AUDIO

JANUARY, 1963
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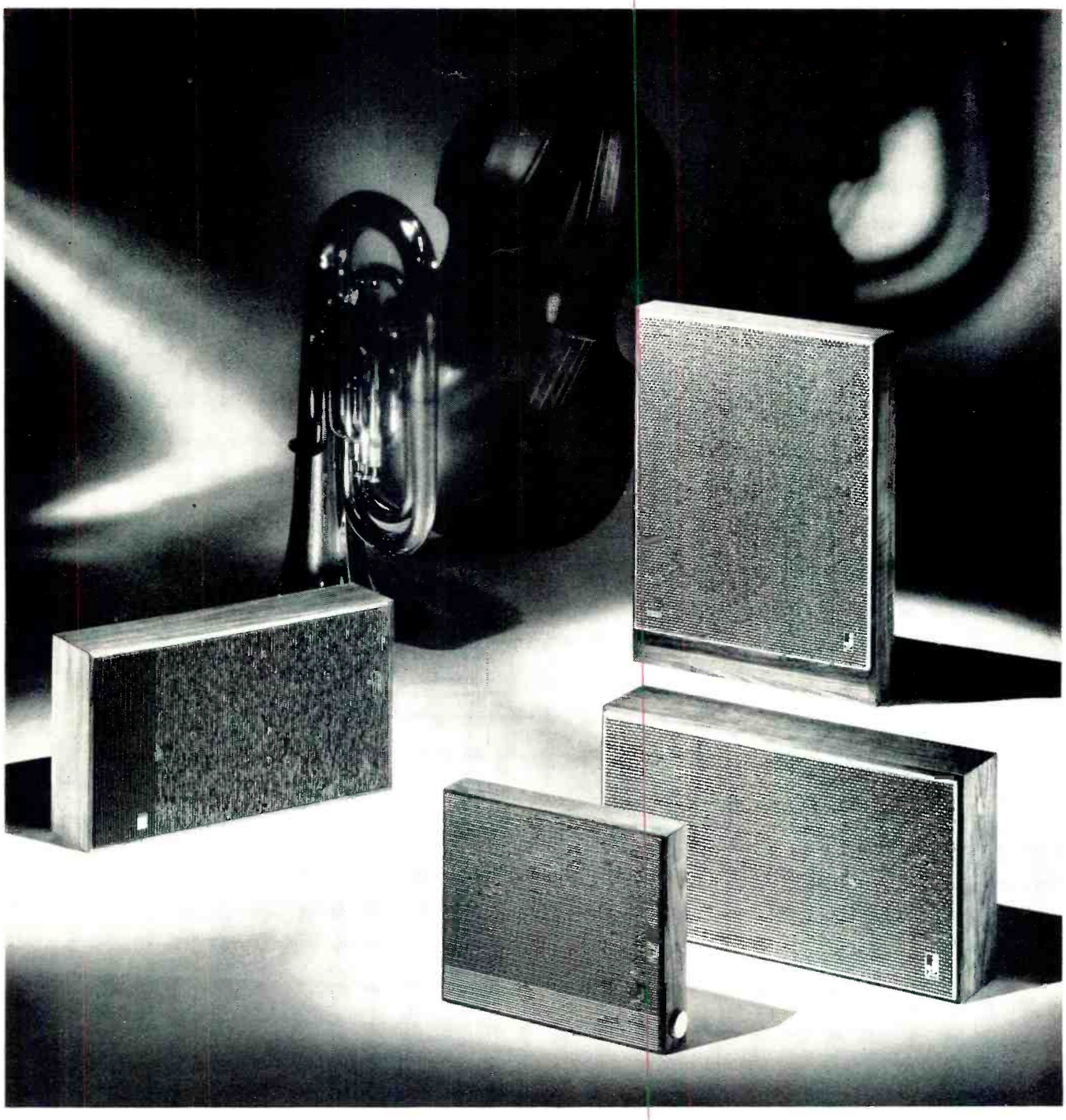

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AUDIO

JANUARY, 1963 Vol. 47, No. 1

Successor to RADIO, Est. 1917

AUDIO Articles

FM Stereo Reception	19	*Jack Beever*
Design of Solid-State Stereo Power Amplifier with Silicon Transistors	21	*Marshall R. Myers, Jr. and Morley D. Kahn*
Alignment and Adjustment of FM-Stereo Tuners and Adapters	26	*C. G. McProud*
A High-Quality Transistorized Stereo Preamplifier	35	*Erhard Aschinger*

AUDIO Reviews

Light Listening	8	*Chester Santon*
Record Revue	48	*Edward Tatnall Canby*
Jazz and All That	54	*Charles A. Robertson*

AUDIO Profiles

Leak Power Amplifier	42	*"Stereo 60"*
Neat Stereo Cartridge	44	*VS1000D*
Neat Stereo Tonearm	46	*GA-17*
AR Needle Force Gauge	46	

AUDIO in General

Audioclinic	2	*Joseph Giovanelli*
Book Review	4	
Audio ETC	12	*Edward Tatnall Canby*
Editor's Review	16	
Tape Guide	40	*Herman Burstein*
This Month's Cover	58	
About Music	64	*Harold Lawrence*
New Products	66	
Industry Notes	75	
Advertising Index	76	

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AUDIO CLINIC

Joseph Giovanelli

Send questions to:
Joseph Giovanelli
3420 Newkirk Ave.
Brooklyn 3, N. Y.

Include stamped, self-addressed envelope.

Leaky Oil-Filled Capacitor

Q. Is a small hole needed in the case of an oil capacitor? I had an oil leak in one of mine and found what looked like a drilled hole. D. M. Anglin, Seattle, Washington.

A. There should not be a hole in an oil-filled capacitor otherwise the oil will leak out and the capacitor will change in value. Discard the unit.

VU Meter to Balance Speakers

Q. I have been trying to find a VU meter that will work with the 8-ohm output of my Williamson amplifier. I tried one that was supposed to work with any circuit but I could not get a reading while the speakers were playing. I want to balance my stereo setup. How are the meters connected —in series with the speakers or in parallel? Would it be an a.c. or d.c. reading? Will it be possible to get a meter which will work with my amplifiers? D. M. Anglin, Seattle, Washington.

A. The VU meter is connected in parallel with the speakers. You are not getting deflection of the meter because the loudness level is too low; there is insufficient voltage developed across the meter to drive the pointer upscale.

Most meters have an impedance of 600 ohms. If yours does the solution is simple. Use a transformer to raise the 8-ohm impedance to 600 ohms. A line-to-voicecoil transformer will do the job. You may need to attenuate the signal to the meter when loud passages occur. Use a 600-ohm T-pad.

The speaker voltage is a.c. so that the VU meter is reading an a.c. voltage. Audio voltages are always a.c. Sometimes this a.c. is superimposed upon a d.c. voltage. An example of such a superimposition is given in our December 1962 column.

Recording from a 70-Volt Line

Q. Do I need a transformer to feed a signal from a 70-volt speaker distribution system to the input of a tape recorder? I wish to record from a number of different locations. Alvin E. House, Ames, Iowa.

A. You do not need a transformer in order to record from a 70-volt distribution system. You do need a potentiometer of high enough value so that it will not take appreciable power from the line. Its power rating should be sufficiently high to prevent burnout at the power level employed.

The signal input of the tape recorder is connected to the arm of the potentiometer and the signal ground to the ground side of the line. The line is connected across the potentiometer. The potentiometer serves as a coarse attenuator. It should be preset and left that way. Recording level is adjusted at the tape recorder in the usual manner.

This arrangement is recommended *only* when the line has one side grounded to the 70-volt line amplifier. In other words, the system should be used *only* with an unbalanced line.

If the line is balanced, a transformer is necessary. The voltage is high enough so that the transformer type is not critical. The secondary has to be wired for an unbalanced line. Use a quality transformer to avoid serious degradation of the program material. If the voltage across this transformer is high, you will need an attenuator. This attenuator can be the potentiometer arrangement we have already described.

Theory of Internal Impedance Measurement

Q. In a previous letter I asked how I could find the impedance of a cathode follower output on my tape recorder. You told me to hook a VTVM to the output while sending a 1000-cps tone through the preamplifier. Then you said to connect a variable resistor across the output and adjust it until the VTVM reading drops 6-db below what it was when no resistor was present. By measuring the value of this adjustable resistor I would find the output impedance.

I am curious as to why impedance can be determined in this way. I know 6 db would be ¼ the original power output. How does the variable resistor affect this? Can you explain? Robert C. Knosalla, APO, San Francisco, California.

A. The reason that a 6-db below the no-load voltage gives the output impedance of the preamplifier is that the tape preamplifier has resistance. For this discussion, let us assume that the output impedance of a cathode follower acts like a pure resistance. Therefore some of the signal is lost across the internal resistance of the cathode follower. When the output of the tape recorder is not loaded, and a VTVM is placed across the output terminals of the unit, it is the same as saying that no signal is being taken from the cathode follower. (The impedance of the VTVM is so high, compared to the impedance of the cathode follower, that the power taken by it is virtually unmeasurable.) When the output of the cathode follower is gradually loaded by decreasing the value of the variable resistor, signal is taken from the unit. Some of this signal is lost across the internal resistance of the cathode follower. There will be a time when the signal voltage will drop to half of its original value, or 6-db below the no load voltage, and is equally divided between the internal resistance and the external load. The current in each resistance is the same by Kirchoff's Law, thus the voltage across each resistor is equal when the values of the resistances are equal. This

(*Continued on page 4*)

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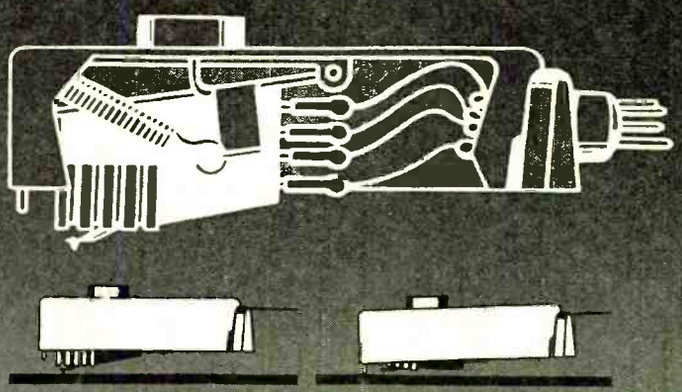

We at Garrard congratulate Shure on the development of this new floating cartridge assembly... only available in a shell designed for this cartridge and the Garrard automatic turntables. Supplied by Shure... premounted, ready to plug in and play.

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WORLD'S FINEST

BOOK REVIEW

MUSIC, ACOUSTICS, AND ARCHITECTURE

Author: Leo L. Beranek
Published: Sept. 1962; 586 pages; John Wiley and Sons; $17.50. Available through the Audio Library.

This latest book by Leo Beranek is a very important book. It is important for several reasons. First of all we have here one of the first systematic and relatively scientific approaches to the definition of what a good, very good, and excellent musical-performance hall is. Secondly, and we suppose out of necessity, he has reduced the definition to a numerical rating scale so that acousticians can design halls more precisely than heretofore. Thirdly he has given us an example of how his rating scale works. Of course the example is Philharmonic Hall in the Lincoln Center for the Performing Arts. Finally he postulates a new way to calculate the audience and seat absorption in large halls which may bring the uncertainty of projected reverberation times back to the realm of accuracy.

What is a Good Musical Performance Hall?

By far the largest portion of this book is devoted to defining the subjective and objective parameters which add up to quality in concert halls and opera houses. This is done in several ways: First the terms commonly used to describe judgement of a musical performance are defined. This step is so obviously necessary that we are surprised that it wasn't done before. With such a standard vocabulary it is possible to communicate effectively in an area which has been rather difficult to pin down. But of course it is a lot to expect musicians to adopt a new language. Dr. Beranek goes further; he says: "I am not proposing that musicians change their ways." He then indicates that it is enough that we now can understand what they mean. Eighteen terms were defined, certainly sufficient for a musician or anyone else to describe his reactions to a concert hall or opera house.

Dr. Beranek next interviewed 23 of the most famous conductors and musicians in the world and 21 well-known critics. From them he gathered opinions as to the best halls in the world and detailed comments about them. He was thus able to correlate this information into significant judgements about the best and least-liked halls. These judgements are of singular value when linked with the measurements Dr. Beranek and his associates made of 54 of the most famous and liked halls in the world. (Figure 1 is an example of the type of presentation.) In our opinion, just the compiling of valid statistics about all these important halls is a great step forward and makes the book worthwhile. From this mass of information it was now possible to explode some of the long-persisting myths which surround music halls, but more important it was possible

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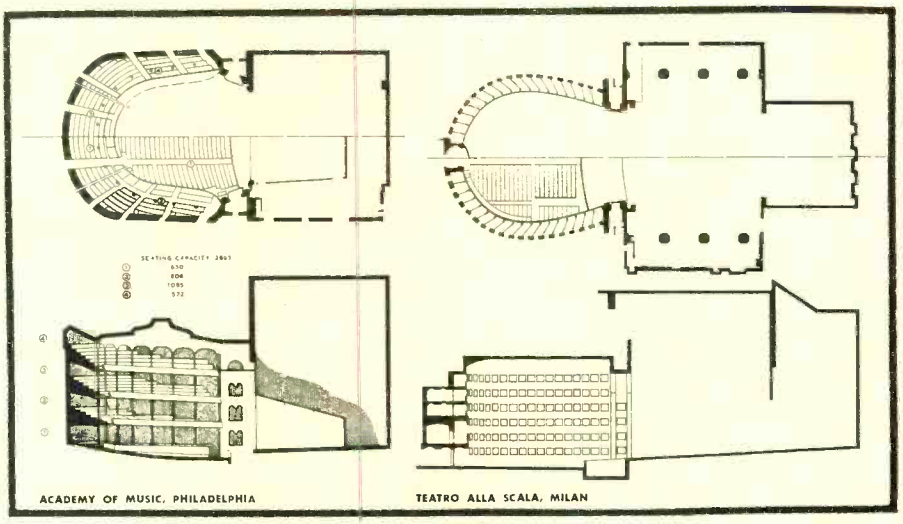


Figure 1.

AUDIOCLINIC

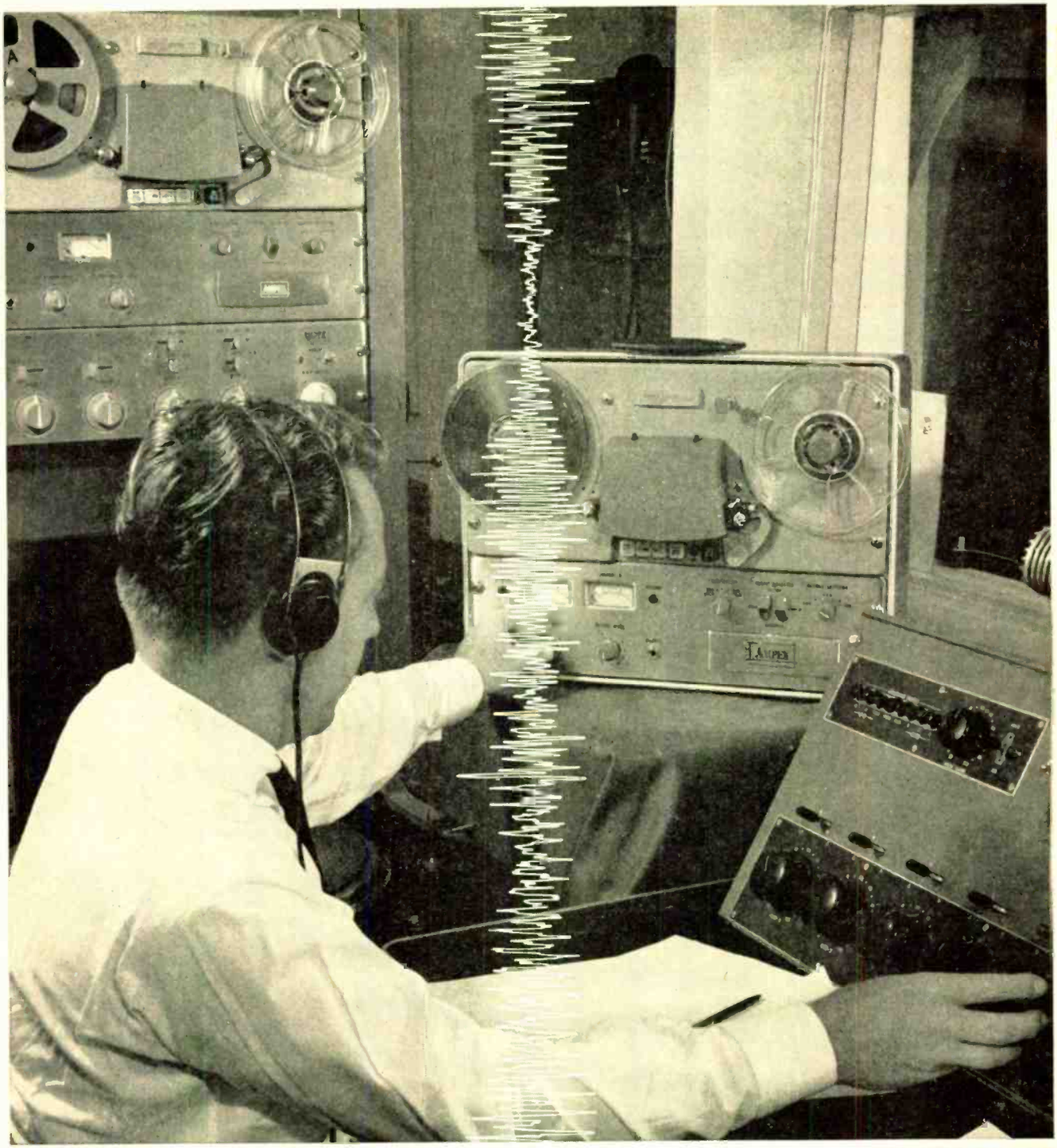
(from page 2)

internal resistance can be said to be the impedance of the preamplifier at the frequency used to make the measurements—1000 cps in this instance. For this reason, when the voltage has dropped to half the no load value, the internal resistance is equal to the external resistance. Now, by measuring the load resistance, we have automatically read the internal resistance, or impedance, of the unit under test.

Actually, there will be some error here due to the negative feedback. As the load increases the voltage tends to drop off thereby decreasing the feedback signal. Reduction of feedback causes the gain of the device under test to increase. This, in turn, will cause an increase in the output voltage. For most applications the results will probably be close enough.

If you had any difficulty in picturing the action of the load resistor, think of the circuit as a series circuit. One end of the internal resistance of the cathode follower (one output terminal) is connected to one end of the external resistance. The other end of the external resistance is connected to the other end of the internal resistance of the cathode follower (the other output terminal).

Think of the combination of the two resistors as a voltage divider. When the two resistors are equal in value, the voltage divider action will be such that half the voltage will be developed across each resistance making up the divider. Æ



What compact can do everything a console recorder can? **AMPEX PR-10**

The Ampex PR-10 gives you all the features, all the performance of a console recorder. Even remote control. And it's all wrapped up in a suitcase-sized package. That means you can take a complete recording studio out into the field, into the school, the church, industry—anywhere you need it. The PR-10 features positive push-button controls; record-safe switch; and separate erase, record and playback heads. And there's room for an optional 4-track stereo or additional playback head. There's also a new electro-dynamic clutch system to give you fast, gentle starts and lower braking tension. If you want to monitor on-the-spot, the PR-10 has A-B switches, VU meters, phone jacks, output circuits. Moreover, electrical alignment controls are accessible through the front panel. You get all this plus a new Ampex "Four Star" one year warranty. For data write the only company with recorders, tape & memory devices for every application: Ampex Corp., 934 Charter St., Redwood City, Calif. Worldwide sales, service.

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LETTERS

Vertical Tracking Angle

SIR:

According to your statement the occasion for the so-called "consternation" was highlighted "a year and-a-half ago," when FM stereo . . . became a reality." This would make it around June 1961. By this date the means of obtaining a summation of the two channels of information from a stereophonic disc was well known because the disc standard covering this specification had been widely publicized to the recording industry in:

R.I.A.A. Bulletin E3	1957
I.E.C. Publication 98-1	1959
B.S.I. British Standard 1928: 1961	1961
E.I.A. Standard RS211-A	1959

While some failures to adhere to these well established standards have caused a few red faces, there was certainly no consternation. The fact that a summation obtained from all stereophonic recordings does not *always* result in the most *desirable* monophonic sound was also known and understood, and this effect was clearly noted in the N.S.R.C. report to F.C.C.

I suggest that it would be more fitting to have devoted more editorial space to Mr. Masden's brilliant work and less to drawing erroneous conclusions based on incomplete consideration of all the existing facts. A more positive approach of exposing some of the effective results that standardization groups have achieved for the easy exchange of goods both domestically and abroad would be highly appropriate toward enlightening many readers concerning what goes on in EIA, IEC, ISO, RIAA, ASA, SMPTE, NAB, CCIR, MRIA, IEEE, and others. Do you know?

E. H. UECKE
Capitol Records, Inc.
Hollywood and Vine
Hollywood 28, Calif.

SIR:

I was certainly pleased to read your editorial support to the standardization of the vertical tracking angle in stereo records. I am slightly disappointed, however, that it took you so long to recognize the problem, and put your weight and prestige behind a corrective movement. Many engineers, including myself, recognized the vertical tracking angle problem four to five ago, and suggested standardization.

REIN NARMA, Chief Engineer
Ampex Corp., Audio Div.
1020 Kifer Road
Sunnyvale, Calif.

SIR:

In this paper Mr. Madsen calls attention to the importance of standardizing and controlling the tilt angle in recording and the vertical tracking angle in playback. On the basis of work in our laboratory, we can endorse Mr. Madsen's conclusions.

However, it is unfortunate that in listing the vertical tracking angles measured for various pickups, the author did not include model designations of the pickups. Our observations indicate that different models marketed by the same manufacturer may differ considerably in vertical angle. It also appears that some of the pickups tested by Mr. Madsen were older models not now in production. While we find that the vertical angles of currently available pickups of various manufacturers cover roughly the same range of angles as those listed in the article, in fairness to the manufacturers, your readers should understand that the listed values of angle do not necessarily apply to current models of the manufacturers as listed.

J. G. WOODWARD
J. B. HALTER
RCA Laboratories
Princeton, New Jersey

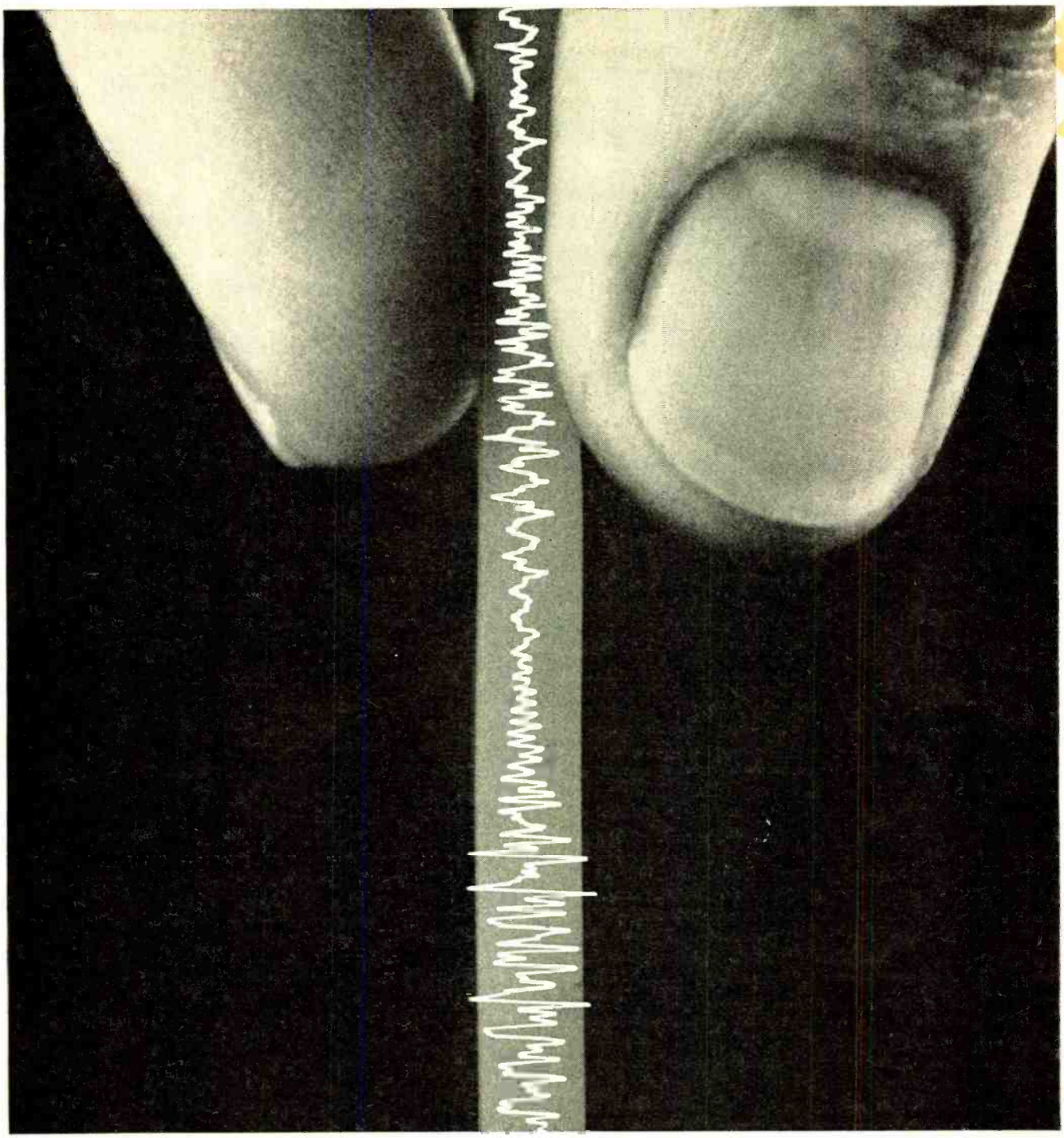
Belt Slippage

SIR:

Mr. Subber is correct in that, if I chose to discuss the matter at all, I should have pointed out that with a belt of finite thickness the effective pulley diameter is greater than the actual diameter. I didn't, out of ignorance.

While he does not directly deny the relevance of belt slippage to speed, the implication of irrelevance seems clear. This is not correct. With the motor in perfect sync, the platen speed (in the AR turntable as well as in all others tested here) will vary

(*Continued on page 71*)



What professional recording tape now offers a new standard of performance? AMPEX 600.

Ampex engineers are never content with present standards. They are always trying to improve what sometimes seems un-improvable. Now they have been at work on the Ampex 600 Series Professional Recording Tape. And they've improved it so much we felt we should call it the new Ampex 600. This 600 Series now offers better high frequency response characteristics. And because an exclusive Ferro-Sheen process makes the tape smooth, the first play and the one-hundredth have the same response characteristics curve. It gives you the kind of reliable performance you expect from Ampex recording equipment. Try this improved 600 Series and see. It's made in the same rigidly controlled clean-room atmosphere as precision computer and instrumentation tapes. Write the only company with tape, recorders for every application: Ampex Corp., 934 Charter St., Redwood City, Calif. Worldwide sales, service.

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LIGHT LISTENING

Chester Santon

Gus Farney: Giant Pipes
Warner Bros. Tape WSTC 1433

During the first month of this decade, Warner Bros. released the initial offering in a series of organ recordings that should take care of our needs until the 1970's. The series, featuring the veteran theater organist Gus Farney, now numbers three recordings and all of them are available on four-track tape. It doesn't take a mind reader to figure out why the engineering staff at Warners urged the front office to waste no time in getting these releases out on tape. Anyone familiar with the sound on the master tapes would have been reluctant to sacrifice even a small amount of the luxuriant bass due to the exigencies of the disc recording curve. Without the walls of a stereo groove to worry about, this tape album will have a good woofer purring in regions that one seldom hears from on a run-of-the-mill tape. Nothing is lacking in the response of the chimes and bells in the upper registers of the five-manual console at Salt Lake City's Organ Loft but the bass is the immediate selling point in all three Farney albums. The recording that preceded this one was devoted to the typical theater organ music of the Twenties: the ballads of the times, popular novelties and a floor-shaking version of *The National Emblem March*. In his latest release, Gus Farney turns his attention to the spectacular musical films that were the rage in the Thirties. "Forty-Second Street," "Footlight Parade" and "Gold Diggers of 1933" are numbered among the sources of the nostalgic movie tunes that roll with beguiling ease from the group of keyboards under the command of Gus Farney.

Music by Cesana: The Sound of Rome
RCA VICTOR LSP 2600

When RCA opened its lavish new recording studios in Rome last March, the occasion received more than passing notice in magazines devoted to the foibles of the record industry. To insure maximum news coverage of the formal inauguration of RCA Italiana's recording center on the Via Tiburtina, a planeload of American editors was whisked to Rome for a tour of the studios . . . one of them (a studio, not an editor) said to be the largest in the world. Preliminary reports on the ultra-modern equipment installed at RCA Italiana could only hint at the nature of the audio work that would be forthcoming from this lavish layout.

"The Sound of Rome," a collection of original compositions by arranger-conductor Cesana, is the first recording I've heard from the new studios and it bodes very well for the future. This disc has everything recently attained in RCA's domestic studios along with a luxurious feeling of freedom in the acoustics that is a distinct rarity in recordings made over here. Some of the favorite haunts of Victor's engineers stationed in New York offer almost-as-good acoustics. Our halls, however, tend to identify themselves by the nature of their resonance characteristics. The Italian studio used by Cesana's sixty-five-piece orchestra has no sound characteristic of its own. Without the cold bounce of sound from nearby studio walls, the listener is free to hear the music without the typical studio effect. This recording is one of the finest examples of the advantages gained when the sound is allowed to go its own way in an enormous room with the mikes placed close enough to permit lower-than-average level settings. Under these circumstances, it's very difficult for distortion to get a toe hold. The effect is very rich and pleasing to the ear because the 65 musicians get a chance to be heard without favor being shown to a few. The Cesana originals are on the bland and soothing side with little in their musical content to describe the specific landmarks of Rome mentioned in their titles.

Scottish Soldiers
London Tape LPM 70057

You'll want to tell the rest of the clan about this one. London Records now has the answer for tape fans hankering to acquire the stirring music of the Highlands in reel form. On the reasonable premise that even a Scotsman would prefer a bit of variety in a bagpipe album, this tape contains not one but two musical organizations long associated with Scotland's soldiery. The Massed Military Bands of the Royal Scot Greys and the Argyll and Sutherland Highlanders provide the more conventional instrumental tonic while the Massed Pipes and Drums of the Royal Scot Greys and the 1st Battalion of the Argyll and Sutherland Highlanders paint the brighter colors in the same tapestry of sound. The opening fanfare by the band sets the mood for the entire album and, in passing, illustrates just how high a signal level can be impressed upon a four-track tape these days. The opening moments of this reel come within the width of a whisker of reaching overload distortion.

The band takes over in the first medley, mingling *Lock Lomond* and *Campbells Are Coming* with more local favorites such as *Stop Your Ticklin' Jock*. The spine-tingling wail of the pipes is heard over the crunch and thud of accompanying drums in other segments of the tape while the band takes a breather. When the pipes and band combine forces on this reel, we're provided convincing evidence that tape is a mightly handy medium to have around when the microphones are given a heavy assignment. Since the frequency response on this tape album seems little better than average, the bagpipes accommodate themselves with greater ease to the available tonal range than do some of the instruments of the band.

Mr. President (Original Broadway Cast)
Columbia KOS 2270

After listening to the original cast recording of Irving Berlin's latest show, one is tempted to decide that "Mrs. President" might have been a more accurate title for this production. As the wife of a carefully unspecified contemporary President, Nanette Fabray is the real vote getter in the stage administration put together by Berlin and the famous writing team of Howard Lindsay and Russel Crouse. According to all reports of the first-night critics, the President uncovered in the portrayal of Robert Ryan is a pretty dull figure. The Lindsay-Crouse book certainly gives him little opportunity to create a personality capable of carrying a show single-handed.

It may be that we were counting on the heretofore salty wit of the authors to give us an updated commentary on the Presidency along the lines of that great classic show—"Of Thee I Sing." Instead, we get a bland recital of the presidential tribulations that recent occupants of the White House have been called upon to endure in order to maintain their popularity. The libretto is careful to avoid reference to a specified President. Robert Ryan adds to the character's anonymity by sounding far younger than either Truman or Eisenhower yet older than Kennedy. Nanette Fabray's First Lady is a carefree invention devoted more to the entertainment of an audience than to depiction of an actual person in charge of housekeeping at the White House. Luckily for the version of the show heard here, Miss Fabray is introduced quite early in the proceedings. Whenever a good song comes along, she is generally on hand to put it across. No sooner does the show get underway, Miss Fabray invades the Oval Room of the White House with a mellow song (*Let's Go Back to the Waltz*) just as the ball being held there erupts in the Twist. The succession of scenes dealing with the private life of President Stephen Decatur Henderson (Berlin's White House occupant) is the source of the first song of real hit proportions when Nanette Fabray asks *Is He the Only Man in the World?* Of all the tunes in "Mr. President" on a wide variety of subject matter, this song most closely typifies the familiar brand of Berlin magic in the wedding of melody to a lyric. The song that follows *Only Man* betrays the first truly gusty moments of animation heard so far on the record. *They Love Me* offers Nanette Fabray the best opportunity to unleash the comedy talent that first brought her to the attention of a nationwide TV audience on the Sid Caesar Show. Her description of the gifts heaped upon her during a world tour is about as high a point as this show manages to reach—if you exclude the America-Be-Blessed number, *This is a Great Country,* which precedes the finale.

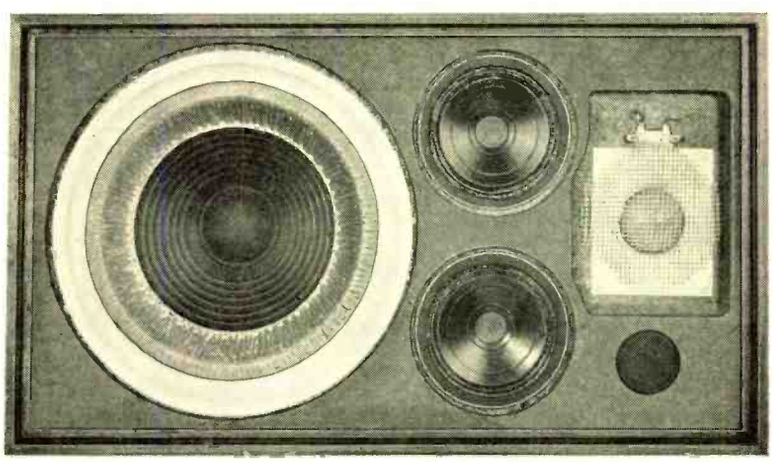
The younger roles in "Mr. President" are filled with more than average skill and talent. Anita Gillette gets her best Broadway break so far as the First Daughter of the land. Miss Gillette first broke into the news on the Main Stem while still an understudy when she replaced Anna Maria Alberghetti for ten days in the leading role of "Carnival." David Merrick, that show's producer, collected a lot of publicity for Miss Gillette (and himself) when he pulled the unusual stunt of praising the work of the understudy at the expense of the established star. Miss Gillette's subsequent engagement in Ray Bolger's show, "All American," paved the way for the favorable impression she makes here as the President's winsome daughter. Jack Haskell, in his first Broadway appearance, easily walks off with top honors in the male vocal department, cashing in on the experience gained during the years spent on the Garroway and Jack Parr television shows. As a Secret Service man in love with the President's daughter (democracy always has a chance in a Berlin show), Haskell is effective in romantic-interest songs that fall just short of solid hit material. Despite the long list of songs supplied by the composer, only a few will be remembered when this Berlin show leaves the national spotlight to return to the "private life" of other bygone stage productions.

