

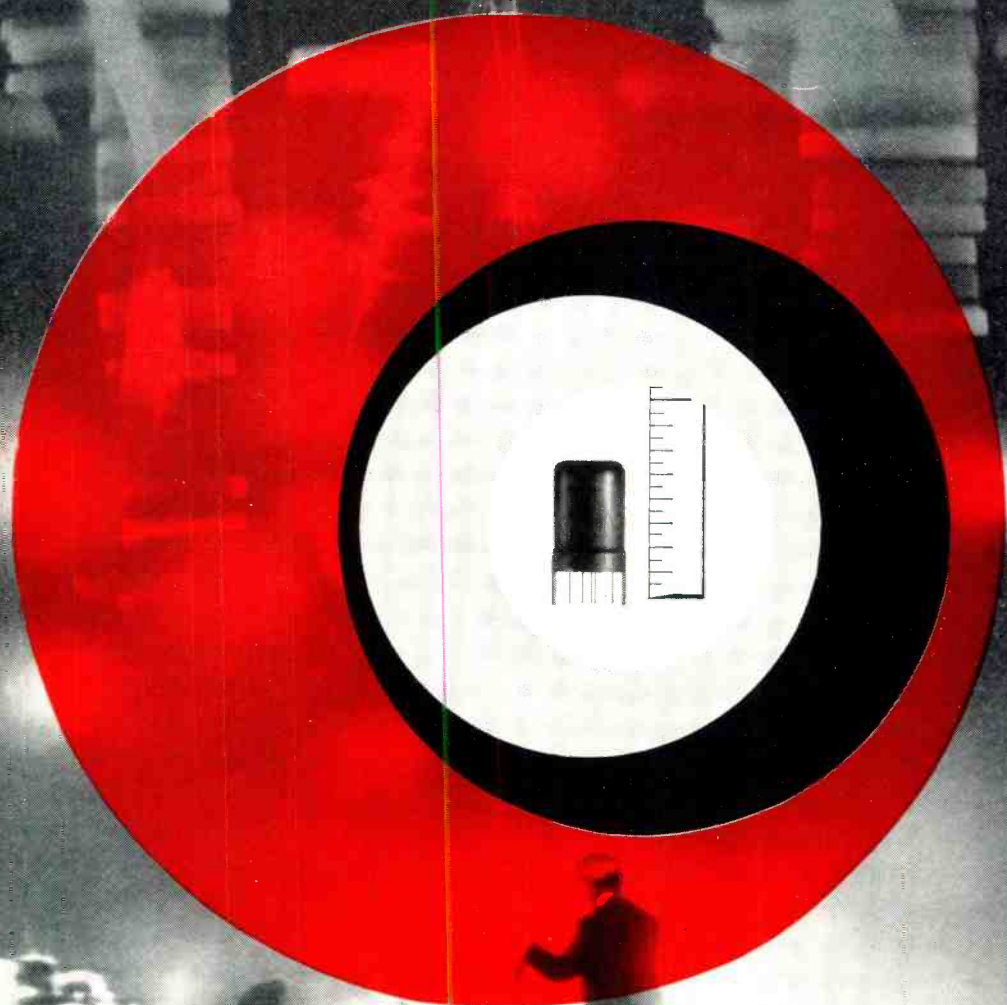
AUDIO

MARCH, 1961
50¢

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RCA-6CW4 **nuvistor** TUNER TRIODE



“The lowest noise figure and highest sensitivity permitted by the present state of the art” **harman kardon**

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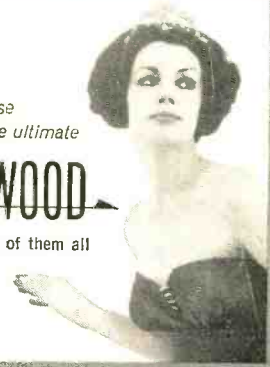
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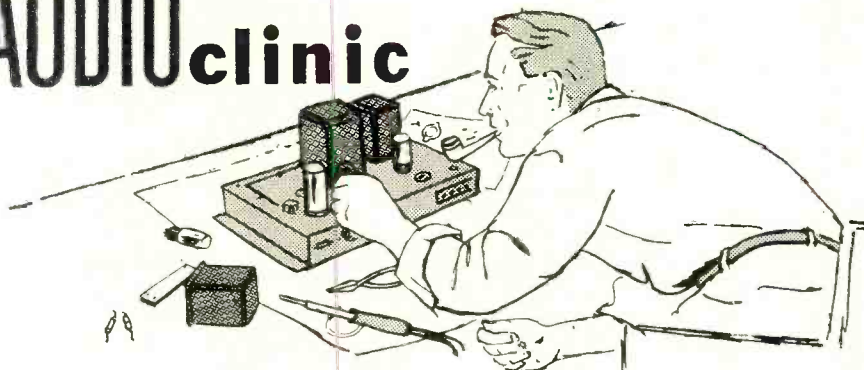
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AUDIO clinic



JOSEPH GIOVANELLI*

Note: I want to ask a favor of all AUDIO-CLINIC readers. Please enclose a stamped self-addressed envelope with your question. You see, even if I don't answer your question in this column, I will answer your inquiry by mail. I receive a large number of letters each month, and much time is lost when I must write out the envelopes as well as the letters.

Further, when you write your letter, please send it to the address shown below. Do not send this material to AUDIO. The mail sent to AUDIO must be forwarded to me; this slows down my replying to you.

I would also like to mention that the material for Audio Techniques, my other column which appears from time to time, is drawn from suggestions which readers have found helpful and which were sent to me in order to help our fellow experimenters. Keep this material coming. I have enough for one or two columns on hand now, so you are likely to see one of them soon.

Now that that's over with, let's get to the business at typewriter:

Passive and Electronic Crossovers

Q. Please list the advantages and disadvantages of the electronic cross-over and amplifier type of system as compared to the passive type of network found in most speaker systems.

I have a good spare amplifier and enough space. The idea seems logically correct, but I have never seen a complete discussion of it. F. M. Woody, Baton Rouge, Louisiana.

A. The conventional passive cross-over network often exhibits ringing because of the sharp rolloff of the network. Freedom from such ringing is probably the main advantage that the electronic cross-over has over the passive type. There is one other advantage which this type of circuitry has over the more conventional variety of network, and that is in the flexibility of cross-over points. Good electronic cross-over networks contain pots which permit a continuously variable cross-over point. This is often desirable since it is sometimes best to have the cross-over point of a particular speaker at a somewhat different frequency than that recommended by the manufacturer of the system.

Further, the electronic cross-over makes use of an amplifier for each cross-over point. This makes it very easy to operate speakers whose efficiencies are considerably

different from one another without wasting power in L- or T-pads. Such an arrangement makes it possible to use speakers whose impedances are different from one another without the need for designing special networks or of using special matching transformers.

The electronic cross-over, however, has some disadvantages. First, the cost is much higher because of the initial cost of the network itself and of the cost of the additional amplifier or amplifiers which must be used. Second, the space requirements are considerably greater for this type of network than for the conventional passive network. Third, this kind of network can do considerable damage to the phase relationships of the signal, and these are considered vital to really good stereophonic reproduction. It is not the network alone which is responsible for this; the amplifier also introduces some phase shift. Although there are many who would minimize the phase relationship aspect of the problem, I believe that if we are to recreate live sounds, we must capture not only the intensity of sound but the phase differences as well. Anything which destroys such relationships is bad, as I see it.

Of course, you must understand that this conventional, or passive, cross-over network also introduces some phase distortion, but I believe that more such distortion can be introduced when using the electronic cross-over networks in combination with the additional amplifier.

If one could know the degree of phase shift, there might be means to correct this situation. Once this correction is made, the electronic cross-over system would be a wonderful scheme, at least insofar as the ultimate in sound is concerned. Incidentally, I recently heard a stereophonic system which utilized a 3-way electronic cross-over. The system was so well engineered that the sound was simply glorious, even though no attempt was made to minimize phase shift.

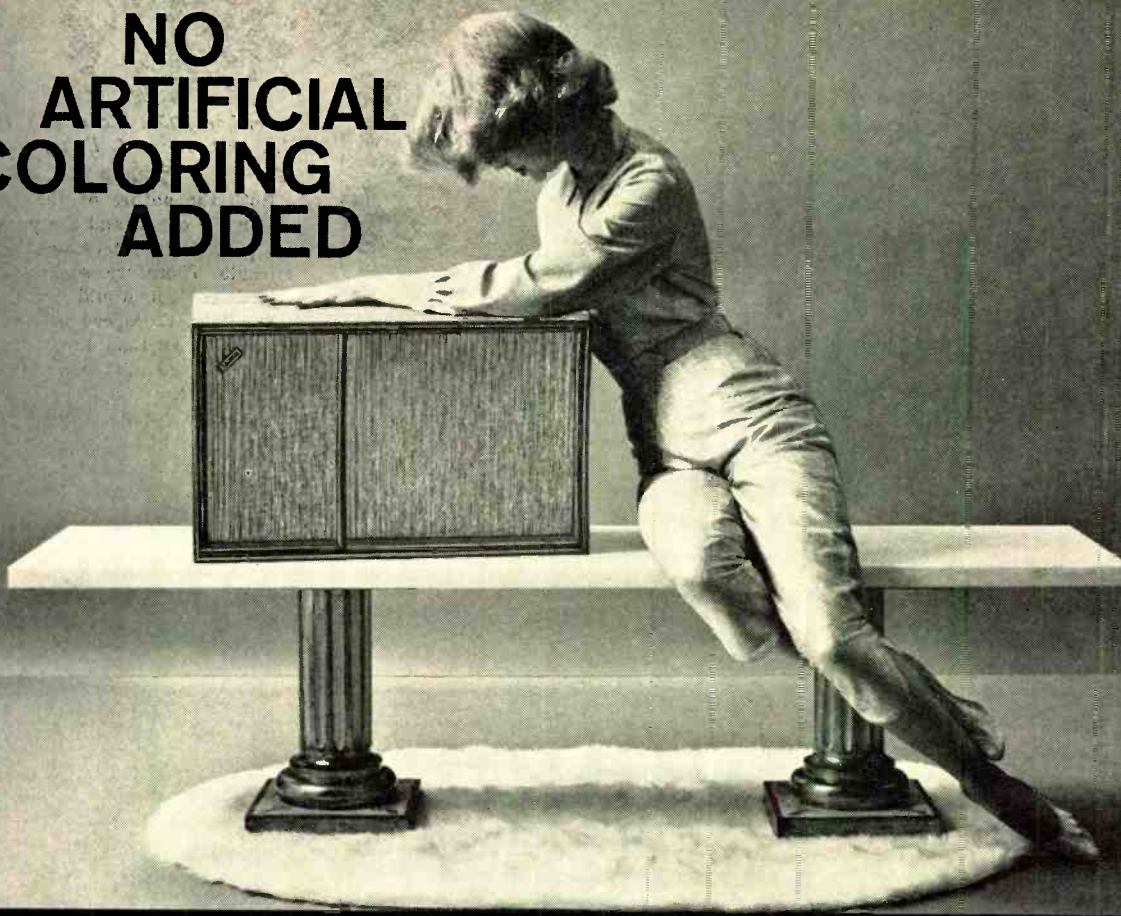
There's one thing we can assume—whatever the phase shift present in one channel, it was also present in the other channel of the stereo system. This raises the question, "Is phase shift really important to good stereo if the same degree of shift is present in both channels?"

Rotating speaker systems

Q. I am building a rotating speaker system for my electric organ. I would like to know if an a.c. motor could be used instead of the d.c. type suggested in your column

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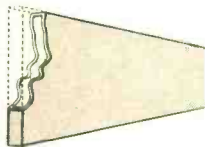
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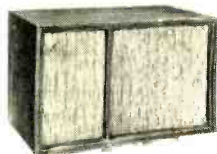
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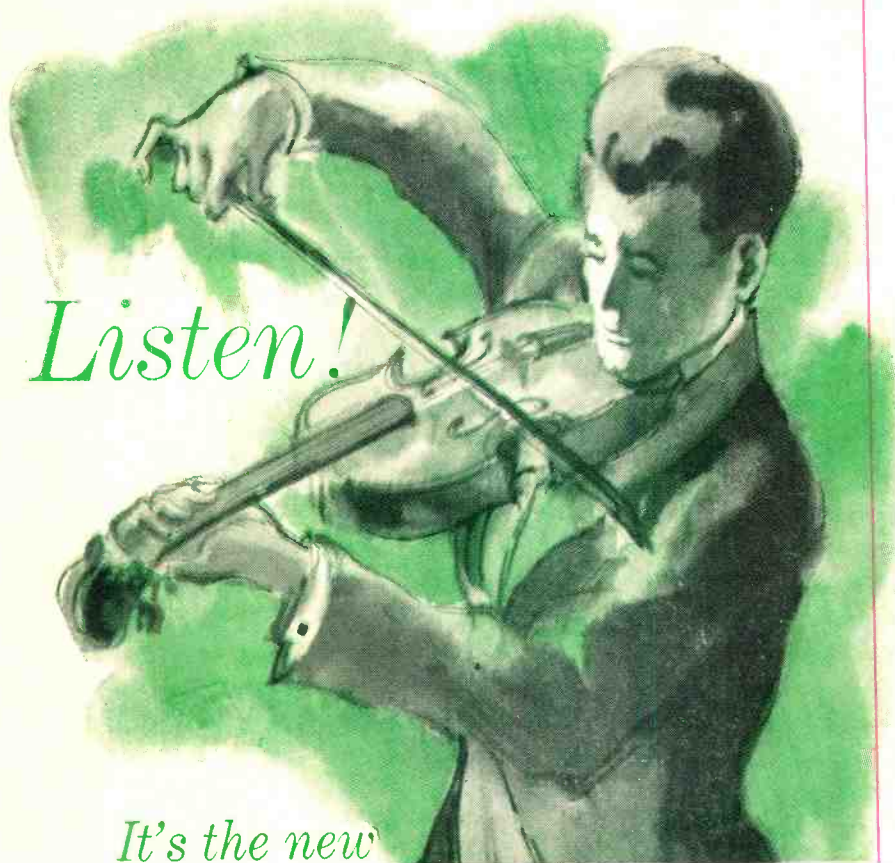
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of November, 1958. Please give reasons for the d.c. unit. Louis J. Dube, Nashua, New Hampshire.

A. Both the nature of the music being played on the organ and the personal taste of the performer determine the speed of the tremolo. Therefore, some sort of tremolo speed control would seem advisable. Unfortunately, the speed of an a.c. motor is harder to vary than the speed of a d.c. motor; the speed of the a.c. motor is dependent upon the frequency of the supply line, while the speed of the d.c. motor is dependent upon the voltage supplied to it. It is easier to vary the voltage by a rheostat or variac, than it is to vary the frequency of the supply voltage. The a.c. motor would have to be driven by a high-powered oscillator. This is a complicated procedure.

Of course, an a.c. motor can be used if you are willing to settle for one tremolo speed or a mechanical linkage which can vary the speed of the speaker mechanism in addition to transmitting power from the motor. Such a system might employ a conical shaft or a variety of pulley ratios.

Hum, an Odd Case

Q. I have a hum problem in my amplifier which was not evident when I first constructed my system. This hum appears to be 120 cps.

About a month ago, there was a loud "blat" from the speaker. The fuse in the primary of the power transformer blew. When I replaced the fuse, the hum level had increased greatly.

This is what I did to solve the problem. I checked the rectifier and all other tubes. I found one side of the rectifier not conducting. A new rectifier tube only slightly decreased the hum. I changed the filter capacitors with no hum change. The hum pot in the preamplifier reduced the hum slightly, but not enough to talk about. I am puzzled, for without the audio cable between the amplifier and preamplifier there is no hum. Plugging in the cable raises the hum.

What should I check next? Arthur L. Stanhope, Haddonfield, New Jersey.

A. The noise you heard in your loudspeaker was probably the result of an internal short in the rectifier. This, of course, meant that the tube was ruined. Since the fuse in the power supply blew, you probably had no further damage.

Had you not already done so, I would have suggested that you check the filter capacitors because the shorting of a rectifier indicates that the a.c. is able to pass into the filter circuits, with possible damage to them. The input filter capacitor is the most likely one to be affected in this manner, but it is well to try them all. I doubt that the decoupling capacitors would be affected because the current which flows in that part of the circuit is small.

Actually, you said you had already changed the filters. Hence, we must figure something else. You did not state whether the preamplifier was powered from the main amplifier. If it is not then you can figure that something happened in the preamplifier and that this something was probably coincidental to the rectifier and fuse

(Continued on page 52)

YOURS FOR HI-FI REPRODUCTION

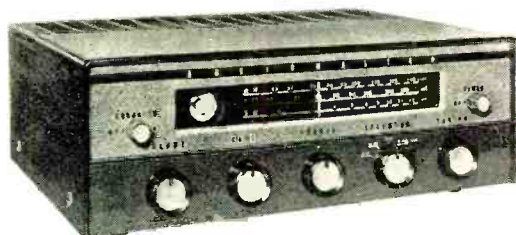
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Monophonic Amplifier with FM-AM Tuner

AUDIOMASTER FM-B302



SPECIFICATIONS

Tubes: 12 tubes and 2 diodes	Inputs: MAG(3mV), MIC(4mV),
Power Output: 10 watts	X'TAL(35mV), TAPE(130mV),
Frequency Response: 20-30,000 cps.	AUX(130mV)
Tuning Range:	Outputs: 4, 8 and 16 ohms
MW . . . 535-1,605 kilocycles	For Recording Tapes
SW . . . 3.8-12 megacycles	Loudness Control:
FM . . . 80-108 megacycles	ON-OFF switchable
Sensitivity:	Dimensions: 14-1/2"(W) ×
AM . . . 63 microvolts for 20 db quieting	10-5/8"(D) × 4.13/16"(H)
FM . . . 10 microvolts for 30 db quieting	Weight: 18.7 lbs

BOOKSHELF SPEAKER SYSTEM CS-12A



Type:	Closed enclosure
Mounted Speaker:	12" coaxial
Frequency Response:	45-16,000 cps.
Power Input:	20 watts
Sensitivity:	101 db/watt
Dimensions:	15 3/4"(H) × 23 3/8"(W) × 10 1/4"(D)
Weight:	3.3 lbs
Finish:	Cherry



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LETTERS

Electron or Current Flow?

SIR:

The Cult of the Conventional Current seems to have an unusual newcomer in its corner. Most of its members are those who at one time of another were taught that "electricity flows from positive to negative" and they either still actually believe it or find it inconvenient in their daily work to change their ideas. But Mr. Goeller ("The Pro- and Con-vention," *AUDIO*, December, 1960) appears to be an unusual case in point. He is actually a convert from the electron-flow camp! He is like the traveler who sails around the world and then maintains that it really is flat after all.

I can understand an old dogmatically-set college professor refusing to change all his class notes, carefully written 30 or 40 years ago. I can sympathize also with the electric motor winder whose left- and right-hand rules are based on Benjamin Franklin concepts. But Mr. Goeller I don't get.

I remember well an impassioned plea made by a non-dogmatic college physics professor. He asked his students to remember that the reason he perforce had to teach the "conventional" flow was that most of the texts available at that time used this concept. He called the confusion a scientific disgrace and added that it was up to those more youthful, more flexible people just entering the field to correct this basic misunderstanding of electricity.

The underlying fallacy of the conventional argument is that it uses a "conceptual approach." What is important to one using this approach is not what is actually *happening* in a process, but rather how one *thinks* about it. The concept takes precedence over the facts. If there is a pragmatic consistency and the theory is convenient, that is good enough for the conceptual approach.

We cannot argue that the problem is merely semantic and therefore not too important. I know people who actually believe that current *can* flow from positive to negative in a wire. This confusion can build a whole pyramid of ignorance. There must be thousands of hours wasted every year by people working in electronics who have to reverse those insidious little arrows on diodes to make sense out of them.

It is imperative that at least new people coming into the field understand the facts. Where electrons and negative ions are the charge carriers (an overwhelming preponderance of the time), the flow of current is from negative to positive. Where positive charges are the carriers the flow is from positive to negative.

ROBERT J. NISSEN, Chief Engineer,
KQED, Channel 9,
San Francisco, California.

TV Tuners

SIR:

A construction article for a TV tuner as requested by Mr. Savada in the February *LETTERS* column was published in *Radio-Electronics* in June, 1957. The author was Richard Graham.

This tuner, which works remarkably well, uses a 21-mc TV front-end followed by a 12AT7 converter stage to change the output frequency to one somewhere in the 88-108 mc FM band. The output of the TV tuner is fed to the antenna input of a conventional FM tuner. Incidentally, the

(Continued on page 53)



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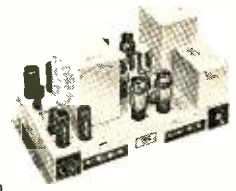
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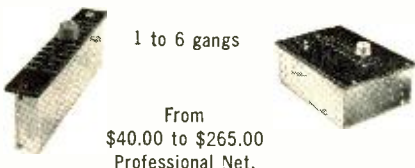
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Serenata Sensacional

Columbia WS 327

How would you like to take on the assignment of recording one hundred guitars in stereo? Someone on the staff of Hispavox Records in Spain was recently handed just such a job. Columbia has now made the recording available in this country as part of its Adventures in Sound series. A somewhat more precise title for this particular orchestra would have been "One Hundred Members of the Guitar Family." The group includes sections that play the laud (a relative of the lute) and a contingent of bandurrias. These three main sections are further subdivided since all instruments are employed in both large and small sizes. All told, eight types of guitars are represented in this orchestra which consists entirely of blind musicians. During the recording session, the instructions of the conductor were relayed to each individual player by means of earphones.

Half the selections were composed by the conductor, Rafael Albert, indicating that a somewhat specialized guitar repertory is required by a group of this size. Serenades and dances figure heavily in the choice of tunes. The sound, when heard on a full-fledged stereo system, is difficult to describe in terms of everyday comparison because I've never experienced anything like it. Multiple miking must have been used in a hall of exceptional liveness in order to capture so effectively the full impact of the total ensemble without losing the fine detail in the sound of each section.

Gershwin: Rhapsody in Blue and Cuban Overture

Mercury  STA 90138

If you go back far enough in the chronology of stereo tape releases, you can find two-track reels that are actually inferior to today's four-track versions of the same recording. When Mercury first brought out Eugene List's performance of the Gershwin *Rhapsody in Blue* on two track, the reel was a revolving catalog of the ills that could beset an overloaded tape. The recent transfer to quarter track, although no match for the best that is possible on two track today, should reassure anyone who has preferred the forthright treatment this music receives at the hands of List and the Rochester Orchestra under Howard Hanson. There's no suggestion of "city slicker" mannerisms in their approach. The other side of the tape is only partly filled by Gershwin's built-on-a-rhumba *Cuban Overture*. Technically, this tape indicates that four track has now reached the point where the age of the master tape is apparent in the finished product. At one time, a sampling of the early four-track catalog led one to believe that master tapes covering a period of several years were pretty much alike in quality. Now, a four tracker based on a master made in the last few months is apt to bear witness to the fact and overshadow this particular recording of the *Rhapsody in Blue*.

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

Camelot (Original Broadway Cast)

Columbia  OQ 344

The latest Lerner and Loewe musical arrived with a fabulous advance ticket sale but only grudging acclaim from the upper echelon drama critics. According to the reviewers, the play fails to establish a consistent point of view. So far, the majority of theatregoers attending performances of *Camelot*, overwhelmed by the rich sets, sumptuous costumes and generally extravagant picture of King Arthur's court, have probably paid scant attention to incongruities in the attitude of the plot. The libretto, a responsibility of Alan Jay Lerner and director Moss Hart, is a mixture of spoof and straight drama that only partly follows the original story—"The Once and Future King" by T. H. White.

In a situation such as this, the home listener actually finds himself in an advantageous position. A good deal of the pageantry and glamour of the stage production shines through the songs—but problems of plot are no source of distraction. Part of the lavish budget of the play has been spent for features that do show up in the recording. The orchestration by Robert Russell Bennett and Franz Allers' direction of the orchestra are as deft as the work performed by these gentlemen for Lerner-Loewe's "My Fair Lady." Speaking of that classic of the musical theatre, the main characters in that show established their own vigorous identity almost as easily on records as they did on stage. By contrast, the people at *Camelot*—Richard Burton in the role of King Arthur, Julie Andrews as Guenevere, and Robert Goulet as Lancelot—are more difficult to fathom as they enter the living room.

Frederic Loewe's music is the most engaging feature the show has to offer. He even manages to ease the way for some of the stilted lines in King Arthur's songs. The strongest tunes, *The Lusty Month of May* and *You May Take Me to the Fair*, go to Julie Andrews. Her ballad *I Loved You Once in Silence* shares honors with *Follow Me* and *If Ever I Would Leave You* as the prettiest melodies in the show. The most rousing item comes rather late in the record—*Fie on Goodness* sung by a group of knights not completely sold on the lofty standards of life at the Court.

Whatever its final place in the annals of Broadway, "Camelot" is entitled to special attention by the recording industry. Columbia has certainly put its best foot forward. In terms of sound, this four-track reel is one of the most convincing arguments advanced for tape since the general abandonment of two-track tapes. Columbia, pretty much by itself, is still releasing two-track stereo reels but "Camelot," in that format, sells for the rather wild figure of \$18.95. At approximately half that price, this four-track tape still tops the stereo disc version.

Gypsy Magic

VOX  XTC 717

Someone in a position to decide such matters at United Stereo Tapes has taken the trouble to uncover something fresh and earthy in a recording of Hungarian music. There are a zillion conventional versions of Liszt Hungarian Rhapsodies and Brahms Hungarian Dances available on discs. These were bypassed in favor of an album that recently

made its appearance on the Vox label. Now the tape fan can sample material that used to be known only by the venturesome record collector. The artists on this reel are the dancers and orchestra of the Hungarian Folk Ensemble which recently made a tour of European cities. Anyone brought up on the "normal" American concert hall treatment of Liszt's *Second Hungarian Rhapsody* will find refreshing departures here at every turn. Smaller than the usual symphony orchestra, this ensemble seems to be improvising even when playing phrases familiar to school children throughout the world. The players work smoothly as a group yet an occasional isolated instrument will manage to conjure up the spectacle of a solitary musician strolling through a village square. The dancers stomp around in selections I never heard before but the Liszt *Rhapsody* and the Brahms Dances are the main attractions.

Wildcat (Original Broadway Cast)

RCA Victor LSO 1060

A musical with Lucille Ball as leading lady cannot take itself too seriously. In "Wildcat," her first major invasion of Broadway, Lucille sings and dances herself to a frazzle—obviously enjoying every minute in the presence of a paying live audience. Her new experience has carried over to the recording session. She's all over the place in this story of a tomboy oil-seeker who never loses her feminine wiles amid the derricks of a small town on the Mexican border.

The other interesting surprise is the flair for Broadway's musical idiom shown by composer Cy Coleman, most of whose fame has been won as a jazz pianist and leader of a trio. He has done an excellent job in tailoring his songs to the gusty talents of Lucille Ball. The title tune, as well as specialties such as *Hey, Look Me Over*, *Give a Little Whistle* and *You're A Liar* are difficult to conceive in the repertory of any other performer. The male chorus wakes up the acoustics around them on two occasions—*Tall Hope* and the construction song *Corduroy Road*. "Wildcat" is not a musical that will be talked about ten years from now but it does mark the welcome appearance on the Main Stem of one of the most disarming personalities in show business.

Percy Faith: Music from Camelot

Columbia CS 8370

Ornadel: Music from Camelot

M-G-M E 3916

Everyone's uncle is already busy arranging and recording orchestra versions of "Camelot's" music. Luckily, the trick in acquiring a good instrumental treatment of this score is not a very complicated one. My formula, despite the fact that I generally check a sizeable number of releases in a given month, is not very different from that of most experienced record fans. Most of us gravitate toward the musical outfits that have already established a reputation in their field. It's easy to see why Columbia selected Percy Faith's staff of arrangers to handle its featured stereo release of orchestral music from "Camelot." The suave yet surprisingly direct approach already famous in Faith's instrumental handling of "Kismet," "South Pacific," and "Sound of Music" is appropriate as ever in the "Camelot" score. There is a sense of humor in the work of the woodwinds in bright songs such as *You May Take Me to the Fair* and *What Do the Simple Folks Do*. The extended treatment given the ballad *Follow Me* indicates the high regard this tune has already won among professionals. In this and other reflective songs, the separation of the string choirs in stereo is well handled.

Cyril Ornadel's mono version of "Camelot" merits the attention of listeners who may feel that only an original cast recording of a show is worth the added cost of stereo. Ornadel's orchestra cannot boast the personnel that Faith has at his disposal but the conductor's association with Lerner and Loewe is a close one. One of Britain's top musical directors, Ornadel handled the pit assignment when "My Fair Lady" moved to London. He also directed the stereo, almost original cast recording made over there by Rex Harrison and Julie Andrews. His "Camelot" tempos strive for greater flexibility than Faith's (his slow pace is slower) and the sequence of tunes is some-

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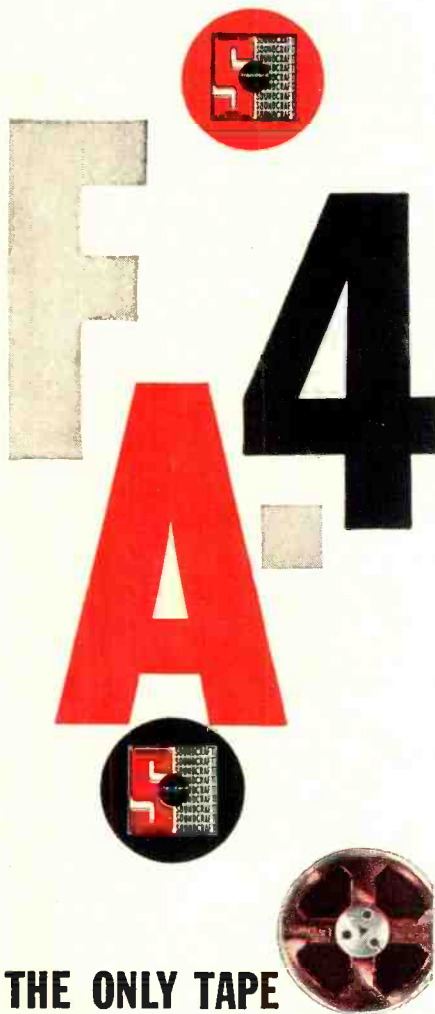
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what different. Yet Orndel's outfit does manage to sound more like a theatre pit band. If that is your usual preference whenever an orchestra covers a show, you may be willing to overlook the occasional touches of volume expansion.

Saul Goodman: Mallets, Melody and Mayhem Columbia CS 8333

In recent months some record labels have owed much of their livelihood to the popularity of percussion. Now, when the pop-in-percussion craze is showing signs of easing up, Columbia takes a step that will be welcomed by record fans who feel that a percussion battery should be charged with only one task—playing music specifically written for percussion instruments. In order to put together a project of more than fleeting value, the first step is always a vital one. Columbia took it with the engagement of one of the top percussion authorities in the country, Saul Goodman, solo tympanist and head of the percussion section of the New York Philharmonic. Mr. Goodman, in the role of soloist, is not a total stranger to record buyers. His Angel release "Bell, Drum and Cymbal" was an outstanding item long before percussion became "commercial". The first percussion ensemble (a group of his pupils at the Juillard School of Music) was organized by Goodman. He was also a pioneer in the search for composers who could be induced to write reasonably coherent compositions for the tinkle and bang department of the orchestra. Harold Faberman, a member of the original group and now head of the percussion section of the Boston Symphony Orchestra, is represented on the record by one of his compositions—a *Theme and Variations* for sixteen or so instruments. Five other percussionists-about-town assist in these performances. Three of them are members of the current Goodman Ensemble.

The record serves several purposes. It is instructive and encouraging to those who happen to be studying the instruments and diverting to the audiofan who has been following the latest advances in the stereo disc. In close-quarter studio pickups, Columbia has corralled some remarkably clean tympani sound. Even more impressive is the low-end response in Morton Gould's "Parade". It has the deepest-register bass drum I've heard on stereo disc. A glance at the record will reveal some pretty exotic etching in the grooves of most of the bands. The greatest surprise is saved for the end when the group plunges into that famous speciality of the fast fiddlers; the Heifetz arrangement of Dinicu's *Hora Staccato*.

Never On Sunday (Original Sound Track Music) United Artists UAL 4070

Modern-day Greeks still favor a stringed instrument that is seldom encountered in reference books. It occupies a starring role in this unusual sound-track disc. The locale is the port city of Piraeus. As part of the background, the bouzoukia is heard throughout the Greek pop score in conjunction with the more familiar sound of the guitar. As played by native musicians, the bouzoukia can do much more than the mandolin it resembles. It has a saucy inflection at the end of phrases that sums up the atmosphere of the seaport patrolled by the star of the film, Melina Mercouri. The title song, *Never on Sunday*, gets quite a workout. It is heard three times before the disc is traversed once as a sultry vocal marking Miss Mercouri's only appearance on the record. This release has been one of the more successful off-beat items. Apparently authentic movie music captured in foreign climes is here to stay.

Frank Sinatra: Sinatra's Swingin' Session Capitol SW 1491

Rosemary Clooney: Rosie Solves the Swingin' Riddle RCA Victor LSP 2265

The linking factor in these two releases is the new swinging style of the Nelson Riddle arrangements. Anyone familiar only with the subdued-mood Riddle albums turned out by Capitol a few years ago will scarcely believe the transformation this band has undergone. Despite the fact that Riddle is working with two of the strongest personalities in the upper

echelon, the unforced good humor of his easy beat shares equal billing with the stars. Both releases are "crammed to the gunwales" with solid standards that thrive in experienced hands. Rosemary Clooney's album, boasting a smoother voice, enjoys a slight edge in the sound department.

Tito Puente: Tambó

RCA Victor LSP 2257

Manny Albam: Drum Feast

United Artists 6079

Although a native New Yorker, Puente has built his career on a musical base more foreign than that of Manny Albam who hails from the Dominican Republic. The point of departure in each of these releases is percussion but the final results spell out the nature of the two different paths these men have traveled in the band business. Ernest "Tito" Puente was involved with vibes, timbales, piano, and alto sax while playing in the Latin bands of Noro Morales and Pupi Campo. Since 1949, as leader of his own orchestra, he has been one of the leading advocates of powerhouse Latin percussion. "Tambó" marks his most ambitious recording effort to date. Even the production man selected for this session, Marty Gold, is a specialist. An imaginative percussion arranger in his own right ("Sticks and Bones," LSP 2070 and "Skin Tight," LSP 2230), Gold has channeled the drive of the Puente band into new tributaries of the Amazon River in *Call of the Jungle Birds* and *Witchdoctor's Nightmare*. Manny Albam, a graduate of the saxophone section of the bands of George Auld and Charlie Baruet, has been increasingly active as a free-lance arranger in the past ten years, cropping up in the books of Basie, Kenton, Herman, and Ellington. His first release on the United Artists label joins a group of nine other records he already has in the catalog on five other labels. The ten morsels composed and arranged by Albam for his venture constitute a light-hearted probe of a dance band's percussion section with each instrument allotted a selection of its own.

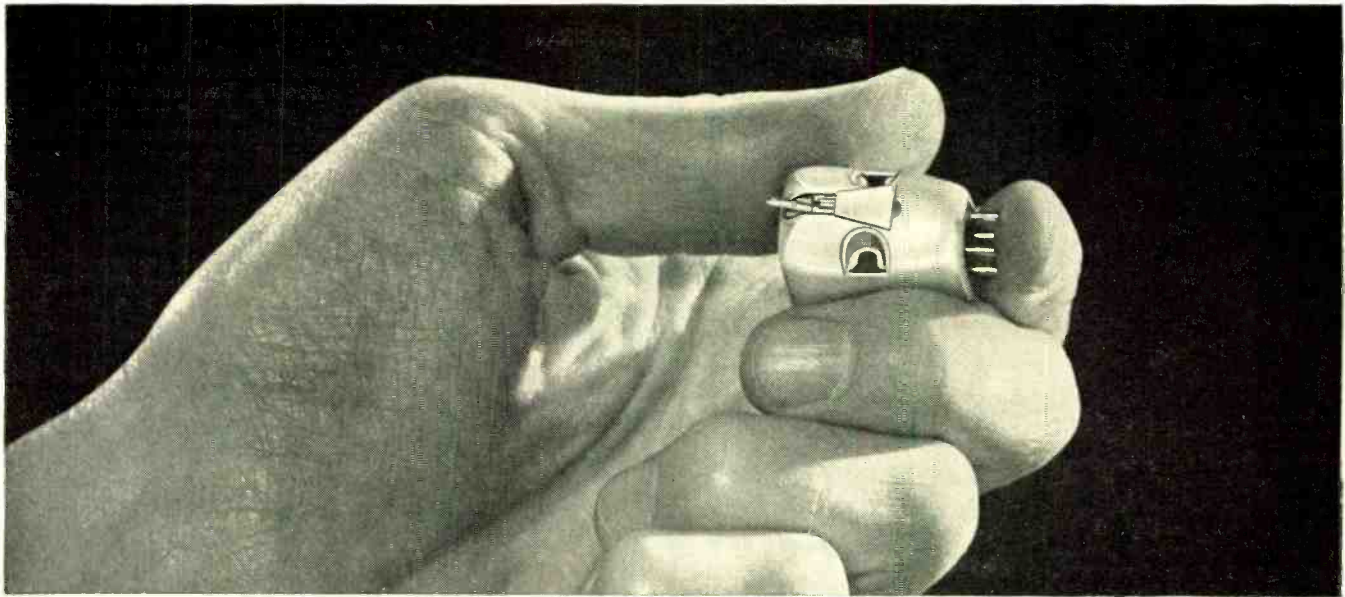
Exotic Instrumentals of the Islands

Capitol ST 1409

They're not stretching a point when they term this one exotic. For the fourth album of his Hawaiian series, Webley Edwards prowled the out-of-the-way places of Honolulu, collecting impressions of more distant Pacific regions that have influenced the music of one of our newest states. Most of the performers who assembled for this recording at the Princess Kaiulani Meeting House were Hawaiian by birth but the nationalities represented numbered at least half a dozen. The backbone of the orchestra contained the familiar array of steel guitars, ukuleles, and pahu drums. In the Japanese, Chinese, and Phillipino tunes, imported instruments such as the samisen, koto, bamboo marimbas, and temple gongs embellish the regular Hawaiian sound. More ingratiating than the average Hawaiian recorded program, the mood of this unusual album is subdued enough for background listening.

