

AUDIO

MUCH ABOUT FM-STEREO

JUNE, 1961
50¢

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The Pro's Nest

Saul J. White
Chief Engineer, Audax, Inc.



No. 4 . . . "OUR NEW SOUND RADIATOR"

The bombardment over the past few years of sophisticated and crackpot cabinets and speaker systems, reminds me of the legend of "The Emperor's Clothes." Like the myopic citizens in this fairy tale we have kidded ourselves. We have been clubbed to insensibility by ad writers of "revolutionary" enclosures, "new discoveries" and "the final break-through." I too have been admiring the Emperor's fine clothes, when in reality, as the child pointed out, the Emperor was stark naked.

Over the past few years I have had occasion to test some three hundred cabinet designs. These were mostly variations of the bass reflex and the closed infinite baffle types. Measurements were taken of competitive designs, models of patented enclosures, etc. I have tested all manner of ports, ducted and unducted enclosures, collateral resonating cavities, cabinets having flapper valves, others filled with helium, some having rubber membranes and vibrating panels, and dozens and dozens of different shapes and cabinet configurations. Some of these were submitted to us by hopeful inventors such as one simulating a scaled-up model of a human larynx; others were of our own conception.

It recently struck me that of all the hundreds of measurements in my file, not a single one concerned a simple flat baffle, or an open-back enclosure! I too had been dazzled by the Emperor's hypothetical adornments. Amateurs and schoolboys had been taking over the engineers' sovereignty.

It sometimes happens that certain theoretical shortcomings prevent for years the introduction of a device without it ever being tested under practical conditions. For instance, the open back or flat baffle speaker has had no acceptance among designers because our textbooks tell us that such a baffle results in the disappearance of low frequencies due to cancellation of front and rear waves, and that its bass cuts off at 18 db per octave. When measured outdoor or in an anechoic room there is a very substantial loss of low frequencies perpendicular to the axis of the speaker. Thus, the radiation contour for uniform output has the appearance of a figure '8'. This class of flat open back speaker is known as a di-pole radiator because it is assumed to propagate sound in two narrow opposing beams.

Recently, listening to one of our experimental speakers incorporating certain of the foregoing principles and mounted on a 21" x 25" baffle set in a 4 inch frame, we were surprised at the quantity and quality of the bass. Measurements in our anechoic sound room indeed showed low frequency losses which did not correspond to what we heard in a semi-live listening area. Further response measurements in a living room showed an entirely different and enhanced picture. Normal room reflections and the inevitable low frequency standing waves developed what seemed to be a 360 degree sound field.

We found an abundance of clean bass and instead of two beams of sound, we could place our favorite armchair in any position with very little change in quality or level.

Naturally, these listening virtues merited further objective studies and we have come up with a really realistic speaker using the oldest of baffle principles, but with certain changes in concept for which patents have been applied. The Emperor wears no phony clothes.

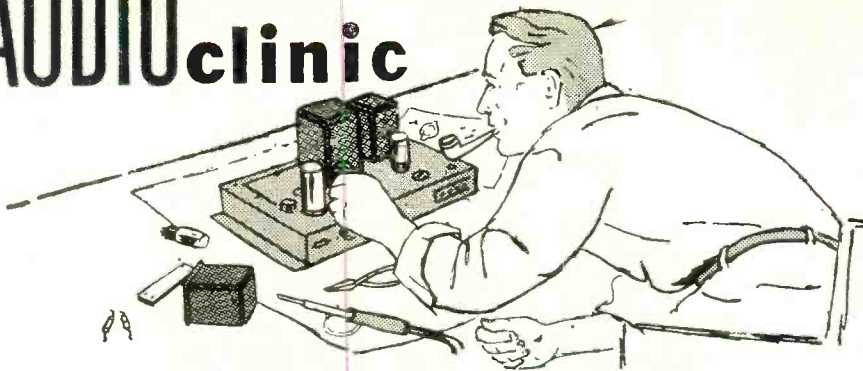
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If you are interested in this speaker write me for literature on Audax Sonoteer Model CA-70.

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AUDIO clinic



JOSEPH GIOVANELLI*

NOTE: I have had to handle a tremendous amount of correspondence from readers. Because of the amount, some questions will not be answered as soon as I would like, or as soon as you would like to receive them. I don't want to rush my work because I wish to give you all the same service I have tried to give you from the inception of this question-answering service. The questions which will take the longest to answer are those where diagrams must be drawn, and those with schematics accompanying them. Bear with me—you will hear from me as soon as possible.

All letters are acknowledged and all questions answered regardless of the suitability of the material for use in the column. This way all can have a chance at getting the help you need.

Another thing which can slow down my reply to you and to many others, too, are those letters which do not contain a stamped, self-addressed envelope. If you figure the time it takes to address envelopes and to put stamps on them, you can see that much time will be lost which could be spent answering your questions. Of course, those of you in foreign countries probably cannot comply with this request, partly because of the lack of reciprocal postal agreements and partly because of the added expense of airmailing the extra envelope. Naturally, I do not expect you people to include a stamped, self-addressed envelope with your material. But the rest of you—please send it to me. Thanks very much.

A special thanks, too, to those readers who have written me lately merely to say that the material I sent them was of help to them. It is nice to know that you would take the trouble to say that what I wrote was of help. All too often we write only when we have some complaint, and it is very nice to know that there are those who will write just to say thank you. To you I say "thank you".

Along this same line, I am very happy to be able to say that I receive very few letters critical of the approach I take in conducting "Audioclinic". This is really very surprising to me considering the tremendous number of letters I answer and the even larger numbers of people around the world who read this column.

O yes, one more thing. I would appreciate it if you local readers would write me about

* 3420 Newkirk Ave., Brooklyn 3, N.Y.

your problems with sound reproduction, rather than to phone me as some of you have done in the past. I can give you better help by mail.

Now to the work at hand . . .

Phase reversal in Preamplifiers

Q. It is obvious that you can make a switching circuit at the speaker terminals of a power amplifier which can serve to reverse the phase of one speaker—useful for stereo. However, you just can't reverse output terminals of a preamplifier, if that is where you want to introduce the phase reversal. Some preamplifiers do have this feature. How is it accomplished? Name Withheld.

A. You are, of course, correct in your statement that merely reversing the leads of one of the output connectors of the preamplifier will not give the desired result. The ground terminal of the preamplifier will be connected to the hot input terminal of the amplifier, and tremendous amounts of hum would be the result. If the impedance of the amplifier and preamplifier were very low, perhaps the hum factor could be minimized, but it is really too much of a chance to take.

Fortunately, there is a way around the problem. In a power amplifier this same problem comes up—at least it does when the output stage of this power amplifier is a push-pull configuration. In order to operate the push-pull amplifier in the proper manner, a 180 degree phase difference must appear between the grids of the stage. This phase difference must, however, be so arranged that the two voltages composing it are at equal amplitudes. This condition is achieved by the use of a phase inverter, or more properly a phase splitter since this stage does not merely invert the phase, but provides two signals in proper phase relationship.

However, aren't these the very same conditions we want in our preamplifier? The answer is of course, that this is the very thing we want, except that we don't necessarily want to have both signals simultaneously. All we have to do, therefore, is to make use of the well-known cathodyne phase splitter, in which half of the load for the stage is in the cathode circuit and half of it is in the plate circuit. If each of these impedances is made low, this phase splitter could be used as the output stage of the preamplifier rather than the cathode

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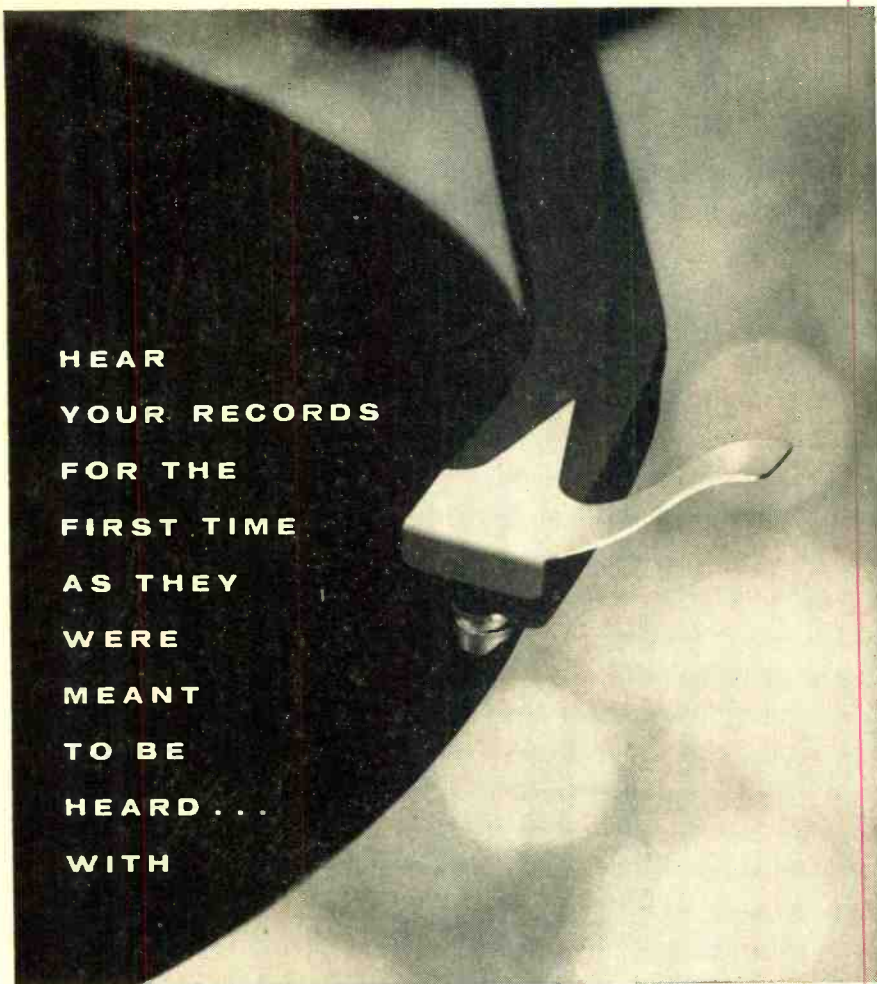
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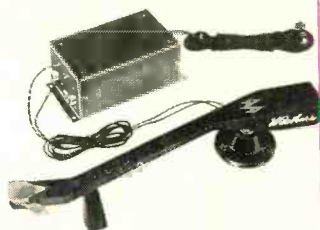
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Circle 4A



follower so often employed. The output terminals would be connected between ground and the "hot" side of a single pole double throw switch. Position A could be connected to the cathode circuit coupling capacitor, and position B could be wired to the plate circuit coupling capacitor. Naturally, you do need the coupling capacitors to prevent the d.c. voltage from appearing in the output. Position A would be phase normal, and position B would be "phase reversed".

The other channel in the preamplifier would have the conventional cathode follower in its output stage. A cathode follower does not invert the phase of the signal feeding it; neither will the phase be inverted in the cathode half of the phase splitter, and this is why position A of the switch gives you "phase normal". This assumes, of course, that the preamplifier contains the same number of stages per channel, and this is most often true.

Negative feedback

Q. Many voltage amplifier circuits achieve negative feedback by connecting the feedback from the output of the second stage to the cathode of the first stage. Well, I guess I should have said that the output of the second stage is taken from the plate. Anyway, I can't see how this will give you negative feedback, and I will explain why. I think I can do this best by showing the signal on one half of a cycle. Let's say that the grid goes positive. This means that the cathode of the first stage will also go positive because the tube is drawing more plate current than it did with zero signal. This makes the plate of the stage go negative for the same reason. This negative voltage is passed to the grid of the next stage, and everything is reversed, with the plate of that stage going positive. The output from this plate circuit is fed to the cathode making the cathode go even more positive than before, and this should increase the signal to the next stage and so on. What do you think? Allen Sullivan, San Francisco, California.

A. Your tracing of the signal is correct in all particulars. However, the conclusions drawn from what you have observed are incorrect, and I shall try to explain why. Let's say for argument's sake that the grid of the first stage is directly connected to ground. Suppose that I introduce a signal between the cathode and ground, across the same cathode resistor to which you
(Continued on page 71)

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Circle 6A

LETTERS

Conversions to "Interconversions"

SIR:

For the case where output declines with frequency due to a simple RC equalization circuit, the article on "Interconversions in Equalization Terminology" in the March issue presents the following formula to convert the loss at the 3-db-down point, f , to the loss at 10,000 cps:

$$db \text{ loss} = 20 \log \sqrt{\left(\frac{10,000}{f}\right)^2 + 1}$$

A simpler formula is:

$$db \text{ loss} = 10 \log \left[\left(\frac{10,000}{f}\right)^2 + 1 \right]$$

This has two advantages. It eliminates obtaining the square root of the quantity under the radical sign, and it is easier to multiply by 10 than by 20.

Letting F represent the loss at a desired frequency, a generalized statement of the formula is:

$$db \text{ loss} = 10 \log \left[\left(\frac{F}{f}\right)^2 + 1 \right]$$

Where the equalization circuit produces rising output with frequency, the formula may be converted to:

$$db \text{ gain} = 10 \log \left[\left(\frac{F}{f}\right)^2 + 1 \right]$$

HERMAN BURSTEIN,
280 Twin Lane E.,
Wantagh, N.Y.

Triode Transformers

SIR:

Referring to the article "Triode Operation of the 88's" by Robert M. Voss and Robert Ellis in the March issue, readers will be interested to learn that Messrs. Partridge Transformers Ltd., of England do manufacture an output transformer especially designed for KT88's in triode operation.

This transformer, Number 3 of the CFB series, represents the perfection of the popular WWFB/0 series by the use of new materials and techniques. Use is made of the latest grain-oriented strip-wound "C" cores. This component is intended for equipment reproducing the full audio band width with the very lowest distortion of any kind. The complete unit is hermetically sealed for all climates.

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"Third Man" Search

SIR:

For some time I have been looking for a stereo tape recording (four-track, 7½ ips) of the "Third Man Theme." I am searching for the song as it was played in the movie, "The Third Man," with the zither and accompanying instrumentation. I am certain that if anyone can help me, you should be able to. If the song is not available on tape, then perhaps it is available on stereo record, and I could dub a tape from this.

If any of your readers has such a tape or record, I would appreciate learning of its source.

LT. COL. DAYTON F. BROWN,
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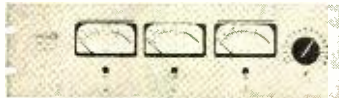
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Light LISTENing



CHESTER SANTON*

The symbol ⊕ indicates the United Stereo Tapes 4-track 7½ ips tape number.

Peter Sellers and Sophia Loren
Angel S 35910

This recording apparently was a spare time project that evolved while Sellers and Miss Loren were filming "The Millionairess." No material from the film was used in the recording sessions held in London and Rome but the zany songs are in keeping with the mood established before the cameras. The high points of the album, for me at any rate, are the unfailing antics of Peter Sellers. His imitation of Alec Guinness is one of the very best things he's done on records. In *Ukulele Lady* we encounter a comprehensive recreation of a corny song hit of the Twenties. The nasal vocal refrain is made doubly convincing with the deliberate application of old-style groove clicks and record wow. The cleverest stunt on the record will have listeners seeking a four-speed turntable in order to figure out what Sellers did to Gershwin's *Lady Be Good* at a recording speed of 16⅓ rpm. The result is quite amusing at normal speed. Those in a position to try the slower playback will discover that, oddly enough, the orchestral accompaniment makes sense at both speeds.

Wild Stereo Drums
Capitol ST 1553

Ever since the day when percussion recordings exploded on the industry's sales charts, there has been speculation relating to the day when all major labels might have to join the parade and issue albums with dots all over them. Most of the majors, although unwilling to succumb to the dot treatment, have been issuing a steady stream of percussion releases. Capitol, in this album, presents an interesting study in reluctance. The jacket's front cover carries a low-key photo of a kettledrum but the reverse side blossoms with a faint harvest of dots. They're barely visible at arm's length but will convey the message to the fellow who refuses to buy a percussion release unless dots are somewhere in evidence. Along with other responsible labels these days, Capitol has gone about the task of recording a melange of skins (big-band drummers, Latin rhythm specialists, and drill-field cymbals and drums) with the conventional tools of the trade. The Tower men in Hollywood placed their faith in the simple virtues of good range in frequency and dynamics—and let it go at that. The large drums are as full throated as any you'll hear on stereo disc. Perhaps the best clue to the honesty in the engineering approach is the unique quality of the uppermost region of the celesta and the tiny Chinese cymbal tree. Easily made strident with an unsuitable mike or recording curve, these instruments emerge from the speakers with the innocent yet penetrating shyness of the real thing. The record begins with a trio of drummers rousing the countryside from a vantage point in Billy May's orchestra. In the

Pepe Dominguin and Les Baxter workouts for Latin percussion, the abrupt left-right separation depends more on deployment of manpower in the studio than upon channel switching at the console. The only concession to special effects occurs in the two segments featuring drummer Dick Harrell. There, contrary to normal practice, the drum parts were recorded first. Other instrumental parts were scored later and then recorded over the initial track. In this way, they end up accompanying the drums.

Peter Nero: Pianoforte
RCA Victor LSP 2334

Victor has launched a new pop pianist with enough on the ball to dethrone one or two ranking keyboard favorites. It seems to be an axiom in the record business that a good-selling pianist can take care of most of the bills of an average-size firm. If he keeps up the pace set in his first release, twenty-six year-old Peter Nero should have the 24th street mortgage paid off in no time. With a confidence that only an adequate grounding in the classics can provide, Nero plunges into ballads and swing favorites with equal verve. There's an unforced exhilaration in his style that spreads to the accompanying orchestra under the direction of Marty Gold. He interweaves a fleeting reference to Rachmaninoff in *My Funny Valentine* and a longer span of Chopin in *Night and Day*, RCA's engineering department has fallen into step with a piano pickup that is remarkably clean. If you're still harboring doubts about the capability of the stereo disc in reproducing a close-up piano, try this one with one of the cartridges of flatter response introduced in recent months. Played with a pickup that slopes off abruptly in the high end, this is just another piano record. A genuinely wide-range pickup of a design that has been on the market for only six or eight months may change your mind about the record—and the performer.

Bobby Hackett: Dream Awhile
Columbia CS 8402

No sooner had some of us concluded that nothing new was left up the sleeves of the record industry, when Columbia comes along with a release which, in stereo at least, establishes a most refreshing combination of sound. First, they decided to flood a spacious organ studio with the several layers of tone furnished by a four-manual Wurlitzer pipe organ. Atop these layers was then placed the glowing sound of Bobby Hackett's trumpet. This somewhat improbable combination works surprisingly well. With stereo maintaining the natural dispersion of sound, there is less pile up of sound from the organ and the trumpet has every chance to hold its own. The ballads, understandably, were selected for easy flow and Glenn Osser's arrangements are the final touch in an unexpected feast.

Les Paul and Mary Ford: Lover's Luau
Columbia CS 8086

Les Paul's first stereo record has a rather unusual history. It offers a good clue to the wide gap that separates the master tape and the commercial disc in these formative years of the two-channel medium. This track-upon-

track recording, with Les playing all the guitars, appeared first on a solely mono basis in the spring of 1959. For some reason, Columbia Records decided not to bring out a stereo version at that time. Exactly two years later, the stereo disc comes along. I'll wager that the same 1959 master tape was used for this release. If such was the case, we now have an excellent illustration of the superiority a master tape still enjoys over the recording that is sold to the public. Using top-grade equipment of his own design, Les Paul has always turned out master tapes of exceptional transient response. Now that stereo lets us listen to each separate guitar as they form a line across the listening area, we can appreciate the know-how applied in this special field.

Farewell to a Formula
Riverside 95022
World War I Fighter Planes in Action
Riverside 95508

These recent specialties from Riverside are bound to have intense appeal in some quarters. "Farewell to a Formula" contains the sounds of 2½-litre Grand Prix cars as recorded at Riverside, California in preparation for their final competition appearance. In time, the cars' last race, held on the twentieth of November in 1960, is sure to be a day of increasing historical importance to followers of the Maserati, Cooper, Lotus, and BRM.

Anyone who has read fictional or historical accounts of the aerial dogfights of World War I will find fascinating listening in the other Riverside stereo album. Aviation buffs who have concentrated on that romantic era will go into an "Innemann turn" the first time they spot the record jacket in a store window. Planes of that vintage in operating condition are prized collectors' items. Heard in the air or on the ground in their original state are six of the most famous and widely used engines of the war. The Sopwith "Camel," Pfalz D-12, Standard J-1, Nieuport 28, and Curtis JN4D are represented. Bold stereo underlines the crochety individualism of motors that range from the 90-horsepower Curtis "Jenny" trainer to the 420-horsepower Liberty engine used in the English De Havilland DH-4 which later became America's first air mail plane.

Persuasive Percussion, Vol. 3
Command ⊕ RS 4T 817

On an over-all basis, the tape fan appears to be several months behind the record collector in keeping up with trends that dominate the music market. This Command series may be old hat to the disc buyer who likes to keep abreast of things but the bing-bang boys are still going strong on tape. The spring pop releases have been dominated by the Command and Time labels and the end is not yet in sight. The venturesome tape user, if his will power is low enough, can now lose himself in such exotic items as "Gypsy Strings" and "Percussion." The third volume of "Persuasive Percussion" offers, at least, the stability of seasoned performers. These include Doc Severinsen and Mel Davis, trumpets; guitarist Tony Mattola, the trombone of Bobby Bryne and a percussion section featuring Don Lamond, Cliff Leeman, Artie Maortti and Sol Gubin. Willie Rodriguez was in charge of the Latin hardware.

Deutschmeister Band: Sousa Marches
Westminster ⊕ WTC 145

This entire production leaves something to be desired in normal listening pleasure. Part of the problem lies in the decision of the small Deutschmeister band to record a program that is more ambitious than those which first established its reputation in this country. The band's normal repertory—one in which it stands unique—is the completely unpretentious march music of Central Europe played with the gusto of a group not expecting to be taken too seriously by holiday strollers in search of light diversion. When the Deutschmeisters buckle down to serious stuff intended

* 12 Forest Ave., Hastings-on-Hudson, N. Y.

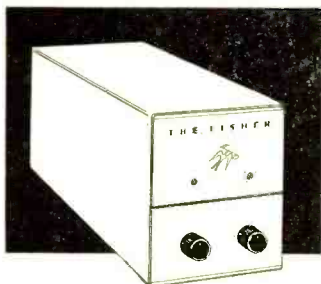
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for a heavyweight band, they're in for trouble. They are certainly out of their element in these twelve Sousa marches. The wayward changes in tempo within a given march, however ingratiating they may be in an Austrian novelty, are quite out of place in the sober step of a Sousa favorite. Neither are the technical elements of this tape all that they might be. The stereo separation is logical enough but the distortion is on the pronounced side.

Esquivel: Infinity in Sound, Vol. 2

RCA Victor LSP 2296

Winterhalter Goes South of the Border

RCA Victor LSP 2271

Latin-American favorites and reverberation figure prominently in these releases. In his second volume devoted to imagination unbridled for stereo, Esquivel demonstrates that he has been finding amusement in recent trends in novelty records. There is certainly more than a suggestion of humor in the way he treats some of the favorite tricks of arrangers-for-stereo these days. The injection of comedy may make more palatable the otherwise familiar stunts in the placing of voices and instruments for maximum two-channel surprise. Some of the tunes are so loaded with far-out harmonies, all the clever touches may not be apparent the first time. Latin specialties such as *El Negro Zumbon*, *Baia*, and *Espana Cani* receive their share of spoofing along with swing standards. Esquivel takes particular pleasure in pointing up, by means of imitating voices, some of the sillier sounds we've generally taken for granted in today's instrumentals. Although the illusion of space is somewhat more contrived than usual, the arrangement of *Time on My Hands* does fill every foot of the recording area with the sound of ticking—some of it real, the rest produced by the orchestra. Esquivelians should find this one of his best releases.

Hugo Winterhalter confines his efforts to domestic and imported Latin tunes but the over-all effect of the album is definitely North American. This is the lush approach carried to an extreme. Then too, in the processing, the whole thing tends to get out of hand. By the time they finish schmaltzing up the sound, the guy with a decent system is hard put to recognize the familiar characteristics of violins and cellos. Webster Hall, the scene of the recording, does not possess the acoustic quality heard on this record.

The Three Suns: Fever and Smoke

RCA Victor LSP 2310

The deluge of percussion stereo recordings has created more than one problem for established performers in the popular field. With a new breed of customer clamoring for the cheap thrills of arbitrary stereo separation, many of the name groups in the business have been faced with an unhappy choice. They could remain on the inactive list until the rage had run its course or they could attempt to get in the swim through modification or abandonment of their past formula. Events of the past months have tended to elbow out of the market some artists who have provided variety and change of pace.

(Continued on page 28)

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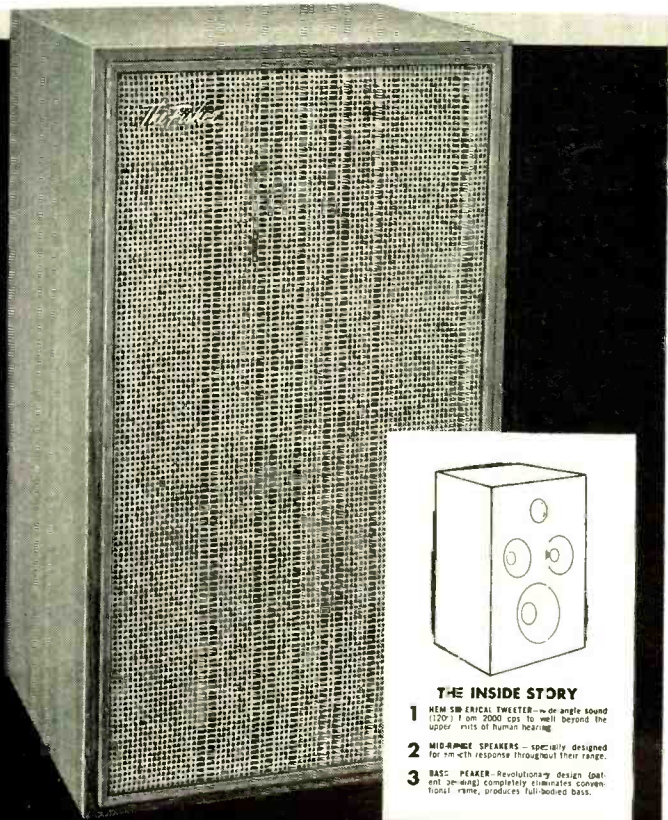
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Edward Tatnall Canby

THE GOOD NEWS— STEREO BROADCAST

Well, the first glossy photo of a real, honest-to-goodness FM-multiplex stereo adapter has just come in the mail (cost \$99.50), the F.C.C. decision on stereo broadcast is still a breathless bit of news—and it seems I made another of my left-handed prophecies. (A left-handed prophecy is one that was written before but published after the fact.) I said last month that maybe broadcast stereo would be this season's coming hi fi sensation. It will be, as witness this issue of AUDIO, given over to the good news that took so long in coming.

You will of course look elsewhere in AUDIO for the technical description of the wiring system, if you haven't had it lying around in your files for a year or so already. (My General Electric press release on this system came to me in the spring of 1960.) It is my business to take the wide view and observe what I may as to the implications.

Well frankly, I am delighted. For it seems to me that a situation which three years ago looked like a real "mess," insoluble unless either an existing industry were to be wiped out (the music stations broadcasting multiplexed restaurant background material on a subscription basis), or unless the quality of FM stereo broadcasting were to be seriously compromised, has instead been resolved with all parties happy. We have found a way to have our cakes and eat them too, without compromise, or so I gather at this point. And the method is ingenious to the point of wonderment—why didn't somebody think of it earlier, back in the acrimonious days of the Crosby-Halstead arguments?

Genius, to paraphrase the familiar phrase, is an infinite capacity to be simple. If I am right, the men at G.E.-Zenith (I'll make no distinctions) are to be congratulated for just that sort of simplicity. They figured a way to avoid all the clashes and conflicts and compromises and counter-accusations of the rival camps that first tried to launch stereo broadcasts three years back, and, it seems, their system is possibly superior even to the best of the original propositions. Hard to believe.

Components Plus . . .

You'll probably read that the prime feature of the now-accepted G.E.-Zenith system is that it requires only a relatively inexpensive conversion unit, the multiplex decoder, utilizing only a single tube in its simplest arrangement. True, this is a big advantage. It's a vital one in view of the huge importance in radio of the mass market, both the small mass-produced radio sets and the millions of large, mass-pro-

duced consoles. The fact is, of course, that component-style radio is all very fine, but radio itself, i.e., broadcasting, can't get along only on components. If we are to have broadcasting of any sort, it must be based on components plus mass-produced equipment. Period.

The broadcast system that will be successful obviously must provide a dual basis: (a) the means for top-quality sound, in the broadcast and in the reception, and (b) simultaneously, the means for simple, low-cost, mass-production receiving equipment.

AM radio has never, except in special cases and special areas, provided the full top-quality potential in actual practice, but has fulfilled the mass-production aspect admirably. That's why AM still horses along, in spite of TV and FM combined. FM broadcast, mono, has done an admirable job from the beginning on the first proposition—top quality sound for top-quality reception. Unfortunately, FM's mass-production capabilities were underplayed at the beginning, and the medium almost went under for good. (I was in on that near-debacle myself; I lost a good job right after the war when the FM boom failed to materialize as predicted.)

Now, happily, in the last few years FM has found itself, partly boosted up by increasing component sales and the general impact of the idea of hi fi, but also buoyed by an increasingly solid mass-production basis in the receiver area. Now—who'd have guessed it even ten years ago?—we have transistor FM-AM pocket radios, not to mention all other sizes. Sound quality is not exactly the strong point in these models. Their mere existence proves my point, that *quality broadcast depends on non-quality mass-production reception.*

FM, then, is on solid ground at last, in the mono medium. And meanwhile stereo, in spite of its not-very-handsome progress, has slowly taken over more and more ground, everywhere but in radio. The persistence of the clumsy AM-FM stereo broadcasts and a few FM-FM arrangements shows that the missing link of broadcast stereo has been a very real one. After all, it is the last link in the chain of linked elements that includes stereo discs, stereo tape, tape recorders and players, the home hi fi component system and mass-produced stereo "hi fi" (quotes are traditional with me). (You'll note that we now have another new noun in the business. A few years back, "hi fi" became "the hi fi"; now one goes out and buys a "stereo.")

Compromises

Thus, to go back to my earlier point, the new stereo broadcast system faced the two vital requirements that would somehow have to be met, both of them—top quality throughout, plus adaptability for inexpensive mass-production receiver equipment.

If both a stereo hi fi band and one or more background music bands were to be carried piggyback on a single FM transmission via multiplex, there just didn't seem to be any way in which they could keep out of each other's hair and yet remain uncompromised in sound quality. Even the reasonable compromise in the assigned bandwidths prepared by Editor McProud was still based on the premise that we had to have both stereo and background music, on the same broadcast signal, imposed in the same manner and thus still potentially subject at least to accidental interference.

What nobody saw, at that time, was the brilliant possibility—so simple—that if we could multiplex these two different and competing signals—one hi fi music, the other mood music—by *different systems* upon the same FM broadcast carrier, there would be no interference. The two would not recognize each other, nor, so to speak, be aware of each other's existence, though part of the same basic signal wave. This was the blindingly happy G.E.-Zenith idea. The question was merely—how. And it must have taken a while to work out the details, since this system did not appear in public and before the F.C.C. until a good while after the earlier proposals.

Again, I refer you to more detailed explanations elsewhere, but just marvel with me at the neatness of the very concept itself: Put your second stereo signal, (the difference signal), onto the main carrier via an *amplitude modulated* subcarrier, suppress the carrier, and use the remaining AM sidebands to *frequency modulate* the main FM carrier. Then, higher up (you have to 75 kc), put the background music signal on the same carrier via the present FM multiplexing. Thus the two will be mutually exclusive; the detector that brings one of these signals to life can't even "hear" the other signal at all. It's wonderful!

It Looks Like This

As the Boss explained the inner details to me (he's the best teacher I've ever run into), the FM stereo transmission under the new system will look like this—I'll give it to you in my lay words, just as a side-prop to the more proper engineering accounts elsewhere.

From 50 to 15,000 cps, on the FM carrier is the main or sum channel, receivable as a standard FM mono transmission. At 19,000 cps there's a control "synch" signal, to grab the local oscillator (producing the subcarrier) in the home multiplex receiver, similar to the TV arrangement. That oscillator runs at 38,000 cps, the second harmonic of the control signal.

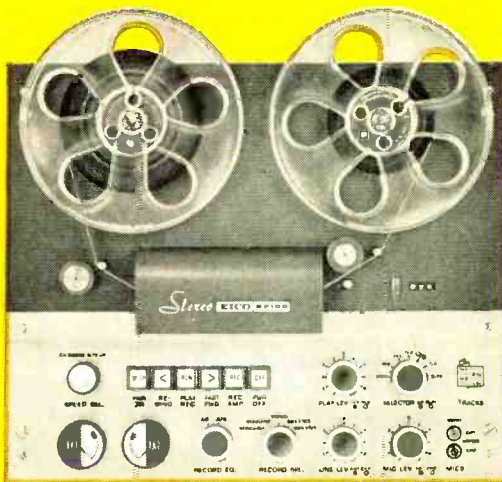
Then from 23,000 to 53,000 cps, still on the FM main transmission, is the vital AM multiplexed signal, 15,000 cps wide on each side of the 38,000 cps AM carrier frequency, suppressed at the transmitter—only the side bands go out on the air.

What? said I, the sides without the middle? Sounds to me like a bottle of milk without the bottle. Yet so it is.

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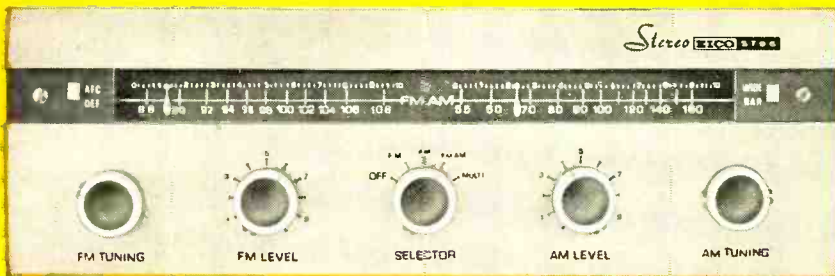
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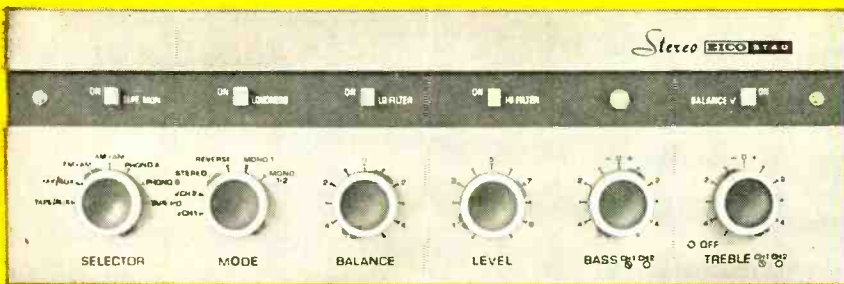
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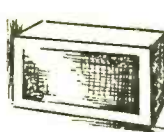
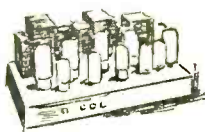
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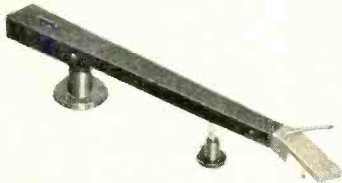
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Tokyo, Japan

receivers. It's far away from the lower FM signal, whose top is 15,000 cps. And it can't even hear the AM signal that fits in between. Neat, neat, neat!

No interference, top stereo quality (50-15,000 cps on both the sum and difference signals) and everybody happy. Cheap receivers too, or so I hear, in spite of that \$99.50 job I mentioned. That is—cheap equipment is inherently possible and satisfactory within its own sphere of operations. Mighty important, I tell you, even if the top product does cost \$100, self-powered. Imagine if it cost \$99.50 to buy *any* stereo adapter. Or even \$39.50. It won't, if all goes well.