Norman Luboff: Choral Spectacular
RCA Victor LSP 2522

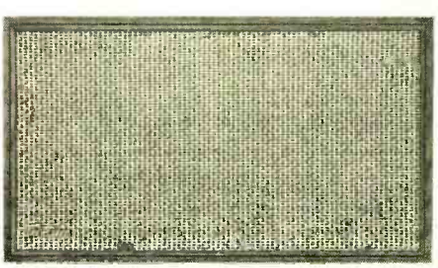
Only a major label could have risked the extra expense involved in this pop recording. Even allowing for the probability that recording costs are somewhat cheaper in England, the budget made available to Norman Luboff in his latest recording was on a scale usually reserved for important classical works requiring a full chorus and symphony orchestra. The germ of the idea for this album first began to wiggle when producer Charles Gerhardt auditioned the recent stereo recording of Beethoven's Ninth (Choral) Symphony made for RCA by the Chicago Symphony under Fritz Reiner. His suggestion: a huge chorus and orchestra placed at the service of standard pop tunes. Gerhard's request for a 100-voice chorus to deliver the arrangements of Norman Luboff was received with favor by the front office and recording sessions were set up in London's famous Walthamstow Town Hall where some of the better classical recordings have been turned out in the last year or two by several American labels. A symphony orchestra of 92 pieces was hired for the occasion and the assignment to arrange their music was handed over to Wally Stott, one of the top arrangers currently practicing in England. This project is on its weakest ground (if that term can be applied to the efforts of 194 persons bent on building up eleven standards) in the somewhat square-cut playing of the orchestra. One misses the snap and verve that Andre Kostelanetz brought to many of these songs when his full orchestra was riding the crest of its

"Over-all, I would rate the XP-4A as one of the best, most truly musical reproducers available today."

—JULIAN D. HIRSCH *



* Noted equipment reviewer, in a lab report published in the December, 1962, HiFi/Stereo Review. Writes Mr. Hirsch: "Inside...the XP-4A is quite unlike any of the other speakers it resembles externally...proved to be an unusually wide-range, smooth system...the response was virtually flat from 5,000 cps to beyond the limits of audibility...Tone-burst tests showed very good transient response...In listening tests, the XP-4A...was almost neutral in character, very smooth and natural-sounding...had an especially fine and satisfying presence...a healthy amount of undistorted output in the 30-to-40-cps range...The XP-4A is priced at $199.50."†



Larger photo shows speaker with grille cloth removed; smaller photo with grille cloth in place.

FREE! $1.00 VALUE! The new 1963 edition of The Fisher Handbook, a 40-page illustrated guide to stereo, complete with specifications on all Fisher components, including loudspeakers. **ALSO:** Free reprint of the Hirsch report on the XP-4A.

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03110

THE XP-4A LOUDSPEAKER BY FISHER

† SLIGHTLY HIGHER IN THE FAR WEST. EXPORT: FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY 1, N. Y. CANADA: TRI-TEL ASSOCIATES, LTD., WILLOWDALE, ONT.

popularity but the choral work is really something special—in performance and sound. This would have been a dream assignment for any choral director and Luboff has made the most of it. Just how he got all that sonority without clouding the words is his own secret. Luboff would probably be the first to admit that the recording engineers—and the hall—had a lot to do with it. After some three hours of experiment in mike setups, most of the chorus was placed in the balcony of Walthamstow with the orchestra spread out on the main floor of the hall. To insure adequate pickup of voices in the low-level passages (*That Old Black Magic* begins at a whisper) twenty-four mikes were used to feed the multiple-channel tape units. The best idea of all was the decision to skip the re-recording step that has usually been part of the process whenever so many microphones have been involved in a session.

If it does nothing else, this record clinches the argument that mastering from the original tape remains the best way yet devised to preserve the fullest possible impact of the sound encountered by the mikes. If you're tired of the fancy equalization found in so many of today's re-recorded releases of light music, try this disc for a treat in the handling of a large chous.

Stop the World—I Want to Get Off
(Original Broadway Cast)
London Tape LAN 85001

Rohbed of its pantomime and tricks in staging, this new show from England is so lightweight in its recorded version, it may be blown off the globe before the world has a chance to stop. It's difficult to see how this production can succeed in attracting many record or tape buyers. The qualities of this new-style musical that first won the attention of American producer David Merrick when he attended the tryout at Nottingham, England, are the very things that fail to register when the show is transferred to the recorded medium. Unlike the average stage production that boasts a varied cast of performers, the brunt of this show is carried by two persons, Britisher Anthony Newley is the star, director, co-author, co-composer and co-lyricist of "Stop the World." Sharing the songs in this album with Mr. Newley is Anna Quayle. Between them, they trace from birth to death the life of a clown character known as Littlechap. The story begins in England but soon switches to Russia, Germany and America. Anthony "Littlechap" Newley and co-author Leslie Bricusse get a lot of mileage out of one tune that is sung throughout the show by Miss Quayle. Changing the lyrics each time, they use it to poke fun at the customs and attitudes of people in all four countries. Mr. Newley delivers some of his songs in the half-singing style that Rex Harrison first made acceptable in "My Fair Lady." The humor in "Stop the World," although attempting to sound adult, succeeds only in verifying the contention of the authors that the show was written in only four weeks.

A Leroy Anderson Concert
M-G-M SE 4075

To all outward appearances, this is merely another release in MGM's 21 Channel Sound that has been making the rounds in recent months. What first aroused my curiosity was the fact that the cover of the jacket does not carry the name of the orchestra heard in these performances of a Leroy Anderson miscellany. The inner fold of the record jacket, however, provides the interesting news that this particular 21 Channel record was made in Germany by the engineering staff of the Deutsche Grammophon Company of Hamburg. In recent months, MGM has been distributing in this country the classical recording of this famous European firm but this release is the first intimation I've had that MGM had persuaded its German partner to adopt an American recording gimmick for pop records. I must say the Deutsche Grammophon crew has done a spanking good job with a technique that must have been a puzzling one at first glance. The silky highs on this record are easily superior to those found on domestically produced MGM discs in this particular series. Only part of the reason is traceable to the 30-inch-per-

(*Continued on page 63*)

The San Diego

Symphony Orchestra

listens to itself

AR-3's

During rehearsals members of the San Diego Symphony Orchestra pause now and then to listen to a taped recording of the passage they have just played.

AR-3 loudspeakers were chosen for the stereo playback system because of their lifelike reproduction of orchestral timbres. Any pseudo-hi-fi coloration here would defeat the purpose of monitoring.

AR-3's and other AR speaker models are often used professionally, but they are designed primarily for the home. Prices range from $89 for an unfinished AR-2 to $203-$225 (depending on finish) for an AR-3. A five-year guarantee on all models covers any repair costs, including freight.

A catalog and list of AR dealers in your area will be sent on request. We will also send a brief description and order form for two books on high fidelity published by AR.

ACOUSTIC RESEARCH, INC., 24 Thorndike Street, Cambridge 41, Massachusetts

AUDIO ETC.

Edward Tatnall Canby

CULTURE FOR FREE

There's no question about it, we have found the means, these last years, to broadcast a really amazing variety of good things on radio, primarily via FM. (AM is, oddly, the secondary outlet. Some of the FM material spills over in various AM-FM broadcasts, such as my own WNYC broadcast in New York.) Broadcasting in this country is a curious thing, of course; the air waves belong to the people and yet that which goes out upon them must, somehow, pay for itself. Somebody must fork over, to meet the not-inconsiderable bills.

It is so much simpler in Europe. Over there, the people not only own the air waves but pay for them too. The government operates virtually all radio service. The government pays for the broadcast equipment in toto and—very important—the government also pays, to greater or lesser degree, for the material it broadcasts. Such down-to-earth money-raisers as taxes provide the funds. There's a tax, over here, on cars and gasoline, to pay for roads. There's a tax, over there, on radios to pay for broadcasts.

Over here, we have a strange idea that culture doesn't pay. We are, of course, entirely right. It does not, in business terms. I mean *real* culture—not spectacular shows, big-name events, first-nights-with-the-President, which pay off in prestige if not in cash. Nobody has yet to my knowledge made Mr. Beethoven pay for himself "live"—that is, strictly in terms of musical performance.

Where does our FM culture system get its steam? Well, there's storecast-multiplex, of course, one ingenious way to promote culture and prestige on a station and yet come out in the black for the expenses of broadcasting. But this is merely a final technical "miracle." What goes out on the air?

Remember that there is an obligation on the part of our stations to promote the public good to some degree, in exchange for the public's air. That much-abused concept still manages to exert its influence in various ways. The government exerts varying pressure, of course, depending on the current climate at the top levels. But the indirect results of the concept itself are more important—every station wants to show how virtuous it is and, indeed, *must* show it. And so, among other public services, a certain amount of sheer, non-paying Culture gets onto the air for sheer prestige, even though it comes out in the red, and is probably expected to. Not at all business-like, of course! The best that can be done is to make this culture the sort which attracts listeners and thus—just maybe—brings a sponsor or two to cushion the financial shock. This means big names and big events. Not dead names like Beethoven, but living celebrities—from Pablo Casals to, maybe, Jack Benny. In addition, it means big-name onlookers, if possible. It never hurts to have Jackie or Rocky or Mamie and Ike on hand for a cultural do! Given all this, a broadcast can pay for itself and add prestige too. But not via our modest FM operations, unless as a mere hand-me-down, from the AM or TV audio lines.

And yet our FM abounds in culture. So does radio in Europe. The sounds you hear on Radio Paris or Radio Genève aren't very different from our own via local FM. The reasoning is, however, quite different from that which brings culture to the European air. Our culture comes to the stations for free.

Paying The Overhead

Our system works well and ingeniously. The station's operating costs are paid for indirectly. It gets a sponsor for a program whose cost is nil and so pays the overhead; or it gets cash out of its storecast operation; or it receives grants from outside philanthropic sources; or has its own built-in source of operational cash.

This last includes many universities and even more, religious organizations all over our land. In fact, much of our audible FM culture is backed by assorted church funds, providing the basic operating upkeep essential to broadcasting. Like the universities, the churches can make excellent use of a radio voice—but not a one of them can keep talking 8 or 16 or 24 hours a day. So they reserve what hours they need and turn their stations over to assorted culture for the rest of the time. That's a lot. It is a worthy system and brings us much wonderful material. But again, the actual programs are rarely paid for. There aren't any funds, or not enough. The setup doesn't envision it, and for good reason. It doesn't need to.

And there is also the latest wrinkle and craziest—in view of its success—the listener-supported radio station. Its programs, individually quite often out-of-the-ordinary, command the respect of an increasingly devoted audience. They find on this type of station things they can't hear elsewhere and, suddenly, they realize how much could be done in radio and isn't. Even when it's half baked; at least, there are new ideas, new attempts. But we must note, once more, that the setup isn't essentially different from those already described. Programs come from many of the same free sources—more of them, in new areas. The basic broadcast facility is again paid for, the programs are not.

Nevertheless, listener's radio, the basic facility supported at least in part by the voluntary donations of the audience, is in "business" on the West coast and, in a related venture, has survived surprisingly long in hard-boiled New York, via the WBAI outlet.

There is still one more built-in source of operating funds for broadcasting, closest to my own experience, the city-owned station, or the state broadcasting network. Our WNYC facilities in New York are provided by the city. Out in Wisconsin there's a whole slew of interconnected, state-owned FM stations. In these cases we have the same basic structure, like church-owned or university-owned stations, the operating cost paid for by the owners, who use a proportion of the time for their own purposes and turn the rest over to culture via the familiar media already described. The difference, here, is that this radio is publicly owned, by government.

It doesn't make much difference, actually. The situation is the same as elsewhere. In New York we hear the Mayor whenever he wants to talk to his people, and we get a spate of school activities, reports of public officials, plus endless "commercials" about not crossing against the red light, and so on. Also much in the way of dietary and market news, out of city departments. Takes a good deal of the station's useful time. And in emergencies, of course, the station goes over 100 per cent to the city. (The UN gets split, significantly, between AM and FM. AM gets the continuous UN proceedings. FM gets "regular" programs.) Even so, as always in our FM broadcasting, the air-day includes many hours of recorded music, educational and government-promoted culture, basically as in the other types of FM operation already described. (In fact, WNYC was the fountainhead organizer of the NAEB educational tape "network" and has used BBC and similar material for many years.)

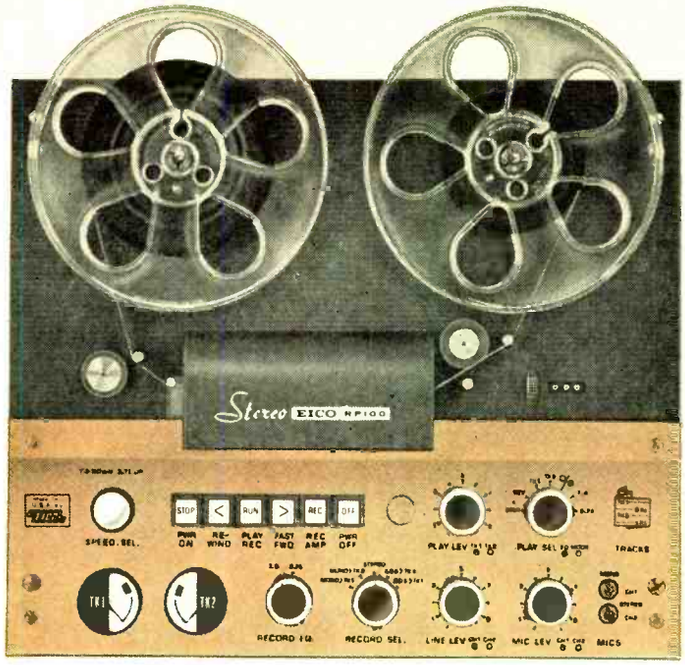
The government station in our country goes further than most others in acquiring free programs because of its unique position. WNYC has long broadcast "live" concerts of many sorts, where other stations would be turned aside. I wish I could say the idea bore notable fruit. Some "live" series are musically superb, but some are just plain terrible. All of them tend merely to prove what we all know, that "live" broadcasts are inferior to those from recordings. "Live" music is fast losing ground to tape, edited or unedited, and to the omnipresent recording . . . but that is another subject.

Program Sources

What are these free sources of programmed culture? First, of course—records. The world's finest music and drama comes to us on records and it doesn't cost much. Mostly, it costs nothing at all.

The record companies are happy to provide their culture free, since in their own quite different area the free broadcasting tends to promote cash sales of recordings, as well as to build prestige for the labels. As we all know, major record companies even go so far as to sponsor programs of their own records, complete with commercials, culture galore. Needless to say, this happy bonanza is sheer clover to FM broadcasting. Imagine it. A steady flow of high quality coming in, month after month, large portions of which can be reused time and again over the years. With this—culture is not surprisingly widespread on the air!

Cultural broadcasting could well exist on records alone, but there are other "lucrative" sources of free material. Second is the "information service" tape, a program provided by some government agency for cultural exchange and propaganda. Here, we benefit indirectly—but very positively—from those distant taxes on radios that people pay in other lands; we get (for a song) the best of the foreign production in every imaginable area. Phew! Imagine *this*! You have on tap the entire resources of giant government-operated radio serv-



9 New Features Now In The New EICO RP100 Transistorized Stereo/Mono 4-Track Tape Deck

A great tape recorder made greater:

1. **New** professional studio recording hysteresis-synchronous capstan motor: 24 stator slots for ultra-smooth drive, ultra-quiet and vibrationless professional bearing system.
2. Two **new** take-up and rewind reel motors, both extra-powered for effortless operation.
3. **New** cored-out steel capstan flywheel with all the mass concentrated at the rim for improved flutter filtering.
4. **New** optimally designed capstan drive belt brings wow down to negligibility.
5. **New** relay provides instantaneous extra power to the take-up reel motor at start to minimize tape bounce. Provides near-perfect stop-and-go operation and eliminates any risk of tape spillage when starting with a nearly full take-up reel.
6. **New** automatic end-of-tape stop switch cuts off take-up reel motor power. Also permits professional editing techniques, whereby tape being edited out runs off the machine while you are listening to it.
7. Playback preamps remain "on" during stop-standby mode to permit cueing.
8. Recording level adjustment during stop-standby.
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And All These Well-known RP-100 Features:

Separate stereo 1/4 track record and playback heads permitting off-the-tape monitor and true sound-on-sound recording; **separate** transistor stereo record and stereo playback amplifiers meeting true high fidelity standards; monaural recording on 4 tracks; digital turns counter; electrodynamic braking (no mechanical brakes to wear out or loosen); all-electric push-button transport control (separate solenoids actuate pinch-roller and tape lifters); unequalled electronic control facilities such as mixing mic and line controls, two recording level meters, sound-on-sound recording selected on panel, playback mode selector, etc. Modular plug-in construction.

Wow and flutter: under 0.15% RMS at 7½ IPS; under 0.2% RMS at 3¾ IPS. **Timing Accuracy:** ± 0.15% (±3 seconds in 30 minutes). **Frequency Response:** ± 2db 30-15,000 cps at 7½ IPS, 55db signal-to-noise ratio; ± 2db 30-10,000 cps at 3¾ IPS, 50db signal-to-noise ratio. **Line Inputs Sensitivity:** 100mv. **Mike Inputs Sensitivity:** 0.5mv.

Semikit: Tape transport assembled and tested; electronics in kit form $299.95

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An original, exclusive EICO product designed and manufactured in the U.S.A. (Patents Pending)

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New Stereo FM MULTIPLEX TUNER ST97
Semi-Kit $99.95 Wired $149.95
Includes Metal Cover and FET

Another brilliant example of EICO's no-compromise engineering, the new EICO ST97 combines the features of station-monitor quality and fringe-area reception capabilities with exceptional ease of assembly for the kit-builder. No test or alignment instruments are needed. The two most critical sections, the front-end and the 4-IF stage circuit board, are entirely pre-wired and pre-aligned for best performance on weak signals (fringe area reception). The front-end is drift-free even with AFC defeated. The four IF stages and 1MC-wide ratio detector achieve perfect limiting, full-spectrum flat response, very low distortion, and outstanding capture ratio. The 10-stage stereo demodulator—EICO's famous zero-phase-shift filterless detection circuit (pat. pend.)—copes successfully with all the problems of high fidelity FM stereo demodulation and delivers utterly clean stereo outputs. Excellent sensitivity, selectivity, stability, separation and clean signal add up to superb fringe-area reception. The automatic stereo indicator and station tuning indicator travel in tandem on twin slide-rule dials. **Antenna Input:** 300 ohms balanced. **IHFM Usable Sensitivity:** 3μV (30 db quieting), 1.5μV for 20db quieting. **Sensitivity for phase-locking (synchronization) in stereo:** 2.5μV. **Full Limiting Sensitivity:** 10μV. **IF Bandwidth:** 280kc at 6 db points. **Ratio Detector Bandwidth:** 1mc p-p separation. **Audio Bandwidth at FM Detector:** Flat to 53kc discounting pre-emphasis. **IHFM Signal-to-Noise Ratio:** —55db. **IHFM Harmonic Distortion:** 0.6%. **Stereo Harmonic Distortion:** less than 1.5%*. **IHFM IM Distortion:** 0.1%. **Output Audio Frequency Response:** ±1db 20cps-15kc. **IHFM Capture Ratio:** 3db. **Channel Separation:** 30db. **Audio Output:** 0.8 volt. **Output Impedance:** low impedance cathode followers. **Controls:** Power, Separation, FM Tuning, Stereo-Mono, AFC-Defeat.

*Actual distortion meter reading of derived left or right channel output with a stereo FM signal fed to the antenna input terminals.

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ices and specialized information services the world around—the BBC, the French Broadcasting Service, the Dutch, Austrian, Belgian—and in less degree many others more remote and more exotic. Even our neighbor Canada, which has a remarkable dual broadcast system, part government, part private (same with railroads), sends us down some fine material every so often. The U. S. itself comes up with quite a bit too, though our principal interest is, of course, to send our culture to other people, rather than to ourselves. (An odd idea, that, but I'll let it pass.)

Third, there are the burgeoning new sources of so-called educational material emanating from all sorts of academic and artistic organizations within our own country. I am not hep as to the precise operations of the numerous and semi-interlocking enterprises of this sort—notably the NAEB—but the principle is quite clear: the talent comes for free, mainly from educational institutions or from cultural outfits like, say, the Boston Symphony. The cost of the talent itself is in the last analysis provided by these institutions. Otherwise the profs and the teachers we hear on the air would long since have begun to starve.

Thus, from Boston's famed WGBH, via a local FM station near me at Amherst, Mass., I heard an hour-long tape featuring my old music professor at Harvard, G. Wallace Woodworth, analyzing the Beethoven "Emperor" Concerto at length, with taped illustrations. Amherst got it from Boston, of course. And Boston got it straight from Harvard. Terrific! But I'll bet dollars to doughnuts that "Woody" didn't make any princely sum out of his hard work. He gets paid by Harvard, mainly, and can afford extras of this sort both as a constructive pleasure to himself (as is clearly the case—you could hear it in his voice) and as an item of excellent personal prestige. Programs of this sort become more frequent every day, under the many tricky systems of dissemination we are now setting up for FM radio.

Thus, wherever we look, we find the picture the same. Before FM, we had precious little of all this culture on the air. Not feasible. Not commercial in a large enough way. Now we have it everywhere and indeed this is a blessing for those who find it worthwhile to listen. Increasing numbers of us do. But in all our various arrangements we subscribe to the same theory, *that the station facilities must be paid for, but the programming must be free.* Mostly, anyhow.

Cultural Commentators

That includes commentators on cultural subjects, non-jockey-style. (Disc jockeys get paid.) There are many of them, these non-paid performers, and most are happy at the rich new audiences open to their material and their personalities. These indirect fringe benefits are supposed to be adequate compensation and, in many areas, they surely are. Especially in the high-density urban regions with vast numbers of listeners. But as for direct compensation, the system simply does not allow for it. Talent—whether live, via tapes, records, even TV (as in the new educational stations) is for free. You make your living elsewhere.

And so I must end on a somewhat wistful personal note that may indicate to you how very much involved I have been in this whole argument. This autumn, I began my nineteenth consecutive year of weekly half-hour broadcasts, my sixteenth on our New York City station. Within a couple

(*Continued on page 73*)

NEW PRODUCTS!

High-performance in a modern design of sense

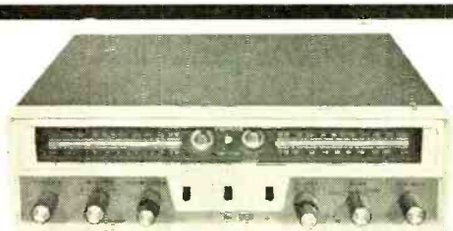
40W Stereo Tuner-Amplifier SM-Q300B

Here is a new amplifier further improved in appearance and performance over SM-Q300, which is widely recognized as the best seller of the year. The newly designed front panel is deluxe in appearance because of the use of a gold-colored fretted material. The frame and the knobs are arranged in perfect harmony with the panel. The output is as high as 40W. The power supply circuit is a voltage-doubling rectifying system using silicon diodes. The main amplifier is provided with a phase-reversing circuit originated by PIONEER engineers to obtain highly stable and distortion-free output.

The tuner is a FM/AM-AM/SW all-wave system with very high sensitivity and selectivity. For FM a multiplex adaptor can also be used. In addition to the use of PIONEER's unique mode-blend control and the 4-gang volume control for cutting down residual noise, the amplifier is provided with rumble, scratch and whistle filters. It is, in fact, a highly versatile stereo amplifier since it is provided with terminals, such as for tape recorder and center channel, for broadening the scope of its application.

Specifications

Vacuum Tubes: 19 tubes 6 diodes; Tuning Range: MW 535-1605Kc, SW 3.8-12Mc, FM 80-108Mc; Input and Gain: MAG. PU 3.4mV, XTAL. PU 38mV, AUX. 160mV, MIC. 4mV; Equalizer: NF type, RIAA curve; Frequency Response: 20 cps – 50kc; Maximum Output: 20W x 2; Output Terminal: 4, 8, 16 ohm for speaker (each channel), extra output for center channel amp. and for simultaneous tape recording; Dimensions: 18½ (W) x 14 (D) x 5½ (H) inches



Handy Stereo Amplifier

14W Stereo Tuner-Amplifier SM-Q141

Our new stereo amplifier SM-Q141, designed and manufactured with an eye to easy operation, is now available at a low cost.

Specifications

Vacuum Tubes: 15 tubes 3 diodes; Tuning Range: MW 535 – 1605Kc, SW 3.8 – 12Mc, FM 80 – 108Mc; Input and Gain: MAG. PU 2.8mV, XTAL. PU 28mV, AUX: 500mV; Equalizer: NF type, RIAA curve; Frequency Response: 40 cps – 100kc; Maximum Output: 7W x 2; Output Terminal: 4, 8, 16 ohm for speaker (each channel) and extra output for simultaneous tape recording; Dimensions: 16½ (W) x 13¾ (D) x 5½ (H) inches

PIONEER

PIONEER ELECTRONIC CORPORATION

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EDITOR'S REVIEW

ONE YEAR LATER

It hardly seems possible but we now begin our second year as Editor. Where did 1962 go to? We enjoyed it very much, thank you.

Looking forward into 1963 we can think of several things we would like to see in AUDIO:

1. More articles on recording techniques.
2. Increased comment from readers on what you would especially like to read about in 1963.
3. A definition of high fidelity compiled from what readers think it is (see next section).
4. A construction article on a high-powered transistor amplifier that doesn't require special transistors and is relatively economical.
5. Photographs of home installations which demonstrate a variety of different ways to install systems.
6. A column devoted to audio clubs (or tape clubs).
7. Product profiles on bourbons (it has nothing to do with audio but we like it).
8. A construction article on a high-quality tape preamp.
9. More Audio Techniques.
10. More book reviews.

We really do not expect all of these thoughts to materialize but with your help we hope to see most. Anyhow we have already started on No. 7 as of New Year's Eve.

HIGH FIDELITY DEFINITION— AN OPPORTUNITY

Last month we urged all readers to write to the Commissioner of the Federal Trade Commission (Hon. Paul Rand Dixon) asking him not to accept the definition of high fidelity being proposed by the Electronic Industries Association. If you haven't written yet, do it now!!

The opportunity we have now is to convince the FTC that an acceptable definition must aim towards the highest and not the lowest. We can't quarrel with an attempt by an industry association to raise the standards in its industry, but not at the expense of the high fidelity components industry.

But that is not the whole of our opportunity. We quote below a portion of the letter we received from the FTC in reply to our letter of protest:

> While no proposal as to a definition of "High Fidelity" has as yet been received, it is my understanding that the Electronic Industries Association expects to submit such a proposal for our consideration in the near future. We would welcome similar suggestions from other groups or individual members thereof. Before any definition or standard is adopted, it would be our purpose to afford all interested persons an opportunity to present their views in the matter.

From this we see that we have the opportunity, and obligation, to supply a definition acceptable to quality-minded people. Therefore we propose that readers who are competent to speak in this area put their definition on paper and send it to us. We will assemble all the points, add the thoughts of as many professionals as we can collar, and send it on to the FTC. We would suggest that existing audio clubs and associations now meet and, as a group, commit their definition to paper.

A few people have asked us, after reading the first definition, why we bother to do battle with such giants as comprise the EIA, especially since the definition is supposed to apply to packaged sets only. Truly, we are not intending to point our lance at the giants of American industry—we make a rather sorry-looking Don Quixote. We just felt that we wanted a better definition than the one arrived at. We want a definition which truly attempts to define this area which is of great importance to us. In the words of the chairman of the group which arrived at the definition: "so many enginering and technical aspects could not be covered that we had to come up with minimum standards." (From *Home Furnishings Daily,* Friday, Nov. 30, 1962.) To us it seems tragic that we should start with a "minimum standards" definition when the word we are trying to define aims at maximum standards. No, we are not Don Quixote, but that doesn't mean we will calmly accept an attempt to degrade standards.

Now what about the contention that the present definition only applies to packaged sets? Frankly we fail to see how one could distinguish between "packaged" sets and really good sets from this definition. Besides are there *really* no good packaged sets? In effect, whether they intend it or not, they have defined every piece of equipment which hopes to be called high fidelity.

Oh, well, we promise to keep you informed. You, in turn, should write to the FTC asking them not to accept the EIA definition, and also write to us what you think the definition should be.

VERTICAL TRACKING ANGLE

In our November 1962 editorial we mentioned the problem highlighted by E. R. Madsen's article on vertical tracking angle. Several readers wrote to tell us that they recognized the existence of this problem (see Letters) but that we were wrong about the amount of "consternation" caused by the discovery that most stereo records were not suitable for FM-stereo broadcasts (the FCC actually made note of this in their order authorizing FM-stereo broadcasts). Also, we were informed, this information was known for a long time, 1957, according to one reader, and why do we raise the question now?

Perhaps we do deserve to be criticized for taking issue at such a late date, but somehow we define late as being after the fact. We did wait patiently for many years while the "proper" organizations followed their normal course of action, but here it is many years with no tangible result in the offing. The truth also is that companies which make record cutters are not yet seriously considering changing the cutting angle of their machines to conform to the 15-deg. "standard" (we called several and asked). The truth is that cartridge manufacturers are also not seriously considering changing. Are we really late?

As to whether there was "consternation," we will concede that many people viewed the distortion emanating from the early FM-stereo broadcasts with less than "alarmed dismay," but those on the receiving end were more likely to be "consterned." Anyhow we all agree that standardization should be effected soon.

*Throughout the entire world... more people listen to stereo records reproduced by the STANTON Stereo Fluxvalve than any other magnetic pickup!

And now...new dimensions for stereo from the world's most experienced manufacturer of magnetic pickups–

STANTON 481

Callbration Standard Stereo Fluxvalve*

Model 481AA STANTON Stereo Fluxvalve—an ultra-linear professional pickup for use with ultra-light-weight tone arms capable of tracking within the range from 1/4 to 3 grams. Supplied with the D4005AA V-GUARD diamond stylus assembly.
AUDIOPHILE NET PRICE $49.50

Model 481A STANTON Stereo Fluxvalve—an ultra-linear professional pickup for use with manual tone arms, recommended tracking force is from 2 to 5 grams. Supplied with the D4007A V-GUARD diamond stylus assembly.
AUDIOPHILE NET PRICE $48.00

Model 481E STANTON Stereo Fluxvalve Set—same as the Model 481A but includes two additional V-GUARD styli: the D4010A 1 mil for LP's and the D4027 2.7 mil for 78's.
AUDIOPHILE NET PRICE $60.00

STANTON 400

Professional Stereo Fluxvalve*

Model 400AA STANTON Stereo Fluxvalve—an ultra-linear professional pickup for use with ultra-light-weight tone arms capable of tracking within the range from 1/4 to 3 grams. Supplied with D4005AA V-GUARD diamond stylus assembly
AUDIOPHILE NET PRICE $40.50

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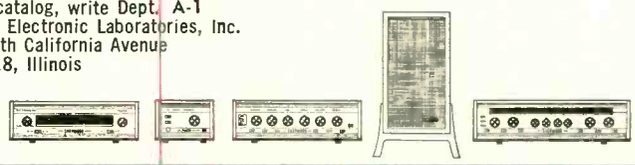

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FM-Stereo Reception

JACK BEEVER*

Receiving FM-stereo broadcasts may require sophisticated techniques on the part of the city dweller because of the multiple paths the signal takes to reach his antenna and the wide angle his antenna must cover.

FM RECEPTION REMINDS ONE of the old nursery jingle—when she's good, she's very very good, but when she's bad, she's 'orrid! Such a statement obviously calls for clarification.

FM reception has a threshold, a level of signal strength, above which the signal produces sound essentially free of "sferics," the background hiss which is the composite of all electrical interference occurring over a large part of the world. This noise is heard in AM tuners as a continuous part of the background of the programming. Below this threshold level, *FM is worse than AM.*

The threshold level is dependent in part on the excellence of the tuner. However, tuner design cannot overcome the limiting factor of noise developed in the circuits of the tuner itself; the thermal noise level. Thermal noise is created by the molecules and electrons "bouncing around" in the tubes, transistors, or conductors of the input (antenna) circuits of the tuner. This problem inspired the use of masers for reception. In order to reduce the thermal noise level, maser circuit components are operated at cryogenic temperatures; temperatures down near absolute zero. These low temperatures reduce the banging around of the atoms of the conductors, hence the thermal noise.

The thermal noise level in practical FM tuners limits useful reception to signals having strengths of about 1.8 microvolts (*millionths* of a volt!) across the antenna terminals. In general, the best tuners will handle signals down to this level, producing "quieting" or elimination of most of the hiss. Less elaborate tuners need more signal to produce the same quieting, as much as ten times more signal in some types.

If you've read this far, you may have come to the correct conclusion that to get good FM, you need good signals from the FM transmitter. You're right, and if we're to do a good job in this article, we'll have to tell you how to get good signals, but first we'd better knock out a lot of the mythology about VHF radiation, which is engineeringese for signals in a band of frequencies which include FM transmissions. We'll include these as statements you've often heard, and then qualify them with the facts.

* *Jerrold Electronics Corp., 15th and Lehigh Ave., Philadelphia 32, Pa.*

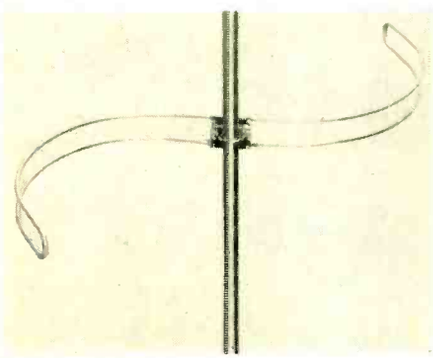

Fig. 1. S-shaped antenna is used for omnidirectional reception.

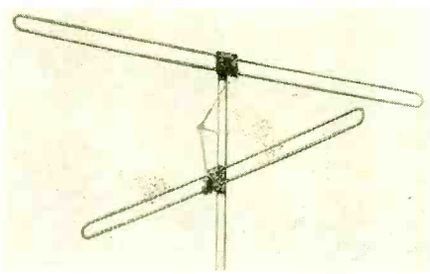

Fig. 2. The turnstile antenna is also omnidirectional.

Mythology

"Radio signals go right through house walls." They do, as long as those walls aren't metallic or insulated with metallic foil. Even then, they'll get in through the holes left by windows and doors, but *they are weakened in any case,* and they are weakened more if the wall is of dense materials. Brick is worse than wood and metal is much worse than brick.

"I can pick up Ft. Wayne, Indiana on AM in New York City, therefore, I should be able to pick up FM stations as far away. They're both radio, aren't they?" They're both radio, true, but the AM stations are on frequencies between 0.5 and 1.7 megacycles, roughly, and have very long wavelengths. These signals often travel around the earth by being trapped between the stratosphere and the ground. They bounce up and down between these two boundaries; thus even though they obey the law that electromagnetic radiation travels in straight lines, they travel enormous distances over the earth's surface.

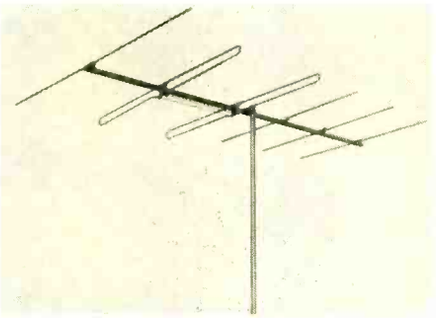

Fig. 3. 6-element FM yagi.

