get anything newer. This, mind you, with a pair of AR-3 speakers that show up rumble very precisely when it occurs.

Between these three tables I've been doing so well that, believe it or not, I have not yet tried *any* post-stereo table, except for a brief whirl with the amplifier-driven Fairchild model some time back. A good table, let me tell you, is a good investment.

Pickering 240-D

In the first of these accounts, involving the Columbia 360 phonograph (March, 1960), I mentioned the familiar designation "just a piece of junk"—and then described how I found that this relatively ancient Model 360 was anything but that, once it had been fixed up right.

Well, here's another example. My secretary brought her own home phonograph woes to me a few months ago and I got interested, for the usual reasons. Wanted to find out exactly what *was* wrong in her system. She was as cryptic as you might guess. The machine didn't play right but she couldn't get over to me what was the matter. She'd sent it out once, at great cost, and it had gone bad again—the old story. Now, the local service man said her cartridge was no good and she'd have to get another one. What, she asked me, was a cartridge?

That intrigued me no end, for here was something I could cope with. Hers was detachable, on a plug-in changer arm, and to my surprise it turned out to be an excellent one—a Pickering 240-D turnover back-to-back model, one separate little sugar-lump cartridge for LP and another for 78. That model was a distinguished one in its day and you don't toss such valuable equipment on the junk pile without a second thought. So I turned her cartridge over to my assistant for exploration. Did it work?

The electrical continuity was OK. But as we tried it, the stylus seemed to produce distortion now and then, a buzzing. And the point seemed sort of wobbly. Vaguely remembering a similar problem with my own example of the same model, I began to speculate. So I ups and sends it back to the Pickering factory with a note. Told them I suspected it might be the stylus damping material; I had heard of minor trouble in that department with that model. Was it OK here? (Or the stylus might have been broken, but didn't feel so). I said please repair and send bill.

It came right back from Pickering a few days later. No charge. Cryptic note saying simply "Stylus is OK." Not a word about the damping or any other trouble. So I gave it back to its owner to try again.

The story isn't finished yet. A week later she was back—the phonograph still didn't work. So I dutifully explained the phono-plug amplifier test that would indicate whether the trouble was beyond the changer —unplug the signal lead halfway, breaking the ground connection, and see if there's a blat. (Be sure to turn volume up and put controls to PHONO. . . .) Another week passed. She came back and said yes, there was a blat. But still no music.

That is as far as we've got to date but it is a long way, you'll realize, even if the darned thing still doesn't play.

For at least I know that I have saved this lucky lady the cost of a new Pickering 240-D, or equivalent, diamond and all, and that ain't hay. Green stuff. It would have brought that crafty local serviceman a neat little profit.

And, moreover, I know that her trouble is no worse than a loose connection somewhere between the cartridge itself and the amplifier. She asked whether she should send for the man again—I said NO! *"But what'll I do?"* Well, I said, maybe one of these days my assistant can get up to your place and check that loose connection. There it stands. She's saved a mint. But she'd had no music for something like three or four months. Æ

LOUDSPEAKER CONES

(*From page 26*)

Radial ribs or corrugations molded in for compliance or stiffness.

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On the other size of the ledger, however, there are problems and techniques to be worked out to make the most of the potential we feel exists in foam for speaker cones. Molding dies are much more complicated and expensive than dies which make paper cones. Variations in angle, density, ribs, and other things must be worked out in sequence, taking considerable time. So far, molded foam seems about on a par with paper for woofers. Performance in tweeter cones is very promising, but methods must be perfected to make very thin sections. These are now under investigation.