Michael Collins: Waltzing Through the Years Capitol ST 10254

This one is aimed at the discreet corner of a mood music collection. It would appear that British string orchestras can play just about any waltz without ruffling the relaxed listener. Capitol, thanks to its overseas affiliates, seems to have a virtually inexhaustible supply of such orchestras. Michael Collins began his career as a classical cellist before taking up arranging and conducting. His arrangements for this album cover a century of light waltzes. The stereo is comfortable and roomy. In addition to the standard Lehar, Waldteufel, Rodgers, and Berlin favorites, the program includes such present-day curios as *Destiny* by Sidney Baynes and a waltz by Ivor Novello. Novello was a phenomenon of the British stage and screen until his death in 1951, yet few remember him now as the composer of *Keep the Home Fires Burning* during World War I. His career as a star of his now-dated musicals brought him success in England that was in many ways more dazzling than that enjoyed by Noel Coward.



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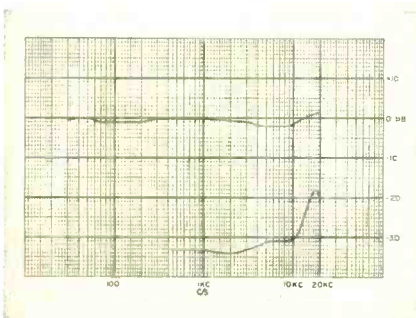
Ability to track at less than 1 gram is only *one* of the impressive advantages of the new ADC-1. Read how this and other features reduce distortion, increase record life and help you enjoy an unusual degree of high fidelity sound reproduction.

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Feature 1—Low tracking force reduces distortion and record wear, prolongs the life of your records

The ADC-1 can track at less than 1 gram, touching your record with the lightness of a feather passed across your hand, never bouncing against or leaving record groove walls.

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Typical response and separation curve, ADC-1 Stereo Cartridge.

Feature 2—Optimum sensitivity results in low amplifier noise

A sensitivity reading of the ADC-1 reveals 7 millivolts at 5.5 cms a second. This means the cartridge develops enough voltage to prevent amplifier strain—a major cause of amplifier noise. (Too high pickup sensitivity can overload an amplifier and cause distortion).

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As the sounds of recorded instruments run up and down the scale, some have a way of wandering from speaker to speaker. The sound of a violin on the left, for instance, may drift towards the room center.

The ADC-1 overcomes this by achieving 30 decibels of separation in the critical 50-7,000 cps range.

You enjoy excellent channel separation, virtually no wandering.

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Much as you lower resonance by slackening the tension of a violin string, resonance at low frequencies has been lowered in the new ADC-1. This produces well-rounded bass tones and greatly reduces the possibility of rumble and feedback.

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REVERB (-ererb-ererb)

It has been borne in upon me, during these last few months, that reverb is the hi-fi sensation of the year. I have resisted the idea, but secretly, I have been intrigued. I tend to fall for gadgets.

Publicly, I have been giving a horsey laugh each time the subject has been brought up, and in a way I really feel like horse-laughing.

Is *this* the best a great industry can do to keep its soul in business, this year when stereo is still teetering on the seesaw of public acceptance, when stereo-machine makers still are casting about for more ways to "simplify" stereo into meaninglessness? Is *this* the best gadget we can find to please that portion of the hi-fi audience that won't buy our stereo in any form or shape, not even close-spaced and single-cabineted?

And is reverb really the answer to all and sundry deficiencies in stereo, mono or compatible form; the cure-all for every problem of room acoustics; the saviour of plain sound, of the ordinary variety our recording engineers turn out?

Well, if you think so you're mistaken, is my reaction. If you think that reverb can pull the hi-fi industry out of its semi-stereo doldrums, you're more mistaken still. The fact is that reverb-in-the-home is a small-time and highly limited gadget, lots of fun for awhile, but also quite useful in a limited and special way. To prescribe it as the key to the "Better Hi-Fi Life" is like suggesting Metrecal for a universal human diet.

Moreover, reverb mostly tends to paint the lily, to spread whipped cream on top of cream. It's silly to use it merely to add more reverberation to records and tapes that are already very well reverberated by the recording companies.

It is wrong, too, to expect a reverb unit to provide fundamental improvement in the acoustics of your listening room via your loudspeaker, though an apparent improvement of a limited sort is possible, I'll admit. Room reverberation is, by definition, the sound that *doesn't* come out of your speaker; it is the room treatment of loudspeaker sound after it has left the speaker itself.

I am intrigued by reverb, but I can't help starting in the negative. Everything is claimed for it, as usual. And as usual, it obviously will not do everything, though it just as clearly can do something. Why do we always invite such negative reactions by plugging preposterous positives? Why do we drive away intelligent people by claims that bury the real advantages of a new kind of equipment under a mass of whopping nonsense? . . . Well, enough said. I've been negative; now I'll wax positive. I grabbed a chance to experiment with home reverb recently when I found all of a sudden that I really could use some re-

verberation—in fact, I desperately needed it. And the unit came through, splendidly. I'm grateful.

Spring-Fed

The Hammond Organ Company unit that is the basis, on the manufacturers' level, of the varied reverb devices now being offered to the public under assorted brand names and with assorted associated circuitry, is without any doubt an honest device; a good idea worked out in uncluttered and economical form, compromised as compared to an ideal of perfection but with sense and judgment in the compromise. As a delay device it is far simpler and much less costly than the tape-assisted and live-acoustics systems usually available to professionals. And it works, this Hammond unit, much better than you might expect; a lot better than the familiar tape feedback "echo" that has so often intrigued home owners of tape recorders—and has been the plague of electronic music composers and TV commercial producers. "*THIS (this-this-this) is the washday MIRACLE (acle-acle-acle-acle)!*" None of that stuff in the Hammond, and good riddance, even if I did use it in my title.

We must note a further favorable circumstance: The more complex the sound to be reverberated, the better any reverb device works. Complexity is the soul of liveness. Music, the Hammond's main fare, is normally a very complex sort of sound. Thus, this slightly simplified Hammond delay-maker does optimum things with the most complex sounds it is likely to deal with—music itself. It is less effective with simpler noises. Who cares.

Finally, this spring-fed reverb unit normally is circuited so as to mix its artificial reverb with a variable quantity of the natural product, since few broadcast and recorded sounds are totally devoid of liveness. (Some already have the artificial product added, in production.) The composite of natural and artificial reverb, liveness enhancement, so to speak, can be really excellent in terms of listenable, natural home sound, given moderation and a halfway decent signal to begin with. The greatest usefulness for this kind of home reverb is to provide a delicate and very gentle *adjustment* of apparent liveness. It's a one-way adjustment, of course. More, but not less. And it thrives on parsimony. In this fashion it is a widely useful adjunct to home hi fi. But is this the fashion in which it will actually be used? Not if I read the ads right.

Reverb is a matter of taste, so we can't be dogmatic. Like the cream in your coffee. Some people like a lot. If you really must, you can use cream—I mean reverb—for everything you put through your hi fi. Your privilege, from Bach to Boogie, from Beethoven to baseball. (Now there's an

idea, too. Reverberated baseball. "*Sensational! Brings the baseball diamond right into your living room!*") But for my coffee—I mean music—I'll use reverb quietly, sparingly, occasionally. Well worth it.

Before I tell you of my recent first reverb experience, under rather special circumstances, I think it would be wise to brief the unknowing reader on the Hammond unit itself, speaking nontechnically. The gadget is built on a small chassis, lengthwise, about fifteen inches by three by an inch or so; inside are the vital organs, two lengthwise springs like half-size screen door springs. They look that way, feel that way, and twang that way when you pluck them with your fingers. (The twang comes through your speaker like 50,000 door springs.)

They are, of course, very sophisticated door springs. Their characteristics are carefully figured; a reverse twist at the halfway point adds to the sophistication, and a delay of 29 milliseconds in one spring and 37 in the other helps to complete the confusion, so decidedly desirable in this treatment of sound. The two springs work together, of course, on one signal—it's a kind of parallel double mechanical feedback—the initial delays, from one end of each spring to the other, compounded back and forth hundreds of times, over and over, neatly out of step, for a smooth and continuous decay. A very pretty idea, you'll admit.

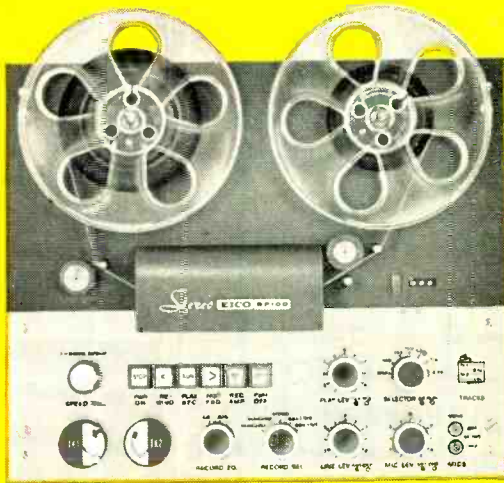
The whole business is kept going via rotational transducers at each end of the springs, one set twisting as per the input signal, the other acting as output, and the two sets twisting each other continuously via the delay springs. Utter sound confusion—which is precisely what we are after.

The output of all this is fed back, variably, into the main signal. In the Fisher, the maximum reverb level is well below the main signal's power, which is wise, you'll admit. The mixture is variable down to zero-reverb.

In association with the basic Hammond spring unit is the electronics and switching section, designed by each manufacturer to his own taste. The design thinking in this second section is crucial and, I gather, runs to quite different approaches, with consequently differing results and control functions. I'm not in a position to comment directly on these differences and do not intend—Heaven forbid!—to compare all the reverb units on the market. I have not seen Hammond's own literature and suggested circuits, if any; Fisher's K-10 is presented at the "audiofan" level as the brain child of Fisher Radio, a statement that is surely true of the well-designed associated circuitry in this reverb model. The name Hammond is nowhere mentioned. But the Hammond name imprint has not been removed from the backside of the basic unit. Backside credit, anyhow.

Let me say merely that the Fisher circuit is designed for maximum versatility, as evidenced by the quite bewildering array of alternative installation schemes presented. Stereo is included, via matrixing that combines signals from the two channels, then feeds this reverberated "A-plus-B" back into each main channel. There is also a "third channel" arrangement—I should say, a provision for a third speaker—intended for use with the main speakers unreverberated; the center speaker is supposed to carry the reverberated sound. This is an effect that I must indeed try, out of sheer curiosity, though my own inclination is more radical: I intend to put that third speaker *behind* me, and I will try alternatively sending only the pure reverb through it and sending the "third-channel" reverb-

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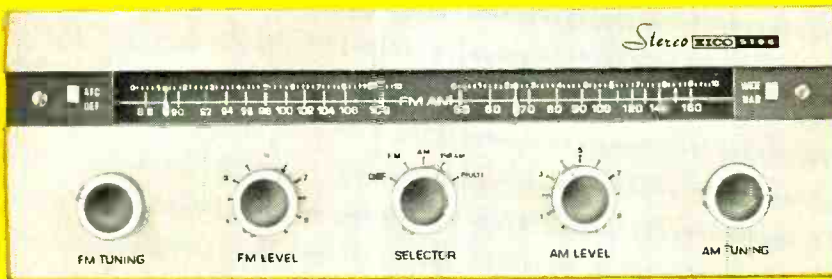
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Perfected 4-track stereo/mono recording, 4 & 2 track playback. True high fidelity transistor electronics, individual for record & playback, plus separate record & playback heads permitting off-the-tape monitor. 2 recording level meters, mixing, mic & level controls, switched sound-on-sound recording. Electro-dynamically braked supply & take-up reel motors; hysteresis synchronous capstan motor. Individual solenoids for pinch-roller & tape lifters. All-electric, interlocked push-button transport control & interlocked safety "record" pushbutton. Precision tape guidance & sweep loading — no pressure pads. No slurring or tape bounce problems. Digital turns counter. Vertical or horizontal mounting. Modular plug-in construction. An original, exclusive EICO product designed & manufactured in U. S. A. (patents pending)

NEW MEDALIST LINE



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Kit \$89.95 Includes Metal Cover and FET Wired \$129.95

FM and AM stereo tuners on one compact chassis. Easy-to-assemble: prewired, prealigned RF and IF stages for AM and FM. Exclusive precision prewired EYE-TRONIC® tuning on both AM and FM.

FM TUNER

Switched AFC (Automatic Frequency Control). Sensitivity: 1.5uv for 20db quieting. Frequency Response: 20-15,000 cps±1db.

AM TUNER

Switched "wide" and "narrow" bandpass. High Q filter eliminates 10 kc whistle. Sensitivity: 3uv for 1.0V output at 20db S/N ratio. Frequency Response: 20-9,000 cps ("wide"); 20-4,500 cps ("narrow").

OF EICO STEREO



70-WATT INTEGRATED STEREO AMPLIFIER ST70

Kit \$94.95 Includes Metal Cover Wired \$144.95

40-WATT INTEGRATED STEREO AMPLIFIER ST40

Kit \$79.95 Includes Metal Cover Wired \$124.95

BOTH AMPLIFIERS: Complete stereo centers plus two excellent power amplifiers. Accept, control, and amplify signals from any stereo or mono source.

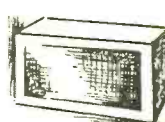
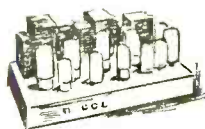
ST70: Cathode-coupled phase inverter circuitry preceded by a direct-coupled voltage amplifier. Harmonic Distortion: less than 1% from 25-20,000 cps within 1db of 70 watts. Frequency Response: ±1/2 db 10-50,000 cps.

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See EICO at IRE BOOTH 3509

plus-matrixed-main-channels. Ought to be interesting, but I haven't had a chance to try any of this yet. (Something for *you* to do.)

The Fisher does allow you to tap off the reverbed signal only, via one switch position. Useful for special applications, but also very informative when you want merely to hear exactly what you are getting, what is being added to make your reverbed mixture. This reverb-only position is a kind of monitor facility and as such is an essential element in a practical reverb device.

Reverbed Rehearsal

Now—to business. My favorite means for trying out audio equipment is to get myself into a real, practical spot where the stuff must perform, or I'm in trouble. Much, *much* better than lab testing, for me. (It supplements lab testing, which is not my business though extremely useful, obviously enough.) To "test" a tape recorder I get involved in recording, preferably for real usefulness. I play records for review through "test" loudspeakers and print the reviews as I hear them. I haul amplifiers and control units to public lectures and dare them to break down, or play tricks on my nervous state while I'm confronted with an audience.

The best technique, as you can imagine, is to combine several functions into one, and this was where reverb entered my picture. I managed to put together four of my major interests for my reverb trial: choral singing, home tape recording, radio program, and meteorology. This last was a sheer accident, though it led to a twelve-hour below-zero cold test on my reverb unit and portable tape recorder.

For a number of years I've made an annual rehearsal recording of the Dessoff Choirs in New York, in which I sing, a week or so before their formal concert. It is subsequently built into a program for my regular Sunday broadcast via WNYC, New York—the singing, the conductor's rehearsal remarks (often forceful and sometimes humorous), plus assorted hamming and incidental guff, the whole assembled along with my own spoken comment by elaborate tape editing. I record the entire rehearsal, then copy off useful portions onto the final tape via my big non-portable Ampex 350. (It's officially portable but I ignore the claim for obvious reasons.)

There is a major problem at these Dessoff rehearsals. It isn't that I sing in the chorus and, theoretically, ought to be singing, not making tapes. I'm expendable. It is simply that the group rehearses, 150-plus singers, in a room that holds 149 people at a squeeze. For such a crowd it is closet-like. There's barely space to get around the edges and the conductor's platform is about three feet in front of the nearest singers, right up against one wall.

Moreover, these final rehearsals involve serious musical business. Recordings must be strictly unobtrusive and catch-as-catch-can. No interference of *any* sort can be tolerated. Mikes must be put wherever a spot can be located—and there aren't many spots. Invariably, I end up with a mike, or two, right next to the conductor (to catch his remarks), some three feet from the front ranks of sopranos. Even on a high mike stand (a low ceiling doesn't help) the front singers are much too near, the back ones too far.

My balance is thus poor, the blend be-

tween near singers and far singers is punk, individuals in the front rows stand out disproportionately, the general impression is of badly uncoordinated singing. My best efforts with trickery have never helped much. I use the wall back of the conductor as a reflector, into a mike placed fairly high—this helps a bit, but not much. The close singers are still right in my lap. I've tried two channels. Still doesn't help much.

But worst of all is the abysmally dry, short-delay liveness, due to a combination of hard-plaster walls, low ceiling, and many bodies. The sound is closet-like, and yet too bright. And this, mind you, for music intended to be heard in large, mellow, reverberant churches, at a distance!

That was my tailor-made situation. Two-plus-two struck me several days after this year's recording session and a couple of days before I was due to polish up the material, somehow or other, into a listenable program. This year's front-row sopranos were particularly wobbly and particularly close. This year's impression of uncoordinated individualism was more misleading than ever. And I was supposed to be promoting the music!

And so my sudden thought—*why not get a reverb unit*. Why not, and thereby with one master stroke (maybe), place the chorus in the large, church-like environment it needs and at the same time push those ineffably flattening and wobbling front-row sopranos back to a decent distance, blur them into the rest of the music! I really needed the thing, and I prayed that, for once, publicity had not gone too far and the reverb would produce a bearable sound.

(Continued on page 36)



1



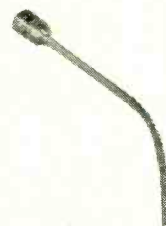
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3



4



5

PEAK PERFORMANCE



Why does the art of recording reach its peak in Vienna?

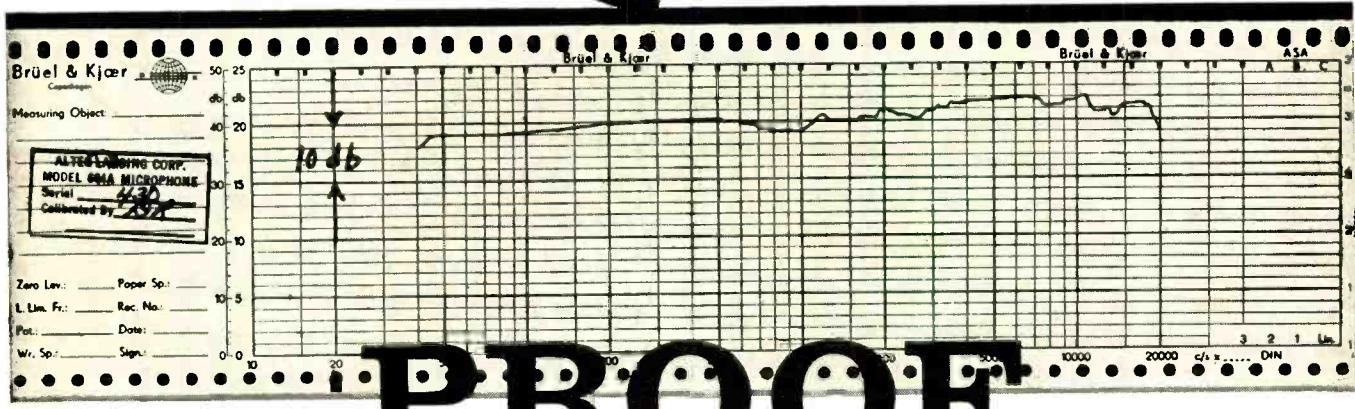
Because here, in "the home town of music", artist and engineer work together to meet the challenge of Haydn, Mozart and Beethoven — of Vienna's great Symphony, Philharmonic and Staatsoper — and of the world's most critical audience. And because AKG is on this team that makes the *truly* significant advances in the technique and equipment of recording.

Each AKG microphone from \$12 to \$900 has gained, from this collaboration, a quality that stamps your tapes with the earmark of AKG, *Earwitness Fidelity*. Compare an AKG with any at twice its price — for clarity, sensitivity, range, directional discrimination. Whatever your standards and your budget, there's an AKG microphone to bring your recording, broadcasts or PA to a peak of perfection with dollars and dB's to spare! For catalog and nearest dealer write the USA import and service agents — Electronic Applications, Inc., Stamford, Connecticut, (203) DAvis 5-1574.

1. **D 11 N Dynamic Cardioid.** For amateur tape recording. Bass-cut switch. 80-13k cps. 2.5 mV/√bar. High and low impedance. \$27.
2. **D 88 Duplex Dynamic Cardioid.** For mono, and MS/XY stereo, recording. 80-15k cps. 0.18 mV/√bar. High and low impedance. \$54.
3. **D 19 B Dynamic Cardioid.** For semi-pro tape recording. Bass-cut switch. 40-16k cps. 0.18 mV/√bar. High and low impedance. \$58.
4. **Dyn 200K Studio Dynamic Omnidirectional.** For fine studio recordings. Very flat 30-15k cps. 0.15 mV/√bar. Impedance 200 Ohms. \$110
5. **C 29 A Condenser, Cardioid-Omnidirectional.** Miniaturized for TV low-visibility. Very flat 30-20k cps. 1.3 mV/√bar. Converts 50/200 Ohms. \$379.50.



Frequency Response: 35 to 20,000 cycles
Output Impedance: 30/50, 150/250 and 20,000 ohms (selection by connections in microphone cable plug)
Output Level: -55 dbm/10 dynes/cm²
Hum: -120 db (Ref.: 10⁻³ Gauss)
Dimensions: 1 1/8" diameter at top (1 1/2" largest diameter) 7 1/2" long not including plug
Weight: 8 oz. (not including cable & plug)
Finish: Two-tone baked enamel, black and dark green
Mounting: Separate "Slip-On" adapter No. 13338 furnished. Adapter has standard 3/8" -27 thread.








PROOF

Concrete visual proof of performance is now supplied by ALTEC with each 684A Omnidirectional Dynamic Studio Microphone. This proof—a soundly scientific and coldly unemotional statement of exact performance capabilities—is an individual certified calibration curve that you receive free with each 684A Omnidirectional Dynamic Microphone.

The calibration curve is so precise that the ALTEC 684A is a completely reliable secondary standard for comparison measurement of other microphones. Can you, if you are a professional multi-microphone user, safely operate without such a control standard in your studio?

The ALTEC 684A Professional Microphone shown is a production model chosen at random. Its calibration curve is actual and unretouched. It offers dramatic proof that the exclusive new ALTEC design, incorporating the highly sensitive ALTEC "Golden Diaphragm" of Mylar®, results in an omnidirectional dynamic microphone of remarkable superiority. This superiority will be maintained, year after year, by the exclusive ALTEC sintered bronze filter that positively bars the entry of iron dust and foreign matter. And, as proof of superior value, consider the price: the ALTEC 684A costs only \$81.00 net!

SUPERIOR PERFORMANCE, SUPERIOR VALUE — THE ALTEC DYNAMIC MICROPHONE LINE:

 <p>ALTEC 681A—\$36.00 net—Inexpensive general purpose omnidirectional microphone with smooth, uniform frequency response from 50 to 18,000 cycles. Includes the new ALTEC "Golden Diaphragm" of indestructible Mylar®. Available with 150/250 or 20,000 ohms output impedance.</p>	 <p>ALTEC 682A—\$49.50 net—Featuring uniform frequency response from 45 to 20,000 cycles, the 682A Omnidirectional Microphone incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedances of 30/50, 150/250, and 20,000 ohms easily selected in microphone plug.</p>	 <p>683A DYNAMIC CARDIOID—\$66.00 net—Uniform response from 45 to 15,000 cycles with average front-to-back discrimination of 20 db. Design incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedance of 30/50, 150/250, and 20,000 ohms selectable at cable plug.</p>
 <p>ALTEC 685A STUDIO CARDIOID—\$96.00 net—This dynamic microphone offers flat frontal response from 40 to 16,000 cycles with average front-to-back discrimination of 20 db. Design incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedances of 30/50, 150/250, and 20,000 ohms selectable at cable plug. Individual certified calibration curve is supplied with this model.</p>	 <p>ALTEC 686A LAVALIER—\$54.00 net—Unobtrusive 3-ounce Omnidirectional Lavalier Microphone. Incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter for an exceptionally smooth frequency response from 70 to 20,000 cycles, equalized for chest position. Selectable 30/50 and 150/250 ohm impedances.</p>	<p>For specific engineering details, call your nearest ALTEC Distributor (listed in your Yellow Pages) or write Dept. A-3-M.</p> <p>ALTEC LANSING CORPORATION A SUBSIDIARY OF LING-TEMCO ELECTRONICS, INC. 1515 South Manchester Avenue, Anaheim, California</p>

Complete line of accessories includes: desk and floor stands, switches, wall mounts, boom and shock mounts.

EDITOR'S REVIEW

WESTWARD HO!

WITH THE COMING of the spring season we have learned to look forward to our annual trek to the West for the San Francisco and Los Angeles hi-fi shows. After a few months of winter and snow shoveling—and this year was the most—it is always a pleasure to contemplate the change.

This year the San Francisco show comes first, being held in conjunction with a Home Show, thus giving the entire family an excuse to visit the Cow Palace where there is to be something for everyone. After the 1960 show—which from the standpoint of the visitors was practically ideal for a large enclosure—it is expected that the minor deficiencies will have been entirely corrected. The arrangement of the booths with entrances to the individual display rooms being on only one side of the aisle avoided the crossfeeding that has always been a bugaboo, even in hotel locations where doors are often arranged directly opposite each other. We still have a warm spot in our memory for the relative freedom from interference by sounds coming from the other rooms.

The San Francisco show will be held March 15 to 19, and at press time some 35 high fidelity manufacturers had already contracted for space. Jim Logan, executive director of the twin affair which is sponsored by the Magnetic Recording Industry Association, announced that this show will emphasize styling for the home and four-track stereo tape.

Back to the Ambassador Hotel goes the Los Angeles show this year—probably the sound hasn't yet died down in the Pan Pacific Auditorium where it was held last year. As one small voice throughout the industry, we raved over the location of the 1957 show which was at the Ambassador because of the size of the individual rooms and because of an arrangement similar to garden apartments. Most of the rooms opened directly into the park-like gardens of the hotel, and the high concentration of sound normally encountered in hotel shows was not noticed there. As we mentioned last year, it is extremely difficult to run a hi-fi show in a single large room where individual "soundproof" cubicles have to be constructed for the exhibitors. Logan did a great job of it in San Francisco, but Los Angeles left a lot to be desired. Anyhow, we are more than pleased that the show is back at the Ambassador. The dates are April 5 to 9, and the show is being presented by the Institute of High Fidelity Manufacturers.

We regret slightly that the Audio Fair in London has to occupy almost the same days, because this removes any excuse we might dream up to attend both. AUDIO will have booths at both San Francisco and Los Angeles, however.

Another type of show is being tried out "out of town" as it were, in the Southern California area. The Audio Components Representatives Association plans a Stereo Components Exhibit in Long Beach on March 3 and 4. This show was first announced to be one in which there was to be no sound, although later announcements do not stress this rather unusual feature. The Long Beach area was picked as a kick-off point because it is close to Los Angeles and thus handy to most of the representatives who are putting on the show so it will be possible to correct errors—if any—at the outset. The displays are to be transported by trucks and station wagons, and the entire idea is designed to enlist the co-operation of local dealers with the manufacturers' representatives. We wish them all the luck in the world.

THE NATION'S CAPITAL

After an absence of a year, the Washington High Fidelity Music Show returned to the Shoreham Hotel February 10 for a very successful three-day run. Despite considerable snow, the show was well attended, and the visitors showed a real interest in the exhibits. The Shoreham is well suited to hi-fi shows because of the relatively spacious rooms, and exhibitors took good advantage of them to show off their equipment. Shrader Sound, a pioneer hi-fi dealer in Washington, presented three different types of systems in typical room settings—each in a separate room—which did credit to the industry and the specialist type of dealer.

One of the interesting features of the show was the demonstration of multiplex broadcasting using the Crosby System for FM stereo transmission. This system is one of several being considered by the FCC for adoption as a standard for stereo broadcasting. For the show, however, the program transmission was over "closed circuits" within the confines of the Shoreham Hotel, and the results were readily comparable with normal stereo reproduction from records or tape with no radio link intervening, and noticeably superior to some of the FM-FM tests conducted in the New York area during recent months, or to continuing AM-FM transmissions which are available in some cities.

Of the specific systems being considered, we feel that it is imperative that the sum signal be transmitted on the main channel and the difference signal on the multiplex channel. This is the only logical way to achieve compatibility, in our opinion. This, of course, the Crosby system does. We hope the FCC agrees with us in its impending decision as to the accepted system.

Whatever the decision, however, we hope it comes up soon so we can have stereophonic broadcasting as a regular service. The delay is not helping the industry at all, and a quick decision would put new life into it.

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.

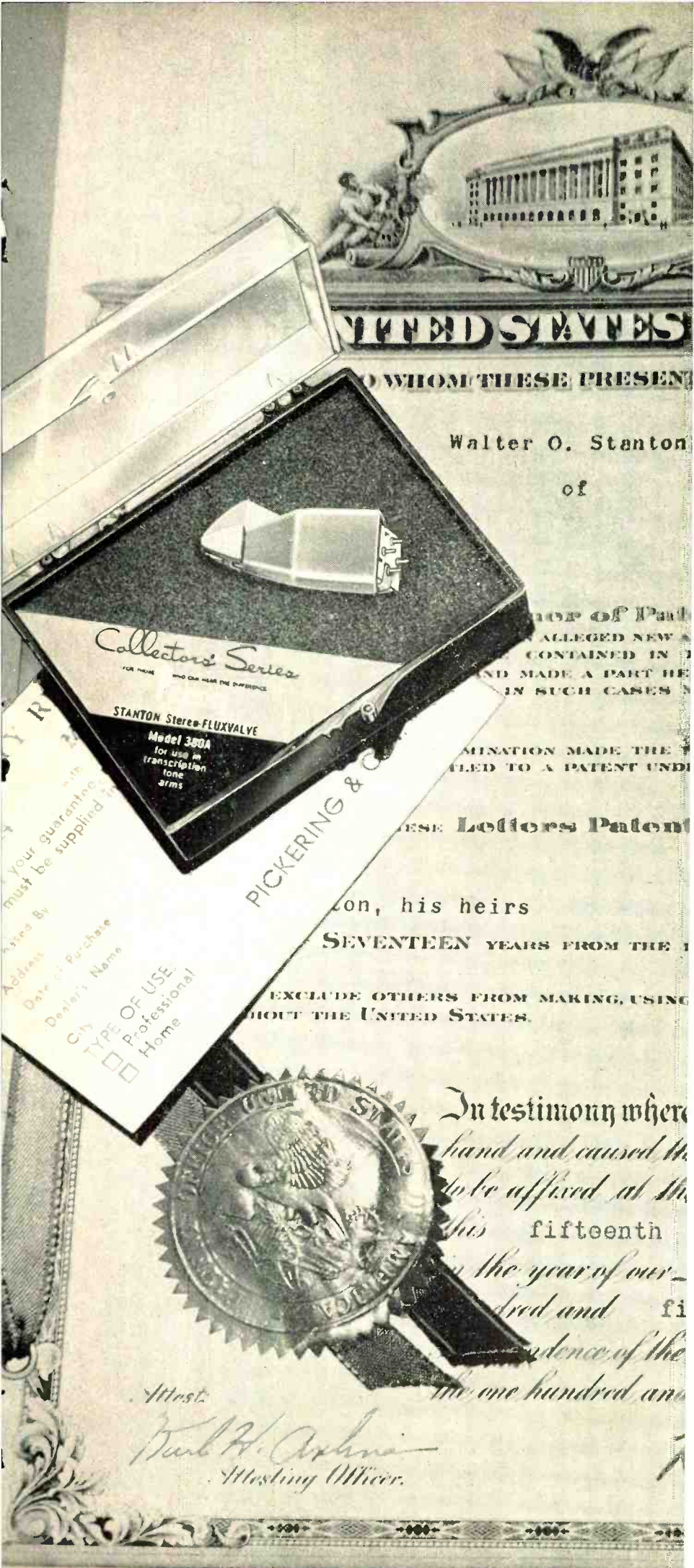
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for more than a decade—the world's most experienced manufacturer of high fidelity pickups . . . supplier to the recording industry.

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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.



Walter O. Stanton

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Attest:

Paul H. Arshman
Attesting Officer.



**“IMAGINATION IS
MORE IMPORTANT
THAN KNOWLEDGE”**

Albert Einstein

There are some who might argue this point with Einstein. But this much is certain: Wherever new knowledge is sought, imagination lights the way. And surely, only imagination of rare quality could have led Einstein to formulate his principle of relativity.

Einstein applied the insight of imagination to basic science. But imagination can be just as powerful in the creation and application of technology. And nowhere, perhaps, is imagination challenged over so wide a range in both science and technology as in the problems of electrical communications.

At Bell Telephone Laboratories, scientists and engineers range far and deep in search of the answers. They probed deep into solid-state physics to discover the transistor principle, and they speculated and synthesized in an entirely different area of knowledge to create the giant microwave system that carries your TV programs across the country. They study ways to protect the giant molecules in plastic cable sheath, and they explore the basic information content of speech to devise better ways to transmit it. They devise ultrasensitive amplifiers to capture radio signals from distant places, while they conceive and develop new switching systems of unprecedented capabilities. Side by side with the development of transoceanic cable systems they are exploring the possibilities of world-wide communications via man-made satellites.

By exploring every pathway to improved electrical communications, they have helped make your Bell System communications the world's best and they will work to keep it so.



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Interconversions in Equalization Terminology

KENNETH W. BETSH*

Phonograph equalization and FM pre-emphasis and de-emphasis characteristics may be expressed in several ways. Converting from one system to another is made easy by the relationships derived in this article.

IN DISCUSSIONS involving phonograph equalization and FM pre-emphasis and de-emphasis, the characteristic may be expressed in one of three ways: (1) The 3-db point or turnover frequency; (2) The level at 10,000 cps in db compared to a reference level; or (3) The R-C time constant. The purpose of this article is to show how conversions from one system to another can be made. To fully understand these conversions, the derivations of the formulas and examples are given.

As an illustration of the need for being able to make these conversions, the RIAA recording characteristic requires the playback equalization to be 13.7 db down at 10,000 cps. In order to design an R-C circuit to provide the equalization, one must know the frequency at the 3-db point. The British specify their equivalent to the RIAA specification in terms of microseconds.

To handle these situations, four conversion formulas are given below:

I. Conversion of 3-db Point to db Attenuation at 10,000 cps

This covers such things as the treble rolloff in phonograph equalization. An R-C circuit such as Fig. 1 would be used in one form or another. The drop in the resistance portion is the loss. Since the voltage drop is proportional to the impedance ratio:

$$\frac{\text{drop in resistance}}{\text{input}} = \frac{R}{\sqrt{R^2 + X_c^2}}$$

Since the 3-db point frequency f , is defined as that where $R = X_c$, then $X_c = 10,000 R/f$. Substituting this into the first equation:

$$\frac{R}{\sqrt{R^2 + \left(\frac{10,000}{f}\right)^2 R^2}} = \frac{1}{\sqrt{1 + \left(\frac{10,000}{f}\right)^2}}$$

* 8515 Pleasant Plains Road, Baltimore 4, Md.

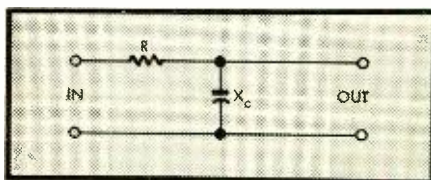


Fig. 1. Typical R-C circuit.

From the definition of the decibel:

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

Inverting by using a law of logarithms:

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

The negative sign only indicates that the db's are a loss:

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

If a voltage ratio-to-db chart is available, the loss can be determined from it by using the result of solving

$$\sqrt{\left(\frac{10,000}{f}\right)^2 + 1}$$

Example: What is the response at 10,000 cps when the 3-db point is at 5000 cps?

$$\begin{aligned} \text{Loss} &= 20 \log \sqrt{\left(\frac{10,000}{5000}\right)^2 + 1} \\ &= -20 \log \sqrt{4 + 1} = -20 \log \sqrt{5} \\ &= 20 \log 2.236 \\ &= 20 \times .3495 = 6.99 \text{ db} \end{aligned}$$

II. Conversion of Attenuation at 10,000 cps to 3-db Point Frequency

This is the reverse of I. and can be done by solving the equation given there for f rather than db drop.