FM stations, on the other hand, are on frequencies between 88 and 108 megacycles. At these frequencies, the signals penetrate the upper levels of atmosphere, and except for freak conditions, do not bounce back to earth. For this reason, FM reception at 100 miles is freakish, depending on unusual conditions such as having the receiving antenna on a high mountain, or freak atmospheric conditions. At these frequencies, it is much easier to beam a signal at the moon and receive the bounce than it is to try to broadcast to a point 500 miles away on the surface of the earth.

"I hate to put up an antenna on my house. I should be able to get just as good results in the attic since it would only be a few feet lower down than an outside antenna." An antenna in the attic will do better than the same antenna on the first floor, but it will not do as good a job as one outside. The roof absorbs and weakens the signals, although usually less than the house walls, which contain pipes, wires, heating ducts, and such which tend to absorb the radiation.

"I get good monophonic FM with an indoor antenna from a station 25 miles away, then I should get good multiplex stereo." Not necessarily true. In the first place, when the station "goes stereo" you have less power in each channel of stereo, so the station is weaker. Secondly, the multiplex stereo transmission is prone to interference by multipath signals—the same thing which produces ghosts on TV —and multipath is much, much worse indoors than out.

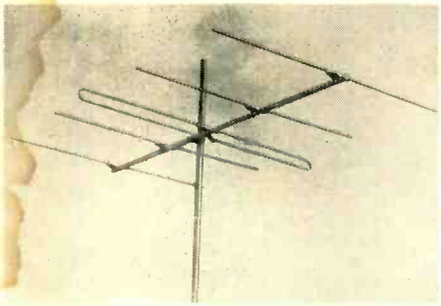

Fig. 4. Bidirectional FM yagi.

Having painted this horrible picture of the FM reception problems, what can we do about it? We'll make one blanket statement: nothing, but nothing, can replace a good outside antenna and the further away from the station, the more it is needed. But this is about the only blanket statement that can be made, because circumstances can make it necessary to use a high-gain fringe-area antenna when you're almost in sight of the station you want, and they can make you wind up pointing the antenna away from the station.

Basically, listeners can be divided into three groups according to normal antenna requirements: local, up to 15 miles from the transmitter; medium range, 15 to 40 miles from the transmitter; and fringe, 40 to 70 miles. Beyond this it is super-fringe and extremely elaborate setups are required for good results.

All the classifications listed above can be further divided into multidirectional reception and uni-directional reception, which affects the choice of antennas just as much as range. With the foregoing groundwork, we can get down to cases, using examples as the best way of making a point.

Local, Multi-Directional Reception

Let us take a hypothetical resident of Queens, one of the boroughs of New York City. This listener will have FM stations to his north, west, and southwest, within 20 miles.

Assume also that he lives in a single frame dwelling and that he is not within a mile of a large apartment or other building (I *know* it's almost impossible, but just imagine, please.) He does not wish to get distant stations, but he does want good stereo FM on his locals.

His problem calls for an antenna which will pick up signals equally well within an angle of about 135 degrees (from north to southwest.) The only kind of antenna which will pick up *equally well* over this great an angle is an omni-directional antenna; one which receives equally well from all directions in the horizontal plane. *Figures* 1 and 2 illustrate two types of antennas having this ability, a "bent" dipole (the "S-shaped" antenna) and a "turnstile" (the two crossed rods). Of these antennas, the turnstile is more effective because it will provide more signal. These antennas are low gain; the turnstile, for example will deliver, from any direction, about one half the signal power a single dipole delivers in its *best* direction. The rods of the turnstile are half-wave dipoles, and the simple half-wave dipole is the reference against which all other antennas are compared. In technical terms, the turnstile will have a "gain" of minus 3 db. This sacrifice in power is made to gain omnidirectionality. Since only local stations are wanted, this loss of power in the signal will not be significant; the signals should be well above the noise threshold.

Local, Multi-Directional Reception, with Multipath Distortion

If we now take our resident of Queens, but put him in an area where he has a number of large buildings or bridges in his vicinity, he is troubled by the fact that the large buildings will act as reflectors to the FM signals coming to his

Fig. 5. Antenna-mounted preamplifier.

antenna. He will thus receive radiation direct from the transmitter and also via reflections from the buildings or bridges. This is the same mechanism which causes ghosts on TV pictures. In stereo FM, it causes distortion of the sound, and sometimes loss of channel separation. The effect is due to the fact that the "ghost" signal is coming over a longer path than the direct signal and may arrive so that it "bucks out" part of the direct signal.

If we're going to solve a problem like this, we need some kind of handle on which to hang an attack. The only handle we have is that the direct signal and the reflected signal come from different directions; they are exactly alike in all other respects.

This, then, calls for an antenna which has "blinders," such as we used to see on horses. We can't exactly duplicate the horse blinders in an antenna, but it is true that the higher the antenna gain the narrower the forward "lobe," which is a way of saying that the antenna is directional, as is the blindered horse.

To use such an antenna, it is aimed at the station, or *at the strongest of the signals,* which may mean that the antenna is aimed at a nearby building. This is particularly true when the direct path from transmitter to receiving antenna is blocked by a building or other obstruction. In practice, the antenna is turned for best results while listening to the stereo broadcast. This process is called "antenna orientation."

Antennas filling this need are generally of the yagi type, illustrated in *Fig.* 3. The rule for yagis is the higher the gain, the narrower the forward lobe and hence the ability to reject multipath signals.

But our hypothetical Queens resident has stations coming in over an arc of 135 degrees. If he aims his antenna at one station, he will probably make his other stations worse, since the antenna's high forward gain will discriminate against stations out of its "line of fire."

This same problem was faced and solved many years ago for TV reception by an antenna rotator, a small gadget on the mast which turns the antenna by means of a control placed convenient to the tuner. With this device, the FM listener tunes in the desired station, then turns the antenna until the reception clears up. All rotators have indicators at the control cabinet which show the antenna direction, and these can be recorded, once found, for quick return to the best position for a given station.

Medium Range Reception, Stations in One Direction

Listeners falling in this category are usually located in smaller communities, and their major problem is enough signal to the tuner. They generally have much less trouble than the resident of a "canyon" city like New York, since multipath problems are much less prevalent.

The usual installation is a yagi, either high or medium gain (and the only reason for the medium gain job is economy). A rotator is not needed, since the range allows the antenna to be orientated to a compromise position where all stations come in satisfactorily. This listener is probably in the most enviable position for stereo.

(*Continued on page 70*)

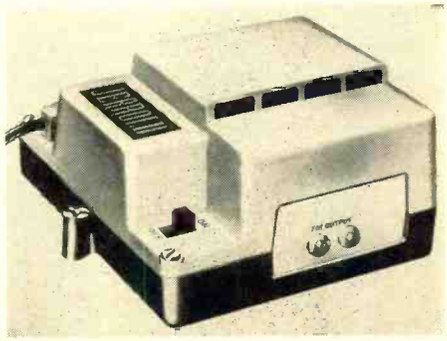

Fig. 6. Set-mounted preamplifier.

Design of Solid-State Stereo Power Amplifier with Silicon Transistors

MARSHALL R. MYERS, JR.* & MORLEY D. KAHN*

The function of an amplifier is to provide an output signal that is an exact, but amplified, replica of the input signal. While this may seem simple, it has been an elusive goal for the audio designer. Now with the development of solid-state circuitry, the unattainable may be in sight.

EVERYONE IS AWARE of the publicized advantages of semiconductors—cooler operation, compactness, lighter weight, lower voltages, and so on. However, the ability of semiconductors to reproduce audio input signals more faithfully has not been as well publicized. To the discriminating music lover, the primary consideration is the quality of sound, not the size or weight. If he were not interested in faithful reproduction of music, he probably would not have invested in components in the first place.

Two of the less-publicized advantages of semiconductors over vacuum tubes are their quick action and their low impedance. Music is full of instantaneous pulses and transients. The transistor can capture this while a vacuum tube with its slower action cannot.

The lower impedance of a transistor makes it possible to direct-couple it and thus avoid the use of audio transformers. Since audio transformers have some limitations, it is a tremendous advantage to be able to omit them.

Amplifier Limitations

The finest vacuum-tube amplifiers have made the problems of non-linear distortion reasonably academic. Harmonic and intermodulation distortions have been reduced to the vanishing points. Flat frequency response from 20 to 20,000 cps at full rated output is also common in the best tube amplifiers (although this is seldom accomplished when *both* channels are operating *simultaneously* at full output). A solid-state amplifier must certainly be able to provide equivalent performance to be considered of top quality.

Unfortunately, the transistor amplifiers hitherto available were generally not able to duplicate the performance of the best vacuum-tube amplifiers in these important criteria. Much of the problem can be attributed to the use of germanium output transistors which are hard put to produce power at high frequencies. As a result, most present solid-state amplifiers have gradually reduced power capabilities at frequencies over 8000 cps and are virtually useless above 15,000 cps. To those desiring high fidelity performance, an amplifier that cannot provide satisfactory output to at least 20,000 cps is not a high fidelity amplifier.

Another limitation of many transistor amplifiers using direct coupled outputs (no output transformers) is the limitation in power at normal speaker impedances. Most solid-state amplifiers using germanium output transistors have maximum output near four ohms. At higher impedances, the power drops so drastically that with a 16-ohm load, as little as one third of the rated power is available. Unfortunately, almost every quality loudspeaker system in use today is rated by its manufacturer at 8 or 16 ohms. The one quality American-produced loudspeaker system rated nominally at 4 ohms actually measures considerably higher that 4 ohms at frequencies below 80 cps—where the power requirements become *more* critical. Publishing power ratings based on 4-ohm output is misleading. Equally misleading is the use of so-called "music-wave" power rather than the standard rms or steady-state values. Granted, the music power will probably be higher than the steady-state value in an amplifier with poor power-supply regulation, and this higher number looks good in ads. However, the entire concept of music power is buried in so much controversy and confusion that its use in the rating of a quality amplifier is questionable.

Another factor in power measurements is the phenomenon of the one-channel measurement. Stereo amplifiers are, of course, intended to be operated

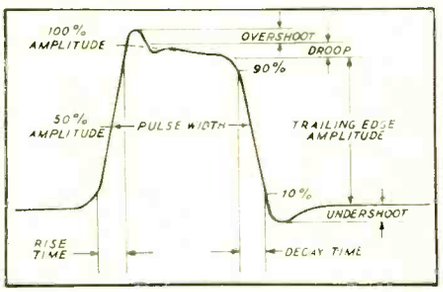

Fig. 2. Actual photograph of an imperfect square wave.

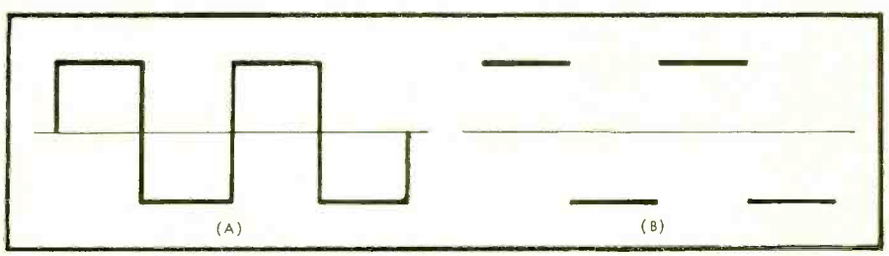

Fig. 1. (A), representation of a "perfect" square wave, and (B), as it would appear on a 'scope. With zero rise time, the cathode ray must travel the vertical paths so rapidly that the phosphor is not excited sufficiently to make it visible.

* *Acoustic Technology Laboratories, Inc., 139 Main St., Cambridge, Mass.*

stereophonically, meaning that both channels will be in use simultaneously. What possible benefit is it to the consumer to read specifications based on measuring only one channel at a time? Again, the answer is that the measurements come out better that way.

Take, for example, amplifier X, advertised at 300 watts. This means 150 watts per channel. Closer inspection shows that the 150 watts is actually music wave, delivered at 4 ohms, with only one channel operating (yet there is no hesitancy in adding together the two one-channel measurements to obtain the 300 watts). In the fine print you notice that the amplifier, at 16 ohms, with both channels operating simultaneously, may produce only 20 watts *steady state* per channel. Then as the last straw, the power measurements were made at 1000 cps. If the amplifier were tested at 20,000 cps, it might deliver only 2 watts (if it uses germanium outputs). What is the correct rating for this amplifier?

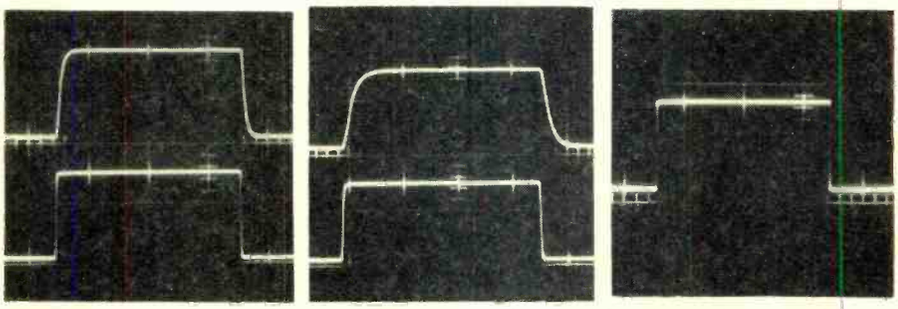

Fig. 3. (A), 10,000-cps square wave as fed into the amplifier (bottom) and at the output (top). (B), same for a 20,000-cps square wave. (C), 1000-cps square wave input and output superimposed to show identical patterns.

Design Criteria

In establishing design criteria for a solid-state power amplifier, all these subtleties are extremely important. The criteria set for the Acoustech I described herein were as follows:

1. All measurements shall be made with both channels operating simultaneously at the rated output.
2. Steady-state (rms), not music-wave power, shall be used.
3. The rated power and distortion specifications shall be the results of measurements made between 8 and 16 ohms, and from 20 to 20,000 cps. The maximum output of the Acoustech I shall be developed into a load somewhere between 8 and 16 ohms.
4. Harmonic distortion shall not exceed 0.95 per cent with both channels operating simultaneously, at 8 or 16 ohms, 20 to 20,000 cps.
5. Intermodulation distortion shall not exceed 0.95 per cent, using frequencies of 60 and 6000 cps mixed 4:1. Because of the aforementioned high-frequency problems with germanium output transistors, some transistor amplifier manufacturers have found it desirable to measure IM with mixed tones of 60 and *3000,* or 50 and *5000* cps. Tube amplifiers have been generally measured with mixed tones of 60 and 6000 or 60 and 7000 cps.

Transient Response

The maximum allowable distortion of the Acoustech I (0.95 per cent) has been achieved by several fine vacuum-tube amplifiers, but never by transistor amplifiers. Why, then, is a transistor amplifier reputed to sound better than tube units? The answer is that good sound does not depend on low harmonic and intermodulation distortion alone. An analogy can be made in the field of medicine. When millions died of diphtheria, tuberculosis, and smallpox, barely considered were heart disease and cancer. Once the former were brought under control, however, the seriousness of the latter became quite evident.

The whole field of transient response has only recently become prominent in audio despite the fact that over 15 years ago its importance was recognized by some authorities. To the casual music listener, a transient is considered the sudden creation of a tone, such as that by a piano, drums, or cymbals. However, almost all music is involved with transients. People are so inured to sine-wave measurements that they overlook the fact that music seldom resembles sine waves. Helmholtz demonstrated years ago that the sounds produced by a violin bow pulled across a string are actually a series of tiny little transients blended together. A similar explanation has been made for the sounds of brass instruments, where the air column is activated by a rapid series of motions from the lips. The problems of piano reproduction have been legend and can mostly be blamed on poor transient response.

It is in the field of transients that the solid-state amplifier is able to make a unique contribution to the art of sound reproduction. In explaining how this contribution is accomplished, let us first examine the concept of the square wave —the most popular method of evaluating transients.

Figure 1 illustrates a perfect square wave. At one instant, the applied signal is zero, the next instant it is at maximum, where it stays for a specified period. Then the signal is turned off and instantaneously returns to zero. With a perfect square wave, the time required to go from zero to maximum is zero microseconds, and the decay time of a perfect square wave is also zero microseconds. When the signal is applied and reaches maximum, it should stop instantly and remain constant without overshoot, ringing, ripple, and slope. In *Fig.* 2 we see an imperfect square wave.

How does one design a power amplifier to reproduce square waves perfectly? The first requirement is extended frequency response. Many designers of tube amplifiers have long claimed that an amplifier that can reproduce from 20 to 20,000 cps is more than satisfactory for music reproduction because the ear cannot hear beyond this range. There is no argument with this statement. The argument is with the method of determining the frequency response. Inevitably, this has been done by feeding in *sine* waves. However, as previously indicated, music patterns seldom resemble pure sine waves. If we accept a square wave as providing a closer approximation of musical patterns, then by rights an amplifier should be able to reproduce *square* waves from 20 to 20,000 cps. A Fourier analysis shows that an amplifier must be able to reproduce *sine* waves to 200,000 cps to reproduce a 20,000 cps *square* wave properly with good rise time. In order to reproduce a 20-cps square wave with minimum phase shift, the amplifier should be able to reproduce sine waves down to below 5 cps.

These square waves must be reproduced with no overshoot, ringing, or ripple, as the time needed for these undesirable characteristics to be damped out far exceeds the rise time itself. *Some* overshoot, ringing, and ripple is present in the square waves of all vacuum-tube amplifiers having fast rise times, due to the limitations of the tubes themselves and of the output transformers. The limitations do not apply to silicon output transistors in a circuit without any audio transformers (neither driver nor output). While most germanium output transistors are limited at high frequencies, it is possible to obtain high-power silicon transistors with a beta cutoff above one megacycle. Using such devices in a transformerless circuit produces square-wave output patterns virtually indistinguishable from the inputs. In *Fig.* 3, (A) and (B) show the 10,000- and 20,000-cps square-wave patterns from the output of the Acoustech I (top pattern) compared to the inputs (bottom pattern). This phenomenal square-wave response is not attained at the sacrifice of the 1000-cps

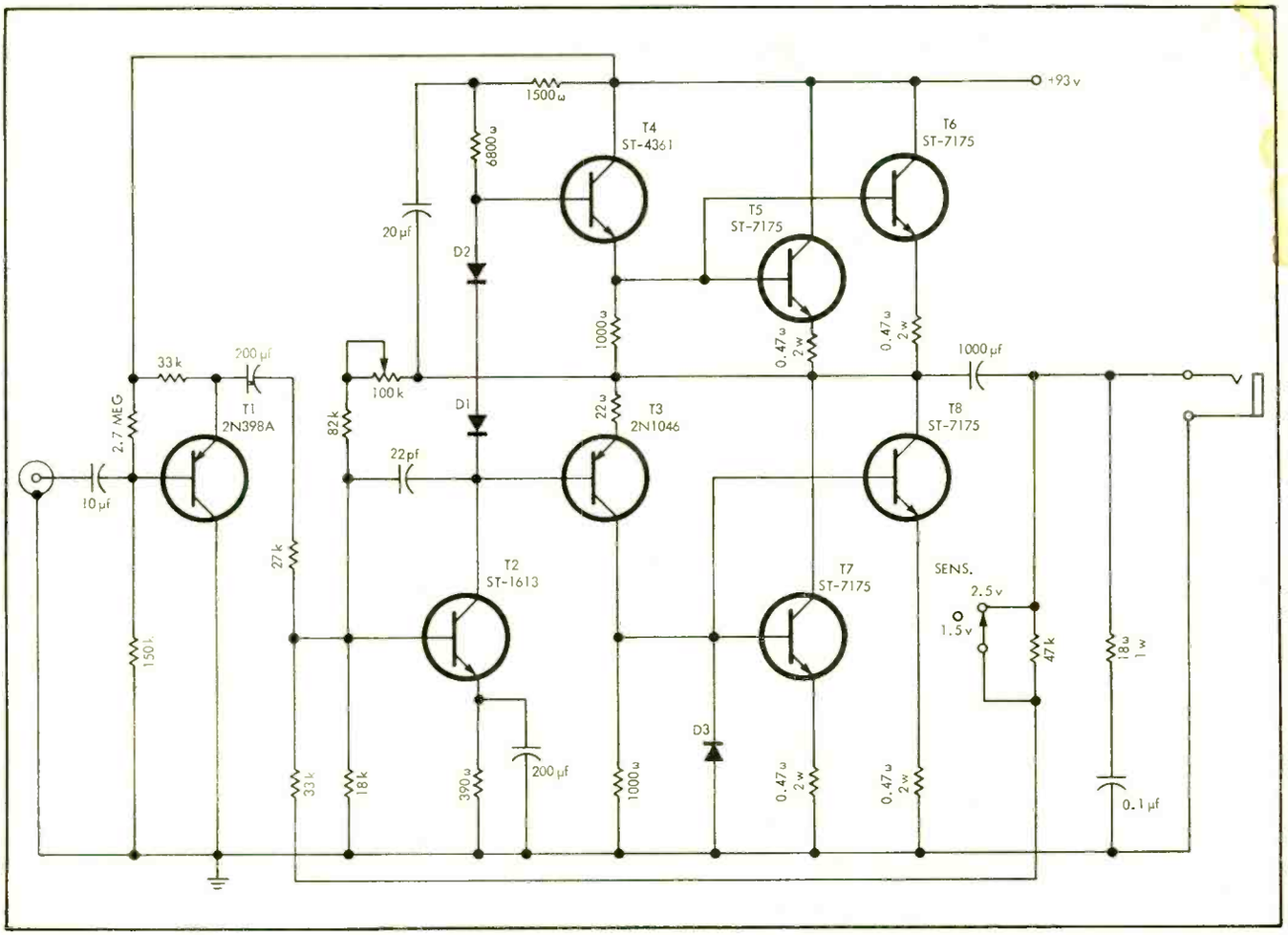

Fig. 4. Over-all schematic of one channel of the Acoustech I power amplifier. Both channels are identical.

pattern; (C) in *Fig.* 3 actually shows *two* 1000-cps square waves—the output from the Acoustech I superimposed over the input wave to the amplifier. The 1000-cps square-wave performance of the Acoustech I proves that the 20,000-cps square-wave performance is not obtained by using elaborate frequency compensation networks which create ringing and overshoot in the mid-frequency square waves.

Damping Factor

Another advantage of direct-coupled solid-state circuitry is its lower internal impedance as viewed from the speaker. This provides a very high damping factor, which in the case of the Acoustech I is over 50 : 1. Speaker manufacturers are not unanimous on the importance of high damping. At one time, some even recommended low damping, although these have recently changed their designs and now recommend high damping as well. The question is—how high can one go before further improvement in sound is no longer detected? In listening tests with almost every well-known speaker systems, it appears that damping in excess of 50 : 1 is valuable. The tightness of the bass response and lack of boom indicates that this is another important advantage that can be derived from solid-state amplifiers. Perhaps it explains why transistor amplifiers sound different—and in the opinion of many experts, better—than tube amplifiers.

Designing the Amplifier

In planning the Acoustech I, the first and most basic decision was to use silicon output transistors. The extended high-frequency range, the ability to operate at much higher temperatures with no ill effects, and the greater reliability all combine to make the use of silicon outputs essential in the design of a quality power amplifier. Indeed, the advantages of silicon are so pronounced that it was decided to use them wherever possible. As a result, 24 of the 28 solid-state devices in the Acoustech I are silicon.

If the advantages of silicon outputs are so pronounced, why have they not found greater application in consumer products? The reason is simple—money! It is possible to pay more for one silicon power transistor than for a complete vacuum-tube amplifier. Unfortunately, top quality does not come cheap.

Once the decision to use silicons was made, a fringe benefit arose. The circuit itself could be basically simple since complicated circuitry would not be needed to compensate for shortcomings of the output transistors. The simplicity of this circuit means that it is easy to build, easy to service, and easy to maintain in top operating condition since there is so little to go wrong. Silicon transistors, computer-grade electrolytics, and oversize power supply are used so conservatively that no degradation of the original performance is likely for many years. Since the unit operates so cool, thermal stresses are minimized.

The Circuit

The schematic of one channel of the amplifier is shown in *Fig.* 4. The output from the preamplifier is fed directly into a high-voltage germanium PNP operated as a grounded-collector stage. This stage provides slightly less than unity gain, for its principal function is to raise the input impedance. The average preamp has an output impedance between 500 and 15,000 ohms. The output coupling capacitors of most preamps will roll off the low frequencies if fed into an impedance less than ten times the output impedance of the preamp. The input stage (T_1) of the power amplifier provides the useful function of

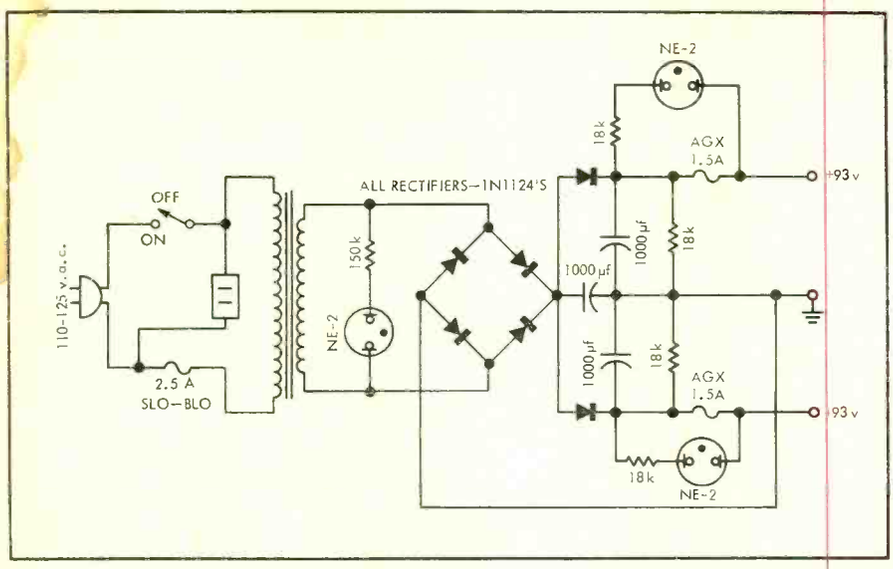

Fig. 5. Schematic of power-supply section.

raising this input impedance to 150 k ohms.

The signal next goes to T_2, a silicon NPN transistor with a high voltage rating. This stage acts as a high-gain amplifier. The main negative feedback loop of the amplifier is connected to the base of this transistor. The 22-pf capacitor between collector and base provides some local feedback. This serves as a neutralizing nework to stabilize the high frequencies. The two series diodes (D_1 and D_2) between T_2 and T_4 comprise a temperature-compensating network in conjunction with D_3 at the collector side of T_3. It has the effect of varying the bias with a rise in temperature. Under normal ambient conditions and with music signals, this network is unnecessary. However, if the amplifier is being utilized for high-power steady-state measurements, as in industrial or laboratory applications, it is useful.

The signal from the collector of T_2 goes to the base of T_3 which acts as a phase splitter and driver for half the output stage. T_3 is a high-power PNP germanium transistor, but this is not the reason it is used here. It was selected because of its exceptionally wide frequency response (its internal cutoff is above 15 megacycles) which makes this germanium comparable in performance (and cost) to many silicons. To compensate for the unbalanced driver stage, a simple bootstrap network provides a little positive feedback from the dividing network between the collector and base of T_4, through a capacitor into the output stage. T_4 is a high-voltage, medium-gain NPN silicon transistor which is a driver for T_5 and T_6 outputs. T_3, its complementary PNP unit, drives T_7 and T_8. The outputs are biased at slightly above Class B (AB_2!).

The particular silicon power transistors used in the amplifier (ST7175) were designed and tested according to Acoustech's exact specifications by Transitron Electronic Corporation of Wakefield, Massachusetts, one of the largest manufacturers of semiconductor devices. The ST7175's have a beta cutoff above one megacycle, and excellent high-frequency response at high power and temperature. A high breakdown voltage and low saturation resistance are other important characteristics. A problem that does exist with silicon power transistors is their somewhat limited current-carrying capability. This is especially important with 4- and 8-ohm loads, when the current rises appreciably. By using the outputs in push-pull parallel, this problem is minimized, and with an effective reduction in saturation resistance, the over-all performance is markedly improved.

The amplifier is fully stable with any load or with no load. The use of silicons means that a very simple stabilization network consisting of an 18-ohm resistor in series with a 0.1-µf capacitor is sufficient to prevent a rising impedance at high frequencies.

Power Supply

The design of the power supply required more than routine thought to meet the basic requirement of providing rated performance from 20 to 20,000 cps, into 8- to 16-ohm loads, with both channels operating at full power simultaneously. As a result, the power transformer used is far above what is needed for music listening. Under the worst possible laboratory, steady-state operating conditions, the transformer is designed so that there will be less than 40° C. internal temperature rise. Under music conditions, the temperature rise will be barely detectable.

A standard full-wave bridge with four silicon diodes feeds into a 1000-µf, 150-volt electrolytic for initial filtering. *Figure* 5 is a schematic of the power supply. From this point, the voltage is split and goes to a separate diode and 1000-µf electrolytic for each channel. In essence, each channel has its own filter network, allowing a considerable amount of independent action between channels. A heavy bass transient on one channel will have little effect on the other channel. A separate B+ fuse for each channel is located between the diode and the electrolytic, protecting against shorts across the speaker terminals or lengthy severe overloads. If one of the fast acting fuses blows, a light flashes on the front panel

(*Continued on page 60*)

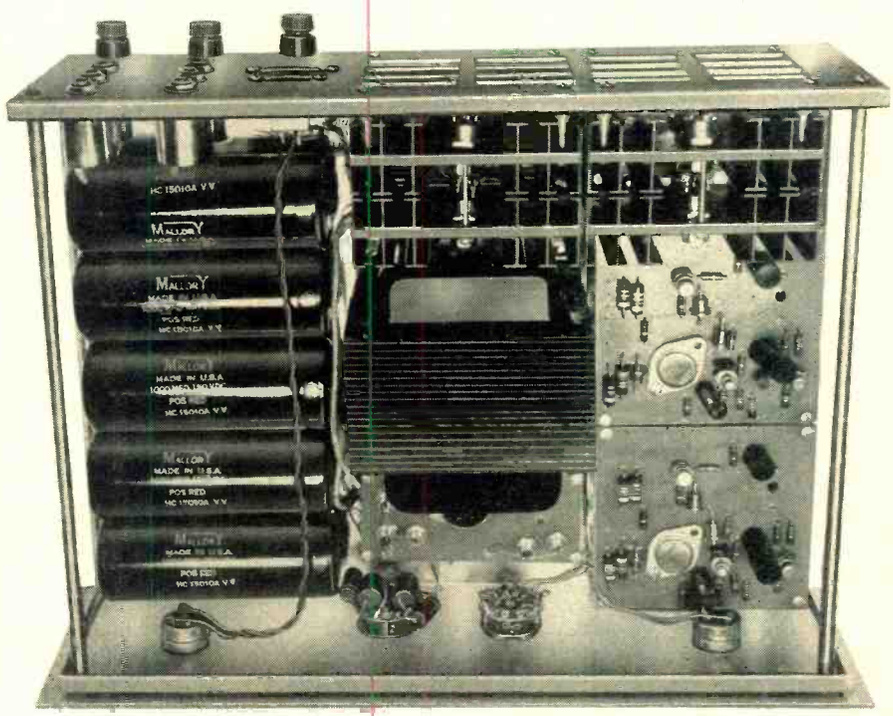

Fig. 6. Top view of the Acoustech I with the protective cage removed.

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For more complete technical information on Citation A write to the Citation Division, Dept. A-1, Harman-Kardon, Inc., Plainview, N.Y.

harman kardon

Alignment and Adjustment of FM-Stereo Tuners and Adapters

C. G. McPROUD

Equipped with suitable test-signal generator, VTVM, audio oscillator, and 'scope, anyone should be able to align multiplex circuits with ease. The MX generator described can serve as a model for the advanced constructor.

EACH NEW DEVELOPMENT in electronic circuitry brings with it a completely new set of problems relating to its maintenance. Time was when we thought that a short-wave set reaching up to 30 megacycles was a pretty daring enterprise—now practically anyone can tune in, by simply turning a switch, a fairly sophisticated piece of equipment working up to around 216 megacycles—the ordinary TV set.

Hi-Fi equipment used to present quite a problem to the average serviceman (still does, too, to judge from some of the comments we hear), but after some twelve years of having hi fi, this condition is fast growing better.

Now, of course, FM-stereo is here, and from the secrecy surrounding the servicing of the equipment, it would appear that it is entirely unsurmountable. To date, we do not recall having seen any information about how to align the FM-stereo circuitry in any service notes for tuners. Nor, for that matter, have there been any such instructions with tuner or adapter kits.

It may be, of course, that the necessary equipment has not been readily available. For a time there was only one multiplex generator available, then there were two, then three, and we have heard rumors of a fourth. The first such unit was quite expensive, and it was not likely the individual would buy a $1000 unit to align a $100 tuner. But if audio servicemen are going to remain in business and continue their claims to being complete service centers for hi-fi equipment, they will have to provide themselves with some sort of multiplex test equipment. For ordinary service use, the device does not have to be especially complicated, nor does it demand the use of a 'scope capable of providing a bandwidth up to 5 megacycles. Such bandwidth may be necessary for the development laboratory, but not for the audio serviceman.

Multiplex Circuitry

Stereo multiplex circuits—either in the adapter or in the test generator—do not represent anything essentially new in electronic circuitry. Basically they consist of oscillators, frequency doublers, phase-shift networks, cathode followers, and so on. The only unusual parts of stereo multiplex equipment are the modulator and demodulator circuits. And it is only the special requirements of signal separation that make these circuits different from other modulator circuits. Since these elements are the fundamental parts of the multiplex equipment, any attempt to understand such circuitry requires a basic knowledge of diode gates and their operation.

Figure 1 shows a typical demodulator gate used in multiplex adapters and tuners, and now the most popular type of circuit. Most of the original circuits employed a conventional AM detector which demodulated the subcarrier, and the resulting output was then matrixed with the sum signal from the main carrier to provide the required L and R signals.

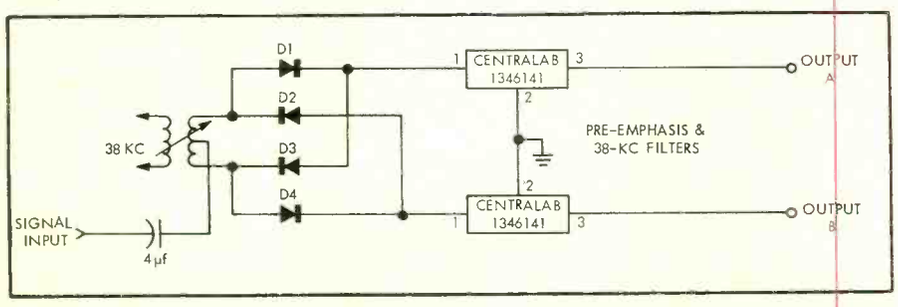

Fig. 1. Schematic of diode-gate circuit used in typical FM stereo tuner or adapter.

The same result can be obtained much more simply by use of the time-division method which samples the signal 38,000 times per second in each polarity and feeds all the samples of the positive side of the signal to one channel and all from the negative side to the other channel. What is needed, then, in the tuner or adapter is a SPDT switch which can function at a 38,000-cycle rate—not a likely mechanical device. Most circuits resort to diode gates to perform the required switching.

Referring to *Fig.* 1 again, the composite multiplex signal is fed to the center tap of the secondary winding of the 38-kc transformer, while the primary is excited from the plate circuit of the 38-kc oscillator or doubler. The amplitude of the switching voltage should be approximately ten times that of the composite signal in order to keep the separation of the two channels at a reasonable level. In any modulator circuit, the fixed or "carrier" signal must be greater in amplitude than the signal with which it is being modulated if the composite output is to vary in direct proportion to the modulating signal. This also applies to demodulation if the recovered signal is to be a faithful replica of the original modulating voltage.