The need for rigidity to prevent bending has been described for woofer and tweeter cones. Yet necessity for bending was pointed out as necessary in a wide-range speaker cone. It must be recognized that wide-frequency-range operation in a single cone always puts a heavy burden on the design, and inevitably results in compromise of some performance factors merely to achieve that wide range. Most generally, efficiency and distribution angle suffer when the bandwidth is stretched out. Where will the foam cone fit into this type of application? Much more work needs to be done here, but one facet of the foam cone is encouraging. Its rigidity is high per unit of mass. There is nothing to prevent thinning of the cone over-all, or in selected parts, until cone areas allow enough bending, except at low frequencies. Probably some compromise in cone angle, extremity of travel or another factor will be worked out to give adequate wideband performance. All these variables give the speaker design engineer more variables to work with. No generalization can be drawn now as to the way each should be incorporated in a particular speaker design. Rather than to rush foam cone speakers to the market prematurely, it is preferable to complete the work and utilize the full potential of this promising material. We believe that judicious employment of the capabilities of this molded cone will in the future improve speakers of many types for many applications. Æ

RECORD REVUE

(*From page 53*)

and freshness, where in all too many recordings it just sounds tired or—worse—overflamboyant and falsely brilliant.

I won't need to play another "Scheherezade" for some time, my feelings tell me. (But I'll probably heed duty's call and play the next one just the same).

Shostakovitch: Symphony #5. New York Philharmonic, Bernstein.
Columbia MS 6115 stereo

"An international triumph!" says the cover blurb on this record and it is, for once, exactly that. This is not only a wonderfully revealing and human performance, of a symphony that can sometimes be hard and synthetic in its intensity, but it is one of the finest stereo recordings I have ever heard. somehow hitting a "natural," in point of mike placement, that—to use an analogy—is like an exact resonance, so easily and ideally is the musical sound projected. I would not begin to try to account for it, but I extend congrats to the Columbia officials who turned the trick. 'Nuff said.

Sibelius: Symphony #2. Detroit Symphony, Paray.
Mercury SR 90204 stereo

It's a pleasure to listen to the dynamic M. Paray go to work on standard classics, with all his inimitable bounce. Maybe the results aren't quite what is average-on-a-high-level, but the sounds is always interesting.

So it is with Sibelius. This somewhat craggy composer, once the hope of the moderns and now retired into utter respectability, is usually given the full "Northern" treatment: bleak, moody, full of passionate tone-paint. As the years roll by, this tends to sound ever cornier except in the hands of a real conductorial master of the style—and there are precious few of them left. The alternative approach is modernization, and that, too, is a risky affair. But it is what happens here under Paray.

Brisk and breezy is the word. No nonsense, no tearing of hair; no windswept pine forests and deep-blue fjords, etcetc. But no modern harshness, either, and a lot of sparkle where sparkle helps. I'll admit that a few of the more poignant Sibelius passages sound as though someone had choked him off with a live herring down the gullet—he sort of gulps, hastily, and swallows fast. But generally, the old piece is neatly streamlined and pleasant to hear.

Schubert: Quartet in D Minor ("Death and the Maiden"); Quartettsatz in C Minor.

a. Juillard String Quartet.
RCA Victor LSC 2378 stereo

b. Amadeus Quartet.
Deutsche Grammophon DGS 712037 stereo

Two maidens and two deaths here, and I hadn't heard a record of this famous old quartet for years. (Its slow movement is a set of variations on the Schubert song of the same name.) I enjoyed both of these distinguished performances.

The more lively of the two is that of the Amadeus, which puts forward a more outwardly passionate expression; the Juilliard has always been a rather bland, well polished ensemble that relies on the graceful perfection of its teamwork—a decidedly legitimate approach. The Juilliard version is cast in a lower emotional key but the effect, if you know Schubert, is not necessarily less appealing.

Stereo for a string quartet is a tricky

thing but also useful, given the right recording technique. Side-to-side separation is dangerous; too much of it can spread the quartet out into a highly false straight line across the home "stage"—as no quartet has ever been known to play! The stereo usefulness is in two respects. Most important is the heightened room-sound, the sense of the players being *in* a room or hall, which adds much to the realism of their musical presence. Less important is the *slight* spatial variation from one instrument to another—slight, but enough to point up the sense of four individuals playing together, exactly as the same slight difference operates in the live situation.