Now there's only one pay-off to mention here. I wonder just how many hopefully thinking audiophans have jumped to a conclusion that is as likely as a short circuit in a wet distributor. Namely, that AM for the second (difference) stereo channel is bad, because it'll be subject to static and noise (whereas the main signal, FM, is immune to the noise)?

This, of course, was one of the most violent objections most of us had to the old FM-AM stereo broadcasts, one stereo channel via the FM transmitter and the other via AM. The noise, in one channel but not in the other, was far more distracting than the difference in tonal quality between the two channels.

Do we have that problem again here, with FM and AM both in use?

Of course not! I almost fell into this trap myself, but managed to save myself and my reputation just before I sprawled. This AM is multiplexed upon a carrier FM signal; it doesn't exist in "free air" so to speak. The receiver picks up only the FM signal, carrying with it three different messages. The AM part is purely internal, if you see what I mean. So—no static.

Sure, sure, elementary; but I'll bet a lot of folks get tangled up on this little point, just the same.

* * * *

Sometimes I wonder what it must be like to be a "lay" member of that august body, the F.C.C. The explanations that must go on, with millions of dollars hanging on every word! Lay or no, I'd say that the new F.C.C. has done a good job this time, seeing a good thing when it was presented, coming to a relatively quick decision in view of the "recency" (as Mr. Harding might say, he of that famous word, normalcy)—the recency of the new set-up.

We'll all be talking more, much more, about the forms of equipment that are now likely for stereo broadcast and the forms of stereo entertainment that may crop up. That, of course, is very much within my own province and if anybody around here wants a guy who knows the technical ropes of stereo and the parallel ropes of its main signal—the art of music—I'm all set to produce stereo music broadcasts galore. I can even explain sum and differences to the folks "out there," if I have to. That takes explainin', let me tell you, especially to Aunt Mamie, who thinks "stereo" is something she saw in the movies, with a giant screen.

Have recorder, can edit. End of plug.

THOSE "STEREO" PHONES AGAIN . . .

I am really not happy about this to-do over the so-called "stereo" headphones. I have incurred the annoyance of a number of manufacturers of two-channel phones by suggesting what is surely the plain truth, that these phones do not give a stereo sound, but rather a binaural sound,

(each channel going *exclusively* to one ear) which is more or less realistic according to the widely varying methods of stereo recordings now being practiced. The sound may be lovely, exciting, a superb new sensation, it may be far superior to mono sound through headphones, and indeed it is. But it isn't stereo, and that is that.

Yet, for solid commercial reasons, the name stereo being what it is these days, this wrong terminology goes right along. I'm looking at an ad for a complete component music system right now, from a large metropolitan music store. Stereo amplifier/FM tuner. Stereo speaker system, two separate units. Stereo turntable, plays stereo and monophonic records. And stereo headphones. "If you've never heard stereo through quality headphones, we know you're in for a thrill."

Very possibly. I don't mean at all to split hairs, nor to run down the genuine pleasure which many people have found in this "stereo" listening. Indeed, I've always been a headphone man, as many a reader knows, and I'm frankly delighted that this very useful form of listening has staged such an unexpected comeback. For years, the mere idea of headphones had been anathema to any salesman—only libraries and laboratories, schools, language centers and the like have used the devices, for purely practical reasons. But for *home enjoyment*—heavens no! Not commercial.

Well, they are commercial now, and a good thing. As I've already suggested, when home recording enthusiasts begin to discover the absolutely astonishing qualities of true binaural recording, listened to *only* via earphones (you'll need batteries of them, for the whole family), then I think the two-channel phone business is really going to spurt. The time is near enough—it's practically now. This particular plug of mine is absolutely hoary with age by this time.

Meanwhile, there are stereo recordings and there are 'phones. I keep receiving a steady spate of inquiries as to that "Bauer circuit" that converts headphones into simulated stereo receptors, and have dutifully sent them on to Mr. Bauer; but I have not heard further as to available commercial versions of his simple circuit. It seems to me that the answer to the whole question of "stereo" headphone listening is to be found in this circuit. Just install it in your phones—or your tape recorder, as an alternative stereo amplifier 'phone output—and then go right ahead and call the 'phones stereo. Correct.

What sounds good and what doesn't via the "stereo" 'phones is a quite interesting question. Stereo has many forms today and only the basic fact that two channels of sound are heard through two loudspeaker systems holds them all together. In the miking, the sky's the limit—from two mikes inches apart and built into the same case all the way out to those elaborate multi-mike five-dimensional set-ups that are now used, mainly in this country, for operas and the like. (One recording session I saw had about forty operating mikes, including a separate mono network.)

Listening is a subjective thing in respect to the effect of stereo recording via 'phones. Some like it, some don't. (Even true binaural recording has a remarkably different impact on different people. I've been recording my own Canby Singers in binaural as a rehearsal aid—some singers just say umph at the earphone playback, others, when the 'phones are put on their heads, simply go straight up in the air and yell in amazement!) It is thus quite likely

(Continued on page 61)

Quality Control at AR

The frequency response of every AR speaker is checked in an anechoic chamber before it is shipped. (Many other tests, of course, are also made.) Acoustic Research is one of the very few companies in the history of loudspeaker manufacturing, so far as we know, that have followed this rigorous practice.



Silvano Cannavacciuolo, AR inspector, checks a speaker response curve at one of AR's anechoic chambers. The response curves of the individual drivers in the system he is testing have already been recorded and found acceptable at the main anechoic chamber.

The purpose of such careful quality control is to make sure, as far as is possible, that AR speakers provide natural reproduction of music, without rattles, buzzes, distortion, or pseudo-hi-fi exaggerations.

Prices are from \$89. to \$225.

Until now, AR speakers have been sold under a one-year guarantee covering materials, labor, and freight to and from the factory.

On the basis of our field experience we are now able to extend this guarantee to five years. The extension is retroactive, and applies to any AR speakers bought since 1956.

AR speakers are on demonstration at AR Music Rooms, on the west balcony of Grand Central Terminal in New York City, and at 52 Brattle Street in Cambridge, Massachusetts. No sales are made or initiated at these showrooms.

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

WARRANTY	
<small>This speaker is covered by a five year guarantee covering materials, labor, and freight to and from the factory. The guarantee is retroactive to the date of purchase of the speaker.</small>	
IN CASE OF DIFFICULTY	
<small>Under the guarantee, if a speaker is found to be defective in materials, labor, or freight to and from the factory, it will be repaired or replaced at no charge to the owner. If the speaker is found to be defective in materials, labor, or freight to and from the factory, it will be repaired or replaced at no charge to the owner. If the speaker is found to be defective in materials, labor, or freight to and from the factory, it will be repaired or replaced at no charge to the owner.</small>	
<small>1. This guarantee covers only the speaker and does not cover the amplifier or other accessories. 2. This guarantee does not cover speakers used in commercial establishments. 3. This guarantee does not cover speakers used in marine environments. 4. This guarantee does not cover speakers used in high humidity environments. 5. This guarantee does not cover speakers used in high temperature environments. 6. This guarantee does not cover speakers used in high vibration environments. 7. This guarantee does not cover speakers used in high shock environments. 8. This guarantee does not cover speakers used in high pressure environments. 9. This guarantee does not cover speakers used in high altitude environments. 10. This guarantee does not cover speakers used in high altitude environments.</small>	
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EDITOR'S REVIEW

THE STEREO DECISION

AFTER MONTHS of more or less patient waiting, high fidelity fans throughout the country were rewarded with the decision of the Federal Communications Commission on FM Stereo on April 19th. Now that the one system has been selected, we may all begin with our experiments toward building our own, or—and probably much simpler—start saving up the pennies to purchase one. At least, there is no further doubt as to which system we shall be using, and it is quite likely that some of the industry's laboratories are working overtime in the search for the "most for the least."

The choice of a single set of standards for the transmission of the signal does not mean that only one type of "decoder"—a term which distinguishes from detector and discriminator, neither of which the device really is—will work. In fact, we already know of three different methods of doing the job, and there are undoubtedly several more. In any case, we are presenting as much information in this issue as we could possibly acquire in just three weeks from decision to presstime. At least we didn't say "*ALL ABOUT FM-STEREO*" on the front cover.

Starting on page 18, Managing Editor Saslaw gives us the background, delineates the actual F. C. C. order which specifies the standards, and describes both transmitting and receiving circuits with particular attention to the Zenith decoder. On page 21, Daniel von Recklinghausen, H. H. Scott chief engineer, delves into mathematics and shows how the signal can be developed by any one of three methods, and how one of the methods can be used as the decoder. On page 24, Antal Csicsatka and Robert M. Linz who did much of the development work at General Electric, describe the G-E decoder, along with still further background information. On the whole, we feel that this issue will serve as a sort of high-level primer to familiarize the audiofan with all of the aspects of FM stereo.

It appears that there are several difficult problems in making a decoder work with a minimum of distortion. That is to be expected—we have most recently gone through it with color television, and those circuits are certainly complicated enough; and before that it was plain old black and white television (remember when there were 30 tubes in a TV set?) and so on as far back as radio itself. There is not much doubt that the first decoders—and they will be in the form of "adapters" to be used with existing tuners—will work, and the integrity of the manufacturers guarantees that. By the same token, it is certainly likely that the device will be simplified appreciably, particularly for complete radio sets, since their standards of performance will not approach those of component tuners and receivers.

The transmitting standards are quite severe, and rightly so. It is interesting to note that the frequency response of the main and subcarrier channels must

be maintained within less than 0.5 db throughout the range from 50 to 15,000 cps, and that the phase differences must be held within three degrees at the transmitter. These standards are certain to ensure that the transmitted signal will be all that we could ask of it—it is now only necessary that our decoders be as good as the transmitters.

As to the advantages of FM stereo, very little need be said. One of the greatest, as we see it, is that it will now be possible to tape some good stereo music from the air. Heretofore about all we could do was to play recorded tapes, or to dub from stereo records. We should soon be able to begin building up a stereo tape library, just as many of us have done on mono over the past ten years or so. We hope we can look forward to more live stereo broadcasting of good music than is currently available on mono, but that will depend on the listener reaction and the number of stereo receivers that are in use.

Anybody can speculate about anything—some prognosticators claim this is the end of the phonograph record, others that there will be a great boom in new tuners and receivers, in loudspeakers, and in tape recorders. We doubt that the phonograph record will ever pass into the discard, at least within our lifetime. We honestly feel that there will be a considerably increased interest in FM reception, and that the over-all effect on the audio industry will be good. We are not at all pessimistic, nor are we over-optimistic. We just look forward to further infusion of the desire for good music because of FM stereo, and this will give us a greater variety of programs from which to choose our musical entertainment.

SEASON'S EVENTS BRING NEW KITS

This has been a busy Spring, what with hi-fi shows in Washington, San Francisco, Los Angeles, and London (we missed the one in Paris altogether), and then the F. C. C. decision followed closely by the convention of the National Association of Broadcasters, also in Washington. But of the many things we have seen at all the shows, the one that impressed us most was a kit to end all kits—a 1000-watt AM transmitter in kit form.

This item was shown by Bauer Electronics Corporation at the NAB show, but we shall refrain from profiling it, even though it does save some \$1300 for an average of about 55 hours of assembly time. Can't do that well with any kits we have seen heretofore.

Another surprising idea in the kit department is Heath's latest, a garage door opener. What won't they think up next? With prefabricated houses, instant mashed potatoes, prepared canvasses for oil painting by the numbers, and even boats of glass fiber cloth, why shouldn't General Motors bring out a do-it-yourself Cadillac?

We'd be glad to Profile one of them!

Exclusive Assurance of Quality

Only the Stanton Fluxvalve can provide the exclusive and patented features which make it the finest pickup available.

The significance of a document . . . a LETTERS PATENT conferring *exclusive* rights and privileges on an individual to manufacture and vend an invention both *new* and *useful* . . . further signifies a most important responsibility upon that individual.

Endowed with this responsibility, PICKERING & COMPANY pioneered—through their outstanding participation in stereophonic development—the STANTON STEREO FLUXVALVE, the very first (and only) stereo cartridge incorporating the revolutionary T-GUARD stylus.

But this was only the beginning—through continued development—major advances in stereo pickup design were brought about by the use of PICKERING & COMPANY's long experience . . . special skills and exclusive techniques.

Thus; less than one year after the introduction of the stereo record, PICKERING & COMPANY introduced the MODEL 380 STANTON STEREO FLUXVALVE. And, in a few short months, the 380 earned its reputation from the experts as—
"The finest stereo pickup ever tested".

Isn't it time you found the true answer to stereo as it was meant to be?

WE urge you to go to your dealer for a 380 FLUXVALVE DEMONSTRATION—we know you will find its quality of performance almost beyond belief.

FOR THOSE WHO CAN HEAR THE DIFFERENCE



for more than a decade—the world's most experienced manufacturer of high fidelity pickups . . . supplier to the recording industry.
PICKERING & CO., INC., PLAINVIEW, NEW YORK

The Stanton Fluxvalve and Stereo Fluxvalve are patented (and patents are pending) in the United States, Great Britain, Canada, Japan and other countries throughout the world.

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Paul H. Ashman
Attesting Officer.

Collectors Series
FOR THOSE WHO CAN HEAR THE DIFFERENCE
STANTON Stereo-FLUXVALVE
Model 380A
for use in
transcription
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PICKERING & COMPANY

your guarantee
must be supplied
by
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City
TYPE OF USE:
 Professional
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What Hath FCC Wrought?

DAVID SASLAW*

After several years of study, the FCC has finally decided upon a system of FM stereo. The system approved has the capability of achieving fidelity as high as is now available with monophonic FM broadcasts. Here are some details—

ON APRIL 20TH OF THIS YEAR, the FCC made known its decision to permit FM stereo broadcasting commencing June 1. The decision, although actively sought for many years, seems to have caught many people by surprise. The surprise does not center about multiplexing as such, but rather the system chosen by the FCC. On the one hand there have been comments implying that the chosen system is "not as good" as one of the systems not chosen. On the other hand, there have been comments to the effect that many FM tuners were rendered "obsolete" because of the FCC decision. Actually these reactions are quite natural considering the enthusiasm with which particular systems were championed and the unusual lack of factual information about the system chosen. At this point it might be well to point out that the Zenith-GE system performed as well as the best of the systems not selected, and in addition is essentially more flexible (able to retain the existing commercial FM multiplex, SCA) than the runner-up system (Crosby). As for the fear that some types of tuners would be unable to be adapted to stereo operation, this is just not so. More about both of these points later.

Exactly What Is the New Stereo System?

First of all it should be noted that the FCC merely established what is to be transmitted, not how it is to be achieved. In essence, what was approved was a basic equation which defines the signal to be transmitted (for the exact equation see the Daniel von Recklinghausen article on page 21). In addition, the FCC defined the transmission standards for this basic signal in order to ensure high

quality broadcasts (from a technical viewpoint). Following is the section of FCC Docket 13506 wherein the transmission standards are defined:

§ 3.322 Stereophonic Transmission Standards.

(a) The modulating signal for the main channel shall consist of the sum of the left and right signals.

(b) A pilot subcarrier at 19,000 cycles plus or minus 2 cycles shall be transmitted that shall frequency modulate the main carrier between the limits of 8 and 10 per cent.

(c) The stereophonic subcarrier shall be the second harmonic of the pilot subcarrier and shall cross the time axis with a positive slope simultaneously with each crossing of the time axis by the pilot subcarrier.

(d) Amplitude modulation of the stereophonic subcarrier shall be used.

(e) The stereophonic subcarrier shall be suppressed to a level less than one per cent modulation of the main carrier.

(f) The stereophonic subcarrier shall be capable of accepting audio frequencies from 50 to 15,000 cycles.

(g) The modulating signal for the stereophonic subcarrier shall be equal to the difference of the left and right signals.

(h) The pre-emphasis characteristics of the stereophonic subchannel shall be identical with those of the main channel with respect to phase and amplitude at all frequencies.

(i) The sum of the side bands resulting from amplitude modulation of the stereophonic subcarrier shall not cause a peak deviation of the main carrier in excess of 45 per cent of total modulation (excluding SCA subcarriers) when only a left (or right) signal exists; simultaneously in the main channel, the deviation when only a left (or right) signal exists shall not exceed 45 per cent of total modulation (excluding SCA subcarriers).

(j) Total modulation of the main

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington 25, D.C.

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In the Matter of)
)
Amendment of Part 3 of the Commission's)
Rules and Regulations to Permit FM) DOCKET NO. 13506
Broadcast Stations to Transmit)
Stereophonic Programs on a Multiplex Basis)

REPORT AND ORDER

By the Commission:

1. The Commission on March 22, 1955 released a Report and Order in Docket No. 10832 (FCC 55-340) which adopted rules providing for the issuance of Subsidary Communications Authorizations (SCA's) to FM broadcasters—Section 3.268, et seq. After a few years of operation under these rules, it became evident that multiplex techniques could be employed for additional uses beyond the limited "news, music, time, and weather" format prescribed therein. Accordingly, a Notice of Inquiry was released on July 8, 1958 (Docket No. 12517; FCC 58-635) for the purpose of exploring possible additional uses of FM multiplexing.

2. A preliminary examination of the comments submitted in response to the Notice of Inquiry in Docket No. 12517 demonstrated a widespread interest in the subject of FM stereophonic broadcasting by means of subcarrier multiplex transmission in conjunction with main channel operation. Accordingly, the Commission on March 12, 1959 released a Further Notice of Inquiry (FCC 59-211) which enlarged the scope of the proceedings under Docket No. 12517 to afford interested persons an opportunity to submit data and opinions directed specifically to the matter of FM stereophonic broadcasting.

3. During the pendency of the Notice of Inquiry, the Electronic Industries Association organized the National Stereophonic Radio Committee (NSRC) to develop and recommend national standards for FM stereophonic broadcasting.

carrier including pilot subcarrier and SCA subcarriers shall meet the requirements of Section 3.268 with maximum modulation of the main carrier by all SCA subcarriers limited to 10 per cent.

(k) At the instant when only a positive left signal is applied, the main channel modulation shall cause an upward deviation of the main carrier frequency; and the stereophonic subcarrier and its sidebands signal shall cross the time axis simultaneously and in the same direction.

(1) The ratio of peak main channel deviation to peak stereophonic subchannel deviation when only a steady state left (or right) signal exists shall be within plus or minus 3.5 per cent of unity for all levels of this signal and all frequencies from 50 to 15,000 cycles.

(m) The phase difference between the zero points of the main channel signal and the stereophonic subcarrier sidebands envelope, when only a steady state left (or right) signal exists, shall not exceed plus or minus 3 degrees for audio modulating frequencies from 50 to 15,000 cycles.

NOTE: If the stereophonic separation between left and right stereophonic channels is better than 29.7 decibels at audio modulating frequencies between 50 and 15,000 cycles, it will be assumed that paragraphs (l) and (m) of this section have been complied with.

(n) Crosstalk into the main channel caused by a signal in the stereophonic subchannel shall be attenuated at least 40 decibels below 90 per cent modulation.

(o) Crosstalk into the stereophonic subchannel caused by a signal in the main channel shall be attenuated at least 40 decibels below 90 per cent modulation.

(p) For required transmitter performance, all of the requirements of Section 3.254 shall apply with the exception that the maximum modulation to be employed is 90 per cent (excluding pilot subcarrier) rather than 100 per cent.

* Managing Editor, AUDIO.

(q) For electrical performance standards of the transmitter and associated equipment, the requirements of Section 3.317 (a) (2), (3), (4) and (5) shall apply to the main channel and stereophonic subchannel alike, except that where 100 per cent modulation is referred to, this figure shall include the pilot subcarrier.

Broadcasting FM Stereo

Previously we indicated that the FCC had approved the form and the technical standards for the stereo signal, not how it would be achieved. The distinction is quite significant. For instance, the approved system is known as the GE-Zenith system. Both GE and Zenith have on file with the FCC diagrams of proposed methods for producing the signal in the desired form. Both diagrams happen to be essentially similar as to method of signal generation. (Compare *Fig. 1* in this article with *Fig. 1* in the article by Csiesatka and Linz, page 24.) Does this mean that this method must be used by all broadcasters?

Definitely not.

There are at least two fundamentally different methods for achieving the standard signal. One of them is the type illustrated by GE and Zenith and described in the Csiesatka and Linz article, the other system is described at length in the von Recklinghausen article.

To summarize the two methods, the GE-Zenith technique requires a matrix wherein the sum and difference signals are achieved. The sum signal is fed to the FM exciter after a suitable time delay (to keep it in step with the difference signal which follows a somewhat different path). The difference signal, on the other hand, goes through a 38,000-cps suppressed carrier AM modulator and then to the FM exciter. Of course, both the sum and difference signals are properly pre-emphasized (before the matrix in the GE diagram, after in the Zenith), and the difference signal is filtered to eliminate the harmonics of the carrier.

Figure 2 shows the block diagram of an AM modulator (Zenith proposal) which will generate the 15,000-cps-wide sidebands around the 38,000-cps carrier (which is suppressed) and, at the same time, provide the 19,000-cps pilot signal. The method used in this modulator is to mix the output of two crystal oscillators to provide the 38,000-cps carrier, or, by a 2/1 division, the 19,000-cps pilot. The pilot is then added to the sidebands which remain after the carrier is suppressed and the combined signal passed through a linear-phase-shift low-pass filter. If we refer back to the FCC specifications we note that the maximum difference permitted between the main and subchannel is 3 degrees. For this reason, care had to be exercised to avoid introduction of unwanted phase shift.

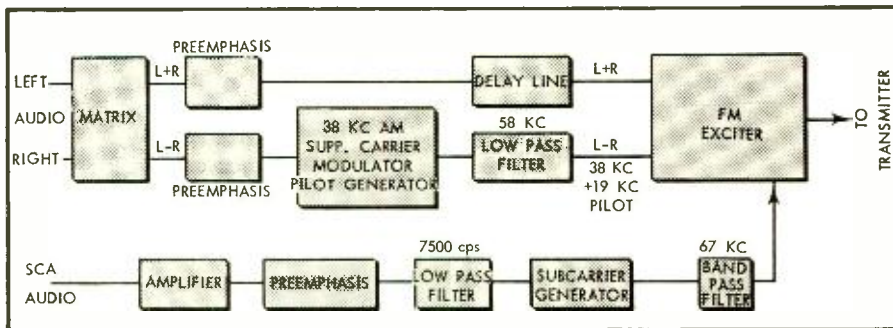


Fig. 1. Block diagram of Zenith proposal for achieving the stereophonic signal.

This is especially true in a system such as this wherein the paths for the main and subchannel are not identical.

On the other hand, the second method for generation of the standard signal is far less critical as to phase shift. This system is a time-division multiplex switching system between left and right stereophonic program channels. In this system a switching device alternately takes the whole left or the whole right signal. In a way it is rather difficult to understand how switching rapidly between the two inputs will produce the standard equation, but the fact of the matter is that it does produce it. In actuality, the form of the standard equation is the key to its derivation; it is essentially a Fourier expansion of two variables. That is, if we were to take any two independent variables and expand them mathematically we would arrive at substantially the same equation. According to Carl Eilers of Zenith Radio Corp. (who worked on it), the idea for the now accepted system had its inception through mathematical analysis of the time-division multiplex signal. Strangely enough, in its own presentation, Zenith did not propose this method of signal generation. Instead they proposed the system shown in *Fig. 1*. As far as we know at present, H. H. Scott, Inc. is the only proponent of the time-division method of signal generation on a practical basis; they have announced the availability of equipment utilizing this principle. Although on the surface this method is much more sophisticated from an engineering viewpoint, it is quite

possible that the matrixing method is much easier to integrate with existing equipment. Most likely this is the reason most of the emphasis has been placed on the matrixing method. It is also possible that the time-division method is not as well known as it should be.

Receiving FM Stereo

Just as there are two fundamentally different methods for transmitting the stereo signal, there are an equal number of methods for receiving it. It might be said that these methods are "mirror images" of the transmission systems; they essentially reverse the procedure of the broadcast station.

For example, let us consider the matrixing method. The sum signal is derived from a matrix and, except for some normal processing, is transmitted in that form. Referring to the block diagram of the GE adapter (*Fig. 2* in the Csiesatka and Linz article) we can see that the receiver just reverses this process. The difference signal, however, must first be recovered from the sidebands in which it was transmitted. This involves reinserting the 38,000-cps carrier which was suppressed at the transmitter and then separating the audio from the carrier. In order to reinsert the carrier precisely where it should be, the 19,000-cps pilot is used; either to synchronize a local 38,000-cps oscillator or directly in a doubler circuit. We know that this pilot will give us the precise time location we need since it was transmitted with the signal. Then we can demodulate. The difference signal is now

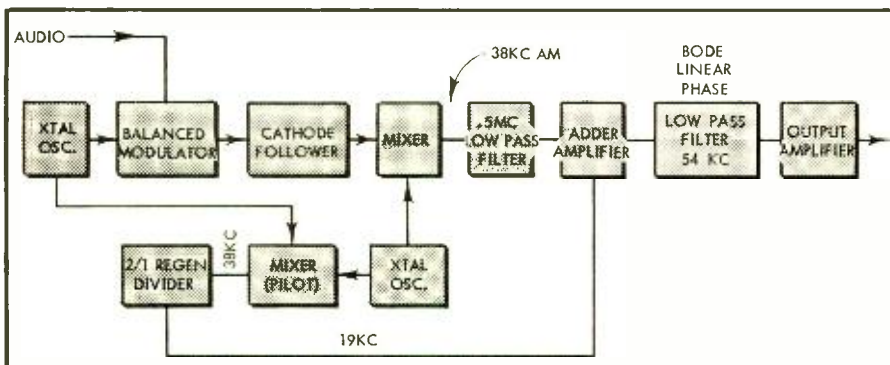


Fig. 2. AM modulator and 19,000-cps pilot generator.

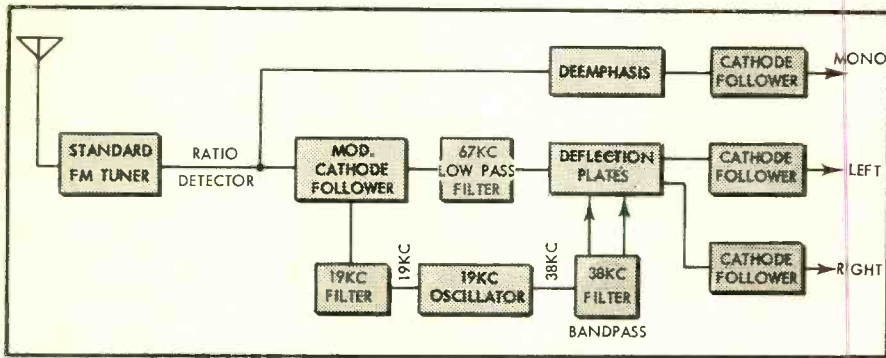


Fig. 3. Block diagram of Zenith time-division adapter.

ready for matrixing to recover the original left and right signals which started the whole process.

The switching (time-division) method, used in the receiver, is a "mirror image" of the time-division transmission method although there are several ways of effecting the time division. *Figure 3* is the block diagram of the method used by Zenith and H. H. Scott uses another method as shown in *Fig. 4* of the von Recklinghausen article. In both cases the switching is synchronized by a 38,000-cps pilot. The H. H. Scott adapter is explained in detail by Mr. von Recklinghausen. A schematic of the Zenith adapter is given in *Fig. 4*. In reality very little explanation is necessary for this system once the time-division method of generation is clear; the receiver is only required to switch between signals at the precise rate used in broadcasting to reverse the process and extend the original left and right signals. The switching rate (as explained by von Recklinghausen) is 38,000 cps, the second harmonic of the pilot signal.

The natural question now is whether the matrix receiver will operate with a signal generated by the time-division method and vice versa. The answer to this, of course, is that the signal generated by both the matrixing and time-division methods is exactly the same in the air; the receiver sees the same signal no matter which method is used to generate it. I must admit, however, that to date I have never actually "heard" the time-division method (I did attend a demonstration of the matrixing method), but then how many people have?

Existing Equipment

Now to return to the apprehensions expressed by some people about the forced obsolescence of some existing tuners. Apparently it was felt that tuners that use Foster-Seely type discriminators would be unable to be adapted. The reality of the situation is that there is no valid technical reason for this fear. It has been stated that discriminators of the Foster-Seely type are inherently too narrow in bandwidth to handle FM stereo transmission, a sit-

uation made more difficult by the fact that in stereophonic transmission more energy is concentrated near the edges of the passband than heretofore. In fact, a well-designed FM tuner, whether it uses a ratio detector or Foster-Seely discriminator, can have a sufficiently wide bandwidth to handle stereophonic transmission under the rules adopted. The key words here are "well-designed." Certainly a poorly designed tuner with a discriminator will probably yield unacceptable distortion with stereophonic signals. But the fact of the matter is that such a tuner will provide distorted monophonic signals too. A poorly designed FM tuner, even with a ratio detector, will also provide unacceptable distortion. This whole matter can be summed up by noting that a high-quality tuner will provide a high-quality signal, whereas a poor-quality unit will distort—no matter what system of FM detection is used. In other words, the existing high-quality FM tuner is not obsolete.

Is the Monophonic Signal Degraded?

In our enthusiasm for the marvels of FM stereo, we tend to overlook the fact that many people will want to continue receiving monophonic FM programs for some time. Will they "pay the piper" for those who wish to have stereo now. In other words, is the monophonic signal degraded? The answer is no—and in fact this was one of the important reasons for selecting the GE-Zenith system. The following excerpt from FCC Docket 13506 indicates that the degradation is only experienced in the stereo channel (system 4-4A is the Zenith-GE system, 1 is the Crosby system):

15. In comparing FM stereophonic systems, it is customary to use as the standard of comparison the signal-to-noise ratio obtained with monophonic transmission and reception for a given amount of transmitted power and other specified conditions, including height of antenna, transmission path and receiver sensitivity. When stereophonic transmission is substituted under the same set of conditions, the main carrier output and subcarrier output at the receiver will have reduced signal-to-noise ratios. The amount of reduction depends upon a number of transmission parameters, including the subcarrier frequency, the frequency swing of the main and subcarriers and the deviation of the main carrier caused by the subcarrier or subcarriers. The calculated loss of signal-to-noise ratio, compared to monophonic transmission and reception for each System is:

System	Monophonic receiver output	System 1	System 4-4A
		6 db	less than 1 db

(Continued on page 28)

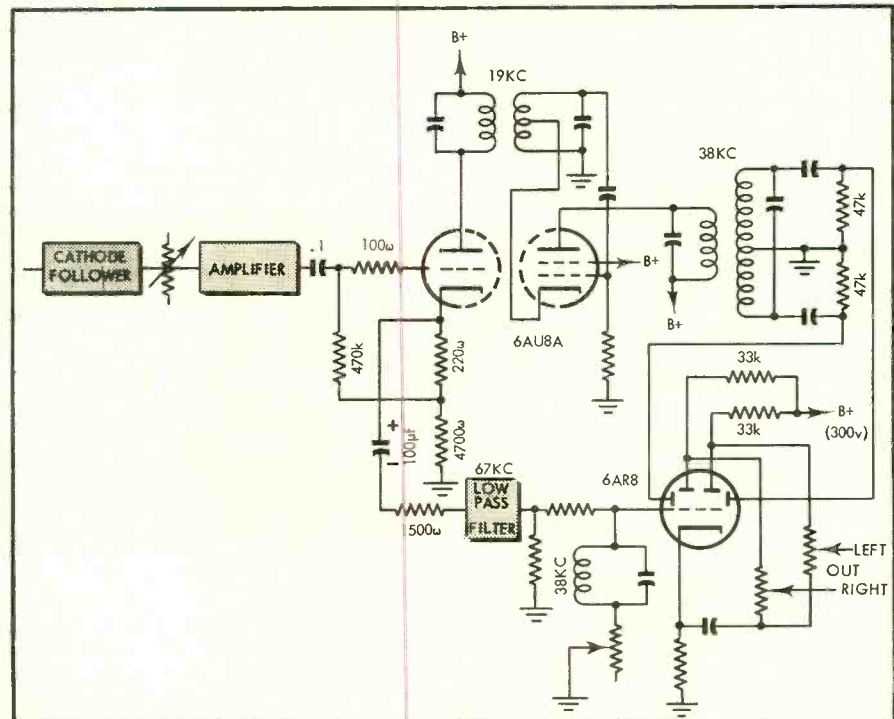


Fig. 4. Simplified schematic of Zenith adapter.

An FM Multiplex Stereo Adaptor

DANIEL R. VON RECKLINGHAUSEN*

This adaptor utilizes time-division to achieve stereophonic FM reception; a method whereby switching rather than matrixing is used to recover the left and right signals.

AFTER YEARS OF STUDY and considerable field testing, the Federal Communications Commission has set the specifications for the compatible stereophonic signals to be transmitted from a single FM station. The system chosen transmits the sum of the left, *A*, and right, *B*, input channels on the frequency modulated main carrier. The difference between *A* and *B* amplitude modulates a 38,000 cps subcarrier with the subcarrier itself suppressed. The subcarrier signals in turn frequency modulate the main carrier. A 19,000 cps signal is also transmitted for stereo demodulator synchronization.

These and other pertinent specifications can be obtained from the FCC rules and regulations. Written in legal and engineering language, they are clear to the engineer engaged in this type of work but not necessarily enlightening to persons unfamiliar with the proceedings of the National Stereophonic Radio Committee (which performed the majority of the work of analyzing and testing the various stereo broadcasting schemes proposed).

The recording and reproduction of stereophonic signals had its inception in the 1920's and 1930's, then described as binaural signals. It was only natural that the attention of scientists and engineers was also focused on means of transmitting these signals to remote points. Carrier current telephony over cables and also radio links were investigated intensively.

The stereophonic system chosen by the FCC may be accomplished by the time multiplex system shown in Fig. 1. Here, the input of a cable or radio link is switched rapidly between the two inputs *A* and *B*. The output of the cable or radio link is also switched rapidly to the

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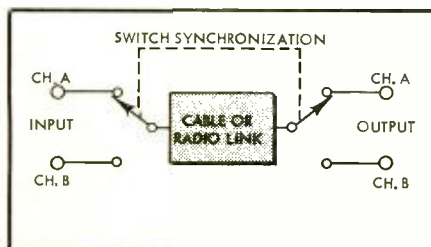


Fig. 1. Basic time multiplex stereo system.

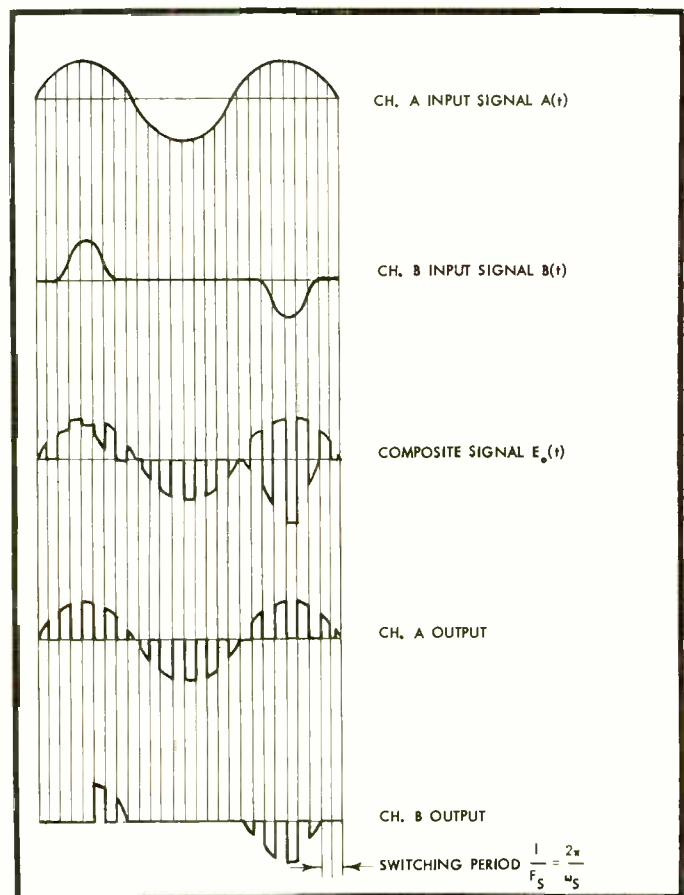


Fig. 2. Waveforms in basic time multiplex system.

two output terminals. Switch synchronization has to be provided so that the channel *A* input signals will not accidentally appear in the channel *B* output.