In *Fig.* 1, it will be noted that a capacitor is provided in the circuit from the signal source so as to eliminate any d.c. voltage from the preceding circuits which would disturb the functioning of the diodes. In operation, the two ends of the 38-kc transformer will have equal and opposite carrier voltages. When the positive swing of the carrier appears at the junction of diodes D_1 and D_2, diodes D_1 and D_3 are conducting and diodes D_2 and D_4 are cut off. Thus the signal voltage applied to the center of the transformer secondary will be fed through the "on" diodes to the filter circuit in the "A" channel. Similarly, when the positive swing of the carrier voltage appears at the junction of diodes D_3 and D_4, diodes D_2 and D_4 are conducting and diodes D_1

What should a good turntable do? Easy to put into words... move the record at the exact specified speed, without variation, and without inducing distortion. Here's how the Empire Troubador turntable achieves that goal: • Empire 208 belt-driven 3-speed "silent" turntable • There are only two moving parts in the 208, the motor and the turntable platter—precise bearing tolerances in those parts • Each motor and each turntable are individually adjusted to perfect dynamic balance • Complete rumble isolation is provided by the motor suspension, flexible belt drive and the resilient nylon "seat" which supports and cushions the thrust of the main bearing • A case-hardened, lapped steel shaft fits precisely into the bearing well (honed to a micro finish)—a hardened steel polished ball on the underside of the shaft rests on the nylon seat in the Empire 208 • Total vibration limited to less than 1/1,000,000th of an inch • 3 speeds, 33⅓, 45, 78 rpm • Constant speed, heavy duty hysteresis-synchronous motor operates independent of variations in current fluctuation • Continuous flexible belt—perfectly ground to constant thickness ± .0001 inch, couples turntable directly to the motor pulley—no intermediate idlers • Acoustic isolation motor suspension • Fine speed control • Push button power control with on-off light • Optimum distribution of turntable mass; 6 pound heavy machined aluminum, individually balanced to precise concentricity • Machined heavy aluminum base plate • Safety suspension rubber mat • Retractable 45 rpm adapter • Rumble better than —65 db • Wow and flutter less than .05% • Satin-chrome or satin-gold finish turntable, $110. (slightly higher west of the Rockies) • Handsome walnut base for 208 turntable, $15. • The "American Record Guide" (Larry Zide column) says of the Empire Troubador turntable: "I found speed variations—that is, flutter and wow—to be inaudible... vibration was extremely low ...rumble figures have not been bettered by any turntable I have tested... the heavy turntable is driven via a belt by a synchronous motor, thus assuring the user of constant speed, regardless of minor line variations... just as a tire is smoothed at high rpm, so the turntable's vibration is reduced and kept low by carefully balancing it... it is attention to this and a number of similar features that make the 208 the value it is" • Don Hambly, station manager of KRE AM/FM, Berkeley, Calif. said: "We have long realized that belt driven tables would be the best to use, but had not been impressed with those on the market... the Empire tables, however, have all the basic requirements of design and simplicity of operation and maintenance that we have sought" • "Audio" magazine's "Equipment Profile" of the 208 said: "A massive turntable with precise performance... individually balanced... the truth of the latter may be observed by lifting the platter up and away from the mounting plate and turning it over... notice the holes drilled to balance the platter in a procedure similar to the way automobile tires are balanced... the turntable platter rides on a ball bearing at the end of an accurately honed 7/16″ diameter shaft... the shaft rides in an equally accurate well, while the ball bearing rides on a nylon thrust bearing... a spiral oil groove is cut into the shaft to ensure lubrication of the bearing surfaces... the motor is mounted to the plate by means of three soft rubber shock-mounts which prevent the vibration of the motor from being transmitted to the platter... thus, because of the compliant drive belt, the motor is completely isolated from the record-bearing elements... the entire turntable system is acoustically isolated by means of ball-shaped soft rubber feet... we tried to induce acoustic feedback by placing the turntable on top of our large speaker system and turning up the gain: we were unsuccessful... total rumble measured better than —62 db, and wow and flutter were less than 0.1% rms, quite accurate" • (Still with us? Empire's advertising agency said people wouldn't read this much copy... the company felt that the serious music lover would) • "High Fidelity" magazine said of the 208: "Bold appearance which suggests massive and reliable construction—an impression which is quite borne out by its performance tests... the various pieces of the turntable are carefully machined aluminum castings, thick enough to provide extreme rigidity... finely machined shaft... wow and flutter, with the 'Troubador', were completely undetectable by ear... rumble also was completely inaudible, even at high listening levels... the hum field above the platter was completely negligible... starting torque was good... speed accuracy very good" • What should a good arm do? It should hold the cartridge in place as the stylus follows the record in the groove... without detracting from the performance of the cartridge • Here's how the Empire 980 Arm achieves this objective: • Better dynamic balance achieved by locating the pivot points at the precise center of the arm's mass—equal mass on both sides of axis. Once in balance in one plane it is balanced in all planes. This permits the 980 arm to track at lowest levels, gives it its rock-like stability that will allow perfect tracking at any angle—even upside down • Lowest inertia achieved by critically calculated distribution of arm mass • Maximum compliance means it yields to the slightest impulse, responds and moves effortlessly, even with a tilted table, a badly warped record, or with the turntable turning upside down. There's no need to level your turntable. The only problem you would have in playing this arm with the turntable upside down would be keeping the record up there • Free suspension—Incredible responsiveness would be another way of saying this same thing • Precision ball bearing suspensions—both the vertical and lateral pivot bearings of the 980 are suspended in precision steel-ball races, precision manufactured to instrument tolerances... vertical and lateral friction are both virtually unmeasurable, permitting high compliance and minimum hysteresis • Lowest fundamental resonance frequency: 8 cps (the lowest ever achieved in any arm), achieved by increasing the rigidity of the arm structure through weight distribution, and by making the cartridge shell an integral part of the arm • 5 wire circuit eliminates ground loops, hence eliminates the hum that ground loops induce • Easy plug-in installation... no wiring or soldering necessary • Self-latching arm rest... a slight push downward on the arm tube latches the arm in position • (You're making our advertising agency look silly by reading this far—score yourself a fairly serious music lover) • Precise stylus force adjustment... calibrated knob dials any stylus force from 0 to 8 grams with an accuracy of 0.1 gram. The application of stylus force does not upset the delicate balance of this arm, because stylus force is not adjusted by moving a counterweight (thus shifting the center of mass). Rather, a linear-torque coil spring acts directly on the pivot shaft at the center of the arm's mass • Arm offset angle: 23.8° • Satin chrome or satin gold finish, $50. • Lowest tracking force possible, because of extreme compliance and low inertia • Counterweight zero balance adjustment for any cartridge from 2-25 grams • Maximum tracking error ± .650° • No acoustic feedback • Exact cartridge positioning, quick-release bracket-mount secures cartridge to arm shell. Stylus is aligned with front edge of cartridge mounting plate for exact overhang dimension • Dyna Lift (Patent Pending) lifts arm from record at play out • "High Fidelity" magazine's equipment report said: "The spring-loaded 12-inch 980 Arm moves exceptionally freely about its pivot points, indicating very well-made bearings" • "American Record Guide" (Larry Zide column) said: "One of the best available... substantial reduction in vertical mass... a cartridge of any dimensions can be aligned in the head for minimum tracking error... calibration is extremely accurate... Dyna Lift most useful... lateral and vertical friction is exceptionally low... exceptionally stable... steady even with shaky floors..." • "Audio" magazine's equipment profile said: "Much thicker walled tubing in the arm to reduce the fundamental resonant frequency, which is now below the lower limit of our test record" • (This settles it, once again the client knows better than the agency—score yourself a dedicated music-loving audiophile for reading this far) • What should a good cartridge do? This, the most complicated component in a record playback system, has a job to do that can be stated with a simplicity that belies the complexity of accomplishing it. It should translate mechanical energy into electrical energy without introducing distortion. And for maximum life of the stylus and your records (not to mention reduced distortion) it should perform this function at as slight a stylus force as possible • Here's how the Empire 880p cartridge achieves these objectives: • Lowest dynamic mass, less than .5 x 10^{-3} grams • Highest compliance, 30 x 10^{-6} cm/dyne... Lower dynamic mass and higher compliance than any other cartridge made—eliminates distortion and makes possible many of the cartridge's other accomplishments • Performance range 6 to 30,000 cps, well beyond the range of human hearing • Channel separation more than 30 db—greater separation than any other cartridge means greater enjoyment of stereophonic sound • Tracking force as low as ¼ gram—lowest in the industry—at such low tracking force, the 880p not only eliminates record wear, but also eliminates distortion • Longest possible cartridge life insured by lightness of stylus and the low dynamic mass of the magnetic element. It's the last cartridge you're ever likely to buy • The amazing "Dyna-Life" Stylus (Patent Pending)—ultra-sophisticated hand-polished .6 mil diamond—world's lightest • Complete freedom from hum pickup: the Empire 880p incorporates a complete mu-metal shield to prevent stray hum in the cartridge • Fully compatible for stereo or mono • "Moving Magnet" principle ...the superiority of this type of design lies in the extremely light and flexible stylus assembly it permits, in the unusually smooth frequency response and the high electrical output of the cartridge • Balanced high output, 10 millivolts per channel ± ¼ db, etc. • Perfectly translates and responds to the intricate movements of the record groove • Stylus inertia approaches the irreducible minimum • Smooth, wide response • Inspected at each phase of its manufacture • Faithfully responds, instantly, effortlessly, favoring neither one wall nor the other • Empire 880p, $47.50 • Natural performance • The Empire 880p is so new, the country's hi fi magazines have not had an opportunity to test and publish their opinions... in the meantime, here's what a happy new owner of the 880p wrote us recently: "Most musical, noise non-existent, the sound is transparent, spacious, airy, exceptionally musical, violins sound like violins not cellos or steel wires, in a class by itself" • The Empire 880p is the cartridge that renders every other cartridge on the market today obsolete • If you've read this far you are by all means a music lover most seriously interested in highest quality record playback equipment. Above you have read a "few" of the reasons why we believe the Empire Troubador is for you. You've got the facts about the Empire 208 turntable, the Empire 980 Arm, and the Empire 880p Cartridge. But what about the integration of these three components? What about the system as a whole? • Every Empire component was designed and built for maximum integration with the Troubador system... no other manufacturer makes all three. You will never have a "matching" problem when you purchase all three Empire components • "High Fidelity" magazine said: "A precision-engineered product of the highest quality... in sum, the parts of the 'Troubador'—taken separately—stand up as first-rate audio components. Taken together, they form one of the finest and handsomest record players available" • "Audio" magazine said: "Precise in appearance and performance... as a system, the 'Troubador' Model 398 is not inexpensive [$222.50 including base], but it just reaffirms something we all know: higher quality means higher costs. The Model 398 is an excellent buy for those who want the quality" • To you determined readers we can only say that we rest our case. (sigh... now you don't have to write for our brochure... you've just read it).

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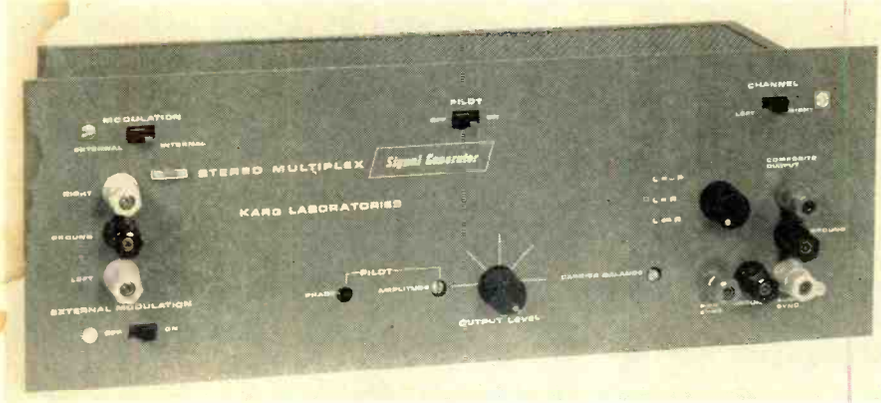

Fig. 2. The Karg MX-1G test signal generator described in the article.

and D_3 are cut off, thus feeding the signal to the filter circuit in the "B" channel. Since the composite signal consists of information from the "A" and "B" channels appearing alternately in 38-kc samples, this results in feeding the "A"-channel information only into the "A" channel and the "B" information only into the "B" channel.

The purpose of the filters is to provide the necessary de-emphasis and to suppress the 38-kc switching signal and its harmonics as much as possible. Since the normal de-emphasis network in a tuner would result in attenuation of the 38-kc subcarrier (and the modulating sidebands which represent the difference signal) by about 26 db, it is obvious that the multiplex demodulator circuit should be fed directly from the discriminator or ratio detector, and thus ahead of the de-emphasis circuit. However, the de-emphasis must be provided somewhere in the audio circuit, and since there are two channels, it follows that there must be two de-emphasis networks, one in each.

Once the basic principles of the diode gate are understood thoroughly, it is easy to follow the operation of the circuit for a generator designed to provide the necessary signals for service on the multiplex portions of FM-stereo tuners or on separate adapters.

Generator Requirements

A stereo test-signal generator must provide a composite signal consisting of several separate frequencies having specific phase and amplitude relationships, together with suitable means for combining these signals in the proper manner. First, the generator must provide 19,000 cps at a high accuracy of frequency. According to F.C.C. regulations, an FM-stereo transmitter must hold the 19-kc within ± 3 cps, and such accuracy is desirable in a test generator. This demands the use of a crystal-controlled oscillator. Second, the generator should provide one or more frequencies in the audio range to serve as the "program" which must be reproduced at the output of the adapter circuit under test. Third, the generator must be able to switch the test signals of the two channels on and off alternately at the rate of 38,000 cps, with a controllable phase relationship to the 19-kc pilot. Fourth, the harmonics of the 38-kc switching frequency must be filtered out. Additionally it may be advantageous to be able to apply the composite signal as modulation of an r.f. carrier in the FM band so as to permit feeding the composite signal into the antenna input of the tuner so as to observe the effect of i.f. and discriminator (or ratio detector) bandwidth upon the recovered signal. It may also be advantageous to have several modulating frequencies which may be switched to either right or left channels as desired. Neither of these requirements is necessary, however, for service work. Thus it is possible to construct a generator which will give a suitable signal without making it a complex and expensive unit.

Such an instrument is the Karg Model MX-1G stereo multiplex generator, which is available in kit form or factory-wired. In addition, the advanced experimenter should be able to follow such a circuit as this and construct his own generator.

Generator Description

The Karg test generator, shown in *Fig.* 2, is comparatively simple, and can readily serve as a guide to the enterprising experimenter who wishes to build his own equipment. It is available as a kit, or as a factory-wired unit. The over-all schematic, *Fig.* 4, shows the 19-kc crystal oscillator comprising a 6AQ8A. The output of the second section feeds a transformer with a center-tapped secondary which in turn feeds a phase-shifting network used to adjust the relative phase between the pilot and the switching rate in the composite signal. In addition, this secondary feeds the grid of the 6AU8 pentode section as the doubler, the two diodes providing positive pulses from both half-cycles of the 19-kc signal and thereby driving the oscillator at a 38-kc rate, and it, in turn, keys the diode bridges at the same rate and feeds the left and right channels alternately to the output.

These diode bridges differ from the simple ones of *Fig.* 1 because in a test generator it is necessary to keep the switching frequency out of the composite signal. In the receiver the 38- and 76-kc components can be filtered out because the only frequencies of interest in the output are those up to 15,000 cps. In the composite output of a generator, however, the 38-kc and its harmonics must be passed in order to carry all of the necessary information, yet there should not be any 38-kc sine wave signal. While this may sound ambiguous, it must be understood that the tiny samples of alternate right and left signals are at the rate of 38 kc, there is still no pure 38 kc in the composite. Since it is not possible to filter out the switching frequency, it must be balanced out in the switching circuits, *Figure* 3 shows the diode bridges rearranged. When terminal A of the transformer is positive, diodes D_1, D_5,

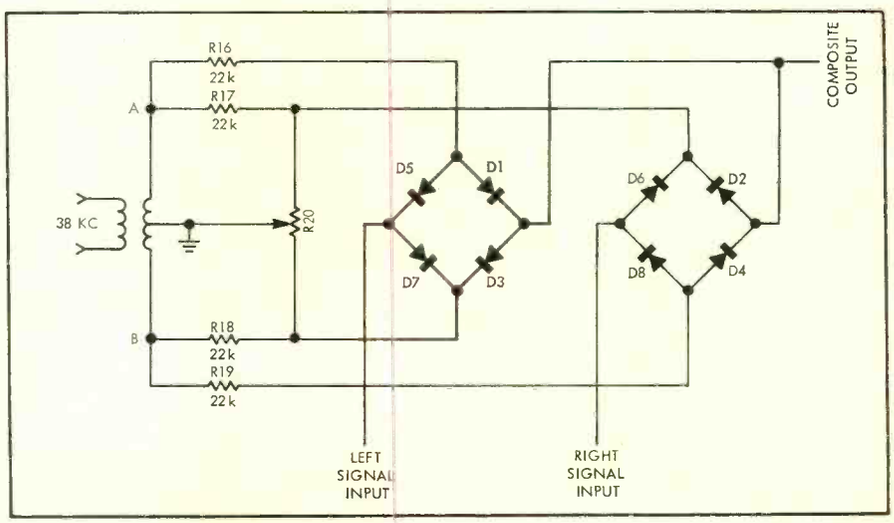

Fig. 3. Simplified arrangement of the diode gates used in the test signal generator.

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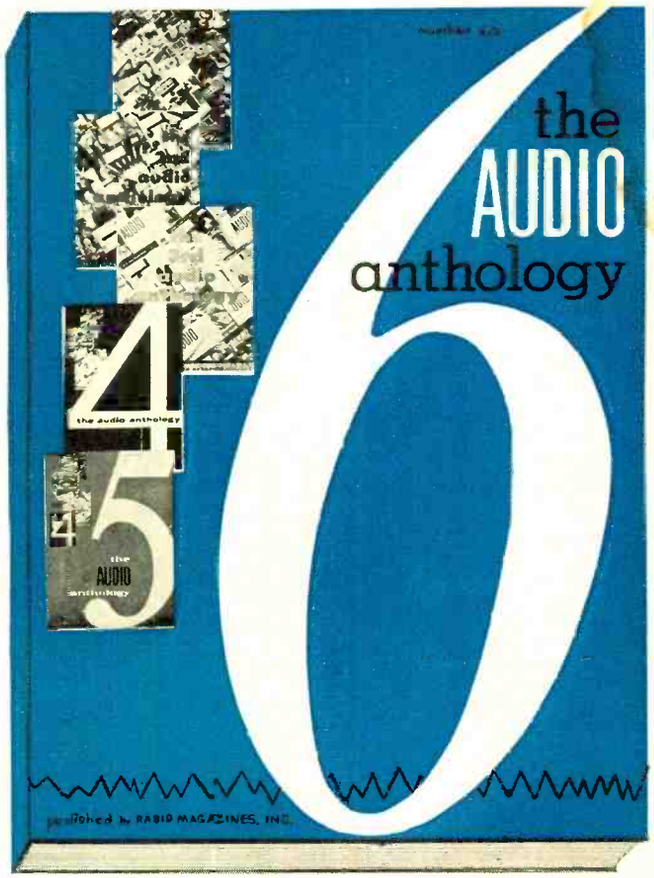

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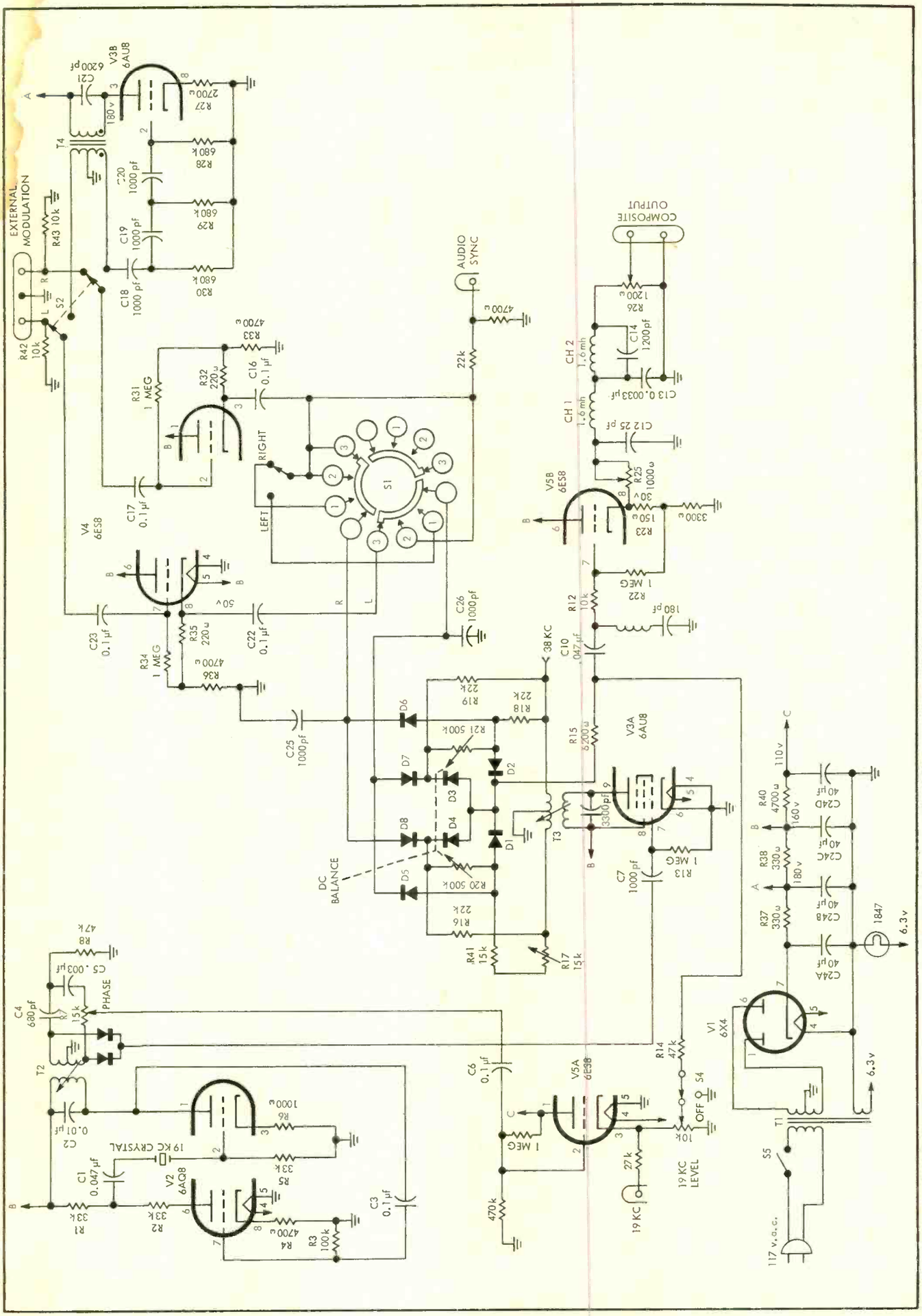

Fig. 4. Over-all schematic of Karg MX-1G multiplex signal generator.

said Anton Schmitt of New York's famed Harvey Radio after listening to the Acoustech I solid state stereo power amplifier for the first time. "The dynamic range and transparency of sound permit me to hear shadings and subtleties I was never aware of," Anton continued. "Even when I turn up the bass controls on the preamp, I still hear more tightly controlled lows, not boom. This amplifier sets a new standard in sound reproduction."

This dramatic advance in the art of sound reproduction results from the sophisticated solid state circuitry of the Acoustech I. The expensive all-silicon output stage (beta cutoff above one megacycle) combined with direct-coupled circuitry (no driver or output transformers) provides unequalled transient response. Together with the high damping, these unique characteristics give a clarity and ease of listening that was as immediately obvious to Anton Schmitt as it will be to you.

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The Acoustech I can be heard at leading audio dealers across the country.

MINIMUM SPECIFICATIONS: 40 watts per channel, rms, both channels operating simultaneously, delivered 8-16 ohms, 20-20,000 cps, with less than 0.95% harmonic and IM distortion (IM measured with 60 and 6000 cps tones mixed 4:1) at rated output; Rise time 1.75 μsec; Frequency response, ±¼ db, 5-50,000 cps; ±3 db, 2½-250,000 cps; Input impedance 150,000 ohms; Dimensions 15¾" w x 5" h x 12" d. **$395** including cage. (Slightly higher West of Rockies).

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COMING . . . Acoustech II solid state stereo decade control center

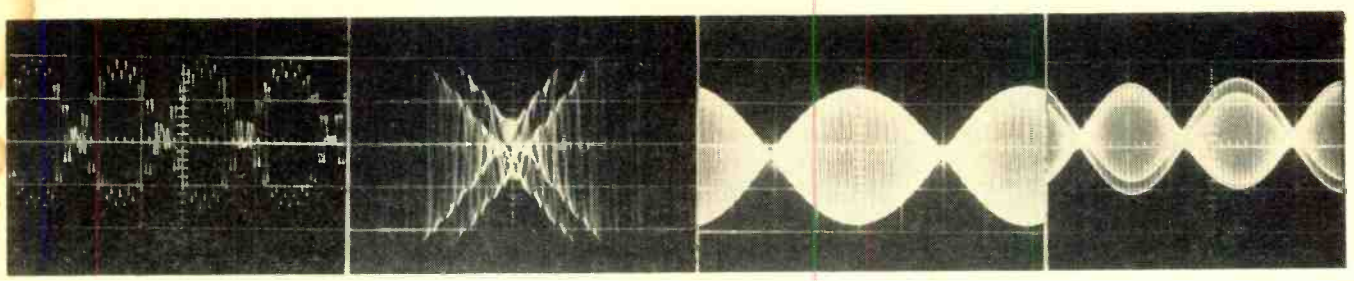


Fig. 5. 'Scope patterns obtained at output of MX test generator. At Two-channel modulation, L = − R, with pilot; (B) L = − R modulation, with pilot, and gain increased to show crossings; correct zero phase shift pilot-carrier relation is shown by the "points" opposite each other; (C) Same as (A), except without pilot; (D) Same as (A), but with phase relation about 30 deg.

D_5, and D_7, conduct and diodes D_2, D_4, D_6, and D_8 are cut off. Thus the left signal is fed to the output. On the next half cycle, terminal B is positive, and the right signal is fed to the output. What is wanted is a series of 38-kc pulses modulated alternately at the audio signal frequency, Potentiometer R_{20} serves to balance the diode bridges so that no 38-kc signal appears in the output. If the eight diodes were all alike dynamically—a condition which is practically impossible of attainment—this potentiometer alone would serve, but since the diodes are not alike, some further adjustment must be provided. In practice, R_{17} actually consists of a fixed resistor and a variable one permitting a range of adjustment from 15,000 to 30,000 ohms. Also in practice, R_{20} is in two sections, each of 500k ohms and connected between the two diode bridges where the 38-kc is injected, as shown in *Fig.* 3. The composite output is fed to a cathode follower, and thence through a filter to the output. The filter is designed to eliminate the second and third harmonies of the switching frequency.

The audio signal frequency, approximately 1000 cps, is furnished by V_{3B}. This is a phase-shift oscillator with the output taken from the center-tapped secondary of a transformer so that the right and left signals fed to the bridges may be in either or out of phase, depending on the position of the switch S_1. The third position of the switch permits feeding only one of the channels—right or left being selected by a slide switch. Another slide switch permits the use of an external source of audio signal when desired. Two other slide switches control the pilot signal and a.c. power to the generator.

Adjustment is quite simple. With the pilot signal on and internal audio on, the output control is set to furnish a composite output of 2 volts; then with modulation off, the pilot amplitude is adjusted to provide an output of 0.2 volts. The pilot is then turned off and the carrier-balance potentiometer adjusted for minimum output signal, which should be around 50 to 55 db below the 2-volt composite signal. Then with the output fed to a 'scope, and modulation set for L = − R, the pilot phase control is adjusted to give the type of signal shown in C of *Fig.* 5 in which the differences between the alternate peaks of the composite signal are the same at top and bottom parts of the pattern. Increasing the amplitude of the signal and concentrating on the axis crossing gives a pattern like (B), which shows clearly the correct phase adjustment when the points are opposite each other. (C) is the same as (A) except for different audio modulation and absence of pilot; (D) shows incorrect phase adjustment.

Figure 6 shows other types of output patterns obtainable. For these patterns, it is desirable to have a wideband 'scope for optimum results, but for service and adjustment of adapters and tuners, such a 'scope is not essential.

Circuit Alignment

The actual operation of alignment of the multiplex circuit of an adapter or tuner is extremely simple, once the generator is available. Although there are minor variations in multiplex circuits, all of them contain essentially the same elements, and even without specific instructions, no trouble should be encountered. Most circuits have a 67-kc SCA filter; all have a 19-kc filter to separate the pilot carrier from the remainder of the signal; all have 38-kc circuits—either oscillator or doubler; and some have a separation control.

The first step is to adjust the 67-kc filter. This requires a source of this frequency, usually from a wide-range audio oscillator. With this signal fed into the multiplex circuit and a VTVM on the output of either channel, adjust the filter for minimum output. If the 67-kc circuit is not identified on the chassis but you have the schematic, you will be able to recognize it by the value of the components. Filters of this type usually consist of an adjustable-cored coil with a small capacitor across or in series with it—the capacitor value usually between 50 and 180 pf.

After the SCA filter is adjusted for minimum, apply a 19-kc signal to the input of the adapter circuit. For preliminary 19- and 38-kc adjustments, assuming the entire unit is completely out of alignment, it is suggested that a 'scope be connected to some point in the adapter where 38-kc is present. With the oscillator type of circuit, this point can be found by probing with the 'scope lead with no signal fed into the adapter. If the circuit uses a doubler, however, no signal will be present unless some 19-kc pilot is fed to the input, so some should be injected. Once the 38-kc point is found and the 'scope connected, adjust all remaining circuits in the adapter for maximum output at 38 kc. While making

(*Continued on page 61*)

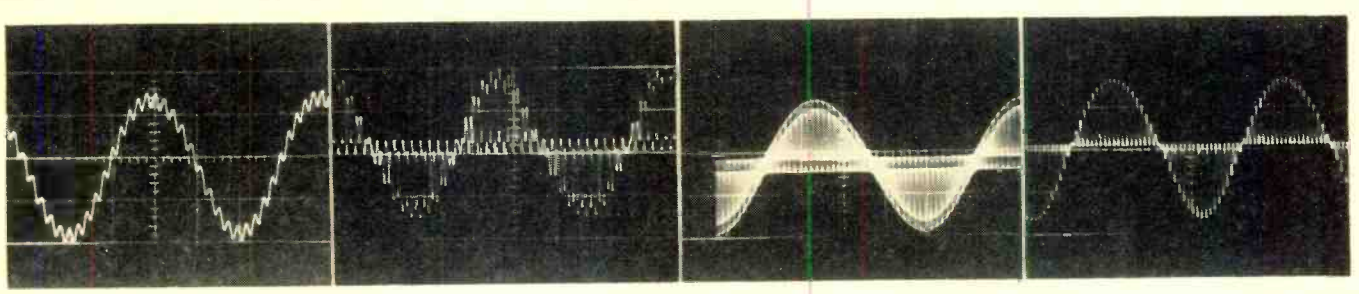


Fig. 6. Additional 'scope patterns. (A) Single-channel modulation. Separation is indicated by ratio of peak-to-peak amplitude of waveform to p-p amplitude of baseline ripple; (B) Same as (A), with 19-kc pilot added. Pilot amplitude should be adjusted to 8-10 per cent at composite; (C) Same as (B), but not synchronized to pilot frequency; (D) Monophonic modulation (L=R), with pilot, and 'scope and audio signal synchronized to pilot frequency.

THESE ARE GARRARD'S AUTOMATIC TURNTABLES

To understand why more fine component music systems are being built around these than any other record playing units, please turn the page . . .

The original

AUTOMATIC TURNTABLE

Laboratory Series

TYPE A

. . . a new kind of record playing unit, which has become a legend.

The Type A established the concept of the Automatic Turntable, combining the professional performance of a dynamically-balanced tone arm, full-size turntable and Laboratory Series motor . . . with the tremendous convenience of the world's gentlest record changing mechanism, to use when desired. Because it is the answer to today's most advanced stereo requirements, this Garrard has enjoyed the most dramatic acceptance ever accorded a high fidelity record playing component. Richly executed in grey, charcoal and chrome, the Type A is designed to enhance the finest music system, fulfilling the most critical requirements through excellent performance, utter reliability, durability, safety and convenience. An extravagant concept, this magnificent unit, refined and restyled, remains moderate in cost at **$79.50.**

Type A includes a dynamically-balanced tone arm, with all the precision, balance, freedom from friction, and low resonance of the finest arms separately sold.

This advanced tone arm is balanced and set in two simple steps: First, the adjustable counterweight is moved until the arm floats level at zero stylus pressure.

Then, the correct stylus pressure for the cartridge is established by moving a pointer along a calibrated gram scale at the side of the arm. This built-in gauge sets tracking force more accurately than by a separate gauge.

The arm will now track perfectly even if the player is intentionally tilted, the record warped, or not concentric. It will bring out the best in any cartridge used, including those labelled "professional."

Turntable is full-sized, balanced, cast and polished. The weight of 6 lbs. has been determined as the optimum for perfect torque and flywheel action in the Type A.

Actually, it consists of two turntables balanced together . . . a drive table inside and a heavy cast turntable outside. These are separated by a resilient foam barrier which damps out noise or vibration.

Type A is built around the Garrard "Laboratory Series" shaded 4-pole motor, designed specifically for it. It is shielded completely, top and bottom, with accurately oriented plates which prevent hum.

The great advantage of automatic play when desired . . . and without compromise! The Type A accomplishes this with Garrard's exclusive pusher platform . . . unquestionably the gentlest, most reliable automatic record handling device ever developed.

Installation and removal have been made very simple. Leads are connected with a built-in Amplok plug (for AC) and a female twin phono socket (for audio). No need to disengage wires from amplifier . . . simply unplug at the player.

Type A is supplied fully wired for stereo, with a 4-pin/5-wire system utilizing separate connection for ground to eliminate hum.

SPECIFICATIONS:

4 speeds: 16⅔, 33⅓, 45 and 78 RPM. 100-130 volts, 60 cycles AC (50 cycle pulley available)

16¾" left to right, 14⅛" front to rear 6" above and 2⅞" below top of motor board.

BRILLIANT PERFORMANCE, CONVENIENCE AND STYLING

The proven results of skilled engineering, meaningful features, rigid quality control — yours to enjoy year after year!

Model

AT6

the compact, intermix

AUTOMATIC TURNTABLE

Handsomely dramatic in grey, charcoal and brushed aluminum, this precision model offers all the critical performance features required of a Garrard Automatic Turntable. These include a particularly sensitive tubular tone arm, dynamically balanced and counterweight-adjusted, with built-in stylus pressure gauge; plus an oversized turntable; the Laboratory Series motor; and an intermix automatic record changing mechanism, to use when desired. Yet, the Garrard engineers ingeniously have designed the AT6 to be so compact that it can be offered in this latest version at only **$54.50.**

AT6 features a dynamically counterbalanced tubular tone arm of outstanding design, comparable with the most advanced, most popular, separately-sold tone arms.

Balance and tracking force are adjusted in two steps: First . . . zero tracking pressure is established by moving the counterweight until the arm floats level, in perfect equal balance.

Next, correct tracking force is set on the stylus scale mounted upright at the side of the tone arm. Settings are more precise than by a separate stylus pressure gauge.