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

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

Since $\frac{1}{\log}$ is an anti-log:

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

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

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

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

The quantity $\left(\text{anti-log} \frac{\text{db loss}}{20}\right)$ is the

ratio number appearing beside the db numbers in a voltage ratio-to-db chart. Either the chart or calculations may be used. When calculating, the anti-log can be determined by finding the number in the body part of the log tables and reading the equivalent along the left edge.

Example: Find the 3-db point of a characteristic 10.5 db down at 10,000 cps (the old London FFR curve).

$$\begin{aligned} f &= \frac{10,000}{\sqrt{\left(\text{anti-log} \frac{10.5}{20}\right)^2 + 1}} \\ &= \frac{10,000}{\sqrt{(\text{anti-log } .525)^2 - 1}} = \frac{10,000}{\sqrt{3.35^2 - 1}} \end{aligned}$$

$$= \frac{10,000}{\sqrt{11.22 - 1}} = \frac{10,000}{\sqrt{10.22}} = \frac{10,000}{3.2}$$

$$= 3125 \text{ cps}$$

III. Conversion of Time Constant to 3-db Point Frequency

The time constant is equal to resistance times capacitance. To get a unit of
(Continued on page 60)

A Unique Motel Installation

BOB KAMPF*

The travelling audiofan will appreciate this haven away from home. Here the fidelity is as high as the surrounding terrain.

JUST THREE YEARS AGO, after much deliberation, we decided to leave the hustle and bustle of Long Island and the New York metropolitan area to purchase the Hilltop Motel in Saranac Lake, N.Y.; a friendly community of 7000 people nestled deep in the heart of the northern Adirondack Mountains. The motel is actually located between the villages of Saranac Lake and Lake Placid, N.Y., at an elevation of 2000 feet and commands an impressive mountain and lake view. Being a dyed in the wool audiofan, one of my first thoughts was to put in a high-fidelity music installation which would be unique—at least for motels. This might seem rather simple until you realize that there are 18 units spread out on three levels on a 12-acre tract. Also there is that small incidental of expense as against the potential of return from it. However we felt that it would surely induce stayover business once people had heard it, so we went ahead with our plans. Installation would cost nothing directly since I would handle this myself.

High Fidelity Almost Nonexistent in Motels

First I wanted to see just how many motels offered or advertised high fidelity music. I had never encountered any in our extensive travels a few years back, but then changes are taking place fast these days, so we resorted to the AAA tour book. There we found a very small percentage advertising high-fidelity music, and set out to visit several of them. In addition, a few gracious friends agreed to stay at some of the motels advertising high fidelity. This would let us know what other motel high-fidelity system consisted of. All reports, including our own, agreed that none were true high fidelity; most of them being installations consisting of a 4-inch speaker of the \$2.95 bargain basement variety, mounted in a wall or ceiling and driven by a PA amplifier with distortion levels so high as to be audible even to the untrained ear. These systems were advertised as high fidelity but unfortunately that's as far as it went—an advertising claim.

After these observations we resolved

* Hilltop Motel, P. O. Box 7, Saranac Lake, N. Y.



Fig. 1. The heart of the music system in its natural habitat; next to the fireplace.

that Hilltop Motel would offer low-distortion high-fidelity music. Of necessity this would be expensive, but compromise with quality was out of the question since compromise is just not listed in our audio dictionary. Of course it was not necessary to install a large corner horn in each unit to achieve the desired result. We were basically interested in clean low-distortion reproduction capable of covering the audible range from near the bottom to near the top, thus offering our guests the most relaxing background music they had ever heard in a commercial installation. We were definitely not interested in the subsonic or the ultrasonic.

70.7 Volt Line Necessary

Because of the unusually spacious arrangement of the motel and cottages the amount of line would run close to 2000 feet. It was obvious that this amount of transmission line with a load of 18 speakers across it would require something more than the usual 8- or 16-ohm taps since losses would be tremendous both in power and frequency, even if extra heavy wire were used. My answer

to this was a 70.7-volt system. Actually the line was so long that I felt it advisable to check with telephone company engineers to see if I would run into any wavelength problems such as retardation time and others encountered in long-line telephony. However they assured me that the lines would have to run miles before any such troubles would show up. I was relieved to find that this is one problem I would not have to work out, but shuddered when I thought of 18 speakers, line-matching transformers, pads, and speaker enclosures all conforming to high-fidelity standards. At least I knew that most of the components in my present home system could also be used here.

Record-playing facilities were a must since we had a library of nearly 500 LP's with a good cross-section of entertainment types. Also it would enable us to handle a reasonable number of personal requests (which we now do during spring and fall seasons when business is at a more relaxed pace than in midsummer). I had excellent equipment on which to spin the records so quality would be high in this department. FM

would be another source of program material thanks to a top-flight tuner which I already owned—and which is so necessary in this difficult fringe and mountain area. With my present tuner-antenna combination I can pick up many excellent stations in both the United States and Canada, the range extending out as far as Mt. Washington in New Hampshire. The Canadian stations, CBC as well as independents, are to be commended on their excellent programming

requiring the speakers and enclosures to be mounted in the individual rooms, as well as the line matching transformers and pads for individual volume control.

I conducted extensive A-B listening tests of loudspeaker and enclosure combinations. The amplifier, preamp, turntable, and cartridge used in these tests were exactly the same as would be used at the motel thus eliminating any chance of variation here. For those who think that the use of an infinite baffle arrange-

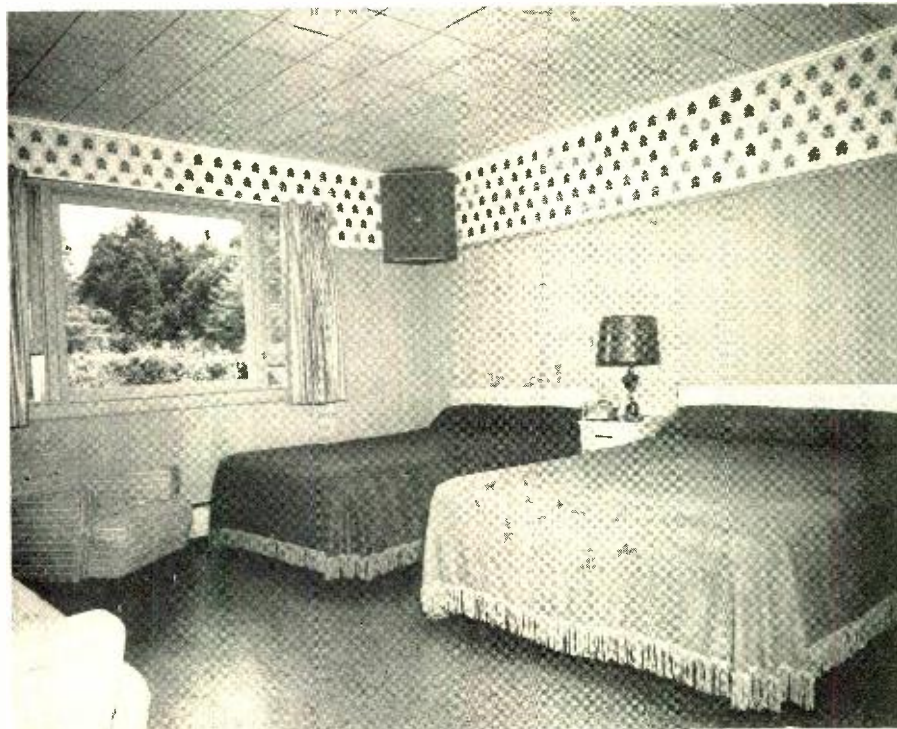


Fig. 2. The corner ceiling location for the speaker system gave best sound and permitted the easiest installation.

both musical and educational as well as their limited use of commercials (some have none at all). My preamp was retained and my speaker set-up, a modified University 3-way corner system, could be used to monitor the entire network. This left the amplifier and the individual speaker systems to be purchased. An 80-watt laboratory amplifier with 70.7 volt output tap was chosen. This insured low distortion levels with enough reserve power for any additional speakers which we might wish to install later.

Purchasing Line and Equipment

First I tackled the purchase of transmission line. Lines for 70-volt systems ordinarily need not be heavy gauge because of the relatively high impedance, except in cases such as this where there is a great amount of line. I chose a 14-gauge solid copper wire with heavy duty neoprene cover suitable for severe outdoor service. I was told that this is what telephone companies used in many cases. With this behind me I went on to the last and most ticklish stage of ac-

ment would save buying enclosures, just consider the work and time involved in placing and wiring 18 transformers and pads in buildings that are already built. We did—and it became obvious that the use of an enclosure would be the best answer since both transformer and pad could be mounted inside. Then too there is the psychological effect on the guests of a sizeable speaker enclosure rather than just a small grille in the ceiling or wall. Infinite baffling would not leave as much room for expansion in the system either because of lower efficiency.

A Problem with High-Frequency Response

Super tweeters were ruled out because Fido, the family dog, would begin to howl at 18,000 cps thus annoying everyone else in the motel; and we do allow dogs here at Hilltop since there are 12 dog-loving acres for them to romp on. I also considered the use of tweeters with attenuators, but this would only complicate things in the mind of the average tourist since anything more than one knob floors most of them. This, I

guess, is due to television advertising wherein it is claimed that one knob on the set controls everything from sound level on through brightness, vertical and horizontal hold, with focus and contrast thrown in for good measure. This sort of misleading advertising has led the public to the state where they just won't listen to anything with more than one knob to turn even though an extra bit of adjusting would mean a far superior picture. We decided, therefore, that one knob for volume would be all that we would have in order to eliminate a thousand-and-one trips to explain what the function of each is. Our final decision was a high-quality full-range 12-inch speaker with good characteristics for both music and speech. Speech intelligibility is important here since we do broadcast news and weather reports once or twice every day. We chose a corner enclosure of the modified bass-reflex type with an internal size of about 4 cubic feet. This combination came about as close as possible to meeting all the requirements sought after. Mounted in a corner near the ceiling, and with the control in the bottom of the enclosure where it would be out of the reach of children, it fit all rooms without difficulty. In addition, it was easy to drop the line through the ceiling to about 50 cps, rolling off below that. For all practical purposes this is enough. On the high end it carries to about 13,000 cps and then slopes off to the upper limit of the speaker at 14,000 cps. Again, this is high enough for all practical purposes. As mentioned earlier, the one ingredient sought after most was clean distortion-free reproduction, not wide frequency response.

Problems with Line-Matching Equipment

With the speaker and enclosure decision behind me I breathed a sigh of relief, figuring that my most vexing problem had been solved. This was not quite the case however as I was soon to find out when my quest for line-matching transformers and the necessary pads for attenuation began. After the heavy expense for major equipment it was so easy to slip into a compromising frame of mind, putting price ahead of quality, on such items as transformers and pads. As a matter of fact I was having difficulty finding transformers with frequency response characteristics which would match the other sections of the system. Because 70.7 constant-voltage systems are used almost exclusively in PA work, the frequency response of the various components is not critical. Consequently most of the line-matching components listed had a response of only about 150 to 7000 cps, with a few from

(Continued on page 62)

Computers in Audio Design

R. G. BUSCHER*

Positive feedback around one stage of a negative feedback loop will decrease distortion if handled in the following manner—

In Two Parts—Part Two

In the previous part the theory behind the analog computer was described in terms of simple spring, mass, damper systems. To further illustrate its use a problem representative of those in audio work will be looked at. The intent is not to solve a particular problem but only to show how the computer could be used for audio work.

The problem is that of stabilizing an audio amplifier. Assume the amplifier is that shown in Fig. 12. This is seen to be a simple feedback circuit. The problem will be to determine the RC combination to be used in the feedback of the amplifier. It is assumed that the individual stages have been previously designated and are unchangeable.

Assumed also is that the three stages

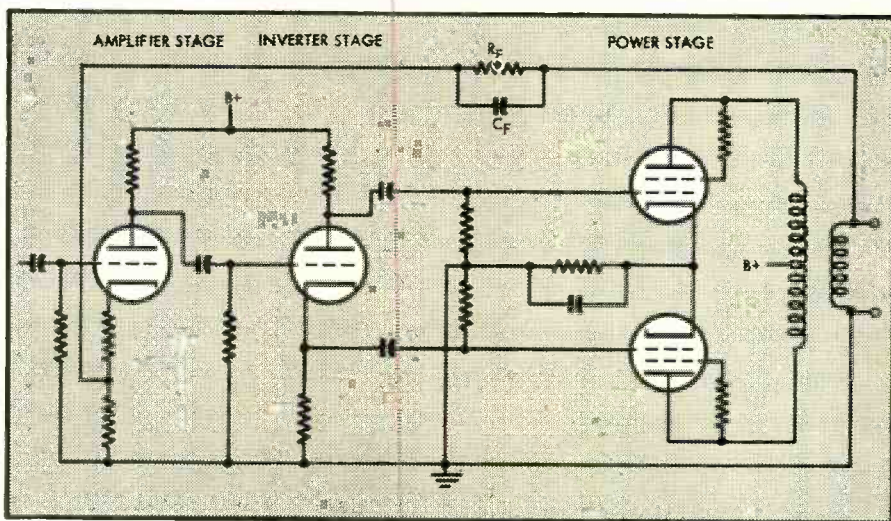


Fig. 12. Typical audio amplifier.

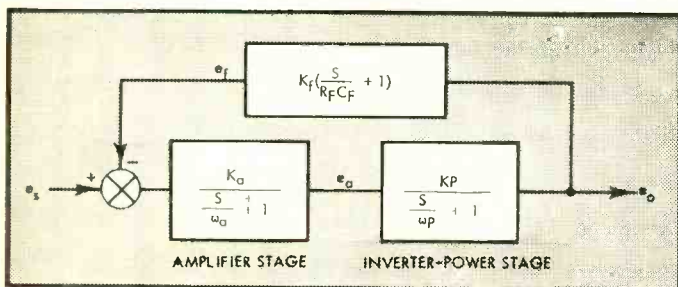


Fig. 13. Block diagram of typical audio amplifier.

Solving for the highest order of e_o :

$$S e_o = \omega_p k_p e_a - \omega_p e_o \quad (25)$$

By integrating this expression, e_o will be determined. The literal circuit for this is shown in Fig. 14. This circuit could be reduced to a one integrating amplifier circuit but as will be seen later, it is convenient to have $S e_o$ available thus the circuit shown will be used.

From the block diagram of Fig. 13 the amplifier stage is seen to have the same form of equations as the inverter-power stage. This circuit can then be directly drawn as shown in Fig. 15. In this case the reduced circuit is shown since $S e_a$ is not needed in the problem. The reduction is seen to be the elimination of the two inverter amplifiers of Fig. 14.

If the relation between e_f and e_o is examined, the following expression arises:

operated open loop appear as two lags in series; that is, the amplifier stage is flat out to some frequency, ω_a , and then drops off at 6 db/decade. Likewise, the inverter-power stage is flat out to some frequency, ω_p , then it too has a 6 db/decade drop-off. The power stage is assumed to include the output transformer. It is to be expected then $\omega_a > \omega_p$.

As typical numbers it will be assumed that $\omega_a = 2\pi 30$ K rps and that $\omega_p = 2\pi 20$ K rps. The cycles per second are $f_a = 30$ K cps and $f_p = 20$ K cps respectively.

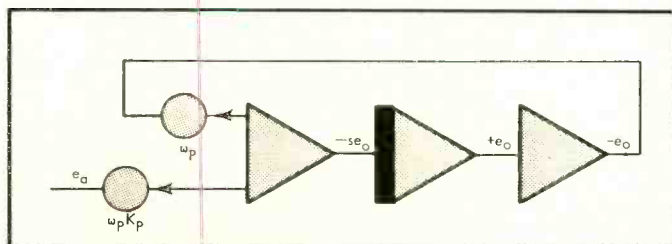
In block diagram form using LaPlace notation, the amplifier is shown in Fig. 13. The feedback RC combination takes the form shown in the feedback block. The gains k_a , k_p , and k_f are the respective stage gains. For convenience the feedback block can be rewritten to be

$k_{rc} (S + k_s)$. It is apparent that RC and k_f are implicit in k_{rc} and k_s , thus can be easily determined once k_{rc} and k_s are determined.

The inverter-power stage will be set up first. The input-output relation is:

$$e_o = \frac{k_p}{S + \omega_p} e_a \quad (24)$$

Fig. 14. Literal analog circuit for inverter-power stage.



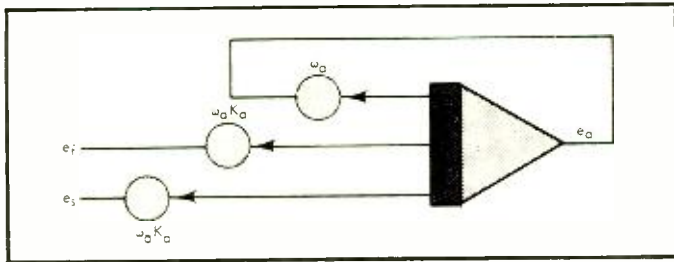


Fig. 15. Reduced analog circuit for amplifier stage.

$$e_f = (k_{rc} S + k_s) e_o \quad (26)$$

multiplied out this becomes:

$$e_f = k_{rc} S e_o + k_s e_o \quad (27)$$

The need for $S e_o$ is seen at this point. The circuit for e_f is given in Fig. 16.

At this point the individual parts can be put together to produce the circuit shown in Fig. 17. This circuit is the complete simulation of the block diagram. With the proper computer facility it would be possible to go much further in simulating the amplifier by putting in more exact expressions for the amplifier. This can be done even to the extent of simulating tube characteristics for a complete design study.

The values of ω_a and ω_p being in the neighborhood of $2\pi \cdot 25$ K rps require operation at frequencies and gains well beyond the capability of most computer amplifiers. This introduces another scaling technique called time scaling. This means that a problem which occurs in time t_p can be simulated to occur in time t_c on the computer. This can be done to

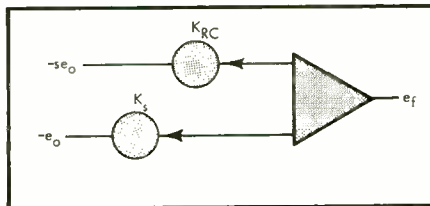


Fig. 16. Analog circuit for feedback.

lengthen or shorten the problem time. A 10 minute problem time can be scaled to take 10 seconds on the computer. Likewise, a 10 microsecond problem time could be scaled to take 10 seconds. Only one time scale per simulation, however, is allowable. This time scaling is done by changing the integrator gains. Going back to equation 12 (Part One) for the basic integrator, the RC product is seen to determine the integrating rate of the integrator. This is normally set at one volt per second per volt of input ($R=1$ megohm, $C=1$ microfarad). Thus, if one volt at the input represents, for example, one foot per second of velocity, the out-

put will increase at one volt per second. At the end of 10 seconds the output will be 10 volts which represents 10 feet, but if the RC is decreased by a factor of 10, the integrating rate is 10 volts/sec/volt and the 10 volt level would be reached in one second. Since the volt per foot relation has not been changed it is apparent that the seconds of computer to seconds of problem have changed or, more simply, a time scale change has been made. This time scale factor will be denoted by k_t . In the problem in question k_t is applied by dividing the inputs to the integrators. (This problem is to be "slowed down"). It is noticed that each integrator input has an ω_a or ω_p associated with it. This leads to the logical and correct conclusion that ω_a and ω_p are to be reduced by the factor k_t . For this problem let k_t be 1000. Some rearrangement of gain terms was made to enable the setup of this problem on an actual analog computer.

The numbers used in this problem require a number of 10 gain inputs and reductions by 20 of various computer amplifier output quantities in order to keep potentiometer settings below one. This leads to the final simulation circuit shown in Fig. 18.

The circuit of Fig. 18 was set up on a Heath Educational Electronic Analog Computer Model EC-1 which is available in kit form for about \$200. This computer contains nine operational amplifiers, five potentiometers to aid in the gain adjustments, and three voltage sources for fixed or step voltages for setting up the analog. In addition, a voltmeter is provided to read the amplifier outputs. The control circuitry is such that repetitive solutions can be made; that is, the problem is started, then after a time determined by a dial setting on the computer the problem is stopped, returned to zero and started again. This process, if done at a fast enough rate, allows the complete time solution to be displayed on an oscilloscope. Pictures or sketches of this display provide a record of the problem.

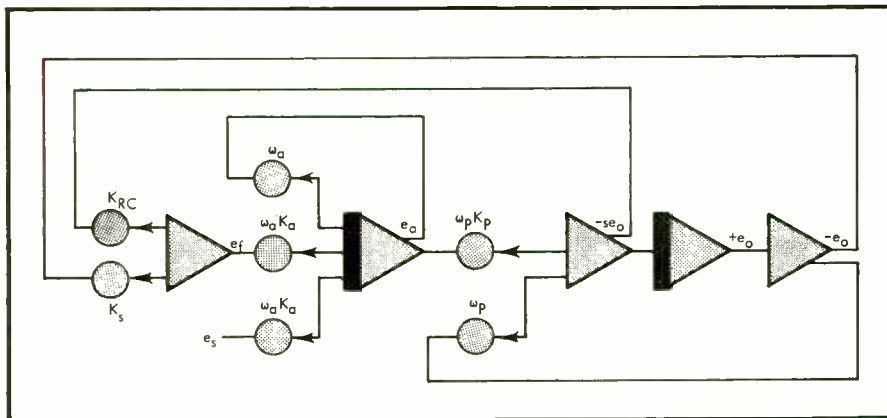


Fig. 17. Analog circuit for the audio amplifier of this problem.

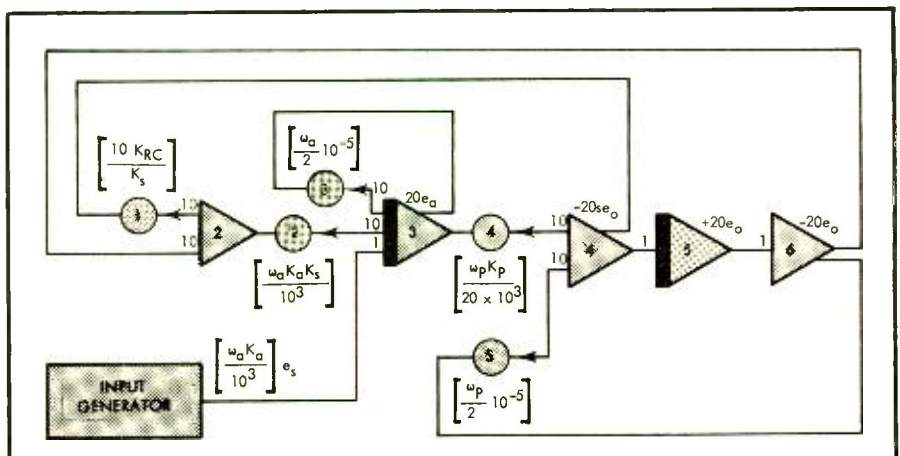


Fig. 18. Final analog circuit used on Heath EC-1 computer.

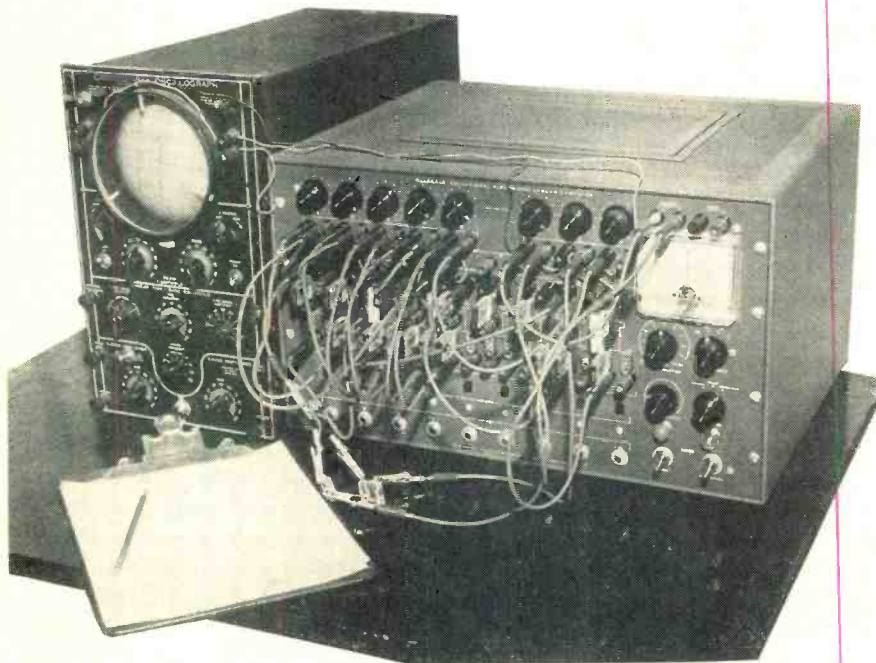


Fig. 19. Heath Educational Analog Computer, model EC-1, showing the hook-up used to study the sample audio problem.

Figure 19 shows the computer and a scope as wired to examine the sample audio problem.

The results of this simulation are shown in Fig. 20. A step voltage was applied as an input. The first response

is the open loop circuit; that is, no feedback applied. As the feedback gain, which is controlled by potentiometer 2 (denoted by P2) is increased, the amplifier rise time becomes shorter. The damping, however, gets less and the cir-

cuit begins to "ring." If P2 were increased too far the amplifier would become unstable. At a value of one for P2 the damping ratio is in the order of 0.1. The value of P1 was then increased. This provides the stabilizing necessary to reduce the ringing and yet maintain the short rise time. The "optimum" response is obtained for P1 equal to 0.11. Comparison of this response to the original open loop response shows that considerable improvement has been made in the amplifier. Using the values found for P1 and P2 it is possible to determine the R and C needed in the real circuit and the problem is finished.

This example has illustrated the procedures used in analyzing a problem and setting up an analog computer simulation.

In this article the subjects of digital and analog computers have been lightly covered. The purpose has been to illustrate somewhat simply how they work and what their applications might be.

As time goes on, computers will perform even more complicated tasks than they do now. As this computer revolution continues, the components produced by audio manufacturers will improve and the high performance specifications of today may become the "so-so" product of yesterday. Æ

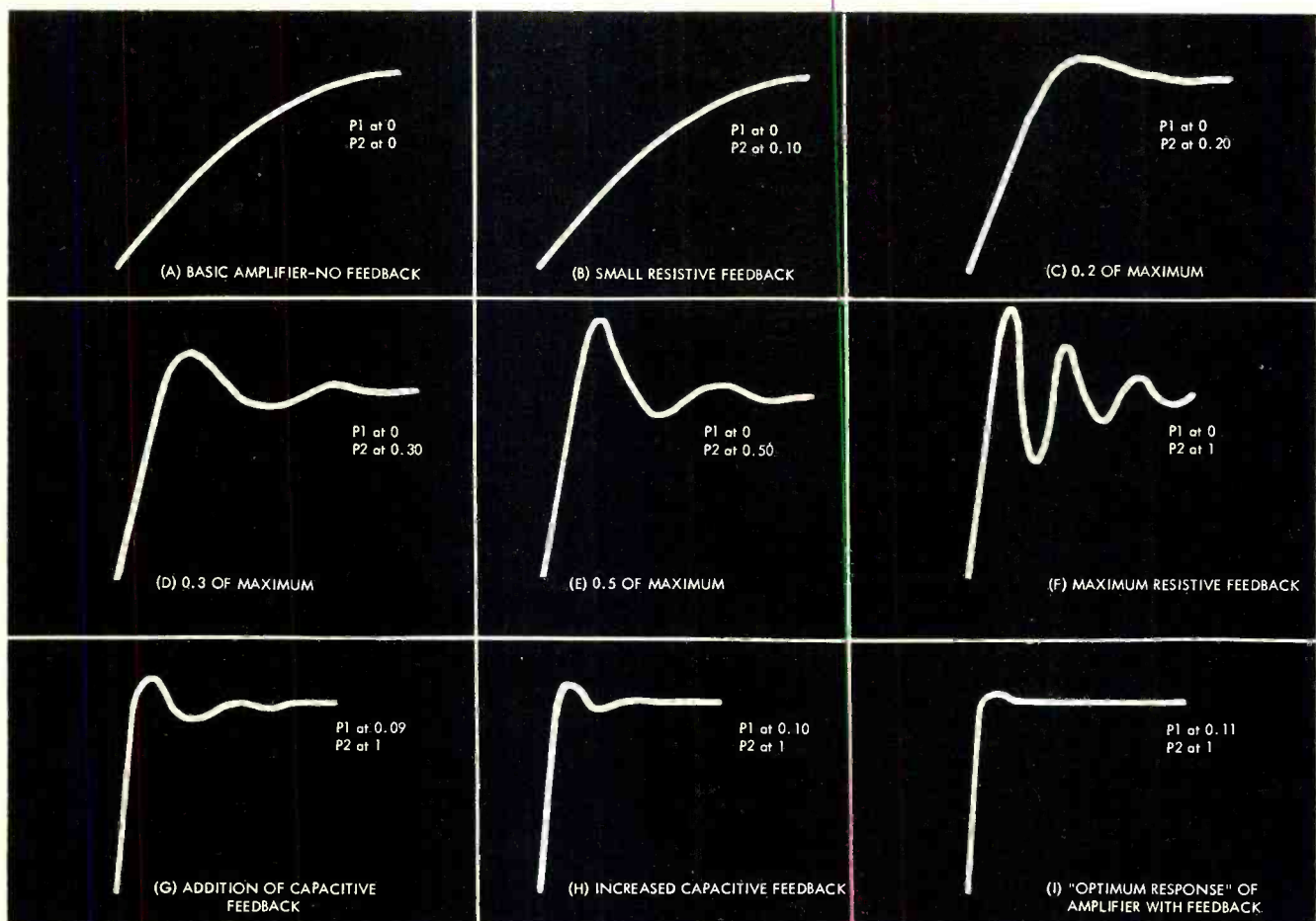


Fig. 20. Step responses of the audio amplifier simulation with variation of the simulated RC feedback.

It's all Empire—from the remarkable 208 belt-driven 3-speed turntable—so quiet that only the sound of the music distinguishes between the turntable at rest and the turntable in motion . . . to the famed Empire 98 transcription arm, so perfectly balanced that it will track a record with stylus forces well below those recommended by cartridge manufacturers. A handsome matching walnut base is provided. And, although we leave the choice of cartridge up to you, we can't help but recommend the Empire 108, the first truly compatible mono-stereo cartridge. The empire 108 in the 98 arm tracks superbly at 1½ grams. The price of this magnificent playback system, less cartridge, \$145.50.

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Stage Sound

RICHARD S. LEVY*

For the amateur theatrical group here is a primer on the equipment needed for excellent stage sound—plus some instruction about microphone placement.

SOPHISTICATION OF AUDIENCES at amateur and professional stage performances has increased considerably in recent years. Frequent exposure to television and other mass media has made all of us expect a pace and polish which requires increasingly elaborate technical effects.

Among the expected effects are realistic recorded sounds and music on cue and, very often, the re-enforced voices of "live" players to enable the majority of the audience to enjoy every word of the lyrics and dialogue.

"Know how" and proper equipment are necessary to provide effective stage sound but enhancement of the performance almost always justifies the effort and cost.

The problems of stage sound divide logically into two parts:

1. The *pickup* or generation of desired sounds.
2. The *distribution* of wanted sound in good condition to all listeners.

This division is quite similar to that made in radio and TV broadcasting: *Pickup* problems are handled exclusively at the *studio*—*distribution*, only at the *transmitter* site.

The Pickup Problem

A. Sound effects and music

A well-equipped stage sound system should include both tape and disc facilities. If a choice must be made, most operators prefer tape, assembled in proper sequence with white mylar leader between passages. Disc material may be transferred to tape and spliced into the "show reel."

If the over-all sound system provides too general a distribution for a specific sound, a secondary system with off-stage or back-stage speakers may be connected as an option to above equipment. Sounds may then be localized at director's discretion.

1. *From tape.* A tape deck, player or recorder should be provided. Requirements are not too stringent except for

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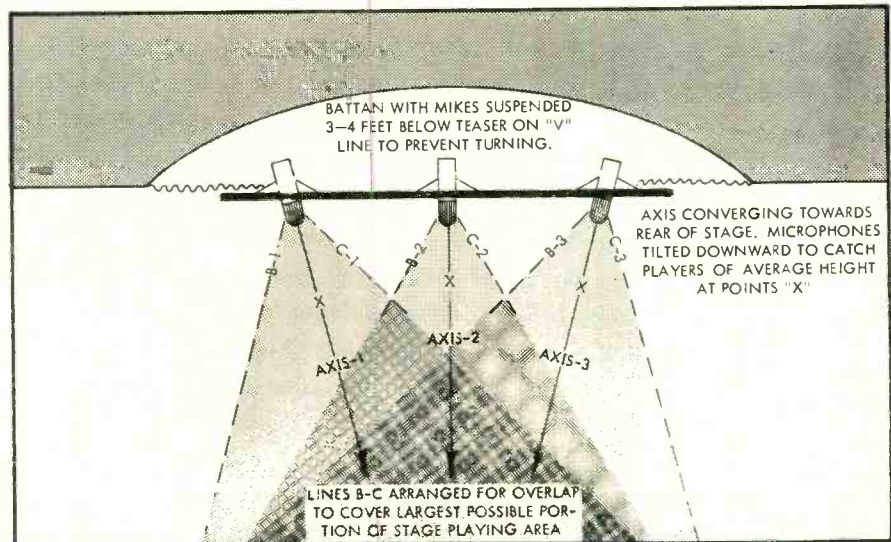


Fig. 1. Indirect pickup of stage voices with "flown," or suspended, microphones. (Top view.)

cueing facilities, which should be convenient. A clutch or "pause" control is desirable. It's also helpful to have an audible pre-cue (ability to hear start of sounds as reels are rotated by hand). The "mute" which blocks this on some models may generally be disabled by a competent technician. The splicing of white mylar leader tape ahead of each sound offers *visual* cueing which is considered the most reliable method. If a complete recorder is used it is advisable to *disable the erase feature*—a relatively simple operation which will prevent possible accidents.

2. *From disc.* A constant-speed turntable with a convenient reproducer arm will be required for almost all stage installations. For accurate introduction of disc material at the proper time, an independent cue amplifier with headsets is a "must." Turntable should be cork or flock-covered to allow slippage while holding record for cues. A fast-start motor may also be used.

Radio broadcast operators have developed the most tried and true system of cueing discs: The start of modulation is found by listening in monitor phones with pickup in lead grooves and rotating turntable by hand. Record is backed

up about $\frac{1}{2}$ turn with needle in groove. The record is held and released (or power applied to motor) on cue and input control to main amplifier is opened to a pre-determined level. Sound is then heard by audience.

B. "Live" voice re-enforcement

1. "Direct" pickup:

a. *Floor microphones.* Good quality dynamic mikes with "cardioid" pattern are preferred in most stage installations. Response from the rear of such microphones is damped and helps avoid "feedback" and other unwanted sounds. For effective pickup, performers should speak or sing within 18 inches of most microphones.

b. *Lavolier (neck) microphones.* In some situations it may be feasible for performers to "wear" microphones. The trailing cord will limit stage action, however, and should, for security, be fastened to a man's belt or safety-pinned to a woman's clothing. Strain at the other end should be relieved from the connector to avoid unscheduled disconnects.

2. "Indirect" pickup:

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A crucial test of any precision instrument—whether it be a navigator's sextant or a broadcast microphone—is its ability to respond *accurately* and *predictably* to a given set of conditions. Judged by these standards alone, the Electro-Voice 655C has easily earned for itself such appellations as "old reliable" . . . "dependable workhorse" . . . "standard of the industry" and the many other tributes heaped upon it by grateful audio engineers in recording studios, independent stations, and radio and TV networks the world over.

The reasons for these compliments are not hard to find. Among them are its—

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- time-proven diaphragm of Acoustalloy[®], a diaphragm material never successfully copied or equaled.
- time-proven dust and moisture filter that eliminated these problems years ago and still leads the field. (It will not corrode and has never been known to clog.)

These features combine to give the 655C the widest range and smoothest response of any professional microphone in common use.

Development of the 655C has never stopped. Whenever possible, improvements have been made to keep the 655C oriented to the needs of the times. This policy of upgrading a product, even after it is in production, means that you can depend on EV to have the answer first, to anticipate the need for new microphone types to fit changing demands.