The signal waveforms of such a system are shown in Fig. 2. Here, the input signals, *A*(*t*), and *B*(*t*), are switched at a rate f_s to the link. The composite signal $E_o(t)$ now shows portions of the two input signals in quick succession and a good representation of the two input signals is evident. If the lead containing the composite signal is then switched in synchronism and at the proper time to the two output leads, the channel *A* and *B* output waveforms result. These waveforms can contain all the information present in the original two signals. The highest input frequency which can be transmitted by such a method is exactly equal to one half the switching rate, f_s .

Mathematically, the composite signal,

$E_o(t)$, by switching *A*(*t*) and *B*(*t*) at a rate $f_s = \frac{\omega_s}{2\pi}$ becomes:

$$E_o(t) = \left[\frac{A(t) + B(t)}{2} \right] + \frac{2}{\pi} \left[\frac{A(t) - B(t)}{2} \right] \{ \cos \omega_s t - \frac{1}{3} \cos 3\omega_s t + \frac{1}{5} \cos 5\omega_s t \dots \} \quad \text{Eq. (1)}$$

where *A*(*t*) and *B*(*t*) are the instantaneous input signals, *A* and *B*, as a function of time. It can be seen from this that the sum of the input signals is transmitted directly. This is also the compatible monophonic signal which can be utilized without any further demodulation. The difference between the input signals appear as amplitude modulation of a series of odd harmonics of the switching rate f_s .

The composite signal might be utilized for modulation of an FM broadcast station. However, the transmission of the higher harmonics of the switch-

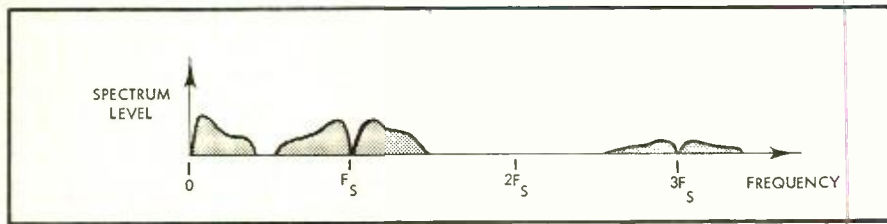


Fig. 3. Spectrum of basic time multiplex system.

ing frequency would result in radiation of signal components from the station outside its allotted 200,000 cps bandwidth, assuming 15,000 cps audio response with inputs switched at a 38,000-cps rate.

Restriction of bandwidth to include only the audio frequencies of *A* and *B*, and the first order sidebands of the switching frequency, results in the basic specification of the present multiplex system. This also has the benefit of a less stringent bandwidth requirement along with only slightly changed effective signal-to-noise ratio or change in separation due to phasing errors of the sub-carrier employed for detection.

To be able to utilize the full amplitude handling capability of the radio channel (i.e. maximum deviation capability of an FM transmitter), the relative amplitude ratio of the main channel, *A + B* and subchannel, *A - B*, has to be changed to give the composite signal *E(t)* which now has been made standard:

$$E(t) = [A(t) + B(t)] + [A(t) - B(t)] \cos \omega_s t \quad \text{Eq. (2)}$$

The composite signal can be generated by at least three different methods. The first one uses a switching modulator and a phase-linear low-pass filter. The second method would employ a two channel square law modulator acting on the two input signals. The third method would require the use of an audio matrix network (with transformers or resistors) and a suppressed carrier modulator. Here, two separate outputs could be obtained: the main channel output

for direct modulation of the FM transmitter and the stereo subchannel for modulation of the FM transmitter at a later stage of multiplication where higher frequency modulation is possible.

The third method is most likely to be incorporated in FM transmitters employing phase modulation in conjunction with a frequency-to-phase correcting network and proper audio delay equalization to correct for the envelope delay of the early stages of the transmitter.

Receiving the Stereo Signal

The above discussion of modulation methods along with the mathematical description of the signal waveform and its development leads to several methods for separating the composite stereo signal into its left and right components.

If the composite signal of Eq. (2) is passed through a square law demodulator driven by a waveform $[1 + 2 \cos \omega_s t]$, the left channel output will be equal to $2A(t)$ plus fundamental and second harmonic of the reinserted sub-carrier, $f_s = \frac{\omega_s}{2\pi}$. The right channel output $2B(t)$ can be obtained by driving a second square law demodulator with a waveform $[1 - 2 \cos \omega_s t]$.

Since good square law detectors are difficult to come by in practice, a linear detector driven with a large reinserted subcarrier, f_s , can also be used. This, in effect, uses a square wave for demodulation which gives the detector a multiplying function $[1 \pm \frac{4}{\pi} \cos \omega_s t]$. This in

turn requires a gain adjustment of the subcarrier signal by $\frac{\pi}{2}$ prior to detection or the same gain adjustment of the difference signal after detection.

A third method of detection would employ the use of a bandpass filter for the selection of the subcarrier sidebands in addition to the use of a suppressed carrier AM detector and a resistive sum and difference audio matrix network with proper main channel audio delay.

All of these stereo detection schemes have one common advantage and one common disadvantage. The advantage is that they are relatively economical in parts cost, employing only two diodes or a beam deflection tube (such as 6AR8) for demodulation. The disadvantage is that all of these detectors produce a very large output at the subcarrier frequency, f_s (38,000 cps), and its harmonics (76,000 cps, 114,000 cps, etc.). These are removed only with difficulty by filtering without disturbing audio frequency response. This, in itself, is not harmful, since these frequencies are above the range of human hearing. However, these signals, if not filtered out, will tend to overload amplifiers and tweeters because of reduced power handling capability at high frequencies. The result is considerably higher distortion. More serious is that the bias frequencies of tape recorders fall in the frequency range of the subcarrier frequency and its harmonics. It is made poorer by the increased amplification of tape recorder circuits to compensate for the required tape pre-emphasis and high-frequency losses of the tape. Whistle tones known as "birdies" are the result of subcarrier signals causing tape overload. Therefore, it is absolutely necessary that sub-carrier frequencies are prevented from appearing at the audio outputs of the multiplex adaptor.

In the H. H. Scott adaptor, the sub-carrier is balanced out by means of balanced bridge demodulators and a 15,000 cps sharp cutoff filter is used at the

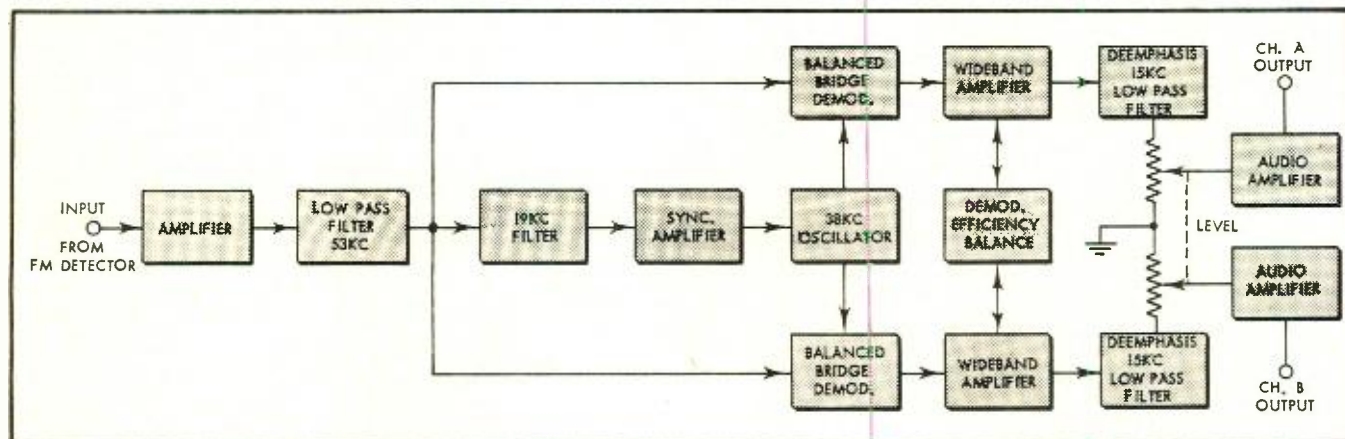


Fig. 4. Block diagram of H. H. Scott type 335 multiplex adaptor.

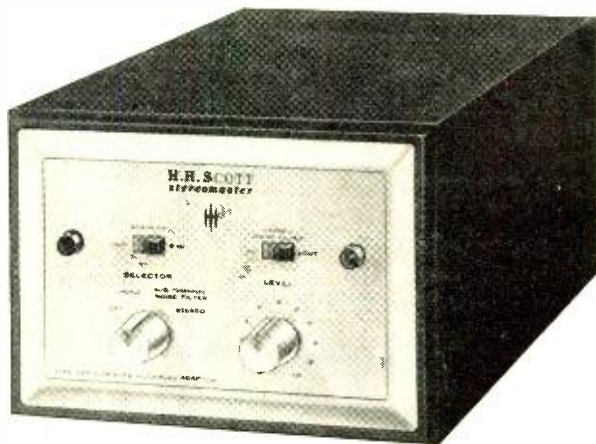


Fig. 5. Front view of H. H. Scott adaptor.

audio outputs. This effectively eliminates any of the subcarrier frequencies at this point.

The forerunners of the multiplex stereo system chosen by the FCC have been described by a magazine writer as "the Radio Manufacturers' Dream". This writer was correct in his estimate since this system allows radio manufacturers to design sets of relatively modest cost which produce stereo of some sort. However, to produce high quality stereo worthy of the name "High Fidelity" a great deal of engineering and complex circuitry has to be expended in both tuner and multiplex adaptor design. For example, to achieve 30 db of separation, the phase response of the tuner-adaptor combination may not differ more than ± 3 degrees between main and subchannel at all modulating frequencies. Similarly, the amplitude response may not vary more than ± 0.3 db, and the phasing of the subcarrier with respect to the pilot carrier has to be constant at all r.f. input levels. For this reason, it is extremely important that the tuner and adaptor match each other and have a wide and phase-linear response including the required connecting cable. Any level controls connected between the tuner's multiplex output and the stereo demodulator circuitry will have a severe effect on phase and frequency response. Similarly, the frequency and phase response of the audio circuitry of existing tuners is not controlled closely enough to use the tuner's regular audio output and maintain high separation between left and right outputs while deriving the subchannel information separately.

For these and other reasons, almost all adaptors derive both main and subchannel information directly from the tuner's multiplex output circumventing all audio stages of the tuner. The wideband ratio detectors used in most high fidelity tuners have a sufficiently wide bandwidth, wide frequency response, and low internal impedance to permit the use of up to a 3-foot connecting

cable with negligible effect on amplitude and phase response. To maintain good low-audio-frequency separation, it was found necessary to maintain the low frequency input impedance of the adaptor in excess of 50 megohms. Sufficient amplification had to be provided in the adaptor to produce a 2.5-volt minimum output at 100 per cent modulation of either left or right channel from the relatively low output of the wideband detector (0.3 volt typical at 75,000 cps deviation).

The Adaptor

Figure 4 shows the block diagram of the H. H. Scott type 335 Multiplex Adaptor. The signal from the FM detector (multiplex output) is first amplified in a high-input-impedance stage and then passed through a phase-linear filter attenuating frequencies above 53,000 cps. This removes any background music signals from the stereo demodulator inputs. A narrow band and noise immune 19,000 cps filter selects the pilot carrier. After further amplification it synchronizes the 38,000 cps subcarrier oscillator. All tuned circuits are temper-

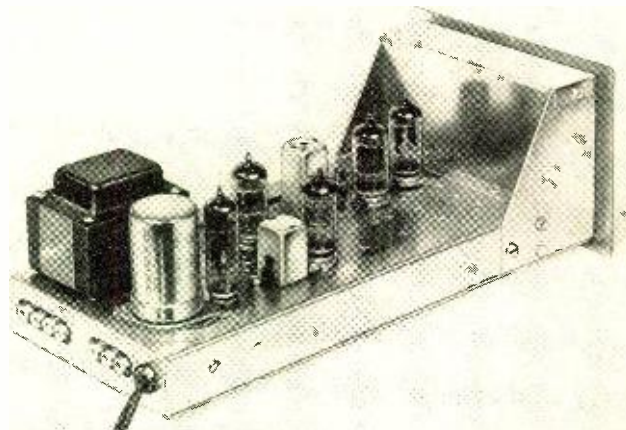
ature compensated so that the oscillator exhibits a warmup drift of only .01 per cent in the absence of a pilot carrier, the 38,000 cps subcarrier oscillator remains phase locked to the pilot signal so that maximum separation is maintained at all r.f. signal levels. Measurements with a wave-analyzer have shown that separation of left and right audio signals is maintained even with such low r.f. signals that the signal-to-noise ratio makes listening impossible.

The output of the 53,000 cps low-pass filter and the 38,000 cps oscillator drive the two balanced bridge stereo demodulators. Two wideband amplifiers following the demodulators have a common efficiency-balance circuit (as required by the difference of Eq. (1) and (2) above). This assures best separation. The de-emphasis and 15,000 cps cutoff circuits are in the separate audio channels rather than ahead of the demodulator or matrix networks. By this method, any component tolerance will not affect channel separation as it otherwise would. A stereo level control with low impedance output amplifiers complete the actual adaptor circuit.

A number of circuit refinements have been incorporated in this self-powered adaptor. A front panel switch permits listening to either multiplex stereo or AM-FM stereo broadcasts if an AM-FM stereo tuner is the signal source. Other switches engage noise filter circuits permitting stereo listening of weak signals with reduced noise and full frequency response or full separation. Both stereo amplifier and stereo tape recorder outputs are provided.

The FCC-approved system can be received with extremely simple adaptors that will provide adequate results with inexpensive FM radios and tuners. Fortunately, for the more demanding music listener it is possible to design a multiplex equipment with the same high engineering standards found in our wideband tuners.

Fig. 6. Top-rear view of H. H. Scott adaptor.



FM Stereo—The General Electric System

ANTAL CSICSATKA* and ROBERT M. LINZ*

Here, in abbreviated form, is an explanation of the General Electric FM stereo system by two of the engineers responsible for it. In addition, a description of a one-tube stereo adapter is given.

THE KEY CHARACTERISTICS of the FM stereophonic broadcasting system adopted by the Federal Communications Commission are that it satisfies all the requirements the Commission set forth and can operate with a one-tube adapter to produce stereophonic sound from a conventional tuner and stereophonic amplifier.

An examination of system specifications (Table I) quickly enlightens the serious listener to the capabilities of the adopted system. In particular, reference is made to the fully separated stereo (30 db from 50–15,000 cps), while maintaining existing monophonic distortion requirements.¹

The transmitter² is most easily explained with reference to the block diagram of Fig. 1. The left, L, and right, R, signals are developed conventionally and then pre-emphasized separately before being fed to the matrix where the sum (L+R) and difference (L-R) are produced. The L+R signal is fed directly to the FM modulator in the usual fashion to frequency modulate the main carrier thus providing one portion of the stereophonic signal while simultaneously serving as the compatible monophonic signal. The L-R signal is fed into a balanced modulator where proportional sidebands are generated above and below the subcarrier frequency of 38,000 cps. The subcarrier is automatically suppressed, but the L-R sidebands frequency modulate the main carrier.

It should be noted that the carrier input to the balanced modulator comes from frequency doubling the input of a 19,000-cps oscillator. A parallel output from the same 19,000-cps oscillator goes into the FM modulator to act as the pilot carrier.

* Radio Receiver Department, General Electric Company, Utica, New York.

¹ FCC "Report and Order," April 20, 1961.

² Comments by the General Electric Company to FCC Docket 13506, October 28, 1960.

TABLE I
SYSTEM SPECIFICATIONS

Main Channel	<ul style="list-style-type: none"> • L+R audio (FM modulating main carrier) • 50–15,000 cps audio band • 90 per cent maximum main carrier deviation • Standard 75 μsec. pre-emphasis
Subchannel	<ul style="list-style-type: none"> • L-R 38,000 cps suppressed carrier AM subcarrier (FM modulating main carrier) • 50–15,000 cps audio band • 90 per cent maximum main carrier deviation • 19,000 cps pilot carrier (FM modulating main carrier 8–10 per cent) • Standard 75 μsec. pre-emphasis
Separation between Left and Right Signals—30db between 50 and 15,000 cps	
Distortion—Maintain existing FCC requirements	

The receiver operates generally as depicted in the block diagram of Fig. 2, and is conventional to the discriminator output which is, however, taken ahead of any de-emphasizing networks. The L+R signal in an existing monophonic receiver would produce a compatible program, but in the stereophonic receiver it is fed directly to the matrix. The L-R sidebands and the pilot signal which are near or above the range of normal hearing would not be heard in the monophonic receiver. However, in the stereophonic receiver they must be decoded to produce the L-R audio signal. This takes place when the 19,000-cps pilot signal is filtered and doubled to recover the 38,000-cps subcarrier which is in turn added with the

filtered sidebands to form normal amplitude modulation. This is detected to produce L-R audio for the matrix.

The matrix outputs, after passing through separate de-emphasis networks, are then the original left and right stereophonic signals.

A study of the spectrum of signals appearing in a discriminator output will help in understanding the system. Such a spectrum is shown in Fig. 3. Shown is a monophonic or what would normally be the 50–15,000-cps audio program, and the SCA signal (storecasting) with the SCA subcarrier at 67,000 cps and maximum deviation of 6700 cps by the SCA program.

Also shown is the stereophonic signal which is made up of a lower sideband

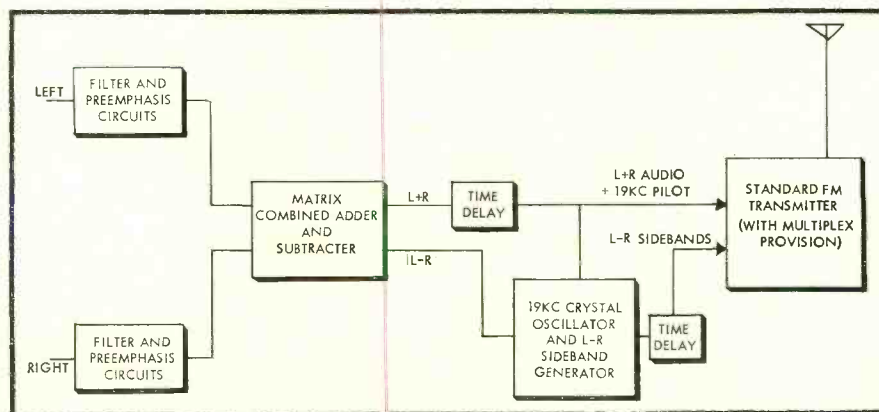


Fig. 1. Block diagram of stereo FM transmitter.

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FCC approves multiplex! And H. H. Scott is now producing the world's first Multiplex Adaptor for Wide-Band tuners. Now you can listen to exciting FM stereo multiplex broadcasts simply by adding the new H. H. Scott 335 Wide-Band Multiplex adaptor to your H. H. Scott tuner, regardless of age or model.

Only H. H. Scott adaptors use famous Wide-Band design which permits receiving both main and multiplex channels with lower distortion and greater fidelity than is possible with conventional circuitry. H. H. Scott's years of experience in engineering multiplex circuitry assures you equipment of highest technical standards.

The 335 Wide-Band Multiplex Adaptor has these important advantages:

1. Wide-Band circuits permit receiving the full dynamic frequency range, both on main and on multiplex channels, even in weak signal areas.
2. New switching methods allow you to fully control multiplex reception from the adaptor itself. You can receive either FM, FM Multiplex or AM-FM Stereo (if an AM-FM Stereo tuner is used) simply by operating the controls on the adaptor.
3. Adaptor is self-powered — no need for taking power from your tuner and possibly reducing component life.
4. All connections between tuner and adaptor are external. No need for making internal connections and upsetting tuner alignments. Connect it yourself in minutes, no tools required.

H. H. SCOTT

Self powered design eliminates complex installation and possible misalignment of FM Tuner . . . All connections external.

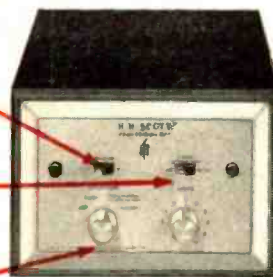
Special circuitry permits high quality tape recording of multiplex stereo programs.

Adaptor Defeat switches Adaptor completely out of system so you can receive AM-FM stereo broadcasts on your AM-FM Stereo tuner.

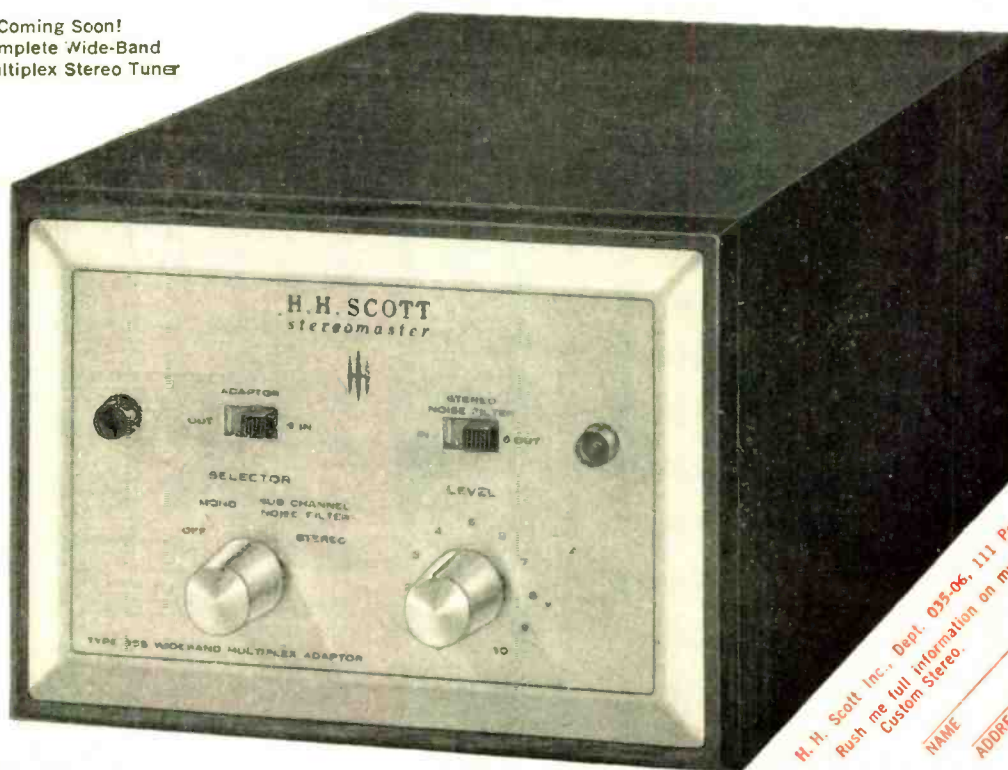
Noise Filter removes noise from both stereo channels. Full Stereo separation maintained.

Master Control: Position for regular multiplex stereo; for multiplex stereo with noise filter on sub-channel only (main channel frequency response unaffected); for regular FM broadcasts.

TECHNICAL INFORMATION: This Wide-Band adaptor can be used ONLY with H. H. Scott Wide-Band tuners. It may be used with all H. H. Scott tuners without any modifications: 300; 310 A, B, C and D; 311 A, B, C & D; 314; 320; 330 A, B, C & D; 331 A, B, and C; 399, LT 10. Connecting cables supplied. Self powered AC. Styling matches all H. H. Scott tuners. Complete instructions furnished. Standard H. H. Scott panel height. Dimensions 7" W x 5 1/4" H x 13" D in accessory wood or metal case. \$99.95. Note to H. H. Scott tuner owners: We do not recommend using any other adaptor with H. H. Scott Wide-Band tuners.



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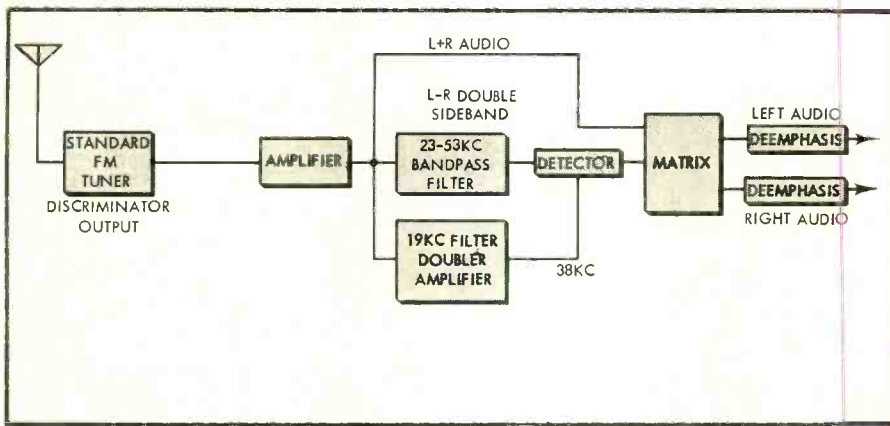


Fig. 2. Block diagram of stereo FM receiver

from 23,000 to 38,000 cps and an upper sideband of 38,000 to 53,000 cps, plus the 19,000-cps pilot.

Interleaving

There are important advantages for suppressing the carrier and transmitting a subharmonic pilot. One of these results in an interleaving effect which permits a 90 per cent maximum deviation on the main channel as well as 90 per cent on the subchannel, with the other 10 per cent in each case being reserved for the pilot carrier.

Interleaving, or nesting, of the L+R main channel signal and the L-R generated sidebands is one of the most interesting and important aspects of the newly adopted system.

Because of this effect, 90 per cent of normal deviation can be used on the main channel, and also the subchannel,

because one is producing peak main carrier deviation while the other is zero, and vice versa. Thus, the monophonic listener experiences a signal-to-noise loss of less than 1 db.

This interleaving effect arises from the fact that the sum of two variables (L+R) is high when their difference (L-R) is low and vice versa. Since the amplitude of the sideband envelope produced by the L-R signal is directly proportional to L-R, this relationship between a sum of two variables and their difference is maintained and the main channel and subchannel will interleave.

Perhaps a reference to Fig. 4 will help in developing an understanding of this phenomenon. In Fig. 4 (A) represents the L signal input; (B) shows an imag-

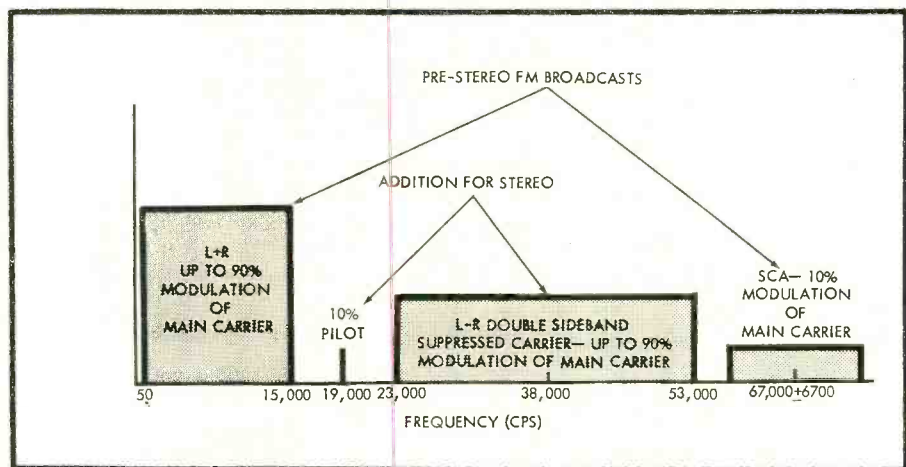


Fig. 3. Spectrum of signals appearing at output of discriminator.

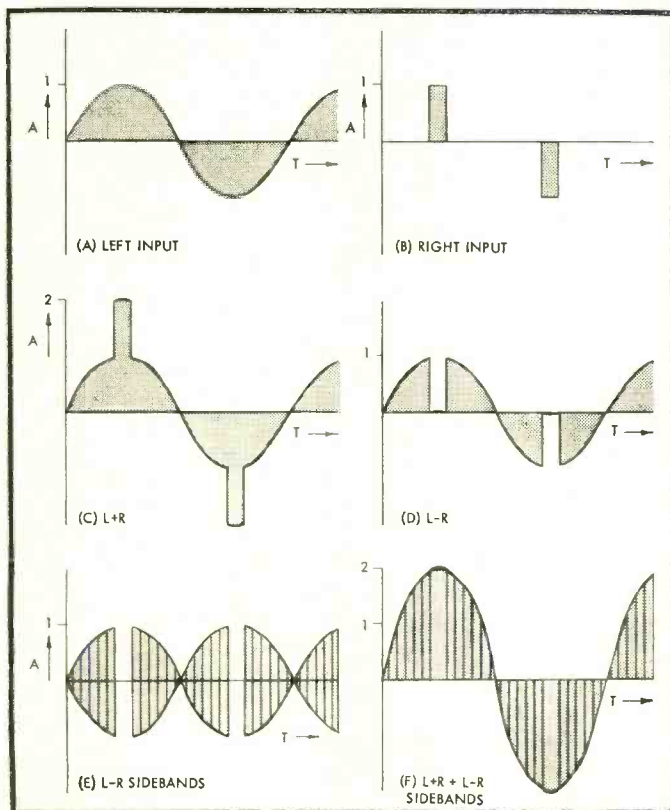


Fig. 4. Interleaving of L+R and L-R sidebands.

inary square wave pulse on R, used for illustrative purposes; (C) shows L+R (sine wave plus pulses); (D) shows the L-R (sine wave minus pulses); (E) shows the L-R subcarrier sidebands and (F) the composite signal (minus the pilot for illustrative purposes) consisting of L+R and the L-R sidebands that would be the signal fed to the FM modulator. Note that its peak amplitude is not greater than the peak amplitude of L+R or the L-R sidebands. Also observe that there is a depression (caused by -R, the pulse) in the L-R sidebands, while there is a simultaneous peak (caused by +R, the pulse) on the L+R signal. When they add to form the composite, the L+R peak fills the L-R sideband depression.

If the subcarrier carrier is suppressed, the main and subchannels can have peak FM deviations limited only by the necessity to provide for the pilot carrier.

Another advantage of the 19,000-cps pilot can best be explained at this time. Note that the 19,000-cps pilot falls in a clear channel portion of the discriminator output, with the L+R audio 4000 cps below and the L-R lower sideband 4000 cps above. It will be recognized that this affords the use of relatively

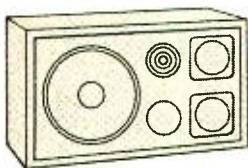
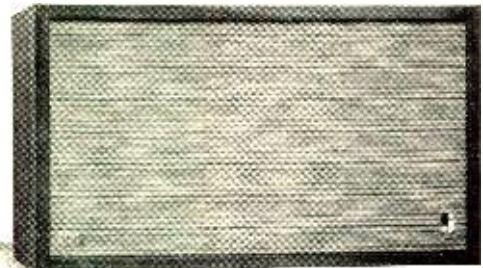
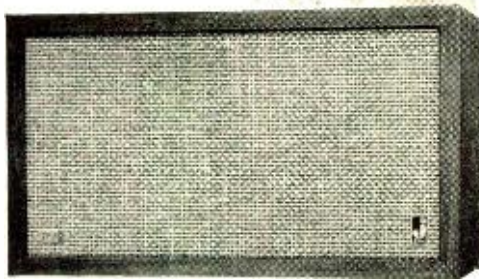
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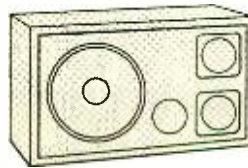
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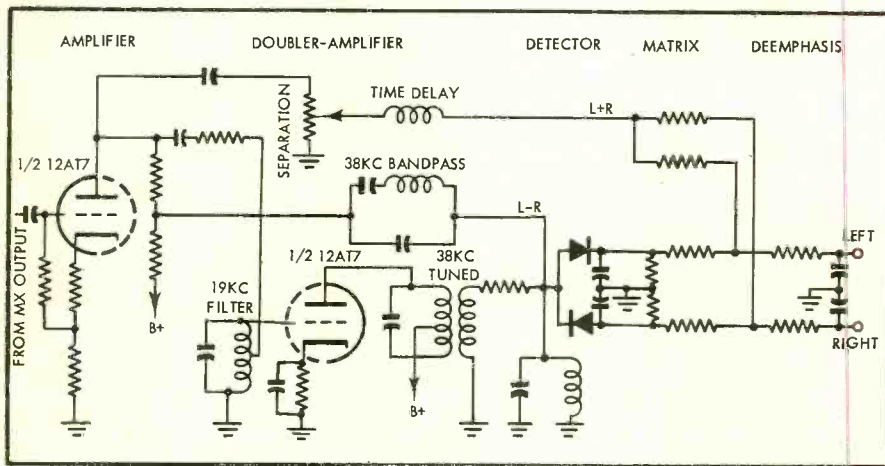


Fig. 5. Simplified schematic of one-tube adapter.

simple filter circuits in the receiver for isolating the pilot signal so that is may be doubled to recover the subcarrier. This is an important feature of the system and is one of the primary reasons that a simple one-tube adaptor can be employed.

Circuit Description

Figure 5 is a schematic³ of a doubler circuit which employs a tuned doubler amplifier to recover the subcarrier from the pilot.

The discriminator output from a tuner is applied to the control grid of the 12AT7 amplifier. The plate of this tube provides an amplified output signal which is applied, via an amplitude adjusting potentiometer and a time delay network, to the L+R signal input line of the matrix.

The output signal of the 12AT7 is also attenuated by a resistive voltage divider and is applied via a bandpass filter⁴ to the input of the detector. The filter is tuned to provide a bandpass from 23,000 to 53,000 cps with the series arm displaying an "anti-resonance" at the SCA frequency which, for the NSRC field tests, was 67,000 cps. If the "anti-resonance" is not designed into the filter, an annoying whistle may be heard because of mixing between the 67,000-cps SCA subcarrier and harmonics of the stereo subcarrier.

The output signal of the 12AT7 is also fed, via a resistor or capacitor, to the pilot signal frequency of 19,000 cps. The output of the filter is coupled to the grid of the second triode of the 12AT7. This tube is operated as a doubler-amplifier.

The plate is connected to a circuit which is tuned to double the frequency of the pilot (38,000 cps). This frequency-doubled signal is applied, via a secondary on the coil of the tuned cir-

cuit or a capacitor, to the input of the detector.

The detector consists of a pair of rectifiers connected to the input with opposite polarities, as shown. Filter capacitors and resistors are respectively connected between the output electrodes of the detector rectifiers and ground.

The matrix circuit contains the resistor bridge shown. It is important to note that stereo separation is dependent on the degree of balance of this bridge.

The de-emphasis network comprises the usual resistor and capacitor providing the standard 75 μ sec de-emphasis. The output signals, L and R, are taken after the de-emphasis.

It should be noted that the output impedance of this one-tube device is quite high, and, also, that the insertion loss will range from 6 to 10 db. Æ

WHAT HATH FCC?

(from page 20)

Subcarrier output	15 db	23 db
Left signal output	13 db	20 db
Right signal output	13 db	20 db

16. It will be observed that System 1 has the greater loss in signal to noise ratio for monophonic reception and the lesser loss for stereo; conversely, System 4-4A has a smaller loss for monophonic reception and a greater loss for stereo. Both the monophonic and stereo losses for System 4-4A would be greater if SCA subcarrier frequencies were also used.

Clearly the public has been served by this FCC decision—it not only preserves the existing monophonic transmission, but in addition provides the new dimension of stereo.