AT6 will now track each side of the stereo grooves perfectly at the lowest pressure specified, even for cartridges labelled "professional" . . . and even if the player is intentionally tilted, or the record warped.

The Garrard plug-in shell will accommodate the cartridge of your choice. In the AT6, a bayonet fitting makes the shell instantly removable, rigidly held while playing, to avoid resonance.

The turntable is oversized, heavy and balanced. Torque is high, and there is no noise, rumble, wow, waver, or interference with the sound of records.

Responsible for the silence and perfect speed of the AT6 is the heavy duty, double shielded "Laboratory Series" motor, engineered specifically to match the AT6 turntable and drive linkage.

AT6 has center-drop turntable spindle, removable for safety in handling records. Actually, two interchangeable spindles are provided: one for automatic; the other, a short spindle for playing singles.

While on automatic play, AT6 is an intermix changer: takes records any size, any sequence.

Convenience—the compact size of the AT6 makes it fit every installation: a snap-in tone arm safety catch prevents accidents.

Leads are connected to unit with a built-in Amplok plug (for AC) and a female twin phono socket (for audio), mounted on the unit plate. Simply unplug at the player.

AT6 is supplied fully wired for stereo with a 4-pin/5-wire system utilizing separate connection for ground to eliminate hum.

SPECIFICATIONS:

4 speeds: 16⅔, 33⅓, 45 and 78 RPM. 100-130 volts, 60 cycles AC. (50 cycle pulley available.)

Minimum cabinet dimensions. 15⅜" left to right, 13⅛" front to rear, 4⅝" above and 2⅞" below top of motor board.

For Comparator Guide and list of dealers, write Dept. GY 1772, **Garrard Sales Corp., Port Washington, N. Y.**

A High-Quality Transistorized Stereo Preamplifier

ERHARD ASCHINGER

PART THREE OF A SERIES

Calculations

In this Section all calculations necessary to achieve the required performance specifications shall be described in detail. If the reader prefers to use a different stereo cartridge or different transistors, or if he wants to select gain and impedance values different from those described the same calculations may be applied using the appropriate new values.

Selection of Operating Points and D.C. Stabilization

The selection of the operating point of a transistor audio-frequency amplifier stage is of great influence upon the useful collector-voltage swing, distortion, and noise level. Any uncontrolled change in the operating point has to be avoided since it directly influences the performance characteristics of the stage. Once a suitable operating point has been selected, it has to be stabilized to be essentially independent of transistor parameter tolerances (especially of variations in current transfer ratio), temperature, and supply-voltage variations.

The influence of the different parameter variations upon the operating point shall not be discussed here, nor is it intended to present a complete theory of transistor-stage operating-point stabilization. Rather elaborate calculations and extensive tests have shown that under normal conditions excellent stability can be achieved by observing two simple rules of thumb.

One of the most effective and convenient methods to achieve d.c. stabilization in a common-emitter stage is the insertion of a resistor in the emitter lead, as shown in *Fig.* 12. The resulting negative d.c. series feedback stabilizes the operating point of the stage against changes in transistor parameters, temperature, and supply voltage. It is obvious that for optimum stability R_3 should be made as large as possible. However, supply voltage is lost in R_3, and a very high value requires an impractically high supply voltage. Normally, a compromise has to be made between stability requirements and supply voltage facilities. It has been found if

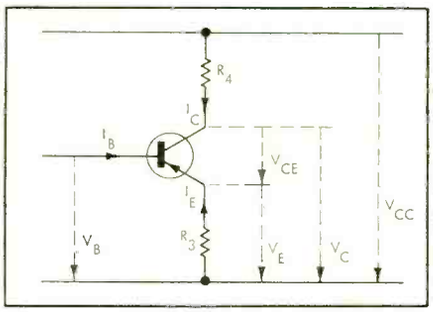


Fig. 12 Simplified circuit of a common emitter stage with series feedback.

that very good stability can be obtained $V_E \approx V_{CE}$ and $|V_{CE}|$ *less than* $0.5\ |V_{CC}|$.

As indicated in *Fig.* 12, the bias problem must still be decided. For good stability of the stage it will be necessary to apply a highly stable voltage, V_B, or current, bias I_B, to the base electrode of the transistor. In addition to this, stability can be improved considerably by the use of a degenerative d.c. feedback loop around one or more stages of the amplifier.

In our special case all three amplifier stages are operated in common-emitter connection, they are directly coupled for optimum low-frequency response and good d.c. stability. Operating point stability of the individual stages is achieved by emitter resistors, and a d.c. negative-feedback loop around the first two stages insures high over-all d.c. stability. Different methods of bias stabilization have ben employed in the individual stages: stage one uses constant-current bias via the d.c. feedback path from the emitter of the second stage, stages two and three are operated with constant-voltage bias from the collectors of the respective preceding stages. The d.c. circuit of the three-stage amplifier which will now be developed in detail is shown in *Fig.* 13.

Since there is no universal standard concerning the use of reference arrows as yet, the system used in the following calculations shall be explained briefly. In principle, any desired system of referance arrows may be used, the results of the calculations will be the same in any case.

All reference arrows will be applied according to the sign convention used in four-terminal network theory. Current reference arrows will be counted positive for currents flowing into the network, and voltage reference arrows will be counted positive for voltages referred to the common or ground terminal.

Actual d.c. currents are counted positive in the direction of conventional current flow, and d.c. voltages are counted positive from positive to negative terminals.

When this system is applied to PNP-transistor circuit analysis, a number of values become negative. To void misunderstandings, a negative sign is always added to the symbol and not to the

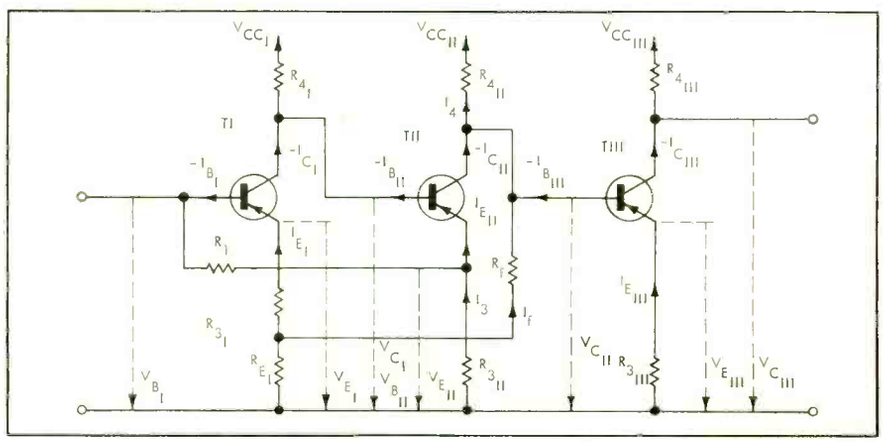


Fig. 13. D-C circuit of the three-stage amplifier.

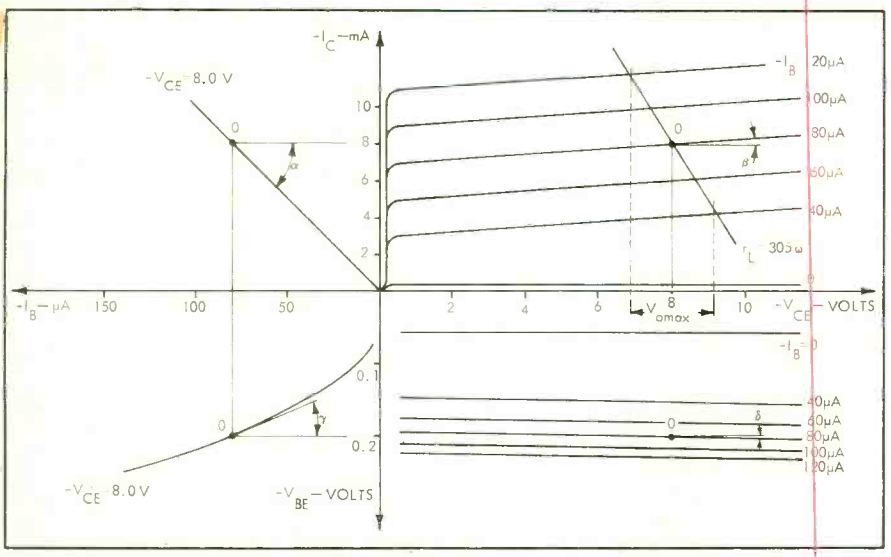


Fig. 14. RCA 2N109 characteristic curves.

figure, for example $-I_C = 3$ mA, and *not* $I_C = -3$ mA.

In the following calculations the subscripts *B, E,* and *C* refer to the respective transistor electrodes. The subscripts *I, II,* and *III* refer to the individual amplifier stages, they will be omitted in places where a confusion with other values is not possible.

Since direct coupling is employed, the base current of each stage affects the preceding stage. The amplifier will therefore be designed starting with the last stage.

Stage Three—RCA 2N109.

Maximum ratings: $-V_{CE} = 12$ v max, $-I_C = 35$ mA max, $P_C = 150$ mw max at $t_{amb} = 25°C$.

The output stage of the equalizer has to feature an output resistance, R_o, of 600 ohms. It has to be capable of delivering an undistorted output voltage of 775 mv into an external load resistance, of 600 ohms, corresponding to an output power of 1 mw

Because of the low load resistance, this stage has to be designed like a large-signal stage, its set of characteristic curves has to be used for operating point selection. As shown in *Fig.* 14, stage three is operated in class A. The operating point, *O,* has been placed into the most linear region of the collector characteristics, which results in very low distortion. Even with heavy overloading, the regions of collector leakage current and saturation voltage are not reached.

The selected operating point is given by $-I_C = 8.0$ mA and $-V_{CE} = 8.0$ v, the supply voltage has been set at $-V_{CE} = 25$ v.

The output resistance of a common-emitter stage is composed of its collector resistor shunted by the output resistance of the transistor amplifier, which generally is in the order of several times 10,000 ohms and may, therefore, be neglected. Thus the required output resistance of 600 ohms can be achieved with sufficient accuracy by using a collector resistor, R_4, of 620 ohms ± 5 per cent. The collector voltage then is $-V_C = -V_{CC} + R_4 I_C = 25 - 4.96 \approx 20.0$ v and the emitter voltage $-V_E = -V_C + V_{CE} = 20.0 - 8.0 = 12.0$ v. According to the transistor characteristics (see *Fig.* 14) the base current is $-I_B = 80\ \mu A$, the emitter current then is $I_E = -I_C - I_B = 8.08$ mA and the required resistor

$$R_3 = \frac{-V_E}{I_E} = \frac{12.0}{8.08} = 1480 \text{ ohms.}$$

The base-to-emitter voltage as determined from the characteristics is $-V_{BE} = 0.2$ v, the required bias voltage at the base of stage three will be $-V_B = -V_E - V_{BE} = 12.2$ v. The collector dissipation of stage three is $P_C = I_C V_{CE} = 8.0 \times 8.0 = 64$ mw, and its total power consumption $P_{DC} = I_C V_{CC} = 8.0 \times 25.0 = 200$ mw.

Stage Two—RCA 2N175.

Maximum ratings: $\beta \approx 65$ – $V_{CE} = 10$ v max, $-I_C = 2.0$ mA max, $P_C =$ mw max at $t_{amb} = 25°C$.

The undistorted voltage output of stage two required to drive stage three has to be almost $v_{oII} \approx v_{oIII} = 775$ mv, since the voltage gain of stage three is only slightly above unity. However, to achieve maximum voltage gain the collector resistor of stage two will be made as large as possible, its external load resistance—the input resistance of stage three—is of the order of several times 10,000 ohms, too. The resulting load line in the collector characteristics, therefore, has a very gentle slope and the stage may be operated at rather low collector current, which, in turn, requires a large collector resistor.

Thus, the selection of the operating point is not too critical. The chosen values are $-I_C = 1.0$ ma, $-V_{CE} = 4.8$ v, and $-V_{CC} = 21.0$ v.

Since it provides the required bias for stage three, the collector voltage has to be $-V_{C\,II} = -V_{B\,III} = 12.2$ v.

The d.c. resistance of the audio-frequency feedback network (as calculated later) is $R_f = 51{,}700$ ohms. Since the feedback network is connected to the current divider in the emitter lead of stage one near ground potential ($R_{E\,I}$ is much smaller than R_f), it may be assumed that the entire voltage $V_{C\,II}$ is dropped across R_f only.

The current in the collector resistor of stage two consists of

$$I_4 = I_f + I_{C\,II} + I_{B\,III}$$

$$I_f = \frac{-V_{C\,II}}{R_f} = \frac{12.2}{51.7} = 0.236 \text{ mA}$$

($R_{E\,I}$ *is much smaller than* R_f)

$I_4 = 0.236 + 1.0 + 0.08 = 1.316$ mA, the required collector resistor is

$$R_4 = \frac{-V_{CC} + V_C}{I_4} = \frac{21.0 - 12.2}{1.316 \times 10^{-3}} \approx 6690 \text{ ohms}$$

or, using the nearest EIA standard value, $R_4 = 6800$ ohms.

The emitter voltage is $-V_E = V_C + V_{CE} = 12.2 - 4.8 = 7.4$ v and the emitter current $I_E = -I_C - I_{B\,II} - I_{B\,I}$. $I_{B\,I} = \frac{-I_C}{\beta} = \frac{1.0}{65} \approx 0.0154$ mA. $I_E \approx 1.015$ mA.

This current consists of the base current, $-I_{B\,I}$, of stage one and the current, I_3, flowing through $R_{3\,II}$, which is $I_3 = I_{E\,II} + I_{B\,I}$.

With $-I_{B\,I} = 0.0077$ mA (as determined in the next paragraph, we get $I_3 = 1.015 - 0.0077 = 1.007$ mA and therefore

$$R_{3\,II} = \frac{-V_E}{I_3} = \frac{7.4}{1.007} \approx 7340 \text{ ohms.}$$

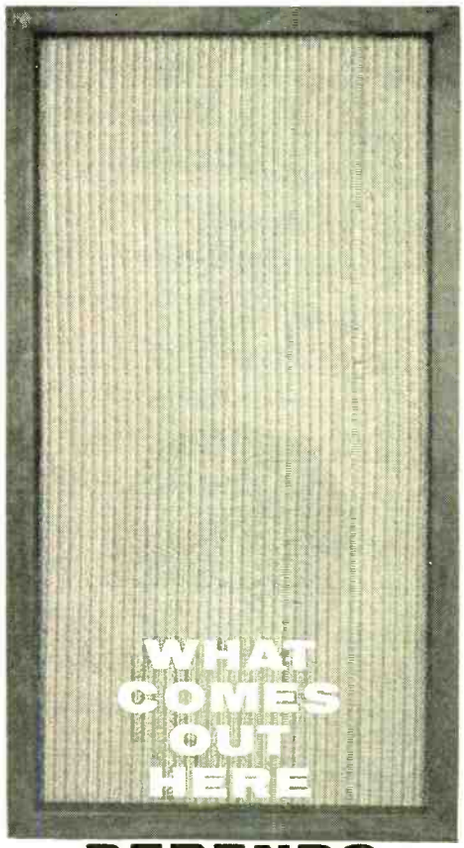
According to the base characteristics of the 2N175 the base-to-emitter voltage for the selected operating point is $-V_{BE} = 0.1$ v, the required base voltage thus being $-V_{B\,II} = -V_E - V_{BE} = 7.5$ v.

Stage two has a collector dissipation of $P_C = I_C V_{CE} = 1.0 \times 4.8 = 4.8$ mw, and a power consumption of $P_{DC} = I_4 (-V_{CC}) = 1.316 \times 21.0 = 27.6$ mw.

Stage One—RCA 2N175. To achieve the desired high signal-to-noise ratio the first stage has to be designed for low noise. Since it has to handle only very small signals, the selection of its operating point is not limited by considerations concerning collector voltage swing and distortion. From the noise characteristics of the RCA 2N175 (*Fig.* 2) the optimum operating-point values have been chosen: $-I_C = 0.5$ mA and $-V_{CE} = 4.5$ v; the selected supply voltage is $-V_{CC} = 19.0$ v. The collector voltage being $-V_{CI} = -V_{BII} = 7.5$ v we get

$$R_4 = \frac{-V_{CC} + V_C}{-I_{CI} - I_{BII}} = \frac{19 - 7.5}{0.5 + 0.015} \approx 22{,}300 \text{ ohms}$$

(*Continued on page 59*)



DEPENDS ON WHAT GOES THROUGH HERE

"SKIMPING" ON THE CARTRIDGE JEOPARDIZES THE SOUND (AND SATISFACTION) OF THE WHOLE SYSTEM The hundreds, even thousands of dollars you put into speakers, pre-amps, amplifiers, turntables and recordings can be virtually nullified by an off-hand selection of the phono cartridge. For even though it is the lowest-cost single component in the typical system, it is charged with the frighteningly complex task of getting the music out of the grooves and translating it into precise electrical impulses . . . without addition, subtraction, or distortion. And without damaging the record grooves. Leading critics and noted audiophiles recognize this and (with due care and study) select a Shure Stereo Dynetic cartridge for their personal systems. It was, from its inception, and is today the finest stereo cartridge your money can buy. And not much money, at that. The $36.50 spent on a Shure M33-5 (if you have a fine tone arm that tracks between ¾ and 1.5 grams) or Shure M33-7 (for tracking pressures from 1.5 to 3 grams) will audibly improve even fine quality stereo systems. Compliance is an astounding 22 x 10^{-6} for the M33-5 (20 x 10^{-6} for the M33-7). Response is transparent and smooth not only at the top and bottom but in the critical middle range (where most music happens—and where most other cartridges garble the sound). No "peaks," no "shattering." Et cetera, et cetera. Better listen to it, and judge for yourself.

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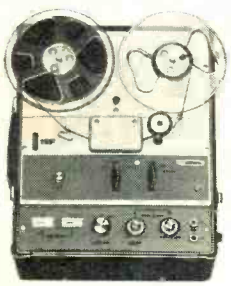
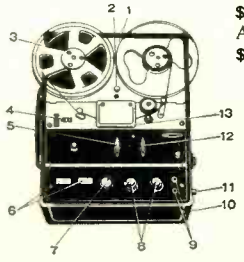


New Heathkit 4-Track Stereo Tape Recorder

Professional performance for outstanding recording and playback of 4-track stereo and mono tapes! Specifications equal units costing up to $800! Amazing response, 40 to 15,000 cps, ±3 db @ 7½ IPS. Easy circuit board assembly. Model AD-22 Mechanism & Electronics; **$179.95**. Model AD-12 Mechanism only for playback applications; **$124.95**. Optional carrying case; **$37.50**. Accessory ceramic microphones; **$9.95**. ea.



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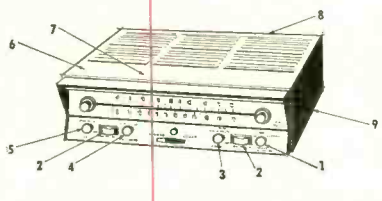
Complete AM, FM and FM Stereo multiplex receiving facilities in a superbly designed, easy to assemble package. Features an automatic stereo indicating light to signal when an FM station shifts to Stereo, adjustable AFC, individual tuning meters for AM & FM, Stereo phase control for best performance, stereo tape recording filters, easy circuit board construction. Model AJ-41 **$119.95**. Assembled AJW-41 **$189.95**.



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Sensational New Heathkit 70-Watt Transistor Stereo Amplifier

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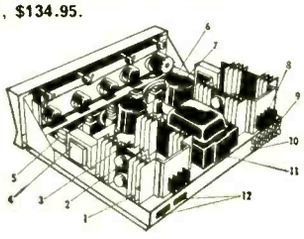

1. Eight power transistors on four heat sinks. **2.** Output circuit breakers. **3.** Two power amplifier circuit boards (four transistors, six diodes). **4.** Two driver transformers. **5.** Two preamplifier circuit boards (six sealed component modules, ten transistors). **6.** Two driver transistors, four filter transistors. **7.** Two 3,000 mfd filter condensers, four diodes. **8.** Output terminals. **9.** Stereo inputs. **10.** Tape recorder outputs. **11.** Power transformer. **12.** AC outlets.

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(Note: To facilitate a prompt reply, please enclose a stamped, self-addressed envelope with your question.)

Microphone Techniques

Q. Can you supply any information on microphone techniques for recording orchestras and voice groups? We have a two-channel tape recorder, mixer, and several excellent microphones, and are interested in developing the correct mixing, and microphone placement techniques.

A. To the best of my knowledge, the professional recording engineer depends more upon cut and try than upon pat formulas, and his selection and placement of microphones varies with the engineer and with the recording site.

Converting to Stereo Record

*Q. I have a **** tape recorder (mono record, stereo playback) which I would like to convert to stereo record. I am aware that it would be a great deal more convenient, and quite possibly less expensive, to just forget this and buy a stereo record model. My idea is this. The preamps and ocsillator are put up as printed circuit units and can be purchased. The machine is equipped with a stereo record-playback head. Could I not add the necessary extra electronics, using the printed circuit units and such extra switches, and so on as would be required to activate the second half of the head and employ it for stereo recording? I have a fair understanding of elementary electronics and have undertaken quite a few construction projects successfully.*

A. You have quite a difficult project ahead of you. First, you have the problem of analyzing the present switching arrangement and converting it so that a recording signal may be fed to the bottom section as well as to the top section of the record-playback head. Second, you have the same problem with respect to feeding bias current to the lower section of the erase head. Third, there is the question whether the oscillator can turn out enough current to do double duty. Fourth, you will have to adjust bias and erase currents to their correct values. Fifth, you will have to add a second record-level indicator and calibrate it properly. Sixth, there is the question whether the present power supply can handle two recording channels at once; more power is employed in recording than in playback because of the oscillator and record-level indicator.

Replacing "Eye" Tube with VU meter

Q. I am enclosing a schematic diagram of the electronic section of my tape recorder. It came with a 6E5 magic eye record-level indicator. I took this out and installed a VU meter. There are 4.5 volts of a.c. signal available at normal recording level, which seem sufficient to drive the meter. Also, there is an isolating stage of amplification between the meter and the recording signal. Have I installed the meter correctly or should there be a separate cathode follower to drive it? Also, how should I connect the meter to read recording bias?

A. A VU meter should be driven by a low-impedance source, whereas in your case you are driving it from a high-impedance one. Therefore you should use a cathode follower to drive the meter. While 4.5 volts is much more than the 1.23 volts required to drive a VU meter (through a 3600-ohm series resistor), your present connection doesn't supply sufficient current to the meter.

To enable you to read recording bias, you can insert a variable resistor between the ground lead of the record head and ground, then connect the input of the cathode follower to the high side of this resistor through a switch. Assuming that bias current is of the proper value, adjust the variable resistor until the meter reads 0 VU. Thereafter, should bias depart from the correct value, the meter would read higher or lower than 0 VU. The value of the variable resistor depends upon the amount of bias current flowing through the record head. Assume that the head is a high-impedance one (usually the case in home machines) drawing 0.8 mA of bias current as the optimum amount. A VU meter requires 1.23 volts to read 0 VU when driven by a low-impedance source through a 3600-ohm resistor, so that by Ohm's Law we calculate that the variable resistor should have a value of 1538 ohms. However, the signal coming out of a cathode follower is only about 9/10 of the input signal. Dividing 1538 by 9/10, the value of the variable resistor becomes 1708 ohms. Therefore a variable resistor with a maximum value of about 2000 to 3000 ohms appears suitable. The resistance of 1708 ohms introduced between the record head and ground should have negligible effect upon bias current and therefore upon performance. The circuit impedances associated with a high-impedance head will probably total about 40,000 or 50,000 ohms, so that 1708 ohms is slight in comparison. However, if you are a purist, you may want to touch-up the value of bias current to allow for the added impedance of 1708 ohms.

A Click-Filtering Tape Recorder

*Q. I have owned a **** tape recorder for more than two years. I am particularly interested in stereo recording of pipe organs and have recorded many recitals using Electro-Voice 664 mikes plus interference filters. Without exception, each time I record pipe organ music I also record clicks that are in tempo with the music, caused by the making and breaking of relays at the organ console. Recently a friend of mine bought a **** tape recorder (another make). I have borrowed it to record two organ recitals and this time there were no recorded clicks, although I used the same microphones, filters, and such. The manufacturer of my own tape recorder has offered no solution in his reply to my letter describing the problem.*

A. Perhaps one or a combination of the following measures may help reduce the clicks, which may be traveling as electrical impulses through the a.c. line or as magnetic impulses through the air: 1. Place a 0.1 μf, 600 v capacitor across the a.c. line going into the tape recorder, or between each side of the line and chassis; 2. place a capacitor across the a.c. line going into the organ console, or between each side of the line and chassis; 3. place a 100-ohm resistor in series between the microphone input jack and the grid of the first stage tube. Place a 10-pf capacitor between this grid and ground.

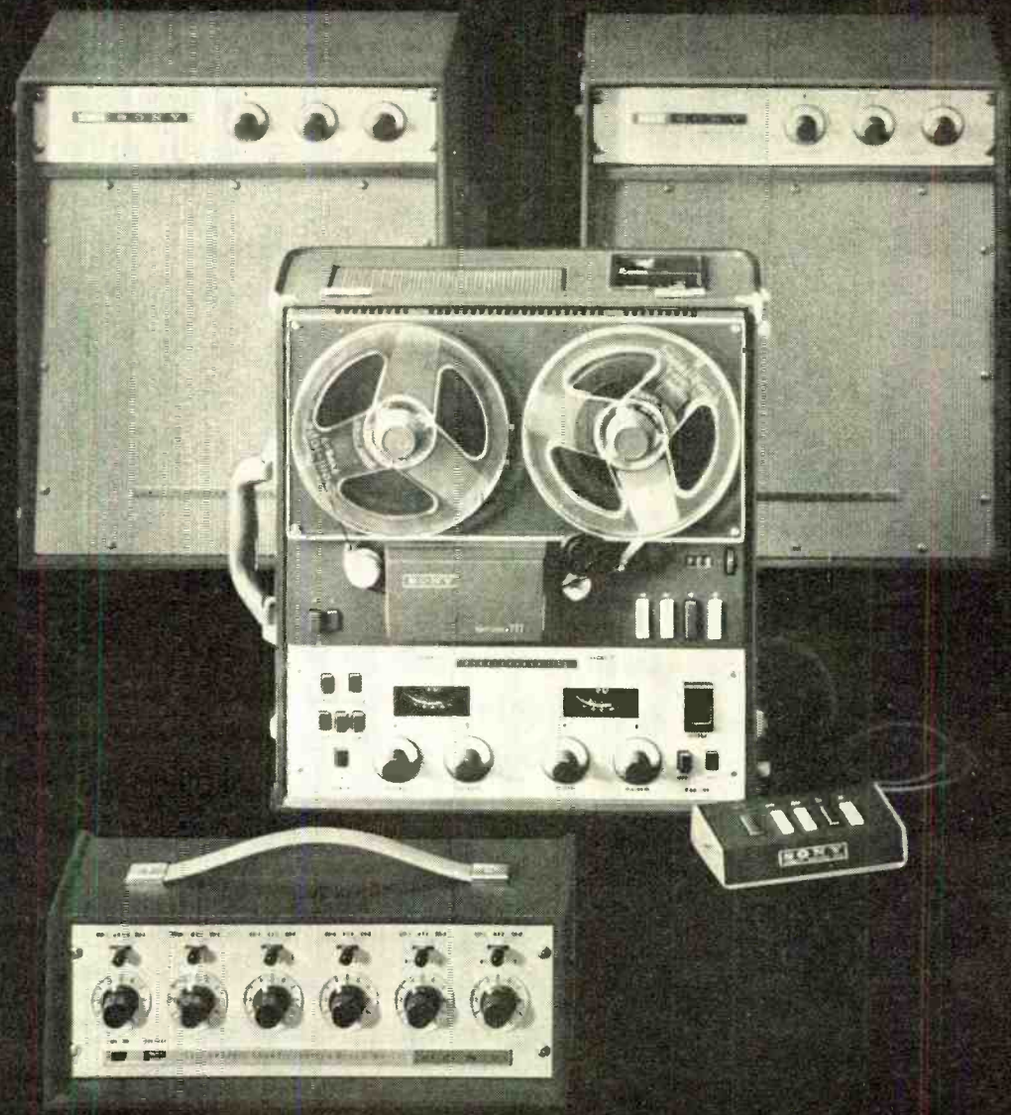
Recording Level Adjustment

*Q. I own a **** tape recorder and would like to ask a few questions about the adjustment procedure: 1. A standard-frequency tape of 250 cps is used to adjust the playback level. The instructions state that I should connect a VTVM to the preamp output and adjust the playback until the VTVM reads plus 4 db, at which time the VU meter should read 0 VU. I would like to know what the plus 4 db refers to. 2. The instructions state that the sensitivity of the VTVM must be increased since the test signals are recorded at minus 10 db. What does minus 10 db refer to? 3. The instructions state that an audio oscillator should be connected to the line input and set for 200 cps with the input level at minus 10 db. What does minus 10 db refer to? 4. How should I adjust the calibration of the VU meters?*

A. 1. It is standard practice to put a 3600-ohm resistor in series with a VU meter, thereby enabling the meter to operate properly. But this produces about 4-db reduction in the signal reaching the meter. Therefore it is necessary to increase the signal 4 db to make up the loss. 0 VU corresponds to 1 milliwatt in a 600-ohm line, which translates into 0.774 volts. A signal 4-db higher translates into 1.23 volts. Accordingly, the "playback-level adjustment" apparently should be turned until you get a reading of 0 VU on the meter and 1.23 volts on a VTVM connected to the output of the tape recorder, as you are playing the test tape. The 250-cps note should be one that is recorded at a level corresponding to 0 VU in playback. 2. The test signals are 10 db below the recording level that produces a reading of 0 VU on the meter when the latter is employed as a record-level indicator (not as an indicator of playback level). 3. Again the reference is to a level 10 db below that which produces a recording indication of 0 VU. 4. I assume that you refer here to adjustment of the VU meter as a record-level indicator. Feed a signal between 250 and 400-cps into the tape recorder. Adjust the recording level until you obtain 3 per cent harmonic distortion in playback, as measured by a harmonic distortion meter. Reduce the input signal about 6 db to allow for the mechanical lag of the meter. Adjust the meter so that it reads 0 VU on the basis of the reduced input signal. Alternately, if the 250-cps signal on the test tape represents maximum recording level (producing 3 per cent harmonic distortion),

(Continued on page 58)

all-transistorized
New Sony Sterecorder 777



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Unquestionably the finest professional value on the market today, the 777 is available in two models, the S-2 (records 2 track stereo) and the S-4 (records 4 track stereo). Both models can reproduce 2 *and* 4 track tapes.* *And,* the Sterecorder 777 models will integrate into any existing component system. **$595** complete with portable case and remote control unit.

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Also available is the MX-777, a six channel all-transistorized stereo/monophonic mixer that contains six matching transformers for balanced microphone inputs and recorder outputs, individual level controls and channel selector switches, Cannon XL type receptacles, a switch to permit bridging of center staging solo mike. ***$175*** *complete with matching carrying case.*

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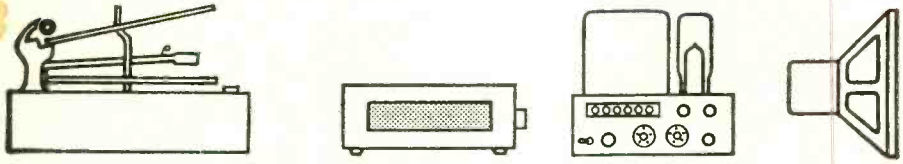

LEAK "STEREO 60" POWER AMPLIFIER

For those few audiofans who are not familiar with the Leak product line, be informed that they have been, and are, used in England in professional applications. That means broadcast studios where durability and performance are more than a hobby. The Stereo 60 definitely continues this tradition.

The Stereo 60 delivers 30-watts per channel (continuous sinewave power), and is designed to operate with the Leak "Point One" stereo preamplifier, or with any stereo preamplifier of your choice. The arrangement for operating with the "Point One" includes a power takeoff socket plus a switching facility which allows on-off control at the preamp. In addition, there are two convenience outlets which are fused.

An additional convenience feature is the use of only one set of speaker terminals for each channel, the impedance being changed by moving a plug on top of the output transformer. Also the power transformer can be set for use with 110-volt, 117-volt, and 124-volt lines also by moving a plug to the appropriate set of holes.

The surprising thing about this amplifier is its unusually attractive appearance when viewed from the underside; here is where the professional touch is revealed. A glance at *Fig.* 1 reveals the rugged terminal board and neat cabling which go into a piece of equipment meant to last for a long period of time. Of course a glance at the sizable transformers and high-quality components tell the same story. For some reason or other the topside is finished in a gold-ish color—perhaps to match the handsome underchassis appearance. It does look rather nice at that.

Fig. 1. Leak Stereo 60 power amplifier showing top and under-chassis views. Note military-board construction.

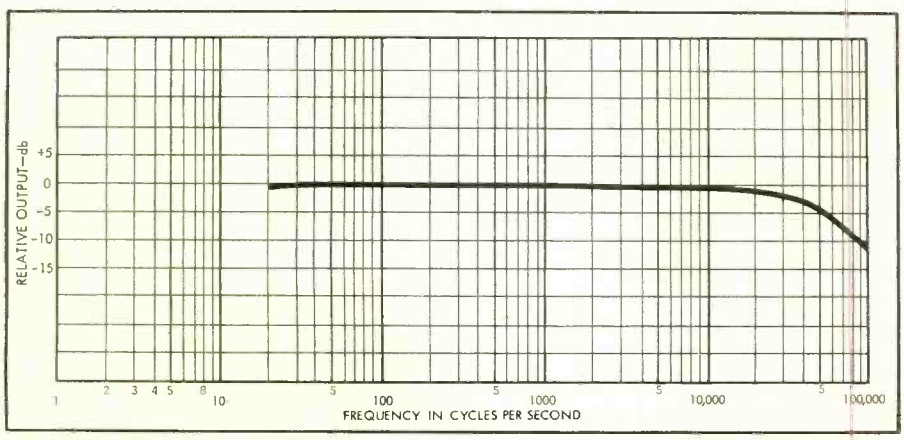

Fig. 2. Frequency response of Leak Stereo 60 at rated power output.

Circuit Description

The circuit of the Stereo 60 is unusually straightforward, each channel consisting of:

1. A triode amplifier stage consisting of half a 12AX7.
2. A cathode-coupled phase splitter utilizing a 12AX7.
3. A push-pull ultra-linear output stage containing a pair of EL34's. Perhaps the strangest part of the circuit is that the tubes in the output stage are completely independent of each other (separate cathode resistors) with no balancing provisions. They claim it is not necessary. On the other hand every other quality amplifier we know of provides a balancing arrangement and we tended to agree with them.
4. A negative feedback loop runs from the 16-ohm tap of the output transformer secondary to the cathode of the input tube.

Clearly this is as conventional a circuit as one could imagine in this age of sophistication, but it is a well-proved conventional circuit. In addition, the components used are of such high quality, and the circuit put together with such care, that the amplifier performs as though the circuit were the most sophisticated.

Performance

It is axiomatic nowadays that the testing of an amplifier used for music reproduction requires two parts: measuring and listening. There are those people who insist that measurements alone can reveal the quality of an amplifier and we tend to agree with them. However we still like to be convinced by listening.

On the measurements scene we should be aware that there are two major schools of amplifier design: The widest-bandwidth-possible school which attempts to make amplifiers with excellent response from d.c. to a megacycle; and the limited low-frequency response school which limits the response below 20 cps. There are several technical arguments for the latter school, but the most dramatic is the effect produced when the rumble of the turntable is amplified—or the resonant frequency of the arm (many modern arms exhibit a resonant frequency below 10 cps).