OTHER FEATURES: Output Level -57 db, 50, 150, and 250 ohm impedance. Impedance easily changed on internal connection. Acoustalloy diaphragm, shielded from dust and magnetic particles. High efficiency, non-welded magnetic circuit with Alnico V and Armco magnetic iron. Non-reflecting grey finish case. Has $\frac{1}{8}$ " 27 thread; 20-foot cable with UA-311 Cannon Connector. Size: $1\frac{1}{8}$ " dia. x $10\frac{1}{2}$ " length. Net weight: 7 oz., less cable. List Price \$200.00

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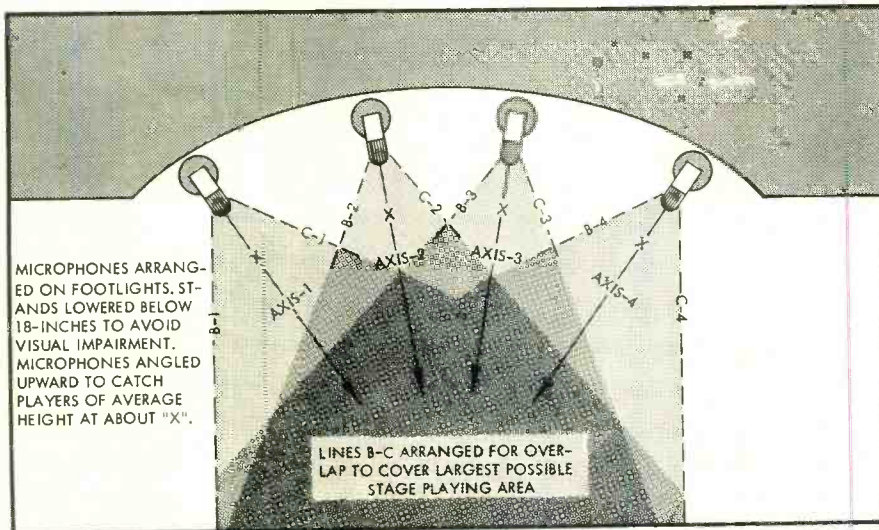


Fig. 2. Indirect pickup of stage voices with floor microphones. (Top view.)

the auditorium—without a single mike visible on stage! This, we must note, is easier said than done, although much progress has been made in this direction and the future holds even more promise. This discussion will, for the sake of simplicity, be confined to the present state of the art.

a. *Wired microphones.* For this application, the new "extended working distance" type should be used to assure maximum pickup. If cables to preamplifier are longer than 35 feet it's best to specify low-impedance mikes and transformers for minimum hum. Mikes may be "flown" (hung) above stage (as in Fig. 1) or spaced along footlights (as in Fig. 2). Number of mikes, spacing and aiming must be determined by actual trial and may be evaluated as suggested in paragraph G below.

Generally speaking, control over fewer mikes is easiest although only one or two mikes need be "hot" at a given time for solo work. All mikes may be required to pick up choral passages or several scattered players.

b. *Wireless microphones.* This is a relatively new development embodying small, transistorized, FM transmitters and microphones which may be concealed on the person of the performer. A special FM receiver picks up the per-

former's voice within a 800-foot range. This seems to be an ideal solution and works quite well, providing that the budget in question can stand between \$250 and \$1000 for each wireless mike and its associated receiver.

Thus far, most wireless mikes have been restricted to TV broadcasting although Mary Martin used one in her famous "flying" number in road presentations of "Peter Pan." Her songs were broadcast and picked up by Miss Martin's system and amplified through the "house" system as she "floated" through the air.

C. Monitoring booth

Ideally speaking, sound system operating personnel should be acoustically isolated from all other stage activity. This permits a close audit of production sound through an adequate monitor speaker. A glass panel should provide a view of stage action and a "peep hole" into the auditorium is also helpful. In some installations a small sliding panel or glass door allows operator, by cupping his hand to ear, to hear a sample of actual auditorium sound.

In still other installations a small mike has been placed in the rear of the auditorium to sample sound through a monitor amplifier feeding a headset,

speaker, meter or all three in the booth. This is a positive indication of level although quality is somewhat degraded when heard through the second system.

D. Mixing-monitoring console

A sit-down position at a console such as those used in radio and TV broadcasting should be provided for the operator. At his fingertips should be sufficient inputs and flexible switching arrangements to satisfy all present and anticipated needs. The console may be purchased as a stock unit, made up to the buyer's specifications, or made by on-the-job woodwork and stock components such as Bogen's model MXM preamplifier-mixer (Fig. 3). Aural monitoring should be available through a speaker and headsets, and a meter should be provided for visual indication of sound level.

E. Personnel

If sound or music cues are frequent, or if "live" pickup is made from stage, it's best if the person handling sound have *no other responsibilities* except cueing, mixing, and adjusting sound output. This is an important job and, if budget provides, a radio or TV audio operator may be engaged from a local station in his off-duty hours.

F. Technique

The suggested procedure is rather similar to that used in radio and TV broadcasting of "live" shows. A competent operator (as noted in E. above) should familiarize himself with the script, action, cues and voice levels, noting all pertinent information on the margins of his copy of the script. Appropriate microphones are cut in only as required at predetermined levels and adjusted subsequently in accord with the performer's vocal impact.

Caution must be taken to avoid "feedback", the howling bugaboo of many stage pickups. Proper placement and selection of equipment will minimize the problem but almost any abnormally high mike level will trigger the round-robin action. Fortunately, feedback always broadcasts its own early-warning. It's a rather subtle "fringe howl" which adds a slight but sharp ring to each syllable produced from the speakers. This is the alert operator's danger sign and calls for a slight lowering of the gain control for the offending mike.

G. Evaluation

How good is stage pickup? If it's properly handled we may secure a satisfactory tape recording from the mixer-

(Continued on page 59)



Fig. 3. Bogen MXM mixer-preamplifier. This type of equipment is ideal for stage use because it can feed any power amplifier and provides extremely flexible mixing as well as a meter for visual monitoring.

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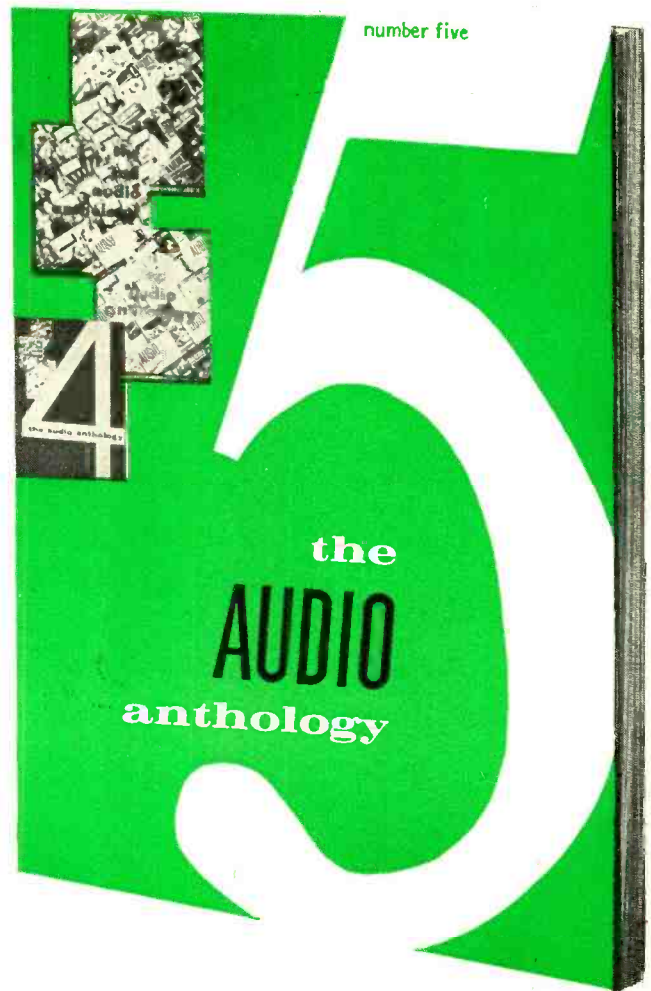
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Triode Operation of KT88's

ROBERT M. VOSS AND ROBERT ELLIS*

In response to many requests, and after a great deal of effort, the authors present a higher-powered version of their ten-watt all-triode amplifier.

THE BRITISH KT88 power pentode, big brother of the much respected KT66, quickly became popular after its introduction in this country not too long ago. Audiophans no longer had to couple four tubes in push-pull parallel in order to get enough power to drive a low efficiency speaker.

In addition to its tapped-screen adaptability, the KT88 has previously unexplored possibilities in lower power amplifiers when used as a triode. A card to British Industries Corp. brought back complete data on the tube, including the following information on triode operation:

E_b	485 v
I_o	170 ma
$I_{max\ sig}$	180 ma
R_k	560 ohms (per tube)
$E_{in(g-g)}$	70 v
$R_l(A-A)$	4000 ohm
P_{out}	27 w
D	1-3%

First to catch our eye were the zero and maximum signal currents; the total

* 697 West End Ave., New York 25, N.Y.

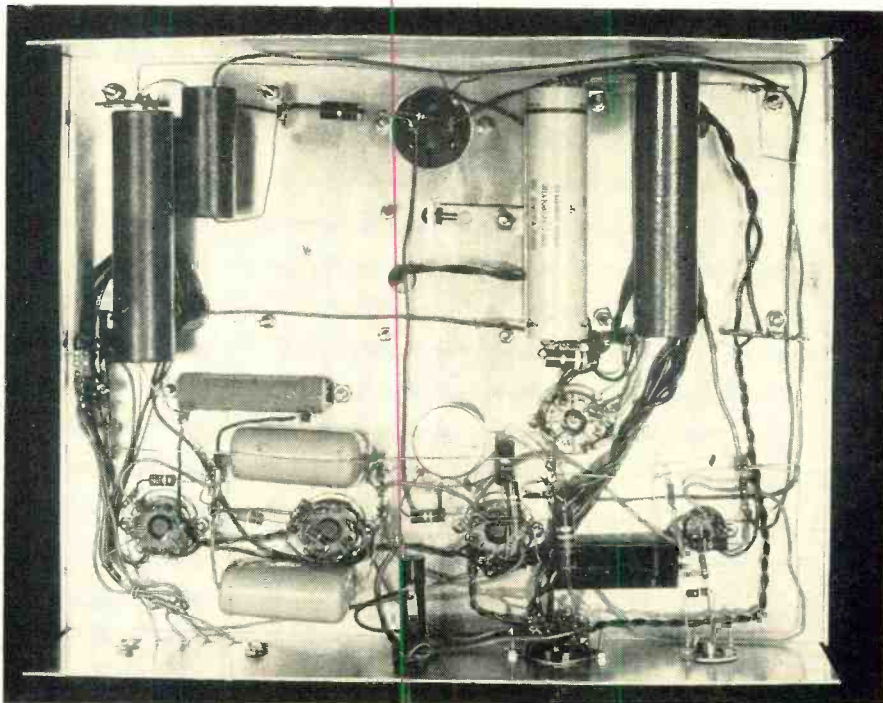


Fig. 2. Bottom view of the amplifier. Note twisted filament leads and ground buss.



Fig. 1. Top view of completed amplifier.

variation is less than 6 per cent, meaning that our power supply requirements were greatly simplified. So far so good. The load impedance of 4000 ohms is, however, a problem. We know of no previously designed tubes meant to work into such a load except in ultralinear operation, and transformers with screen taps are expensive. We settled for a Triad S-42A which is wound for 4500 ohms, and, by juggling the operating parameters a bit, were still able to obtain 25 watts.¹ The S-42A is rated at 50 watts, which means that power at frequency extremes will not drop off because of poor output transformer power handling capability. The amplifier delivers the full 25 watts at 18 cps, (the lower limit of our generator) and only slightly less at 20,000 cps.

The Power Supply

As we mentioned before, the low current fluctuation of the output stage sim-

¹ An advantage of triodes is that using too high a load impedance will not increase distortion although it will decrease power.

It Took Eleven Years and One Night to Design The World's Best Speaker System The New CITATION X by Harman-Kardon



Stewart Hegeman, Director of Engineering, Citation Kit Division, Harman-Kardon, Inc.

STEW HEGEMAN owns a big, old Charles Adams-type wood frame house in New Jersey. It has its disadvantages—but it's a rather special kind of house. The original high-ceilinged living room has been converted into a sound laboratory replete with morris chairs, the best testing equipment and Universal Coffematic machines. According to legend, Stew has coffee now flowing through his veins instead of blood—a concomitant of spending night after night searching for perfection in audio design. It was at this house, one night last summer, that the Citation X speaker system was born.

The antecedents of this story date back to 1949 when Hegeman first heard a Lowther driver. That was it; the beginning of a remarkable collaboration between this great American audio engineer—now Director of Engineering of the Citation Kit Division of Harman-Kardon—and the highly regarded Lowther company of England. Together, they created speaker systems which became classics: the original Hegeman-Lowther horn—the great "Grey Monster" with its top section of plaster of Paris and the Brociner Model 4 Horn.

Over the years, Hegeman and Donald Chave—head of Lowther—continued to work together. Ideas were exchanged; concepts discussed and explored. Independent lines of research into the perfection of speaker design were followed by both. Then came their meeting one night last summer—and the creation of Citation X—the culmination of 11 years of joint and independent research into speaker design.

Reflected Sound

DESIGNED IN THE CITATION TRADITION—the best regardless of cost—the new speaker system places no limits upon performance. It can perfectly reproduce the whole com-

plex structure of a musical composition without adding or taking anything away from the original performance.

The Citation X diffuses sound in a hemispheric radiation pattern—by a blend of direct and reflected sound. In creating this design, the precise process of what occurs in a concert hall has now been duplicated.

Audio engineers know that approximately 80% of the sound in a good concert hall is reflected from the ceilings, walls, etc. It is this mixture of direct and reflected sound that gives music its depth and dimension, its exciting spatial quality.

The Citation X achieves precisely this effect by distributing music on vertical and horizontal planes. Conventional speakers beam the sound at you on a horizontal plane—similar to automobile headlights. In stereo, this is akin to listening to the full orchestra through two holes in the wall. Replace the conventional speakers with Citation X and the wall disappears. *You are in the same room with the music.* There is no ping-pong effect; no "hole-in-the-middle." All of the music is there in all of its depth and dimension and reality. For the first time, the word "presence" has been made meaningful.

The Lowther Driver

THE BASIC ELEMENTS of the Citation X are the Lowther driver and the Hegeman enclosure design—a split, slot-loaded conical horn, with two 7½ feet sections folded within the enclosure.

The driver is a massive Lowther unit specifically engineered for the Citation system. It consists of four working elements:

- Direct radiation from front of cone.
- Radiation from the midrange "whizzer" cone which operates between 2000 and 7000 cycles.
- A stabilizer which places a damping load on the cone and acts as a diffuser and distributor of the very highs.
- Radiation from the back of the main cone which is directly coupled to the folded horn.

Features of the specially designed driver include: magnetic structure of anisotropic magnetic alloy (Ticonal G) which is the most efficient magnet material known today; usable frequency range of 20 to 50,000 cps; gap flux—17,500 gauss; total flux 196,000 maxwells; aluminum voice coil for increased high frequency efficiency; twin cone construction with foam plastic front and rear suspension; no distortion at crossover frequencies due to elimination of distortion producing LC networks.

The Horn

CONVENTIONAL HORN DESIGNS use an acoustic chamber to couple the diaphragm to the throat of the horn. In the Citation X, the chamber is removed and the driver placed directly into the throat of the horn. This eliminates the last resonating element in the horn configuration and results in absolutely smooth transfer of radiation between horn and driver.

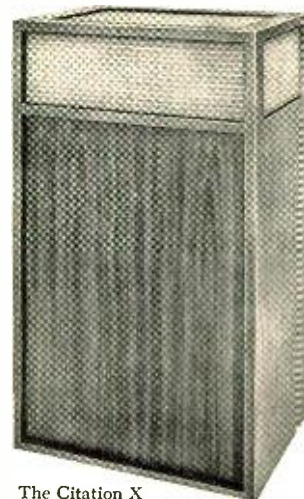
Instead of the conventional "open mouth," the Citation X horn terminates in a slot at the base of the enclosure. This presents the horn and driver with the impedance of an infinite horn. Thus, phase shift is reduced within the horn and room reflections are prevented from entering the horn's mouth and reaching the driver. Pressure loading by the horn damps completely the mechanical resonance of the cone and its suspension.

The interior of the handsome, hand-rubbed walnut enclosure is constructed of Timblend which has no directive resonance and is stronger than wood. The entire internal horn structure is honey-combed for strength and prevention of panel resonance.

For those who own Citation units—for all those who want perfection in speaker performance—we can recommend the Citation X without qualification. *The dimensions of the Citation X are 20" wide x 14¾" deep x 36½" high—because that is the size necessary for the design of the world's best speaker system.*

The Citation X—\$250.00

Price slightly higher in the West. For complete Citation catalog write to: Dept. A-3, Citation Kit Division, Harman-Kardon, Inc., Plainview, New York.



The Citation X
A Hegeman-Lowther Design

CITATION by

harman kardon

plifies the power supply. A single GZ34 rectifier feeds what is essentially a capacitor input filter. After an LC network to the output stage supply, B+ goes through resistance-capacitance filters to the earlier stages. The preamp power take-off socket will supply sufficient power to most unpowered control units. The 10-ohm resistor is a device recommended by the Dyna Co. to avoid ground loops. If you're not powering a preamp, make up a shorting plug with jumpers from pins 6 to 7 (to turn on the amplifier), and pins 4 to 8 (to place bias on the heaters).

The Audio Circuit

To drive the output stage, we used the cathode-coupled phase splitter, with which we and other designers have had excellent results. Driving the inverter, and determining its operating point, is a conventional voltage amplifier. The phase splitter, which is capable of delivering almost 200 volts of audio, has a balance control in its plate circuit, about which we shall speak later.

There are two methods of achieving low frequency stability within a feedback loop. One is to use small coupling capacitors and hope for a sharp cutoff without a significant hump at the knee. The other way involves the use of high-

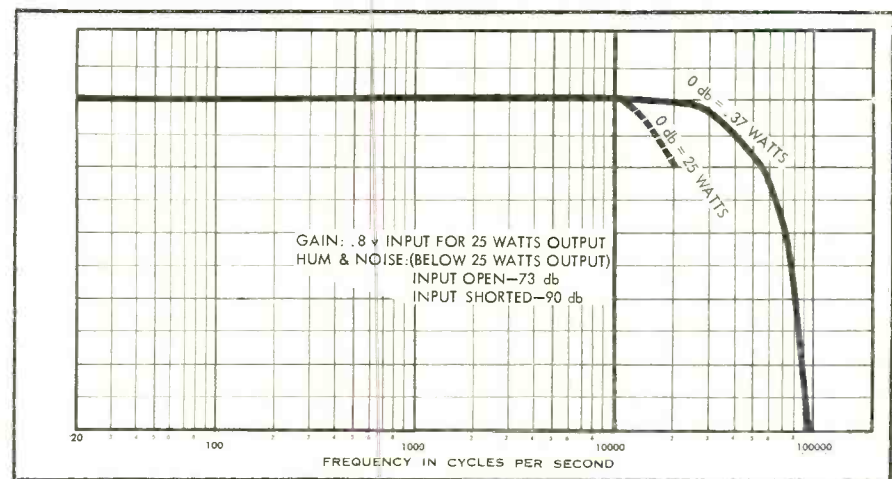


Fig. 4. Frequency response.

value capacitors, using them to extend the low-frequency response below that of the output transformer. We chose the second alternative, because the first presents phase-shift problems which make it somewhat unpredictable. If you want to reduce bass response, perhaps to protect a delicate speaker, put a capacitor before the input grid resistor. By no means tamper with the values inside the feedback loop, or the amplifier may go wild in the subsonic region.

Although Genelex quite clearly recom-

mends separate cathode resistors for the output tubes, we used a common resistor, mainly because we are using a matched pair of tubes. The control grid and screen damping resistors are the values recommended by Genelex.

Construction

Use a very large chassis for the amplifier; the coupling capacitors and electrolytics take up a great deal of room under the chassis, and Genelex recommends a minimum of four inches between the KT88's.

Standard construction practice (isolated ground, twisted filament leads, etc.) will help in achieving the potential of the circuit. There are however, a couple of things worth remembering. First, a word of caution in reference to the filament windings. When we first turned on the amplifier, it immediately blew the fuse. After a bit of head scratching, we tried reversing the leads of one of the windings. This cured the trouble; they had been bucking. Color coding won't help you here; trial and error is the only way to insure correct phasing. Secondly, several electrolytics are tubulars instead of the common chassis-mounted cans. Therefore, if you're unfamiliar with this type of work, it pays to take a little extra time looking for hidden shorts under the chassis. Finally, before connecting the feedback loop permanently, check by soldering only one side and, with a signal going through the amplifier, touch the other side quickly. If the sound goes down in volume, well and good; if it makes a loud buzzing sound, reverse the leads from the output transformer to the KT88's. Then attach a load to the amplifier and use a signal generator to feed into the amplifier a 1000 cps signal which is loud enough to be heard. Then adjust the balance control for equal signals at the plates of the KT88's.² With this taken care of, solder
(Continued on page 59)

² Better yet; if you have the equipment, connect the feedback loop and adjust the balance control for lowest IM at about 2 watts.

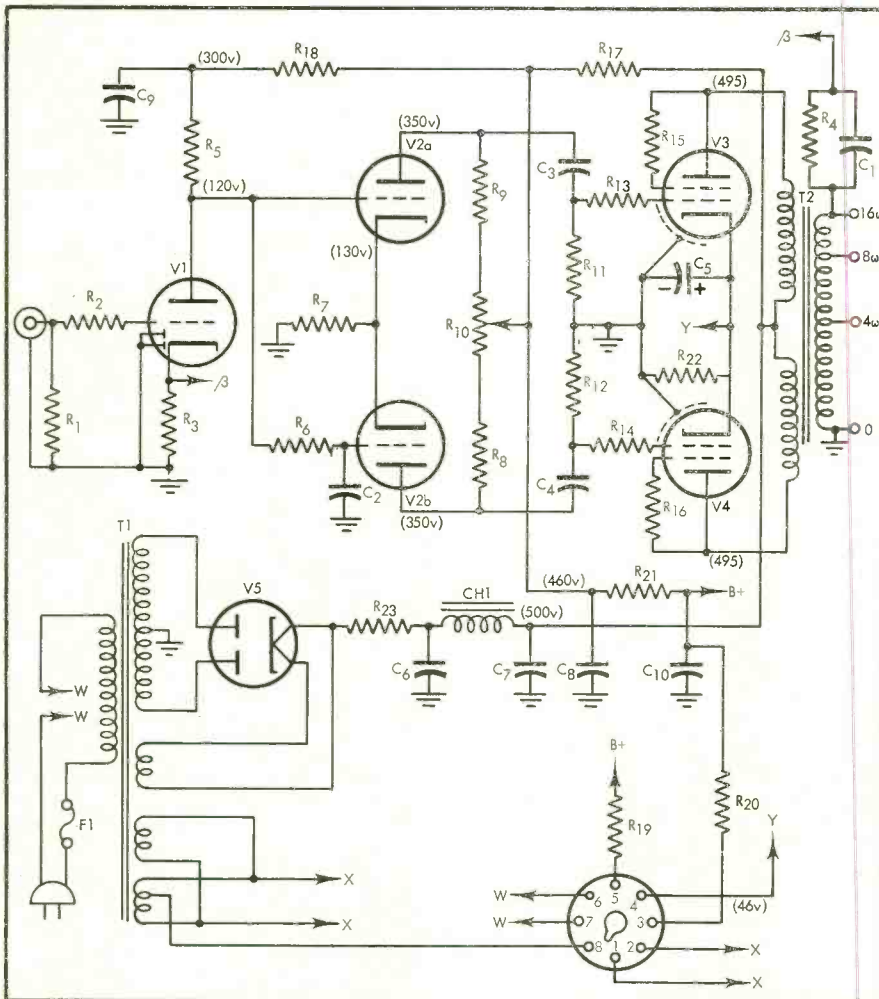
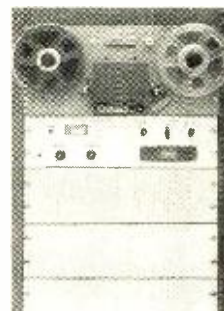


Fig. 3. Schematic diagram of 25-watt amplifier.

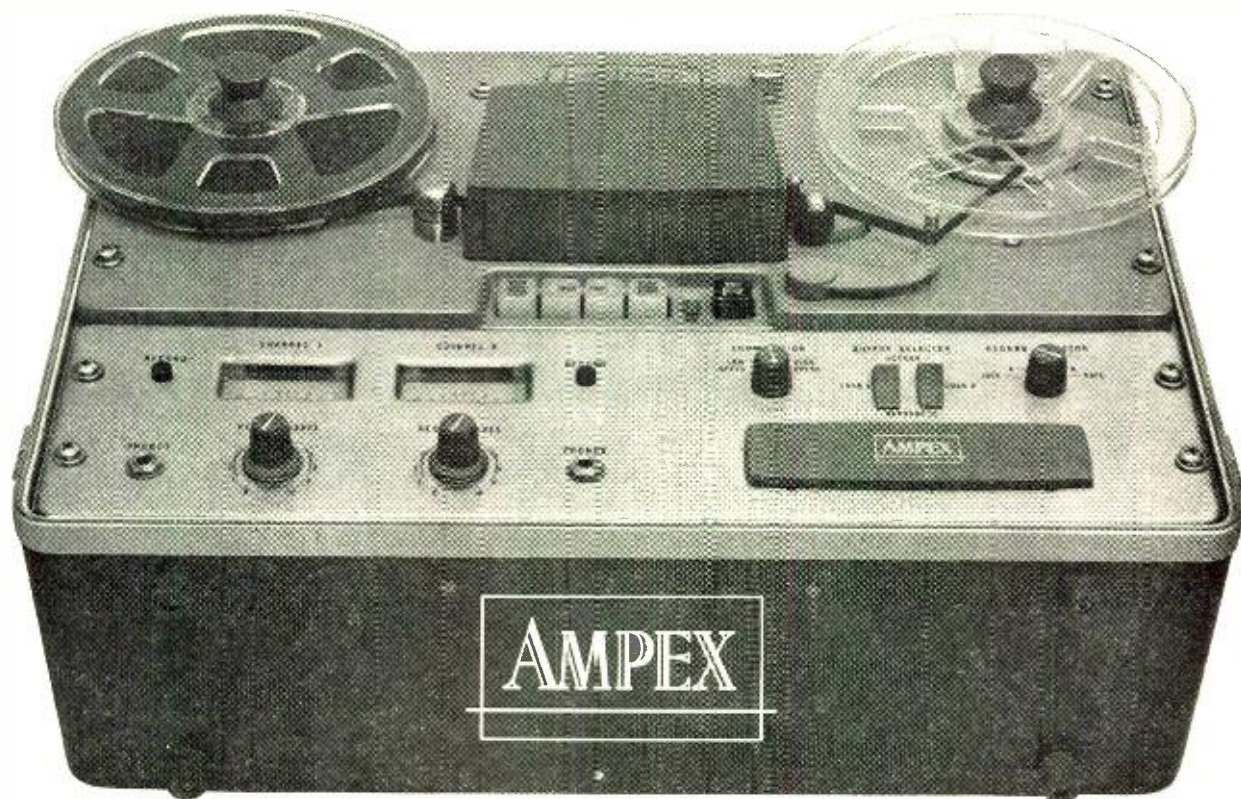
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FEATURES AND ESSENTIAL DATA PR-10-1 Monophonic model (\$845) available full track or half track—PR-10-2 Stereo/Monophonic model (\$945) records and plays stereophonic, monophonic, sound-on sound, cue track, selective track and two-microphone sound • Pushbutton controls of professional relay/so.enoid type • Full remote control provisions and accessory remote unit • New automatic 2-second threading accessory, optional • All new compact electronics • Professional monitoring includes A-B switches, VU meters, and 600 ohm output circuits • Separate erase, record and play heads on individual mounts • Open fourth head position for optional 4-track or other playback head • Two speeds: 15 and 7½ ips or 7½ and 3¾ ips • Hysteresis synchronous motor • Proved electrodynamic clutch system for lowest flutter ever in a portable/compact recorder • Plug-in modules for flexibility of equalization and input characteristics • Portable or rack mount • Dimensions for both models: 19" w by 14" h permitting easy replacement of many older rack recorders • Associated equipment includes a four-position stereo/mono mixer (MX-10) and a new 40 watt speaker-amplifier system (SA-10).



PR-10



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Patent Applications and the Taint of Public Use

ALBERT WOODRUFF GRAY*

Be careful about who uses your invention before you apply for a patent on it!

IN CONSIDERING THE PRODUCTION of magnetic oxide tape as a recording medium the Minnesota Mining & Manufacturing Company suggested to the Armour Research Foundation that it might be interested in products of this character. The response to this suggestion was that Armour had succeeded in manufacturing tapes evidencing a higher coercive force than those submitted by the Minnesota company.

At the request of that company Armour submitted samples of its tape and later ten pounds of oxides that had been used as coating. Armour had also, a few months before, supplied some of this oxide to the Du Pont company.

Later when suit was brought by the Armour Research Foundation against the C. K. Williams Company charging infringement of the patent issued on this coating, the defense was made that the patent of these oxides was invalid and the invention in public use for more than a year prior to the filing of the patent application.

Under the patent law, "A person shall be entitled to a patent unless the invention * * * was in public use or on sale in this country more than one year prior to the date of the application for patent in the United States."

Application for the patent on which this suit was based had been filed on July 25, 1947. These donations of magnetic oxides to the Minnesota and the Du Pont Companies had been made in April and June of the preceding year.

As authority for holding the Armour patent invalid under these circumstances and as a consequence no grounds for this infringement suit, the court rested its conclusion on an old decision by the United States Supreme Court.

In 1855 a Samuel Barnes had invented an improved spring for use in women's corsets and eleven years later secured a patent on this invention. However, after he had perfected his invention he had given a woman who later became his wife, and a friend of hers, each a pair

of these corset springs. When later suit was brought for an infringement of this patent the public use of the invention before the application for the patent destroyed the validity of the patent that was later issued this inventor.

"To constitute the public use of an invention it is not necessary that more than one of the patented articles should be publicly used," said the court in this decision. "The use of a great number may tend to strengthen the proof, but one definite case of such use is just as effectual to annul the patent as many.

"We remark secondly," continued the court in that decision, "that whether the use of an invention is public or private does not necessarily depend upon the number of persons to whom its use has been known. If an inventor, having made his device, gives or sells it to another, to be used by the donee or vendee, without limitation or restriction, or injunction or secrecy, and it is so used, such use is public even though the use and knowledge of the use may be confined to one person."

Only a few months ago a situation such as the court referred to in this old decision, in which the use of the patented device by only one person was sufficient to bring the patent within this provision and invalidate it for public use, was before a Federal court in New York. Involved in this action was a windshield wiper blade that had apparently been offered to various prospective customers prior to the application for a patent.

In its decision here the court followed clearly the law as it was laid down long ago by the Supreme Court, that but one incident may constitute the public use by which the inventor forfeits his right to a patent.

"It is sufficient under the law," said the court in this recent instance, "to establish either prior knowledge or prior use alone. The cases also make it clear that to constitute a public use only one specimen of the article need be used,

and that used by one person alone is sufficient."²

A few months later this decision was followed by another that while involving very similar circumstances, emphasized an important exception to this rule. When the use is incidental to experimental work in relation to the invention this provision of the law does not operate to forfeit the right to a patent.

Here the invention was a shim, a thin metal plate inserted between an engine bearing and bearing holder to compensate for wear occurring in the bearing and so reduce oil consumption. By the inventor a set of these shims had been installed for experiment, in a five year old car. Three years later the car was sold and the shims forgotten.

The automobile passed through the hands of several owners and four years after the sale of the car the inventor applied for a patent on these shims. The application was denied on the ground that the invention had been in public use. On the appeal to the Federal court the issuance of a patent for these shims was authorized.

In ordering the patent office to issue the patent the court said, "The courts have engrafted onto the statute an exception, to the effect that public use does not bar a patent where that use was incidental to experiment. In order to understand the reason for the extremely broad construction of 'public use' and the judicial exception read into seemingly statutory words, it is necessary to examine the policy involved.

"The cases seem to be hospitable to the inventor during the experimental stage of his invention, but become disposed to construe the law against him thereafter." This the court supplemented with a further comment, "On the other hand the law always recognizes that the inventor may wish to perfect his idea before applying for a patent and indeed it is in the public interest that he

(Continued on page 65)

* 112-20 Seventy Second Drive, Forest Hills, N.Y.

¹ Egbert v. Lippmann, 104 U.S. 333, October, 1881.

² Anderson Company v. Trico Products Co., 162 F.S. 224, January 17, 1958.



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LINEAR-EFFICIENCY SYSTEMS



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Aristocrat of bookshelf-size speaker systems, the JBL Ranger-Minigon provides integrated stereo through radial refraction, the same patented method used in the fabulous JBL Ranger-Paragon. Minigons accommodate either LE8 full-range units or JBL Model S5 two-way systems. Grille may be either the unique louver assembly shown here or fabric.



THE MADISON



THE DALE

THE JBL MADISON

An exquisitely-styled minimum volume enclosure, the Madison reflects the Danish design influence and is especially popular in oiled teak or walnut finish. Finished four sides and front for vertical or horizontal placement. Takes the LE8 speaker or S5 system.

THE JBL DALE

A timeless, elegant, modern design with removable legs and hangers on back (also on Madison) for wall mounting. Finished four sides and front. All finishes and grille cloths available.

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THE LANCER 33

It is possible to offer typical JBL precision response, fine cabinet craftsmanship, and lasting-listening satisfaction at a lower price than ever before by making a simplified enclosure, longer production runs, limiting choice of finishes, using one grille, and providing somewhat less flexibility. The Lancer 33 is a ducted acoustical enclosure with an LE8 eight-inch, full range speaker. Lancer finishes are those most frequently asked for—tawny walnut, oiled walnut, dark mahogany, ebony, and pumice. Grille cloth is beige linen-weave.

THE LANCER 66

Similar in appearance to the 33, the Lancer 66 is a "buttoned-up" enclosure with a two-way, dividing network system with an LE 10 and new high frequency unit. Performance is remarkably smooth and transparent. Lancer speakers are factory installed.

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AUDIO ETC

(from page 14)

hurry, to borrow the editor's unit, but I found that the Boss had already built his reverb into his home system for keeps. It would take days to extricate it. His, I think, was a Sargent-Rayment, one realization of the Hammond base unit. So I turned to Fisher Radio; they were close at hand, and I have considerable respect for the Fisher approach to any problem of control circuitry, as in the added electronics that must go with the Hammond unit. I figured my chances of success would be pretty good with their equipment. (The chances *had* to be good—I couldn't wait, though I am quite aware that other Hammond-type reverb units are worthy of consideration too.)

Show

That was a Wednesday. I was to pick up the Fisher K-10 reverb on Friday morning, allowing time for checking out; it would go to Connecticut with me, 100 miles away, for the taping and editing in my home studio, the rehearsal tape to be played on a portable machine and copied, plus reverb, on my Ampex 350, the stationary recorder. (My voice goes in via mixer on another channel.) All simple enough; but I had to get the show done and back 100 miles to the city by Sunday noon, for broadcast.

Well, that Thursday New York had a li'l snow storm. A mere 10 inches. Friday morning the town was shut tight. Fisher's Manhattan phone didn't answer. The plant, off in the industrial suburbs, said my contact man was snowed in and would not appear that day. The radio said, "Don't drive unless absolutely necessary." And I *had* to get out of town by mid-afternoon.

Yes, New York (*sic*) had been hit by a blizzard. All storms in the area "hit" the big city like a bullseye, and never mind the seven or eight hundred miles of surrounding territory. Reading the papers, you might think the snow never got ten miles out of Manhattan itself. It never does, by local account.

At noon that day Fisher was still out cold, but at two I roused the phone, from a freezing subway station, and lo!—in another half hour I had my reverb unit, freshly rushed in from the plant, which happens to sit on top of a subway station. I was off in a swirl of road salt and slush.

It seemed that the suburbs were also hit. Indeed, the further I went, the higher grew the banks of snow on the side of the road. I got to my driveway well after dark, at two below zero, found my road ploughed only a hundred feet or so, leaving three hundred feet in virgin white; so I blithely started to walk in, reverb in hand. I had not gone five feet before I abandoned the K-10, in its small suitcase, and bent all my energies towards self-preservation. I was up to my shoulders, and there wasn't a soul within a quarter mile to help me.

It took me twenty minutes to flounder halfway up my short hill, and more time to get to safety. Incredible! Worst storm in a half century. Next morning, at five below, I got out my skis and sluffed out a ski path down the hill to the lonely little suitcase in its drift, then on to the car; it took me most of the morning to get tapes, reverb and the "portable" tape recorder up the hill and into the house, in easy stages. To hoist the heavy recorder, I draped an old seat cover over my head and set the weighty thing down on it for awhile each time I ran out of breath. And

so I finally got the whole collection of incongruous electronics indoors and ready to go to work. When I plugged in the frigid recorder it wuld not even turn, but after a half hour it warmed up enough to play. The portable "church" for the choir to sing in, the reverb unit, was OK in its cardboard carton. I was in business.

It was odd, seeing that brand new Hammond-type reverb unit sitting lonely in the middle of a large expanse of rural snow-drift, deserted. But oddly enough, Mr. Hammond, *the* Hammond of Hammond Organ, lives not five miles away and might even have stumbled upon it himself. Don't suppose he'd be a bit surprised. End of my snow saga.

The Portable Church

It only remains to tell you what happened with the reverb. It worked beautifully and the broadcast was fine, as witnessed by some of the astonished singers who heard themselves singing where they clearly had never been. The music was ideally suited to the reverb process, both in its need for a church-like resonance and in the complexity of its 150-voice texture. The front-row ladies were heard ever so nicely blurred, at an apparent fifty or sixty feet, their assorted wobbles merged together. The conductor's heavy stamping, to mark an occasional rhythm, sounded like a battery of tympani in a far corner of the edifice. One singer who had actually been present asked me how I had got those drums into the recording.