Our title paraphrases the statement made at the inauguration of the telephone which ushered in a new era. I trust this decision by the FCC may be as momentous for FM broadcasting. Æ

LIGHT LISTENING

(from page 10)

The Three Suns, a fixture for decades among the outfits offering light background music, have now felt it necessary to add a seasoning of percussion to their arrangements. In their latest album, the old standbys—electric organ and accordion—are surrounded by marimba, vibraphone, kettledrum, and Chinese gong. In a further departure, a Salvation Army drum has been pressed into service. Listeners whose recollection of the Suns goes back to their hotel broadcasts will find little left of the early casual style. The arrangements by Charles Albertine generate steam in every phase. Wild wrinkles show up in the *Colonel Bogey March* but his original composition *Smoke* offers the greatest reward to those who insisted on good bass response in their right playback channel.

The Fantastic Raymond Shelley

Columbia CS 8393

Normally, Columbia doesn't introduce a new member on its roster of organists with an album title as extravagant as this one. My curiosity, therefore, centered on the artist as I started to play this release. I was already reasonably certain that the recording job on this theatre organ would be a good one. A favorite in my collection of auditorium acoustics-in-stereo is Columbia CS 8230 ("Ashley Miller at Radio City Music Hall"). Possibly the first aspect of this recording to strike the listener is the rhythmic command of a Wurplitzer exhibited by Raymond Shelley. I would hesitate to call it fantastic but a few measures of the opening selection, *I Got Rhythm*, explains the acclaim that greeted his appearance at the Detroit convention of the American Guild of Organists in 1960. Among the delegates assembled in that city's Fox Theatre on that occasion was Columbia's well-known organist in the classical field, E. Power Biggs. His enthusiastic endorsement of Shelley to the "home office" made possible this recording in the same setting. The Fox Theatre Wurplitzer was one of five installations designed by Jesse Crawford back in the late Twenties when a hundred thousand dollars could buy one whale of a four-manual. All the trimmings were included—two sets of cathedral chimes, three xylophones, two marimba-harps, drums, traps, and percussion galore. Restored by a group of volunteers who worked after the theatre closed for the night, the organ provides a wonderful palette for staples such as *Birth of the Blues*, *Brazil*, *Misty*, and *The Band Played On*.

Les Brown: The Lerner and Loewe Band-book

Columbia CS 8394

When show music reaches the popularity enjoyed by the Lerner and Loewe productions, it is sure to be put to a variety of uses. Here it is made to serve as dance music while Les Brown raids the rosters of four top "L and L" shows—"Camelot," "My Fair Lady," "Gigi," and "Brigadoon." Those familiar with the original cast recordings may be tempted to wonder what on earth the Les Brown arrangers accomplished with only reeds and brasses at their disposal in spelling out the appeal of the tunes. One addition to the band was worked out for this occasion—the tuba of Phil Stephens. Arrangers Hill, Barket, and Comstock have used the five saxes, five trumpets and five trombones of the band with easy flexibility. They have converted to dance tempo such disparate items as *Follow Me* from "Camelot" and *Get Me to the Church on Time* from "My Fair Lady." The crisp beat and relaxed discipline of the Brown crew is a pleasure to hear in Columbia's realistic sound. This is the straight-from-the-shoulder impact of a good band playing in a live studio. Coursing through a bona fide sound system, an unvarnished job such as this can sound twice as effective as the fussed-over novelties of the moment.

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"Reflection Coupler" Gives Stereo Spread

LEON J. KNIZE*

By radiating the sound from the rear of a cabinet and using the wall as a diffuser to spread the sound, a remarkably good illusion is presented to the listener.

WITH STEREO REPRODUCTION firmly established as a technical possibility—and, in fact, an electronic miracle as far as the outputs from the two amplifier channels are concerned—the next problem centers around the need for converting these ideal, let us say, electrical signals into a reasonable facsimile of the original acoustical environment. The simplest solution is the use of two conventional loudspeakers systems spaced a finite distance apart. This finite distance, however, seems to vary with each individual selection and with each type of microphoning, and unless the two loudspeaker systems are placed on some movable "trolley" so that their spacing may be altered to suit each recording situation, it is likely that the reproduction will bear little resemblance to the original performance. Let us look into the reasons for this.

We can agree that the only way to judge whether reproduction of music is occurring accurately or inaccurately is to go back to the original live performance. If it is not our intention to recreate this performance as closely as possible, the use of the word "reproduction" as applied to recordings of music is entirely wrong. The word itself describes what we are trying to do.

* President, Scott Radio Laboratories, Inc., 241 West St., Annapolis, Md.

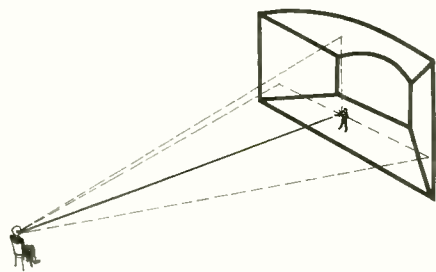


Fig. 1. Sound reaching the listener from a single performer in a typical stage is composed of direct sound from the instrument and reflected sound from the top and from the back and side walls. In addition, there are other reflections from the listening area itself.

We know that sound waves, when leaving an instrument or other source, travel in all directions. This means that in any normal concert hall (or for that matter, any location in which music originates) reverberation begins on the stage (or in the performing area) even when only a solo instrument or voice is involved. The sound traveling upwards into the "shell" of the stage or the ceiling of the performing area will scatter off the ceiling; the sound traveling to the back will scatter off the back of the stage; and that to the right or left will be reflected from the sides, as in Fig. 1

By far the major portion of the sound reaching any person in the audience will be this scattered sound, even if this person were sitting somewhere in the audience where the direct sound reached him before it struck the walls, floor, ceiling, or some other object in the listening area. Basically, therefore, we must divide our auditorium or room into (a) the playing area, and (b) the listening area.

The playing area creates sound that is largely reverberant in nature; that is to say, it has struck a reflecting surface before it leaves the playing area. The listening area creates sound that is entirely reverberant in nature. We must add to this the fact that the rate of attenuation of direct sound is the same indoors as it is outdoors. The direct sound will reach a person far back in a listening area not at all, or at least reduced from the strength it had at its source. A reverberant sound, however, can leave a reflecting surface at practically the same intensity at which it impinges upon this surface. Therefore, a sound hitting a flat surface which is reflective enough to return this sound at its full intensity will reach the listening area almost as strong as the direct sound is, and when the sound is reflected from many points at once, as it may well be, the total reflected sound can be considerably greater than the direct sound.

Now consider a listening area that has more than one voice or more than one instrumentalist, as in Fig. 2. Here

we have a more complex phenomenon occurring, since there are many sound sources simultaneously sending sound energy in all directions. Obviously these sound waves mix together and form a sort of turbulence. Just as obviously a large proportion of this sound mixture and reverberation occurs inside the playing area, so one might say that this reverberant and turbulent sound leaves the playing area in a body very much like fog or smoke; that is, it is diffused over the entire front area of the stage, both vertically and horizontally. Figure 3 shows an "apparent source" plane which might well be a sound-transparent screen at the front of the playing area. The X's show the apparent sources of both direct and reflected sound, and it will be assumed by the listener that his virtual sound source, or screen, is the actual source of the sound. The listener hears various intensities and directions of sound sources which—if one were sufficiently skillful and if sufficient channels were available for the equipment—could be duplicated by a multiplicity of loudspeakers in the plane of the sound screen. Therefore, it must be admitted that the sound leaving the playing area—assuming the use of a conventional stage and not the top of a mountain—is not limited to direct sound, but is a composite of direct sound and reflected sound of differing intensities and directions. Once this condition is recognized by the listener—and by the loudspeaker designer—the problem of creating the illusion of sound coming from a typical

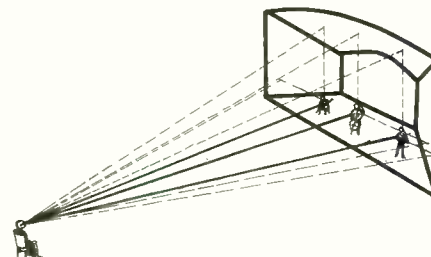


Fig. 2. Sound reaching the listener from a group of performers is still more diffused than in the case of a single performer.

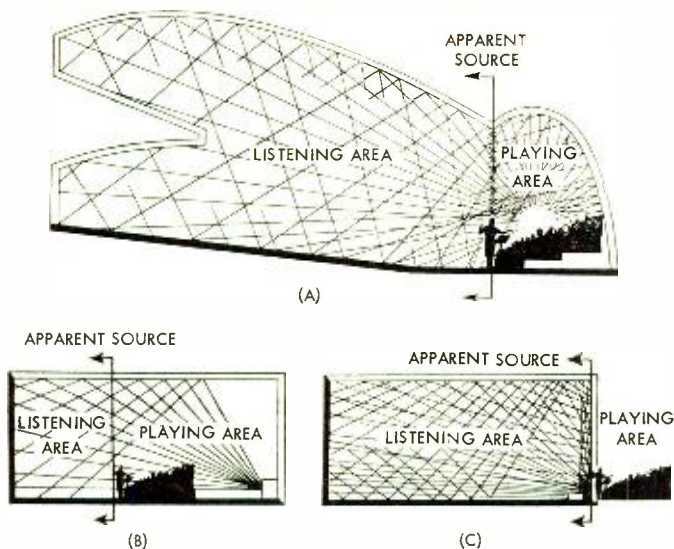


Fig. 3. If all of the sound—both direct and reflected—could be measured at an imaginary plane, and then reproduced with the same directivity and intensity, the imaginary plane would serve as the virtual source. The problem remains as to how to transfer the imaginary plane into the listener's home.

playing area is considerably simplified. All that is necessary is to cause the sound to be distributed over a large area, either by means of a large number of loudspeakers covering an entire wall or by some more practical method.

Living Room Conditions

In the home we have a listening area which is generally somewhat smaller than the listening area at the usual live performance. It is well nigh impossible to duplicate the conditions of any given live listening area in the home, and completely impossible to duplicate all of them. Ideally, however, following the logic of our discussion on live performance playing and listening areas, if we can divide the listening area from the playing area we can come much closer to the reality of the original performance.

Let us go back to this diffused turbulent wall of acoustic energy which leaves the front of a stage—the imaginary sound-transparent screen at the front of the playing area. It would seem that the first ingredient in duplicating the live performance would be to create such a wall of diffused turbulent acoustic energy, since this would then give us the feeling of the front of a playing area. However, with microphones placed relatively close to the source of sound, the resultant recording has relatively little reverberation in it. One channel differs from the other primarily in intensity. The exact reproduction of these two recorded signals has practically none of the reverberation which existed at our imaginary plane, in most instances. Yet the reproduction from the recording must of necessity be limited to the direct (and reflected) sound which reached the relatively close micro-

phones, and these limited signals are all the information which is offered to the loudspeakers in the home or other listening area. The reverberant and stereophonic effect which the playing area leads to a performance is to a large extent missing, since at best we are capturing only a portion of the wall of diffused acoustic energy with microphones placed in the usual positions.

If it were possible to take this imaginary plane of acoustic energy and transfer it to the listening area, we should then have re-created the original effect as heard by a listener at the live performance. In addition to the reverberant energy present at this imaginary wall, we add the reverberation of the listening area, with the result that we have arrived at a remarkably good facsimile of the original performance. All that remains now is to design a loudspeaker system which is capable of reproducing this imaginary sound source in the home or listening area.

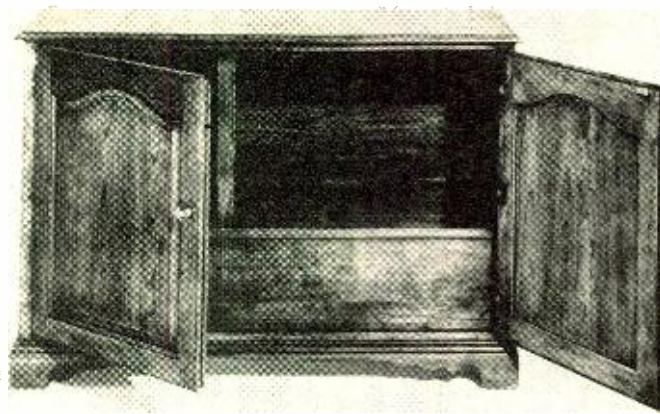


Fig. 5. Since the loudspeaker system is a compact unit in itself, it can readily be housed in a cabinet with sufficient room remaining for equipment and record storage.

The "Reflection Coupler" Stereo Speaker System by Scott of Annapolis

Having thus determined the requirements of a suitable stereophonic loudspeaker system, it only remains to fulfill them as closely as possible. By utilizing a wall of the room as a diffraction surface for diffusing and reverberating the acoustic energy coming from the loudspeakers, the Scott Radio Labs "Reflection Coupler" Speaker System succeeds in reproducing the conditions necessary to the imaginary sound screen, and thus in re-creating the original sound source in a listening area of limited size. Instead of the sound appearing to come from two "holes in the wall," it appears to be spread out all over the wall behind the loudspeaker system. Instead of an instrument appearing to be in its normal position when the listener is on the center line between the two loudspeakers, but moving to the left or right as the listener moves to the left or right, the instrument appears to come from the same point on the wall regardless of where the listener is. We have, in effect, moved the perfor-

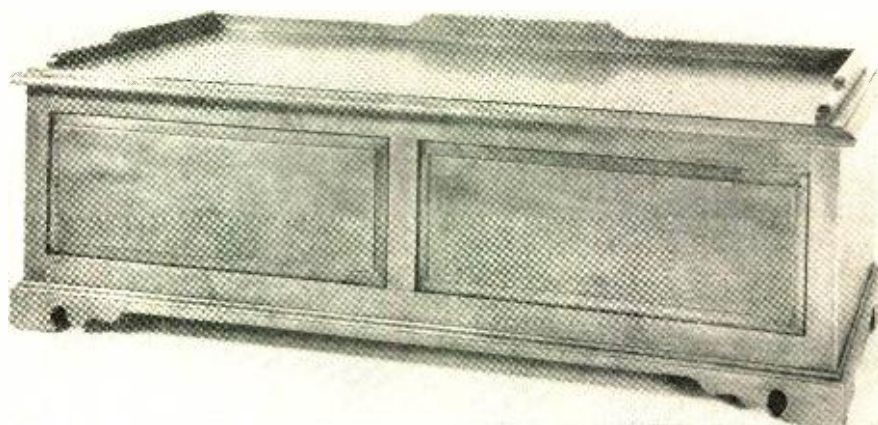


Fig. 4. External appearance of one of the benches available to house the Scott of Annapolis "Reflection Coupler" system. Note that it does not "look like a loudspeaker."

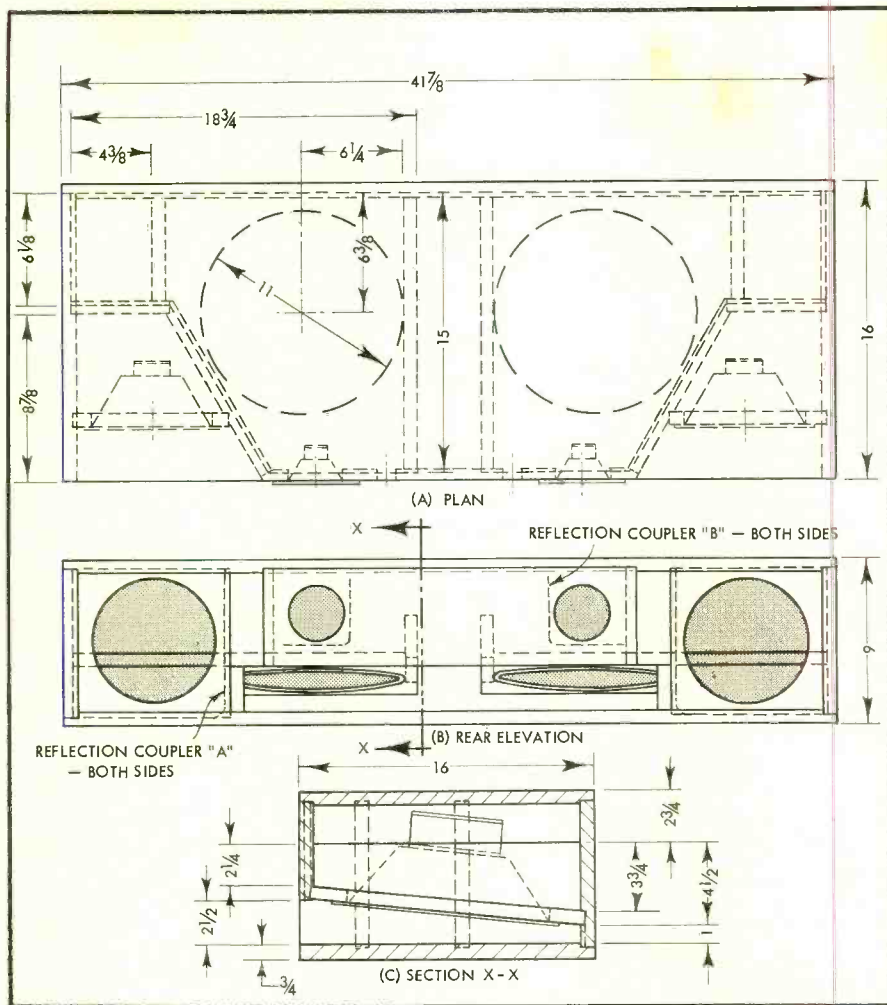


Fig. 6. Internal construction of the Reflection Coupler loudspeaker system. (A), plan view; (B), rear elevation; and (C), section through (A) at X-X.

mers so that the playing area appears to be just back of the wall. Thus it is apparent that the loudspeaker system has re-created the diffused and turbulent wall of acoustic energy which was represented at the plane of the imaginary "sound screen," and the illusion of the individual positions of the instruments remains the same no matter how the listener moves around the room. This seems to be the ultimate objective of the system insofar as the distribution of sound is concerned. It is important, however, that the loudspeaker system should be of a size and configuration which would be acceptable in the average home, and—in the opinion of the average housewife—that it should not "look like a loudspeaker." How well the latter objective has been achieved should be readily apparent from Figs. 4 and 5, which show one of the benches that may be used to house the loudspeaker system, and a console model which can house the complete hi-fi system and still provide some storage space for records. How well the first objective has been achieved can be judged only by listening.

The loudspeaker system by itself is

a completely integrated unit housed in a box approximately 42 inches long, 16 inches deep, and 9 inches high, and containing two woofers and two mid- and high-frequency speaker units. In the most expensive models, it also contains two super-tweeter units, relieving the mid-high unit from the chore of reproducing frequencies above 2000 cps. All of the sound comes out of the back of the cabinet, and nothing about the unit "looks like a loudspeaker," much less two of them.

The woofer section employs two 12-inch cones, each in 0.9 cu.-ft. enclosures and loaded both front and back by slots, with the back slot being common to both channels, resulting in a mixing of the very low frequencies. The slot design is such that front and back pressure waves

are equalized to bring them into phase, and also to damp the outputs of the low-frequency radiators effectively. The horn aspect of the combined front and back slots help greatly in creating a unit of high efficiency, as will be noted from the output figures.

The high-frequency cones are mounted directly into the back of the cabinet and radiate into the molded plastic "reflection couplers," whence the sound is directed upward and outward against the wall behind the speaker. The two sound patterns from the couplers mix between the two channels near the center at some distance above the cabinet itself, resulting in a very noticeable sound spread without any tendency toward a "hole in the middle." This sound spread completely eliminates any "ping-pong" effect, which is considered most unpleasant to music lovers, yet it gives a definite feeling of location to stereo reproduction. This was clearly demonstrated at the Washington High Fidelity Show where the unit was shown to the public for the first time. Two small speaker cabinets of conventional bookshelf dimensions were placed alongside one of the combined speaker-equipment consoles. Most listeners appeared to be thoroughly surprised when the small cabinets were picked up and shown to be empty boxes. Blindfold tests by experienced listeners as well as by laymen have consistently resulted in selection of the Scott of Annapolis "Reflection Coupler" speaker system as the best for sound distribution in stereo demonstrations.

Construction

Figure 6 shows the general principles of construction of the speaker system. The same basic unit is used in both the separate speaker systems and in the consoles. In the figure, (A) shows the plan view, (B) shows the rear elevation, and (C) shows a section through (A). Note that the plane of the "baffle" on which the woofers are mounted is at an angle with the bottom of the housing so as to provide a smoother impedance match between the cone and the mouth of the slot.

The appearance of the back of a finished cabinet is shown in Fig. 7, with the two Reflection Couplers in place. The exact shaping of these plastic reflectors is important in providing proper

(Continued on page 69)



Fig. 7. Rear view of the loudspeaker system showing the placement and shape of the mid-high reflectors.



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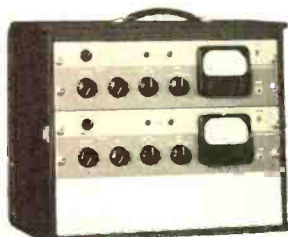
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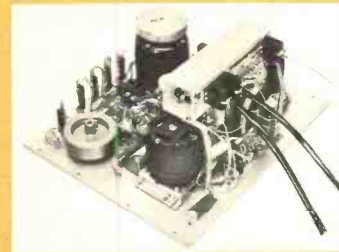
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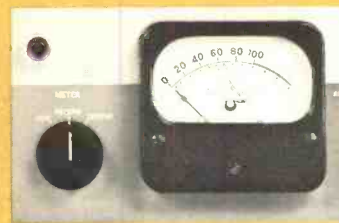
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For the first time in four years,

AUDIO visits the International Audio Exposition

Proof that people still go to audio shows is offered by the crowds during the four day successor to the "London Audio Fair"

LIKE MANY A LONDONER, two representatives of AUDIO started out on the evening of April 6, 1961 to see the Fifth International Audio Exposition. While the distance was somewhat greater than any Londoner had to go, it was no longer a trip than was required of, for example Gilbert Briggs, who came the 225 miles from Yorkshire in a motor car, with an elapsed time of almost eight hours (he drives slow). All we—AUDIO's editor, C. G. McProud, and its photographic consultant, Mort Weldon—had to do was to cue up in the approved London fashion at New York's Idlewild Airport and board Flight 2 of Pan American World Airways at 8:00 p. m. Of course, it was already 2:00 on the morning of April 7 in London, and the show was thoroughly closed for the night, but we went anyway. There'll always be a tomorrow, we felt.

And there was. After some six hours and forty minutes of wondering whether we had yet taken off (that's the trouble with Pan Am's jets, they are so-o-o-o smooth) we looked outside and there was London Airport North—scarcely changed from when we first saw it in 1953. Managing to be last off the plane (it was such a pleasant ride we were loath to get off, particularly considering the refreshments) we ran square into a Pan American photographer, John North, with his camera pointed our way complete with flash which was undoubtedly necessary in the early morning haze. After due consideration, we decided he was there to secure evidence in Pan Am's favor in case we fell down the landing stairway. His evidence we now have, and it appears on our front cover for this month. We did make it down the stairway uneventfully, had a short ride



Hotel Russell, in Russell Square, was the scene of the four-day International Audio Exposition. Not the most modern of hotels, it had the advantage of high ceilings and solid walls. Furthermore, the food and service were impeccable.

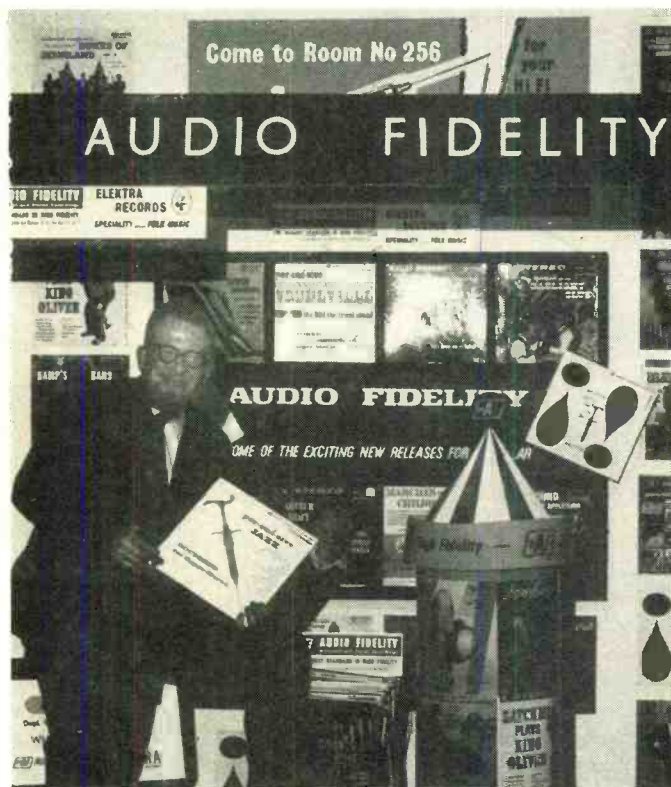
in a Pan Am bus, and were set down in a lounge where we waited until they had assembled the requisite number of immigration officials. We succeeded in convincing them we were not going to stay over three months, that we were tourists, and that we were going to stay in some hotel in London (neither of us knew then which one), and they stamped our passports and let us through to the customs authorities.

Now if anyone ever wants to be treated like a gentleman, here is the place for him, at least if he is an American citizen. We made feeble passes with our keys for the luggage locks while we were explaining that we had no gifts for anyone in the United Kingdom, that we had no more than 200 cigarettes nor more than 50 cigars nor more than one pound (avoirdupois) of tobacco, and before we got the locks open, the luggage all had chalk marks on it and we were shunted out, but gracefully. Later we learned that one pound (sterling) does not buy one pound (avoirdupois) of *smokable* tobacco in London.

After acquiring some spendable money at the bank's counter in the airport exchange for some U. S. green, we ran into another traveling convenience—Pan American “happened” to have a car going into the city and would gladly give us a lift (ride, that is, not elevator) to our respective hotels. This, we were told, doesn't happen to everyone—only to those who consent to having their pictures taken. So we got into the car with a driver who insisted on driving on the left side (most Americans say “wrong” side, but who's to say which is right and which is wrong?) of the road all the way to the city. That, we found out, was customary in England, even though they go through revolving doors just like we do, counterclockwise. We mention that because we noticed later in Sweden that even though they drive on the left side of the road there, they do, at least, remain consistent and go around revolving doors clockwise—even though their cars *are* all left-hand drive cars just like we use in the U. S.

And thus ended our experience with Pan American before the show.

Although the high fidelity show idea originated in the United States, it must be admitted that the variations introduced by C. Rex-Hassan, Festival Director, have much in their favor. Instead of the usual exhibit rooms where everyone congregates to ask questions of the attendants as



John Ridley, head of the British Audio Fidelity Records organization, was on the scene in the booth and demonstration room—seemingly at the same time—and still found it possible to present “Adventure in Sound” on Saturday and Sunday evenings to tell as entertainingly as possible the story of Stereo.



C. T. Malone, applications engineer for Ampex (Great Britain) Limited, puts the 960 through its paces with stereo music reproduced through a pair of 2010 amplifier/speakers. He also had a 351 on exhibit.

well as hear the demonstrations, practically all of the exhibitors use two spaces—one a booth in the Exhibit Hall where nothing is heard except the questions of the visitors and the answers of the attendants, and the other a typical hotel-room exhibit where the equipment is demonstrated aurally. This has mixed blessings, of course. While the listeners to demonstrations are not annoyed by the conversations between visitors and attendants, it is also necessary that the exhibitors staff two places. At any rate, the crowds are distributed, and considerably more people can get the information they want with a minimum of disturbance, be it answers or Ansermet. And somehow, we can't visualize Americans cueing up docilely to await their turn in the demonstration room, even though we have seen *some* of this in the early U. S. shows. But it works in London, and it works well. In fact, during the four days of the show, the turnstiles counted 39,143 visitors—which exceeds, we believe, any U. S. show to date. We presented ourselves dutifully to Mr. Rex-Hassan, affectionately called The Colonel, were received with the honor and fanfare we expected, and were promptly hustled off to lunch where we encountered many more of our old acquaintances. Lunch over, we finally got around to seeing the second day of the show.

Space does not permit the entire portrayal of the booths, rooms, and personalities that we visited, but the products that are most familiar to U. S. readers are represented in these pages.

AKG (Akustische u. Kino-Geräte GmbH)

One of the largest manufacturers of microphones in the world, AKG showed a new miniature condenser microphone which weighs only two ounces. This unit, Model C60, can be fitted with either cardioid or omni-directional heads, and is powered by a rechargeable battery pack or by a line operated supply unit.

AmpeX

All U.S. readers are familiar with the 960 and 970, both of which are available in Britain, and undoubtedly almost everyone would like to have a 350 series recorder for his home system. These models were shown along with the amplifier-speaker units designed for home use, as well as for "location" monitoring.



Leslie Watts, Export Manager for Goodmans Industries, Ltd., is kept busy almost continuously explaining the wide variety of loudspeakers, driver units, horns, and other paraphernalia so dear to the audiofan.



Gilbert A. Briggs, the Grand Old Man of British Audio, and well known to every audiofan in the world. Late on Sunday afternoon, Mr. Briggs stepped out on one of the balconies for a bit of fresh air just as we came into his room. He consented to pose for this study which successfully masks his good humor and whimsicality and turns him into an Elder Statesman. Which maybe he should be.



Harold J. Leak (left), of amplifier, pickup, and now loud-speaker fame, poses with the Managing Director of the show organization, C. Rex-Hassan, whom we met for the first—but probably not last—time.



Richard Merrick, Managing Director of Ferrograph, relieves some of his demonstration personnel and puts on his own selling pitch. While Ferrograph policies are serious and conservative, Dick is only serious when he is extolling his products.



E. W. Mortimer, Chief Research Engineer to Garrard and "Monty" to his friends, was on hand to make sure that all of the technical questions would be answered correctly. With most of these products he maintains the air of a proud father, as he well might.

Audio Fidelity

"The little Company with the BIG sound" has established itself in Britain in a short two years—possibly aided by the fact that Ridley, head of the offshoot of Sid Frey's American enterprise, is himself an Englishman and thus is not faced with the language difficulties that others might encounter. We all remember him fondly from his presentations in both New York and Los Angeles.

Ferrograph

This year marks the introduction of the Series 5 Ferrograph which have a number of refinements which further enhance the usefulness and quality of these instruments. While the company has gone on record saying that the four-track system is not regarded by it as a true high-fidelity system of operation, it has acceded to demand and produced a four-track head for playback only. So far, however, no provision is made for recording the narrower tracks.

Garrard

The well known Model A and the compact Model 210 were both shown, along with the 4HF, the TPA-12 arm, and the SPG-3 stylus force gauge. Here, too, were the 301 transcription motor—available with a stroboscopic turntable. This is a desirable feature with a record playing turntable that has the adjustable speeds that are so useful to trained musical ears.

Goodmans

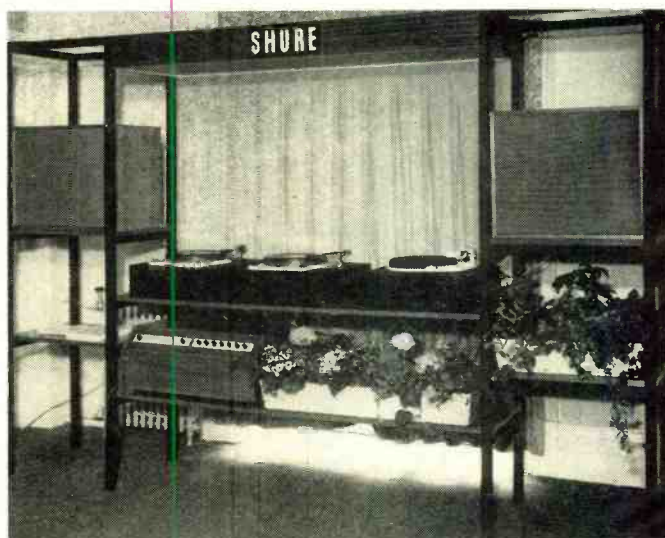
The exhibits of this company presented a large line of full-range loudspeakers in 12-, 10, 9½-, and 8-in. sizes, 12-in. woofers, pressure-type high-frequency units, and mid- and high-frequency horns. In addition, there was a full line of complete systems in enclosures, and the ARU acoustical resistance units for use in home constructed cabinets.

Leak

The line of Leak amplifiers and preamplifiers is too well known in the U.S. to warrant special description, but they were all there in force and demonstrated to their usual high standard of excellence.

Lowther

Further steps "towards perfection" were shown by Donald Chave of Lowther—one of them being a new Acousta enclosure which bears a striking resemblance to the "CW" horn-type enclosure described in these pages by D. P. Carlton some time ago. We are pleased to find this unit available commercially. Also on view was a new symmetrical, push-pull, transformerless transistor amplifier.



Shure Brothers phono arms and pickups, as well as the microphones, were among the few U.S. products represented. But they drew the same interest in London as they have consistently done in New York, Los Angeles, San Francisco, Chicago, and other U.S. cities.

Lustraphone

A wide range of microphones is produced by this company, including "Steromic" stereo units, studio ribbon velocity models, and general purpose moving-coil units, covering practically every possible requirement for high-quality microphones for home, PA, and professional use. Also shown were transistor mixer units, floor and table stands, and a line of matching transformers.

Quad

Doubling as Managing Director and relief operator for his demonstration room, Peter Walker presented his practically timeless Quad amplifiers and tuners and his newer Quad electrostatic loudspeakers. The quality of his reproduction and the excellent choice of demonstration material made this one of the aural attractions of the entire show.

Reflectograph

A tape recorder not yet introduced in the U.S., the Reflectograph makes an excellent bridge between the high quality home machine and the true professional recorders. In several models to cover quarter- and half-track applications in mono and stereo uses, these machines offer superb reproduction for the critical user. Also available is a deck which can serve as a playback instrument alone for dubbing or for those who wish only to reproduce recorded tapes.

Sony

The entire line of home-type tape recorders was shown and demonstrated, most of them having different type numbers than those employed in the U.S., even though the machines were the same. For professional users, the C-37A condenser microphone was shown—probably to incite the desire to own one, as do so many recording studios.

Vitavox

According to Mr. L. Young, Director of Vitavox, their line of Klipsch-licensed enclosures is unexcelled for mono reproduction, while for stereo the new Hallmark system makes it possible to get two speakers into the home at once. Vitavox also showed microphones, horns, and dividing networks of professional quality.

Wharfedale

Most of the Wharfedale designs in cabinets differ so greatly in appearance from those sold in the U.S. that it would be folly to describe them. The same acoustic principles appear in both, however, and the performance is what would be expected from Mr. Briggs' products.



Fi-Cord, a professional tape recorder which can be used for broadcast on 7½ and as a pocket memory on 1½, is discussed here by Sales Manager S. Duer (left) and J. Harrison, sales representative. The company also makes a unique dictating machine.



Tannoy is seen and heard everywhere in Britain—but nary a member of the demonstration staff could be found for this picture.



Director P. Merrick (left) and A. J. Williams of Wilmex (Distributors) Ltd. talk over a new reel of Irish Tape. Merrick is the son of Ferragraph's Merrick, which results in mutual aid for their respective businesses.



Sales Director S. Macadie (right) and L. B. Cash, representative, stand in readiness as the doors opened for the second day of the show. They showed a wide line of well built components.



In the Connoisseur room, Ralph West, well known British audio authority (left), and E. Emerson of the company watch the stroboscope on a new Connoisseur turntable. Also shown was a new loud-speaker of practical dimensions.

Old and New Friends Week

A trip to London is always the occasion for meeting with newcomers to the industry, as well as those who have visited the U. S. in former years to attend our own shows, and this trip was no exception. This year, however, we finally made the acquaintance of our own counterpart in England, Mr. Miles Henslow, who is editor and publisher of *Hi-Fi News*, the oldest hi-fi magazine there, and of *The Tape Recorder*—only two years old—and of the *Hi-Fi Year Book* since 1956. As is usual with audio-minded people, Rex-Hassan, Henslow, and ourselves succeeded in finding something to talk about for hours, comparing publishing and exhibiting problems in our respective countries, getting ideas from each other, and collectively think-



George R. Pontzen, technical manager for Lustraphone, is kept busy demonstrating recordings made through the company's microphones.

ing up new ones after the manner of brainstorming. Then, too, we met old friends again—Donald Aldous, well known writer on audio and founder-member of the British Sound Recording Association, as well as technical editor of *Record Review*; Percy Wilson, who edits the technical section of "The Gramophone," and John Gilbert, one of his experienced audio writers; Andrew Reid and Joan Cutting, who handle public relations for the Radio Show in the fall; and, of course, H. A. Hartley who was one of the first exporters of hi-fi loudspeakers to the U. S., and Mrs. Hartley. There is never enough time to see everybody, do the requisite amount of shopping, and see some more of London.