We present this background to indicate some reason for the low-frequency power response of the Stereo 60 as indicated in *Fig.* 3. Note here that the maximum power obtainable at 20 cps, before clipping, was 20 watts (continuous sine wave). This roll-off is deliberate and not indicative of poor performance. The same figure also shows that the amplifier produces well above the rated output, without clipping, throughout most of the frequency range up to 20,000 cps. Also note the frequency response as shown in *Fig.* 2. Here we see response which is only 12 db down at 100,000 cps with excellent waveform. (As standard practice we monitor waveform.)

Perhaps the most impressive aspect of measured performance is the low distortion exhibited by this amplifier: Harmonic distortion is 0.3 per cent at 30 watts and 0.2 per cent at 1 watt; intermodulation is a maximum of 0.5 per cent at 44 watts. Test with a square wave indicated excellent transient response.

The Stereo 60 showed excellent stability with a 0.2-μf capacitor across the output. Also it delivered just a fraction less power than indicated in *Fig.* 3 with both channels loaded, thus attesting to the sturdiness of the power supply. We did note that one channel required only 1.4 volts to deliver 30 watts at 7000 cps while the other channel required 2.5 volts. On the other hand the less sensitive channel could deliver more power; possibly the feedback loop of

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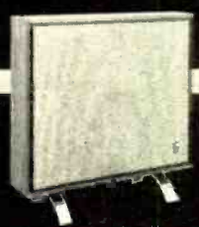

TRIMLINE 54

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JBL produces precision loudspeaker systems which are acknowledged to be the finest in all respects by critics, scientists, musicians, engineers, and composers throughout the world. JBL systems are the reference standard for excellence in studios, laboratories, and the listening rooms of audio connoisseurs. They range in size and complexity from the magnificent JBL Ranger-Paragon to the ultra-compact new Trimline 54. Each is the finest of its kind; one is certain to fit your needs exactly.

The most popular of the more elaborate JBL systems is the highly versatile Apollo. This is a Linear-Efficiency system of moderate dimensions but life-scale reproduction.

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The JBL Ranger-Paragon is an integrated stereo system with two matched, three-way speaker systems. The radial panel distributes true stereo to every position in the listening area.

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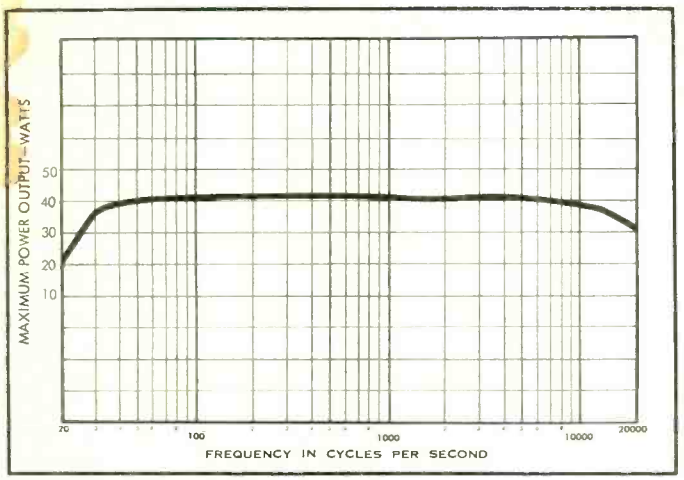


Fig. 3. Maximum power response of Leak Stereo 60 (before clipping).

this channel was not properly set. (One of the output tubes in this channel became defective during the testing and we replaced both tubes.)

Hum and noise was 82 db below rated output at 1000 cps in one channel, and 79 db down in the other. Actually the Leak Stereo 60 is one of the quietest amplifiers we have not heard in some time; with gain at the maximum position, and our ear up against the speaker, we could not hear even the slightest noise.

In listening tests, the Leak Stereo 60 proved that measurements *can* reveal the quality of an amplifier: It reproduces music musically. The sound quality could be characterized as tight and clean; a precise and controlled bottom end and sharp well-defined highs. Musically modern.

The Leak Stereo 60 is an unusually rugged stereo amplifier obviously intended to last and last under the most arduous use. It is of professional quality in construction and performance and merits the attention of those audiofans seeking top quality.

Please note that the 30-watt per channel rating of this amplifier is an extremely conservative rating; it could easily be upgraded to 35 or 40 watts by the standards commonly used in this country. But of course the British are so modest. A-15

NEAT VS-1000D STEREO CARTRIDGE

The Neat VS-1000D is a moving-coil cartridge with an easily replaceable stylus. That statement alone makes it one of the most unusual cartridge entries in a long time. Normally the construction of a moving-coil cartridge prevents the cartridge from being replaced easily; usually they have to go back to the factory. In the case of the VS-1000D one merely lifts the stylus assembly up and out.

The secret of this unusual facility is the unique coil construction which is shown in *Fig.* 5. In this close-up head-on we can see that the coil is attached to the yoke on which the stylus bar rests. Thus, when the stylus bar moves, the yoke moves the coils which are in the field of the magnets.

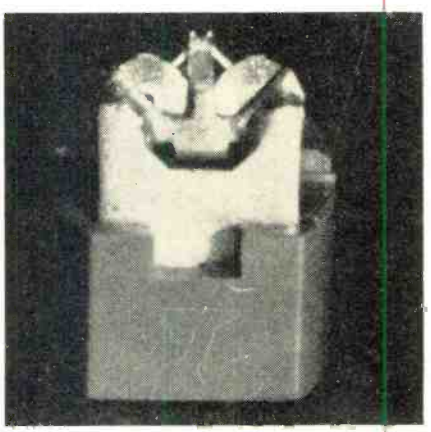


Fig. 5. Front view of Neat VS-1000D with top portion of cartridge removed. Yoke is top center.

One of the problems experienced by moving-coil cartridges has been the difficulty of preventing dust and dirt from entering the space between the magnet and the coils without restricting stylus movement. Commonly, a diaphragm of some elastic material is placed over the entire coil-magnet area and the stylus-tip would be the only moving element peeking through. With this arrangement the diaphragm is in intimate contact with the stylus bar. Unfortunately, it has been very difficult to find a diaphragm material which did not cause strange behavior as it aged (we understand that this problem has been solved, but we have not yet tested the finished product).

The Neat method, however, avoids this problem completely. When the stylus bar assembly is in position, the magnet-coil area is completely sealed off by the plastic case. The only opening is the one for the yoke, which is quite small.

Performance

The Neat VS-1000D has an unusually smooth and flat frequency response, perhaps a characteristic of moving-coil designs because the cartridges which are closest to it in this area are also moving-coil designs. *Figure* 6 shows the frequency response and the crosstalk performance. We especially noted that both channels were some 5-db different throughout most of the range, although this makes little difference in listening.

The one major caution we noted in relation to this cartridge is its strong magnetic field which makes it generally unsuitable for use with a magnetic turntable unless it is very well shielded. We would estimate that a space of over ¼ in. is needed between the cartridge and the table. On the other hand the VS-1000D is not very sensitive to induced hum.

We noted a tendency to pick up lint and dust in sufficient quantity to cause clogging. Naturally, as dutiful and cautious audiofans, we clean records and styli frequently, don't we?

Now that we have dispensed with the small details we will get to the important aspect of the Neat VS-1000D: How does it sound when reproducing music? One of the best.

It is truly hard to describe, but in our opinion this cartridge reproduces music as well as we have ever heard from a record. We did compare it with other excellent units and it compared well. Its handling of transients and ability to track at high velocities also compared well, and probably are significant factors in its excellent performance. (We used the new CBS STR-111 test record for the square-wave test and the Fairchild 101 for the high-velocity tracking test.) We found the Neat able to track well at 1¼ grams, even with records that had heavily cut areas, although the tests were conducted at 3 grams (Neat rated value.) The output was 4.2 mv at 5 cm/sec.

In sum, the Neat VS-1000D is a very fine music reproducer, certainly in the top rank of cartridges we have listened to. It is well worth investigation by any audiofan who is in need of a cartridge. A-16

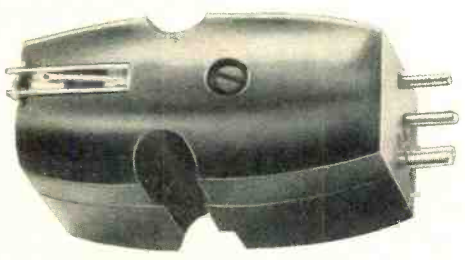


Fig. 4. Neat VS-1000D moving-coil stereo cartridge.

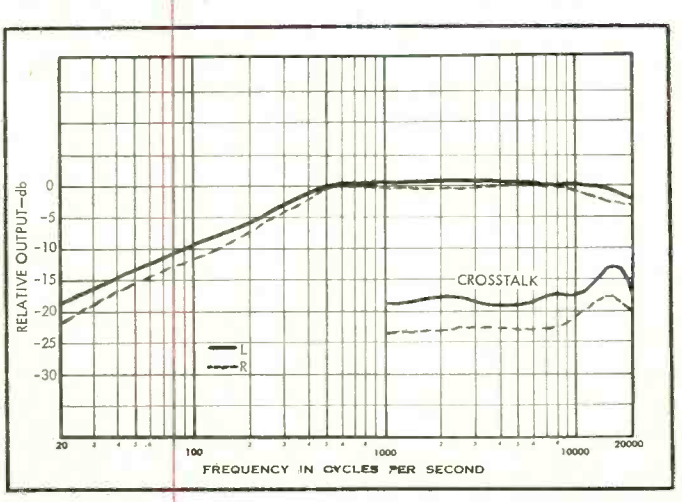
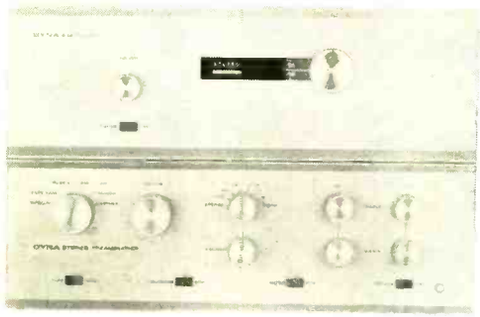


Fig. 6. Frequency response of Neat VS-1000D.

WILL * REPLACE ?



No, Music-Lover—take heart. Live music is here to stay. But when recorded music can be so perfectly played back that *even experts* can't tell the difference from a live performance, this is big news for those who love music, live or otherwise. For three years now, thousands of discriminating listeners have attended concerts of the Fine Arts Quartet, sponsored jointly by the manufacturers of Dynakit amplifiers and AR speakers. Performances were so arranged that the audiences were alternately listening to live and recorded portions, without prior announcement as to which was which. These are typical comments of recognized experts:

> *C. G. 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 E. T. Canby wrote: "My eyes told me one thing, my ears another." Ralph Freas, audio editor of High Fidelity, wrote: "Few could separate the live from the recorded portions."*

When reproduction and reality cannot be separated, the reproducing equipment has achieved the top-most *practical* level of quality. And when that equipment is so moderately priced as Dyna Mark III amplifiers and PAS-2 pre-amplifiers, the obvious conclusion is that you *can* spend more money but you *can't* get higher quality. Anybody can build a Dynakit, including you, Music-Lover. And you can be confident that it will work well with performance indistinguishable from the original source of sound.

All Dynakits are designed with top performance as the primary objective. In any power range, mono or stereo, the established excellence of Dynakits is assured. If Dynakit's superior engineering, high quality parts and functional layout give you such fine performance that you can't *tell* the difference, why *pay* the difference?

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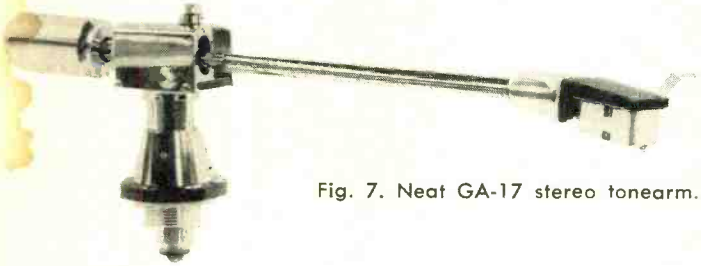


Fig. 7. Neat GA-17 stereo tonearm.

NEAT GA-17 STEREO TONEARM

The Neat GA-17 is a 12-in. tonearm intended for use with stereo cartridges and features plug-in heads and audio cable, static and dynamic balance adjustments, isolation of the arm from the counterweight by means of damping rings, arm tubing stuffed with foamed plastic to reduce arm resonance, and the ability to handle any stereo cartridge with either 3- or 4-wire connections and varying in weight from 10 to 20 grams. In addition, a built-in mechanical contrivance lifts the arm off the record at the end of play. Actually it would be more accurate to say that it springs it off the record since the mechanism uses a spring pushing up beneath the arm just forward of the pivots. To reset the spring, the arm is carried back to the rest position by hand and pushed down. It is then ready to jump up at the end of the next record.

The first thing one notices about this tonearm is its very chromey appearance. We must admit that we are not of the chrome-liking school, but it is very well done so that it looks quite opulent. Also they haven't scrimped on performance in order to provide the chrome. In fact, at second glance one is impressed by amount of fine workmanship that has gone into this product—and ingenuity too. Unquestionably, the Neat people have solved some

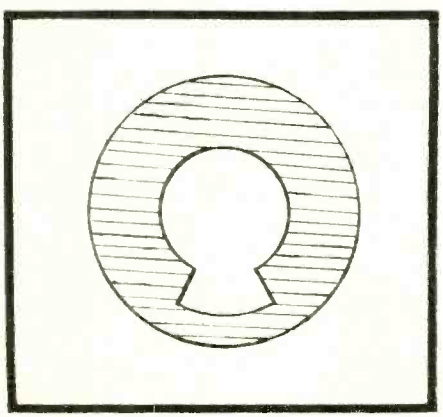


Fig. 8. Cross-section of counterweight.

arm problems in a highly original manner. For example note the cross-section of the counterweight shown in *Fig.* 8; here we see a solution to the dynamic balancing problem which is perhaps the simplest we have seen yet. All they did was broach (it could be drilled) one side of the counterweight enough so that one side is heavier than the other. Now one can rotate the heavier side to balance the arm dynamically without changing the static balance. It eliminates the need for an outrigger. It works too.

Figure 9 shows the configuration of the pivots in a cross-section view. (Please note that the arm is not constructed exactly as shown, but essentially.) Here we can see the excellent mechanical structure as embodied by two rows of ball bearings for the horizontal pivot (10 balls in each race) and the use of sapphires in the vertical pivots. Damping (rubber) pads are placed behind the vertical pivots to isolate the arm from mechanical feedback. Also note the use of foamed plastic inside the arm tube to damp the natural resonance of the arm.

The plug-in head is made of molded plastic with threaded-metal inserts for the cartridge-mounting screws. The contacts at the rear of the head butt against spring-metal fingers to make a very positive electrical connection. The head is locked in position by a very satisfactory scheme which is hard to describe.

The GA-17 installs by drilling a 1 in. hole for the main mount and a ¼-in hole for the arm stand. After the arm is balanced, stylus force is applied by means of a screw on top of the pivot housing. This

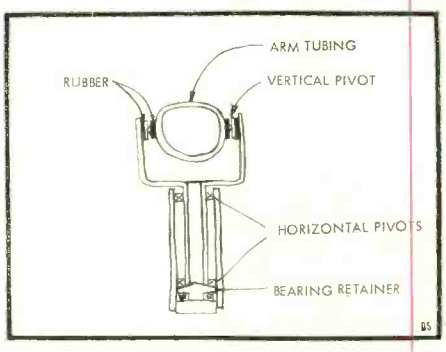


Fig. 9. Cross-section of arm pivots.

screw presses down on a leaf spring which in turn presses down on the arm in the area of the vertical pivots. Connecting the arm to the system is by means of a cable which plugs into a socket beneath the arm and has RCA jacks on the other end. The cable also has a fifth wire for grounding the motor and arm to the amplifier chassis.

There is very little else we can say about this arm except that it does not have a resonance peak above 10 cps—and that it is extremely well constructed. Look for yourself. **A-17**

ACOUSTIC RESEARCH NEEDLE-FORCE GAUGE

In November, in our New Products section, we described a new product from Acoustic Research intended to serve the owner of a quality turntable and arm—a gauge for measuring needle force (that's the term AR uses, we commonly use the term stylus force—they both mean the same thing). Immediately after the report appeared we were questioned as to the accuracy of the gauge; its price and method of operation make it rather attractive.

The AR needle-force gauge is an equal-arm balance, to the best of our recollection it is the only one of its type used for this application; most stylus-force gauges use springs. Of course uniqueness is not in itself significant; we are more interested in whether the gauge is accurate. We can state that this gauge is accurate, well within the limits required of it.

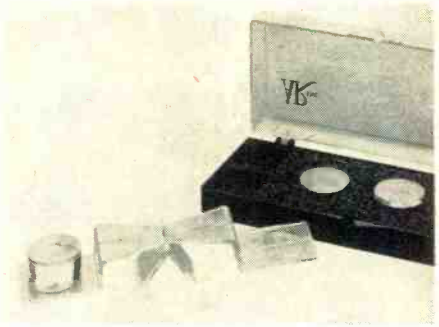


Fig. 10. AR needle force gauge.

Before pursuing that topic further, we will describe what the gauge consists of. The "arm" section of the balance is made of clear plastic and the over-all length is a little over 4-in. Of course the ends of this section are dropped lower than the rest to form "pans" for either the weights or the stylus as shown in *Fig.* 10. In the center of each pan area there is an engraved cross, the center of the cross being the resting place for the stylus tip. On the underside, there is an engraved V-shaped line midway between the centerpoints of the crosses. The sharp-edged inverted-V stand fits into this line. The stand is also made of clear plastic, as are the supplied weights. There are four weights supplied with the balance: 2 grams, 1 gram, ½ gram, and ¼ gram. Obviously, the maximum force this gauge will set is 3¾ grams, and the minimum ¼ gram with the weights supplied. The instructions point out that if one should desire to set forces above 3¾ grams that a penny is a fairly accurate 3-gram weight. We might add that it would be safer to use a newly-minted penny.

In order to obtain accuracy with an equal-arm balance there are three basic conditions which must be met: 1. The arms must be equal within a very close tolerance; 2. the pivot friction must be very low; and 3. the weights must be accurate.

When we measured the length of each arm we found one to be longer than the other by 1/64 in. This adds 0.03 gram when using the 2-gram weight—obviously an insignificant amount.

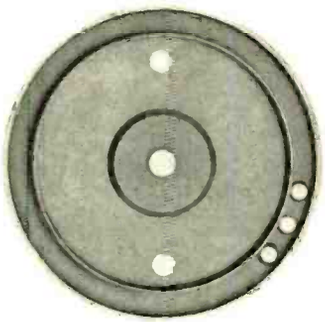
Considering the second condition, we had no way of measuring the amount of friction but we do know that a smooth, hard plastic such as this has a very low coefficient. Also the V-shaped sections of the both the stand and the arms have a very small radius; very close to the knife-edge classification.

The accuracy of the plastic weights was remarkably good; we found the worst one to be within 2 per cent of its stated value (the 2-gram weight was just a shade less than 0.04 grams light). Actually, knowing that one arm was slightly long (0.03-grams worth) and all the weights were on the light side (from 2 per cent down), we were able to get very accurate readings by using the weights on the long arm. But even with the worst situation, the weight on the short side, the over-all accuracy using the 2-gram weight was within 3½ per cent.

Thus, using the best situation, we were able to set stylus force at ¾ gram within 1 per cent as checked by our very much more expensive gauge. We should point out that the weights were checked on a laboratory balance.

In our estimation, the AR needle-force gauge is a simple but accurate device which is more than adequate for the audiofan. And it is certainly inexpensive. Note, however, that it is *not* available at your local dealer—it is only available directly from AR. **A-18**

Aren't these the qualities you look for in a fine record player?



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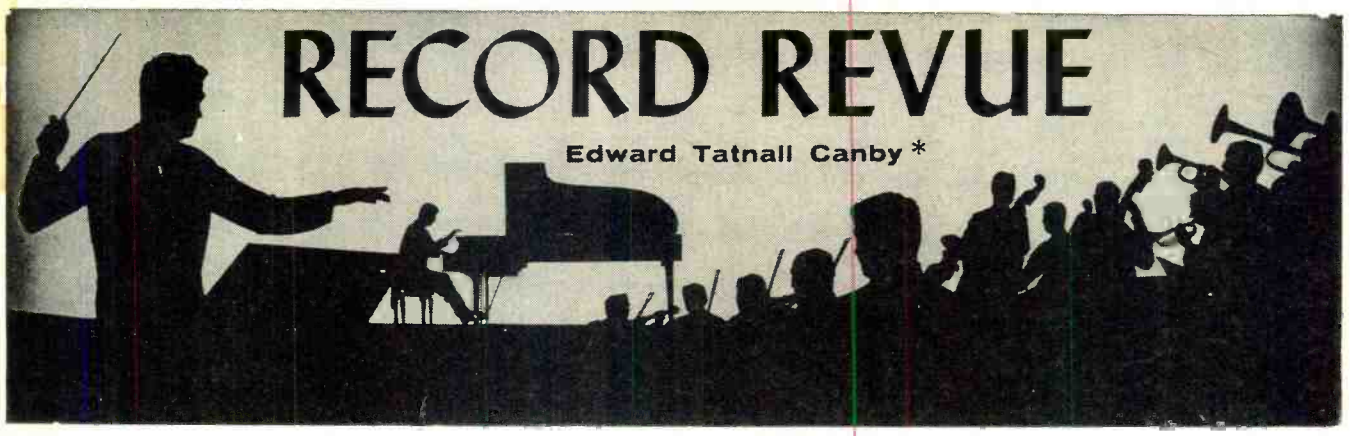


RECORD REVUE

Edward Tatnall Canby*

NATURAL DYNAMICS!

Instruments of the Orchestra. National Symphony Orch., Mitchell. Teaching Guide by Charles W. Walton.

RCA Victor LES 6000 (2) stereo

With one swoop RCA here forges out ahead of every previous recording designed to illustrate the orchestral instruments. This one is superb.

This is a "live" job, for one thing. The illustrations are played directly for the album, not excerpted from already-existing recordings. But that has been done before, notably in the huge Wheeler Beckett series. This recording confines itself to music alone—no recorded commentary. While commentary can be fine, given the right personality and the right information, the material is more compactly presented without comment, which here is confined to a large, fat booklet. Excellent.

But what really makes this job tick is the recording itself. Each of four sides is devoted to an instrumental family—strings, woodwinds, brass, percussion—and each side starts with the high instruments and works downward toward the bass. In each case, the instrument plays alone, usually first an exercise, scale, arpeggio, then some famous passage from a symphonic work. The solo rendition is immediately followed by the same passage in its full orchestral context.

That, too, has been tried before. But what is astonishing here is the marvelous recorded balance, as between the solo instrument by itself and within the orchestra, *and* as between one instrument and another. Perfect. Ideal.

As any recording man knows, relative closeness and loudness as between different musical sounds can make or break a recording—and will surely break it unless the greatest pains are taken in the recording dynamics. For example, a triangle recorded at "standard" recording level and placed next to a kettle drum taken at a similar level will sound like some enormous metal pipe yards long. Castanets, tambourines, xylophones, celesta, harp—all must be balanced one against the other in relative level, if an accurate impression of their musical impact is to be conveyed.

It is this which RCA has so skillfully done here. The triangle, rightly, is a faint, –20db tingle, *not* a loud jangle! Thus when the full orchestra plays with the triangle, the relative balance is correct and natural. So with all the other instruments, each according to its kind. Naturally, the full dynamic spectrum is somewhat compressed, to fit the recorded medium. But the relationships between the musical parts of the orchestra are faithfully, remarkably, kept constant. A stunning job! And in stereo, too.

I recommend the recording immediately to any and all hi-fi or musical listeners, as well as to school teachers.

ARTS OF FUGUES

Bach/Glenn Gould The Art of the Fugue. Organ at All-Saints', Toronto.

Columbia MS 6338 stereo

Genius can do no wrong, I guess. To begin with, the "Art of the Fugue," Bach's last big work, unfinished at his death, wasn't written for organ, or anything else. Just notes on paper, exploring the furthest implications of composing technique applied to an ultra-simple theme. It has been arranged for all sorts of media; it can be played successfully on the organ. But how, and by whom?

Glenn Gould, it says here, was an organist first, before his pianistic fame began. He appeared in Toronto at 14. Well, maybe so. All I can say is that the benevolent eccentricity of genius was never more wonderfully exposed than in this Gould organ recording! I could scarcely believe my ears. I'm willing to bet that many a professional organist will turn green and pink and blue with shock.

What's wrong with it? Well, oddly enough, it isn't easy to say. It is always musical—Gould is without question a musician in the innate sense, wherever he goes and whatever he does. But it is also wholly untraditional—built straight out of Glenn's inner ear with, apparently, not the slightest reference to anybody else's organ playing on earth. So I hear it.

The Bach comes through in impeccable note-perfectness but with such jagged, staccato, thumpingly erratic phrasing as I never expect to hear again. So help me, it sounds like a pianist who had never heard of an organ and didn't know it lacked a sustaining pedal to keep things vibrating, nor the ability to make a loud note when one pushes hard on the key! The Gould performance sounds like the opening of a long series of compressed air valves. That is precisely what it is, of course. But the beauty of the organ—ordinarily—is that it doesn't sound that way.

Nevertheless, after I'd caught my breath, I enjoyed this recording. It is always possible to find interest in the work of a strong mind and a positive personality, no matter how eccentric. It's always possible to find musical value somewhere in a performance by an innately musical person.

Bach, transcr. Samuel Baron: Art of the Fugue; Contrapuncti I-XI. Fine Arts Quartet; N. Y. Woodwind Quintet.

Concert-Disc CS 230 stereo

As I was saying . . . the "Art of the Fugue" was not composed "for" any particular medium, and thus is necessarily heard in transcription. Transcriptions of myriad sorts exist, and here is a new and interesting one, for four strings and five winds, made, obviously, to fit these two groups working in consort. What better impetus?

This is a splendid way to hear the music. (We can assume that the rest of the work will appear on a later record.) Being in a sense timeless and peculiarly abstract, Bach's great work is more than usually adaptable to media that are not of his own day—clarinet, French horn, in this version, for example—where in more specifically oriented Bach they would be highly out of place. (Bach used horns, but not in the manner employed here.) To be sure, certain more fundamental elements of Bach style that stem straight from his compositional technique must he observed, or should he—consistent instrumentation within each piece, without sudden changes of color, for instance. Many an arrangement has violently flouted this principle; not here.

These players' are not particularly Baroque-minded, but they are all solidly musical and masters of their craft, generally applied to later music. There is mildly anachronistic styling here, some of the fugues played more like Mozart or Beethoven than Bach, with expressive shaping and a few rather old fashioned ritards. The only mannerism I really found occasionally annoying is an old Stokowski trick of years back—the sudden loud crescendo at cadence figures (musical paragraphs, so to speak). That's both old-fashioned and too modern, if you can call Stokowski technically "modern" in respect to Bach himself.

Generally speaking, the vital stuff of the music is both transparently clear and full of life in these playings—the increasing complexity and tension, as the work slowly evolves, is made evident in terms of excitement, where many a misguided "pure" performance merely plods along interminably in the name of non-interference. I'll be looking forward to the second half.

A Bach Recital (Capriccio on the Departure of His Beloved Brother; Toccata, Adagio and Fugue in D mi., Four Duets; Adagio in G.) Rosalyn Tureck, piano.

Decca DL 710061 stereo

Bach should be played on the harpsichord or the organ—so say the purists. The superpurists, like myself, say it differently. Given a real musician, a pianist who understands Bach's music in its own terms, who can "translate" the essential meaning into the newer medium—then the piano is just fine.

It is just fine here, as it was under the fingers of Myra Hess and Harold Samuel of an earlier generation. You will not find more musical playing of Bach anywhere, on harpsichord or piano. And in many endearing respects Miss Tureck has done what few pianists bother to do, studied the music in its original context outside of the piano literature. Ornaments, for instance. She plays them invariably correctly. I am sure every harpsichordist of vision will respect each note she plays. And would-be Bach players on the home piano had better try her too.

CHRONICLES AND DOCUMENTS

Chronicle of Music. The Age of Romanticism (Series F: No. 1). Brahms: Serenade No. 1 in D, Op. 11. Symphony of the Air, Stokowsky.

Decca DCM 3205 mono

Chronicle of Music. The Age of Transition from Baroque to Classic (Series D: No. 1.). Concerts Royaux Nos. 3, 4. N. Y. Chamber Soloists.

Decca DCM 3203 mono

Decca lost the Deutsche Grammophon "Archive" series along with the rest of that label last year. (Now issued through MGM.) The newly launched "Chronicle" is patently a replacement, even—as above—to the title format, dividing music history into Ages. ("Research Periods" the "Archive" people call them.) Each Age-group now has one record, as per the first Chronicle release.

The Chronicle, of course, is simply a collecting-together of past releases in the Decca catalogue, plus new recordings as and when available. Many of the first batch have been seen before. How much of a recording

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

project will be involved in the future depends, obviously, upon the success of the opening offering.

Again following the "Archive" system in principle, Decca includes file cards and notes on each record, plus fine-type detailed (unsigned) discussion of the whole period printed on the back of the jacket. An assorted collection of school and college music educators make up the consulting board; the editor is Decca's Ben Deutschman and the records come from something called the Educational Research Division.

It would be silly to underestimate the value of Decca's catalogue, as combed for this historical survey. There is good material in it, as witnessed by these two samples, both worth owning anytime, though neither is exactly a top performance. But I would not expect the Decca project to have the authority and first-hand musicological know-how that goes into the major efforts in the immense "Archive" series. This one is primarily educational in the narrow sense (i.e., tied in with music educators' needs) rather than musicological in the wide sense. It could develop into a worthy American counterpart of "Archive"; but then again, it could fritter away into a mere sales gimmick. Bears watching.

First Performance Lincoln Center. Complete Documentary, Sept. 23, 1962.
Columbia L2S 1008 stereo

Sometimes I wonder why people bother to acquire albums like this for sheer listening. The musical content—yes. But the speeches and the applause are good for one hearing, maybe. That's enough. Perhaps 100 years from now . . . but why think that far ahead.

Nevertheless, the "documentary" has a good deal to offer. A fat booklet, interesting. A fine, windy performance of the opening portion of Mahler's huge double-chorus Eighth Symphony (Mahler made it windy). An excellent playing of a brand new Copland instrumental piece, for this occasion, called "Connotations" and composed in a serial fashion ("twelve-tone"). There's the Gloria from Beethoven's "Missa Solemnis," not very well projected—the chorus entrances are consistently weak—and a dreamy, impressionistic late-Vaughan-Williams work, "Serenade to Music," mainly significant for the 12 famous soloists who sing it simultaneously.

The booklet is full of comment, some of it of the expected dedicatory sort, a good deal of it more interesting than that. Also fine pictures.

Better check to see whether Columbia will issue the musical works separately before you plunge into this album on purely musical grounds.

BEETHOVEN

Beethoven: Complete Violin Sonatas. Aaron Rosand, vl., Eileen Flissler, pf. Vols I, II.
Vox Boxes SVBX 17, 18 (2 each) stereo

Here Vox has picked out a first-rate team, if a youthful and somewhat brash pair of collaborators. Interestingly, it is the piano which leads in buoyancy and enthusiasm—Miss Flissler, hailed by Vox as *the* coming American woman pianist, is precisely that. Her enthusiasm is instantly communicated, her energy is boundless and, best of all, her musicianship is flawless. Aaron Rosand, however, takes only a slightly less forward role, exactly as the music demands, and the workmanship of his playing is clearly attuned to that of the pianist. These sonatas have been well studied. Only a slight tendency to slurred playing in the faster passages mars his superb violin approach.

These two young people bring out first of all the extraordinary musical energy of Beethoven's work, notably in the earlier sonatas, often played in a more "Mozarty" manner than here. Good—the energy is there. You will unavoidably sense a certain youthful impatience, an un-mellowness; but that must await the years—it can come in no other way.

Beethoven: Piano Sonatas "Tempest", "Pastoral," "Les Adieux" (Op. 31, No. 2; Op. 28; Op. 81a). Andor Foldes.
Deutsche Grammophon 136 002 stereo

Piano Recital Andor Foldes
Deutsche Grammophon 138 784 stereo

The Foldes Beethoven series is surely as fine as any on records to date, granting that every artist has his own individuality. Foldes is neither monumental nor grandiose; his Beethoven does not strike you in the noble manner of some of the greats—from Schnabel to Backaus. It is more straightforward—but no less impressive for its power, its superb sharpness of detail and extraordinarily careful calculation of effect. Not a thing escapes the Foldes observation; every trick Beethoven used, every possible shade of harmony of expression, is grasped and neatly set forth, but without ostentation or extra dramatics. There was a time when Foldes seemed to be a "pounder," a hard, driving keyboard man. Now his understanding of this music has mellowed that hardness to perfection. Perhaps he does not rise to romantic heights of ecstasy. But then, he is not that sort of pianist.

If you prefer a standard survey-type recital disc, try the other one listed here. It has Bach-Beethoven, Brahms—three Bs—plus Falla, Debussy, Liszt, and Poulenc. The Beethoven disc is more heartfelt.

Beethoven: Piano Sonatas Op. 101, Op. 78, Op. 109, Op. 49 No 1. Andor Foldes.
Deutsche Grammophon 138 643 stereo

Quick add this one as well. Last summer in Switzerland I heard Andor Foldes play this Opus 101 on an elderly rented upright with one key that didn't work—it was even better then than here, or so it seemed to me as I watched a helicopter hover over the top of a nearby alp, then drop behind it just as the first movement ended. An excellent rule for good pianists: they always sound marvelous on beat-up pianos! This one sounds good on a good piano, too.

Beethoven: The Late Quartets. Op. 127, 130, 131, 133, 135. Budapest Quartet.
Columbia M5S 677 (5) stereo

Again the Budapest records Beethoven—over the years this group has covered the same high ground numerous times, as technological improvements have dictated. Here they record in stereo.

The inevitable question from the *afficionados* is—how do these compare musically

with earlier Budapest? The answer is simple. There is no real change; no sacrifice, no compromise in drive, no diminution of force, no relaxing of the disciplined concepts so beautifully worked out over the many years. But, on the other hand, there are physical weaknesses, notably in the first violin, who has the toughest job. Perhaps just because there *is* no compromise, notably in the rapid tempi, the first violin sometimes has to do a bit of "faking" to come out right. It really is not important—what counts, still, is the superbly sure over-all concept of Beethoven's works. There have never been more profoundly revealing performances in respect to intensity and drama than these.

The tone is subdued and not harsh, the blend of the instruments like one instrument.

Beethoven: The Complete String Quartets. Vol II Op. 59, 133; Vol. III Op. 74, 127, 130, 135. Loewenguth String Quartet.

Vox Boxes SVBX 543, 544 (3 each) stereo

Volume I of this series is played by the Endres Quartet; the French Loewenguth plays these six. Compared to the famed Budapest, this group, also an old and long-established quartet, plays a relatively slow and mild Beethoven, rich in individual expression, accurate in tempo, rather flowery and stringy in tone color, the blending of the four instruments relatively minimal. This is definitely not the high-intensity, ultracompact Beethoven that is the hallmark of the Budapest. It is less imaginative, but no less musical, within its own scope.

I could not help thinking—perhaps this is the way these works sounded on first performance, in Beethoven's time? The Budapest brings us the accumulated insight of more than a century of performance plus the taut, razor-edge modernity that is merely one of the things that Beethoven implies for future generations in his work. The Loewenguths bring out other aspects—more conventional, perhaps, but still a part of music.

HI-WAYS AND BYWAYS

Music for the Harpsichord and Virginal. Stewart Robb.