I didn't have to worry about the conductor's speaking voice. He had laryngitis. My own voice was unreverbed, of course, via my mixer mike channel. All in all, the music was a technological success, especially since I was forced to use the reverb sound at full top level, without any assist from natural liveness. In most normal use, the unit can be run at considerably lower levels, for a more natural enhancement.

The broadcast was produced deliberately without an explanation of the artificial reverberation (except for a cryptic reference to my "portable church") until almost the end; the entire emphasis was on the music itself and on the rehearsal, thereby allowing the artificial reverb to have full freedom, impressing itself on the listeners in the musically correct manner as the incidental sound of a large and reverberant hall. The explanation, when it came, was after the fact and the more dramatic for it.

The Natural Background

There are always unexpected things to be learned in an operation of this sort. My discovery, this time, had to do with the nature of musical reverberation as we listen, not to the reverb, but to the music itself.

The sound of liveness is essential in most music, and music minus reverberation is like oatmeal without salt. But at the same time, paradoxically, reverberation belongs in the background, as an unconscious sound. It is normally not an active part of conscious listening.

You hear music, and you "hear" a room; but you listen to the actual sound of reverb *only when it is forced upon you*, by exaggeration, by a serious lack, or by poor quality. It is heard most negatively when its character is most positive.

Therefore, artificial reverb, in order to seem natural, must be applied as a background, i.e., in a manner that will not attract sudden attention. Above all it must, to be natural, remain steady; for the ear

will not accept a sudden liveness change in terms of imagined space.

Change the liveness—turn the reverb volume control—and your ear immediately hears active reverb, not passive background. Just as quickly, the ear loses its sense of a space and hears, instead, just an echo, blurred. The whole spatial illusion is shattered!

I'm not referring here to the undoubted stunts of reverbed sound that can be done with the Hammond-type unit as well as with more flexible professional equipment. They are effective and often quite legitimate as new sounds, for color, drama, variety. You may produce these sounds to taste, just as you may foul up any number of your best recordings with great globs of erratically applied reverb. Cream again, whipped. It's yours if you want it.

The point here is simply that though reverb tricks may be novel and interesting, they are not "natural" because they are conscious, active, where musical reverberation, whether fake or real, must be steady, consistent, unobtrusive. Thus I found that the instant I turned the Fisher reverb control on and off a couple of times while music was being heard, my large church disappeared. Instead, you heard merely the reverb itself, in all its artificiality. A delicate illusion! For comparison, I did just that on the air, switched the reverb in and out of the broadcast a couple of times. It was astonishing how a hitherto pleasing and natural background turned into a spaceless sound-stunt.

The somewhat over-simplified reverb sound is indeed rather artificial when you hear it for itself, though it is entirely acceptable as a steady-state background. On simple material, single voices, loud taps, creaks, bangs, the Hammond shows up its springiness quite clearly, or did in my unit—a sort of metallic twang, faint but clearly audible in the decaying sound once you notice it. No natural reverb could sound quite like that. Door springs—you can recognize them.

Nervous Shakes

Some of this was clearly due to resonance, an audible pitch like white noise with a slight peak. (There was some tube hiss in the reverbed sound, too, at full volume.) More was due to a visible sidewise shaking of the springs in the unmounted unit, clearly noticeable at the slightest disturbance of the basic chassis. This produced a burble, a slight brrrr at perhaps ten cycles or less as the springs shook back and forth. In full musical passages it was of course inaudible. But in simpler reverbed sounds it was often apparent.

True, the unit should be permanently mounted, whereas I merely rested it on some crumpled cloths. I had no time for mounting. But I suspect that even in a solid mount those springs are going to keep shaking sidewise at every tremor of walls, floor, furniture. They can't help it. I should guess that a selective lateral damping might be hard to design as well as expensive. I hope I'm wrong. I tried to damp out the shakes with a light finger, but even the slightest touch removed about half of the reverb itself. That's the problem.

I noted too that the reverbed signal is not exactly a hi-fi image of the original. One engineer listener spoke of distortion in the reverbed music. Technically he is right; but I must point out that *all* reverberation is "distorted" in frequency response. The nature of confused room reflection is to be variably nonlinear. Some patterns of absorption, as with soft plaster and old wood, produce musically highly de-

(Continued on page 58)

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The Sony-developed gold membrane in the **C-37A Condenser Microphone** is another example of Sony superiority.

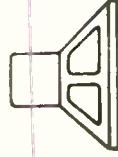
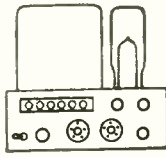
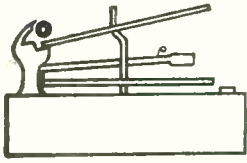
The **262-SL** sound-with-sound tape recorder at \$199.50, the **262-D** four track stereo recording and playback tape transport at \$89.50, the **101** transistorized dual track monophonic recorder at \$99.50, and the many other Sony/Superscope products are all remarkable achievements; the inevitable results of Sony/Superscope's commitment to engineering perfection.

For literature, or the name of your nearest franchised dealer, write: **Superscope, Inc., Dept. 2, Sun Valley, California.**

SONY SUPERSCOPE The Tapeway to Stereo

SUPERSCOPE INC., SUN VALLEY, CALIFORNIA

EQUIPMENT



PROFILE

PACO AM-FM STEREO TUNER KIT

Some time last year PACO entered the kit sweepstakes with a stereo amplifier kit, the model SA-40. It was, and is a fine amplifier. Subsequently, an AM-FM stereo tuner kit was released to complement the amplifier. That tuner, the model ST-45, has much to recommend it to the audio-fan. It is a sensitive, low distortion, AM-FM tuner. And at a very attractive price.

The AM and FM sections of the ST-45 use separate printed-circuit boards, which make it relatively easy to construct and increase the possibility of succeeding in achieving a result comparable with the factory product. We all know that FM tuner kits are notoriously tricky for the inexperienced. Variations in wire-length and placement are likely to produce a variety of unexpected and undesirable results. These difficulties are avoided when printed-circuit-boards are used. To make construction even easier, PACO has a version of this kit wherein almost all of the tedious work of mounting components on chassis and printed-board has been done. This version, model ST-45PA, is the one we built. Frankly, we chose the easier version because we are long-time exponents of the "less work, more listening" school. Indeed the eleven-and-some hours it took us represents a saving of at least five hours and possibly more. Of course, there is also the problem of increased cost; the ST-45 PA costs \$15.00 more. However an added bonus for the extra cost is the fact that the front-ends of both the FM and AM tuners are pre-aligned. (Well—it did require some touching up, but more about this later.)

Circuit Description

The AM section of the ST-45 consists of an r.f. amplifier stage utilizing a 6BA6, a 6BE6 converter stage, a 6BA6 i.f., a crystal-diode detector, and a cathode-follower output consisting of one section of a 12AU7.

A built-in loopstick antenna receives the signal, although an external antenna may be used if sensitivity is insufficient. The secondary of the loopstick is tuned by one section of the AM tuning-capacitor gang and the signal fed to the grid of the r.f. amplifier tube. The r.f. amplifier is transformer-coupled to the converter, with the transformer secondary tuned by another section of the AM tuning capacitor gang. The use of a tuned r.f. amplifier stage usually provides excellent sensitivity and selectivity. It does in this case.

The oscillator section of the 6BE6 is tuned by the third section of the AM

tuning capacitor across an oscillator coil, to oscillate at 455 kc above the signal frequency. The two signals are then combined and the resultant i.f. signal (455 kc) amplified. After being detected, the audio output is then available through the cathode-follower output stage. The output of the cathode follower is filtered through a "whistle filter" to eliminate the 10,000-cps beat signal which occurs between two adjacent strong, AM stations.

The FM section consists of a ECC85/6AQ8 r.f. amplifier stage, a ECC85/6AQ8 mixer stage, two 6BA6 i.f. amplifier stages, two 6AU6 limiter stages, and a 6AL5 discriminator.

The signal from the antenna is fed to the r.f. amplifier which operates as a grounded-grid amplifier. One section of a 6BK7B is used as the FM oscillator. After being mixed, the signal is amplified in two i.f. stages as well as in the two limiter stages. These two stages are in reality i.f. amplifier stages which limit amplitude modulation because of the low plate and screen voltage on the tubes. From the limiters the signal is fed to the discriminator and from there, through a de-emphasis network, to the cathode-follower audio output stage. The audio signal is also fed from the discriminator, without de-emphasis, to the multiplex adapter socket.

Performance

FM sensitivity of the ST-45PA is rated at 2 μ v for 30 db of quieting with harmonic distortion less than 1 per cent. This puts it into a fairly select class; not many FM tuner kits can boast of performance quite that good. Of course specifications can be somewhat misleading. It is not uncommon to hear an audiofan wonder why his statistically superior instrument sounds not quite as good as neighbor X's "just-

fair" equipment. For this reason we lean heavily on listening tests in conjunction with measurements, depending upon the sensitive, trained ear to give us answers that we have not yet succeeded in obtaining from measuring instruments.

Anyhow, our ears tell us that the ST-45 is a low-distortion tuner. In addition, it pulled in all the stations in the Metropolitan New York area, which is all we could desire of it. During the FM testing we used a dipole we made from twin-lead. With this makeshift antenna we pulled in all the local FM stations. Subsequently, we hooked up the tuner to our large TACO multi-bay antenna and pulled in stations up to 75 miles away.

Using the built-in ferrite antenna, AM sensitivity compared well with other tuners. In our location we have always had difficulty in receiving some Metropolitan New York stations; but with the PACO tuner we were able to hear them all loud and clear. It should be noted that we reside some 35 miles from New York City.

Alignment

Previously we mentioned that the ST-45PA required some alignment even though it had been pre-aligned at the factory. This may seem to be a contradiction, but in reality it is quite simple and aboveboard. Slight variations in tubes could, and probably do, account for the tiny amount of touch up that almost all pre-aligned kits require.

Procedurally, alignment is relatively simple utilizing the tuning eye on the front panel. Instructions are also provided for those fortunate enough to possess an FM signal generator and either an oscilloscope or a v.t.v.m. In fact, this manual contains the most complete set of alignment instructions we have seen to date. It encompasses some seven pages of detailed instructions.

Construction

The ST-45PA is extremely easy to construct—as we noted before it took us a little over 11 hours, which amounts to a few pleasurable evenings. Considering the fact that this is both an AM and FM tuner, 11 hours is a very short period of time.

The instruction manual is clear and easy to understand. In some ways the manual is the keystone of a tuner kit; a manual which is illogical and hard to understand will prevent all but the most experienced audiofans from achieving success. With the PACO manual, however, even a novice may succeed.

In summation, therefore the PACO ST-45PA AM-FM stereo tuner kit is a good tuner which is easy to build. An ideal answer to those with a modest budget.

C-22

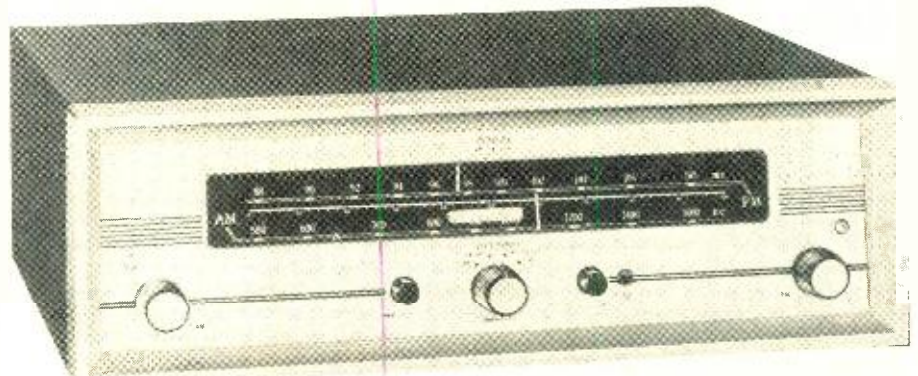


Fig. 1. Front view of the PACO model ST-45PA AM-FM stereo tuner kit.

High Fidelity's Ultimate Standard:

ILLUSTRATION

The term *high fidelity* has been used so freely that its literal meaning is often forgotten. It does not refer to over-loud, over-resonant, over-brilliant sound, but to the faithful recreation of a musical performance.

The ultimate test of a high fidelity system, then, is a direct comparison with the sound of the original instruments.



The moment of transition from live to recorded sound: AR-3 speakers and Dynakit amplifiers take over from the Fine Arts Quartet.

Such a comparison was made during the recent hi-fi show in New York City, when AR speakers and Dynakit amplifiers vied with the Fine Arts Quartet in a "live vs. recorded" concert. At intervals the Quartet stopped playing and allowed the hi-fi system to take over, using pre-recorded sections of the music, without missing a beat.

McProud, editor of *Audio*, reported: "We must admit that we couldn't tell when it was live and when it wasn't." The *Herald Tribune* referred to "awesome fidelity". Record reviewer Canby wrote: "My eyes told me one thing, my ears another." Freas, audio editor of *High Fidelity*, wrote: "Few could separate the live from the recorded portions."

After all of the trade jargon and esoteric talk heard at hi-fi shows, this was the real thing.

DYNACO, DYNAKIT, AR-3, AND STEREO PREAMP AND ACQUA TONE RESONANCE SPEAKERS, components designed for the home, created the illusion. Although these components are medium priced,* they are widely regarded as representing the highest quality that the present state of the art makes possible.

Further information on these products, including a list of high fidelity dealers in your area who carry and demonstrate them, is available for the asking.

*A complete high fidelity record playing system using the above components would cost about \$750. You may hear AR speakers and Dynakit amplifiers together (in these and other, less expensive models) at AR Music Rooms, on the west balcony of Grand Central Terminal in New York City, and at 52 Brattle Street in Cambridge, Massachusetts.

ACOUSTIC RESEARCH, INC., 24 Thorndike Street, Cambridge 41, Massachusetts
DYNACO, INC., 3912 Powelton Avenue, Philadelphia 4, Pennsylvania

NESHAMINY JanKit 41 SPEAKER SYSTEM KIT

Normally, when we think about kits, we envisage a conglomeration of parts, large and small, which require varying amounts of time and skill to assemble. If that is the picture you have in mind, you will be surprised when you unpack the JanKit 41; it is not a kit in that sense of the word. Instead it is complete speaker system, mounted on a baffle board, ready to be installed in a cabinet, enclosure, or wall. After reflecting about this for a bit, we decided that the idea is fine; it permits the user great flexibility in selecting the housing for his speaker system. It may even be built in to existing cabinets. And it meets the true test of a kit—it saves money.

The JanKit 41 combines a pair of Jans-Zen electrostatic elements with a specially designed 11-inch woofer. The electrostatic elements handle the mid- and high-range while the cone-type woofer handles frequencies below 1000 cps. In reality, the crossover region is very broad, 1000–2000 cps, in order to provide better blending of the woofer to the electrostatics. This, of course, highlights the problems involved in hybrid speaker units of this kind; electrostatic units differ considerably in efficiency and sound character from cone speakers.

The 11-inch woofer is a Neshaminy model 350 and is designed to retain full efficiency in enclosures as small as 2 cubic feet. It has a low-mass cone which is weighted at the apex to provide smooth rolloff above 2000 cps. The plastic-treated cloth surround permits excursions up to $\frac{3}{8}$ -inch. The cone is controlled by a $3\frac{1}{4}$ -lb. magnet.

Each of the 2-element mid- and high-range electrostatics consists of 176 sheathed conductors. Mounted in opposing arrays, these conductors provide force to move the sensitive diaphragm with the same amplitude and phase over its entire area. Both elements are matched for output within 1 db.

Performance

The JanKit 41 produces clean, well-bal-

anced sound which does not intrude upon the music as do many speaker systems. It is the type of system which makes one forget that it is reproducing music; instead it permits an increased awareness of the performance. Frankly this is an unexpected pleasure. We had been prepared for the characteristic electrostatic sound, especially on heavy passages. This sound has been described variously as tinny, thin, and so on. In all fairness, it should be stated that only *some* electrostatic systems sound that way, just as there are poor cone-type speaker systems.

In any case, the JanKit 41 does *not* sound that way. In spite of the fact that our testing setup did not achieve all the bass of which the system is capable. For most of the listening it was "jury-rigged" in a less-than-ideal location. Certainly bass production could have been improved by carefully sealing the woofer in its enclosure and stuffing the cavity with Fiberglas as the instructions recommend.

Construction

It is customary, when reviewing kits, to describe how well, or badly, the unit goes together. In this case we must change the procedure and describe instead the installation instructions and aids provided.

The JanKit 41 can be mounted from either the front or rear of an enclosure, in either case the cutout is precisely the same in size. The difference is that for front mounting, the mounting board must be set back further from the front of the box in order to accommodate the thickness of the baffle board. Another possible variation is to remove the electrostatic units and the woofer from the board and mount them separately, locating the electrostatic speaker to suit your acoustic requirements. Only the woofer requires a sealed enclosure.

In addition to installation instructions, the kit comes with mounting hardware for the baffle board, and sealing compound to prevent air leaks.

In summation, the JanKit 41 is a natural-sounding speaker system which offers great flexibility of installation. A good buy for the do-it-yourself audiofan. C-23



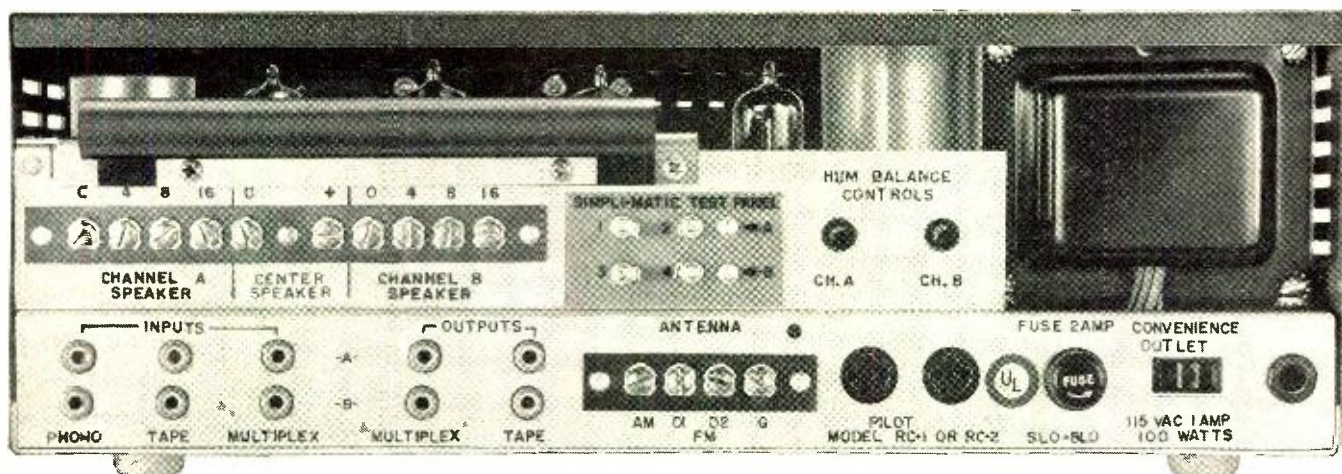
LAFAYETTE RK-120 MINIATURE TAPE RECORDER

Small, transistorized tape recorders are fairly common by now but this unit, priced at around \$80, is attractive, efficient, and a good performer. It is beautifully built and looks easily twice its price. Measuring only $7\frac{3}{4} \times 5\frac{3}{4} \times 2\frac{1}{2}$ in., it records and plays at two speeds— $3\frac{3}{4} \times 1\frac{1}{2}$ ips—and rewinds, all under the control of one lever. A half-track machine, playing time with its 3-in. reels is 34 and 68 minutes respectively with normal tape, 51 and 102 minutes with longplay. It operates from six "Z" cells, and at the record or play current drain of 40–50 ma, battery life is around 25 hours for intermittent use. Rewind current is about 150 ma. Five transistors and one thermistor serve as the electronic section, and a 2-in. loudspeaker is built into the case. A meter indicates battery voltage when playing or rewinding, and serves as a volume indicator during recording. Jacks are provided for microphone or radio inputs and for earphone monitor, and receptacles are provided for input in the a.c. power supply and foot-switch accessories. Also available as accessories are a telephone pickup coil and a radio connecting cord with plug and clips. Earphone, dynamic microphone and desk stand, and carrying case which provides access to all controls are all furnished with the basic recorder.

While we cannot consider this machine as "high fidelity," it does have excellent quality on reproduction of music on tapes recorded on normal machines within the limits of the size of the loudspeaker. This is probably due to the use of d.c. bias and erase on material recorded directly on the machine. However, for any practical use to which a miniature machine is likely to be put—such as an "aural notebook" or for conference or telephone recording (illegal, but still done for reference purposes)—it is ideal, and we have had made considerable use of the recorder for just these purposes. One accessory we would like to see is an adapter for use with 12-volt automobile batteries for easy use in a car, thus saving the internal batteries. Voice quality, even at $1\frac{1}{2}$ ips, is completely understandable with respect to tone and timbre, and individuals are readily recognized. For this type of application, we feel that anyone who has occasion to use a recorder would be completely satisfied. C-24



Fig. 2. JanKit 41 speaker system kit ready to be installed in user's cabinet



WHAT'S BEHIND THE EXTRAORDINARY PERFORMANCE OF THE PILOT 602 RECEIVER?

COMPACTNESS... The rear panel of Pilot's new 602 stereo receiver is an impressive concentration of inputs, outputs and terminals. It reveals the ingenious use of space that makes this the most compact all-in-one stereo instrument available. Imagine a stereo FM-AM tuner, a stereo preamplifier, and a 30 watt stereo power amplifier all on a single chassis no larger than most tuners!

COOL RUNNING... Pilot engineers have paid meticulous attention to circuitry and design, making possible the close proximity of component elements . . . tuner, preamplifier, and dual channel amplifier . . . without excessive heat generation. This makes the 602 ideally suited for wall, cabinet or bookshelf installations. Or, in its own enclosure, it makes a handsome tabletop unit.

DEPENDABILITY... Many thousands of audiophiles all over the country now using the 602 report completely trouble-free performance. This functionally versatile unit has been approved by Underwriters Laboratories and may be used in custom installations with complete confidence. Simply connect speakers and record changer for a complete, flexible stereo system. Play AM or FM broadcasts alone or simultaneously for stereocasts. Pilot's exclusive Stereo-Plus Curtain-of-Sound center channel signal allows you to add a third speaker to eliminate the "hole-in-the-middle." The Pilot 602 stereo receiver costs only \$249.50. Write today for full specifications.

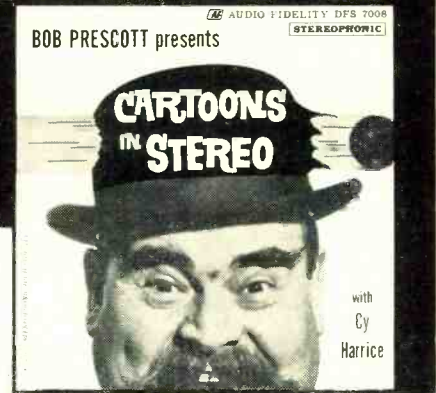
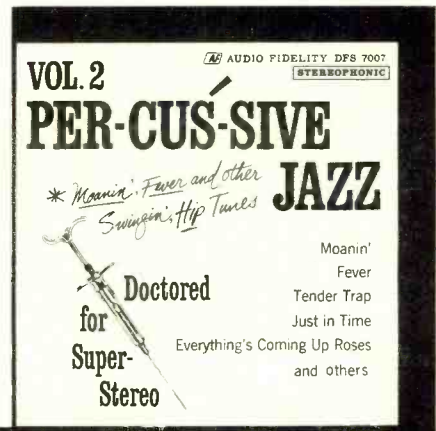
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You will proclaim the new Audio Fidelity Percussive Jazz albums the greatest examples of engineering sound reproduction skill you have ever heard on any label!



PERCUSSIVE JAZZ, Vol. 2... The thrilling ricochet sound in the swinging, modern jazz idiom. Specifically designed to highlight ultimate stereo "directionality," maximum signal, balance, and definition. Outstanding arrangements by Sid Cooper. Better than anything else you have heard in percussive high fidelity!
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AUDIO FIDELITY® NEW RELEASES!



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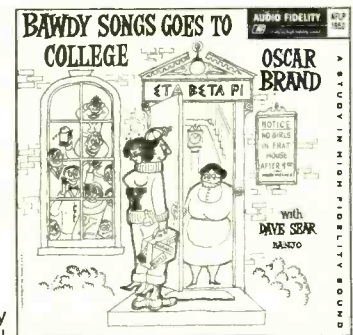
THIS IS THE
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The strobe pattern on the record label when viewed under a 60 cycle neon or fluorescent light source should remain in position if the turntable speed is correct. If there is a marked "walking" of the stroboscopic pattern the turntable is off speed.

TO CHECK YOUR TURNTABLE SPEED

At last, more Bawdy Songs by Oscar Brand on a campus kick! Youth will be served Frat house favorites with a spicy flavor.

CARTOONS IN STEREO—DFS 7008
CARTOONS IN SOUND—DFM 3008
Bob Prescott, long-time peer of the professional sound effects men, gives his talents full expression in a mad variety of comical sound situations. Aided by the many voices of Cy Harrice.



AFLP 1952/AFSD 5952



Selections include: Hava Nagila, Tzena, Tzena, Bei Mir Bist Du Shein, Roszhinkes Mit Mandlen.

AFLP 1950/AFSD 5950



Selections include: Milenberg Joys, Shine, Beale St. Blues, Deep River, Ain't Misbehavin', Moonglow.

AFLP 1927/AFSD 5927



Selections include: A Felicidade, Aquarela Do Brasil (Brazil), Bahia, Delicado, Apanheite Cavaquinho.

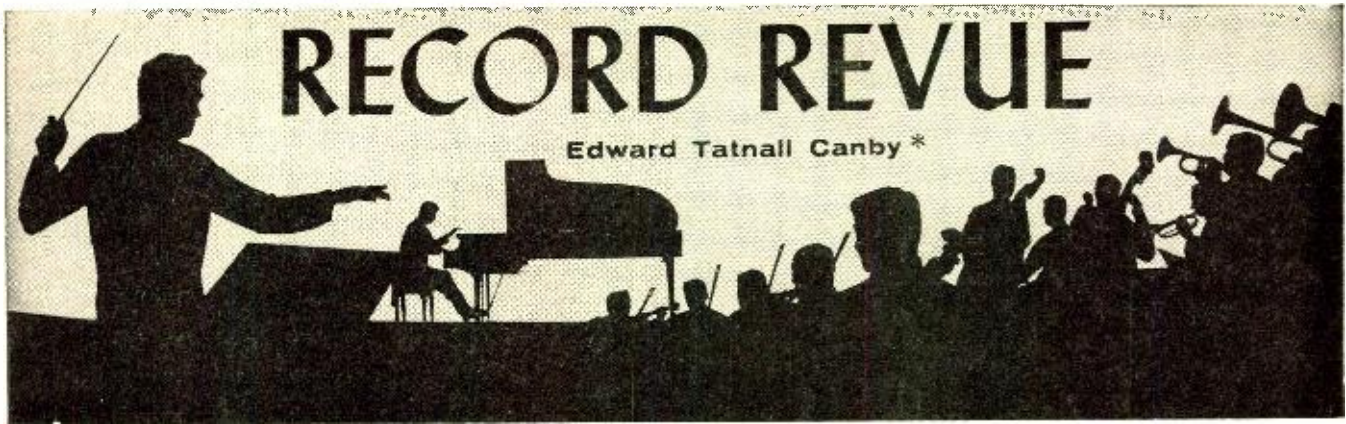
AFLP 1939/AFSD 5939



Selections include: American Patrol, Columbia, The Gem Of The Ocean & Dixie; Semper Fidelis; King Cotton;

AFLP 1908/AFSD 5908

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FOUR-TRACKERS

NOTE: It is not easy to know how best to deal with 4-track tape in respect to reviewing its actual contents—as opposed to its hi-fi characteristics. As of now, the contents are mostly the same as in the equivalent in disc form.

Quite rightly, a large part of the 4-track classical repertory is now catching up via tape reissue of already-released disc stereo recordings, often going back four or five years. Even the cover art is the same. (The "twin pack" tapes combine two LP's, sometimes splitting the cover art half and half.) Many of these items have already been reviewed in their disc form. Few are technically "new recordings," though plenty are first rate in all respects.

Our problem will solve itself automatically when stereo is released simultaneously in both tape and disc form. Meanwhile, here is a token survey to show that I'm by no means unsympathetic to the four-trackers—even if I do have more discs than I have space to cover.
—E.T.C.

Bruckner: Symphony #4 ("Romantic").
Bamberg Symphony, Hollreiser.

S M S ⊕ S41-A stereo

This was one of the earliest 4-track tapes I received (it was sponsored by the Tandberg people) and perhaps it is not surprising that there are a few whiskers in it, especially in the louder parts. My tape player is so new that I'm not ascribing *all* the whiskers to the tape; it could be the machine. But without a doubt, newer 4-track tapes are now considerably cleaner in sound. This one may have been greatly improved in subsequent "pressings."

It's a really lovely performance of the easiest Bruckner in the repertory, played by a knowing German orchestra under a literate and musical conductor, both of them familiar already in the LP disc repertory. This recording is not available on stereo disc. Could it be an unannounced Vox, a never-issued Urania, a tape that didn't happen to get as far as stereo disc release? Could be, since tapes of this sort are often bought up as bargains from among the thousands of tapes, dead or dormant, for technological or economic reasons, that now wait hopefully here and there around the world for an opportune rebirth. Many of them are good, too.

Anyhow, this is musically excellent, whiskers or no. I hate the thin (1 mil) tape itself, and broke this one ten seconds after I started it. Tried a too-quick reverse. But that's another matter. Just gotta be careful . . .

Stravinsky: The Firebird (complete ballet); Pulcinella Suite; Song of the Nightingale.
L'Orch. de la Suisse Romande, Ansermet.
London ⊕ LCK 80042 stereo

"This package contains the equivalent of two complete albums" says the box cover of this tape, and so it does; I have the very "albums" themselves right before me. Two LP stereo discs. They illustrate the sort of complication we're now running into in turning our attentions to 4-track tape.

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

I reviewed this "Firebird" in its disc form via one of my scouts back in the March 1959 issue of *AUDIO*. It was released late in 1958, part of the first big flood of London stereo discs. Right now, I still find it a good stereo disc, its main fault being excessive surface crackle. (Newer pressings are no doubt greatly improved.) But this disc in its turn was the stereo version of another and earlier mono disc, of 1955. It may even have been the same performance; or perhaps it was re-recorded for stereo mikes. I don't even remember whether I reviewed it the first time, back in 1955.

As for the other half, "Pulcinella" and "Song of the Nightingale" were jointly released just last year on a stereo disc, but again there was an earlier mono—as I remember, it used the same cover. Indeed, I based a WNYC broadcast on the mono "Nightingale" and ran that tape on the air again just this season. So we have a span of five years in this one box.

How best to treat such complications? If I'm not careful, most of our space will disappear into similar statistics.

Anyhow, to sum up this "Twin-Pak" anew, it is of top interest throughout and a happy musical combination. The complete "Firebird" is much to be desired, a surprisingly different and more modern-sounding work than the truncated and familiar Suite, which carefully omitted the once-radical parts of the score. This sounds like one of the revised versions, perhaps that of the late 1940's, with interesting changes of detail and added transitional material between sections.

"Pulcinella" is the Stravinsky rewrite of a collection of little Pergolesi works, out of the 18th century; it starts Pergolesi, grows gradually more and more "Stravinskyesque" in a jolly, brassy way as it progresses. A witty combination of modern and 18th century idiom with some superb instrumental sounds in it. "Song of the Nightingale" is the symphonic poem derived from Stravinsky's strange split opera, part composed before "Firebird," part done much later, after "Le Sacre." I like the opera itself better, but this is a colorful distillation of it, oddly oriental with weirdly hollow harmonies. These last two items are noticeably better in the hi-fi sound than the earlier "Firebird" tape.

R. Strauss: Rosenkavalier Suite. Graz Philharmonic, Cerney. **Dukas: Sorcerer's Apprentice.** Florence May Festival Orch., Gui. **Beethoven: Leonore Ov. No. 3.** Bizet: **Carmen Suite.** Mannheim Nat. Symph., Rosenstock. **Verdi: Overture "La Forza".** Graz Philh., Caridis. **Tchaikovsky: Symphony No. 6.** Sinfonia of London, Mathieson.

Livingston ⊕ 4T-100-1 stereo

For goodness sake! Here's another fine reviewer's problem in 4-track stereo. Talk about potpourris! A little bit of everything and a different orchestra, different conductor, for every piece—somebody must have been on a tape safari to bag all these outfits for a single release. "100 minutes of spectacular symphonic performance for only \$10.95!" I'll sample some of it, to see how spectacular the tape may be on the average:

Well, the Graz Philharmonic is a lively if

somewhat undersized minor Austrian orchestra, playing the Strauss music with very much the right spirit if with a somewhat uneven ensemble and a hint of the pops approach to it. A huge bass drum was discovered somewhere by the recording engineer. He put his mikes nearby. Nice, though not spectacular.

The Italian festival orchestra playing the familiar French piece about the apprentice and his broomsticks is a more accurate ensemble than Graz's, tuned up to a tighter discipline. Excellent brass and woodwind, the strings a bit thin. Accurate but not very passionate, I'd say. Just good minor-orchestra playing of a competent and professional sort . . .

The Mannheim orchestra, descendant of one of the very first orchestras in the modern sense, is heavier, more German—which is good for Beethoven. "Lenore" is thoroughly German here, decidedly right in its almost mystically Romantic feeling. (Just as well that Italian orchestra didn't try this piece.) If the style and feeling is very right, the playing is not top rank. Slight mishaps, out-of-tune notes, the ensemble not always exactly in time. Again, a good small-town orchestra, playing music it knows all about and really understands. Good! But not exactly spectacular.

That's plenty—you can get the drift. An interesting tape, neatly recorded, the varying minor orchestras well chosen to suit the music they play, nicely varied in temperament, the styling mostly excellent but the standard of playing definitely second string. I'd gladly go on, but there are so many other recordings to review . . . some of them really spectacular, at that.

Gershwin: Rhapsody in Blue; Cuban Overture. Eugene List; Eastman-Rochestra Orch., Hanson.

Mercury ⊕ STA 90138 stereo

A gorgeous hi-fi 4-tracker here, but with the sound on the dead side, as often *chez Mercury*. (On this one you could try a bit of home reverb with perhaps interesting results.) The deadness does not interfere with Mercury's very positive stereo projection. The orchestra again has that peculiar quality of suspended-in-space nearness; numerous instruments seem to hover before you at close range, yet at the same time they are a part of the obviously spread-out big orchestra. Peculiar, and interesting.

This is not the warmest Gershwin I've heard. The orchestra has the familiar business-like crispness of the Eastman approach, clean-cut and objective. Eugene List is all cold passion. I took an immediate dislike to his idea of Gershwin, who was just the opposite, all warm feeling. List has the finger technique, but his ear allows him to do sloppy little things, blurring good harmonies, overplaying the rubato, pounding furiously in the loud parts, instead of triumphantly. He seems to frown when he should smile, he plays Rachmaninoff when he should play jazz.

The Cuban overture is nice for being so seldom heard. Gershwin mixes most of the Latin America of 1932 into it, though in those times Latin American rhythms lived mostly South of the border and Fidel didn't mean anything in particular except just faithful.

Beethoven: Symphony No. 7. Symphony of the Air, Stokowski.

United Artists UATC 2215 stereo
(Disc: UA 8003)

I skipped over four brand new discs of the Beethoven Seventh, to play this tape by the old master himself, Leopold Stokowski. It was worth it.

Stokowski is surely the father of classical music on records in this country. To find him still active at this late date is really exciting for those of us who remember him a quarter century and more ago. He's uneven—he always was. He can be outrageously corny. But, in a work like this, he can be counted upon to rally up the old magic, proving his real conductorial leadership on the highest plane.

Some younger listeners will object to the schmaltzier moments here, though the rest of us will remember that this was the way it always sounded, back then. But the few overplayed spots, the numerous areas of less-than-perfect playing, are balanced by superb touches. Stokowski's own, reflecting a lifetime of experience in just this sort of music-making. Such marvelous control of tension, such plastic freedom at the crucial moments of sudden change, the climaxes of drama!

The Symphony of the Air, once a great or-

chestra, is merely so-so today. But throughout this recording you will feel the extra intensity and respect that Stokowski generates in these musicians. They are far from a top ranking ensemble, but here they are playing for all they are worth. It may not be a first rate performance but it is an absorbing one and full of vitality even so.

Villa-Lobos: Uirapuru; Modinha. Prokofieff: Cinderella. Stadium Symphony, Stokowski.