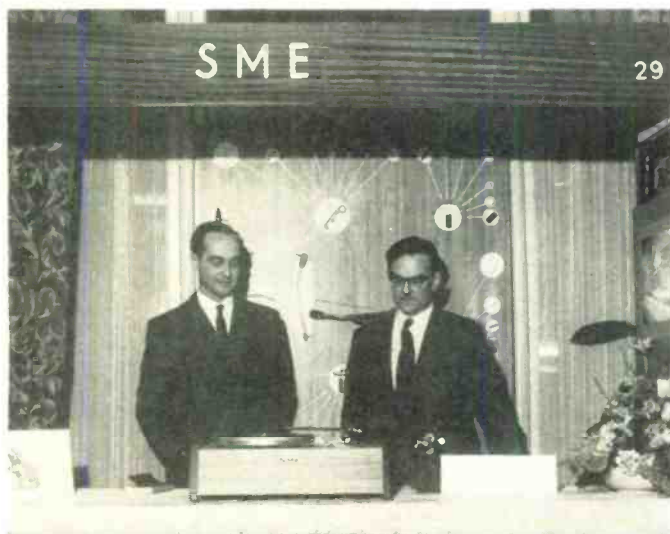
But we did manage to do some of the latter. On our last day, we engaged a taxi driver to show us Limehouse, got too far from the City proper, and



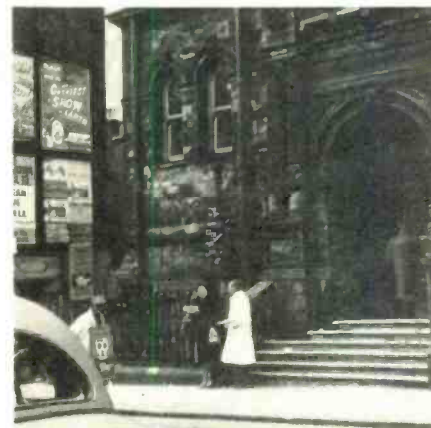
With an all-new Reflectograph stereo recorder to show, Brian Arbib points out the features of most interest.

arrived at the airport three minutes after our plane was scheduled to leave and we found that it had already left—and who expects planes to be *that* close to schedule. So we waited until noon the next day—not risking a trip back to the city but remaining at the airport hotel—and took Pan Am's Flight 101 instead of Flight 1, and 101 was exactly on time, too. On time at departure, that is, and thirty minutes *early* on arrival, making the westward crossing in seven hours and ten minutes. But with a good lunch on the way, the seven hours seemed like nothing at all.

We *did* find our excuse for visiting the London Audio Exposition, and our photographer, Mort Weldon, got most of the pictures we wanted, so now we have eleven months to think up some excuse to go to the next one. See you there?



In the S. M. E. booth, A. Robertson-Aikman, Managing Director, and W. J. Workinson stand by to pass out information.



The back door of the Russell Hotel. Actually this is where the 39,143 people passed into the hotel to see the show—they came out the front door. But here were many non-exhibitors passing out circulars, so your pockets were full before you even got inside.

Never before so much performance, versatility and styling in a speaker as small in size as it is in price!

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PA 15



Model PA15 (8-ohms) \$39.00 List
Model PA15-45 (45-ohms) \$31.25 List
Model PA15T (70.7-volt transformer) \$35.00 List

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Now, from Electro-Voice—home of major PA speaker improvements since World War II—comes the most effective solution to many sound problems. It's the exciting new PA15! Features a driver located right up front—in the horn mouth itself—to eliminate one of the “bends” of ordinary reentrant horns . . . and to

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Better check these other PA15 features:

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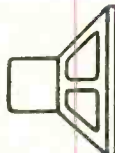
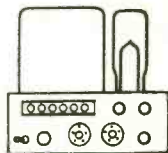
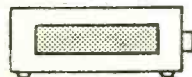
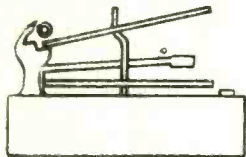
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EQUIPMENT



PROFILE

FISHER XP-4 SPEAKER SYSTEM

The Fisher XP-4 is a three-way speaker system consisting of four speakers in a bookshelf-size enclosure. Despite these innocent sounding words, there are many surprising facets to this speaker system.

Before exploring these facets we would like to dwell for a moment upon the visual appearance of this system. In our opinion the visual appearance of a bookshelf speaker system is of great importance. Although not as important as the sound quality, we must remember that one of the *raisonns d'etre* for the bookshelf system is the reaction against the unsightly large speaker systems. In addition a bookshelf speaker system is meant to be placed at eye level, and to be constantly in view.

The view provided by the XP-4 is indeed handsome. The unit we reviewed was finished in oiled walnut, and although we must admit a certain partiality towards oiled walnut, it certainly conveys a feeling of luxury.

The four speakers comprising the XP-4 system are a relatively long travel bass speaker (with some revolutionary features which we will go into later), a pair of cone type mid-range speakers, and a hemispherical tweeter with wide-angle dispersion. Over-all system balance may be adjusted to fit the individual home environment by means of a high- and low-frequency balance control at the rear of the speaker enclosure.

Bass Speaker Design

The normal speaker construction consists of a magnet, a voice coil which drives the cone; the cone, of course; and a metal basket which provides rigid support for the cone at both ends. Provision must be made for making sure that the cone and voice coil remain in proper relation to the magnet at all times. The bass speaker of the XP-4 system is essentially the same structure that we have just described except that instead of using a metal basket, the speaker enclosure itself has become the basket for the speaker. It sounds startlingly simple, doesn't it? Instead of mounting the speaker cone to a basket, the cone is mounted through a surround directly to the front baffle. Obviously, in this respect alone, it is probably a money-saving innovation, but what about performance? Is it really a valuable innovation as far as performance of the system is concerned? Although we were not able to corroborate it, it would seem to us that this design would eliminate some peaks and valleys in the low-frequency response of the system.

Our reason for saying this is that the basket of the conventional speaker undoubtedly vibrates and transmits unwanted vibrations back to the suspension of the speaker cone. Because of the size of the basket and the distances involved it would probably affect the low-frequency end of the sound spectrum. By removing the basket and having the vibrations now travel through the greatly increased path of the enclosure sides, which of course are wood, the vibrations are essentially damped out. If nothing else, this should make the response smoother. (More about this when we talk about the performance of the system.)

Naturally if this system is to work well over a period of time, there can be no warpage in the "wooden basket." Obviously, one of the virtues of an extremely heavy metal basket is that it does not warp easily, and thus keeps the speaker cone in a correct position for a long period of time, indefinitely in many cases. Thus we can conjecture that the enclosure would be extremely well built with precautions taken to avoid warpage. Without being able to see within the XP-4 enclosure, we did note that it is extremely heavy construction, and seemed to be much heavier than many comparable speaker systems. It weighs some fifty pounds, and the enclosure is only $24\frac{1}{2} \times 14 \times 12\frac{1}{2}$ -in.

Performance

Reviewing speaker systems is at the same time the most frustrating yet the most enjoyable of the reviewer's tasks. It is enjoyable because it necessitates long periods of listening to familiar music, and

ADDENDA

ADC-1 Stereo Cartridge

Audio Dynamics Corporation calls our attention to an error made in the May PROFILE where it was stated that the compliance claimed by the manufacturer for the ADC-1 Stereo Cartridge was 10×10^{-6} instead of the figure of 20×10^{-6} , at which current models are rated. Although the figure given was excellent, it was still far below the actual value claimed for it.

Sherwood S-2200

Although it probably fooled no one, we stated in the April issue that "from the standpoint of sensitivity, Sherwood need take a back seat." Of course we meant "... Sherwood need *not* take a back seat." If it were not so obvious, we would be thoroughly embarrassed.

of course familiar music means music that we like to listen to. On the other hand, it is frustrating because we do realize that we are injecting our own personal taste and prejudices. We mention this merely to caution the prospective purchaser that insofar as speaker evaluation is concerned, our science is not as "scientific" as we would like it to be. Naturally, we can certainly discern gross distortions or limitations, but as yet we have not been able to distinguish between fine speaker systems except on the basis of personal preference.

This brings us to the XP-4. As we noted previously, we would suspect that the new construction for the bass reproducer would provide smoother responses in the lower frequency. To our ear this was so. Although the frequency range extended down to only 30 cps, it handled this range exceedingly well and in a very smooth manner. At first the mid-range seemed somewhat thin, and there was a slight edge in voice reproduction. After some knob twirling with the balance controls at the rear of the high enclosure, we were able to reduce this problem. Obviously when the balance was set at the factory, it was set to suit some individual whose preferences were different from ours. The XP-4 handled high frequencies exceptionally well, and with excellent dispersion.

In summation, therefore, the Fisher XP-4 speaker system provides fine sound from a bookshelf-sized enclosure whose appearance will be an asset to most modern decors. In addition the new patented speaker design makes this system lower in cost than previous comparable systems.

F-22

Fig. 1 Fisher XP-4
3-way speaker
system.



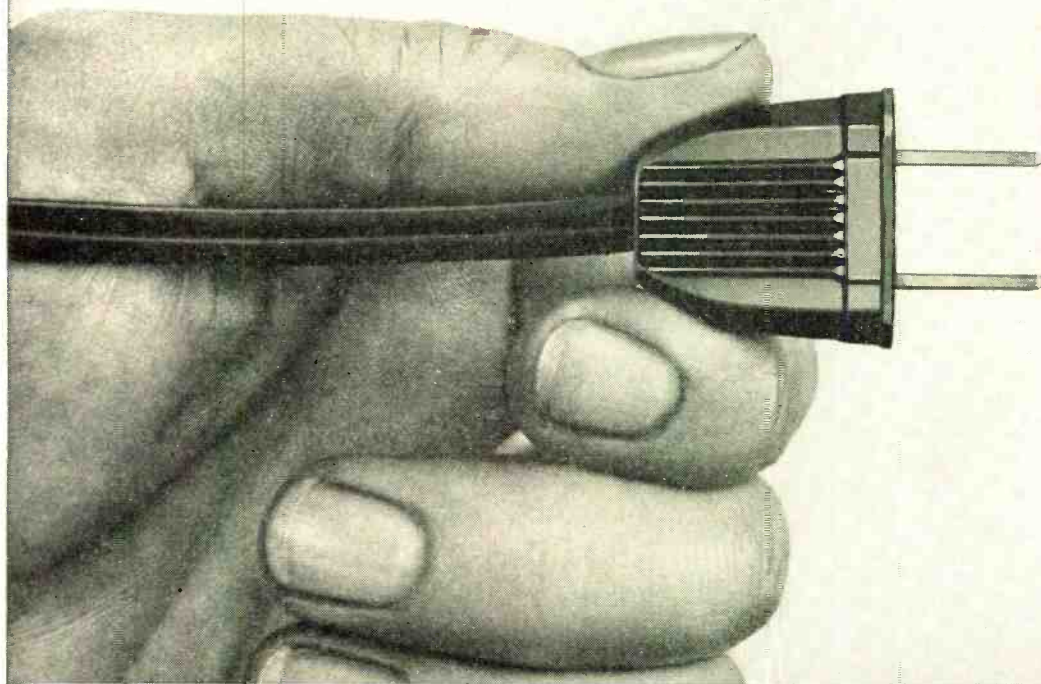
In stereo receivers specifications alone can be deceiving. How then, do you recognize quality? Plug in a Pilot 654—and in seconds you'll hear it—quality that can be measured not only by specifications but by your own ears as well! You'll hear brilliant new clarity in every musical performance, thanks to the low 0.5% harmonic distortion of this powerful new stereophonic receiver. The 654 combines separate FM and AM tuners, 60 watts of power, and a total of 15 operational controls in one compact unit, no larger than many tuners. The Pilot 654 is the ideal way to set up your home stereo system. Simply hook up a pair of speakers and a turntable, and enjoy sound reproduction of incomparable beauty. Special features of the Pilot 654: cool-operating chassis—UL listed—for safe custom installation. Rumble filter, scratch filter, tape monitor, and automatic shut-off. Pilot's exclusive Stereo-Plus Curtain-of-Sound third speaker terminal can be used for simultaneous remote



monophonic performance, or three speaker Curtain of Sound. Complete with handsome brass and black enclosure, only \$299.50. See the 654, or 30 watt Pilot 602 at \$249.50, at your authorized Pilot dealer.



ANY SIMILARITY BETWEEN THE PILOT 654 AND OTHER STEREO RECEIVERS



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LAFAYETTE KT-550 POWER AMPLIFIER KIT

The KT-550 is a 100-watt (50 watts per channel) stereo power-amplifier kit. Without question this kit is a prime example of the recent trend towards more powerful amplifiers and quality without compromise. We have taken notice of this latter trend several times in the recent past; it is certainly natural that we take special cognizance of things we like. Indeed, and in fact more important, the consumer has also shown approval for this trend. In any case, the KT-550 is an excellent amplifier which builds easily, certainly within the capabilities of almost any constructor.

As a side note we would like to point out that the KT-550 is most attractive in appearance. Normally when we think of such a functional instrument as an amplifier, we are not interested in its appearance. This is especially true since most of the time amplifiers are placed in some cubbyhole where they will not be seen. Be that as it may, this particular amplifier with its two-tone brown body and gold instrument panel is quite handsome in appearance, and deserves mention even though it be forever more hidden from sight. At least, when you *must* service it, there will be some joy in looking at it.

Circuit Description

One of the important new developments which has contributed greatly to the quality of recent amplifiers has been the use of multiple feedback loops. In the past the feedback consisted of a single loop, usually from the voice coil back to the input stage of the amplifier. With this technique the amount of feedback usually was limited to about 20 db. Higher amounts of feedback, which of course would reduce distortion, would also cause the amplifier to become unstable. With multiple-loop techniques, however, if one stage has twice the distortion of another, twice as much feedback is applied around it. This permits the use of larger *total* feedback without sacrificing stability. In the KT-550 six feedback loops are used with a total feedback of over 50 db. Referring to the schematic, Fig. 3, we will trace a signal as it proceeds through Channel A. The input signal enters at J_1 and is fed to the grid of the pentode section V_{1a} (a 6BR8A) which acts as a voltage amplifier. The output of V_{1b} is connected to the grid of V_2 (6CL6) one of the driver tubes. The output of V_{1a} is also connected to the grid of V_{1b} (triode section of 6BR8A). V_{1b} is adjusted by means of plate-to-grid feedback to provide a gain of unity. The signal appearing at the output of V_{1b} is therefore equal in level to the

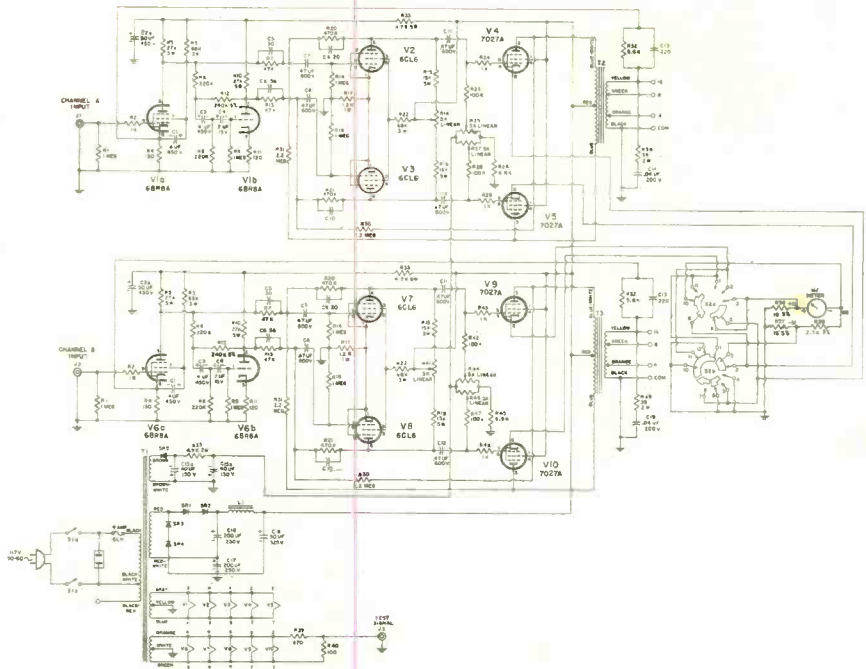


Fig. 3. Over-all schematic of KT-550.

signal fed to V_2 , but 180 deg. out of phase. This reversed-phase signal is then applied to the grid of the other driver tube, V_3 . The outputs of tubes V_2 and V_3 are fed to the grids of the push-pull power output tubes V_4 and V_5 , respectively. The newly developed 7027A beam-power output tube is used with fixed bias. To compensate for changes in tube parameters, and to avoid the use of matched pairs, an indicating meter and bias and balance controls have been incorporated. Bias controls R_{25} and R_{27} can be adjusted to provide the proper indication on the meter which will ensure that V_4 and V_5 are drawing the same amount of current. In this manner both tubes are made to operate at the same quiescent point, and are therefore "d.c. balanced."

Dynamic or "a.c. balancing" is accomplished by adjustment of R_{18} . The control changes the plate loads of V_2 and V_3 , causing the voltage at the grids of V_4 and V_5 to change correspondingly. During adjustment the meter is connected across the two cathode resistors R_{16} and R_{17} . If the tubes are perfectly balanced when an a.c. signal is applied to the input of the amplifier, the meter will indicate zero. A 60-cps 20-watt test signal is supplied from a test jack at the rear of the chassis. All bias and balance controls are conveniently located on

the front panel of the amplifier. The power supply consists of four silicon diode rectifiers in a voltage doubler circuit, and a fifth silicon diode and an R-C filter provide rectification and filtering for the bias-voltage supply to the output tubes of both channels.

Construction

The KT-550 is an unusually easy amplifier kit to construct. This is the result of the use of printed circuit boards for the major portion of the wiring. As a result of the reduced amount of soldering and wiring it took us just a shade under six hours to construct this kit. This came to two nights' work in practical terms.

A contributing factor to the extremely easy construction is the manual accompanying this kit. It is certainly one of the most concise, clear, and easy-to-understand manuals that we have encountered for a power amplifier kit. Of special value in this manual are the pictorials and instructions describing how to solder connections to switches and to the printed circuit board. These are areas where the novice constructor commonly has difficulties.

On the whole the manual is excellent, as we noted, but we did discover four or five inaccuracies although they were of the sort which are easy to detect during construction. There was one error (not in the manual) which was somewhat more serious however. We discovered that a hole had not been drilled in one of the circuit boards. Although this was not especially serious for us—we just went ahead and drilled a hole with the proper size drill—the novice, however, would probably be quite alarmed especially since most of the components had already been mounted to the board by the time this was discovered. The novice would probably hesitate before drilling for fear of ruining all the work that he had done up to that point. We don't blame him.

Although not of vital importance, we would recommend that kit manufacturers include the plastic nut starters which are included in one manufacturer's kits. They could not possibly cost more than a few pennies, and yet they are probably the



Fig. 2. Lafayette KT-550 power amplifier.

**ALL-WEATHER
ALTEC 50A
"BI-ACOUSTIC"
HORN SYSTEM
... \$57.00**

**ALTEC 834A "MONTEREY"
SPEAKER SYSTEM
\$169.00 UNFINISHED:
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**ALTEC 309A AM/FM
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ENJOY YOUR HI FI OUTDOORS THIS SUMMER!

Whether it's work or play or plain relaxation, you'll have more fun this summer with outdoor high fidelity by ALTEC. For a permanent outdoor installation, try the ALTEC 50A Horn—the wide range outdoor speaker that is completely weather-proofed for any climate. For portable outdoor high fidelity, take your pick of ALTEC compact speaker systems—they offer superior reproduction yet are light enough for easy portability. (You can enjoy your ALTEC compact indoors when you are not using it outdoors!)

And here's a practical point to remember: With new ALTEC stereo amplifiers as part of your central indoor hi fi system, you need no separate amplification to power an outdoor speaker! Each ALTEC amplifier features an auxiliary speaker tap so that you may enjoy one or more extra speakers anywhere in the house or yard.

PERMANENT:

ALTEC 50A "Bi-Acoustic" Horn offers smoothest, widest frequency response of any competitively priced all-weather speaker! Made of heavy, double-reinforced Fiberglas. Comes with universal mounting bracket for easy mounting in any direction and to any surface or structure.

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ALTEC 834A "Monterey" Speaker System features guaranteed 40-22,000 cps frequency range. Finished on four sides in walnut, blond, mahogany, or fruitwood for use vertically or horizontally. 14" H, 26" W, 14½" D.

FREE! Get the new 1961 ALTEC Stereo Catalog and informative Loud-speaker Enclosures Brochure at your Professional ALTEC High Fidelity Consultant's or write Dept. A-6.

ALTEC 835A "Monterey Jr." Speaker System is a smaller version of the 834A. Guaranteed 45-18,000 cps frequency range. 11¼" H, 23¼" W, 11¼" D.

ALTEC 836A "Lido" Speaker System boasts beautiful styling and sound to match. Available in walnut or mahogany, the "Lido" is 12¾" H, 26" W, 12¾" D.

ALTEC STEREO COMPONENTS INDOORS POWER A SPEAKER OUTDOORS:

ALTEC 707A Stereo Center combines four hi fi components in one slim-line package: AM and FM tuners (same sensitivity as 309A below), 40 watt-per-channel (stereo prog. pk. pwr.) amplifier, dual-channel control preamp with 9 inputs, 6 outputs, plus facilities for stereo center speaker and auxiliary speakers indoors or out.

ALTEC 309A AM/FM Stereo Tuner and 353A Stereo Amplifier-Preamplifier are look-a-like mates that offer a harmony of styling and engineering balance. The 309A features (FM) 2 mv max. sens. (equivalent to 1.0 mv, ref. 72 ohm antenna), 2.9 mv for 20 db quiet. sens. (equivalent to 1.45 mv, ref. 72 ohm antenna); ±1 db 20-20,000 cps freq. response and (AM) 3.2 mv max. sens.

The 353A provides 14 stereo or mono inputs, 6 outputs plus matricing network for 3-channel stereo and auxiliary speakers anywhere in the house or yard. 100 watts stereo prog. pk. pwr., 50 watts rms contin.; freq. response ± 1.0 db 20-20,000 cps at 25 watts / ± 0.5 db 10-30,000 cps at 1 watt.

NOTE: The tuners above are fully wired for FM Multiplier Converter.



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most convenient tool we have found for mechanical assembly. We recommend this as an inexpensive way to the "heart" of the kit builder.

Performance

The published specifications for the KT-550 are unusually fine, well up amongst the top-quality amplifiers available. This amplifier met every one of its published specifications. For example, we found frequency response from 20-30,000 cps to be within 0.25 db at 50 watts output. Harmonic distortion was 0.12 per cent at 1,000 cps and 50 watts output. We measured IM distortion at 0.4 per cent, and hum and noise at 90 db below 50 watts.

In view of the excellent performance and easy construction, we would recommend this amplifier to any audiophile who is willing to pay for performance. F-23

NEUMANN DST PROFESSIONAL STEREO CARTRIDGE

The Neumann name is one which is highly familiar to the professional in the recording industry. They have been making professional condenser microphones and disc-mastering lathes for thirty years. On the other hand, the audiophile would have had little opportunity during these years to become familiar with this name because until now the company has never produced a consumer item. In fact as we understand it, this is not truly a consumer item in that it was designed and is still used, as a monitor for a Neumann-Teldec stereo disc-cutting system.

As we can note from Fig. 4 the DST is more than a cartridge, it actually is an entire plug-in head. For that reason it is only suitable for certain arms: namely the SME and the ESL arms, as well as the Neumann arm with which it was originally designed to operate. It should be noted that the SME arm should be the model with the anti-skating feature. The reason for the latter requirement for the tone arm is that the DST requires a stylus force of four to five grams compared with the less-than-one-gram required for many currently avail-

able cartridges. The relatively high stylus force and the extremely low friction of the SME arm combine to cause the arm to "skate" toward the center of the record.

One might question whether the DST with its high stylus force would cause unusually heavy record wear. Apparently this just isn't so. We observed a record which had been played with a DST over a hundred times and there was no appreciable record wear noticeable—or audible either, for that matter. The secret to this extremely low record wear is the highly-polished diamond used in the stylus. Of course, all things being equal, a stylus force of four grams will certainly produce more wear than a stylus force of one gram or less. But apparently all things are not equal. We can speculate that other styli may not be as highly polished as the DST seems to be.

Performance

From its highly professional background we would expect the DST to be highly professional in performance. We were not disappointed. The frequency response from 10-20,000 cps was within ± 2 db. The channel separation at 1000 cps was 29 db and at 15,000 cps it was 23 db. One unusual appearing feature of the DST is that the stylus arm and indeed the entire underside of the cartridge is covered by a sheet of rubber-like material so that the stylus tip is the only component observable underneath the cartridge. Apparently this sheet supplies a certain amount of stress to the stylus and also protects it from dust.

In a listening test the DST produced some of the cleanest sounds we have heard in some time. In fact it is so free from coloration that it actually takes a little bit of getting used to. We must admit however that perhaps some of the excellent sound might be attributed to the professional Neumann equipment we used in conjunction with the cartridge; namely the automatic turntable model PA2a and the model WV-2 preamplifier. In summation, therefore, the Neumann DST stereo cartridge is truly a professional unit in all respects.

F-24

NEUMANN AUTOMATIC TWO-SPEED TURNTABLE

This is the turntable used for testing the Neumann DST cartridge. This turntable is high in quality and in price—a seemingly natural relationship. An unusual feature of this turntable is its small size. The mounting plate is only $14\frac{1}{2} \times 12$ in. The arm, as we can observe from Fig. 5, is proportionately small.

The turntable is built on a solid cast plate. The hysteresis drive motor on the one hand, and the turntable and the arm on the other, are separately shock mounted on this plate. Rotation of the motor is transmitted by means of a rubber belt to two idlers, either of which—depending on the setting of the speed selector switch—is brought to bear against the inner rim of the turntable and thus driving it. When the speed selector switch is in its neutral position, both wheels are free.

Next to the speed selector switch is the tone arm lever. Bringing this lever forward causes the pickup to lower slowly to the disc until it gently sinks into the groove. Moving the same lever gently to the right raises the arm just as slowly while leaving the motor rotating. The tone arm is also raised at the end of a record, or when the speed selector switch is manually depressed. For easy location of the disc's starting grooves, a detent in the tone arm rest automatically locates the stylus directly over the lead-in groove of the standard 7-, 10-, and 12-in. diameter records.

The Neumann PA2a automatic turntable is obviously built to professional standards. It hardly need be stated how low wow and flutter is (0.1 per cent rms). In addition this is one of the most ruggedly built units to cross our path in a long time. Previously we noted how small this entire unit is, and yet without base it weighs twenty-five pounds. It is rather difficult to point out all of the attributes which make this an unusually fine turntable. In reality, one need only look at the unit to see how carefully and meticulously it has been constructed. This is definitely a unit for those who want professional performance and are willing to pay professional prices. F-25



Fig. 4 (left). Neumann DST stereo cartridge.



Fig. 5. Neumann automatic 2-speed integrated turntable.



pioneer

Features of STEREPHONE SH-100

1. Its price is surprisingly low.
2. The tone quality is highly excellent (reproduction range: 30—15,000 cps). The tone quality of the low range, in particular, is no less excellent than the sound reproduced with a high-quality hi-fi system.
3. It is extremely rich in volume, but the volume control provided allows you to enjoy the reproduction at the most desirable volume.
4. The stereophonic sense can be adjusted from binaural to monaural.
5. The needle pressure is adjustable from 3 to 6 grams. Moreover, constant needle pressure is maintained by means of a special spring which completely prevents damage to the records.
6. A special protective mechanism is provided. In this mechanism the needle point does not come out until the record begins to revolve.
7. Three to four persons may listen to the reproduction if an adaptor is used.

Neither Amplifier

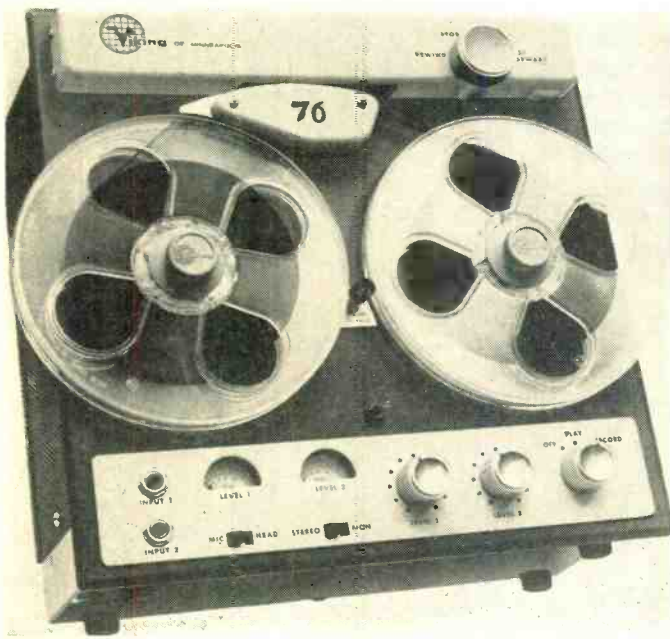
Nor Loudspeaker Required!
Stereophone SH-100

A new-system stereophonic reproduction unit far beyond human imagination has been developed! That is PIONEER'S STEREPHONE SH-100. STEREPHONE is a device which conveys the sound cut in the record groove directly to human ear. If STEREPHONE is used, you will need neither amplifier nor loudspeaker. If you have a record player or a phonomotor capable of revolving recorded discs, you will be able to enjoy stereophonic reproduction by using this STEREPHONE. We invite you NOW to enjoy to your heart's content, stereophonic music full of presence by using the PIONEER STEREPHONE.



FUKUIN ELECTRIC, LIMITED

5 Otowacha 6-chome, Bunkyo-ku, Tokyo, Japan



THE VIKING "76 COMPACT" STEREO TAPE RECORDER

The Viking "76 Compact" is indeed aptly named. Measuring 13 x 13-in. across the front panel and requiring only 6¼-in. behind the panel, this unit certainly is appropriate for today's ever-smaller and ever-crowded equipment cabinets. We have often wondered which came first, smaller cabinets or smaller equipment. It's sort of like the old chicken-and-egg riddle. No matter, the end result is smaller units which are easier to locate in today's cramped quarters.

Lest anyone be misled into thinking that small size means small performance, we would like to make it clear that size and performance are not necessarily related, at least in tape recorders. One need only examine any one of several professional, portable, battery-operated recorders to dispel this unwarranted notion.

The "76 Compact" is a 2-speed (3¾ and 7½ ips) tape recorder and playback machine. It records only quarter-track tapes, stereo or mono. A recording preamplifier is incorporated in the unit and features two VU meters as shown in Fig. 6.

Operating controls of this unit have been reduced to the minimum. For example, to play back one need only operate two knobs, one knob for setting the machine to the play position, and the other to start the forward motion of the tape. For recording, the only additional operation required is to adjust the individual level control knobs while observing the VU meters.

There are two sets of inputs, one set on the front panel for high-impedance microphones and tape heads, and the other set on the rear panel for high-level inputs such as tuners and so on. Jacks are provided on the back panel for playback head output, and monitoring.

A single motor is utilized for all drive functions, power being transmitted through a round, cloth covered, flexible belt. Motion is transmitted to the capstan by means of a heavy, balanced turntable.

Performance

A recent trend in tape recorder design has been to raise the bias frequency to extend the frequency range of the unit. For example, the bias frequency of the "76 Compact" is 80,000 cps, which is the fifth

harmonic of 16,000 cps, the latter being for all practical purposes the upper limit of this machine at 7½ ips. The stated frequency response, both in recording and playback, is 25-16,000 cps at 7½ ips, plus or minus 3 db. Our measurements corroborated this, except that we measured 3-db down at 13,000 cps and 4-db down at 16,000 cps. Signal-to-noise ratio was 59 db and the playback-head output was 2.2 mv at 1000 cps.

In sum then the Viking "76 Compact" is a compactly sized and priced tape recorder and playback instrument which would integrate well with modern, compact reproduction systems.

F-26

CROSBY R80 AM-FM STEREO RECEIVER

Over the past few years the name Crosby has become well known as the developer of a FM-stereo multiplex system. Although the particular stereo system championed by Dr. Crosby was not adopted, it is quite obvious that he still is one of the leading experts in this field. The R80 is a good example of this knowledge in that it contains full provision for FM stereo with the exception of an adapter appropriate for the system adopted by the F.C.C. All controls necessary to operate an all FM stereo system have been incorporated and are available at the front panel, in consideration of the probability that the adapter need only be a relatively small "black box," the audiofan will find the R80 ready for stereo when he wishes to have it.

The Crosby R80 is classified as a receiver because it contains an 80-watt (music power) stereo amplifier (dual 40) in addition to separate AM and FM tuners and sufficient controls to suit the most avid knob twister. In addition, it uses a twin "magic eye" tube which is used either as a tuning indicator or as a two-channel program-level indicator.

The appearance of the R80 seems to have been inspired by the space age; the control knobs remind us of the intake of a jet engine and the plastic lens over the tuning dials resembles the airfoil of a rocket. The R80 is shown in Fig. 7 in a wood enclosure.

The FM section contains a shielded front end consisting of a grid-fed r.f. amplifier



Fig. 7. Crosby R80 AM-FM stereo receiver.

Fig. 6 (left). Viking "76 Compact" stereo tape recorder.

(½ ECC85) and a reflex triode converter (½ ECC85) with a variable capacitance type semiconductor a.f.c diode. Three i.f. stages are followed by a discriminator employing a pair of 1N541 diodes for FM detection. A printed-circuit board is employed for the FM section. The 300-ohm antenna input is balanced.

The AM section consists of an r.f. pentode (6BA6) followed by a pentagrid converter (6BE6) and 6BA6 i.f. stage and a 1N541 detector. A rotatable ferrite loopstick is built in.

The amplifier accepts inputs from a variety of low- and high-level sources; phono (both magnetic and ceramic) and tape head are the low-level inputs, and tuner and auxiliary are the high-level inputs. The low-level inputs are preamplified in a 12AX7 which features 20 db feedback equalization circuits for magnetic cartridge and tape-head playback. This stage utilizes d.c. on the heater. The high-level inputs enter the circuit at this point and all signals are fed to the grid of a ½ 12AU7 (tone control) and from there to a ½ 12AX7 (voltage amplifier). Next the signal goes to a 12AX7 phase splitter and finally to the push-pull, self-biased, 7591 output tubes. Over-all feedback 17 db per channel.