On stereo grounds, RCA wins hands down here. The Juilliard Quartet is placed just far enough away so that it is easily imagined behind and between the stereo speakers, as though in a room adjacent to your own. The liveness is just right—not too big (for a pseudo-orchestral effect) nor too dry. I could not tell which way to put my two speakers, so little spatial difference is there from left to right; but the sense of differentiation is there and, even more, the sense of players playing in a space. That's what counts.

The Deutsche Grammophon recording is made closer, close enough so that with a fairly wide speaker separation (normal, I should say), the quartet is apt to be stretched sidewise out of shape. (It's fine if you use two stereo speakers right next to each other!) There is too much separation; it tends to be distracting. And the sound seemed to me a trace harsh where the RCA sound was bland and even a bit dull on the cutting edge.

Brahms: Symphony #4. Columbia Symphony Orch. Bruno Walter.
Columbia MS 6113 stereo

This is, indeed, a gentle recording, in the Bruno Walter tradition—at least so it seems at the beginning. But when you play all the way through, you discover that this is a matter of over-all architecture; the opening movement is held back, but by the end of the symphony it becomes dramatically a part of a subtle build-up of effect covering the entire work. This is very much to the point in Brahms, who characteristically built his great climaxes late in the course of his big movements. But it takes a Bruno Walter to apply the principle on such a large scale.

The stereo recording is conservatively distant, somewhat diffuse in over-all effect but gaining thereby an accurately musical ensemble and balance. No harsh and steely string-to-the-left here!

We can assume that this is one of a complete stereo set of the four Brahms Symphonies, to match the set of stereo Beethovens.

LIGHT LISTENING

(*from page 8*)

pay off the best on larger stereo systems. In recent months, RCA has been deploying the members of the Boston Symphony orchestra on the level floor of the hall instead of the stage. The new angle of mike pickup almost doubles the stereo depth in the latest recordings of Charles Munch at the helm of the Boston. All signs point to the use of the same technique in this stunning job by Arthur Fiedler and the Pops. The reflection of sound has greater uniformity than it did when the orchestra had the wall of the stage behind it. This is especially noticeable in the *March of the Siamese Children* from "The King and I," while the air above the orchestra is heavy with the soft drone of the oriental instrumentation. Leo Litwin is the pianist in the big flashy items such as *Warsaw Concerto* and *Cornish Rhapsody*. Poise and musicianship carry the day in smooth arrangements of *Laura, Gigi,* and *Intermezzo*.

Tutti Camarata: Deep Purple
Everest SDBR 1079

Camarata underlines his loyalty to the music of Peter De Rose in a second Everest album on the subject. Few pop conductors today can match Camarata in recalling the uncomplicated era that produced *Deep Purple* and the other De Rose hits. Depicted here in Everest's best sound, the past four decades of this composer's music already seem rather remote. De Rose, after all, saw the world through an unusually well-fitting pair of rose-colored glasses. The orchestra alone is heard in some of the more famous items. Dolly Dawn, Ralph Young, and the Stuarts—a relatively refined vocal group—take turns handling the words of the seldom-heard tunes. The lyrics of one of these, *Let's Dream Together,* haven't been recorded before. As part of the documentation of the De Rose career, Camarata even includes a hymn that Babe Ruth considered his favorite. The sound is on the bright side yet subject to the careful discipline of the latest in recording studios.

The George Gershwin Story (Popular)
Epic BN 552

This cavalcade of Gershwin hits doesn't live up to the entertainment values promised by the size of the orchestra. D'Artega conducts a large Pops orchestra recruited from the ranks of New York City's Symphony of the Air and the songs are some of the best Gershwin wrote for Broadway and the films. The routine performance would be somewhat more appealing if the sound were really first-rate. The recording locale apparently discouraged top effort in later stages of the recording process. There is a mustiness in the over-all audio quality that reminds me of discs made ten years ago. This is difficult to fathom because Epic has a stereo recording of Gershwin's *Cuban Overture* (Cleveland Pops Orchestra BC-1047) that features some of the better sound in the current catalog. The selection of tunes is exemplary, ranging from *Swanee,* Gershwin's first important Broadway success, to the movie score for "The Shocking Miss Pilgrim" released some time after his death. Robert Russell Bennett's familiar arrangement of *Porgy and Bess* rounds out the release.