Everest STBR 3016 stereo

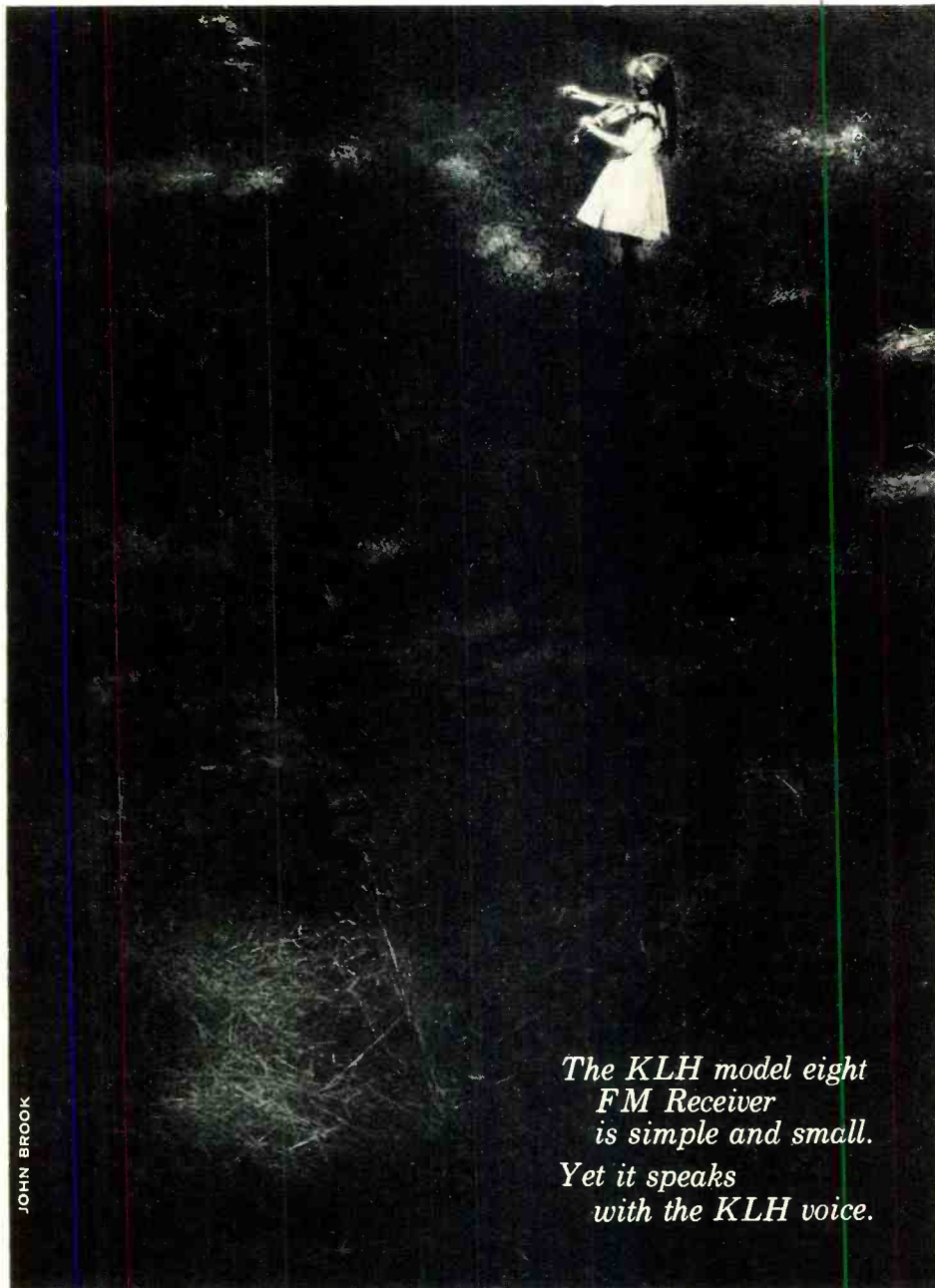
Here is Stokowski on another 4-track label (also disc mono: 6016, stereo: 3016), with two easy-to-follow works by composers of the older generation that was once called modern. The Stokowski touch is evident—if touch is the word for something so overwhelmingly glutinous—in the performance of both. But there's no great harm and some real good.

Villa-Lobos' heavyweight combinations of modern dissonance and peasant folk stuff make slow going, though the details are always arrestingly dramatic. His hi fi is a bit thick for best sonic effect but there are many colors, percussives, tricky sound configurations, that come through the speakers with

a good deal of impact. Stoky plays this neo-Romantic dish for all its worth, unctuously, sobbingly. Not beyond the edge of good taste, but darned close to it—this, after all, is the famed Stokowski brand of aesthetic brinkmanship. The short second item, from the "Brazilian Bachiana" series, is sheer Bach-Stokowski; it's obvious that Stoky and Villa-L. think the same about Bach! Most of us think otherwise at this point. Real sticky stuff.

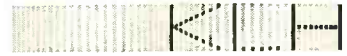
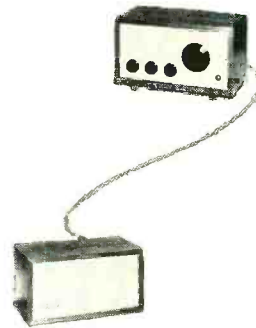
"Cinderella" is a late-Prokofieff ballet, full of everything we already know of his tuneful, personable music (à la "Peter and the Wolf") plus latter-day additions out of Shostakovich and Khatchaturian and a wry, gentle agony that seemed to imply the end of the trail for this too-humanist composer in a day of hard-boiled propaganda music. The agony is hammed up by Stokowski and is the less effective for it; but the old-fashioned, off-dissonant waltzes and all the rest of a true fairytale score are put over with effectiveness, even so.

I continue to marvel at the truth of Everest's claims towards extra-hi fidelity. There is a cleanness of sound, an effortless dynamic range, a velvety background of silence, that goes beyond most other recording and comes through again in this medium, the 4-track tape. Hi fi bravos.



JOHN BROOK

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Vox XTC 715 stereo

An excellent collection of well played and interesting works by the famed semi-pops Dalmatian composer who turned Viennese and set the Viennese style, pleasurable one after the other in this respectful and appreciative approach to his music. Von Suppé has a somewhat exaggerated reputation hereabouts as an incurably lightweight musician, whose overtures somehow find their way into music boxes and mechanical pianos and the like, not to mention carousels, all of which play *Poet and Peasant*. Suppé does sound pretty corny on a carousel or music box, I'll admit. But here, in his original glory, he comes through as an exquisitely knowing master of smooth, effective orchestral styling, warm, fluent and sincere.

You won't even notice the superficiality of the music in this tape. It isn't superficial, when played right.

Includes *Poet and Peasant*, *Beautiful Galathea*, *Light Cavalry*, *Morning, Noon and Night in Vienna*, *Boccaccio*.

Khachaturian: Suite from Gayne

Kabalevsky: The Comedians. Vienna State Opera Orch. Golschmann.

Vanguard VTC 1619 stereo

Luckily, I'm not responsible for Vanguard's sales economics and so I can say, irresponsibly, that I'm sorry to see that high-minded label go in for sales-pitch stuff like this, especially with performers who are not by any means right for it. It's a shame to put the eloquently Viennese virtues of this orchestra to work on such hard-boiled music. A harder-boiled orchestra can make it bang and whang even louder and—oddly enough—for better results. And to think that Vladimir Golschmann, who has been safely holed up in Saint Louis for a quarter of a century, is an exponent of "Russian" style of this sort is to wishfulthink! He isn't.

But I should say that if you don't give a hoot for Golschmann or care a fig for Vienna but you *do* like Gayne, you'll find this a good hi-fi number for your tape recorder. That's the intention.

WORDS AND MUSIC

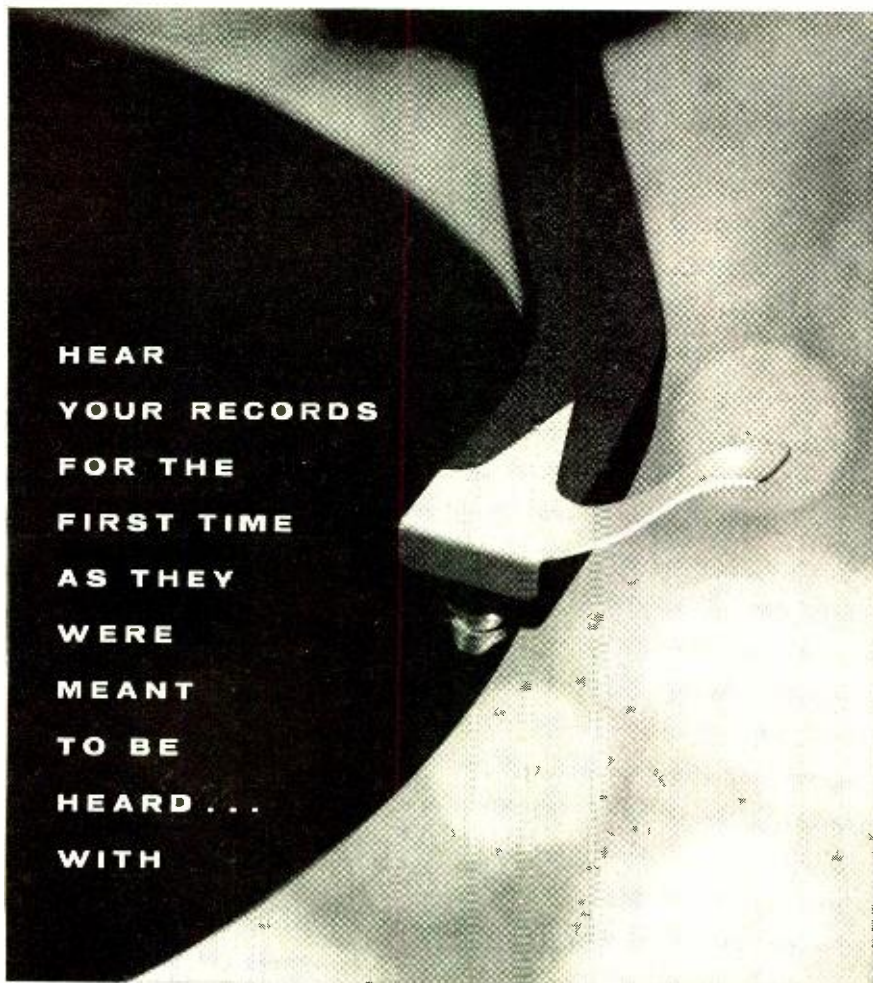
Blitzkrieg! Narration by Walter Cronkite. (CBS broadcast of Sept. 1, 1959).

Columbia ML 5511

On the twentieth anniversary of the German invasion of Poland that started World War II, CBS came up with this documentary history, an account of the period leading up to that war and of the first deadly year when, so to speak, Western Europe's chickens came home to roost, when the consequences of paralysis and inaction for so long a time were painfully blitzkrieged into our consciousness. The recording on LP brings the broadcast to permanent format, adding another to a long series of Columbia documentaries of the type.

This one, to use the corniest of words, is tremendously moving. It is, indeed—outwardly a somewhat corny job, especially the music—which annoys me as a practicing musician. Whenever doom and coming destruction are hinted, which is practically all the way through, Sibelius and "Finlandia" groan forth, in an arranged movie-style score. Musical bridges and background are entirely too plentiful for my taste; I'd prefer the poignant stuff of this history without a conventionalized mood-music assist.

But how can mere mood-music stand in the way of such awesome material as this? Unlike earlier documentaries, this one is paced slowly, for maximum impact. The headlong rush toward war is made enormously more effective by its immovably solemn, day-by-day inertia—for this is how we oldsters so poignantly remember it. In times of violent crisis, hours are like days and days seem months long. CBS has managed to give us here that very sense of agonized waiting, even during those frantic weeks when Poland was overrun and fell. It did not—remember?—fall instantly. The debacle took the full length of most of a month. Eternity.



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The recorded excerpts of actual scenes and voices in this broadcast are extraordinary. Not merely for their period interest, but for their newness as well as their incredibly apt pertinence. Predominantly from broadcasts—often as we remember them, via our own radios—these moments are those that too many of us had forgotten. Chamberlain himself, so quietly sincere, so utterly wrong. Churchill in his seldom heard earlier warnings, so utterly realistic behind the florid prose. King George, conquering that well-remembered stammer. Jan Masaryck, a voice to stab anyone's conscience, out of the old and familiar Czechoslovakia. And above all, Hitler, in many a crucial speech, the simultaneous translations (remember—we had them then, too) breaking in, with that tenseness of delivery that so marvelously reflects the feelings of us all in those dreadful days of helpless watching and waiting and indecision in the face of huge and implacable events.

Frankly, I was so shaken by this recording I could not go on to mere record-reviewing for a time. It is a terrible, painful thing to hear for anyone with two bits' worth of sensibility,

alike for those who remember and for those who are too young for remembering.

To think that now these ghastly events, these painfully ominous moments of dread, these enormous unthinkable tensions, have all since been worked out into sheer violence, destruction, killing—only to give way to another and new era of gathering ominousness, so different and yet so much the same. To think that all of this recording is so out of date, to realize that the still-dreadful scream of diving Stuka piston planes, the heavy rattle of automatic guns, the sodden plop of bombs (the actual sounds here of the Polish invasion and no faked-up sound effect) are now technologically antiquated, old fashioned, militarily feeble, fit for no more than "brush fire" warfare!

It is a superb documentary, music or no music, because it achieves its impact deliberately, by indirection, not merely in the words of those who were important and who reported upon events in that time but in the sheer tensions of their actual voices, deliberately given full play in the editing—the despair, the confusion, the grim soberness, the

helplessness on one side, the steely glint of triumph in Hitler's voice on the other, (and Goering too; I do not remember his voice at all). There is the honest wrongness of Lindbergh, the crisp clarity of FDR, above all the utterly touching final message of poor Chamberlain to his people that, in spite of him, England was finally at war.

Those few words are enough to make any man weep. For in them is summed up that pathetic faith in civilized good intentions, in truth and sincerity, that was the dogged hope of thousands of people in the Munich period. No mere outward account can so touch its reality.

Was ever history so real before?

Prokofieff: Peter and the Wolf. Narration by L. Bernstein.

Tchaikowsky: Nutcracker Suite. N. Y. Philharmonic, Bernstein.

Columbia MS 6193 stereo
(mono: ML 5593)

A very attractive album, this one, visually as well as audibly. It has two covers, one on each side, one for each work. The small "Peter," Daniel Boone style in fur cap, with gun, is a charming photo of a child in spite of the props in it—a black cat (with collar) and a stuffed duck. Cover No. 2, on the reverse, shows "Nutcracker" toys.

As for the music, "Nutcracker" gets the full sincere Bernstein treatment. The man can't seem to produce a superficial record, though he and his orchestra are humanly fallible as to detail work, much less slick than the ineffable Philadelphia. The "Nutcracker," we sometimes forget, is a small masterpiece. Bernstein makes sure that we realize it, and only a somewhat uneven ensemble in the several louder portions is less than excellent. It is a pleasure to hear the music taken seriously, on its merits.

"Peter" is fast becoming a tradition in personality plugging. Nowadays, each new narrator makes up a new version of the text, to be different. Bernstein's opens with a quiz on the instruments—"you're right, it is the cat . . . you're batting a thousand." The rest of his reading follows convention, but the music is relatively deliberate, though dramatic enough and transparently recorded for a gorgeous exposure of the incidental detail work, especially when the voice is speaking. I found the editing-together of voice and music a bit logey; Bernstein doesn't come in fast enough at many points and the fading-down of the hall-sound is often more noticeable than it should be. Still, it is a leisurely and full-bodied "Peter," exploiting every bit of Prokofieff's material. And kids will probably go for Bernstein, the story-teller, real cool-like.

Poulenc: Concerto for Two Pianos.
Saint-Saëns: Carnival of the Animals.
Whittemore and Lowe; Philharmonia Orchestra, Derraux.

Capitol SP 8537 stereo

It is not often that a good time being had by all is projected entirely by sheer musical expression via the recorded medium. That's what we have here, a cracking good time, plus accurate and careful playing of both works.

Whittemore and Lowe always please me. They lean to the modern, tend to avoid sentimentality in favor of crisply styled teamwork, yet I have not yet heard them play a harsh note; their sense of joint rhythm and phrasing is always good, even in the most hard boiled two-piano writing.

Take the Poulenc—it dates from those rowdy early twenties in France when nose-thumbing was in fashion and hilarity was generally mixed with furious noisiness; the then-modern composers did their best to shock, and usually succeeded admirably. Yet through all the mock-Mozart, mock-music-hall, mock-everything and the hilarious racket of this jolly piece, W. and L. keep their pianos ever eloquent and always good mannered.

And as for Saint-Saëns, the ancient joke piece is just delightful, here ever so lightly hammed up in a very proper virtuoso style by all concerned. Try the famous donkey violin solo. Or the tortoise, or the elephant. Just enough stereo separation to distinguish one piano from the other—adding a lot to the musical sense.

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Prokofiev: Peter and the Wolf. Michael Flanders, narrator.
Saint-Saëns: Carnival of the Animals. Hepzibah Menuhin, Abbey Simon; Philharmonia Orch., Kurtz.

Capitol SG 7211 stereo

Lord! Once I start on a particular piece, I can't get away from the numerous versions that proliferate. Here we go again, more Saint-Saëns, on the same label, same orchestra, with another conductor and two new pianists. And more "Peter," too.

Well, Michael Flanders, of Flanders & Swan, speaks the more usual text, without tricks, but goes in for characterization (with a British accent)—the cat is guttural and evil. Sounds as though Flanders may have narrated right along with the live orchestra, rather than via tape editing. Longish pauses, as would naturally occur in a live reading-with-orchestra, and no fading-out of room sound. The music is more distant, less enveloping than Bernstein's, but is lushly, masterfully played.

Odd—the two lady pianists and Mr. Kurtz do a quite different job on Saint-Saëns than the two man team, Whittemore and Lowe. The ladies, surprisingly, are better technicians. They play faster and furiously, with smoother phrasing, in a more Romantic manner—more pedal, less detachment. Their pianos sound much bigger and closer, too—quite magnificent, indeed. Where the Whittemore-Lowe version goes in for gentle but unmistakable hamming, the Menuhin-Simon-Kurtz version is more classical, the hammy aspects subordinated to fine music making. Really lovely.

I enjoyed both of these Carnivals as each one was played; their values are different but on a par. Interesting that the same orchestra can lend itself to such distinctly different approaches, all on the same record label.

Gilbert and Sullivan: H.M.S. Pinafore. (Complete with Dialogue). D'Oyly Carte Opera Company, Godfrey.

London OSA 1209 (2) stereo

The D'Oyly Carte recordings have been constantly updated ever since the first of them that I can remember, back in the very early thirties. Now, of course, it's stereo as well as LP and hi fi; but the largest innovation in this recording, a direct product of changing tastes in LP opera, is the inclusion of the spoken dialogue as well as all the music. The opera is substantially different in this Sing-spiel form, and there is no doubt that its recorded impact is the more authentic, for better or worse.

I say this because, of course, the dialogue offered by Mr. Gilbert in these operas is generally pretty silly, and not half as good as the more poetical lyrics that go with the songs and choruses. Some is downright sappy. And yet, on the other hand, the dialogue is part of the total and, more important, it carries on the plot. On the stage, it is heard in action and costume, too, and the ineptitudes of its language are forgiven!

On records, the talk stuff may produce mixed feelings in your Savoyard bosom. It's well enough spoken, decidedly, even when, as in some cases, the spoken words must be assigned to an *alter ego* because the tenor doesn't know how to talk. There is not here the incongruous change of voice that sometimes takes place in such recorded productions; D'Oyly Carte has sense enough to ensure that its singers and talkers have matched voices.

Generally speaking, the move towards inclusion of the whole opera, talking and singing, reflects the still-growing realization that the greatest blessing of LP is time—and leisure. It has already taken us a dozen years to get this far, though the actual allowable time has not materially increased; we are still growing into the new medium, thinking of new ways to capitalize on its technical values.

(Continued on page 61)



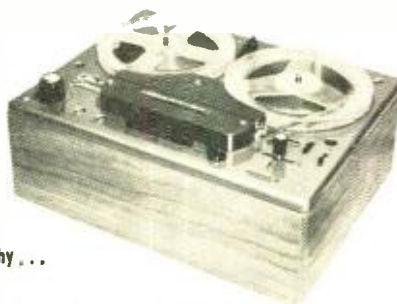
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CHARLES A. ROBERTSON*

STEREO

Max Roach and Oscar Brown, Jr.: Freedom Now Suite
Candid 9002

An original work and a new jazz label, both of which show great spirit and promise, are launched with this release. Promising seems to be the correct way to describe "Freedom Now Suite," a collaboration between Max Roach and lyricist Oscar Brown, Jr. begun two years ago and intended for the centennial of the Emancipation Proclamation in 1963, as it is still unfinished. The final draft will enlist a choral group and corps of dancers, but each section introduced here is complete in itself and contains a full quota of aural excitement. As the preliminaries match Roach, a leading exponent of American jazz drumming, with African drummer Michael Olatunji, besides drawing on the services of Coleman Hawkins and Abbey Lincoln, the main event will require thoughtful planning to be of surpassing interest.

The man behind Candid is Archie Bleyer, president of Cadence Records, who contemplated entering the jazz field for several years before taking the step. His plans materialized when jazz critic Nat Hentoff consented to supervise sessions and act as musical advisor to the new subsidiary. Bob Altschuler left a job as publicity director of United Artists Records to accept the post of general manager. All three united in formulating a policy that bodes well for both the company and jazz collectors.

Altschuler, whose career also includes publicity stints with Prestige and Riverside, in summing up some of the main points said, "Archie Bleyer's only concern is that we put out a quality product. We intend to record important jazz, regardless of period, and will touch all bases, from country blues singers to the more advanced modernists. We believe a good jazz record can sell over the years, and our promotion will be geared accordingly. United Artists was disappointed because initial jazz sales were below those of popular names and filmscores, but their jazz LP's are the ones still being reordered two years later. We hope to introduce many of our artists to a wider audience through concerts at schools and colleges. Several are interested in having Max Roach perform the Suite."

Albums produced by members of the newly formed Jazz Artists Guild are to be distributed under the Candid label, and an early release will unite Roy Eldridge with the Charlie Mingus group. Also in prospect is Mack McCormick's "Treasury of Field Recordings," which was first released in England to great critical acclaim when no company in this country would touch it. Other projects will feature such artists as Lightnin' Hopkins, Memphis Slim, Benny Bailey, Booker Ervin, and the Toshiko-Mariano Quartet.

Candid began holding sessions at just the right time to take advantage of the opening of a new studio a few doors away on West 57th Street. Tommy Nola's Penthouse Sound Studio was ready for business in March, 1960, having moved to the 17-story roof of Steinway Hall. Nearly all Candid LP's are engineered

* 732 The Parkway, Mamaroneck, N. Y.

by Bob d'Orleans, who joined Nola in August after spending two and one-half years at Bell Sound Studios. While there he handled jazz dates for Warner Bros. and Roulette, including the Monday Night at Birdland series on location. As such leading lights of the teenage world as Fabian and Frankie Avalon were also entrusted to his care, it was only natural that he be asked about the experience.

"Dealing with rock-and-roll singers," d'Orleans commented, "requires an altogether different approach than a jazz date. Lots of expensive equipment and all an engineer's skill are directed at making a voice sound in a way that will make youngsters want to buy the record. The singer always goes into a vocalist's booth, and the voice is spread out on top of the recording. The musicians never get a chance to feel any great empathy toward the singer, even the drummer who, if the truth were known, is often the most important personage on the date. A recording will not sell unless teenagers feel the beat, and a mere singer's whim never causes a drummer to change a beat he knows is right.

"For Candid, however, I recorded both Abbey Lincoln and Nancy Harrow without a vocalist's booth. It meant more work for me, but the singers and musicians liked the idea and were willing to move around until I got the balance I wanted. I wouldn't try it otherwise, but then I probably wouldn't even think of it on a pop date. The difference was quite noticeable in the studio, and I think listeners will hear something in Max's drumming during his duet with Abbey that wasn't there before. I never heard anything like the way they blend together on the record and practically become one voice."

After starting out as an assistant film editor at M-G-M in Hollywood, d'Orleans drifted into audio because, in his opinion at least, it seemed to be "more creative." Besides working at 20th Century-Fox and other film studios, he helped out after hours at a small independent record company and handled Chico Hamilton's first date, before Dick Bock discovered the drummer for Pacific Jazz. He also held jobs in Dallas, Texas, and at Olmsted Sound Studios previous to arriving at his present post at Nola's. Clients other than Candid include Verve, Argo and various advertising firms. The studio is associated with Warne Jenkins in the operation of Plaza Sound Studios, which are used to record Gerry Mulligan's Concert Band and other large units.

When asked to comment on the changes wrought by stereo, d'Orleans expressed satisfaction at the amount of new equipment studios have acquired and added, "I find that it helps if the musicians understand stereo and some of the problems it presents. I always explain the effect I want, and usually aim at a completely natural one that seats the listener right in front of the band at a comfortable distance. Jazz fans are less interested in trick effects than in hearing what each supporting musician is doing every minute of the time. Stereo separation makes this easier to achieve, but I like to tie things together by putting the featured soloist or main rhythm instrument in the middle. Four drummers surrounded Abbey and three microphones were on Olatunji's drums in one part of the "Suite." still I picked out her voice. Jazz dates are

enjoyable because everyone becomes so involved, including me, when Mingus passes out compliments, which I understand are hard to come by. It was typical of Coleman Hawkins to stay on after his part was finished and lend encouragement to the others."

Whether releasing a work before completion is justified or not is best answered by the fact that the sections of "Freedom Now Suite," as presented here, make an important and rewarding document. Furthermore, it becomes the first of the current spate of Civil War Centennial albums to deal with problems of slavery, and those of racial equality that still exist, rather than the glories of war. Also worth noting is the emergence of Abbey Lincoln as a vocalist of stature, especially after her wordless pyrotechnics on *Triptych*. When dueling with Coleman Hawkins on *Drive a Man*, she parries his attack in a cold fury that only Odetta among today's singers can match. Hawkins' power could be duplicated by no other soloist, which explains why he was picked for the part and still reigns over fellow tenor saxists.

Recent events in Africa prompted the addition of two sections uniting Olatunji and a pair of Afro-Cuban drummers with Roach's regular quintet. They combine brilliantly on rhythmic patterns of mounting intensity, distributing crisp transients and deep bass notes across the width of *All Africa*, or roaring unrestrainedly on *Tears For Johannesburg*.

Because of insurmountable odds against public performance, jazz works of a serious nature often fail to fulfill early expectations and live only in recorded form. Max Roach plans to hurdle this obstacle by delivering his message wherever possible, even though his own pocketbook suffers. Besides various colleges, the National Association for the Advancement of Colored People and the Congress of Racial Equality are interested in sponsoring concerts.

Clancy Hayes Dixieland Band Audio Fidelity AF5D5937

When the revival of traditionalist jazz got underway in San Francisco, Clancy Hayes was right there to hold casual patrons while Lu Watters and Bob Scobey struggled to implant the eternal verities of New Orleans style. As the seed began to grow and the reputations of all concerned increased, Hayes never lost sight of the need to entertain the customers. He works now as a single act, picking away at his banjo and singing in a style that recalls lazy minstrel days. Although Hayes is best known for his work with California bands, he started out playing drums at the age of nine for silent movies in Isola, Kansas, his hometown. During his formative years, he journeyed all over the Middle West with dance bands of the '20s. On this recording, he revisits the old locale and is back with a band again.

Art Hodes, a pianist who knows from experience the route Hayes traveled, helps shift the scene to Chicago at the head of a righteous group which includes Earl Murphy, Buddy Smith, Bob Ballard, Bill Harch, and Roy Daniel. Hodes also knows the blues and backs the singer with loving care on such themes as *Careless Love*, *Washboard Blues*, *Willie The Weeper*, and *Blues My Naughty Sweetie Gives To Me*. Hayes revives Ida Cox's *Nobody Knows You When You're Down And Out*, and airs in typical Windy City fashion his own *Huggin' And A Chalkin'*. Stereo centers on Hayes and his spunky banjo, but not to the neglect of the fine Hodes piano.

Phil Napoleon: Tenderloin Dixieland Capitol ST1535

This show score is right up Phil Napoleon's alley, and it is certain that few members of the Broadway cast know more about the musical comedy's setting than just about any veteran dixielander. For once, most of the tunes adapt readily to a jazz setting—at least, they pass muster as played by the Memphis Five. Ken Davern's liquid clarinet tone is a natural for *Artificial Flowers*, with its resemblance to Sidney Bechet's *Petite Fleur*. And Napoleon's trumpet peals out affirmatively on *Tommy, Tommy*, and *My Miss Mary*. There is plenty of room for the entire ensemble to parade across the stereo stage on *Army Of The Just*, and *Little Old New York*. A few

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of the lesser songs receive a quick once over, but all are danceable and filled with rare Tenderloin atmosphere.

Oscar Brown, Jr.: Sin & Soul

Columbia CS8377

The work of Max Roach's collaborator on the "Freedom Now Suite," this album gives a broader sampling of the numerous talents of Oscar Brown, Jr. Several of the songs fall somewhere in between the title's sin and soul categories, but all bear the singer's personal stamp. Some are adaptations of folk material, and others are original blues. The three likely to attract the most attention are recent jazz compositions for which he supplies apt and imaginative lyrics. His ingenious setting of *Dat Dere*, the Bobby Timmons tune, is being pushed on the hit parade but still remains cute, tender and utterly charming. The best example of his vocal abilities occurs on Nat Adderley's *Work Song*, and humor comes to the fore on Bob Bryant's *Sleepy*. Brown is one singer who manages a hip style without being offensive, but how well it will wear a year or so from now is another question. Particularly when Paris designers are bringing back cat's pajamas. Trumpeters Billy Butterfield and Joe Wilder stand out in the various small supporting groups, and the singer is centered in excellent stereo.

Cannonball Adderley: At The Lighthouse
Riverside RLP9344

Shelly Manne: At The Black Hawk, Vol. 3
Contemporary S7579

Victor Feldman takes care of the honors on these albums, and both go a long way toward finally establishing the Britisher as a major pianist in this country. Cannonball Adderley introduces the new member of his quintet in person at the Lighthouse, and the problem created by the departure of Bobby Timmons seems solved for the moment. Feldman's reputation for versatility has proved itself quite convincingly here. Not only does he match the Adderley brothers in their particular brand

of sound, but the clan is often outshouted on *Black Daniel*, and *Sack O' Woe*. These numbers are sufficiently in the current vein to alone assure large sale for the set. By contributing *Azule Serape*, Feldman also indicates what his abilities as a composer will mean to the group in the future. Cannonball will undoubtedly keep rolling right along, and he wields his alto sax assuredly on *What Is This Thing Called Love?* Wally Heider earns credit for the fine stereo, and the audience is warmly receptive.

Shelly Manne showcased Feldman adequately for the first time in the Black Hawk series, and the third volume features the pianist on a stirring stop-time chorus behind Richie Kamuca on Cole Porter's *I Am In Love*. Also a piano-bass duet, with Monte Budwig responding airily, is one of the highpoints on *Whisper Not*. The only other number is a drum-driven blues lasting more than eighteen minutes, but Manne, Joe Gordon and the rest will be back on a fourth volume.

Victor Feldman: Latinsville!

Contemporary S9003

Della Reese: Della Della Cha Cha Cha
RCA Victor LSP2280

The maiden ventures into Latin rhythms come from unexpected sources, but for all that they both hold torches capable of igniting romantic fires under dancing couples. After settling in this country, Victor Feldman discovered employment, even for jazz players, often depended upon an ability to swing against a background of bongos and timbales. Having absorbed the idiom with typical British thoroughness, he now offers arrangements for a quintet fashioned after George Shearing's, and for a ten-piece band that is more subtle than most. Armando Peraza and Al McKibbin, both Shearing veterans, make appropriate adjuncts to the rhythm section, while Conte Candoli, Frank Rosolino, and Walter Benton revitalize such venerable themes as *Lady Of Spain*, *Poinciana*, and *Flying Down To Rio*. As leader, Feldman holds to moderate dance tempos until the wild, con-

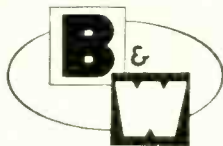
cluding *Woody'n You*, and stereo spotlights the mellow sound of his vibes throughout.

Della Reese tops off a steadily rising career with a set she could have done at the beginning. Before plunging into Caribbean waters, she tried all sorts of material with varying success, including a sortie into opera. But whoever accused her of developing an eccentric style was wrong. It seems now that she has been singing cha cha rhythms to the wrong accompaniment all along. With O. B. Masingill to provide the right setting in amply proportioned stereo, she dives in like a native and makes the biggest splash since Carmen Miranda exploded on the scene, singing such non-Latin tunes as *Tea For Two*, *Daddy*, and *Come On-a My House*.

The Limelites: Tonight: In Person

RCA Victor LSP2272

Since Elektra first recorded the Limelites, a group best described as a graduate school version of the collegiate Kingston Trio, audiences have welcomed the new act in concerts and folk-music bistros across the nation. Hollywood's Ash Grove is tonight's meeting place, and the patrons are receptive only to those non-ethnic performers who have something original or entertaining to contribute. The amount and kind of levity permissible at these gatherings is measurable in no known quantity, but the Limelites form a triple-threat combination that is always bound to please at least a third of those present. Glenn Yarbrough plays guitar and sings romantic lead on such lyric serenades as *Molly Malone*, and *Seven Daffodils*. Alex Hassilev, who speaks more than a dozen languages, lends the international touch, and his robust baritone and dashing banjo enliven *Monk Of St. Bernard*, and *Rumania, Rumania*. Lou Gottlieb, the bespectacled intellectual who plays bass and dreams up most of the arrangements and introductions, draws a ready response with his sophisticated humor on *Hey Li Lee Li Lee*, and Michael Flanders and Donald Swann's *Madaira, M'Dear*. Engineer Al Schmitt puts them all together, along with the applauding crowd, in the best of stereo.



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Professor Alex Bradford: Abyssinian Baptist Gospel Choir
Columbia CS8348

Langston Hughes remarks in his liner notes that "musical historians say church music is usually about fifty years behind worldly music, but eventually it catches up with and borrows from popular songs." While crediting gospel music with taking less time to close the gap, he should feel no hesitancy about claiming a lead position for it in many instances. Perhaps lack of space precluded mention of even a few examples of how gospel sounds have infiltrated secular fields, but Hughes will find complete agreement in this corner whenever he decides to state that most of the borrowing is done by jazz and popular composers. Gospel songsters like to try creative wings on original material and flock to where songs and arrangements are fresh and new, which is one reason why there are seven regular choirs at the Abyssinian Baptist Church of Newark, N. J.

The chief attraction is Professor Alexander Bradford, a musical director who knows how to write in homely, everyday terms and has more than 200 songs to his credit. As a further inducement, the best 200 voices were picked about a year ago to form the world's largest gospel choir. In supervising the recorded debut of the full assemblage, John Hammond visited the church during an actual service and presents nine of Bradford's songs in natural surroundings. Ecstatic outcries and shouts of encouragement from the congregation during climaxes broaden a stereo panorama of already generous proportions, and the Rev. R. P. Means joins in with a bit of spontaneous preaching on *He Stays In My Room*.

Altogether unable to control all aspects of the performance, Bradford handles the sizeable force so as to get a big sound without loss of gospel fervor. He keeps his own charges under strict discipline and insists upon precise responses from the various sections. This schooling pays returns when soloists Bessie Lewis, Margaret Simpson, and Calvin White are given free reign, and the choir never founders or appears cumbersome as the pace quickens and tension mounts. The excellent recording misses none of the excitement,

MONO

Little Brother Montgomery: Tasty Blues
Prestige/Bluesville 1012

Prestige is a little late in adding Little Brother Montgomery to its steadily growing blues series and just misses being the first company to put the veteran blues pianist and singer on LP. Little Brother, now 53 years old, toured Britain a year or so ago, and English Columbia released his first album late last year. *The Gramophone* refers to it as "one of the most distinguished recordings to be made by an American visiting these shores." The prospect that it will be issued in this country is still remote, and for all practical purposes Prestige has done it again. Oddly enough, *Shreveport Farewell*, one of his best piano solos recorded in 1936 on Bluebird, appears on neither LP, so perhaps he will return to the studios again. It is more appropriate that versions of another showpiece from the same period, *Vicksburg Blues*, should appear as an unaccompanied solo on both, as Little Brother develops his own specialties differently each time. All his old zest and skill are also evident on *Brother's Boogie*, and the title tune.

In comparison to his playing and graphic blues lyrics, singing was never Little Brother's strong point. A good recording changes all that, and there is much to enjoy as he vocalizes in a rich vibrato on *Sattelite Blues*, and *No Special Rider*. Julian Euell helps out on bass, while Lafayette Thomas plays down-home guitar and contributes *Sneaky Pete Blues*.

Casey Anderson: Goin' Places

Elektra EKL192

Audiences partial to the performances of Leon Bibb and Josh White will no doubt welcome Casey Anderson, a young newcomer who is well on the way to perfecting his own style of telling stories in song. He may even live down a mistake made early in his career which could prevent his acceptance in some quarters. But how was he to know that a college degree and teaching school might disbar him from

the use of ethnic material? He does possess a six-foot-five frame and 220 pounds of sinew to throw into a number like *Steel's Gotta Be Drove*, which he sings on this LP with enough conviction to encourage most listeners into believing they are hearing a former track layer or sharecropper. Anderson proves to be as imaginative and versatile as Harry Belafonte when it comes to reshaping *John Henry*, *Strawberries*, and *Grizzly Bear*. Besides directing the accompanying group, Walter Haim provides arrangements that help translate Anderson's many original ideas into finished form.