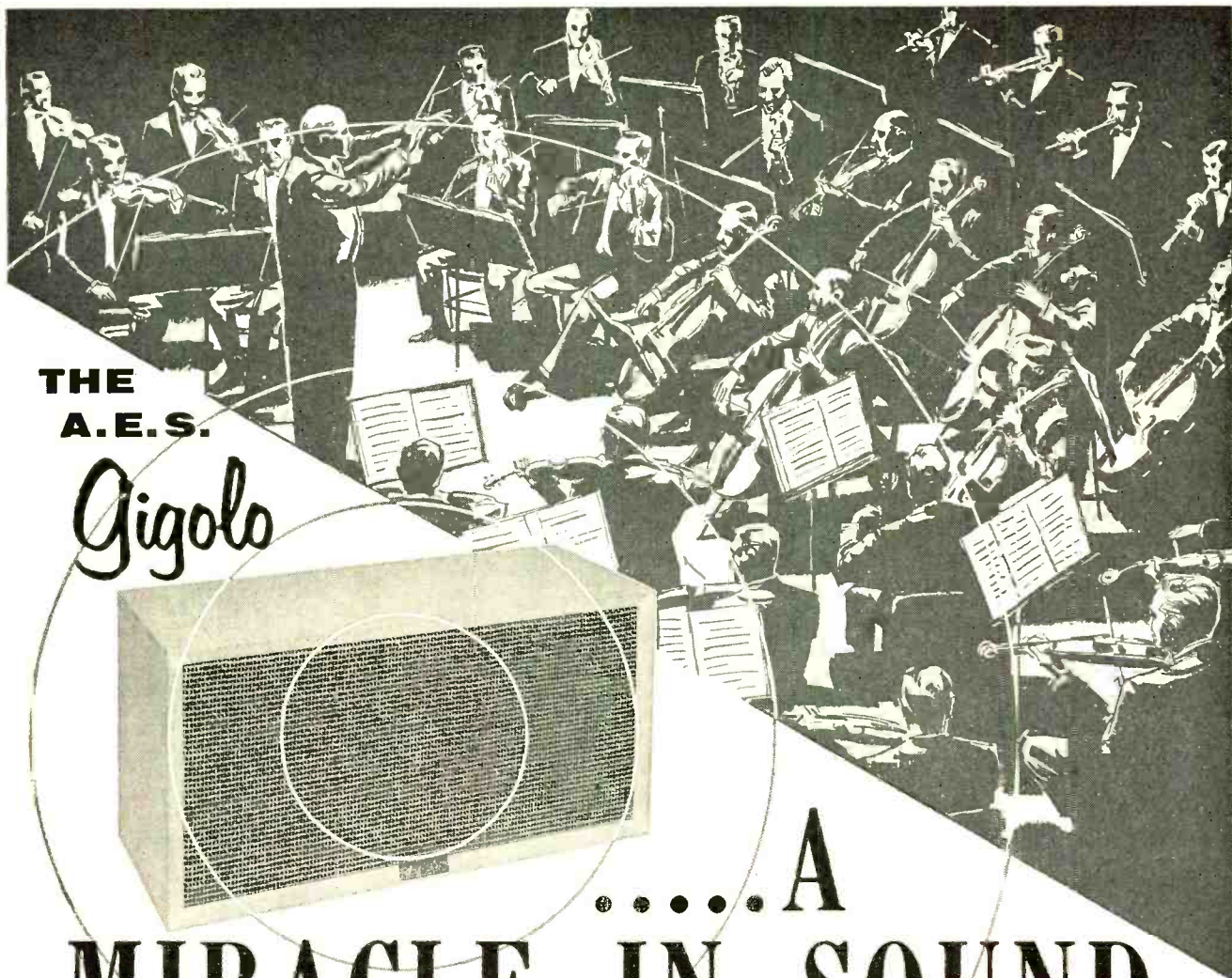
It should be noted that the circuitry of the R80 offers many control features which provide exceptional flexibility of operation although the fundamental circuit is quite conventional. One would suspect, just from examination of the tuner circuits, that the R80 is not in the "super-sensitive" category. Of course, extreme sensitivity is required in very few locations. Indeed, all of the high-sensitivity sets have a "local" switch which reduces signal level to avoid overloading the tuner.

Performance

As a receiver the Crosby R80 performs quite well. Frequency response is plus or minus 2 db from 20-40,000 cps and power response is plus or minus 0.5 db from 40-20,000 cps at 40 music watts per channel. Residual hum and noise is 88 db below 35 watts. Harmonic distortion in the AM section is less than 1 per cent. In the FM section harmonic distortion is less than 0.75 per cent at 100 per cent modulation with a 10 µv input.

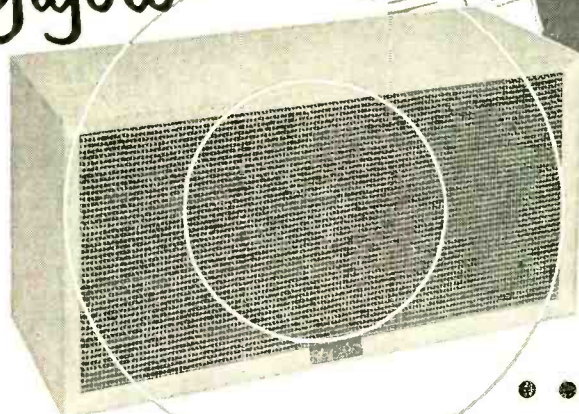
All these statistics add up to performance at a relatively modest price. The Crosby R80 is well equipped to be the "nerve center" of a home music system.

F-27



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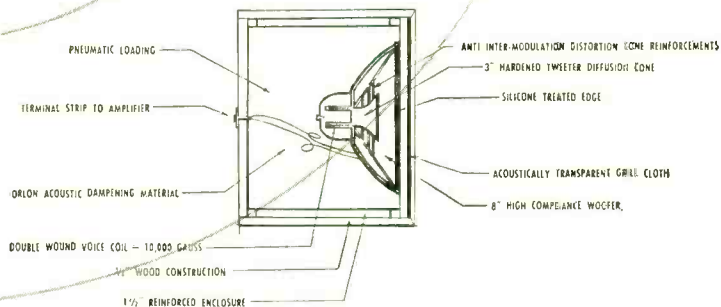
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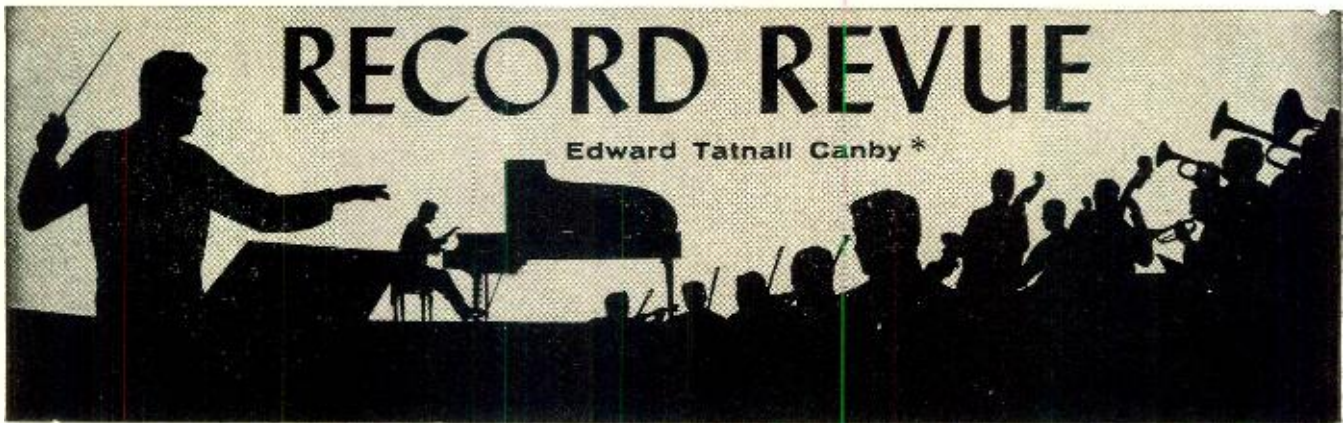
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Don't Miss This One

Copland: Billy the Kid; Rodeo. New York Philharmonic, Bernstein.
Columbia MS 6175 stereo

Nobody, but nobody, can play Copland like Bernstein. This is for my ear the finest coupling of these two pleasantly jazzy works so far to hit records; they positively titillate, and Columbia's new-style stereo is wonderfully grateful to the music.

CLASSIC MODERN

Stravinsky Conducts, 1960. (Le Sacre du Printemps; Petrouchka; "Apropos of Le Sacre"—comment by Stravinsky). Columbia Symphony Orch., Stravinsky.
Columbia D35 614 (3) stereo
(mono: D3L 300)

What a whale of a spectacular *this* is! As in others of the sort, the music is only one element among many in the package. As usual, the *décor* is varied and colorful, the information and illustration enough to keep you busy for hours. But this documentary, unlike a good many earlier spectacles, is full of vital stuff, an astonishingly thorough presentation of the man Stravinsky—by himself. He conducts, he speaks at length, he writes personal reminiscences most of which are brand new and of historical importance, for all their chatty flavor. It is, in this new medium, a sort of interview-in-depth, a self-revelation that is complemented by the superbly played definitive readings of the music in terms of the conductor's own present-day thinking.

As for the "personal appearance" of Stravinsky himself, it is amazingly successful. The trick is its generous length. The first few moments of his speech are halting, not easily intelligible in his thick, half-French half-Russian accent. But as the grooves slide by he warms up and before long his account of the famous "scandal" at the first performance of "Le Sacre" in Paris, first-hand and highly animated, is on its way to become, before your very ears, a unique musical document already of enormous value but surely destined for even more extraordinary usage in the future. Imagine Mozart talking to you for a quarter hour in your living room!

As for "Le Sacre" and "Petrouchka", you'll find here one of those rare instances when a skilled body of performing musicians is audibly electrified to greatness under the impact of a great personality, outdoing even its own virtuosity. You can cut the musical tension here with a knife, but every bit of it is functional, for my money far more so than in the famous Toscanini ensembles of the past. The precision here is just unbelievable, even in this day of virtuoso orchestral playing.

In comparison with Ansermet's somewhat

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

heavy and slightly old-fashioned performance, Stravinsky's "Le Sacre" is lithe, sharply defined, fast, economical; compared to Dorati's steel-hammer approach, Stravinsky's is all grace and poetry. Those who know the music will find many unusual bits of emphasis and of phrasing in the composer's own version. "Petrouchka" has similar qualities though on first hearing I felt somehow that the real showpiece of the album is "Le Sacre"—a performance in a thousand—whereas "Petrouchka" is a top performance among others not radically inferior.

Again, Columbia's new-sound stereo, close-in but with a perfect rounded sense of space, is beyond any comparing. I loved it.

Bartok: Piano Concerto No. 1; Rhapsody for Piano and Orch. Sudwestfunk Orch. Baden-Baden, Reinhardt.
Vox PL 11.350 mono.

It's hard to believe that this is the first recording of a major work of Bartok's maturity, his Piano Concerto of 1926.

We have been through a topsy-turvy era in music this last quarter century, where the once-violently-dissonant composers of the brash 1920s gradually toned down their mature output and became more acceptable. Thus in the case of Bartok, as with Prokofieff, Hindemith, Copland and many another, it is his latest music that is best known. Only now are we progressing backwards into the music of the brassy Twenties, as with increasing distance we discover for our own ears that it really isn't as different from the later music as we had thought.

The "Concerto for Orchestra" is the most popular Bartok piece, one of his last; but recently we have moved back from the gentle "Third Piano Concerto" to the wild and woolly "Second Concerto"—now comes the "First", even wilder and woollier, but (as we now hear) all the better for hi fi and in the listening not really so different from more familiar Bartok. This concerto does, to be sure, whang and bang in true Twenties style; but you'll also hear many an endearing bit of the "Concerto for Orchestra" of almost twenty years later—and the similarity to the now well-known "Sonata for Two Pianos and Percussion" and that even better known hi fi miracle, "Music for Strings, Percussion and Celesta" will be immediately clear. In short, this unfamiliar Bartok will turn out to be remarkably familiar as a member of the Bartok musical family.

The early "Rhapsody," from 1904 when the composer was only 23, is one of those big, splashy pieces of pure derivitiveness that borrows from everybody in sight yet manages also to foreshadow much of the mature style of the composer. This piece is all Liszt, all Hungarian Rhapsody, with strong touches of Brahms, César Franck, Strauss. But it is very often unmistakably Bartok too, as of much later, and though the music is long-winded in its youthful exuberance it is effective and entertaining. Quite a guy, this young Bartok.

The "First Concerto" gets a somewhat rough playing, understandably in a first recorded performance, the rhythms often hesitant and unsteady. Practice makes perfect. But the big sense of the music is easily conveyed, the hi fi is excellent and the spirit

right throughout. The early "Rhapsody", more predictable, gets a polished and splashy performance, just right for it.

I don't know whether this is available in stereo; mine came in mono format.

Bartok: Concerto for Orchestra; Dance Suite. Concertgebouw Orch. of Amsterdam, Haitink.

Epic BC 1129 stereo
(mono: LC 3772)

It is astonishing to find how many aspects this late Bartok Concerto can reveal, under varying conductors and orchestras. It seems to have summed up, belatedly (1943), a whole century of composition, from Beethoven through the whole Romantic period and on past Tchaikowsky into the satirical ribaldry of the Twenties and the restoration of a sort of neo-Romanticism in the Thirties. All this is in the music, and each element is there to be emphasized according to taste; the concerto-like flexibility of the score is such that the most varied treatments still leave it intact in balance and expressive power.

This recording, thus, presents a sound that is quite new to me. It puts forward elements in the score that I seem never to have heard, though they were there all the time. Where Fritz Reiner makes this a work of ultra-high-tension modernism, where Ansermet gives it an almost Brahmsian old-fashionedness, the Concertgebouw under Haitink plays a sort of high-level Tchaikowsky—I mean Tchaikowsky at his razor-edge best. The implied comparison is between the concerto treatment of solo voices within the orchestra in the Bartok and the sharply similar treatment of the Tchaikowsky orchestra in his big works. The two men, after all, were both masters of detail within a large symphony orchestra, both could achieve massiveness, or lightness and transparency, within the big aggregation of instruments.

There is, of course, a certain quality of honest conservatism here—it is good in such a well-rounded performance (though it can be dull in less fortunate circumstances). The themes and melodies are taken full-value and with leisure, each given all the time it can use for its best impact, and this adds to the Tchaikowsky flavor; for the Bartokian tension under this same moderate approach is, again, remarkably like that of Tchaikowsky.

Only in the high-speed last movement is the music somewhat out of its element. Reiner does it even faster but maintains a tempered steel sharpness even so; here there is incipient confusion and orchestral floundering.

The earlier "Dance Suite" (1923) is also slightly out of place in this moderate and thoughtful orchestral milieu; it is better played where the snazzy, brassy, jazzy elements can have fuller play. Even at their most eloquent the Dutch are seldom jazzy. Not in symphonic music, anyhow.

Bloch: America (1927). Symphony of the Air, American Concert Choir, Stokowski.
Vanguard VSD 2065 stereo

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2. BEACH SURF (1:00)	17. HORN BLOWING (1:00)
3. BEACH SURF (1:00)	18. HORN BLOWING (1:00)
4. BEACH SURF (1:00)	19. HORN BLOWING (1:00)
5. BEACH SURF (1:00)	20. HORN BLOWING (1:00)
6. BEACH SURF (1:00)	21. HORN BLOWING (1:00)
7. BEACH SURF (1:00)	22. HORN BLOWING (1:00)
8. BEACH SURF (1:00)	23. HORN BLOWING (1:00)
9. BEACH SURF (1:00)	24. HORN BLOWING (1:00)
10. BEACH SURF (1:00)	25. HORN BLOWING (1:00)
11. BEACH SURF (1:00)	26. HORN BLOWING (1:00)
12. BEACH SURF (1:00)	27. HORN BLOWING (1:00)
13. BEACH SURF (1:00)	28. HORN BLOWING (1:00)
14. BEACH SURF (1:00)	29. HORN BLOWING (1:00)
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is the musical testament of an old-line immigrant from Europe, a much-beloved Jewish composer who left the Old Country for our "promised land" and hereby thanks America for all that it means to him. The music is built around a number of familiar American tunes; it is pictorial, heroic, sentimental, touching in its honesty—and about as unpalatable today as you can possibly imagine. Alas, the very vehemence of its defenders (including Stokowski) betrays, I think, a pretty sure doubt as to its musical value. Frankly, I found it perfectly awful, though this does not one bit reduce my admiration for the man himself nor for the feeling that led to such a heroic monstrosity.

The stuff is dismally dated, in the true sense of that word; its whole approach and language is of a sort that is now meaningless, except perhaps in a misguided local affair of patriotic pageantry. The musical construction that might give it permanence is so flimsy, the style such a hodge-podge, the extra-musical dramatics so distracting, that

not even Stokowski's magic can pull it together.

You will not find any reputable musician who will admit this in public, of course. Bloch was one of the great inspirations for American music in its budding years of this century and his name is sacrosanct. But if you expect a work of patriotic fervor—be warned. The going is heavy.

At the end of the big piece, a short excerpt from an actual speech by Bloch concerning this work gives his own patriotic feelings, in reasonably intelligible fi. Interesting.

Claire de Lune (Debussy Piano Recital).
Philippe Entremont.

Columbia MS 6214 stereo
(mono: ML 5614)

Piano Colors of Ravel. Leonard Pennario.
Capitol SP 8533 stereo

Here are two of the younger generation pianists, each busy re-interpreting major

slices of the two big French "modernists" of the early part of our century. The albums are curiously significant for piano listeners in general as well as piano players.

Philippe Entremont, to be sure, represents a much newer concept of pianism than Pennario—though perhaps neither would be aware of it. Pennario is one of the postwar pianists of the "hard" school—a basic piano premise carried over from the Twenties, that the instrument is percussive in our day, that pianism must be stern, strong, dry in color, as contrasted to the melting, thundering grandeur of the older days. Though he has moved into more subtle expressions than this might imply, Pennario's playing is still of a slightly austere power, tempered with Hollywood urbanity. He has grown in spite of Hollywood and a play-anything slickness of technique now widely appreciated. His Ravel, thus, is good for the strong, stern underpinnings of advanced harmonic language that were Ravel's assets; his austerity is in tune with the composer's in such exquisitely controlled evocations as the *Pavane for a Dead Princess* and the *Tombeau de Couperin* suite. The more violent Ravel is sparingly touched upon in this record, nor is it as good, for Pennario's steeliness is not warm, whereas that of Ravel is white-hot.

Pennario's "refined artistry" (as per the cover blurb) could be innately excellent for Ravel if he could only give more of his own passionate complexity to it. He has the stuff, but perhaps the Hollywoodish slickness is not easy to put off—least of all when it has been so successful.

Entremont is of the newer generation that suddenly plays the piano gently, all soft and trusting, young pianists who again use the pedal—practically taboo for these many years—and eschew the hard tones of percussion. Like Glenn Gould, he mastered the classics first—Beethoven and Mozart. His Debussy is trusting and straightforward and thus a pleasure to hear, but it is less sophisticated and in a way less mature than Pennario's polished Ravel. Compared to the Debussy of the great Gieseking, Entremont's is of an advanced student, turning master but not yet sure of the larger shapes and emotions.

His *Reflets dans l'eau* is pedaled and shimmering, his *Minstrels* gently jazz. But the big, clanging moments of Debussy sonority are a bit forced—perhaps in sheer honesty. For Debussy was a shrewd promoter of piano trickery and it takes a master like Gieseking to cover up the lurking banalities behind his stunning moments. I like Entremont.

PAST AND PRESENT

Gregorian Chants—Good Friday; Septuagesima. Choir of the Monks of the Abbey of Saint Pierre de Solesmes.

London OS 25229/30 stereo

Solesmes in France has lately been distinguished for being near Le Mans, where auto racers tear their cars apart. Le Mans was there all along; but long previously Solesmes had an enviable world-wide reputation as the center for the restoration of Gregorian chant to its original form, after many centuries of gradual corruption. The monks even devised moveable type for this old music and back in the 19th century printed the first of those huge volumes of chant that are now the official sources for Catholic Gregorian music. In the first decade of electrical recording, these monks issued a monumental series of 78's which were my own introduction to this music.

In comparison with several other recent LP's of Gregorian music I've been hearing, one from Germany and another from the U.S.A., the Solesmes monks sound older, sing with a very slightly more romantic approach and produce a peculiarly lovely slightly nasal tone that would seem to be of French origin. Their singing is deliberate, with a good deal of emphasis and quite a bit of swelling and dying away on individual tones. The pitch is no less than superb—in a half hour of unaccompanied singing they do not slip. (Try it yourself—just play the beginning of side 1 of the "Good Friday" disc, then the very end.)

I particularly enjoyed the first part of the Good Friday music, which is an exposition of

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the Good Friday story (in Latin, of course) somewhat reminiscent of the Lutheran "Passion drama" as set by Bach—three voices alternate, one of them an Evangelist, one the "Synagoga", and the third Christ himself. The Evangelist is somewhat neutral, while the other two have more individuality, one singing higher, one lower. The entire story is told in terms of an exquisitely balanced series of short chant formulae, repeated dozens of times to new words. The serene, utterly musical confidence of these individual voices is something to marvel at and should move any listener.

Distler: Die Weihnachtsgeschichte (The Christmas Story). Norddeutscher Singkreis, Wolters.

Barenreiter Musicaphon BM 30 L 1302

This poignant, restrained modern setting of the Christmas story for unaccompanied chorus and solo voices looks back beyond Bach, perhaps to the "Christmas Story" of Heinrich Schütz in the early part of the 17th century. Its composer enjoyed only a brief musical fame; the growing Nazi dominance and increasing militarism of the Thirties in Germany was wholly alien to his nature—as is abundantly clear in his sensitive music—and, if my slightly faulty German is correct, he endured only the first half of the war before committing suicide in final desperation.

His music is hardly forward-looking and, I suppose, could be called introspective to the point of near-decadence. On paper, perhaps. But there are times when it is good to look backward, to revere, preserve, make newly fruitful those traditions of the past that are threatened with horrible extinction in a world of terror. Great art has often come from such a situation and has been duly honored, the equal of any innovation.

The gentle Christmas story is told here mainly by an unaccompanied solo narrator (as in Schütz), who is surrounded in the music by others—an angel, Mary, King Herod, Simeon; the quiet flow of their voices is taken up here and there by the choir, unaccompanied, which sings a series of lovely choral variations on the familiar Christmas tune *Lo, How a Rose e'er Blooming* (*Es ist ein Ros' entsprungen*) as well as brief contrapuntal motets on portions of the story's text.

The mood is quiet and reverent throughout, the music far removed, as indeed it must be, from the rigors of daily life and the grating coarseness of the Nazi regime's years of expansion. How else, surely, must the story of Christmas be told, today as then? If you would like to hank up some moments of Christmas peace in advance, against next year's department store Xmas rush, put aside this disc and bring it out next December.

Deller's Choice. Alfred Deller, counter-tenor, with Gustave Leonhardt, harpsichord and organ.

Vanguard BGS 5038 stereo

Vanguard's immense success with Alfred Deller has led to a few recent releases not exactly on the highest plane, though pleasing—yet this new recording, far from exhausting the Deller repertory, is one of his very best to date.

It is entirely of songs to harpsichord or organ (with a fiddle and cello here and there); the music is superb, the singing inimitable—there is no one I know of who can do it as well—and the variety of material is remarkable, the interest well sustained. (A solo harpsichord or organ piece now and then breaks the monotony of the same voice.) Best of all, Deller controls his vocal instrument more beautifully and rigorously than I remember hearing it before, with scarcely a tone anywhere of his earlier yawpish sort. His sense of pitch is exquisite. Few singers can match it. His feeling for purely musical drama and the dignity of simple expression is flawless.

The music ranges back and forth, mainly English but with complementary Italian and German items; there is a Bach and a Handel, a brace of virtually brand new 17th century English works (to most of us) by such as Humfrey, Blow, Weldon, an unusual ornamented version of a madrigal by Cipriano de Rore, decked out fifty years afterwards as a

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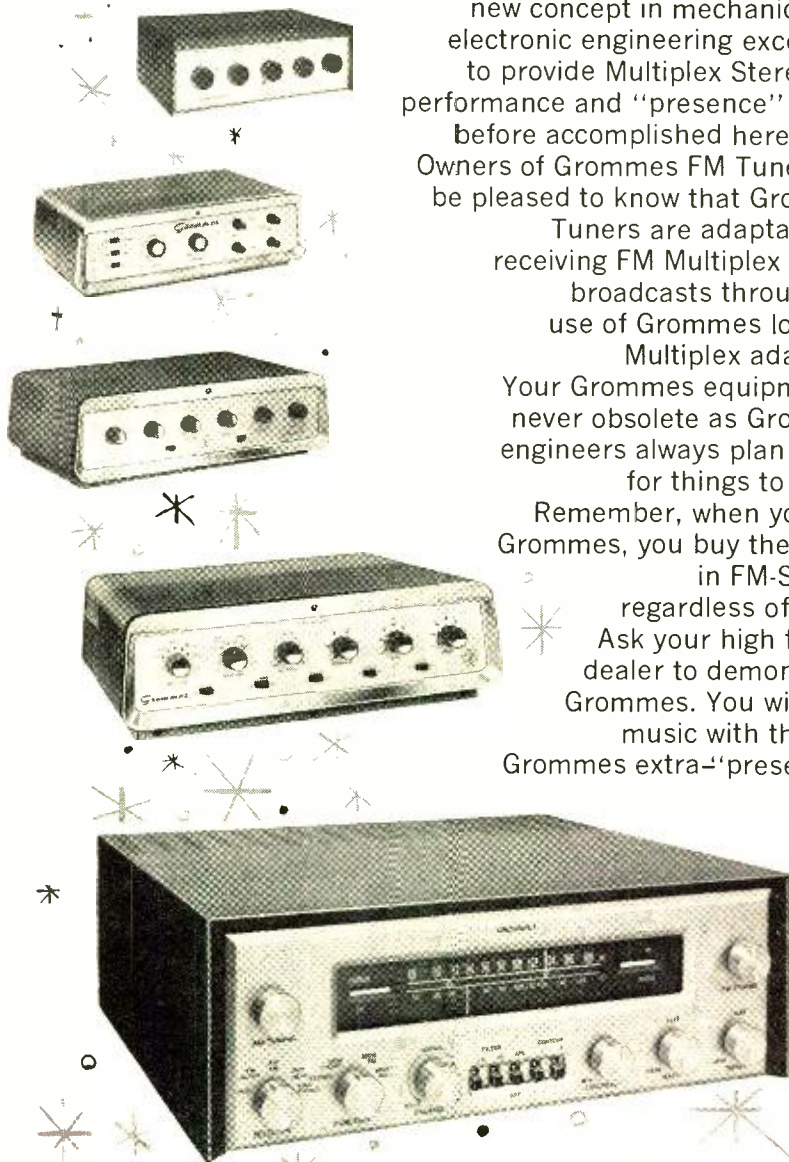
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scholarly illustration on paper of the elaborate *ad lib* additions that singers then made to other printed music. (My own Canby Singers has performed the original madrigal). Who but Alfred Deller could sing these ornaments today in such a musical fashion?

The high spot of the recording (as in Deller's work as a whole) is his Purcell, in this case the *Elegy on the Death of Queen Mary* (The Queen's Epicedium) of 1695. Purcell was a counter-tenor too and doubtless sang this piece himself; Deller's sympathy for Purcell's difficult and unaccustomed vocal music is extraordinary. It's an experience to hear him, and to realize what sheer genius there was in this British composer.

Lotte Lehmann—Opera Recital (Great Recordings of the Century).

Angel COLO 112

Those who remember Lotte Lehmann in her later career as one of the finest of all lieder

singers will recall how we used to talk about her—"she doesn't have much of a voice, but..." and so on. That's the fate of all singers whose musical minds outlast their physical powers!

If you've heard Lehmann's 78 rpm *Sieglide*—if my memory is right—or her famous "Rosenkavalier" recordings of the same period (COLH 110-111), you'll scarcely be surprised at this set of short operatic "singles" from the high times of her earlier career, 1927 through 1933. She had a great voice then, as well as the familiar and fascinating Lehmann personality, so sincere, so dramatic, so dedicated to her music.

On these two sides are nine famous 78 records with orchestra and only two, Korngold and d'Albert, are of less than top musical calibre—but she makes them shine too. The best are Beethoven ("Fidelio"), Weber ("Freischütz"), and the two Strausses ("Fledermaus" and "Ariadne auf Naxos"); she was a pure German singer, who did even

her French and Italian opera in German. A touching and revealing article by the present Lehmann, "Listening to My Old Records", is the nicest part of the excellent accompanying booklet.

Schubert: Trio No. 2 in E Flat, Op. 100.
Rudolph Serkin, Adolf Busch, Hermann Busch. (Recorded in 1935).

Angel COLH 43

For a good many years, Adolf Busch and his pianist son-in-law Rudolph Serkin performed together, both in chamber music and in works for orchestra, with a good deal of the *éclat* that now goes to such as Alexander Schneider and Pablo Casals. In their chamber music, brother Hermann Busch played cello, as brother Mischea Schneider has played to his brother's fiddle.

I can remember many a Busch-Serkin event myself, and the familiar impact of Adolf Busch's fiddle, not always accurate and often over-emphatic but always musical, is a sound-symbol of an era for those of us who enjoyed his then-new small orchestra "Baroque" concerts and recordings—presaging the great movement of today towards "authentic" older music. His were among the earliest of the sort in this country, though the idea was nothing new in Germany.

Serkin is still with us as a leader; instantly, the compelling power of his piano leadership will strike you in this famous old recording. A human dynamo of music! For all his later career, I suspect that these relatively youthful moments of superb Schubert playing have not been surpassed by him. By himself, Adolph Busch was often too heavy, too Germanic for an American taste. Serkin on his own was nervously tense. Together, these two associates held each other to the optimum, and the eloquent but circumspect playing of Hermann Busch made for the perfect trio.

After a quarter century, the playing here has an oddly old-fashioned eloquence, free of that unyielding tension that is so marked in our music today. This is the way Schubert ought to be played, I'm tempted to say—knowing perfectly well that each age finds its own way to play any music that may be lucky enough to survive from an earlier period! This is one of the glorious ways that Schubert *has* been played, anyhow, during the 135-odd years since this music was composed.

Beethoven: Two Romances for Violin and Orch. Mendelssohn: Violin Concerto.
Arthur Grumiaux; Concertgebouw Orchestra, Kaitink.

Epic BC 1120 stereo
(mono: LC 3762)

I tried this record mainly for the two lovely Beethoven "Romances," old favorites of mine for years past. They aren't often played because they do not fit in any standard category—they are short, simple songs but require a full orchestra as well as a soloist.

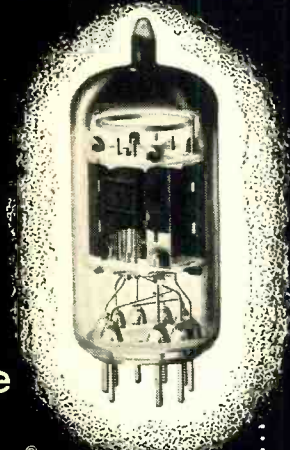
It was good to hear the music again, but I felt that these performances were somewhat hurried, missing that sublime slowness that is especially Beethoven's in such music. These move along too fast for the proper musical impact, losing the dignity, the impressive simpleness, that can be projected, and has been in other recordings. The music is more important, I think, than these players are allowing it to be. It is the very best of a type of expression that Beethoven particularly liked in his early-middle period.

The Mendelssohn Concerto is well and lightly played with a good balance between solo and orchestra, no unnecessary hoopla, a fine fiddle tone from Grumiaux. Even without trying the dozens of other available versions, I'd be willing to settle for this one. (See following.)

Mendelssohn: Violin Concerto.
Bruch: Violin Concerto No. 1. Nathan Milstein; Philharmonia Orch., Barzin.
Capitol SP 8518 stereo

—Hold it! Here's another Mendelssohn, which out of curiosity I compared directly with the preceding, featuring Arthur Grumiaux.

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aux and the Dutch orchestra. (Note that these two are perhaps the two highest-rating orchestras in the world.)

The Capitol (E.M.I.) sound is sweeter and smoother than Epic's (Philips of Holland) and the performance is more mellifluous, to the point of being a bit slick. It's interesting that the Mendelssohn orchestra is peculiarly tough to capture in stereo against a solo violin, and Capitol's Philharmonia is distinctly subdued and "backgroundish" here, more so than the Concertgebouw in the Epic recording though both versions subordinate the orchestra to the prominent solo violin.

Yes, I distinctly prefer the Epic recording. It is slightly rougher, but in the direction of real sincerity and musical expressiveness. As a matter of fact, the coordination and cooperation between solo and orchestra is better than between Milstein and his very expert orchestra man, Leon Barzin. Differences are slight in outward detail, but I sense rather definitely that the Milstein-Barzin cooperation was somewhat routine, if highly skilled, whereas the Grumiaux-Haitink collaboration (Haitink is one of the two permanent conductors of the Concertgebouw) is a working ensemble of real expressivity.

All of which is to say that my first impulse, as of the above—to settle for the Epic recording—is sustained in subsequent comparison here.

Mozart: Symphonies No. 25 ("Little G Minor"), No. 36 ("Linz"). Pro Musica Orch., Klemperer.

Vox PL 11.820

If I am right, these recordings are out of an earlier Vox catalogue, put down when Otto Klemperer did not yet have his present elder-statesman reputation, that has so felicitously come his way in the last four years, during which his Angel recordings have made him famous on records. Klemperer went through an unfortunate period in late middle life but his return to "full production" has been the more extraordinary. A comparison of the two cover photographs of the man will perhaps suggest the change; the side face on the front shows the wise, contemplative aspect of a great musical mind, the front face on the back of the album shows the nervous, high strung, slightly fanatical look of his less successful period.

The Mozart symphonies show both aspects of this conductor. They are, indeed, taut, rather tense in the performance. But in spite of it, the masterful understanding of shape and line comes through. Comparison can be made with Klemperer's Angel recording of the No. 25 with the Philharmonia.

The sound of these is quite acceptable, though somewhat on the wooden side, lacking in upper sheen. If they are as old as I think, in the original, Vox has done an excellent job of refurbishing.

ECHT- AND NEO-BAROQUE

Bach: Sonatas Nos. 3 and 4 for Violin and Keyboard, in E Major, C Minor. Hansheinz Schneeberger, violin; Eduard Muller, harpsichord.

Barenreiter Musicaphon BM 25 R 902 (10")

The German-Swiss firm that rides the bear (Barenreiter) is now being imported hereabouts and I'm lucky enough to be on their reviewer list. Their product is ultra-German in the highest sense—even to that typically complicated file number on the record, as well as the somewhat chastely designed soft record cover (quite lovely, even so) and, most important, the marvelously played Bach.

It takes a German understanding, I sometimes think, to play this ultra-German composer as he must be played. In particular, this violinist is unbelievably "right"—his instrument is subordinated to the whole music both in the playing and in the recorded sound (which places him somewhat off-mike for a beautiful blend with the harpsichord), his fingering and bowing as precisely accurate as though the tones were played on an organ, his phrasing superbly musical, making even

(continued on page 68)

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JAZZ and all that

CHARLES A. ROBERTSON*

STEREO

Jesse Fuller: The Lone Cat
Good Time Jazz S10039

Railroading and its associated sounds stir the imagination of amateur enthusiasts as well as professionals, and by now the piece of track which has never seen a portable tape recorder is lonely indeed. The deep throb of the newest diesel monster is harnessed to test stereo equipment, while distant whistles of the last steam locomotives are being faithfully documented for space-age posterity. Before the first microphone was posted beside a roadbed, however, blues artists had already passed by, on the way picking up the rhythmic pulse of cars in motion and putting it into songs about the trip. That these practitioners often heard as much as any microphone and more is ably demonstrated by Jesse Fuller, who acts as a one-man band to tell of three separate journeys on his first stereo performance.

Although the blues are full of railroad lore, with only subject matter of an amatory or monetary nature turning up more frequently, such purely descriptive pieces are usually set apart and designated as train blues. Early blues artists made them into individual specialties and always had one ready to roll. Fuller started learning as a youngster when working "on transportation" a half-century ago in an Alabama lumber camp, rode the rods throughout the South, and once held an annual pass on the Southern Pacific. He boasts of catching freight trains running thirty miles an hour with a guitar strapped on his back, and his fingers are still fleet enough to hit a better gait. It would come as no surprise to learn that Fuller is the only man alive who can estimate the speed of a train from a song's tempo.

Rather than work against the sound of the rails, passengers on the old sidedoor pullman cars picked tunes and adjusted their playing to conform to the basic rhythm patterns. Fuller controls the pace by taking a position at the throttle of the fottella—an instrument of his own invention consisting of a big six-string bass viol which he operates with his left foot through a system of pedals and levers. Counter-rhythms are played on guitar, and signals for crossings come from either harmonica or kazoo attached to a harness worn around his neck so that he can shift from one to the other at will. Bridges and switches are marked by his right foot working a home-made "hat" cymbal. Fuller is fully occupied by the time everything is going at once, but the drivers are rolling and a live, breathing locomotive moves at his command. A crack transcontinental express pulls out on *Leaving Memphis, Frisco Bound*, while the local tracks are used on a novelty tune, *The Monkey And The Engineer*. And hard-working logging trains climb over the hills on *Beat It On Down The Line*.