Trapp Family Singers: The Sound of Music **Warner Bros. WS 1377**
Alfred Newman: Fiorello/Sound of Music **Capitol ST 1343**

In some respects, Warner's Sound of Music album surpasses the original cast recording on Columbia. It was a bright idea to record some of the members of the Trapp Family Singers in the music used to tell part of their life story on Broadway. While only the cast headed by Mary Martin can recreate the flavor of the Broadway production, this performance of the songs does help to put the show into perspective. As arranged and conducted by Father Franz Wasner, the family's music teacher, the score has only two numbers that sound awkward—*Sixteen Going on Seventeen* and *So Long, Farewell.* Too much Tin Pan Alley. Only the most jaded ear could resist the freshness of the voices in the rest of the songs. The Alpine instrumental work is in a class by itself. The stereo version divides the group into two sections—one for each channel.

In his latest Capitol album, Alfred Newman leads his Hollywood sound-stage orchestra in tasteful and straightforward arrangements of six tunes from the same show and an equal number from the other ranking hit, "Fiorello." No high pressure here—just cogent translations of Broadway's best into motion picture scoring by an arranger-conductor who has done the same for "The King and I," "Carousel," and "South Pacific."

Jerome Kern: Leave It To Jane (Original Cast) **Strand SL 1002**

The "original cast" heard in this release does not match in originality the one that

preceded it when the musical first opened on Broadway in 1917. The 1959 revival at the intimate Sheridan Square Playhouse in Greenwich Village gives us the cast currently under consideration. It is not easy to estimate how wide an audience this Strand album will ultimately embrace. The first in line will be theatre fans of Jerome Kern who know his early work from hearsay or manuscript. RCA Victor, decades ago, released excerpts from this show in a cramped acoustical setting. Those ancient-sounding 78's were the closest representation we had of the style found in the book and lyrics of Guy Bolton and P. G. Wodehouse. The documentary value of those excerpts merited reissue on LP and they came out on the Camden label. The sound had the range of the original discs but very little of the old clarity.

Kathleen Murray is the current star in this innocent picture of campus life based on George Ade's play of 1904, "The College Widow". The plot is as wholesome as a Harold Lloyd movie—the boys in blazers, the flappers busy with the latest snappy sayings. The *Cleopatterer* song, dealing with the Siren of the Nile, is a good example of the comic lyrics employed. The *Siren Song* and *The Crickets are Calling* stimulate the most nostalgia. Mirroring a happier age, this bright and neat production should prove a welcome change of pace.

VARIABLE FILTER

(*from page 30*)

Q = a peaking factor dependent upon the setting of R_{11}.

Minor deviations from this response occur above 50 kc due to stray wiring capacitances. Æ

REFERENCE

[1] Richard S. Burwen, "Portable transistor music system." *J.A.E.S.*, Vol. 6, No. 1, January, 1958, pp 10–18.

Industry Notes . . .

NEW YORK SHOW PLANS ANNOUNCED. Plans for the 1960 New York **High Fidelity Music Show** to be held September 6 through 11 at the New York Trade Show building were unveiled at a membership meeting of the **Institute of High Fidelity Manufacturers** held recently in the New York Coliseum. Milton Thalberg, IHFM treasurer, announced that regularly scheduled entertainment will be a part of the show program, and that the show will run on Sunday for the first time. A 10-man Show committee, composed of three manufacturers, four dealers, and three representatives, was named

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Low quotes on everything. Hi Fi and Stereo tapes. Bargain list. HIFI, Roslyn 4, Pa.

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124 RARE BACK ISSUES Audio Sept. 1947–Dec. 1957 inclusive. Prepaid to first money order for $75. R. Mitchell, 13085 SW 124 Ave., Tigard, Ore.

INDUCTORS for crossover networks, 118 types in stock. Send for brochure. C & M Coils. 3016 Holmes Ave., N. W., Huntsville, Ala.

SELL: Weathers turntable. Weathers stereo cartridge, ESL arm. $65. Robert Stafford, 1650 Neil Ave., Apt. 21, Columbus 1, Ohio.