Folkways FM 3320 mono

For a long while this Mr. Robb kept calling me to find whether I'd received his record, then whether I'd played it. Since I tend to be swamped with everybody's records, I was mildly annoyed. Well—I'm happy to say that the disc is really very excellent. He was right.

Never heard of "it" in the singular before, like a trouser—one normally speaks of the "virginals," plural, always wondering how "they" came to be that way. "They" are a single small-edition harpsichord, table-model (with or without legs), with a single set of plucked strings and a short keyboard. There was much lovely music in Elizabethan times for the instrument, and Mr. Robb manages to make it sound a lot less monotonous than it can sometimes sound, what with the one, single tone color and loudness available for the playing.

On a medium-size harpsichord, Mr. Robb plays a fine long set of later Buxtehude variations on a simple theme. The Italian works by Frescobaldi and several items by Purcell are technically post-virginal but sound out very musically on the little instrument even so.

Note that this is a kind of absolute recording, i.e. with almost no liveness. Play it at the absolute loudness of the instruments themselves.

Des Prez: Missa Patris et Filia. Motets from the 16th and 17th centuries. Harvard Glee Club, Elliot Forbes.

Carillon LP 124 mono

This is no ordinary Harvard Glee Club—such as the groups in which I sang, many years ago. This is the 1961 world tour group, trained up to a pitch of accuracy and ensemble far beyond that which is practicable for the regular stay-at-home singers, who must keep up their classwork and their lives as well. Part of the recording was made in Manila; the rest back home after the tour was over.

The Des Prez Mass is sung, accordingly, with both fervor and remarkable unanimity of ensemble as well as pitch. The boys know the music intimately well; their voices are relatively hand-picked and so is their musical sensitivity. Not a dull moment. Especially since this interpretation is ultra-modern—i.e., it is fast, peppy, almost jazzy in spots, tossing out completely the older tradition that made most such music into a misty, impressionistic, austere visit to an unreal world. No longer!

I question only the rather complete absence of word-phrasing here, the shaping of musical ideas according to the emphasis of syllables, words, sentences, and the resulting free flow of rhythms, not syncopated, that is supposed to be a prime feature of older vocal music. Of course nobody can prove it one way or the other; the new school of thought treats the words instrumentally, ac-CENT-ing the syl-LAB-les wherever they may fall ("Glo-RI-a Pa-TRI . . ."), resulting in a bouncy sort of fast beat and a strong syncopation. That's what happens here, and it is what happens when the New York Pro Musica sings fast music of the same period. Myself, I don't like it that way. The other way brings more rhythmic subtlety as well as a better sense of the text itself. But it's an arguable point.

The Harvard Glee Club, finally, has mastered under its new conductor the art of choral showmanship. The sudden louds and softs, the crescendi, the dramatic continuity, make for hair-raising musical impact, where many a performance of this ancient composer is just plain dull, or worse. Thanks be, at least, that Mr. Forbes brings old Josquin to life in full color. That's a lot accomplished.

The second side contains assorted short pieces as fillers of varying interest. The Manila items are poorly edited—instant cut, minus liveness, at the end of each piece. Makes you notice the otherwise unobtrusive background ambient noise.

Strauss Waltzes. Chicago Symphony, Reiner.

RCA Victor LSC 2500 stereo

If only RCA had *always* let Fritz Reiner do, what he could do best, as Columbia did with Bruno Walter! Here's a case in point—a superb waltz recording, the essence of the best Viennese, even if it is straight out of Chicago. The combination of the taut Reiner discipline with the unbuttoned Reiner pleasure in this music is irresistible.

Four waltzes and a polka from Johann Junior, one waltz from brother Josef. "The Blue Danube" is *not* included.

Ravel: Introduction and Allegro. Debussy: Sonata for Flute, Viola and Harp. Roussel: Serenade.
Ropartz: Prelude, Marine and Chansons. The Melos Ensemble, Ossian Ellis, harp.

L'Oiseau-Lyre SOL 60048 stereo

A lot of title, but don't let is stop you—this is one of the finest discs of its mellifluous kind I've yet to hear. Music for harp and flute, plus assorted strings and a clarinet, all French and all full of flavor—even the relatively unknown Ropartz, a post-César-Franck man writing in the Twenties.

Atmosphere is the word. And this sort of music is not easy to play right. I do not know whether the unidentified Melos Ensemble is French or English (the label operates in both countries) but I can assure you its style is impeccably lovely and the lushly realistic London recording goes with it to perfection. Just buy it and listen.

Ravel: Trio in A Minor
Mozart: Trio in A. Yehudi Menuhin, vl., Louis Kentner, pf., Gaspar Cassado, cello.

Angel S 35630 stereo

These three distinguished players emanate a warm, somewhat old-fashioned sound in their playing of these two very different works, more Romantic in tone than any playing we have heard of this sort for some years. All are impeccable artists, all of them play in the high style of the 1930s—which means, simply, that there is a certain elegance to the effect, a leisureliness, a pre-atomic soulfulness, that will delight those listeners who yearn for the good old days in musical performance. (Well, fairly old days, anyhow.)

Younger people, used to the snappier, drier, more stylized playing of today, may find the going a bit thick here. Worth a try, if only to see how it used to be. AE

JAZZ and all that

CHARLES A. ROBERTSON

STEREO

Ravi Shankar: Improvisations
World-Pacific Stereo 1416

With all the talk about freer rhythms and unusual time signatures in jazz, the question often arises as to how far jazz groups can go and still not lose their audiences. If this meeting between East and West is any indication, the answer must be—pretty far. On the first side Ravi Shankar leads three Indian musicians in joint improvisations with a jazz quartet headed by Bud Shank, who plays flute Indian style. The two pieces picked for this venture are both Shankar originals, including the theme music from the film *Father Panchali,* and *Fire Night,* which was suggested by the enormous brush fires around Los Angeles last fall. On the last title, drummer Louis Hayes, Dennis Budimir, guitar, and bassist Gary Peacock are also heard. While Shankar places limits on the scope and duration of the improvisation, the results are still more varied than most jazz audiences are accustomed to hearing.

If the reverse side continued in the same vein, the Western artists would have good cause to pat each other on the back. Instead, the musicians from the East engage in an authentic evening raga, an infinitely more subtle and complex form. Kanai Dutta, tabla, and Nodu Mullick and Harihar Rao, tampura, accompanied Shankar on a recent United States tour and are expert instrumentalists in their own country. Many listeners will undoubtedly find the preliminary side helpful in reaching a closer understanding of the second. The percussive sounds throughout top most stereo spectaculars, and producer Dick Bock surpasses his own high sonic standards.

Joe Morello: It's About Time
RCA Victor Stereo LSP2486

Too much time went by before the arrival of an album which gives Joe Morello top billing, but the drummer's admirers have increased in number all the while and now comprise a vast waiting audience. His name promises to figure prominently in RCA Victor's new jazz program, according to George Avakian's plans, and intervals between appearances are likely to be brief in the future. This introductory set permits his great technique to be spotlighted against three backdrops, including the only example on record of his ability to drive a large band. A brass ensemble augments the basic sextet on four numbers, and Manny Albam's arrangements deliver all the impact of a big band. Aided by stereo, Phil Woods weaves alto-sax lines in and out of the charging brass to give the effect of a full sax section in motion. Woods also contributes the sextet charts, sharing solos with vibist Gary Burton.

Although every title contains the word time, Morello never uses complex rhythms or unusual time signatures just to experiment. But the lone trio number is adventurous enough to satisfy almost anyone. Superb as Morello is in other contexts, he surpasses himself as a trio improvisor and accompanist. Pianist John Bunch and bassist Gene Cherico each holds up his end of the triangle. The liner bears an appreciative note from Marian McPartland, in whose trio Morello developed sensitivity to a pianist's need, and it serves as a reminder that the one prize example of the two together at the Hickory House is still available on Capitol.

Helen Humes: Swingin' With Humes
Contemporary Stereo S7598

Since returning to recording studios three years ago, Helen Humes has limited herself to annual visits, each time in the company of different groups. This third appearance was recorded last summer, and the supporting hornmen are two of the hard-swinging modernists being developed as leaders at Contemporary. If how well a singer performs in various contexts is any test of ability, then Miss Humes is chalking up a high score. About the only one of the company's regulars still left to try her luck with is Kid Ory, and she may yet get around to showing her marksmanship as a traditionalist in the Good Time Jazz division. Her aim this time is to give new and unusual phrasing to such old favorites as *Solitude, When Day Is Done, Home,* and *The Very Thought Of You.* Surely, rare insight is indicated when she hits upon something fresh and springlike to say about *Pennies From Heaven.*

Joe Gordon, trumpet, and Teddy Edwards, tenor sax, are equally inventive when it comes to refurbishing standards and avoiding the commonplace. Wynton Kelly, who sits in as guest pianist, comes bearing a gift of the novel treatment of *Some Day My Prince Will Come,* currently a feature of his regular job with Miles Davis. The whole rhythm section is of stellar quality, and stereo separation becomes a great boon to proper appreciation of guitarist Al Viola, Leroy Vinnegar, bass, and drummer Frank Butler.

Earl Hines: A Monday Date
Riverside Stereo RLP9398

The Earl Hines album in the "Living Legends" series is representative of the sextet the pianist leads at home base in San Francisco and takes out on the road. By lucky chance, the band was booked into a Chicago club at the same time Riverside got around to recording the musicians who made early jazz history in the city. Hines plucks his pianistic pearls from a mixed bag and still casts them about with a lavish hand. Some tunes are more productive than others, and they range from *Yes Sir, That's My Baby,* a gaudy bangle retrieved from a flapper's wardrobe, to a rare and lustrous *Lonesome Road,* As every jazz follower should know, the album title refers to one of the six numbers Hines played at his first solo recording date. Its brilliance sent every other pianist back to the woodshed, and the resulting impact continues to be felt in many quarters today. How many times Hines has polished it during a period of more than thirty years would be impossible to say, but the changes wrought are considerable. Only slight hints of the original "trumpet-style" remain, and Monday now begins the week in a relaxed and mellow mood.

Veteran clarinetist Darnell Howard matches up a string of perfect phrases on *Clarinet Marmalade,* and Jimmy Archey's trombone urges the prompt return of *Bill Bailey.* Eddie Smith's trumpet passages recall the first meetings between Hines and Louis Armstrong, especially on *West End Blues.* But the prize of the collection is a superb *Just A Closer Walk With Thee,* mounted reverently on a bowed-bass background supplied by Pops Foster. Turning up a facet of his craft not disclosed before, Hines displays a different brand of sound than the hybrid varieties heard so often today. With the Chicago era wrapped up so neatly, Riverside should let Hines loose on a program of spirituals and folk themes.

Edmundo Ros: Dance Again
London Stereo SP44015

Bongos jumping from channel to channel are nothing new in stereo, but never did they leap so gracefully as in this colorful Latin dance set. With all the resources of London's phase 4 plus LM 20 CR to command, Edmundo Ros still manages to hold onto restraint and good taste instead of falling into the tempting trap of meaningless sensation. In fact, bongos play a very small part in the overall musical scheme thought up by the arrangers, who evidently decided to let the rhythm take care of itself and concentrated on placing the brilliant hues of the orchestra in motion. Because Ros employs a larger and more varied instrumentation than the usual Latin group, the choice of contrasting shades is virtually unlimited. Included are outstanding examples of the merengue, mambo, conga, rumba, tango and samba, but the pleasantest surprise is the chance to dance the cha cha to *Cocktails For Two,* and *When The Moon Comes Over The Mountain.* Ros puts his best foot forward in a friendly salute to Perez Prado on *Cherry Pink And Apple Blossom White,* and *Tea For Two.* Or it might be that he really intends to trip up one of his closest rivals.

The Staple Singers: Hammer and Nails
Riverside Stereo RLP93501

Many students of gospel music regard The Staple Singers as one of the outstanding groups in the country, both for creative drive and great respect for tradition. While acquiring each of the quartet's recorded appearances on release, they have waited impatiently for one that would do justice to the soloists and stunning ensemble sound. Hopes were undoubtedly raised at the prospects of a sensitive and discerning recording with the group's transfer to Riverside, but something went wrong in the studio. Ensemble passages are treated to enough reverberation to take care of a chorus of twenty, while the dead atmosphere of a vocalist's booth surrounds the soloists. The electronic guitar of Roebuck Staples, father of the family group, seems to be channeled directly to the console. At least, it bears little relationship to what the other members of the family are attempting to accomplish. And adding insult to injury are a wholly unnecessary bass player and drummer. The music itself is exceptional, especially the title song, but admirers of The Staple Singers must still wait to hear them properly.

MONO

Ray Noble: 24 Distinguished Dance Arrangements **Capitol TBO10312**

Rudy Vallee: The Young Rudy Vallee **RCA Victor LPM2507**

Dance bands in the early Thirties were either sweet or hot, and the word jazz was applied indiscriminately to one and all. Youthful saxophonists were torn between trying to emulate Rudy Weidhoft or Coleman Hawkins, who sat enthroned at opposite stylistic extremes. Quite a few leaders and arrangers plotted to bring the best elements of both together in the same band, and among the first to achieve a successful mating was an astute Englishman named Ray Noble. Records bearing his signature or the imprint of the New Mayfair Orchestra created a slight sensation when imported to this country on the HMV label. The demand grew until Victor started turning out domestic pressings, then Noble himself arrived to organize another band and become entrapped in a radio variety show. The élan of the London recordings was never quite recaptured, even though Noble brought along vocalist Al Bowlly, continued to compose hit songs and went on to lend class to Hollywood.

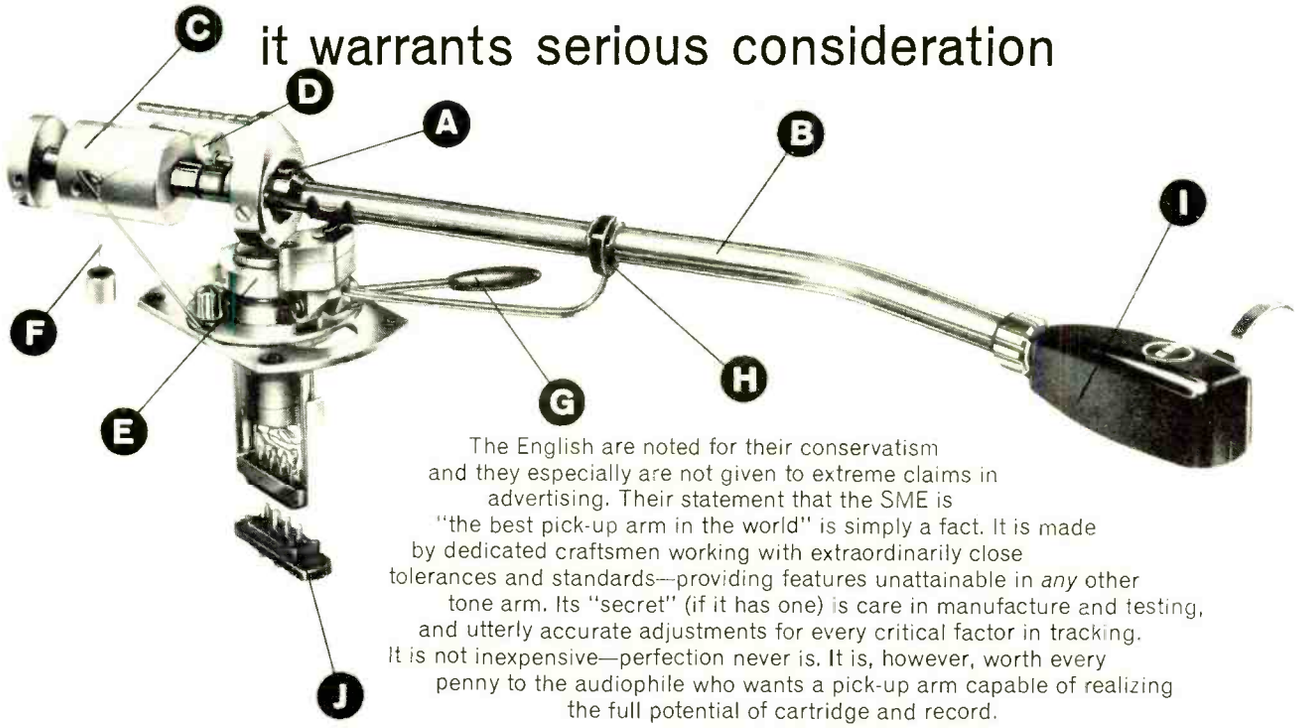
One of the reasons why the original band made such an impression was the sumptuous

* *732 The Parkway, Mamaroneck, N. Y.*

when the British say

"the best pick-up arm in the world"

it warrants serious consideration



The English are noted for their conservatism and they especially are not given to extreme claims in advertising. Their statement that the SME is "the best pick-up arm in the world" is simply a fact. It is made by dedicated craftsmen working with extraordinarily close tolerances and standards—providing features unattainable in *any* other tone arm. Its "secret" (if it has one) is care in manufacture and testing, and utterly accurate adjustments for every critical factor in tracking. It is not inexpensive—perfection never is. It is, however, worth every penny to the audiophile who wants a pick-up arm capable of realizing the full potential of cartridge and record.

SHURE SME DESIGN FEATURES

A. Virtually frictionless knife-edge bearings. Pivot friction is less than 20 milligrams, horizontal and vertical!

B. Wood-lined stainless steel tube arm. Resonances are outside recorded range, of small amplitude, and damped.

C. Unique weight system statically balances arm longitudinally AND laterally.

D. Rider weight adjusts tracking force from ¼ to 5 grams, adjustable for ¼ or ½ gm. increments, as accurate as a fine stylus pressure gauge.

E. Sliding base offers alignment adjustment through 1 inch. Height is adjustable through ¾ inch. Fulfills optimum requirements of length, offset, overhang when adjusted with alignment protractor included.

F. "Anti-skating" bias adjuster counteracts tendency of the arm to move toward record center and "favor" inner groove.

G. Hydraulic lever-operated set-down for "slow-motion" feather-light lowering onto any part of the recording.

H. Nylon-jaw arm rest with stainless steel locking link.

I. International standard 4-pin socket. Cartridge shells fitted with detachable pillars and mounting screws at standard ½ inch spacing.

J. Output socket and plug provides a rigid junction for the "stiff wiring" and delicate pick-up lead, eliminating influence on free tone-arm movement.

PRICES:

Includes one shell, arm, template, alignment protractor, hardware

MODEL 3009 for 12" recordings	$89.50 net
MODEL 3012 for 16" recordings	$99.50 net
ADDITIONAL SHELL Model A30H	$5.50 each

the perfect companion cartridge

The Shure M33-5, of course. With the SME, provides absolute minimum tracking force . . . *without distortion.* Incredibly transparent sound. Peak-free high end, clean lows, astoundingly natural and clear in the middle range where most other cartridges suffer serious deficiencies. 22 x 10^{-6} cm per dyne compliance. $36.50 net.

SHURE SME series 2 pick-up arm

LITERATURE: SHURE BROTHERS, INC., 222 HARTREY AVE., EVANSTON, ILLINOIS

sound. A newly appointed musical director for E.M.I. at the time, Noble learned to take full advantage of the big Abbey Road studio and supervise sessions from the control room. Besides writing full-bodied ensembles, he made certain of bright, clean solos and the widest range of dynamics possible. As recording was the group's primary purpose, the personnel consisted of top studio men and included such versatile performers at Nat Gonella, Stanley Black, Monia Lister, Lew Davis, Eric Siday and Freddy Gardner. While their solos seem commonplace now, the way in which Noble contrasted one against the other was something out of the ordinary. And even today the dulcet tone of oboist Leon Gossens and the fiery phrases of American clarinetist Danny Polo would be an eventful combination. Al Bowlly sings on all twenty-four titles but *Mad About The Boy,* probably skipping the Noel Coward tune because changing the lyrics to feminine gender was still not considered cricket.

As only the earliest portion of Noble's songwriting career is covered, RCA Victor might well follow with a sequel, but enough memories should be stirred for now by *The Very Thought Of You, Love Locked Out, By The Fireside,* and *I'll Do My Best To Make You Happy.* Bill Borden produced the double-LP set, and a slight surface noise indicates nothing was taken off the top of the original pressings. According to Borden's ample notes, Noble is living contentedly in retirement on the British Channel Island of Jersey.

Rudy Vallee's present occupation is known to every theatergoer, and the rush of business prompted the reissue of his early triumphs. While success never bothered the youthful singer much, it proved to be the ruination of his Connecticut Yankees. The lively little crew at the Heigh-Ho Club was full of personality and gives a good account of itself on 1929 versions of the old radio theme, and *Deep Night.* No vocalist could ask for a more sparkling accompaniment than Cliff Burwell's piano. Vallee, who studied under Wiedhoft, became more interested in show business than playing saxophone after a few years of good fortune. The band grew in size and acquired polish by the time the last of these dozen sides were recorded in 1942, but it sounds like a pretty faceless group of remakes of *My Time Is Your Time,* and *I'm Just A Vagabond Lover.* The young and sprightly original versions of both tunes are preferable, and the album would be better if it had kept to the letter of the title.

Calypso Dancing Belly To Belly
Cook 930

About the only reason for this album title is to convey the idea that a man and woman dancing European style with their arms about each other seems positively indecent in some areas of the West Indian bush country. Only in Port-of-Spain and other sophisticated centers are such liberties permitted, and the blend with wild rural improvisations has created what is known as calypso dancing. From tapes recorded in Trinidad and British Guiana, Emory Cook presents a representative sampling of five calypso groups, ranging from the small Vin Cardinal Combo to massive bands headed by Tom Charles and Fitz Vaughn Bryan. The most popular and versatile is the new Clarence Curvan orchestra, which unfortunately bases too much of its appeal on fashions imported from the States. However, one aspect of calypso dancing now gaining popularity among party goers in northern climes is something called the limbo. An exercise for the spinal column and other parts of the anatomy, the limbo consists of facing a suspended horizontal bar, preferably bamboo, and passing under it in rhythm at successively lower levels. A variety of tempos are available here, and beginners should need no warning to start with the slowest.

Donald Lambert: Giant Stride
Solo Art BJ18001

One of the few remaining graduates of the Harlem school of stride piano and a living

legend of jazz, Donald Lambert passed away on May 8th, a few short months after recording his first LP. The last twenty of his 58 years were spent playing at Frank Wallace's High Tavern in Orange, New Jersey, a neighborhood bar of the homey type preferred by the pianist over cocktail lounges and glossy night clubs. Word of his prowess and where it might be witnessed was circulated by Rudi Blesh, who has just revived the Solo Art label to present Lambert and other overlooked piano soloists. Fanciers of happy, tuneful, two-fisted piano work made pilgrimages to the Tavern, but Lambert's only departure from home base was to appear with Eubie Blake and Willie "The Lion" Smith in 1960 at the Newport Festival. The fine reception accorded the veterans resulted in 20th Century-Fox signing Lambert to a one year contract. He failed to see the inside of a studio until the period was up though, at which time Blesh negotiated a series of sessions held early this year.

Enough material to fill three LPs was recorded, but the first installment indicates only a slight dent has been made in the pianist's immense repertoire. Lambert knew the new tunes as well as the old, hits from Broadway shows, and forgotten melodies from early talkies. Everything was grist for his mill, and the tritest songs came out transformed into something never dreamed possible by the writers of *Swingin' Down The Lane, Spain,* and *My Sweetie Went Away.* Lambert's growth went beyond the stride style of playing, and in any of fourteen numbers he may resemble a figure out of the '20s at one moment and sound like Erroll Garner or Oscar Peterson the next. In many respects, he could be called Garner's spiritual progenitor, and not simply for his playing of *Misty.* Both men's work spans a broad expanse of jazz piano, combining barrelhouse, joyous swing and balladic tenderness.

The original Solo Art label came into being the same year as Blue Note, at a time when Commodore was the only other jazz independent. As this writer was in the studio while Dan Qualey supervised the first sessions, his feelings at the label's return can only be pleasurably affected. Blesh intends to release unissued material prepared for his Circle label, and future plans also include LPs from Ralph Sutton and Eubie Blake. Anyone who has trouble locating copies can always reach the proprietor at 38 East 4th Street, New York City. Acting on Peter Bartok's advice, Blesh arranged to take Lambert to the studios of David Trimble, an engineer known for his ability to record classical pianists. Only a monophonic version is available, but no artist could ask for a more sensitive handling of a last testament.

Mose Allison: Ramblin' With Mose
Prestige 7215

Ever since the delightful "Back Country Suite" marked Mose Allison's recording debut as writer of piano sketches, his followers have faithfully awaited the arrival of an LP entirely devoted to similar works. So far, each succeeding album contains a helping of standards along with three or four of the pianist's compositions, and the latest is no exception. Even the most patient must be ready by now to take matters in hand to obtain a program of unencumbered Allison. The only solution seems to be the tape recorder, and some of the impatient have undoubtedly extracted all the original titles from the eight LPs issued to date. Deciding how to fit the individual pieces together in orderly fashion should be a pleasant diversion. It might be helpful if Prestige provided the composer's own chronological listing on some future liner note, or went so far as to prepare a special bulletin. Of course, it would spoil all the fun of making up a tape by hit or miss for some, but others will stick by their own choice in any event.

The proportion of originals to standards is about average on the present set. Five numbers stem from country blues and Allison's Mississippi boyhood. Also well worth including in any taped program is the vocal on Joe Liggins' *I Got A Right To Cry.* But dedicated fans will already have a special tape of Allison's singing in preparation. Bassist Addison Farmer and drummer Ronnie Free complete the trio.

THIS MONTH'S COVER

This month's installation is in the home of Dr. Ralph Yochim, 725 Leamington, Wilmette, Illinois.

In this installation, in order to place the speakers opposite the listening area, it was necessary to locate them on either side of the area between dining and living rooms. However, a Steinway piano, which had to be placed on a particular wall (it being the only inside wall in the living room), posed a difficult problem of decor to overcome.

Fig. 1. Room arrangement in Dr. Yochim's home. Note speaker placement.

It was decided to construct a cabinet for the Acoustic Research AR-3, which would take the appearance of a music cabinet. This enclosure was constructed of "Avoirdure" mahogany to match the piano. The other speaker was housed in the equipment cabinet where the AR-3 was floated on foam rubber isolation pads to eliminate feedback to the turntable. An oven lift top was provided for the McIntosh tuner and preamp and for the Thorens turntable. The cabinet was constructed of matching grained walnut and the side-opening speaker used invisible catches. A modern-weave cane served as the speaker grill on both cabinets.

Components included a McIntosh MR-55A FM-AM tuner, a McIntosh C-20 preamp, two McIntosh MC-60 60-watt amps, a Thorens TD-124 turntable, a Rek-O-Kut S-120 arm with a Shure M3D cartridge, and two Acoustic Research AR-3 speaker systems.

The system and installation was designed by Allied Radio.

TAPE GUIDE

(*from page 40*)

do the following: record a 250-cps signal so that the VU meter reads 0 *in playback*; reduce the input signal 6 db (to allow for the mechanical lag of the meter); calibrate the meter, when used as a record-level indicator, so that it reads 0 VU on this reduced input signal. If the 250-cps signal on the test tape represents a 1 per cent distortion level, do *not* reduce the input signal when calibrating the meter as a record-level level indicator.

Wow and Flutter

*Q. My **** tape recorder produces noticeable wow and flutter at 3.75 ips. Also, there is slippage between the motor drive and pickup reel on fast forward. The idler wheels and all involved surfaces have been cleaned with carbon tetrachloride, but no improvement has occurred. Also, the machine is adequately oiled. Please suggest a correction, particularly for the wow and flutter. I find that I can correct the slippage in fast forward by increasing the spring tension.*

A. The wow and flutter may be due to any or a combination of several factors, including spring tension adjustments, binding of a shaft, a slipping pulley, film of oil on an idler wheel, and so on. Wow and flutter are apt to be more pronounced at slower speeds because of the lesser inertia of the parts in motion, which is the reason why you may think you have this difficulty at 3.75 ips but not at higher speeds.

I believe that your tape recorder has separate idler wheels for the 3.75 and 7.5-ips speeds. Is it possible that you have cleaned one adequately and not the other? Carbon tet is not apt to be the most effective cleaning agent for rubber idler wheels. Commercial preparations, such as those sold for cleaning tape heads, generally contain Xylene. On occasion, I have used vinegar with success; however, I want to be cautious in suggesting its use because it is an acid, and, unless used sparingly, may cause damage. If another cleaning of the idler wheels as well as shafts, pulleys, and so on, does not produce results, your problem is properly within the province of the service technician. Consult your dealer or manufacturer for the name of an authorized service agency. AE

TRANSISTORIZED PREAMP

(*from page 36*)

or $R_4 \approx 22{,}000$ ohms.

The emitter voltage $-V_E = -V_C + V_{CE} = 7.5 - 4.5 = 3.0$ v. With $-I_B = \frac{-I_C}{\beta} = \frac{0.5}{65} \approx 0.0077$ mA and $I_E = -I_C - I_B \approx 0.5077$ mA we get $R_3 = \frac{-V_E}{I_E} = \frac{3.0}{0.5077} \approx 5900$ ohms. The base-to-emitter voltage being $-V_{BE} \approx 0.1$ v, the base voltage is $-V_B = -V_E - V_{BE} \approx 3.1$ v.

Constant current bias is applied to the base electrode via the feedback resistor R_1 from the emitter of stage two.

$$R_1 = \frac{-V_{E2} + V_{B1}}{-I_{B1}} = \frac{7.4 - 3.1}{0.0077} = 560{,}000 \text{ ohms.}$$

The collector dissipation of stage one is $P_C = I_C V_{CE} = 0.5 \times 4.5 = 2.25$ mw, and the power consumption $P_{DC} = (-I_{C1} - I_{B11})(-V_{CC1}) = 0.515 \times 19$ $P_{DC} = 9.8$ mw.

Fortunately, nearly all calculated resistance values come out near standard EIA values. The small differences remaining are of no consequence since they are covered by the tolerance range of the resistors.

TO BE CONTINUED

TRANSISTOR AMP

(*from page 24*)

indicating whether it is in the right or left channel. There is a separate a.c. fuse for the power supply.

Safety Provisions

Much has been made of the ease with which transistors can be destroyed. It is true that a misused transistor will blow in a fraction of a second, while the same abuse to a vacuum tube will merely shorten its life, not instantaneously destroy it. On the other hand, a vacuum tube degrades in performance gradually from the first instant of use. The transistor, if operated within its limits, will perform at its initial level indefinitely. Even in conservative design, the life of a tube is limited to a few years if quality is important. The same conservative operation is applied to a transistor amplifier provides extremely long life.

In the Acoustech I, steps have been taken to ensure that operating abuses will do nothing worse than blow an easily replaceable fuse. For example, a short circuit across the output of most transistor amplifiers will immediately destroy the output transistors. If the output of the Acoustech I is shortened, the amplifier will either continue to drive across the short, or, at worst, the B+ fuse in that channel will blow. To minimize the chance of shorting the amplifier outputs, the old fashioned speaker terminals have been eliminated. Instead, rugged phone jacks are used. A pair of cables consisting of 15 feet of wire terminating at one end with a phone plug and the other with color coded spade lugs are supplied with each unit. To connect the speakers one simply plugs into the output jacks of the amplifier.

Figure 5 gives a clear picture of the pains taken to provide structural features equal in quality to the electrical performance. Note particularly the girder construction, heavy aluminum chassis, Mil-spec glass-epoxy circuit boards, and the large, sturdy heat sinks. The massive power transformer is so located that the unit can be lifted with just two fingers—one under the center of each girder rod. This ideal center of gravity eliminates one of the most common causes of shipping damage. A black, perforated cage is provided that covers the entire chassis.

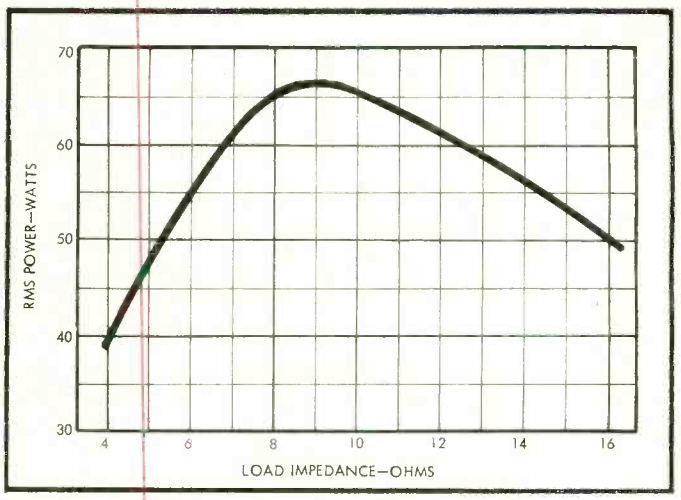


Fig. 7. Curve showing clipping point of the output stage as a function of power related to the load impedance, with both channels operating.

The Sound

Discriminating music listeners and audio experts listening to the Acoustech I under a variety of conditions and with a range of speakers were struck by the considerable improvement in sound over anything with which they were familiar. One interesting phenomenon noted in all the demonstrations was the ability to play the system louder than possible with vacuum-tube amplifiers and still have clean sound. Women in particular liked the sound of the unit—even when played loudly, suggesting that perhaps women are more sensitive to transient distortion and appreciate the clean sound of this amplifier. The Acoustech I is rated at 40 watts per channel, from 8 to 16 ohms. *Figure* 7 shows that the clipping points are 67 watts at 10 ohms, 65 watts at 8 ohms, and 50 watts at 16 ohms. Its effective power seems much greater than even these figures indicate. This will require further investigation.

One point is clear. Solid-state power amplifiers with silicon output transistors are capable of setting new standards in reproducing music.

NOTE TO THE HOME EXPERIMENTER

Many readers of AUDIO are capable of taking a published circuit and building a unit from it. In the case of the Acoustech I, there may be many difficulties and a stiff cost. Several of the silicon transistors used in the circuit are designed specially for Acoustech by Transitron Electronic Corporation of Wakefield, Massachusetts. The nearest commercial equivalent to the ST7175 costs well over $20 each, and the nearest commercial equivalents to the ST1613 and ST4361 cost over $10 each. The Texas Instrument germanium 2N1046 drivers cost $10. (All prices quoted are for small-quantity lots.)

MULTIPLEX CIRCUIT ALIGNMENT

(*from page 32*)

these adjustments, reduce the 19-kc signal gradually. This ensures that the circuits are so accurately tuned that they will remain synchronized even with low inputs. This may sound like a haphazard procedure, but it works. We have tried it on several multiplex tuners—some with the various circuits identified (as they all should be), some with none marked, and one without even a schematic. When the 38-kc output is at a maximum, the final steps take the form of "touching up" operations—rather like a vernier adjustment on those previously made.

For the final steps, feed a 1000-cps signal into the left input of the generator and a 60-cps signal into the right input. Adjust the signal levels so that they are approximately equal (an input of 5 volts on each channel will make this possible). With the pilot signal ON, feed the composite output to the input of the multiplex circuit. Connect the 'scope to

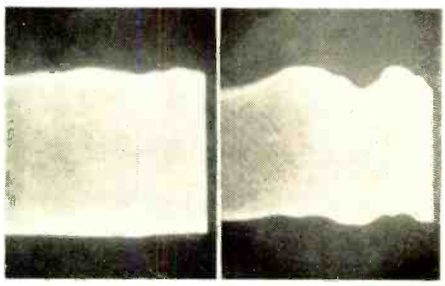


Fig. 7. Patterns obtained with modulations of 1000 and 60 cps on the respective channels, and 'scope connected to output of 1000-cps channel. (A), left, shows optimum adjustment of 19- and 38-kc circuits; (B), right, shows 60-cps modulation on 1000-cps pattern with incorrect adjustment.

the left-channel output and adjust the horizontal sweep for 60 cps, synchronized to the line frequency. The pattern should resemble that of (A) in *Fig.* 7. Then readjust the 19- and 38-kc circuits very slightly to make the top and bottom edges of the pattern as straight as possible—misadjustment will cause notches to appear on these edges as in (B) of *Fig.* 7. If there is a separation control on the multiplex unit, trim it also for minimum notching.