Art Blakey: At The Jazz Corner Of The World, Vol. 2
Blue Note 4016

Art Blakey: Paris Concert
Epic LA16009

At home or abroad, in concert or in night clubs, the pulsating rhythms of Art Blakey are monarch of all but the indomitable voice of Pee Wee Marquette, the pint-sized encee at Birdland. Shortly after returning from a successful European tour, the drummer resumed his stand at the Broadway jazz corner and was recorded there by Rudy Van Gelder. Blue Note is releasing the performance, announcements and all, on two LP's. The Jazz Messengers lost Benny Golson at the trip's end, replacing him on tenor sax with Hank Mobley, who contributed three tunes to return the confidence. *Hipsippy Blues*, which appeared several months ago on the first volume, already has attained some currency in jazz circles.

The prize of the second package is *Chicken An' Dumplins*, a churchy Ray Bryant theme that also takes note of Blakey's travels in references to *Christopher Columbus*. Pianist Bobby Timmons solos lyrically on Randy Weston's *Hi-Fly*, and bassist Jymie Merritt joins Blakey in a rhythmic workout on Gildo Mahones' *Art's Revelation*. Lee Morgan, trumpet, and Mobley engage in a technical dual on the latter's *M & M*.

While Blue Note presents the Messengers coding new pronouncements, Epic delivers a full-dress recital of earlier incendiary statements. Paris audiences thrilled to the group

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at its 1958 peak during concerts in November and December at the Olympia Music Hall. The excellent in-person recording reprises Timmons' *Moanin'*, and Monk's *Justice*. The guiding influence of Golson is evident throughout, especially on his own splendid tunes, *I Remember Clifford*, *Are You Real*, and *Just By Myself*.

Horace Parlan: Speakin' My Piece
Blue Note 4043

This is Horace Parlan's second album, and the pianist takes the hurdle in splendid style with a bit of coaching from the Turrentine brothers. A jazz artist readying a second LP is much like an author trying to follow up a successful first novel, and the result usually determines just how fast each will progress. By way of preparation, Parlan apparently reviewed his Ellington, and the quintet functions with the practiced informality of one of the Duke's small groups. More than a hint of Ellington also turns up on Parlan's opening theme *Wadin'*, which swings as though it

meant it. Stanley Turrentine is a big-toned tenor player in the manner of Coleman Hawkins by way of Ben Webster. He flexes his muscles on his own *Borderline*, or relaxes with a sensitive, balladic solo on *Oh So Blue*. Brother Tommy carries full weight in the ensembles and develops a strong, brassy blues line to showcase his trumpet on *Rastus*. George Tucker is on bass, and Al Harewood is the drummer. Parlan's solos are bright and lustrous in this setting, and he would do well to insist on another visit from the Turrentines.

Howard McGhee: Music From The Connection
Felsted FL7512

As Blue Note releases are unavailable through regular distribution channels in Great Britain, this LP was prepared in anticipation of demands created by the London production of "The Connection." Freddie Redd, who composed the score, headed the group from the show which made the original Blue Note recording and conceals his identity as pianist

this time under the pseudonym I. Ching. Tina Brooks frequently substituted for Jackie McLean at the theater and does so again. The main reason for duplicating a previous purchase of the recorded score is the appearance of Howard McGhee, a trumpet great whose return to the studios is something of an event in itself. He turns in a seasoned performance, playing open and muted solos that are both brilliant and tender, and no better excuse is needed to acquire a second version. Milt Hinton, bass, and drummer Osie Johnson complete the quintet, and the session was held at Bell Sound Studios. As the play is still on the boards in this country, using different musicians, a third album would not be amiss.

Etta Jones: Don't Go To Strangers
Prestige 7186

Vocalist with Earl Hines from 1949 to 1952, Etta Jones disappeared from the recording scene about the same time as Helen Humes. Her return is a happy event, as fully rewarding as the recent reappearance of Miss Humes on the Contemporary label, and adds another name to the scanty female list of real jazz singers. No one-dimensional stylist, Miss Jones ranges far and wide, shifting with ease from *Yes Sir That's My Baby*, to the beautifully delicate *If I Had You*. Capable of sounding like the Basie band when it is putting on, she gives buoyant lift to *I Love Paris*. She revives Billie Holiday's *Fine And Mellow*, but her resemblance to the late singer is most apparent in a stature that permits a satirical treatment of *Where Or When*. The title tune is bound to become a classic, unless beaten out by her version of *Bye Bye Blackbird*.

Frank Wess, who heads the accompanying group on tenor sax, also tosses off brightly swinging flute obbligatos, aided and abetted by Dick Wyands on piano, Skeeter Best on guitar, George Duvivier on bass, and drummer Roy Haynes. Aspiring girl vocalists everywhere should enroll in this postgraduate course.

Harry Edison: The Inventive Mr. Edison
Pacific Jazz PJ11

Recorded at the Haig in July, 1953, this in-person set made up the fourth 10-inch LP released on the Pacific label. It marked a turning point in Edison's career, and soon he was recording muted trumpet solos behind Frank Sinatra and other vocalists. His style gradually acquired the polish and restraint evident on his latest albums. Jamming with a rhythm section composed of Arnold Ross, Joe Comfort and Alvin Stroller, however, Edison still has the old Basie sound and also plays fine open horn. Additional titles added on the excellent reissue are *Just You Just Me*, *S'Wonderful*, and *Tea For Two*. AE

AUDIOCLINIC

(from page 4)

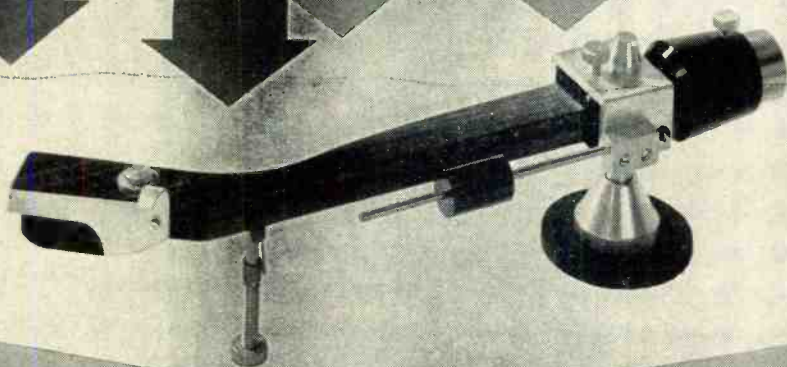
incident. If there is no hum in the amplifier when the preamplifier is disconnected, and if the preamplifier is powered from its own internal power supply, it is certain that the trouble is in your preamplifier. Here again it is probable that there are bad filter capacitors or a bad rectifier.

If the preamplifier is powered from the main amplifier, it would not be surprising for the preamplifier to exhibit hum even though the power amplifier appeared to be free from hum. After all the preamplifier does possess gain. Thus if there is hum present in the power supply which is insufficient to affect the power amplifier circuitry, that same hum can be amplified in the preamplifier and will come through with greater volume on that account.

As a further check, try shunting de-

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coupling capacitors with some of known performance. Do this in both the power amplifier and preamplifier.

If you built this unit yourself, be sure to recheck all solder joints, especially the grounds of the filters and decoupling capacitors.

Check the rectifier to see if it is working properly. Check the voltage between each rectifier plate and ground. These voltages should be equal if the amplifier is operating correctly. You may find that there is zero voltage from one plate to ground. This situation would probably introduce 60 cps hum into the amplifier rather than the 120 cps hum you mentioned, but I include this check for completeness. After all, perhaps the shorted half of the rectifier placed a load on the power transformer sufficient to burn out one half of the high voltage secondary winding. The result would be a 60 cps hum as I said already.

Mr. Stanhope made his checks and wrote me the results:

"Thank you for your personal answer to my appeal for help. This letter is written to tell you how I made out.

"Upon your advice, I checked the rectifier tubes and the voltage across same. They were okay. I then checked the decoupling capacitors as you suggested. They were okay too. Since I had wired the kit myself, I rechecked all solder joints to no avail. By this time, I was really beginning to wonder just what was going on.

"I then received my October issue of AUDIO with your *Audio Techniques* article. Your last part entitled "Turn it On" started me to wondering what usually goes wrong in a radio, TV set or high-fidelity system. The answer was just tubes. I robbed the piggybank, went to a radio supply store, and bought a set of replacement tubes. Now comes the clincher. After replacing the tubes—no hum.

"By substituting the old tubes back in one at a time, the culprit was found to be an output tube, EL34.

"I had previously checked all the tubes in a Hickock tube tester which had a leakage resistance test by meter (not just a neon lamp.) The tubes all checked okay.

"Since the hum increased at the same time as the rectifier tube blew, I would suspect that the EL34 went at the same time. Here again is a case of tubes not operating correctly even though the tube tester says 'okay.' Next time before I get involved in a long troubleshooting operation, I'll plug in a spare set of tubes first."

Editor's comment: I surely did not guess this one. When I consider the number of letters that I have received discussing the poor performance of EL34's and ECC83's I should have thought of this possibility at once.

However, it is odd that an output should cause hum in the power amplifier only when the preamplifier was plugged in. The only explanation which comes to my mind is that the defective EL34 drew so much current from the power supply that the efficiency of the filter circuits was decreased. If some of the stages of the preamplifier were not too carefully decoupled it is possible that the hum got in via the preamplifier as explained some time ago—toward the beginning of this unusual troubleshooting problem.

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LETTERS

(from page 6)

parts list for this tuner has an error on the coil forms. For 21- and 41-mc tuners, the L_1 coil form should have a $\frac{3}{8}$ -in. diameter (Cambridge Thermionic LS3 slug-tuned or equivalent). L_2 should be on a coil form $1\frac{1}{8}$ in. long with a $\frac{3}{8}$ -in. diameter (C-T LS3 or equivalent).

BARNEY V. PISHA,
Audio Electronics Laboratory,
P.O. Box 365,
Albertson, N. Y.

(Also, according to reader Jack Preston, Hollister, Mo., AUDIO had an article by Oliver Berliner in April, 1956, describing a tuner designed to work with a Dumont front end, but which should work equally well with the currently available units. Ed.)

THIS MONTH'S COVER

Photographed in the Forest Hills, N. Y., apartment of Stephanie Greenburg is this ensemble by Kent Custom Audio of New York and Brooklyn. The center section contains a Knight KN-720 Deluxe stereo tuner and a KN-700 preamp-control unit, two Aero Ultra-Linear II amplifiers, and a phono section comprising a Pickering Gyro-poise turntable with an ESL S-2000 Gyro/Balance arm and an ESL C-99 moving-coil cartridge. Additional cartridges mounted in color-coded shells permit immediate selection. The two end sections house Tannoy 12-in. Dual Concentric Monitor loudspeakers. In the center is a 23-in. Fleetwood remote control TV set, with a relay switching the loudspeakers to the TV sound when the set is turned on.

Photo by Mort Waldon.

EICO described the Amperex tubes used in their new *HF89 100-Watt Stereo Power Amplifier* with the word, "unsurpassed." And with good reason. The *HF89* delivers 100 RMS watts undistorted from 20 to 20,000 cps. IM distortion at normal listening levels (even with low-efficiency speakers) . . . less than 0.1%!

To achieve these standards, EICO chose 4 Amperex 6CA7/EL34's for the *HF89*'s output stage and 1 Amperex 12AX7/ECC83 for its voltage amplifier stage. The results: full-rated power output, inaudible distortion, low hum and noise, and the absence of microphonics.

These and many other Amperex 'preferred' tube types have proven their reliability and unique design advantages in virtually all of the world's finest audio components.

Write today for the *Audio Designers Handbook*, new 33-page booklet featuring 14 pages of complete schematics of mono and stereo preamplifiers and amplifiers. Price, \$1.50. Amperex Electronic Corp., Special Purpose Tube Division, 230 Duffy Ave., Hicksville, Long Island, N. Y.



about hi-fi tubes
for hi-fi circuitry

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6CA7/EL34: 60 w. distributed load
7189: 20 w., push-pull
6BQ5/EL84: 17 w., push-pull
6CW5/EL86: 25 w., high current, low voltage
6BM8/ECL82: Triode-pentode, 8 w., push-pull

VOLTAGE AMPLIFIERS

6267/EF86: Pentode for pre-amps.
12AT7/ECC81: Twin triodes, low
12AU7/ECC82: hum, noise and
12AX7/ECC83: microphonics
6BL8/ECF80: High gain, triode-pentode, low hum, noise and microphonics

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6ES8: Frame grid twin triode
6ER5: Frame grid shielded triode
6EH7/EF183: Frame grid pentode for IF, remote cut-off
6EJ7/EF184: Frame grid pentode for IF, sharp cut-off
6AQ8/ECC85: Dual triode for FM tuners
6DC8/EBF89: Duo-diode pentode

RECTIFIERS

6V4/EZ80: Indirectly heated, 90 mA
6CA4/EZ81: Indirectly heated, 150 mA
5AR4/GZ34: Indirectly heated, 250 mA

INDICATORS

6FG6/EM84: Bar pattern
1M3/DM70: Subminiature "exclamation" pattern

SEMICONDUCTORS

2N1517: RF transistor, 70 mc
2N1516: RF transistor, 70 mc
2N1515: RF transistor, 70 mc
1N542: Matched pair discriminator diodes
1N87A: AM detector diode, subminiature

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... its performance specifications have not been equalled!

The full meaning of Marantz Quality becomes clear when you compare competitive performance features with those inherent in the Marantz design. It becomes apparent that: 1—hum, noise and distortion are all many times lower in the Stereo Console; 2—accuracy, sensitivity and reliability are all much greater, and; 3—its superb precision construction has no counterpart in the field. Most of these are the important characteristics which directly determine sound quality. Let's see how much more one gets for his investment in Marantz:

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ABOUT MUSIC

HAROLD LAWRENCE*

An Evening Of Experimental Music

IN 1916, SEVERAL ARTISTS AND POETS living in Switzerland, banded together for the avowed purpose of destroying all prevailing concepts of art. They called themselves Dadaists after the French, "dada" for "hobby horse." Within a larger context, they were protesting against a civilization plagued by chronic warfare. Employing the logic of guilt by association, they rejected everything that civilization had ever produced. A case in point is Marcel Duchamp's *Mona Lisa*. Duchamp, whose *Nude Descending a Staircase* anticipated stroboscopic multiple-image photography, embellished a reproduction of the famous da Vinci portrait with a subway-style mustache and the caption: L H O O Q, which forms a ribald sentence when pronounced like the letters in the French alphabet. Its objective was admittedly to outrage the bourgeoisie, to "spit in the eye of the world."

For a while these artistic rebels were successful in setting the public back on its heels. They scandalized the people of Cologne in 1920 by holding a show in the rest room of a cafe, providing visitors with hammers with which to smash the exhibits. At other Dada exhibitions, thirty-eight speakers delivered lectures simultaneously, poems were composed on the spot by random selection of words written on separate slips of paper and shuffled like a pack of cards, and collages were put together containing bottle driers, bicycle wheels, sand, wire, and fragments of newspapers, burlap, and other untraditional materials.

Dadaism died in the early Twenties of "cheerfulness" as the world recovered from the effects of the war. But many of its principles live on: chance; the fortuitous juxtaposition of unrelated elements; the abandonment of the orthodox relationship between the artist and his creation; and the use in art and music composition of everyday sounds and objects hitherto confined to the kitchen, the street, the garage, and the factory. Today, forty-five years after its introduction, we are witnessing a full-fledged revival of Dadaism in all the arts. Dada's offspring possess different names: abstract expressionism, *musique concrète*, action painting, etc., but the genealogy is clear. Perhaps its most persuasive exponent in the world of music is John Cage, whose twenty-fifth anniversary as an experimental composer was celebrated last year in a comprehensive album of discs released by George Avakian. To describe Cage as a neo-Dadaist, however, would be wildly inaccurate. Dadaism was a shortlived protest movement. Once its protest was registered, it lost its *raison d'être*, and the artists and poets returned to their ateliers to take up

where they had left off before the war. By its very nature, the new movement—call it "indeterminacy," "unpredictability," or "neo-Dadaism"—is also a protest, but it is more than that. In philosophy, scope, and influence, it has outgrown its predecessors, incorporating elements of Oriental concepts, re-examining the sonic properties of all objects and instruments (both in their natural and recorded states), and exploring the accidental factor in musical performances.

One of the younger experimental composers, Toshi Ichianagi, gave an evening of his own music last January in downtown New York City. Mr. Ichianagi, a disciple of John Cage, has taught experimental composition at the New School for Social Research and has been associated with Mr. Cage for the past few years in the latter's educational activities. Although Mr. Ichianagi's works had been performed in public on previous occasions, this was the first concert series devoted exclusively to his own music. The works on the program were scored for traditional as well as unorthodox instruments, including violin, koto, metronomes, hammer, tape recorders, voices, piano (without lid), and trash can (with lid).

The concert took place in a spacious loft studio. In Japanese fashion, most of the audience sat on the floor; others stood leaning against the walls, or sat on wooden planks. Until the program got under way, it was difficult to tell the audience from the performers, since the latter were stationed in various parts of the room. The first piece, or rather the first two pieces (to be played simultaneously), *For Strings No. 2* and *Music for Piano No. 4*, began almost unnoticed. The violinist, La Monte Young, crouched forward on a stool and moved his bow slowly across an open string, first up, then down. The grating monotone seemed to soothe the audience and, after a while, the sounds of the light Sunday evening traffic, inaudible a few moments before, penetrated the quiet room. Soft footsteps were heard approaching the piano. It was the composer. Thoughtfully, Mr. Ichianagi reached inside the piano, grasped a piece of wood, leaned forward, and plunged the stick into the middle-register strings. Pressing down firmly, he pulled the stick toward the keyboard. Suddenly the audience was in a subway car, straining its way around a sharp curve, tracks and wheels emitting high-frequency screeches. Young moved to another open string and increased the pressure of his bow arm slightly. The composer attacked another section of the string bed and produced a metallic stutter as the wooden knife bounced over the strings. . . . The piece ended quietly; the performers stopped

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

playing, exchanged nods, and shook hands.

The second work on the program, *Music for Electric Metronome*, might be described as "music in the round," from both the visual and aural standpoints. Performers and instruments were dispersed throughout the room, and some of the former were "mobile." Here is a telegraphic account of the proceedings:

Metronomes establish sonic framework. Performer whistles unidentifiable tune. Chair placed on piano. Trash can moved closer to piano. Performer puts on jacket, exclaims, "Whew!" Metronomes accelerate. Performer clears throat, clucks tongue. Tape recording of gurgling drain pipe. Performer yelps. Gurgle. Performer places chair in front of piano, climbs on top of piano, walks on strings, jumps off piano into huge trash can filled with paper, slowly sinks into trash up to shoulders, rocks back and forth until trash can crashes to floor, crawls out of trash can, creeps back to metronome in time to make next tempo change. Gurgle. Bell. Small drums. Groan. Performer drops trash can lid on piano strings. Depresses pedal to sustain tone. Another performer removes lid from piano, tosses it on floor. Gurgle. First performer retrieves lid, throws it back on piano. Second performer angrily hurls lid to floor, etc. Tape recording of dripping faucet. Metronomes die out. Silence.

The third piece was a work for piano solo performed by the composer. It was in two parts, one loud and the other quiet—a sort of experimental Prelude and Chorale. Mr. Ichianagi confined himself to the keyboard in the vigorous "prelude." Employing elbows, forearms, fists, and palms, he attacked the keys with a panther-like ferocity and speed. Abrupt pause. The composer rose, depressed the pedal, and calmly selected various strings to be plucked. The sounds he produced might be described as those of a "prepared harpsichord."

Next, Yoko Ono, a young poet, recited and "interrupted" a Zen poem. Miss Ono



Fig. 1. Composer Toshi Ichianagi performing on koto.

(Photo by author)

walked quietly toward the piano, holding a paper bag. She turned her back to the keyboard and began to speak. By way of punctuation, she struck at the keys behind her with her elbows. Then she sat on the piano stool, reached into the paper bag and drew out a string bean, which, after uttering a Japanese phrase, she dropped to the floor. Then she stood up, cried out, jerked her head from side to side

(Continued on page 61)



F

or concert hall realism, for the richness and depth of music that rivals the living performance, a BIG Bozak speaker system is a must. No small system, however ingenious and well made, can equal it. We have demonstrated this conclusively to any number of discerning listeners.

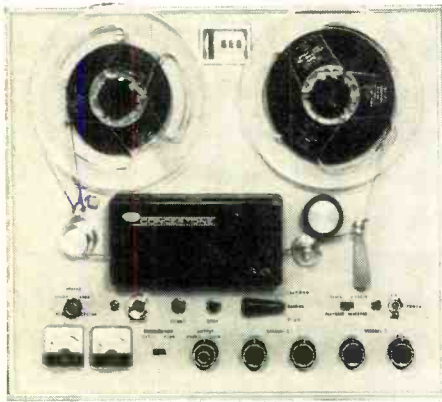
To those of you, therefore who are primarily interested in great music, re-created as perfectly as can be done, we say: listen BIG, hear it on one of the larger Bozak systems, such as the B-310A or the B-305 shown above. Whether stereo or mono, we feel sure you'll agree that the grandeur of sound much more than justifies the size of the instruments. Call on a Bozak Franchised Dealer for a convincing demonstration.

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● **4-Track Stereo Tape Recorder.** Permitting the playing of an entire reel of quarter-track tape without attention, the American Concertone Reverse-O-Matic model 505-4R provides up to 1½ hours of continuous stereo playback at 7½ ips or three hours at 3¾ ips. Performing all functions of the normal 4-track recorder



and playback machines the 505-4R features two separate 4-track playback heads, one for each direction of tape movement, thus ensuring optimum fidelity in both directions. Another feature of the 505-4R is its use of three hysteresis motors for maximum smoothness of tape motion. Concertone is also making available a kit, No. 540, for converting 4-track versions of the model 505 for automatic reversal operation. American Concertone, Inc., 9449 W. Jefferson Blvd., Culver City, Calif. C-1

● **Record Cabinet.** Designed to match the equipment cabinets and speaker enclosures in the Rockford line, model 106 record cabinet is crafted in furniture-grade woods and is available in natural walnut, hand-rubbed mahogany, blonde, or ebony finish.



It can accommodate a large number of 12-in. records and is available with a choice of removable base or with legs. The model 106 record cabinet is 20-in. wide, 32½-in. high, and 18-in. deep Rockford Special Furniture Co., 1803 W. Belle Plaine, Chicago 13, Illinois. C-2

● **New FM Tuner with DSR.** Featuring dynamic sideband regulation (DSR), the new Knight KN-150 FM tuner is claimed to provide optimum reception of all FM stations. The advantage of DSR is that it virtually eliminates the distortion of a weak signal as well as the distortion caused by overmodulation of the signal at the station. Another feature of the KN-150 is its easy adaptability for multiplex. Provision has been made for the addition of a multiplex adapter, and a control for regulating stereo balance is already included. A panel light, which will glow automatically when a multiplex signal is



received, has also been included. IM distortion of the KN-150 is below 0.25 percent at signal levels over 10 microvolts. The audio output stage utilizes a cathode follower to permit cables up to 100 feet in length. AFC and inter-station muting are also provided. An output level control is mounted on the front panel to facilitate tape recording FM broadcasts. The KN-150 is provided with a beige-finish metal case and the control panel is gold and charcoal brown. The price is \$119.95. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois. C-3

● **Wireless Microphone.** Weighing only 7½ oz., and measuring one inch in diameter by five inches long, the Vega-Mike wireless microphone affords unrestricted mobility within its useful range. Although it looks like a conventional lavalier microphone, the Vega-Mike is actually a self-contained FM broadcast station, including transistors and battery. Even the neck strap which supports the mike is part of the system, acting as an antenna element. Power output is .020 watt and its useful range about ½ mile. Operating frequencies



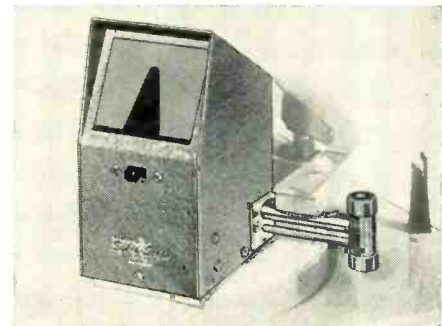
range from 24 to 45 megacycles, in channels assigned by the FCC for general business and broadcast relay use. Price of the Vega-Mike alone is \$249.75. A specially-designed FM receiver for use with it is priced at \$267.75. Vega Electronics Corp., 10781 N. Highway 9, Cupertino, Calif. C-4

● **Improved Changer.** United Audio Products announces the availability of the new Dual-1006 Custom turntable-changer. Similar in external appearance to the original model, the Dual-1006, which it supersedes, the Custom features a number of internal engineering and material improvements. The Dual has been noted for its versatil-



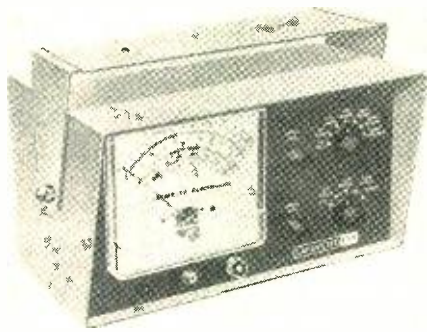
ity of operation and this feature is continued in the new model. Among its other features are its roller-feeler indexing action which measures each record to find the exact location of the lead-in groove, and the elevator-action changer spindle which operates without pusher arms or off-set spindles. Its one-piece tone arm tracks at a stylus force as low as 1½ grams. Price remains \$79.95. United Audio Products, 12 West 18th St., New York 11, N. Y. C-5

● **Optical Instrument for Detecting Stylus Wear.** An optical instrument which shows stylus wear, the Robins "Syl-A-Scope" model SG-66 magnifies the contours of the stylus and reflects the image upon an illuminated screen. Permitting examination of the stylus while the cartridge is



mounted in the tone arm, the Syl-A-Scope is well suited for use by the audiofan. The principle upon which the instrument is based is the same as that used in the "shadowgraph" which is widely used in industry for quality control and parts inspection. For this reason it can also be used for examination of small parts, tools, and instruments. It plugs into any convenient outlet and projects its image on a screen measuring 2¾ x 2¼-in. Model SG-66 retails for \$19.95. Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y. C-6

● **VTVM Kit.** Designed to meet the most rigid laboratory standards of accuracy and sensitivity, the Lafayette model KT-174 v.t.v.m. is a recent addition to the Lafayette kit line. Furnishing extreme accuracy within its 200 µa meter movement and balanced-bridge push-pull circuitry, the meter provides an easy-to-read two-color scale incorporating a direct-reading db scale plus a zero-center scale. Scope terminals are provided on the rear panel for simultaneous waveform observation while making a.c. measurements. Also accessible at the rear panel are calibration controls for: a.c., low a.c., d.c., d.c., and a.c. bal. In addition to its uses as an ohm-



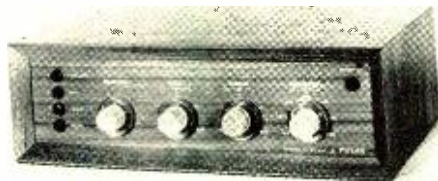
meter, d.c. voltmeter, and a.c. voltmeter, the KT-174 incorporates low a.c. ranges for noise and gain measurements for audio and high-fidelity applications. A specially designed probe provides push-button selection of a.c., d.c., or ohms. The KT-174 utilizes a printed circuit to insure fast, accurate assembly. The case measures 8½ x 6 x 5-in. Price is \$39.95. Lafayette Radio Corp., 165-08 Liberty Ave., Jamaica 33, N. Y. **C-7**

• **Pickup Arm and Cartridge.** The outstanding feature of the Fairchild model 500 arm and "Linear Separation" model SM-2 cartridge is its anti-skating characteristic. Skating is tendency of an arm to ride towards the center of the record. More pressure is placed on the inner wall than on the outer wall of the groove, this condition being especially undesirable for stereo. The Fairchild model 500 overcomes



skating by a method that applies an equal but opposite force. One benefit resulting from the anti-skating characteristic is the ability to employ a very-high-compliance cartridge such as the SM-2. The arm also utilizes a system of dynamic balancing, without springs, which ensures uninterrupted tracking in the event of sudden shock. Price of the arm and cartridge combination is \$55.00. Fairchild Recording Equipment Corp., 10-40 45th Ave., Long Island City 1, N. Y. **C-8**

• **Transistorized Stereo Amplifier.** Offering 15 watts per channel, the newly developed Polar Electronics stereo preamplifier-amplifier operates on either a.c. or d.c. Distortion is stated to be less than 1 per cent over the frequency range from 20 to 20,000 cps. The unit has a sensitivity of .2 millivolts for the tape head input, .9 millivolts for magnetic phono input, and .5 volts for tuner and auxiliary inputs. Separate bass, treble, and loudness controls are provided



for each channel. A unique feature is the complete encapsulation of the circuit. This protects it from rough usage, dust, and moisture. The all-transistor construction of this amplifier eliminates heat, hum, and microphonic problems. It comes in an all-wood cabinet which is 3-inches high, 12-inches wide, and 7-inches deep. The price is \$96.50. Polar Electronics, Ltd., 1514 Oak St., South Pasadena, California. **C-9**

AUDIO • MARCH, 1961

BREAKTHROUGH IN KIT DESIGN!



LK-72 72-Watt stereo complete amplifier kit (left), \$149.95. LT-10 Wide-Band FM Tuner kit \$89.95.*

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BREAKTHROUGH! Here, for the first time, are kits with the performance, features and handsome good looks of H. H. Scott factory-assembled components . . . kits that are a real pleasure to build and so expertly designed that you can achieve professional results in just a few hours.

H. H. Scott assures you the performance of factory-built units with these innovations:

1. All mechanical parts such as terminal strips and tube sockets are firmly riveted to the chassis thus assuring sturdy professional construction and eliminating the bother of this time-consuming operation.
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" . . . designed to professional standards; sound absolutely clean; very sensitive; instruction book of outstanding clarity." — Major B. W. Cotton, Jacksonville, Ark.
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 " . . . without a doubt the easiest kit I have ever built (out of 11) . . ." — B. P. Loman, Jr., Rochester, N. Y.
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Rush me complete technical specifications on H. H. Scott kits. Include your new "1961 Guide to Custom Stereo."

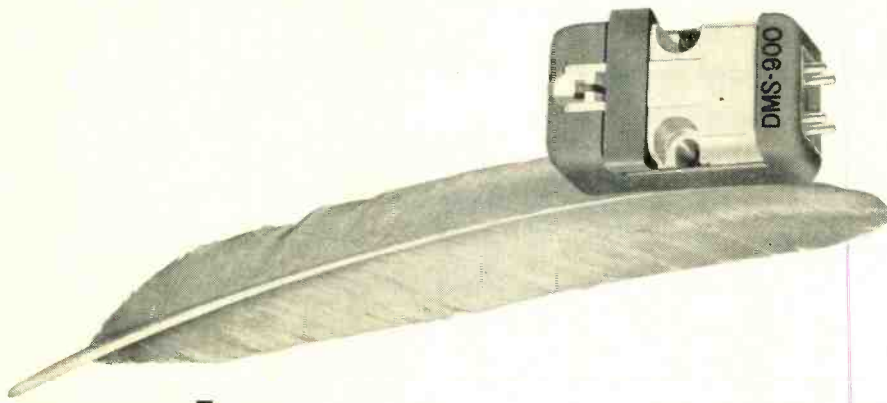
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rarely

does a product happen along in the crowded high fidelity components field that warrants any extraordinary attention. There is, of course, an exception to every rule. In this case, the new DMS-900 magnetic stereo cartridge is the exception.

Here are a few of the findings from an exhaustive test made at our request by Hirsch-Houck Laboratories, a leading independent research organization:

- "Tracks well at less than 2 grams . . . indicating it is easy on records."
- "Channel separation superior to practically any cartridge we have tested . . . being maintained all the way up to 15 KC."
- "Frequency response and output voltages of the two channels are well matched."
- "Few cartridges have as symmetrical channel separation properties as does the DMS-900."

Ask your dealer to demonstrate the fabulous DMS-900... the new magnetic stereo cartridge that tracks feather light! With .7 mil diamond stylus, \$34.50.

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Circle 58A

AUDIO ETC

(from page 36)

sirable effects. A "hi-fi" reverberation, utterly flat, is a most unlikely phenomenon in nature, I'd guess. So why not a low-fi artificial reverb?

The Hammond reverb delay is arbitrarily chosen and is supposed to approximate the size of a typical good concert hall. More reverb, or less, does *not* change the delay and, hence, the size of the invisible pseudo-room. Only the liveness is changed, within the same space. Therefore, you can't make your artificial room bigger, or smaller, though on casual trial you may think you've done it. You have—if you mean that on fading the reverberated sound down to almost nothing you have allowed a (presumably) smaller original space to take over. The large space does not shrink; it merely fades into "invisibility." Interesting idea.

Presumably, then, the somewhat less than flat reverberated sound, as picked off the spring ends, is also an arbitrary "curve," corresponding to an arbitrary interior-wall finish. Fixed as to reflecting properties, though variable as to degree of reflection—also a rather unlikely phenomenon, but acceptable. You can imagine your Hammond "concert hall" to have some strange new synthetic plastic wall surface. The surface, to my ear, is too hard, emphasizing mid-range reflection for a somewhat brittle effect. Definitely not soft, polished wood—but how much can you ask for? I'll take the Hammond-Fisher sound any day as a useful one in many practical situations.

Use It This Way

A final word—what are good uses for home reverb?

1. With a tape recorder, to make small rooms into big ones, to push close-up sounds back, to enhance the impressiveness of music that needs space but doesn't have it—all this for a legitimate "natural" sound. (Note: you can do it in the recording, or in the playback.)

2. To add large-hall sound and variably longer decay time to many older 78-rpm recordings (and their LP reissues), which by present standards of recorded reverberation seem too dead. This applied to most classical recordings made in the early and middle thirties; it applies to the totally dead sound on popular records of the same period. Acoustical records, Caruso *et al.*, may be reverberated, but the sound will be strange, at best. Like an acoustical phonograph playing in a big hall.

3. To *slightly* modify the liveness of assorted modern LP's, some of which are still recorded with relatively dead, close-up sound. Many classical M-G-M records, for instance, were made studio-style, with little reverberation. Some Mercury discs can stand an extra boost in the liveness, to taste.

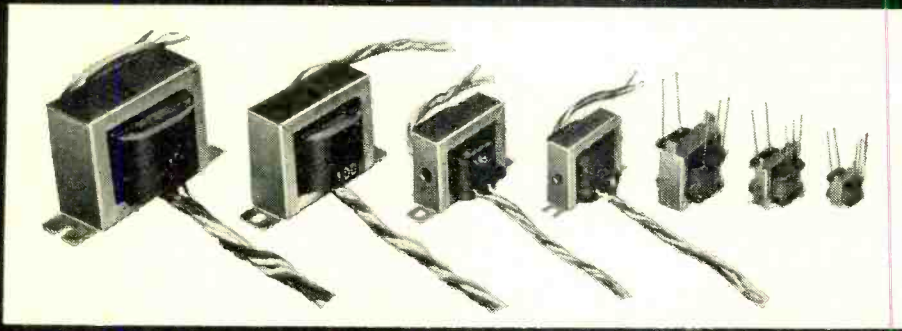
4. A technically doubtful idea—to modify the apparent liveness of your listening room, via added reverb through the speakers.

It is true that in a dead listening room ultra-live recordings tend to sound best, whereas a live listening situation favors the less live recordings. Thus, reasonably, a deadish listening room may be made to accommodate a greater variety of records if the less live recordings are *slightly* reverberated. (The opposite procedure is impossible, of course.)

Nevertheless, liveness emitted from your

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SANSUI ELECTRIC CO., LTD.

460, Izumi-cho, Suginami-ku, Tokyo, Japan

Circle 58B

speakers can't really replace liveness in three dimensions from good room reflection. Not even in stereo. More on stereo later.

5. Last and not least, reverb may be used for all sorts of clowning and stunting, again according to taste and ingenuity. But keep in mind that a unit such as the Fisher, with the delayed reverb blended conservatively into a large proportion of the original sound, cannot give the dramatic exaggerations of reverb you hear on TV and radio. (It's possible that other Hammond-based units provide more of the stunt sort of effect via a larger proportion of reverberated sound and a higher level, for longer decay. But long decay quickly turns into oscillation and electronic overloading, when there

is too much gain in the circuit. Risky, always)

* * * *

I'll get to stereo and "third channel" applications later, when I've tried for myself. But I suggest right now that for a true stereo reverb you will need *two* units, one for each channel. Mono reverb, the two channels blended together and then reverberated, for mono-style feeding into both speakers, precludes any chance for that wonderful "well-bounce" sense of stereo space that is one of the top features of big-hall ultra-live stereo. Two reverb units might well simulate the effect. Record companies often use a pair of reverb chambers (or "machines") to dress up stereo sound.

TRIODE OPERATION

(from page 32)

the feedback resistor and capacitor in position, shake the bits of wire and solder out of the chassis and you're through.