AMPEX (Sigma) 4 Channel microphone mixer, in guaranteed new condition, $195. H. White, 2123 Kenmore Ave., Bethlehem, Pa.

SELL: Brush Soundmirror Tape Recorder. $50; Monarch 3-speed record-changer, base, new cartridge, $15; Approved A-800 Audio preamplifier, $15. All excellent condition. V. R. Hein, 418 Gregory, Rockford, Illinois.

SEVERAL audio process AP-11 low resonance woofers. 0.45 lb. magnet; rigid, low density cone; filled cloth suspension. $14 each. G. Cain, 15 Manet Circle, Chestnut Hill, Mass.

FOR SALE: One 40 Watt amplifier using a pair of 6550 tubes, with a Dynaco A-430 transformer. One 20 Watt amplifier using a pair of KT-66, with Dynaco A-420 transformer. Also a Hartley-Luth 220 speaker in a Holton style A enclosure. Kenneth E. Gould, 509 Vine St., Liverpool, N. Y.

COMPLETE FILE Audio from Aug. 1947, 6 vols. bound, make offer. L. Krauss, 1174 6th Ave., N. Y. 36, N. Y.

to organize and direct the show.

Members of the committee are:

Manufacturers: Mr. Thalberg, Audiogersh Corporation, chairman; Julius Glaser, Glaser-Steers, and Herbert Horowitz, Audio Empire.

Dealers: Paul Sampson, Harvey Radio Company; Sol Baxt, Hudson Radio; Jerry Russell, Lafayette Radio; and William Kolbert, Audio Exchange.

Representatives: Jock Brittain, Be-Esco Sales; Jack Simon, Fields & Simon, and Paul Nichols, Land-C-Air Sales.

TELECTRO OPENS N. Y. SHOWROOM. A new display, intended for the permanent exhibit of its commercial products, has been opened in New York by **Telectro Industries Corporation.** Located in the 25-floor penthouse at 1776 Broadway, the show-room will contain tape recorders as well as other industrial and commercial products manufactured by Telectro. It will be manned by representatives of Robert E. Marcy Associates, Telectro's New York sales rep for professional equipment, as well as by Telectro personnel.

REK-O-KUT EASES CONTEST ENTRY. As part of its "Tropical Holiday" dealer contest, **Rek-O-Kut Company** launched a promotion making it possible for dealers to order Rek-O-Kut and/or Audax products in April for May and June delivery and receive points toward a Nassau vacation. Rules specify that each 5000 points accumulated by a dealer by April 30 will earn a free week in Nassau. The vacation will take place shortly after the May parts show.

FISHER IN SMITHSONIAN. Believed to be America's first authentic high-fidelity receiver, a Fisher Philharmonic Futura has been presented to the Smithsonian Institute in Washington by its designer and builder, Avery Fisher, president of **Fisher Radio Corporatiotn.** Built in 1937, the set will become a part of the permanent collection of the division of electricity of the Museum of History and Technology.

EIA PUSHES STEREO DRIVE. Excellent progress has been reported by the phonograph section of the **Electronic Industries Association** in its efforts to develop a public relations campaign to help clear up public and dealer confusion about stereophonic sound. L. M. Sandwick, vice-president in charge of sales for **Pilot Radio Corporation** and chairman of the EIA committee, states that final results will not be determined until the group's annual meeting during the May parts show in Chicago. A recent meeting in Washington was affected considerably by a heavy snowstorm which grounded many of the major concerns scheduled to appear to discuss whether they would take part in the projected promotion.

RCA MANUFACTURES TAPE. A new line of magnetic tape, called the Vibrant series, has been announced by RCA, and is now in production in a new plant at Indianapolis. "For the time being we will concentrate on the manufacture of audio tape," stated A. L. McClay, general plant manager, manufacturing, **RCA Victor record division.** "Later we will turn out tape for use in electronic data processing systems and television tape recorders." The Vibrant tape line will be available in 5- and 7-inch reel sizes, in lengths of 600, 900, 1200, and 1800 feet on a splice-free plastic base. In addition to its production units, the new plant will house a technical development group for experimental and test work in the magnetic tape field.