A senior member of the blues fraternity, Fuller has roots in the post-reconstruction South where he was born 63 years ago, and his experience is by no means limited to railroading. In fact, his first airplane flight, from

* 732 The Parkway, Mamaroneck, N. Y.

Liverpool to Belfast, and admiring fans who carried him on their shoulders, served him better than a train ride which took him to the Newport Folk Festival a day late. The ability to entertain Douglas Fairbanks won him a job soon after World War I as extra during the filming of "The Thief of Bagdad," and other epics. By that time his style of vocalizing and guitar playing was fully formed, and later improvements in the way of greater proficiency and added instruments all fit in. Today Fuller's music is an authentic voice from the past, even though he nurses an ambition to appear on the Ed Sullivan show. When describing *New Corrine*, he still sees a country road and a girl no older than she was in 1915. Also included are a superb *Guitar Blues*, and a mournful *Down Home Waltz*.

When future citizens of other planets attempt to gain an inkling of what railroad travel was like by listening to locomotive recordings, much of the romance will be missing unless they also hear Fuller and some of his fellows performing train blues. Some modern singers try to update the idiom with references to Cadillac cars, rockets, and circling satellites, but they must look elsewhere for a beat. As long as the blues are sung and played, some performer will be taking an old coal-burner on down the line. All of Fuller's sounds are relayed without resort to overdubbing, tape editing, or channel switching, and Roy DuNann's stereo setup helps untangle the assorted instruments. Fuller, indefatigable to the last, concludes with a lively huck and wing across the studio.

Jon Hendricks: Evolution Of The Blues Song
Columbia CS8383

Like any good blues, the story Jon Hendricks told last fall at the Monterey Jazz Festival is a purely personal one that bothers little with published histories. On this slightly shortened version, which was recorded in Hollywood a week after the concert, he speaks in terms youngsters can easily understand about plain truths their elders should never forget. To him the blues are a living language of today, with a growing future and an unburied past, and he believes everyone should hear and know the messages carried in the old songs and the new. Musical examples are selected with this view in mind, and assisting vocalists include Hanna Dean and gospel choir, Big Miller and Jimmy Witherspoon. Hendricks is heard in three songs which he wrote especially for the recorded performance, and two should be enored in another context soon—a calypso *They Stopped On The Way*, and the amusing *Aw, Gal*. The Ike Isaacs Trio, his regular accompanying group with Lambert, Hendricks, and Ross, is joined by Ben Webster, Pony Poindexter, and Bobby Gibbons. Every school board should be required to invest in several copies.

Elmer Snowden: Harlem Banjo
Riverside RLP9348

One of the happiest sounds anywhere is the banjo playing of Elmer Snowden on this date, the first to be held under his own name in a professional career dating back to 1912

when he joined Eubie Blake's Baltimore band at the age of twelve. In fact, he left recording studios a quarter-century ago, returning only recently to play guitar on a Prestige LP featuring Lonnie Johnson. Chris Albertson, who rediscovered both men through his jazz program on a Philadelphia radio station, switched labels since then and is now producing for Riverside. And Snowden is back playing banjo, just as he did when he first met Duke Ellington in Washington, D. C. Their two careers ran parallel for several years, and Snowden is credited with bringing the younger man to New York. All the tunes recall those roistering Prohibition days at the Kentucky Club, Barron Wilkins, Small's Paradise, and the Bamville Club, where gangsters mingled with the upper crust and the bands played *Doin' The New Lowdown*, *Diga Diga Doo*, and *Tishomingo Blues*. But the banjo was on the way out by repeal, and Snowden went with it.


He remained musically active, however, and kept his wrist flexible by playing with such Philadelphia youngsters as Ray and Tommy Bryant. The last named brother renews the association as bassist in the quartet, and the drummer is Jimmy Crawford. Harlem stride piano is the rightful complement for this sort of banjo playing, and the veteran Cliff Jackson proves to be a perfect partner. Snowden's single-string solos are pure delights, and engineer Ray Fowler catches nuance on Ellington's *C-Jam Blues*, and *It Don't Mean A Thing*. If the designers of stereo spectacles and television producers are really looking for the authentic sound of the Twenties, Jackson and Snowden are the men to see.

Toshiko Mariano Quartet
Candid 9012

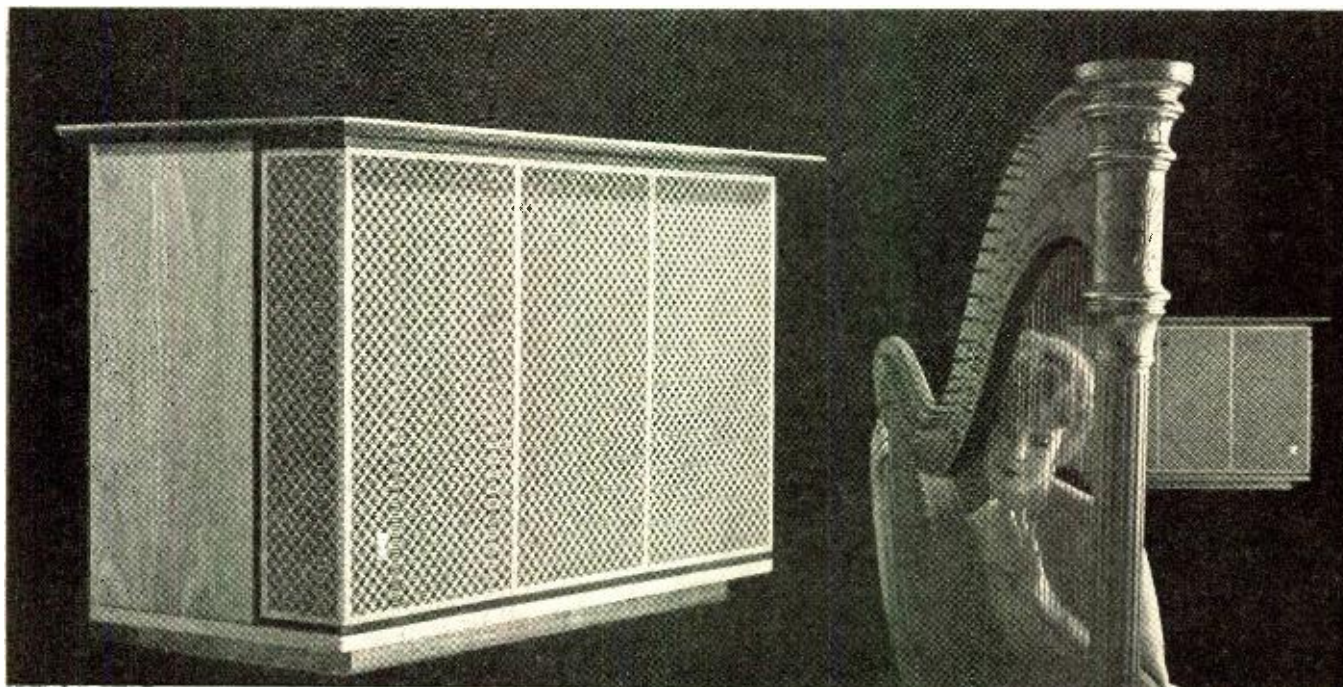
Toshiko Akiyoshi and Charlie Mariano formed their quartet a year ago, shortly after they were married, and have welded it into the unique and invigorating unit heard here in the interim. The first Japanese to win a reputation as a jazz musician, Toshiko came to this country five years ago on a scholarship from Berklee School in Boston. Work in clubs and close association with various jazz greats hastened her progress until now she is a thoroughly developed jazz pianist. Her husband was featured as an alto saxist in the Charlie Parker style with Stan Kenton, but has since thrown off shackling influences. Both retain a certain identity by writing original material, and each claims ownership of two compositions in the present set. How much of the individuality is real and how long it can be kept separate are matrimonial questions best left unanswered. But Mariano becomes as much involved in Toshiko's lyrical *Long Yellow Road*, as she does in her husband's waltz theme on *When You Meet Her*. The remaining number is a moving realization of *Deep River*, and brings Mariano to the fore. Gene Chericco, bass, and drummer Eddie Marshall complete the quartet. Bob d'Orleans engineered the date.

Johnny Dankworth with the London Philharmonic Orchestra: Collaboration
Roulette SR52059

While critics and musicians in this country and in Germany were raising considerable fuss the last few years about the union of jazz and classical forms, the British went about the same bit of business quietly and with little fanfare. Johnny Dankworth's modern jazz orchestra and the London Philharmonic first met in concert at Royal Festival Hall on June 2, 1959, and the experience proved mutually rewarding enough to bear repetition on several subsequent occasions. Furthermore, composers of both persuasions were given commissions and encouraged to join forces in preparing new works as the concerts continued. The two introduced here, with Hugo Rignold as conductor, succeed in drawing both units together more closely than is usually the case in such marriages. Dankworth, who later answered an invitation to bring his entourage over for the Newport Jazz Festival, paired up with Matyas Seiber to produce *Improvisations For Jazz Band And Symphony Orchestra*. The five-part *Rendezvous*, a collaboration of David Lindup and Leonard Salzedo, visits such international


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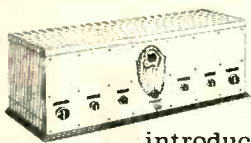
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points as West African "Highlife," the gospel church, contrasting Peruvian rhythms, and London's own South Bank.

The show is very nearly given away at the start, as the first item programmed turns out to be Stravinsky's *Ebony Concerto*, written in 1945 for the Woody Herman Herd. What follows is in the same general tradition, with a bow or two in the direction of Darius Milhaud, and should attract an equally large and cosmopolitan audience. That a tradition can be said to exist in this sort of endeavor indicates how quickly jazz moves along. Soloists from the jazz contingent make certain that time marches just as fast, and Rigold conducts with a light, airy tread. A spacious recording hall was employed, and percussive effects on the stereo version are sufficiently spectacular without aid of channel-switching fakery. The managements of the Boston Pops and Lewisohn Stadium concerts might take heed and brighten summer fare by scheduling these works, or commission others from similar composing teams in this country.

Art Farmer: Art

Argo LP678

Since organizing the Jazztet a year ago, co-leaders Art Farmer and Benny Golson have worked to make the unit a winner and are being repaid by growing approval in clubs from coast-to-coast. So far, they have just missed achieving the same success in the studio together, perhaps because everyone concerned wanted the first two Jazztet LP's to act as showcases. Neither seems to worry quite so much when recording apart, and mundane affairs are far away as Farmer meanders effortlessly through this gratifying set of ballads. Whether sales reach a million copies or a dozen appears to be of no concern as long as he knows the playing is his best.

Farmer can create the same introspective mood on trumpet as Miles Davis, yet phrases so distinctively that he is never called a Davis imitator. He also searches out neglected songs, rescuing *I'm A Fool To Want You*, *Younger Than Springtime*, and *Goodbye, Old Girl*. Pianist Tommy Flanagan is an equally lucid partner, and Golson contributes *Out Of The Past*. Jazztet members Tommy Williams, bass, and drummer Albert Heath complete the quartet. Engineer Tommy Nola's stereo setting maintains the warm and intimate qualities.

Jimmy Smith: Home Cookin'

Blue Note ST84050

Having won a reputation for igniting the Hammond organ with conflagrations fiery enough to singe rare porterhouse, Jimmy Smith turns on the back burners to slowly cook a mess of blues until thoroughly done. The menu was inspired by the homey confines of a restaurant which Kate Bishop operates near the backstage entrance to Harlem's Apollo Theatre, but the proper amount of seasoning is entirely up to Smith and his assistant chefs. Smith works at a leisurely pace, carefully testing each concoction at every stage preparation, and anyone in search of short-order cooking had better look elsewhere. The main dishes are *See See Rider*, and Smith's own *Messin' Around*, with Kenny Burrell, guitar, and Percy France, tenor sax, supplying the extra touches. Burrell also brings along two recipes of his own—a tasty *Sugar Hill*, and a well turned *Come On Baby*. Everything is nicely spread out in the stereo version, and engineer Rudy Van Gelder never lets the hearty organ sound overpower Burrell's softer rhythm passages.

George Shearing with Nancy Wilson: The Swingin's Mutual

Capitol ST1524

Aretha Franklin with The Ray Bryant Trio

Columbia CS8412

If record companies still think the only way to launch a new, young singer is to hire an expensive arranger and large studio band, these two albums should go a long way toward disproving the theory. Nancy Wilson has two previous Capitol albums to her credit and some favorable reviews, but the freedom enjoyed here with the George Shearing Quintet was never hers before. The lightly swinging background is just what she needs to deliver a buoyant *Things We Did Last Summer*, and

a sultry *All Night Long*. A claim that the date came about because of mutual admiration is easier to believe after listening to the pianist's flexible response to the singer's slightest whim. They also apportion the program quite sensibly, and the Quintet performs half the numbers alone, reprising *Lullaby of Birdland*, *Blue Lou*, and Margie Hyams' *Don't Call Me*.

Aretha Franklin's debut LP is even more informal, with a steady stream of jazzmen strolling in and out to give the whole affair a party atmosphere. The eighteen-year-old miss began singing in her father's gospel choir in Detroit when she was eight, and alumnus Sam Cooke is helping to further her new career in night clubs and theaters. Ray Bryant is another who lends encouragement, and his piano is a great help on the adult-sounding *Over The Rainbow*, and *By Myself*. Some numbers are frankly directed at the teenage market, and the lists of hit singles are already registering *Love Is The Only Thing*, and *Today I Sing The Blues*. This last tune comes from Curtis Lewis, who gets into both albums with *All Night Long*. Having satisfied both age groups, the singer plays her own brand of gospel piano on *Won't Be Long*, and *Who Needs You?* Among the invited guests are Tyree Glenn, Al Sears, Quentin Jackson, and Lord Westbrook.

Sid Cooper: Percussive Jazz, Vol. 2

Audio Fidelity DFS7007

Of the sum total of seventeen musicians engaged in decoding Sid Cooper's arrangements on this date, fourteen belong to the rhythm section and all are kept fully occupied. The area around and in between stereo speakers is filled with flying sounds that take off like rockets or soar gracefully about before disappearing into outer space. Anything as simple and direct as a ping in one speaker, followed by a pong in the other, is now hopelessly old-fashioned among the stereo buffs who have become addicted to lots of percussive action. Cooper performs triple duty, providing charts for the musicians, charts for the engineers, and finally charting a safe course for readers of liner notes. An arranger's job is no longer limited to keeping a band-leader happy, and electronic computers soon may take over.

Cooper picks tunes that are resistant to rugged treatment, featuring Bobby Rosengarden's rosin-coated bongo drums and Sol Gubin's cow bell on *Moanin'*, and Don Arnone's guitar on his own *Percussion-Aire*. Some positions are filled twice over, with organists Sy Mann and Nick Tagg, pianists Buddy Weed and Andy Ackers, vibists Harry Breuer and Eddie Costa, and Tony Mottola as the other guitarist. That non-percussionists Doc Severinsen, Bobby Alexander, and throughout should be qualified enough for an astronaut diploma.

Limerick Party

Cook 1074

As the special dispensation granted to make this recording at an annual meeting of the Benevolent Society for the Preservation of Ancient Rhymes & Limerix may never be granted again, all serious collectors are advised to eavesdrop while they can. The group assembles at the chairman's home the weekend before Ash Wednesday, and there seems to be no reason to doubt that this is the seventieth meeting—if you believe such things happen in Emory Cook's New England at all. Some rhymes on the yearly report are quite venerable, others are told with a new twist, and a few are recent enough to include references to Loas and electronic brains. They are told with varying degrees of inhibition as the proceedings get underway, by people who left their last names at the door, and with increasing frankness after 1 A. M. By then, dissident members are adjourning to more daring recitals in an outside hallway, and the host finally is left to conduct the meeting alone.

Even of the next chairman is willing to chance a similar fate, the stereo version will probably cause the barring of all microphones in the future. Quite a few members will become aware for the first time of what a four-foot parabola can do when they hear themselves in conversations that were presumably held far from any electronic device. These

amusing asides crop up all over the room and fill interludes on the agenda. The principal stereo mikes must compete with a public address system unfortunately, and a vocal quartet sounds like a rock-and-roll group. Of course, it could happen that the members will elect Emory Cook permanent engineer and purchase tape recorders to rehearse for future meetings.

The Belafonte Folk Singers At Home And Abroad RCA Victor LSP2309

Members of the Belafonte Folk Singers always act as though the call to solo comes from an unexpected inner urge that can be satisfied only by bursting into full-throated song. This effect is patently calculated and results from the planning of Robert DeCormier, who conducts the group and works hard to make every performance appear spontaneous and unrehearsed. It all sounds like a plot to fool the public, but DeCormier's goal is much more difficult to attain. He hopes each of his charges will find it impossible not to become emotionally involved in the role assigned, and audiences are well aware when the transition from acting is successfully accomplished. The fact that it occurs frequently can also be attributed to experience with the unpredictable Harry, whose absence gives the soloists an open track on this occasion. Roy Thompson is featured on *Muleskinner Blues*, *San Suso*, and *My White Horse*. Ned Wright takes over on *Didn't It Rain*. Bob Harter on *Poor Boy*, and Joli Gonsalves on *Tunga*.

Too much stereo movement is never allowed to rock the boat in an excellent Webster Hall recording by Bob Simpson and Ray Hall.

MONO

Bob Wilber: Blowin' The Blues Away Classic Jazz CJ9

This LP is the outgrowth of a Music Minus One session organized to prepare a survey of the blues for younger aspirants and provide a refresher course for any older players who want to brush up on the latest trends at home. The nine easy lessons also are offered in alternate versions, with either Bob Wilber or Clark Terry laying out, under the heading "Evolution of the Blues (MM01008)," and touch briefly on such current subjects as the blues waltz, soul jazz, Latin rhythms, and the gospel church. Both experts on their respective horns are heard sermonizing at top form here, and a less instructive project might have resulted in the title "Clark Terry Sings." Disclosing a vocal talent hitherto unrevealed on records, the former Ellington trumpet star bursts forth in a robust entreaty of his own called *Please, Blues Go Away From Here*, delivered in a style reminiscent of the late Oran "Lips" Page. Terry works at present for Quincy Jones, a leader who wants his new band to acquire a group personality the public can readily identify. Now that Terry's secret is out, Jones had better take advantage of his blues shouting before alert record companies start talking contract.

Wilber, who speaks of the rest of the quintet in laudatory terms on the liner notes, takes credit for planning the date and notating the missing parts in scores furnished with each MMO set, but any references to his own playing are omitted. Such modesty is wholly unwarranted, especially in view of his ability to span all periods of jazz on either clarinet

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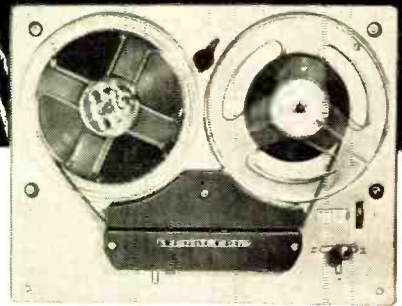
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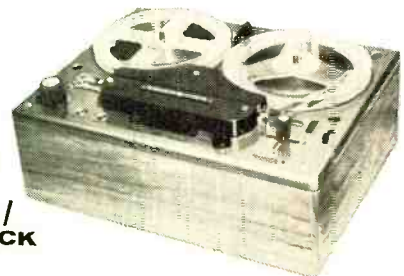
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or tenor sax, and a style unlarded with eccentricities makes him an ideal mentor. Besides, who else would think of going to Lehar for a blues waltz? Pianist Dick Wellstood contributes *The Maryland Farmer*, and *Baptist Blues*. Bassist George Duvivier is always reliable, and Panama Francis sticks to the basic ingredients in displaying a beat that sells millions of records. Thanks to clarity of Dave Hancock's recording, novices will have no trouble following any instrument.

The Bud Freeman All-Stars featuring Shorty Baker Prestige/Swingville 2012

When Bud Freeman played with Tommy Dorsey, the sound of his tenor-sax characterized the band almost as much as the leader's trombone, and things never seemed the same after he left. His choice of harmonies and distinctive way of phrasing, which set the style for the entire sax section, always pleased dancers. Jazz listeners were just as satisfied, despite a preference for the longer and meatier solos he recorded with small groups of displaced Chicagoans. There are no Chicago boys in this quintet, and Freeman takes the label at face value to play like the old Dorsey sax section once did at the Hotel Commodore. As an extra incentive, pianist Claude Hopkins heads a rhythm section that makes the whole affair even more agreeable to dancers.

Only a brief audition of the lyric wiles of Freeman and partner Howard "Shorty" Baker are needed to stretch the Dorsey analogy a point further. The trombonist, as jazzman rather than leader, might consider their cunning manner of surrounding the melody a more fitting tribute than all the posthumous big-band recreations. The sentimental touch never bears too heavily on *S'posin'*, *Love Me Or Leave Me*, and *But Not For Me*. Baker recalls his days as a leading light in Ellington's trumpet section on *Shorty's Blues*, but heads in the direction of Sy Oliver on *Hector's Dance*. Another original titled *Move On*, an excursion into current soul jazz, turns out to be a detour for *Everybody Loves My Baby*. Now that LP's based on the Jonah Jones formula are glutting the market, perhaps the time is right for an equally swinging approach from a different corner.

The Bix Beiderbecke Legend RCA Victor LPM2323

George Avakian, who prepared a three-volume set of reissues on Columbia to tell a good part of the Bix Beiderbecke story, continues to investigate the cornetist's career, dipping into RCA Victor vaults this time, and his latest report adds appreciably to the factual side of the legend. One important piece of evidence is a previously unreleased Jean Goldkette before 1926, even though this recorded at the Detroit Athletic Club on November 24, 1924. Uncovered in 1960, it proves without doubt that Beiderbecke played with Goldkette before 1926, even though this particular solo lost him the job for two years. Charles Edward Smith relates just how it happened in the accompanying four-page brochure and several revealing bits of information from Paul Mertz and Pee Wee Russell are also printed for the first time. Taken together, these features add up to an essential album, and the excerpts included from Paul Whiteman days and recording groups are merely that much extra frosting on the cake. Additional collector's treats are alternate masters of choruses with Whiteman on *Changes*, and *Lonely Melody*.

Josh White: Spirituals & Blues Elektra EKL193

The sudden burst of interest in young and old blues singers on the part of record companies is just the spur Josh White needed, and he digs into his material with renewed vigor. Even while enjoying an international reputation that weathered changing musical trends, he must have felt lonely from want of competition. That he thrives on it as well as any other blues singer is evident by his strong, prideful treatment of such stories as *Black Snake*, *Silicosis Blues*, and *Southern Exposure*. Langston Hughes is the writer of the vivid lyrics to *Red Sun*. Five spirituals are delivered with gentleness and hope. The singer sets his own pace on guitar and never

forces the beat into a false fervor. Bill Lee, bass, and drummer Walter Perkins are the accompanists, and Dave Jones engineered the date.

Songs Of Memphis Slim And "Wee Willie" Dixon Folkways FA2385

Previous albums by this seasoned pair of blues singers have presented one or the other as featured vocalist, leaving the odd man out of the billing but not completely out of the picture. This time they share and share alike, taking turns at recalling favorite tunes, inserting alternate verses or joining in together on the choruses. A musical tour of some of the cities and places best known to itinerant blues singers is included at no extra charge. In fact, three separate ways of getting to Kansas City are outlined in graphic phrases attributed to Jim Jackson, Big Bill Broonzy, and Willie Lovefield. A rolling piano solo by Memphis Slim, with a boogie bass from Dixon, sets the train in motion and prepares for a visit to a *Chicago House Rent Party*. A stopover at a Dallas racetrack involves a bet on a horse called *Old Stewball*, and the result gives rise to the lament *Unlucky*. They even ask *Have You Ever Been In Nashville Pen?*

Anyone still unacquainted with these two amiable characters will find this an ideal introduction. Once the preliminaries are out of the way, the acquisition of additional LP's under their individual names is inevitable.

The Curtis Counce Group: Carl's Blues Contemporary M3574

Organized in Los Angeles in 1956, the Curtis Counce Group was about three years ahead of its time and disbanded shortly after the death of Carl Perkins, the pianist in whose memory this album is dedicated. The reputations of the surviving members continue to grow, particularly that of Frank Butler, who just now is gaining the recognition he deserves. A drum solo lasting nearly five minutes demonstrates why Jo Jones calls him "The greatest drummer in the world." Counce recently toured Australia as bassist with Benny Carter, while Harold Land is heading his own group. Land's tenor sax is heard to good advantage on *I Can't Get Started*, and trumpeter Jack Sheldon contributes *Pink Lady*. This 1957 session was the last for both the group and Perkins, with a long ad-lib blues by the pianist as a high point. His solos, and those of Gerald Wilson on trumpet, are topical and soulful enough to bring the group offers from any of several clubs today.

King Oliver Epic LA16003 Johnny Dodds And Kid Ory Epic LA16004

A prospering record club is evidently the reason for the repackaging of these essential collections. Epic reissued them on LP once before, but a new audience and market has developed in the last few seasons. The dozen King Oliver sides date from 1923, when the New Orleans cornetist was trading chase choruses with Louis Armstrong at Chicago's Lincoln Gardens. With the sessions held the same year for Gennett now available on Riverside, his Creole Jazz Band at its greatest is thoroughly documented on LP.

Johnny Dodds, who headed his own group on clarinet at the neighboring Kelley's Stables after leaving Oliver, recorded under the New Orleans Wanderers name with Kid Ory in 1926. Believing the cornetist to be Armstrong, collectors placed a high premium on the records. Later proof that the fine blues choruses are the work of George Mitchell does nothing to impair the value of the performances. The Chicago Footwarmers and Dixieland Thumpers, with Natty Dominique on trumpet, are among the other Dodds' groups represented. Charles Edward Smith provides ample notes in each case, and the remastering from Columbia and Okeh originals is carefully done. Let's hope all the club members buy copies. Perhaps Epic will then bring over the Clarence Williams Blue Five LP, featuring Armstrong and Sidney Bechet, which its affiliate Philips has released in England.

RE

AUDIO ETC

(from page 14)

that you may, indeed, be in for a thrill, as the ad says, when you try your first 'phones. Or you may merely be mildly amused. Some of you may even be distressed, as I have been, by unreal and "out of focus" effects, as described in my earlier discussion.

What I would like to add here is merely that the effects upon the ears vary greatly from one recording to the next, according to the microphoning used. None of the microphone systems were intended for reproduction with one channel exclusively going to each ear; all were meant to be heard via the cross-relating spread of stereo speakers, each ear hearing *both* speakers, as disparate sound sources in space.

But if you treat those mikes as surrogate ears, which is what happens in earphone listening, you may by accident or chance receive a very interesting signal. Or a very garbled and nonsensical one. It all depends.

Cross-Mike and M-S

I suspect that the European stereo recordings that are made via the M-S system, two mikes in one case plus a matrixing circuit, or by the simple cross-mike arrangement, two mikes at an angle and close together, will provide some very realistic

binaural listening—perhaps better than the actual stereo via loudspeakers. (I am not very enthusiastic about this rather mild stereo, where the two-channel effect through speakers is so genteel as to be an almost inaudible step away from straight mono sound.) Two mikes in this European arrangement make two tolerably good and well-placed ears, and that's all you need. It sounds terrific!

Indeed, recordings of this sort could well account for much of the genuine pleasure reported by earphone "stereo" listeners, and for the lack of unpleasantly noticeable falseness or fatigue effects. These listeners, to be sure, aren't hearing stereo; but they are hearing something even better, real binaural, or a very good semblance of it.

On the other hand, a recording made via twenty or thirty mikes, in and out of isolation booths, blended through two-channel reverb, artificial or otherwise, is just not binaural in any conceivable sense! Like trying to look at a scene through one of those new Japanese kaleidoscopes. Multiple images, overlapping, beautiful but—at least in this sort of fancy stereo sound—incomprehensible.

To tell the truth, the analogy is dangerous, because in the kaleidoscope you do not usually try to discern reality of any sort (though you can, if you work hard at it); whereas in "stereo" listening via 'phones you are necessarily trying hard to create a mental image of a musical performance, as we always do in any listening to reproduced music—and you are fighting against a raft of dizzy, incompatible, contrary-minded sounds, near and far, throw-

ing the two ears out of gear and every which way. Exciting, but quickly exhausting, conducive to severe ear strain if your listening imagination is at all subtle.

Come to think of it, the way to fix up your 'phones (you manufacturers and you home tinkerers) is to install a *variable* Bauer circuit, adjustable to compensate as well as possible for these large differences in stereo recording. Leave it to Mr. B. to cite the variables; maybe an on-off switch would be plenty. Variable or no, though, I don't honestly think you should rest your 'phones in peace on your head until you have figured out this little problem some way or another. Worth your attention.

Let me add a quick and necessary post-script: In terms of *loudspeaker* listening I am all in favor of the highly tricked-up stereo now being used in some classical recordings and feel that, though sometimes it goes too far, in general the tricks have added a great deal to the purely musical effectiveness of the stereo medium.

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ABOUT MUSIC

HAROLD LAWRENCE*

The Score Screen—Innovation In The Concert Hall

CONCERT HALL procedure being almost as rigid as Latin declensions, the slightest departure from customary practice invariably arouses comment. Such was the case when the Canadian violinist, Hyman Bress, gave his second New York recital early this year. There was nothing unorthodox about the program, which included works by Mozart, Brahms, Prokofiev, and Schoenberg. The deviation occurred during the performance of Schoenberg's *Fantasy, Op. 47*, when slides of the music's twelve pages were projected on the Town Hall movie screen. The picture was large enough to be seen clearly from most parts of the hall so that score readers in the audience could follow the intricate notation. This visual device won Bress two additional paragraphs in the *New York Times*'s review, a headline story in the *New York Herald Tribune*, and an article (with photograph) in *Time*.

Although Bress believes the score screen is primarily aimed at modern repertory, it is interesting to speculate on how this classroom technique would affect concert life were it to be used on a broader scale. First, it would bring about the emergence of a new class of worker, the musical projectionist—a sort of cinematic page turner. Replacing the warning bell in the projection booth would be copies of the scores to be performed down on the stage. The duties of the musical projectionist will be much more demanding than those of his movie counterpart, who only has to change (reels) every eleven (or twenty-two) minutes. Shortly after the score projectionist becomes a regular part of the musical scene, performers and concert managers will come to realize that the slide system, though perfectly adequate from the utilitarian standpoint, is cumbersome and inflexible. While few or no "turns" occur in a Scarlatti sonata, or in movements of a Bach solo violin partita, the opening of Ravel's *Daphnis and Chloë* (Suite No. 2), with its two-bar pages flashing by every five seconds like telegraph posts on a railroad journey, would set a brutal pace for the projectionist—and Lord help him if he gets his slides mixed up!

One remedy for this state of affairs would be the moving scroll method, a "horizontal teleprompter" used in the Japanese film, *Gate of Hell*. Here, the score would travel across our field of vision in a tempo consistent with that of the music as performed. Operated by a skillful projectionist, the effect could be quite musical.

The score screen will provide rich opportunities for the musician with pedagogical tendencies. The pianist who is ever

on the alert for inner voices now will be able to spotlight his "discoveries" by means of three techniques: arrow, zoom, or color. The arrow, employed for years by a publisher of study scores, is a crude indicator. Zooming is a familiar device in our camera-conscious age, but one which, with repeated use, brings on vertigo or *mal de mer*. That leaves color. Of the three, this is easily the most artistic method: a colored counter-melody would be detected at once, without the necessity of injecting any non-musical signpost.

Beyond merely pointing up melodic lines, color could also be used to enhance moods, reflect degrees of intensity, and separate strands of a complicated orchestral work. In *Rhapsody in Blue*, the entire page might be drenched in the title color, projected on the screen in varying shades. The opening clarinet cadenza could begin in a pale baby blue, and rise up to a deep ultramarine at the climax of the glissando. And think of what color could do for Schoenberg's *Five Pieces for Orchestra, Op. 16*, with its "pointilliste" instrumental texture! Why, if colored scores took hold, they might become to music what color-coded wires are to the electrician, except that color associations of course, would be left strictly in the hands of the performer.

There are other ways of suggesting mood without altering the notation. Take Chopin's "Raindrop" Prelude, for example: the repeated A Flats could be made to fall, glistening, on the page as the pianist plays them. (Remember the old movie sing-alongs: "Follow the Bouncing Ball"?)

Turning from notation to general esthetics, the darkened stage is a pleasant concomitant of the score screen. Let's face it, there are some performers whose physical attributes clash with their musical talents. Now the public would be able to hear Glenn Gould (the first to come to mind) without having to watch his now celebrated twists and fidgets.

The question arises as to what to do about between-movement pauses. Should the last page remain in view, or should the next be projected to prepare for the music to come. I hope the concert halls will not adopt the Italian movie theatre practice of showing commercials between parts of a film.

We might then have slides reading—*This score may be purchased at the "X" Music Shop in either full or miniature size. Visit the "X" Music Shop tomorrow. Or, "Z" records exclusively for "Y" Records.* And other timely reminders.

The larger concert halls had best prepare to buy the giant screens. The normal screen, while perfectly adequate for most pre-20th century music, falls down com-

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

pletely when confronted with, say, Schoenberg's *Gurre-Lieder*, which is scored for 4 piccolos, 4 flutes, 3 oboes, 2 English horns, 7 clarinets, 3 bassoons, 2 contra-bassoons, 10 horns, 7 trumpets, 7 trombones, 5 tubas, 6 kettledrums, bass drum, cymbals, triangle, glockenspiel, snare drum, tenor drum, xylophone, rattle, several large iron chains, gong, 4 harps, celesta, and full string complement. There are also 6 soloists, 3 four-part men's choruses, and an eight-part mixed chorus. This is definitely in the Vista-Vision class.

As Hyman Bress must have realized on the morning after the recital, the score screen can be a risky business for the performer. The critics were quick to point out that the young instrumentalist was not always in full command of the notes, and that he failed to follow the spirit of the dynamic indications. We are entitled to assume that few in the audience, including the critics, were well enough acquainted with the work to detect any musical lapses, without having recourse to the score screen. But with standard repertory, total (or near-total) recall is a necessary part of the critic's equipment. Nevertheless, the score screen could prove enlightening to the layman and, by way of being a reminder, to the critic as well. The *Love Duet* from Act I of "*Bohème*" is a case in point. The final note dies out, *pianissimo*, as Mimi and Rodolfo go out into the Parisian night. In most performances, however, both tenor and soprano are reluctant to leave the stage quietly, preferring instead to swell out to a grand *fortissimo*. With the score screen plainly in view, and indicating *pp*, would the singers now dare to flout the composer's intentions? (Don't answer that question.)

Transposing arias is a common practice in the opera house. The star with a brilliant upper register may raise the pitch for his key aria in order to exploit this facet of his voice; the aging singer may, on the other hand, wish to lower certain arias when he finds he cannot produce the top notes. All this is not lost on the few members of the audience who possess absolute pitch. The others will not suspect anything by merely checking the score screen. Why not then install a headphone on the back of each seat to transmit the "A" to curious "relative pitchers"?