Performance

The specifications look nice enough, but it is the sound of this amplifier that you'll like the best. The extreme stability (we used 20 db of feedback, leaving a stability margin of more than 15 db) of the amplifier is demonstrated by the fact that it recovers immediately from d.c. pulses of considerable magnitude applied at the input, with no ringing or hangover. We tried several records which we had considered to be substandard as far as over-all clarity is concerned. The new amplifier reversed our thinking—the deep bass had been there all the time, and the record scratch was not nearly as prominent as a less smooth amplifier had led us to believe.

This amplifier cost close to a \$100 to build,³ which you may consider extravagant in view of the fact that one can buy 60-watt amplifiers for that price. However, the sound from it is so clean

³The stereo version would cost about \$150. It could use as a power transformer a Triad R-25A, and a C-20A for the choke. For the input stage, each channel could use half of a 12AX7 to eliminate the filament drain of the 6AV6.

at normal and well above normal listening levels, that we feel it is well worth the cost.

PARTS LIST

R_1	470,000 ohms, ½ watt
$R_2, R_{13}, R_{14}, R_{21}$	10,000 ohms, ½ watt
R_3	1000 ohms, ½ watt, 5%
R_4	30,000 ohms, ½ watt, 5%
R_5	180,000 ohms, 1 watt, 5%
R_6	1 megohm, ½ watt
R_7, R_{19}	18,000 ohms, 2 watts, 5%
R_8, R_9	22,000 ohms, 1 watt, 5%
R_{10}	25,000 ohm, potentiometer
R_{11}, R_{12}	220,000 ohms, ½ watt
R_{15}, R_{16}	270 ohms, ½ watt
R_{17}	3900 ohms, 2 watts
R_{18}	150,000 ohms, ½ watt
R_{20}	10 ohms, ½ watt
R_{22}	280 ohms, 20 watts (selected 250 or 300 ohm)
R_{23}	200 ohms, 20 watts
C_1	47 µf, 5%
C_2	.25 µf, 600 v
C_3, C_4	1 µf, 600 v
C_5	300 µf, 150 v, electrolytic
C_6	16 µf, 700 v, electrolytic
C_7	20 µf, 600 v, electrolytic
C_8, C_9	40/40 µf, 500 v, electrolytic (can)
C_{10}	12 µf, 500 v, electrolytic
T_1	Triad R-71A
T_2	Triad S-42A
CH_1	Triad C-15A
V_1	6AV6
V_2	6SN7GTB
V_3, V_4	KT88
V_5	GZ34
F_1	3AG, 3 amp

SOUND STAGE

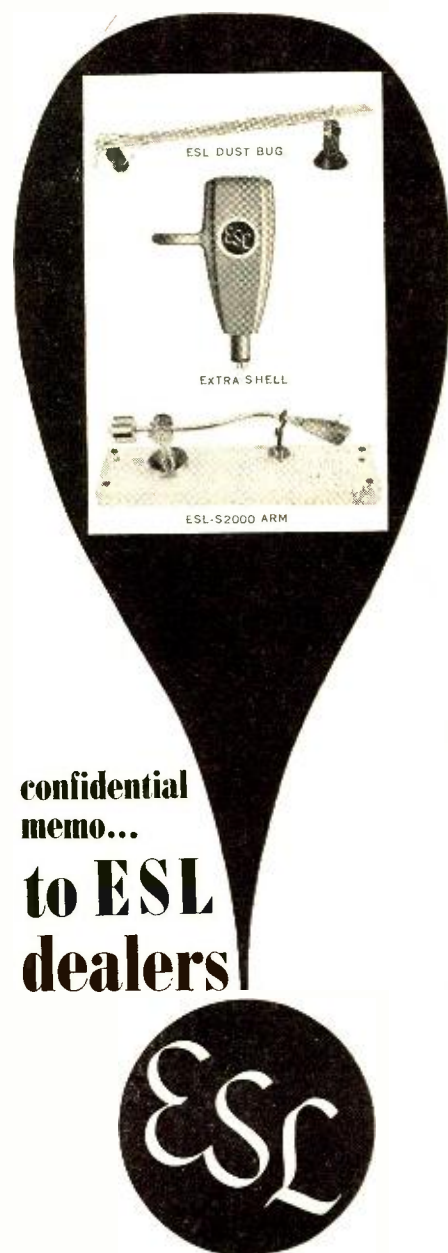
(from page 28)

preamplifier output. A cord should connect this output directly to the high level or "phono" input of the tape recorder without additional microphones.

Several tapes of typical rehearsals should be made and studied by everyone concerned. Is every voice heard and understood? Is the level reasonably consistent (keeping in mind, however, that certain voices are naturally weak, others naturally powerful. While all voices should register clearly through a sound

system it can not and should not make them *exactly* equal).

A good actor or vocalist will automatically "project" and little difficulty will be encountered in picking up trained voices with well-placed mikes. If some voices register poorly in a check tape ask the performers to listen, and stress diplomatically the need for further practice and training. This will aid them in giving more effective performances.



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The Distribution Problem

If, from the above evaluation and previously outlined technique we are certain that a well-balanced, clear pickup of the program is available, we may direct our attention to *delivery* of this material in good condition to every member of our audience.

No "blighted" seats should be tolerated until all possible means of sound distribution have been tried. A few compromises may be necessary, but modern methods have effectively covered most situations.

The sound level maintained throughout the auditorium must not seem uncomfortably loud to persons with normal hearing, yet persons with up to 25 per cent hearing loss should be aided in understanding all lyrics and dialogue. Persons with a hearing impairment more serious than -30 db should, of course, use a hearing aid. In these cases distribution of stage sound should deliver a usable signal at the microphone of the hearing aid for reamplification at the required level of the individual user.

A. Personnel requirements

In large sound installations, or radio-TV transmitters, a second person or team is required for the "distribution" phase because of the complexity of equipment. In theatrical work it's possible for the person handling pickup problems to turn on and adjust the power amplifiers which drive the auditorium speakers. Output level may, under most conditions, be set at the beginning of a program, and not be varied unless the audience size or noise habits change considerably.

B. Equipment location

Power amplifiers may be located in the monitoring booth with other equipment or at a remote point. It should be accessible for maintenance, however.

C. Equipment Requirements

1. *Speakers.* These should be of adequate size and baffled to handle bass requirements of all program material, with capabilities of handling treble range to upper limits of human audibility. Manufacturer's specifications should be consulted for this information, plus dispersion angles, mounting information, etc.

Speaker selection and placement depends to a large degree upon the characteristics of each hall, and no two auditoriums present identical problems. This is a job for an acoustic expert who may require several days of trial and testing before proper results are achieved. Once set, no further changes need be made.

2. *Amplifiers.* The amplifiers should have sufficient power output and frequency response to drive the speakers selected. Although complete amplifiers are adequate for simple systems of 1-2 microphones plus phono or tape, theatrical applications are more flexible with *separate* power amplifiers fed by mixer-preamplifiers.

D. Evaluation

A recorded tape of known clarity, even level and sound quality (preferably the material finally accepted in evaluation of stage pickup) should be played directly into the power amplifier input and through the auditorium speakers. A critical jury should be dispatched to try all seats in the house before the job is accepted.

E. Standby equipment and procedures

The show must go on. And good sound helps it to go on. It's wise therefore, to provide all equipment-in-depth. This means extra microphones, cords, mixers, and power amplifiers. All connectors should be quick-disconnect and standardized for complete mechanical and electrical interchangeability. Standby equipment should be installed, or ready, as close as possible to the active pieces they are understudying. Power cords may be connected and everything ready at the throw of a switch or change of input and output connections. Personnel should be instructed, and signs should warn, that *power amplifiers must not be powered without connecting speakers* or an output load. Output transformers might suffer serious damage if this caution isn't observed.

F. The final test; an actual performance

If the pickup and distribution phases of the problem have been properly handled, and a competent person placed in charge without acoustical or other interference, and if all equipment is properly maintained on a schedule, a significant addition to audience enjoyment will be noted. Æ

EQUALIZATION TERMINOLOGY

(from page 19)

time, the capacitance is changed to capacitive reactance:

$$T = RC = \frac{R}{2\pi f X_c}$$

In terms, this is:

$$\text{ohms} \cdot \frac{1}{\frac{\text{cycles}}{\text{sec}} \text{ ohms}} = \frac{\text{sec}}{\text{cycle}}$$

Since the 3-db point we wish to determine is the frequency where $R = X_c$; these two quantities may be cancelled in the equation. Therefore:

$$T = \frac{1}{2\pi f}$$

$$f = \frac{1}{2\pi T(\text{sec})}$$

Because the time constant is expressed in microseconds:

$$f = \frac{1,000,000}{2\pi t(\mu \text{ sec})} = \frac{159,155}{t}$$

Example: The FM de-emphasis characteristic has a time constant of 75 microseconds. The 3-db point frequency is:

$$f = \frac{159,155}{75} = 2122 \text{ cps.}$$

IV. Conversion of Time Constant to Attenuation at 10,000 cps

This is simply the combining of the formula of III. into that of I.:

$$\text{db loss} = 20 \log \sqrt{\left(\frac{10,000}{159,155/t}\right)^2 + 1}$$

$$= 20 \log \sqrt{(.0628 t)^2 + 1}$$

Note that if t is zero we have the log of 1 which is zero. As before the db can be

determined from a chart by looking up the result from solving: $\sqrt{(.0628 t)^2 + 1}$

Example: What is the response at 10,000 cps in the FM de-emphasis curve (75 μ sec)?

$$\text{db loss} = 20 \log \sqrt{(.0628 \cdot 75)^2 + 1}$$

$$= 20 \log \sqrt{4.71^2 + 1}$$

$$= 20 \log \sqrt{23.181}$$

$$= 20 \log 4.81 = 20 \cdot .683 = 13.66$$

In summary, the use of these four conversions should be of great convenience to a circuit designer in determining circuit values to meet characteristics expressed in attenuation at 10,000 cps or in the time constant. They are also useful to one checking the response of equalizing networks when only the bare amount of information is known.

The author included the mathematics involved to show how the formulas were determined and as a guide for anyone in deriving other conversions.

There is one word of caution to be noted. The rolloff equations are on the basis of a simple R-C circuit which has a maximum slope of 6 db per octave. The result of I., for instance, cannot be used with a 12 db per octave speaker crossover network. Æ

ABOUT MUSIC

(from page 55)

flinging about her magnificent black hair, and pulled out another string bean. One by one, she removed all the beans and concluded her recital by dropping the empty bag.

Following the intermission, the composer performed *Kaiki* for koto, dedicated to John Cage. The work is in ternary form; that is, in an A-B-A pattern. The koto is a Japanese zither, about six feet long and nearly a foot wide, with a convex sound-board, and thirteen strings. Mr. Ichihyanagi did not perform in traditional Japanese style sitting on the floor, nor did he utilize plectra. Instead, he placed the instrument on a plank resting on two barrels and moved a bow across the extreme end of the board, in order to produce a ponticello effect. (Fig 1)

The final work on the program was called *IBM*. As in the previous compositions, no conductor was required: the sequence of the music was dictated by the perforations on IBM strips. Mr. Ichihyanagi returned to the piano strings, a recorder player sat off to one side, and a man with a hammer stalked about the room, striking the floor and walls, running his "instrument" along the inner rim of the trash can lids, and smashing light bulbs and bottles. Miss Ono unraveled a ball of twine and wound it around the composer's neck, around the ends of pipes, chair legs, and spectators' limbs, "entangling all in her web." Later, she cut up an afternoon newspaper and wrapped it around her head.

In an imaginary interview written by John Cage, he is asked the question: "Then what is the purpose of this experimental music?" Answer: "No purpose. Sounds." Sound, of course, was the principal source of interest in Toshi Ichihyanagi's music, but few of those present at his concert would deny that the visual element played an equally vital role in the total experience. Æ

RECORDS

(from page 47)

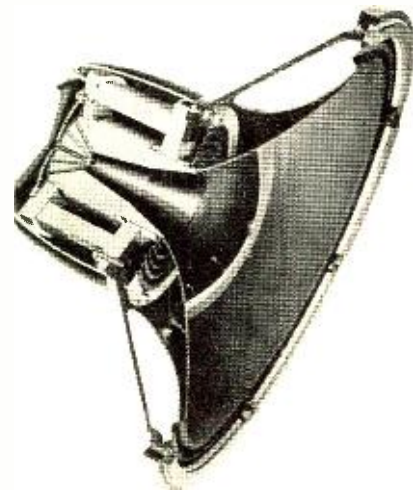
Let me say of the performance merely that it is guaranteed as traditionally correct by its very origin, and by the long-time D'Oyley Carte conductor, Isidore Godfrey, who knows what's what if anybody does. Let's say also that, with no great breaches of tradition apparent, the fact is that even the D'Oyley Cartes are edging very slowly towards a more professionally conventional operatic technique in the singing, with less individualism of production, better pitch, more Italianate wobbles and edge, an inevitable though slight loss of the keen edge of G & S humor. The humming is now actually less prominent, as I hear it—yet it seems a trace more forced.

Ah, for the good old days. But the new days aren't too bad, considering.

Gilbert & Sullivan: Iolanthe. D'Oyley Carte Opera Co., Godfrey.
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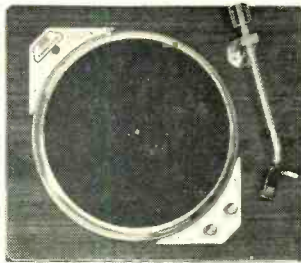
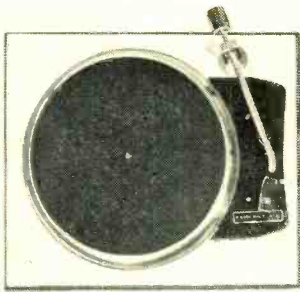
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THE AUTHORS

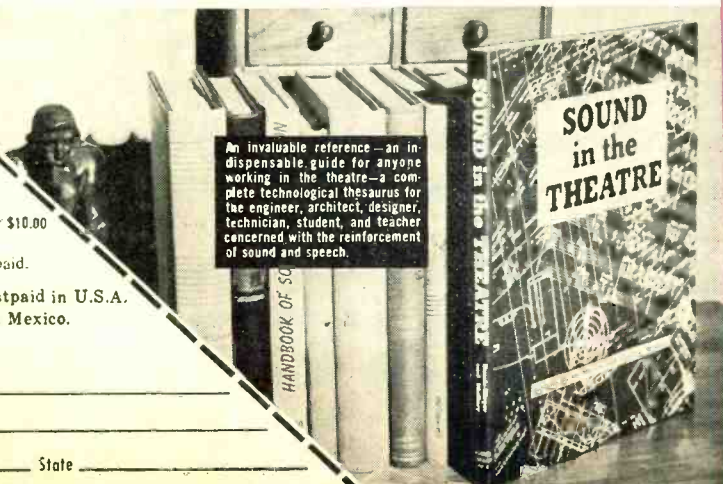
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MOTEL

(from page 21)

100 to 10,000 cps. Even at that the response was not guaranteed to be flat. We felt sure however that someone carried line-matching transformers with a wide-range frequency response and kept looking. This effort was rewarded when we found the answer in the Jensen and the Triad lines. They listed units with a frequency response of 30 to 15,000 cps, plus or minus 1 db. It was these that were ordered for our installation, in spite of their high cost (about 4 times the price of the average PA types). It would have been "penny wise and pound foolish" to restrict frequency response at this point. Pads were chosen on the same basis, with quality the prime consideration.

The equipment was loaded into our truck and with a full tank of gas and about enough money left in my pocket for a hamburger, we started the journey back to the "north woods." Rolling north with all that audio equipment gave us the feeling of a Hi-Fi show on wheels.

Upon arriving home at Hilltop, the accumulated mail revealed a few pieces of literature on the installation procedures for constant-voltage systems. It was difficult to even locate literature pertaining to this type of installation. After reading a few of the instruction sheets it became obvious that there were differences of opinion, particularly in reference to amplifier loading. Some sheets stated that the amplifier load should be anywhere up to the rated output, but not over, while others insisted that the amplifier must be loaded to its maximum rated output in order for the system to function at top efficiency. It might be mentioned here that the line matching transformers have their primary tapped in terms of watts to be fed the loudspeaker rather than in ohms. Since the amplifier is operated at a constant voltage it is insensitive to impedance variations, and the power fed to any speaker across the line is governed by its impedance. Multi-tap windings enable the output of each speaker on the line to be varied to best fit the size and acoustic requirements of the room it is installed in. Then the over-all level is controlled at the amplifier. At the motel it was necessary to use pads in addition since each room had to have a level control with a control range from zero to a predetermined maximum which is set by the amplifier gain control.

The instruction sheet written and offered free, by the Triad Transformer Corp. of Venice, California, impressed us most. It is entitled "Sound distribution using the RETMA 70-volt line." About loading, it has this to say, "The amplifier is not necessarily operated at

maximum power but this figure is used to determine the output impedance and maximum power available in the system. For optimum performance the sum of the calculated powers fed to the speakers must equal the rated power of the amplifier. This is the factor which establishes the matching between the amplifier and the total speaker load." Our installation followed this principle and it has performed to perfection.

Installation Procedures

The long hard task of mounting and installing all the equipment was next, and running the parallel line was our first project. From the main control to the first loudspeaker (about 150 feet away) we ran two runs of 14-gauge line, paired, this being the equivalent of about an 8-gauge cable, which meant virtually zero loss to this point. From here on through the remainder of the buildings and speakers we ran the straight 14-gauge line. With this transmission line setup, loss is almost undetectable, and thus enables the system to be properly balanced by using the monitor speaker at the end of the long cable. The transmission line runs part of the way just below the ground, and the rest of the way above ground.

The L-pads created a problem in that the threads on the shaft did not extend through the wood of the enclosure sufficiently to allow a nut to engage on the other side. Therefore, it was necessary to cut small metal plates on which the pads were mounted, and the plates were then screwed to the inside of the enclosure. Why the people who manufacture these L- and T-pads (we used them from two different manufacturers) can't provide a few extra threads so that the shaft will fit through and fasten to a reasonable thickness of wood I will never know. This little shortcoming caused us considerable delay and unnecessary work when you consider that adapters had to be made for 18 of them.

From here on, everything went quite smoothly with just one or two very minor slowdowns. The speakers, transformers, and pads were all mounted into the enclosure and wires soldered to their proper terminals. The soldering was double checked by a second person to make sure that there were no cold joints. The same person also double checked the wire coding. After completion of each 3 units we rough checked them for performance and then final checked the entire 18 units by wiring them all together. This was to eliminate the troublesome task of probing the entire system for an error in hookup after it had all been completely mounted and installed in the rooms. At this point our garage had speakers and enclosures just about everywhere you looked.

For proper loading of the amplifier and to correctly match the individual speakers output for the size of the room, taps of from 4 to 8 watts were used. Considering the low-distortion characteristics of the equipment, this would be more than enough to supply clean sound in each room, even including leeway for peaks.

In the course of the next few days all the enclosures were mounted in the motel units and attached to the previously installed parallel line. Our system which had been months in the designing and building stages was now ready for its first test. A record was placed on the turntable, the gain control advanced, and the monitor speaker began to reproduce musical tones loud and clear. We all breathed a long sigh of relief at this point. We were well rewarded for our extra care and time consumed in double checking as we went along. Proceeding out into the motel units we found all 18 speakers working very well and with a remarkably even level of output, considering such a long transmission line, as well as all the other factors involved. The individual gain controls at the room speakers could be adjusted any way at all without a bit of noticeable effect on over-all sound level or quality.

There was however a hum coming from all the speakers, but it didn't sound like a hum which was generated within the system. After a bit of investigation we found that the hum continued after the system was shut off, and traced it to high voltage pickup from neon-sign transformers. By moving the main transmission line a good distance away from the neon-sign transformers, the hum was completely eliminated and no further trouble has been experienced.

This system, now in operation for well over a year, is producing the finest, cleanest, high-fidelity music that I know of in any motel throughout the United States. The preamp tone controls are set essentially flat with a very slight bass boost. We tested it on various different recordings and these settings were found best all around. The only time the controls are ever altered is when we transmit speech during news and weather reports.

Lightning and Static Electricity a Problem

About the only other problem we have encountered has been static electricity during thunderstorm activity. Hilltop Motel is situated on a high point of land which is called "The Overlook" by the old timers. Being so situated, it is subject to an unusual amount of static electricity during periods of turbulence or thunderstorm activity. During these periods we do not use the system at all and have devised a means of shunting any

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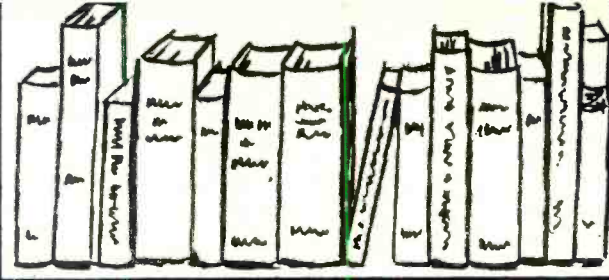
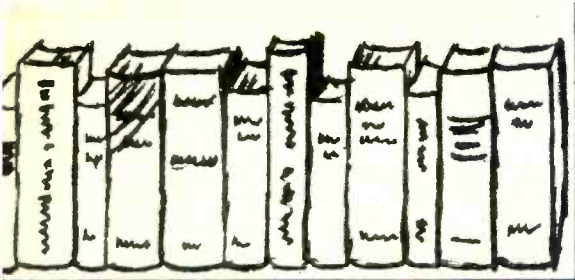
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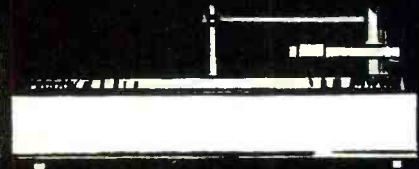
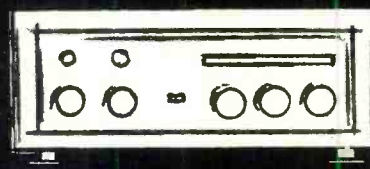
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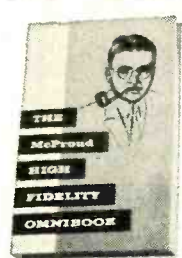
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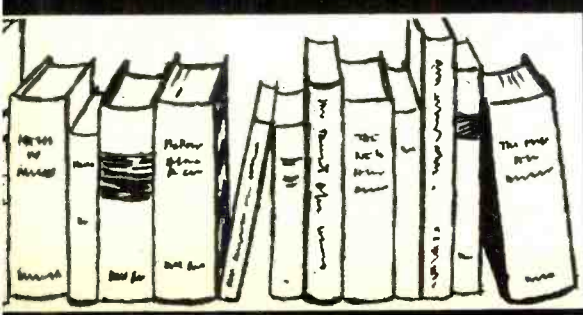
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current induced into the system to ground by use of switches at various points, thus preventing the entire system from being burned out by lightning charges. We had this type of power surge here last summer which blew every light bulb in the motel that was on at the time (11 in all), yet didn't blow any of the fuses. The high-fidelity system, however, was protected and came through it unscathed.

Future Plans

In conclusion, if we had to do it all

over again, we would. The public's reaction to the sound has been quite gratifying. As to plans for the future they include the installation of two outside projection horns, which will cover the grounds with low-level music. Also we intend to put speakers underwater to supply this unique type of music to swimmers in a 30 x 60-foot pool we plan to build. Future plans also include a multi-wire transmission line to offer a choice of FM or our own recorded music. Eventually we contemplate the possible addition of stereophonic reproduction.

Æ

PATENT APPLICATIONS

(from page 31)

do so. Hence facts that may be fatal to patentability after experimentation are frequently excused if they occur during experimentation.

"A sale which is primarily for the purpose of experiment will not bar patentability. During experiment use by assistants under no obligation of secrecy will probably not bar a patent although after the experiments are ended use or knowledge by assistants or workmen under no obligation of secrecy may well bar the patentability.

"Our conclusion is that the courts accord considerable hospitality to the inventor during the experimental stage. However, as a limitation we note that this hospitality disappears even during the experimental stage when the experimental motive wanes or is substituted by a profit motive or is attended by careless acts of the inventor."³

This right that the courts have granted the inventor of experimenting in the development of his discovery leaving him free of the thought that he might otherwise entertain of a loss of his right to a patent, rests on a decision of the United States Supreme Court rendered three quarters of a century ago.

In perfecting the invention of a wooden pavement the inventor laid a pavement of this character on Mill-dam Avenue in Boston in 1848 where it was used for six years before application was made for a patent. When later suit was brought for an infringement of this paving patent the defense of public use was set up by the infringer. In sustaining the patent the United States Supreme Court said of this experimental use of the pavement, "It is not a public knowledge of the invention that precludes the inventor from obtaining a patent for it but the public use or sale of it.

³ Watson v. Allen, 254 Fed. 2d 342, April 3, 1958.

"In England formerly as well as under our patent act of 1793, if an inventor did not keep his invention secret, if a knowledge of it became public before his application for a patent, he could not patent one.

"To be patentable an invention must not have been known or used before the application. But this has not been the law of this country since the passage of the act of 1836. And it has been very much qualified in England. Therefore, if it were true that during the whole period in which the pavement was used the public knew how it was constructed, it would make no difference in the result.

"It is sometimes said that an inventor acquires an undue advantage over the public by delaying to take out a patent, inasmuch as he thereby preserves the monopoly to himself for a longer period than is allowed by the policy of the law. But this cannot be said with justice when the delay is occasioned by a bona fide effort to bring his invention to perfection or to ascertain whether it will answer the purpose intended."⁴

Interpretation today of the words "public use" as they are used in the statutory provision that, "A person shall be entitled to a patent * * * unless the invention was in public use," in its application to such circumstances as those surrounding the transfer of the magnetic oxides by the Armour Research Foundation in this recent incident, rests on a decision by the United States Supreme Court handed down in the early years of the last century, that has since been closely followed.

There the invention of a tube or hose "for conveying air, water or other fluids" had been perfected in 1811 and no patent granted until 1818, seven years later after upwards of 18,000 feet of this hose had been made and sold. By

⁴ Elizabeth v. Pavement Co., 97 U.S. 126, October, 1877.

Pro's Nest

Saul J. White
Chief Engineer, Audax, Inc.

This is the first of a series of adventures in personal journalism from the technical stand-point. As such, this is not an advertisement even though we are paying for the space.

I hope to present some technical viewpoints, to upset some current superstitions, or to take issue with the poetic claims of ad-writers. This may sometimes reflect the battle between Engineering and Advertising. Engineering, in this instance, will hold the upper hand.

To clarify some mysteries regarding the use of magnets in loudspeakers, I would like to emphasize that weight of magnet is not necessarily proportional to speaker performance. Users are impressed with weight and, often, this becomes the only criterion for purchase.

In the dynamic loudspeaker, there are currently 3 methods of forming the magnet assembly (or pot structure.) (1) The first and most efficient is the use of a *slug magnet*. This is a cylindrical center plug located directly under the soft iron pole piece, and forms part of the center pole. (2) The next method is the use of a *ring magnet* which forms the outside portion of the pot. (3) The third magnet shape (in limited use) is a "W" shaped magnet, a combination of center slug and outer ring.

If we assume that all magnets are Alnico 5 and that the air gap is identical, the amount of weight which produces the same hypothetical flux density is as follows: slug — 1 lb; ring magnet — 2.5 lbs; "W" magnet — 2.0 lbs. The reason for this disparity lies in what is known as *leakage factor*. Since we are interested in drawing all the magnetic energy into the air gap, the only area where work is performed, we must avoid magnetic fields around the pot, outside the air gap. The leakage factor in a slug magnet is approximately "2". This means that ½ of the total potential magnetic force is lost in external leakage and only ½ is available within the air gap. This is considered excellent.

The ring magnet has a leakage factor of about "4" to "7", meaning that only 15% may be available in the air gap and 85% is lost externally. Thus, to equal the slug for the same density in the same gap, the ring must weigh 2½ times more.

The ceramic (barium-ferrite) magnet is inherently light and in terms of cost per unit flux density is not yet the equal of an Alnico 5 slug but is close as a runner-up. The ceramic has the advantage of decreasing the pot length so that the front-to-back dimension of the speaker is reduced. The ceramic magnet also points up the naiveté of judging a speaker by weight.

Slug magnets are capable of showing a greater energy product than ring magnets, even though both are Alnico 5. Reason: the slug magnet may be produced by the "chilled plate" method, which assists the orientation of the molecular domains. This method, sometimes referred to as "D.G." (directional grain), is not applicable to the ring magnet, so that ring magnets have lower potential energy than slug magnets, even with the wide disparity in leakage factor set aside. Among reputable loudspeaker manufacturers the ring magnet has disappeared except for special applications. The purchaser of a ring magnet is penalized since he is paying for magnetism that appears outside the air gap where it cannot aid speaker performance. An efficient pot structure will not attract a heavy screwdriver, iron plate, or magnetize a watch.

Because of limited space the "PRO'S NEST" must be brief. Please do not send me indignant letters because of minor omissions or neglect to explore all ramifications.



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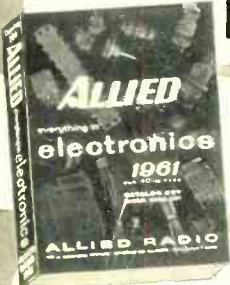
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this public use that court held the inventor had forfeited his right to a patent.

"By the very terms of the first section of our statute," said that court, "the Secretary of State is authorized to grant a patent to any citizen applying for the same who shall allege that he has invented a new and useful art, machine, etc., 'not known or used before the application.'"

"The authority is a limited one and the party must bring himself within the terms before he can derive any title to demand or to hold a patent. What then is the true meaning of the words 'not known or used before the application?'"

"They cannot mean that the thing invented was not known or used before the application of the inventor himself, for that would be to prohibit him from the only means of obtaining a patent. The use as well as the knowledge of his invention must be indispensable, to enable him to ascertain its competency to the end proposed as well as to perfect its component parts.

"The words then, to have any rational interpretation, must mean not known or used by others before the application. But how known or used? If it were necessary, as it well might be, to employ others to assist in the original construction or use by the inventor himself, or if before his application for a patent, his invention should be pirated by another or used without his consent, it can scarcely be supposed that the legislature had within its contemplation such knowledge or use.

"We think then the true meaning must be, not known or used by the public before the application. And thus construed there is much reason for the limitation thus imposed by the Act. While one great object was, by holding out a reasonable reward to inventors and giving them an exclusive right to their inventions for a limited period, to stimulate the efforts of genius, the main object was 'to promote the progress of science and useful arts.'

"This could be done best by giving the public at large a right to make, construct, use and vend the thing invented at as early a period as possible having a due regard to the rights of the inventor."

In conclusion the court added, "Upon most deliberate consideration we are all of the opinion that the true construction of the Act is that the first inventor cannot acquire a good title to a patent if he suffered the thing invented to go into public use or to be publicly sold for use before he makes application for a patent."⁵

⁵ Pennock v. Dialogue, 27 U.S. 1, January, 1929.

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Industry People...

SARGENT-RAYMENT OPENS EASTERN OFFICE. Effective January 16th, Sargent-Rayment of Oakland, California, has established an Eastern regional sales office and showroom at 30 Rockefeller Plaza, New York. Heading up the new office, as East Coast Division Manager, is Carl Carlson, formerly of Fisher Radio.

BOGEN-PRESTO REALIGNS MARKETING GROUP. In an aggressive approach to consumer markets, Bogen-Presto Division of the Siegler Corp. has named M. S. Sumberg to the newly created position of Director of Sales, Sound Products and High Fidelity. At the same time Harold Barton, formerly of United Audio, joined the company as Sales Manager, High-Fidelity Equipment. James W. Kearns moved up to the position of Field Sales Specialist.

CROSBY-ELECTRONICS CORP. TO PRODUCE INTEGRAND SPEAKER SYSTEMS. An exclusive licensing agreement was signed by Crosby-Electronics Corp. for the production and distribution of Integrand speaker systems. First models of the servo speaker-amplifier systems are expected in early Spring.

WILL RAYMENT JOINS FISHER BERKELEY CORP. Resigning as President of the Sargent-Rayment Co., Will Rayment has joined Fisher Berkeley Corp., manufacturers of intercoms and commercial sound systems, as Executive Vice-President. In announcing the move, Mr. Rayment predicted a strong trend towards commercial sound in the future.

GOTHAM AUDIO OPENS WEST COAST OFFICE at 1710 No. LaBrea, Hollywood 28, California. The new office is under the supervision of Hal Michael.

UNITED AUDIO NAMES SALES MANAGER. The appointment of Hal Dennis as National Sales Manager for United Audio Products was announced by Julian Gorski, President. Mr. Dennis was previously Sales Director of Westminster Records and prior to that General Manager of Urania Record Corp.

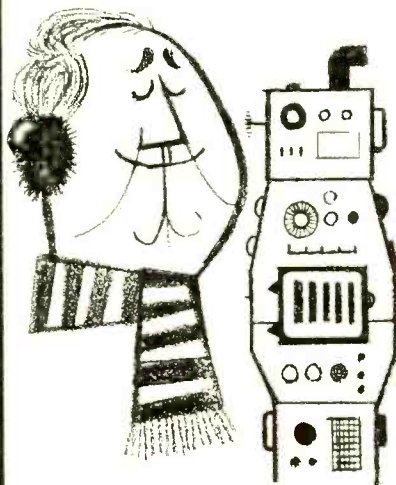
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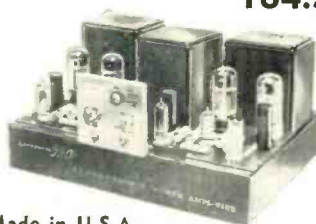
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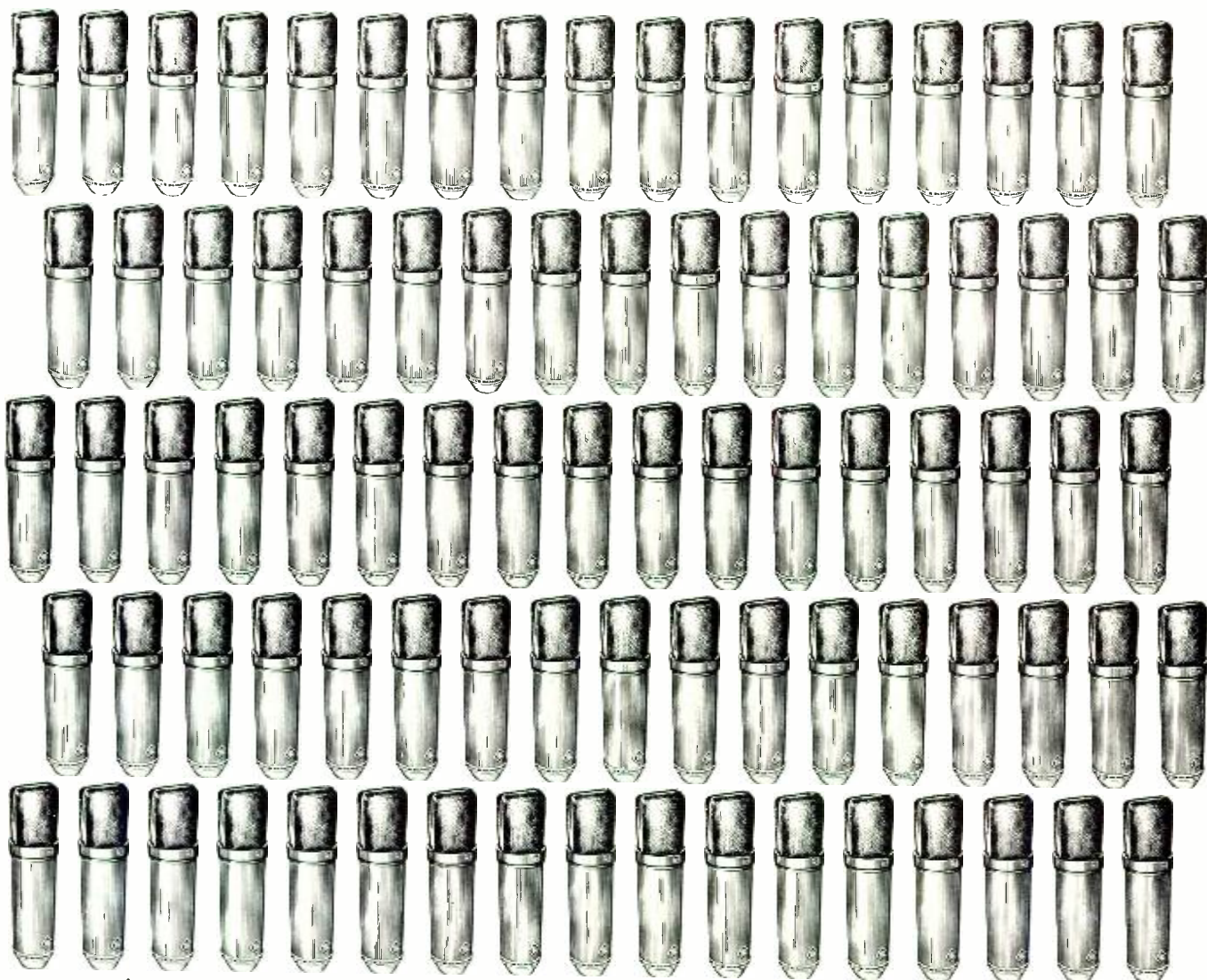
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