ADVERTISING INDEX

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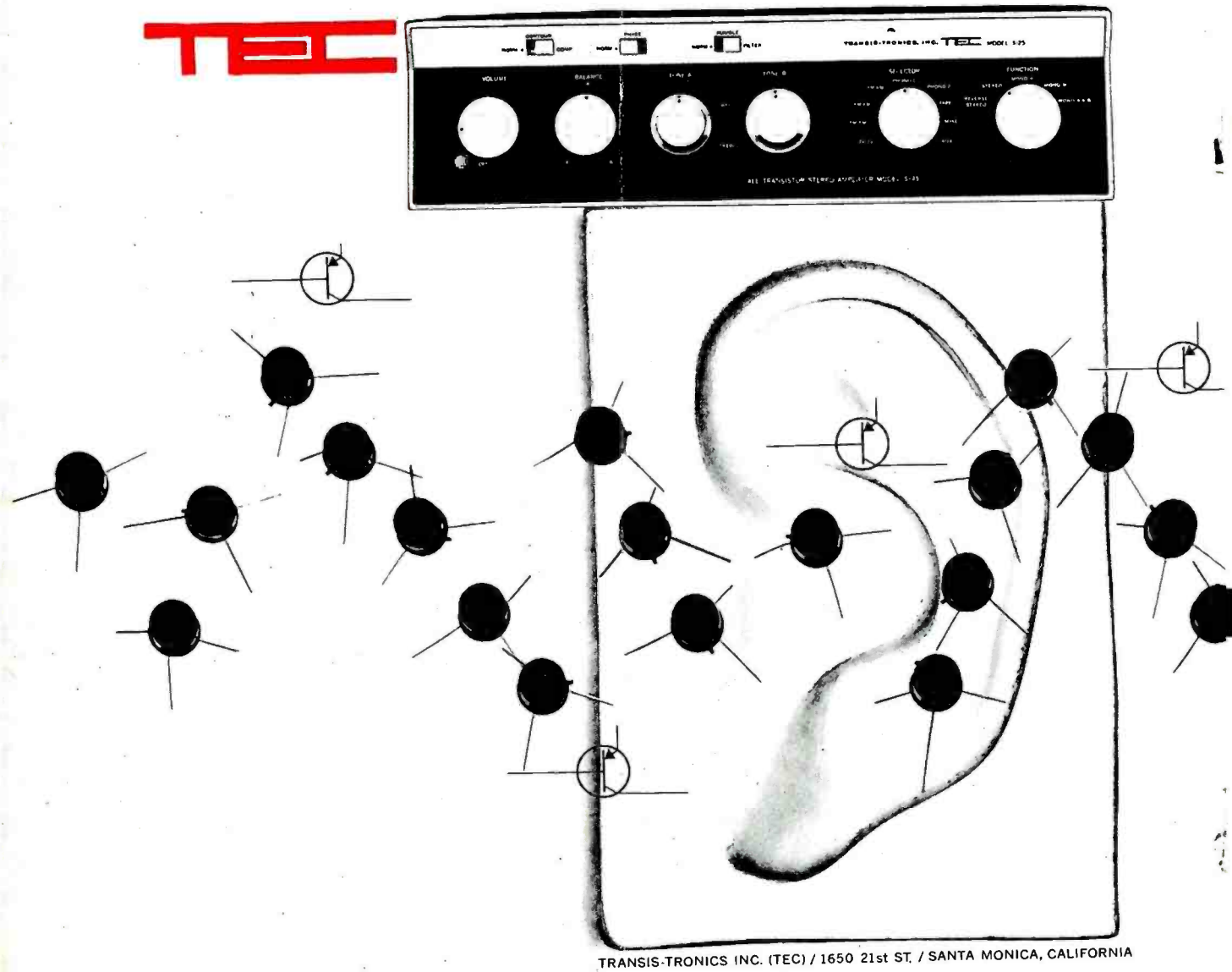

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