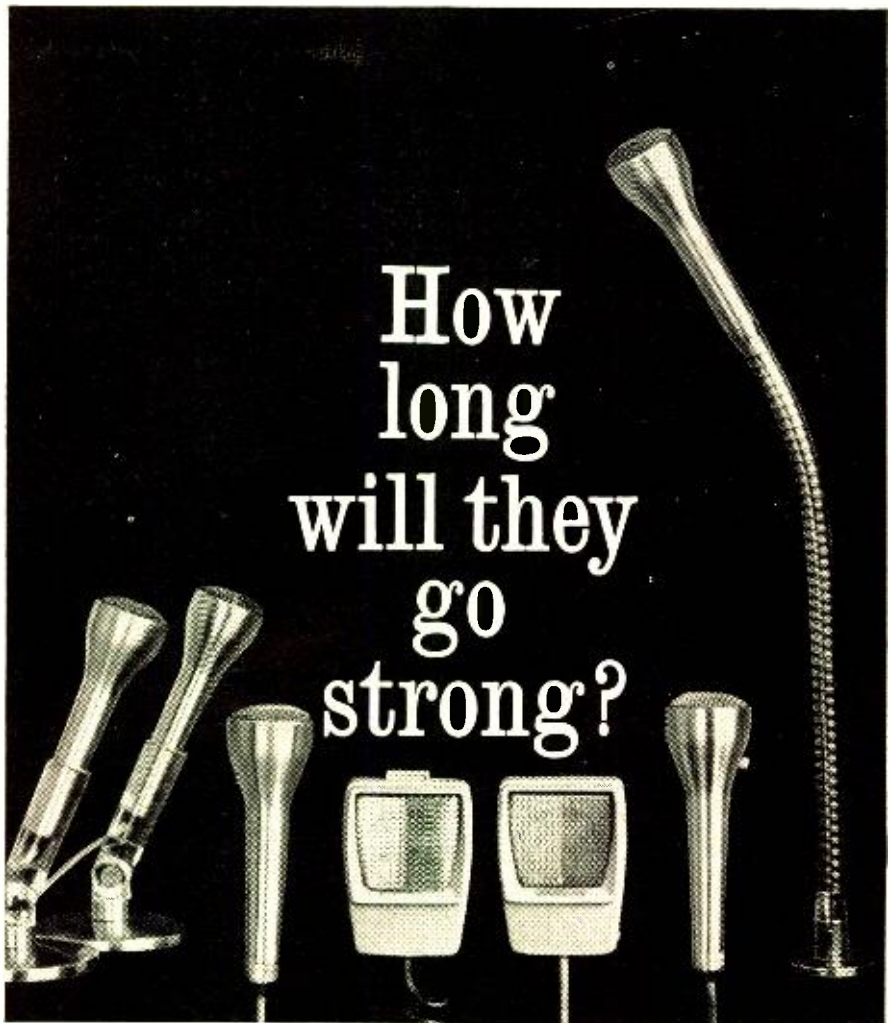
The performer need not regard the score screen as a mute monitor. It could easily save his concert some evening when, as sometimes happens to the best of musicians, memory lapse strikes. Æ

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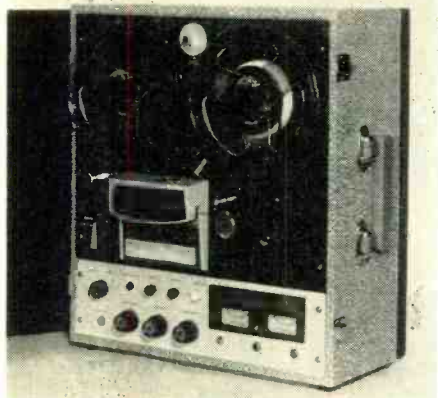
NEW PRODUCTS

● **Automatic Turntable.** Combining the advantages of a high quality turntable with the ease and convenience of the automatic record playing mechanism, the new Miracord Studio-H introduced in this country by Benjamin Electronic Sound Corp., is claimed to be the only automatic turntable with hysteresis motor. The tone arm features an adjustable counterbalance, for adjustment of stylus force. The turntable is 12-in. in diameter, and is constructed in one piece of a non-ferrous material. It is



dynamically balanced and weighs seven pounds. Of especial value to those desiring the convenience of automatic mechanisms is the pushbutton operation. One need merely press the button indicating the appropriate record size. The Studio-H will accommodate 7-, 10- and 12-in. records. In addition, the Studio-H is extremely handsome in appearance; satin chrome finish on all machine parts, and baked enamel finish on the table deck and other services. The plug-in head accepts all cartridges now in use. Also available is the lower priced Miracord Studio, which features a heavy-duty, shaded four-pole induction motor in place of the hysteresis motor. The Studio-H is priced at \$99.50; the Studio is \$79.95. Benjamin Electronic Sound Corp., Corona, N. Y. **F-1**

● **Automatic Repeat Tape Recorders.** Featuring a "Magic Memory" automatic repeat, the new Roberts Models 440 and 144 DPA repeat all or any part of the tape by simply pushing the "repeat" button and setting the "repeat" knob back to the desired position. Complete 1800 feet tape rewind takes just sixty seconds; thus with the "Magic Memory" these Roberts



recorders can play for a full nine hour period with just six 60-second silent intervals during that time. The Model 440 comes complete with power amplifiers and forward facing stereo speaker system, and is priced at \$699.50. The 144 DPA is identical to the 440 except that it comes without the built-in power amplifiers and speakers. It is priced at \$649.50. Roberts Electronics, Inc., 829 N. Highland Avenue, Los Angeles, California. **F-2**

● **Dual Trace Oscilloscope Kit.** Keynoting Radio Shack's entrance into the kit field (on a large scale anyhow) the new Dual Trace Oscilloscope kit which sells for less than \$80.00 is the first available in kit form as well as the first available at a cost of under several hundred dollars. Because of its ability to observe two signals simultaneously, it is possible with this oscilloscope to observe, for example,



amplifier input and output at the same time. This of course is a great convenience and benefit in testing amplifiers and similar equipment where the testing involves observing how well a piece of equipment handles a standard signal. Features include push-pull vertical and horizontal amplifiers, cathode follower inputs and a five inch screen; over-all size is 13 1/4 x 8 3/4 x 8 1/2-inches. This kit is sold with detailed assembly and operating instructions and a money-back guarantee. Radio Shack Corp., 730 Commonwealth Avenue, Boston 17, Mass. **F-3**

● **Tape Strobe Kit.** Designed to aid the tape recorder owner in checking the speed of his drive system, a new tape strobe and light kit, Model TK-5 has been made available by Robins Industries. The kit consists of five twenty-five-inch lengths of non-magnetic leader tape with stroboscopic markings, and a small neon light which flickers 120 times per second. The



leader can be spliced into a roll of tape at intervals to check the performance of a recorder, or it can be used as a leader. As the Strobe tape passes through the tape recorder, it is exposed to the flickering light. If the lines appear to stand still, the drive system is running at the correct speed. If the lines seem to advance, the drive system is running too fast, and if they seem to lag, the drive system is running too slow. By making an endless loop of the Strobe tape, the speed of the capstan can be tested. The Strobe tape kit is packaged in a clear polyethylene package complete with instructions. It lists for \$2.00. Robins Industries Corp., Flushing, N. Y. **F-4**

● **60-Watt Stereo Amplifier.** Featuring fifteen front panel controls and switches and twelve inputs, the new Sherwood Model S-5500 amplifier provides 25 watts (music power) per channel. Included in the front panel controls are 12 db/octave rumble and scratch filters (effective at all inputs), friction locked bass and treble controls (each channel separately or both channels simultaneously), function switch, selector, stereo balance and individual gain, loudness, tape monitor switch, loudness in-out switch, phase-reverse switch and stereo-reverse switch. To facilitate home or professional type stereo tape recording, two cathode follower outputs and front panel tape monitoring switch combine to give complete recording flexibility. Hum and noise is 80 db below 24 watts (radio input) and 60 db below 24 watts (phono input). Frequency response is plus

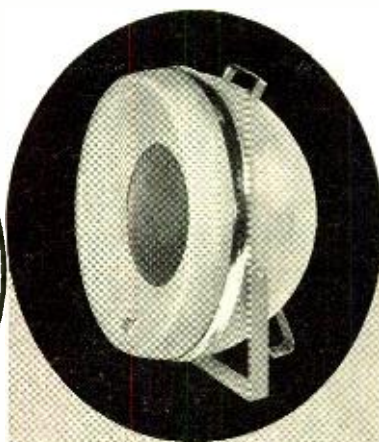


or minus one db, 20-40,000 cps; I. M. distortion is 1.5 per cent, and harmonic distortion is 0.5 per cent at 24 watts continuous. Damping factor of five assures optimum performance with today's low-efficiency speaker systems. Dimensions are 4 x 14 1/4 x 14 inches; price is \$159.50 (less case). Sherwood Electronic Laboratories, Inc., 4300 N. California Ave., Chicago 18, Ill. **F-5**

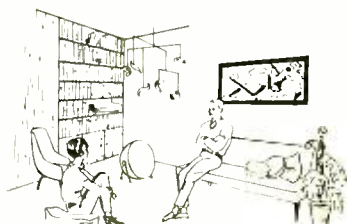
● **Stereo Tape Recorder.** Manufactured in western Germany, the new Körting Model MT-158S is a four-track stereo recorder-playback machine with features unusual in its category. A three-head machine, the Körting permits synchronized dubbing. You can actually hear the first recording while the second recording is being added. In addition the recording is modified



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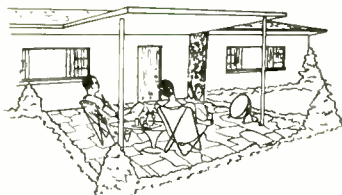


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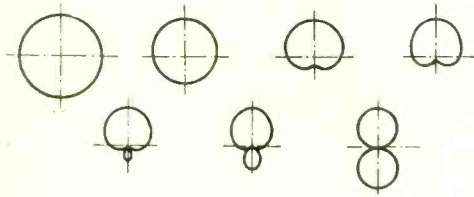
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rived systems and equipment specifications. Complete procedures are given for: Planning, assembling, and testing sound control installations—Articulating sound control with other elements of production—Rehearsals and performances—Operation and maintenance of sound control equipment.

THE AUTHORS

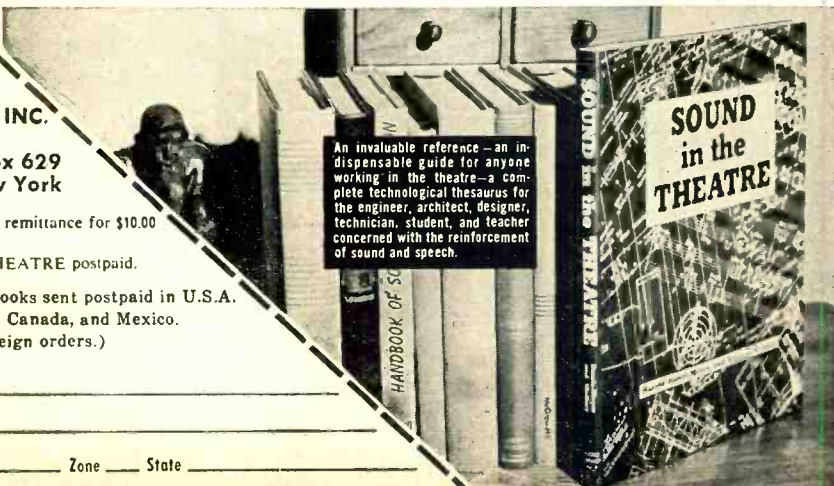
During the past thirty years, the authors have developed the techniques of sound control in opera, open-air amphitheatres, theatres on Broadway, theatres on-the-road and off-Broadway, in concert halls and night clubs, in Hollywood and in the laboratory. Some of their techniques are used in broadcast and recording as well as in performances where an audience is present. From their laboratory have come notably successful applications of sound control to psychological warfare and psychological screening.

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rather than the input signal. Because of the head construction and other circuit features, a recording can take place on one track while the other is playing back independently. Tape speeds are $3\frac{1}{4}$ and $7\frac{1}{2}$ ips and wow and flutter are less than plus or minus 0.2 per cent at $7\frac{1}{2}$ ips. Other features of the machine are recording-level indicator, automatic shut-off, and a low-noise transistor input stage. The Körting MT-158S comes in an attractive carrying case and weighs twenty-nine pounds. Kimberly International Ltd., 346 W. 44th St., New York 36, N. Y. F-6

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sponse at full output is 50-70,000 cps, plus or minus one db. Sensitivity for full output at 1000 cps is 0.75 volts for high level inputs and 5.5 mv for low level inputs. Hum and noise is 78 db below full output for high-level inputs and 50 db below for low-level inputs. Supplied with enclosure and legs, the LA-240 is priced at only \$79.95. Supplied with a gold finished cover and an ivory and gold front panel with gold-metal knobs. Layayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y. F-8

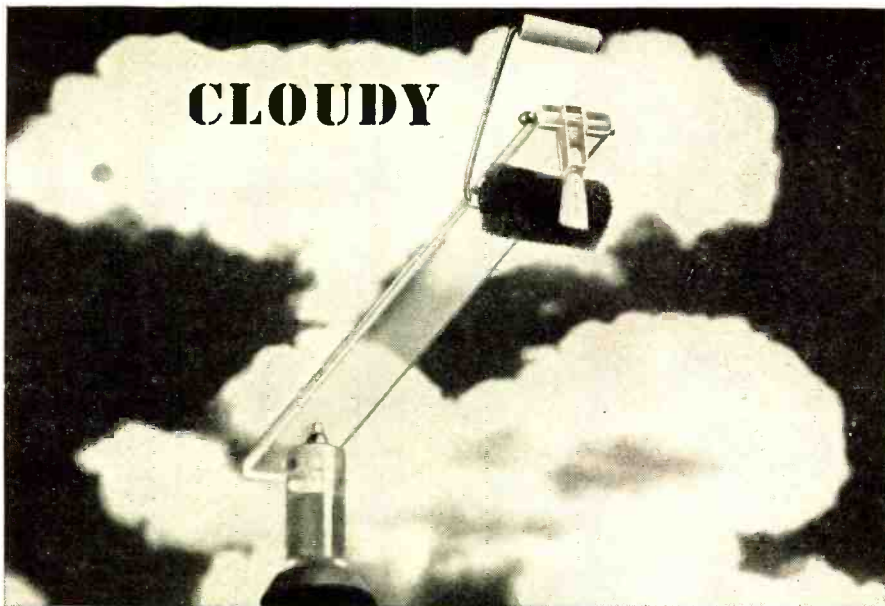
NEW LITERATURE

● **Hi-Fi Component Brochure.** A new revised edition of its high fidelity component brochure was announced by Shure Brothers, Inc. Several new components are featured in the publication, along with illustrations and specifications of standard models in the Shure line of photograph cartridges, tone arms, and other high fidelity equipment. Among the new components listed is the N21D tubular stylus which is available in combination with the Shure M3B and M7D stereo Dynetic cartridges. Also new in the catalog is the stereo conversion preamplifier Model M-65, designed to provide equalization with amplification for conversion of ceramic inputs to magnetic inputs. The brochure is available through high fidelity dealers or by mail request. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. F-9

● **Sonotone Audio and Electronic Products.** The new eight-page Sonotone catalog contains photos of all products with detailed specifications for each. Included are Sonotone's latest ceramic phonograph cartridges, crystal cartridges, tone arms, magnetic (velocity) equalizers, mono and stereo tape heads, and ceramic microphones. It also displays the Sonotone rechargeable flashlight battery cartridges, loudspeakers, and electronic tubes. Copies are available free from Electronic Applications Division, Sonotone Corporation, Elmsford, New York. F-10

● **Electronic Test Instruments.** The 1961 Hewlett-Packard Catalog of Electronic Test Instruments is available. The 220-page catalog contains complete listings, descriptions, and specifications of the more than four hundred test instruments offered by Hewlett-Packard Company. It also includes a sixteen-page descriptive listing of the special systems and instrumentation produced by the company's Dymec Division. Instruments are grouped by type or function in the catalog. Each group is preceded by application data which summarize the equipment offered, and discuss latest measuring techniques. The catalog is only available upon written request on company stationery. Write to Harry J. Lewenstein, Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California.

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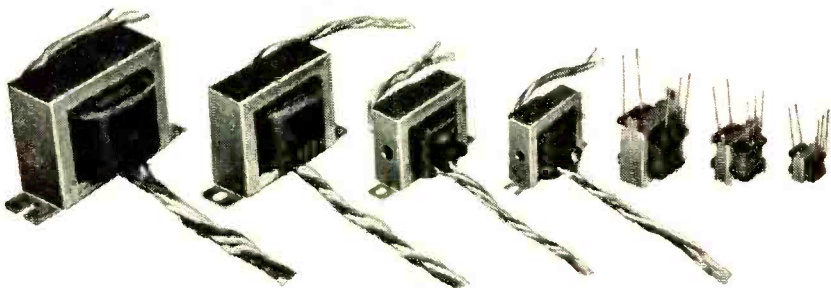
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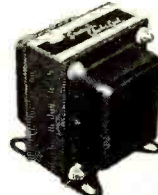
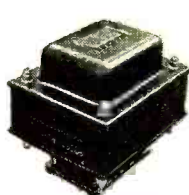
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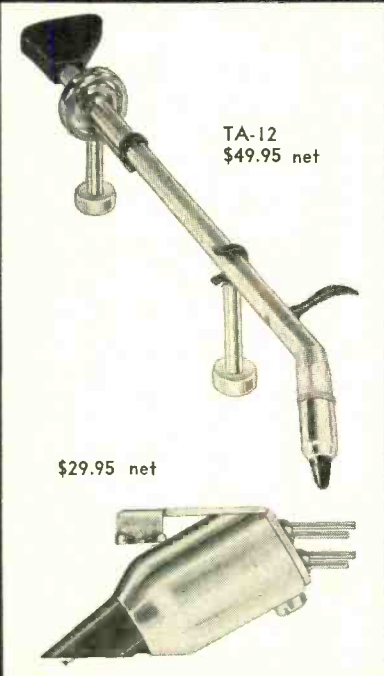
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(from page 55)

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Fat little Buxtehude (I imagine him that way) was the leading popular organ and cantata composer of extreme Northern Germany, verging into Denmark, back in the days of Bach's early youth and before. His music was once patronizingly called "pre-Bach"—plenty of us are now finding that Bach, indeed, is more accurately post-Buxtehude; for many aspects of the Bach style depend directly upon Buxtehude's very great influence in German Baroque music.

Buxtehude reminds me of the earlier paintings of Breughel, for his music has the same buxom, jolly, peasant-like quality along with the same superb sense for artistic design, for color and line, and shape and thickness. Buxtehude is actually a far cry from Bach, a more direct, earthy composer, much less the apotheosis of all music, more the common man's musician on the highest plane. Once accustomed to his Baroque language, rich and ornamented, nobody can resist him long. And his music is ideal for the recorded medium, too.

The little Bärenreiter Musicaphon disc has two short cantatas by this pleasant master, both showing that fatness and healthy serenity which seems to have been Buxtehude's best expression, both featuring the predominantly high voice quality of the period, pairs of violins, pairs of sopranos, choirs of boy trebles. The *Cantate Domino* is technically a motet, which seems in this case to mean a work for voices with organ and continuo accompaniment, no orchestra—there is a certain magnificence that goes here with the Latin text, notably the familiar "Sicut erat in principio" (as it was in the Beginning, World without end.)

Lauda Sion includes a typically early Baroque instrumentation with the inevitable pair of fiddles, a viola da gamba, cello, double bass plus organ. Assorted solos sing with the chorus.

No doubt about it, the Germans can sing their own music most beautifully. This smooth, beautifully blended choir is assisted by modest but excellent solos, my only reservation being a somewhat too metrical, "time-beating" with a mild lack of good phrasing. Our wobble-ridden American choirs could take a leaf from this German notebook!

Buxtehude: Complete Organ Works, vol. 2. Finn Viderø, organ at St. John's, Vejle, Denmark.

Washington WR 422

Above all, Buxtehude was an organist—upon the finest organs ever built, in the very heyday of organ literature. Inevitably, Buxtehude thus sounds biggest and best and most modern in the organ medium. The well known Finn Viderø (his early organ LPs are collectors' items) here gives him all the stature of Bach himself.

There is a certain impetuous haste in Viderø's present playing that betokens a recognized master of this music who has so long played it as to arrive at an economy of expression that is almost too condensed for the unaccustomed listener. The marvelous Buxtehude tricks, the square, buxom themes, the plenitude of solid imitation, the

sudden drama and even more delightful humor, are played as though we all should know it all long since, like "To be or not to be," or "The boy stood on the burning deck"—and surely for Viderø this music is precisely that familiar. Not bad, by any means; but you'll want several playings to get well into the meat of this ever-so-solid roast beef music. Gorgeously colored for your hi fi.

Handel-Beecham: Love in Bath. Royal Philharmonic, Beecham.

Angel S-35504 stereo

I remember a Beecham recording of a part of this ballet score under its stage title "The Great Elopement," back in 78 days; some numbers have appeared in other Beecham suites and a few items are well known on their own, Beecham or no. But it is the late Sir Thomas who is mostly the composer here—not Handel.

Why fuss over authenticity in such a case? There isn't a trace of it, not even to Handel's own scores, which are lavishly rearranged and in some cases re-composed, or fused together—as in the marriage of the familiar "Largo" with a rhythmical figure quite definitely not from the "Largo" nor probably from the same opera if from any Handel. . . . Most of the music, even so, breezes along pleasantly and with musical shaping, the Beecham-built joints hardly showing at all, the harmonies generally untempered-with except in the sequence of pieces, the orchestrations sublimely Beecham.

Beecham's ballet (never yet performed on stage) was to be about a young lady who goes to Bath and meets a young gallant, marries him in spite of Papa. I've been reading Jane Austen's "Northanger Abbey" and I suspect that Sir Thomas had been reading it too. Striking similarity, and I had thought myself that the Austen pictures of Bath society in the 18th century would make a marvelous period play, or a color film like that memorable "Importance of Being Ernest" of a few years ago.

Anyhow, give Sir Thomas credit for good entertainment, plenty of Handelian tunefulness and only a reasonable amount of gross distortion. **RE**

BOOK REVIEW

Noise Reduction, Edited by Leo L. Beranek, McGraw-Hill Book Company, Inc., New York, 1960, 452 pp. + x. \$14.50.

Based on a series of special summer programs on noise reduction at the Massachusetts Institute of Technology, this new book edited by Dr. Leo L. Beranek provides a broad and detailed base for engineers and other technically trained personnel in the fields of noise measurement and noise control. Dr. Beranek states in his preface, "No effort has been made by the authors to produce a handbook or an inclusive compendium. Rather, this text seeks to lead the reader by gradual steps from the beginning of the subject on into the more advanced aspects. Each man with a noise problem should find assistance." Chapter 1 of the book titled "Some History of Early References" provides a review of the development of the techniques of noise reduction as they became consolidated into a scientific field. This chapter also contains a bibliography including 107 items. The book is then divided into four parts. Part 1 deals with the elementary behavior of sound, the decibel notation and its use in expressing sound levels, the methods and instrumentation used for sound and vibration measurement. In this section the chapters on selection of instrumentation written by A. C. Pietrasanta and on the performance of sound and vibration instrumentation by G. W. Kamperman are particularly

noteworthy. The latter chapter contains a number of excellent tables and charts outlining the performance of a considerable number of sound and vibration pickup devices and indicating instruments, and the cables required to connect the pickup device to the amplifying or indicating instrument. Part 2, "Fundamentals Underlying Noise Control," contains three chapters on the propagation of noise both outdoors and in enclosures of various size. A chapter is devoted to both theoretical and practical discussions of porous acoustical materials. These materials are used in the variety of ways for noise control purposes. The two most familiar forms being acoustical tiles and large sheets of glass fiberboard or blanket. The next chapters detail the transmission and radiation of acoustic waves and the transmission of sound through structures containing porous materials. Although much of the material in these two chapters has been published earlier by Dr. Beranek, it has not been readily available to engineers in the field in such a well-integrated form. One chapter in this section is devoted to acoustical materials for architectural uses and is written by Jack B. C. Purcell who is both architect and acoustical consultant. The chapter contains the usual tables of acoustical materials and illustrations of the surface and suspension methods of such materials. However, following this material, the author provides some recommendations on the control of reverberation in speech rooms through the use of standard acoustical materials and some illustrations which show the imaginative use of acoustical materials for the architectural control of noise and reverberation. The next two chapters in this section deal with mufflers and discuss the two general categories of mufflers, those which do not contain materials such as glass fiber, but consist mainly of tubes and expansion chambers and are called reactive mufflers. They are similar in physical behavior to the reactive electrical networks such as constant k and m -derived filters. While the second class of mufflers, the dissipative mufflers, are those which contain sound absorbing material and may be likened to those electrical networks which contain both resistive and reactive elements. The final chapter in this section contains a brief review

of the behavior of resilient vibration isolators applied to systems where the foundation is an infinitely large and rigid mass as well as to the more likely situation where the foundation is somewhat massive and not quite rigid. This is the case most usually found in practice. Part 3 contains two chapters, "Damage Risk Criteria for Hearing" and "Criteria for Noise and Vibration in Buildings and Vehicles." These chapters provide a basic review of the criteria by which tolerable noise levels are set, thus providing a basis for noise reduction design when combined with the measured or predicted noise levels, the determination of which has been described in the earlier chapters. Part 4, "Practical Noise Control," contains 5 chapters detailing practical applications of the material found in the first three sections in the areas of ventilation, noise control, machine and shop quieting, office and residential noise control, the control of jet noise and the control of noise in transportation. Three appendices contain the conventional tables of decibels and pressure and power ratios, a brief but excellent discussion of systems of units used in handling the mechanical aspects of acoustical problems, and a table of conversion factors. In addition to the bibliography of Chapter 1, each individual chapter includes a comprehensive list of references and suggestions for further reading. The book is well illustrated and brings together in one place much of the information assembled and published by Dr. Beranek and his colleagues in individual scientific papers and technical reports.

The only major omissions appear to be in the areas of the design of doors and in the discussion of the influence of the fundamental flexural resonance of a vibrating panel on its sound transmission in the low frequency region. These omissions notwithstanding, this book is a most valuable contribution to the literature in a highly specialized branch of acoustics. It should prove of considerable value to studio engineers striving to provide a minimum background noise level in their recording studios as well as to anyone involved with the design of noise control features for residential construction, including both apartment houses and individual homes.

Lewis S. Goodfriend

REFLECTION COUPLER

(from page 32)

loading of the mid-high loudspeakers. These reflectors are thermo-formed from $\frac{1}{8}$ -inch sheets of Plexiglass and attached to the back of the cabinet with wood screws. It is only necessary that the cabinet be located not less than two inches from the back wall for effective operation.

All wood parts of the cabinet are made of $\frac{3}{4}$ -inch plywood, and all joints are made with glue in addition to wood screws, except for the bottom panel, which is removable to permit access to the woofers. Both woofers and mid-high units are front mounted and gasketed to prevent air leakage. The entire space behind the two woofers and the portion of the center slot below the "baffle" boards is filled with predetermined amounts of Ultralite glass wool

cut into rectangular "blocks." The amount and configuration of these blocks has considerable effect upon over-all performance, and is the result of a large amount of experimentation. Once determined, however, the performance is readily repeatable from one unit to another.

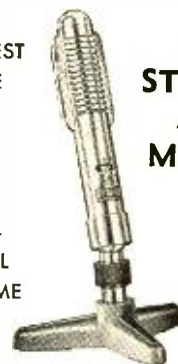
Performance

In the present era of low-efficiency loudspeakers, it is pleasant to note that the Scott Radio Labs Reflection Coupler will give good performance with ten- and fifteen-watt amplifiers without the undesirable effects of amplifier overload. In technical terms, this loudspeaker system is capable of creating a listening level of 95 db—which is considerably

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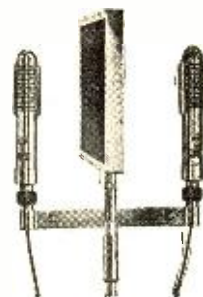
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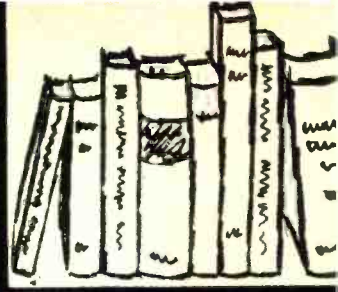
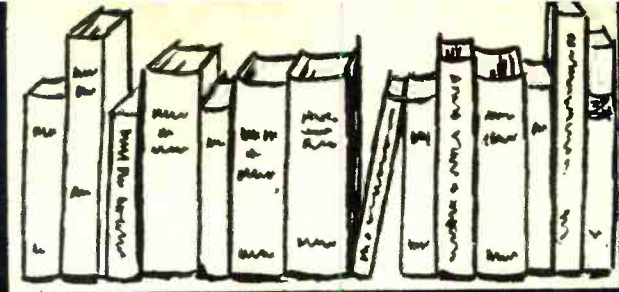
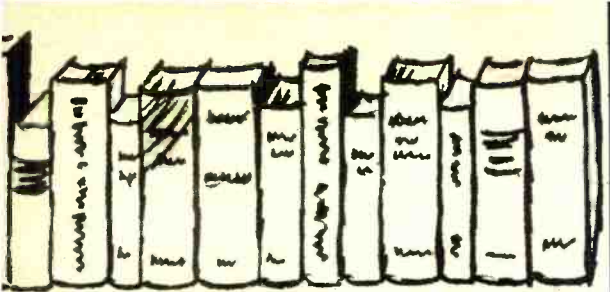
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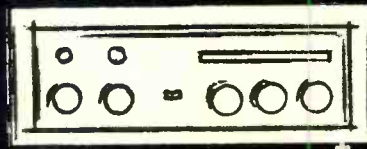
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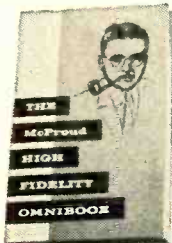
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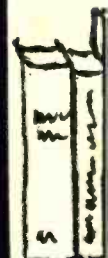
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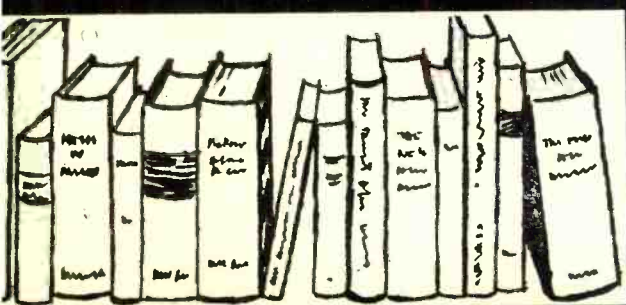
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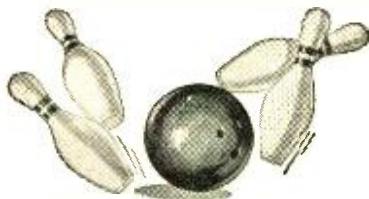
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AUDIOCLINIC

(from page 4)

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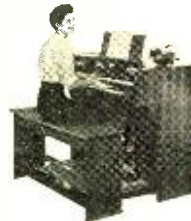
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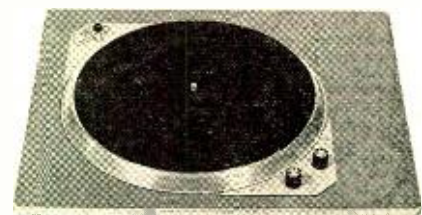
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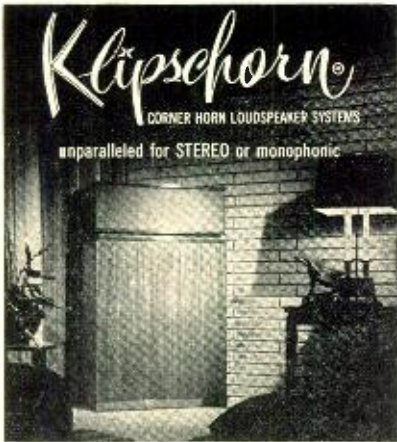


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the cathode is one volt above ground. This meets the condition that the grid must be negative with respect to its cathode for proper tube operation under Class A conditions. If I remove the grid from ground and apply a signal which will make it positive, or should I say more positive, the potential between grid and cathode is reduced and more current will naturally flow, and we will have the conditions you have already described in your question. Good, then let's return the grid to ground and apply the signal only between the cathode and ground, just as is done with the feedback signal from the plate of the second stage. (Naturally, there can be no signal from that plate now, so we will apply it artificially, maybe even from a battery. You can try all of this very easily, too, if you want to take the trouble to breadboard a stage, and you can watch all of this for yourself.)

We'll make the cathode more positive. The grid is grounded, so this is the same as saying that the grid has been made more negative. Remember that the grid is now grounded so that if the cathode moves more positive, the grid must, of necessity, be more negative—not with respect to ground, but with respect to its cathode and that is the only thing which counts here.

For purposes of clarity I set the grid at ground potential, but it could have been at any potential with respect to ground. I would imagine that in most instances it would be positive with respect to ground. It is true that the grid makes the cathode go positive at such times but the signal from the second stage which appears at the cathode also makes it, the cathode, go positive more than would have been true if the grid alone were acting here. This extra amount by which the cathode has gone positive with respect to ground—independent of grid signal—will cause the grid to go more negative, and this tends to reduce cathode and plate current, making them tend to go more negative. This, after a long way around, is negative feedback for it is making the stage behave in a manner opposite to that in which it would behave in the absence of the feedback.



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TAPE RECORDER HOBBY CLUB. Have organized for pleasure and to save in our purchases. Buy quantity on tape recorders, pre-amplifiers, amplifiers, tuners. No charges to join, information furnished. George Bischof, Manager, 1503 E. Vickery, Fort Worth 4, Texas.

NORELCO "400" 4-track recorder. Guaranteed unused. Factory carton, guarantee, accessories. Original price: \$400.00. Best offer. Allan Mandelstamm, 708 Richfield Drive, Nashville 9, Tennessee.

AMPEX 3761 MIXER. Sigma manufactured. Four balanced microphone inputs, balanced output. Discontinued model, brand new, full warranty. Were \$315.00, now \$165.00. Stereo version also available. Sigma Electric Co., Inc., 11 East 16th St., New York 3, N. Y.

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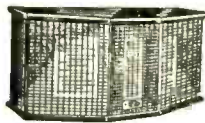
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Industry Notes . . .

• **Tandberg Announces Enlarged Facilities.** Tandberg of America, Inc. recently announced plans for tripling facilities in Oslo to meet increased demands from American consumers for Tandberg stereo and monophonic recorders. New facilities include a nine-story building with increased research and manufacturing accommodations, as well as additional employee recreational facilities, including a swimming pool.

• **Fanon Acquires Masco Intercom Company.** According to Salo Nachtigall, president of Fanon Electronic Industries, Inc. "the acquisition of Masco by Fanon will be of substantial benefit to both corporations. We anticipate effecting substantial economies in general overhead and operational costs. It is our intention to maintain separate sales organizations for both companies." Manufacturing operations and general management of both Fanon and Masco will be located at Fanon plant in Newark, New Jersey.

• **Stan Neufeld, Distributor Sales Manager for University Loudspeakers.** Charles Ray, general sales and merchandising manager of University Loudspeakers, announced the appointment of Stan Neufeld as distributor sales manager. Mr. Neufeld will be responsible for sales covering all products in University's line of high fidelity and public address components.

• **Shure Bros. Appoints.** The appointment of Ronald Boston as a manufacturer salesman was announced by Shure Bros. F. V. Machin, Shure vice-president, stated that Boston will handle special sales assignments under the direction of C. L. McCabe, manufacturer sales manager in the Evanston office.

• **American Concertone Appoints Western Division Sales Manager.** Barton O. Williams has been appointed Western Division sales manager for American Concertone, Inc., a division of Astro-Science Corporation in Los Angeles, California.

• **Allen W. Greene Elected Daystrom Vice-President.** Allen W. Greene, president of Heath Company, a subsidiary of Daystrom, has been elected a corporate vice-president. Mr. Greene will continue as president of Heath Company, a post he has held since 1959.

• **Precision Appoints Fleischman.** Sidney Fleischman has been appointed sales manager of Precision Apparatus Company, Inc., a subsidiary of Pacotronics Inc. A veteran of over twenty-five years in the electronics field, Mr. Fleischman will be in charge of marketing and sales for the precision test instrument line. He will also handle sales for the Government, and special contracts.

• **Reeves Soundcraft Elects Vice-President.** The election of Arthur J. Seiler as vice-president and director of Reeves Soundcraft of Danbury, Connecticut, has been announced by Hazard E. Reeves, president. Mr. Seiler is also president of Alloy Surfaces Company of Wilmington, Delaware, a company recently acquired by Reeves Soundcraft Corp.

• **At the same time Reevesound Company, Inc.,** a subsidiary of Reeves Soundcraft Corp., announced the appointment of Michael W. Chitty as chief engineer. Mr. Chitty was formerly associated with Canadian Marconi, Limited, as division manager.

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