Then connect the 'scope to the right-channel output. The pattern should resemble that of (A) in *Fig.* 8 Readjust the circuits again, very carefully and minutely, to determine if there is any improvement over the adjustments previously performed with the left-channel adjustments. Misadjustment with the right-channel display will widen the trace appreciably so that the pattern resembles that of (B) in *Fig.* 8. The correct adjustment of the 19- and 38-kc circuits and the separation control will give a minimum of 1000 cps on the right channel, and a minimum of 60-cps notching on the left channel.

It is advisable to recheck the entire final adjustment procedure with the input signal reduced as much as possible. At a certain minimum signal input to the multiplex unit, the output patterns will no longer resemble their original form but will become a mixture of both —looking rather like the pattern from an audio amplifier which is oscillating on part of each cycle of the input signal.

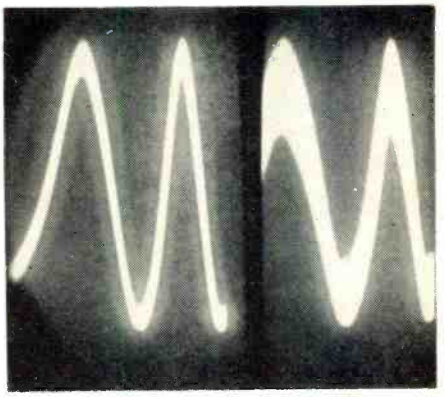


Fig. 8. Same as Fig. 7, except 'scope connected to output of 60-cps channel. (A), left, shows correct adjustment, with minimum of 1000-cps signal on the 60-cps pattern: (B), right, shows incorrect adjustment, with large amount of 1000 cps showing up as a wide band on the 60-cps pattern.

Conclusion

While these instructions may not be strictly in accordance with those issued by the manufacturers of tuners or adapters, we believe that they will enable any careful technician to align multiplex equipment for close-to-optimum performance. While it is possible that more sophisticated equipment may give better results, it is inevitable that the servicing procedure must be simplified so that every hi-fi serviceman will be able to make complete adjustments on stereo circuitry. There was a time when it was thought impossible to align any radio receiver properly without a sweep oscillator and a 'scope, yet today there is no low-priced sweep oscillator for AM alignment. FM recievers were considered even more difficult, but several of the modern kits make it about as simple as tuning in a station.

No part of audio servicing is actually very difficult. Of course there is still the problem of the intermittent, but a little common-sense applied along the right lines can reduce even this difficulty to a minor annoyance.

As we hope to show in future articles, the difficult we can solve immediately—the impossible may take a little time.

Acknowledgement

The author is indebted to Lester Karg for the use of the multiplex generator described, and to George Mordwinkin, who did most of the development work on it, for the circuit schematics, the detailed descriptions of the diode gates, and for the 'scope patterns of *Figs.* 5 and 6. Æ

BOOK REVIEW

(*from page 2*)

to distill out those attributes which make a particular hall liked for a particular type of performance. In other words it is now possible to define what is necessary to make a good, very good, or excellent hall.

Frankly we were greatly impressed by the scientific approach taken by Dr. Beranek. Our only reservation is directed at the validity of drawing such broad conclusions from such a relatively small sample. One of the small bits of heretofore useless information that has stuck with us from our college days is that a significant statistical sample is patterned to eliminate all of the intangibles except those being tested. It would seem that the main qualification for inclusion on "the list" was fame or position. But perhaps we are expecting too much at this time. A good start has been made.

The numerical rating scale developed in this book is obviously a numerical way of stating the various ingredients which go into a hall. In Dr. Beranek's scale, he has taken the terms he defined previously, seasoned them with the judgements of musicians, added a pinch of measurements, and came up with a recipe he likes. In reality there is much more to it than this simple simile would indicate—experience, sincerity, and humility. Anyone who reads Dr. Beranek's book is sure to be impressed by his earnestness and complete lack of pretention. In other words this numerical rating system is the best scientific effort of a knowledgeable and serious gentleman. It is too early to tell whether his assumptions are correct. In our judgement this is also true of Philharmonic Hall, in spite of the critical comments of the first few weeks. Somehow these early comments remind us of the reactions which usually accompany wearing new shoes; they pinch here and there and perhaps make strange noises until feet and shoes become thoroughly acquainted.

In Appendix I Dr. Beranek analyzes the prevailing method for calculating audience absorption and points out that it may very well lead to an erroneous value. Certainly it can be demonstrated that even the originator, Sabine, was unable to predict reverberation accurately using the number of people in the audience as an index of absorption. Dr. Beranek proposes instead that the area occupied by the seats be used. Relating this concept to the statistics of known halls seems to corroborate his assumption. All that remains is to prove it in the design of new halls. We are eagerly waiting for the answer from Philharmonic Hall.

An Important Book

As we said before, Dr. Beranek's book is important in that it provides a method of attack for a problem which has defied solution: a scientific method for designing good music-reproducing halls. Whether or not we agree with the particular answers he arrives at, we are in agreement with his approach. We do heartily recommend this book for every concertgoer as well as those professionally involved with acoustics and sound system design.

D. Sasiaw

(As a service to AUDIO readers, we are making this book available through the Audio Library.)

LIGHT LISTENING

(*from page 10*)

second recording speed used. The meticulous care employed in checking out all circuits and the recording equipment itself certainly pays handsome dividends in most of today's top recording from Germany and this one is no exception. No equalizers or limiters were used in the production of this recording. While no one can quarrel with the sound on this disc, few of us will be tempted to throw away the competing versions of this music that we may happen to have in our libraries. The German ensemble under the direction of Hans Wege tries hard to latch on to the saucy style of Leroy Anderson's compositions but it doesn't quite come up to existing performances by Arthur Fiedler or Frederick Fennell—not to mention the recordings made by the composer himself.

Oklahoma/Carousel/The King and I
Capitol STCL 1790

When the movie versions of these Rodgers and Hammerstein shows appeared some years ago—"Oklahoma" in 1955 and the others in 1956—Capitol acquired the master tapes of the scores recorded in stereo on Hollywood's sound stages. Issued as single albums, some of these shows were among the early stereo discs to reach me back in the days when tone arms and pickups were nowhere near as good as they are at the present time. Now that Capitol has brought out new pressings of all three productions in a deluxe album set, these deservedly popular recordings are now available in better sound. Although the original stereo discs show improved response with today's playback equipment, the newer pressings have better surfaces, slightly higher signal level and improved overall presence that puts them just about on a par with recently recorded movie tracks. **AE**

ABOUT MUSIC

Harold Lawrence

Music To Sell By

Ever since the first street vendor hawked his wares in some ancient city, music and selling, like love and marriage, have gone together. The rag-and-bone dealers, the scissor-grinders, the eel merchants, and the rat-killers all used music to convey their sales messages. Their street cries were the forerunners of today's "jingles." But they were a far cry from what has become a multi-million dollar business.

The explosive growth of sales music is a postwar phenomenon brought about by television. Until the late 1940's, advertising agencies produced nearly all the broadcast commercials themselves. Because they concentrated their expression in newspapers and magazines, they maintained small radio and television departments. In a real sense, the majority of the commercials written in those days were "messages," a word which announcers employ loosely to refer to anything from a jingle to a "dramatization." With the emphasis now switching to the communications media, the agencies began to farm out the work of creating music and lyrics to independent producers.

Almost overnight a new industry sprang into being. Today, commercials for radio and television are turned out largely by some twenty-five companies, located in New York, Los Angeles, and Chicago. These hawkers are on much higher social, economic, musical and literary planes than their street-crying predecessors. The personnel of a typical jingles firm might include a composer who studied music under Hindemith at Yale, a lyricist with Broadway shows to his credit, and a versatile side man who has played recording dates of all kinds, from Stravinsky to rock-and-roll.

The influx of this specialized talent in a field once dominated by hack writers has had a profound effect on the "sound" of advertising. Aggressive, between-the-eye merchandising is still with us, of course, but the soft-sell commercial with imaginative musical treatment is now preferred by many agencies and sponsors.

Of the dozen-odd jingle companies operating in New York, *Forrell, Thomas and Polack Associates, Inc.* is one of the most active. During its six-year existence it has serviced an impressive list of clients including Trans World Airlines, Schaefer Beer, York Cigarettes, Wonder Bread, Ford, Chevrolet, Hostess Cakes, and others. The enterprising trio consists of Gene Forrell, a film composer, singer and conductor; Edward Thomas, formerly a recording artist (guitar), arranger, and group singer; and James Polack, a musical comedy singer whose background includes stints with the George White Scandals and the St. Louis Municipal Opera. Before merging their talents, all three already had excellent contacts in the advertising field.

F. T. P. Associates rarely see the client who commissions their jingles. Once they land an account, they deal exculsively with the people from the agency. Together, hawkers and advertisers set the complicated machinery into motion that will one day produce a one-minute commercial.

In its initial stages, jingle-making has the flavor of politics—the agency suggests to F.T.P. a "copy platform" and a "campaign theme." F.T.P. writes variations on this theme and submits them to the agency. The text approved, next comes the music. As many as seventeen tunes have been composed; and an elimination session is scheduled. Following this, Thomas brings his

Fig. 1. Gene Forrell (left) with singing group.

guitar and a rhythm section along with him to play and sing the three "finalist-melodies" to the agency. His partners join in.

Finally, the advertisers settle on a tune. The client pays a nominal fee for recording a "demo." Usually, this trial session is performed by a skeleton instrumental group (piano and rhythm section) and a vocal quartet. If the demo recording costs exceed the agency's estimate, F.T.P. pays the extra charges. Three to five versions of the winning melody are recorded.

The tape or disc demo then goes to the agency, which in turn submits it to the client, who makes the final selection.

The recording date, the size of the musical forces, and the number of spots to be recorded are now decided upon. The jingle is to be given the full-scale treatment: strings, winds, brass, rhythm section, harp, two pianos, and a vocal sextet.

At last, the long-awaited day has arrived. The control room resembles a shuttle

Fig. 2. "I think that's it!" (Photos: Harold Lawrence.)

car during rush hour, as engineers, agency people, secretaries, and F.T.P. men squeeze past each other entering and leaving the glass-paneled nerve center. Thomas, on the podium, checks the score and the stopwatch, and signals for the first take.

Here are some random bits of dialogue between the control booth and studio:

C.R.: "You're five seconds over." Thomas: "You're darn right. Gonna have to pick up the tempo." C.R.: "Let's put it on and see what happens."

Vocal group (singing): "Look for tomorrow's features/In your gasoline today!" C.R.: "Hold it. You've been saying *features* together for fourteen times. What happened?"

C.R. (to singer): "Are you doing B Flat in the last chord? Well, that should be heard. (To another singer) Also, the G is very strong." Singer: "I'll sing E Flat."

C.R.: (interrupting take): "Two things wrong. . . . It seemed to increase tempo as it went along. And watch your pronunciation! It's Sunoco, not Senoco."

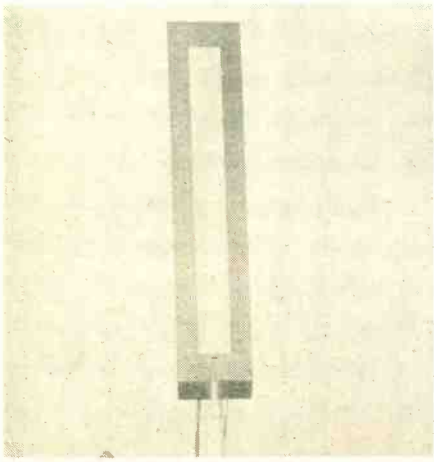
After attending a jingle recording session, it would surprise no one to learn that more money is spent producing a minute commercial than a full LP of popular music. Says Gene Forrell: "People expect to be entertained by jingles." People, that is, besides the agency and the client. Æ

NEW PRODUCTS

● **4-Speed Tape Recorder.** The new Norelco Continental 401 (Model EL3534) 4-track stereo record and playback tape recorder is completely transistorized and features the 15/16-ips speed for up to 32 hours of recording on a standard 7-inch reel. The Continental 401 is self-contained. It includes two preamplifiers, two power amplifiers, and two loudspeakers, one of which is in the romovable cover to permit realistic stereo separation during playback. The 401 records stereo and mono, and plays back stereo on mono tapes through the unit itself or through an external system. The machine has inputs for recording from microphone, tuner, and phono with facilities for mixing, multiplay (sound-on-sound recording), and a special input jack

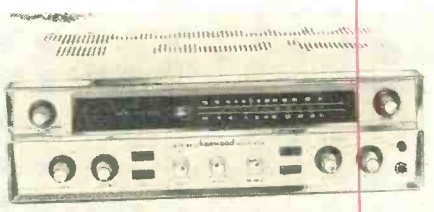
for a footswitch control. An output jack for monitoring with stereo headphones has also been incorporated in the unit. Stereo monitoring is also possible via the internal loudspeakers. The Continental 401 comes furnished with the Norelco dynamic stereo (dual elements) microphone. Specifications of the 401 are: Frequency response at 7½ ips is 60–16,000 cps (± 3 db); signal-to-noise ratio is better than – 48 db; wow and flutter (rms) at 7½ ips is less than 0.14 percent; bias frequency is 50,000 cps; input sensitivity is 1 mv for microphone and 150 mv for radio-phono. Built-in circuitry permits mixing the microphone and radio inputs. Price is $399.50. North American Philips Company, Inc., High Fidelity Products Division, 230 Duffy Avenue, Hicksville, New York. **A-1**

● **New Sound-Column Speakers.** R. T. Bozak has announced the availability of a new series of sound-column speakers for use in auditoriums, theaters, outdoor stadia, halls, and other large-audience gathering places. The units are designed to offer superior performance through clear, undistorted sound dispersion and



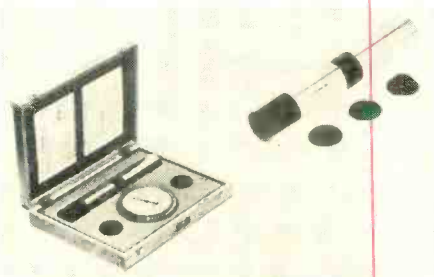
full high fidelity quality. They feature groupings of Bozak M-109 outdoor speakers arranged in vertical array and enclosed in weatherproof baffles. The company revealed that the new sound columns were used at a series of recent concerts given by the "King of Swing," Benny Goodman, and his orchestra upon their return from a tour of the Soviet Union. Mr. Goodman performed at the Yale Bowl, New Haven, Connecticut; Ravinia Park, Chicago and at Dogwood Hollow Park, Stony Brook, Long Island. R. T. Bozak Mfg. Co., South Norwalk, Conn. **A-2**

● **Integrated Stereo Tuner-Amplifier.** The new Kenwood Model KW-40 receives AM, FM, and FM-stereo programs and requires only the addition of a pair of loudspeakers to function as a complete system. The power amplifier, Kenwood claims, will deliver 20 watts per channel at less than 1 per cent harmonic distortion. The control center has inputs for a low-level magnetic



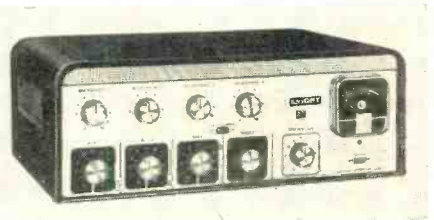
stereo phono cartridge (as well as for high-level ceramic or crystal stereo cartridge) and provides RIAA phono equalization. Features of the KW-40 are a conveniently accessible jack for stereo headphone listening, convenient speaker cut-off switch for private listening, and a method of "stereo subcarrier" tuning. With the subcarrier tuning in operation, only stations broadcasting stereo programs are heard at normal volume, as the dial is swept across the FM band. After a desired stereo station is located, a switch is flipped to receive both channels. Tone controls, stereo balance control, rumble and noise filters, loudness compensation, blend control for stereo effect, and a.f.c. are other features of the KW-40. Kenwood Electronics, 212 Fifth Avenue, New York 10, N. Y. **A-3**

● **Condenser Microphone Calibrator.** B & K Instruments announces the Model 4220 Pistonphone, a small battery-driven precision sound source for quick, accurate and direct calibration of measurement microphones, sound measuring instruments, and sound tape recording equipment. A calibration accuracy of 0.2 db is assured at a controlled frequency of 250 cps and 124 db (referred to 2×10^{-4} microbar). The Pistonphone is rugged in design to fulfill



the need for accurate calibration in the field and laboratory. The calibration procedure of fitting the Pistonphone coupler over the condenser microphone is quite "Idiot Proof" and not subject to variations in the manner of holding. With the high level output of 124 db, accurate calibration can be performed even in very noisy surroundings. Each Pistonphone is calibrated at normal atmospheric pressure. A barometer is supplied with each unit to indicate ambient pressure correction directly in db. Price is $245. B & K Instruments, Inc., 2972 West 106th St., Cleveland 11, Ohio. **A-4**

● **50-Watt Public Address Amplifier.** A new professional quality 50-watt public address amplifier featuring the latest in styling, the Knight KN-3050, is offered by Allied Radio Corp. This amplifier will meet most public address requirements and may be used effectively in halls, school auditoriums, churches, or other large gathering areas. Features include full mixing of four microphones; remote mixing facilities; sockets for plug-in low-impedance microphone transformers; cali-



brated sound level meter, separate bass and treble controls plus a master gain control. There are balance controls for output tubes and hum; boost and cut-type tone controls; an anti-feedback control, and a pilot light. Another important feature is an output jack for simultaneous recording. Special circuits are incorporated to reduce feedback and avoid trumpet burnout. The KN-3050 has an aluminum and black case. Its size is 6⅞ by 17¼ by 11 inches and it weighs 29 lbs. The unit is priced at $129.50 (Allied Cat. No. 57 DU 055). Allied Radio Corp., 100 Western Ave., Chicago 80, Ill. **A-5**

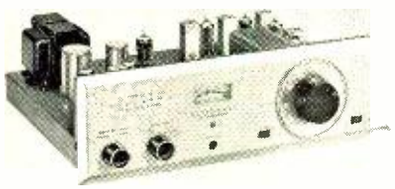
● **Slim 3-Way Speaker System.** The EICO HFS-6 speaker system can be either wall-mounted or placed on a narrow shelf in any desired location, above room furniture where required. Of paramount importance, however, is the performance of the HFS-6. It uses three speakers of advanced design plus carefully designed cross-over and balancing networks. The hand-rubbed, oiled, solid-walnut enclosure has a ducted port and is only 5¾-in. deep. Mounting hardware is supplied. The 10-in. woofer has an impregnated cloth suspension and ¾-lb. ceramic magnet. Free-air resonance is 30 cps. The 8-in. closed-back mid-range

speaker has high internal damping for smooth response. The special dome radiator ultra-tweeter extends response to beyond audibility. There is an LC crossover at 600 cps and a bridging capacitor at 4000 cps. Rated impedance is 8 ohms and rated power handling capacity is 25 watts. List price in kit form is $52.50, and wired $62.50. EICO Electronic Instrument Co., 33-00 Northern Blvd., L.I.C. 1, N. Y. **A-6**

● **Retractile, No-Scratch Cartridge Assembly.** A Stereo Dynetic cartridge assembly with a retractile safety suspension system has been announced by Shure Brothers, Inc. It is designed for use with Garrard Automatic Turntables and features scratch-proof operation. Called the Shure "Gard-O-Matic," the new cartridge assembly includes a Dynetic cartridge installed in a tone arm head. This assembly is available as the Model M99/A for use with the

Scott Stereo Tuner Kit Wins Rave Reviews from every Leading Hi-Fi Expert!

Just one year ago Scott introduced the LT-110 FM Stereo Tuner Kit. High Fidelity Dealers built this superb kit themselves, examined its many features, and recommended it without reservation. Enthusiastic kit builders deluged us with mail. Now the verdict is in from all the leading technical experts. Never before in the history of the industry has a single kit received such unanimous praise. We reprint a few excerpts below.



from POPULAR ELECTRONICS

"No commentary on *Scott Kits* would be complete without first mentioning that this company pioneered new areas in the hi-fi kit market and brought forth several (then-radical) innovations. One of them continues to fascinate all purchasers of a *Scott Kit* — the full-color instruction manual. . . . Scott also pioneered the Kit-Pak — a shipping container which serves as a temporary workbench and storage box . . . a test model of the LT-110 was wired at POPULAR ELECTRONICS in just under five hours. Another 40 minutes was used for careful alignment and the tuner was "on the air." . . . The LT-110 met or exceeded all the manufacturer's detailed specifications on sensitivity, distortion, output level, a.c. hum, and capture ratio . . . the audio response is excellent, being within ± 1 db, from approximately 20 to 16,000 cycles. . . . Channel-to-channel crosstalk is particularly excellent both in terms of uniformity and the fact that it holds up well above 10,000 cycles. . . . Frequency drift of the LT-110 from a cold start is extraordinarily low — less than 5 kc. The a.c. hum level (referred to 100% modulation) is low and exceeds the manufacturer's rating by 5 db. . . . It's difficult to imagine a kit much simpler to assemble than the LT-110. The full-color instruction book eliminates just about the last possible chance of wiring errors. . . . From a plain and simple operational standpoint, the LT-110 *works well and sounds good.*"

Popular Electronics, Oct. 1962

from ELECTRONICS WORLD

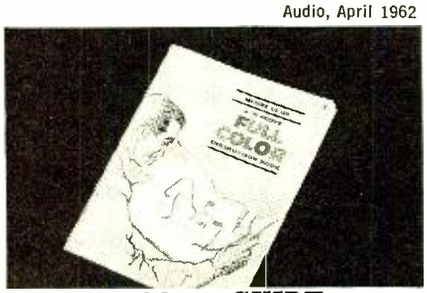
"Construction time for the unit we tested was 6½ hours, without alignment . . . in listening tests, the tuner showed its high useable sensitivity to good advantage. Using an in-door antenna which produced marginal signal to noise ratios on most other tuners we were able to get noise-free, undistorted stereo reception. It's quite non-critical to tune, hardly requiring the use of its tuning meter."

Electronics World, Nov. 1962

from AUDIO

"The LT-110 (is) so simple to build that we unhesitatingly recommend it for even the novice. . . . We found that the useable sensitivity (IHFM) was 2.1μv . . . a fine stereo tuner and an unusually easy kit to build."

Audio, April 1962



from RECORD GUIDE

"It seems to me that every time I turn around I am building another of H. H. Scott's kits. And each time I end up praising the unit to the skies.

The Scott instruction books should be a model for the industry. They feature full-color, step-by-step, illustrated directions. Each resistor or other component is shown in the progressive phases in its color code and in its proper position. . . .

There is no audible drift in the LT-110 whatever. You can shut the tuner off on a station and pick it up the next day, perfectly tuned, without touching the tuning dial. No AFC circuits are included in this tuner and none are needed.

This tuner kit has to be ranked on the same plane as H. H. Scott's factory-wired units. It is an excellent product, and because of its conservative parts very likely to give long, trouble-free service."

American Record Guide, Sept. 1962

Now Sonic Monitor* Added

Scott's unique Sonic Monitor has now been added to the LT-110. This foolproof stereo signaling device tells you audibly when you are tuned to a stereo station. If you want the best in kits, visit your Scott dealer. Choose from:

LT-110 FM Stereo Tuner Kit . . . $159.95
LK-48 48-Watt Stereo Amplifier Kit . . . $124.95
LK-72 80-Watt Stereo Amplifier Kit . . . $159.95
LC-21 Stereo Control Center Kit . . . $99.95
LK-150 130-Watt Stereo Power Amplifier Kit . . . $169.95

*Patent Pending. (All prices slightly higher West of Rockies.)

SCOTT

H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass. Dept. 35-I
Rush me complete details on your LT-110 FM Stereo Tuner Kit and other superb Scottkits. Be sure to include your new free Stereo Record, "The Sounds of FM Stereo" showing how new FM stereo sounds, and explaining important technical specifications.

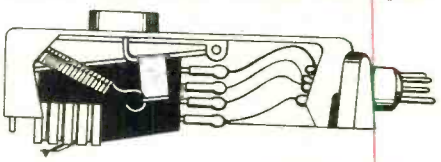
Name_____

Address_____

City_____ State_____

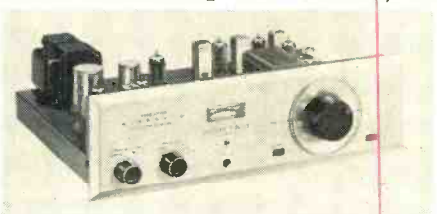
Export: Morhan Exporting Corp., 458 Broadway, N.Y.C.
Canada: Atlas Radio Corp., 50 Wingold Ave., Toronto

Garrard Type A Turntable, and the Model M99/AT6 for use with the Garrard AT6 Turntable. These Shure cartridge assemblies are designed to track at 2 to 2½ grams. When force on the arm equals



or exceeds 3 grams, the cartridge retracts into the head, with no increase in tracking force. Excessive force on the arm results in a small, plastic, non-scratching "lip" on the cartridge head making contact with record. Price of either the M99/A or M99/AT6 mounted in plug-in head is $49.50, audiophile net. Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Ill. **A-7**

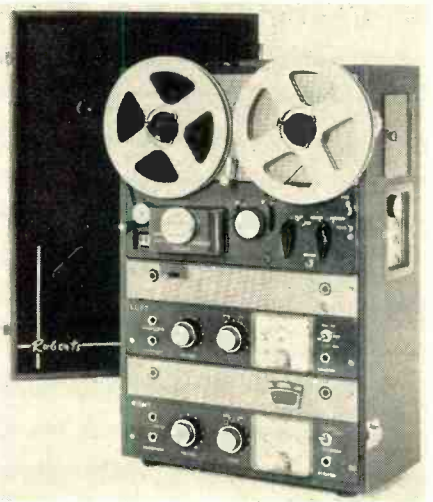
• **New Version of LT-110 FM-Stereo Tuner Kit.** The Scott LT-110 FM-Stereo tuner kit has been redesigned to include Scott's unique Sonic Monitor (pat. pending). This Scott invention signals the listener audibly to tell him when he is tuned to a station broadcasting in FM Stereo. To use the Sonic Monitor, the listener simply turns the switch to "Monitor" and tunes across the FM dial. When he reaches a station broadcasting in FM stereo, he



hears a tone through his speakers. Then he switches back to "Listen" and FM-stereo reception. Other changes have been made in the LT-110. It is now packaged in Scott's new Kit-Pak container. All parts come mounted on special Part-Charts in the order used. There is a separate blister-packed Part-Chart for each page in the full-color instruction book. The instruction book has been rewritten, making it even easier to follow. The face-plate of the LT-110 now has a brushed gold finish, making it a perfect match to Scott factory-wired units. H. H. Scott, Inc., Dept. P, 111 Powdermill Road, Maynard, Mass. **A-8**

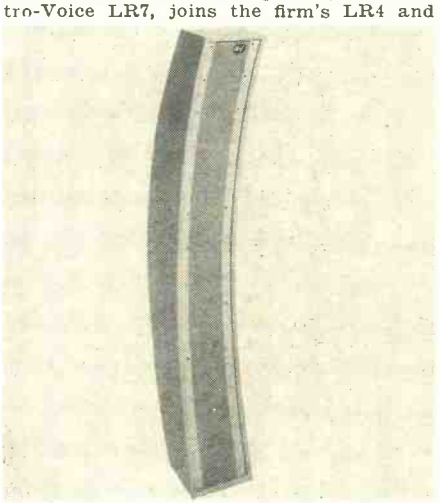
• **Moderate-Price 8-in. Loudspeaker.** A new moderately priced high fidelity loudspeaker, the Michigan MC8, has just been introduced by Electro-Voice, Inc. This new loudspeaker, E-V officials claim, offers for the first time a combination of true high fidelity speaker characteristics and a price structure competitive with that of quality replacement-type loudspeakers. The wide range, low cost, and high efficiency of the MC8 make it ideal for use in home high fidelity systems, quality background music, sound reinforcement systems, and many industrial applications. Features of the MC loudspeaker, first model in E-V's new Michigan Line, include extra-slim styling, a rugged die-cast frame, and an edgewise-wound voice coil that provides 18 per cent more efficiency than ordinary coils. The dual-cone design is claimed to provide wider range and wider dispersion than single-cone types. The MC8 has a frequency range of 50 to 13,000 cps and power handling capacity of 12 watts, program and 24 watts, peak. Inquiries should be made to: Sales Department, Electro-Voice, Inc., Buchanan, Michigan. **A-9**

• **Stereo Tape Recorder.** The new Roberts, Model 997 4-track stereo tape recorder features 6 low-impedance stereo outputs, studio-type VU meters, 'motor-on' indicator lights, mute-monitor speaker switch, and simplified sound-with-sound recording. The 997 is designed to function as a complete sound system: It has inputs for stereo record changer and/or AM-FM and FM-stereo tuner, so that it can serve as the heart of a stereo system. It is priced at $449.95. Other features of the 997 include a multiple-adjustment head; dual monitor speakers; lever-type automatic



shut-off; dual head outputs; dual preamp outputs; dual power amplifier outputs; double fast rewind; automatic shut-off and interlocking controls that prevent accidental erasure of recorded tape. The 997 will operate either vertically or horizontally. Tape speeds are 3¾, 7½, and 15 ips. It uses a 24-slot high-torque hysteresis-synchronous motor with dynamically balanced rotor and flywheel. Roberts Electronics, Inc., 5920 Bowcroft Ave., Los Angeles, California. **A-10**

• **Line-Radiator Speaker.** A new Line-Radiator public address speaker, the Electro-Voice LR7, joins the firm's LR4 and



LR4S. The LR7 is a sophisticated version of the column speaker offering a well-defined polar pattern with maximum radiated energy in a 160-deg. horizontal plane and a 45-deg. vertical dispersion. It thus provides the broadest possible coverage with an absolute minimum of feedback. The unit may be mounted in almost any location, which allows positioning for most effective audience coverage. No complicated installation accessories are required, since it weighs only 70 pounds. A power-handling capacity of 50 watts permits use in a wide variety of indoor and outdoor installations. The new Line-Radiator is said to provide excellent sound, despite its low price, through the use of nine 5" × 7" high-quality loudspeakers. Electro-Voice, Inc., Buchanan, Mich. **A-11**

NEW LITERATURE

● **Printed Circuit Materials.** Drafting Materials for use in the layout of printed-circuit masters are described in a 12-page catalogue available from Flexigraph Inc. The catalogue includes information on precision grids and tapes accurate to plus or minus 0.001 and die-cut symbols accurate to plus or minus 0.002. Flexigraph, Inc., Morristown, N. J. **A-11**

● **Soldering Iron Catalogue.** An 8-page catalogue describing Ungar's Imperial soldering iron is available free. This iron which is designed to meet the needs of production line assembly operations in electronic industries is completely described in so far as application, specifications, and user net prices. Also included are descriptions of the interchangeable Imperial components such as the pastel-colored Perma-Kool handles, standard or grounded cord sets, and 25-30-40-watt long-life heat cartridges, and 42 Mini-Tip thread-on soldering tips. Information on a variety of accessories such as the "safety guard" holder and the "heat seal" compound is also included. Ungar Electronic Tools, Hawthorne, Calif. **A-12**

● **1963 Catalog.** Lafayette announces its new 1963 catalog, with the latest in electronics and stereo high-fidelity equipment, is now available to anyone upon request. The 1963 catalog contains 388 pages and is the largest and most comprehensive ever offered by Lafayette. Featured items include Lafayette's exclusive top-quality equipment in kit form and completely assembled, as well as the latest stereo high-fidelity components of all major manufacturers—tuners, amplifiers, preamplifiers, tape recorders, turntables, speakers, and so on. Also offered are complete selections of citizens band equipment, optics, books, tools, radio and TV components and accessories, cameras, public-address systems and parts—everything in science and technology for hobbyists, students, experimenters and industry. The free Lafayette 1963 catalog #630 may be obtained by writing to: Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L. I., New York **A-13**

● **Application Manual for Transistor Heat Sinks.** Astro Dynamics, Inc. has made available at no charge an 18-page manual containing information on heat dissipation. The purpose of these notes is to present some of the basic principals of heat transfer in a very simple form and to indicate the steps which lead to the proper selection of a cooling system for critical transistor applications. A nomograph is provided which enables proper selection of heat sink models suited to any given application. Inquiries should be addressed to John H. Sununu, Heat Transfer Lab, Astro Dynamics, Inc., Second Ave., Northwest Industrial Park, Burlington, Mass. **A-14**

● **Transistorized Voltage Regulators.** The latest addition to RCA's Application Guide series, Transistorized Voltage Regulators, describes step-by-step design procedures and the solution to sample design problems for the three basic types of regulating systems: series, shunt, and combination series-shunt regulators. Each of these systems can provide constant voltage, constant current, or constant impedance across the load. The Guide covers design considerations and discusses the numerous advantages and capabilities of transistorized voltage-regulator types: small size, low cost, increased reliability and accuracy, and extensive control range. Copies of Transistorized Voltage Regulators, ICE-254 may be obtained by sending twenty-five cents to Commercial Engineering, RCA Semiconductor and Materials Division, Somerville, New Jersey.

FM RECEPTION

(from page 20)

Medium Range Reception, Stations from Different Directions

The reader by this time will probably have reached his own conclusion that this calls for a yagi on a rotator, and in most cases he's right. The problem is the same as the previous one with the only difference showing in the need to change the aim of the antenna.

However, in the special case of all desired stations being from either the front or the back of the antenna, there is a bi-directional yagi which receives equally well from either front or back and exhibits medium gain characteristics. Such an antenna, illustrated in *Fig.* 4, can save the cost and complexity of a rotator installation.

Fringe Reception, 40 to 70 Miles

Fringe reception can embrace a great range of conditions, since this encompasses the area where the intervening terrain may be of utmost importance. For example, an antenna on high ground, a few hundred feet or more above average terrain, can produce results at 70 miles equivalent to normal elevation results at 40 miles. Conversely, an antenna, located in a valley at 40 miles may give worse results than an antenna in normal terrain at 70 miles. Prediction of results is at best a risky thing, and reception can vary from good to impossible within an area of a square mile in rugged terrain.

The above should not be taken pessimistically, but it should not be disregarded in considering an antenna installation.

In general, one must try, but it is pointless to try anything other than a high-gain FM yagi, and if conditions warrant, an antenna rotator.

Certain rules apply. For example, the higher the antenna, the higher the signal, but also the longer the antenna lead. And antenna leads have loss. Usually, beyond some height, which varies in each location, increased height will be counterbalanced by increased line losses, and nothing will be gained.

When a practical installation of a single high gain yagi is not enough, two avenues of help are open. The first is to use *two* yagis—"stacked"—connected together to provide additional gain. Such stacking must only be done according to the maker's instructions: improper connections or spacing can result in a loss rather than a gain.

The other avenue is the use of a low-noise preamplifier mounted at the an-

tenna or in the house. The preferable system is the antenna-mounted type. Such preamplifiers amplify the signals as much as ten times, allowing the tuner to limit, and thus give hiss-free reception. *Figure* 5 illustrates an antenna-mounted unit and *Fig.* 6 a set-mounted preamplifier.

In effect, an antenna-mounted preamplifier takes the signal *before* it has been degraded by the lead losses and amplifies it so that the losses will not increase the signal-to-noise ratio at the tuner's input. In a way, it effectively places your tuner at the antenna, instead of a hundred feet or so away through the down-lead.

Super-Fringe Area Reception, Over 70 Miles

Super-fringe reception is only more of the same fringe area techniques, used with greater care. For example, four yagis may be stacked to provide added signal.

An antenna or array should not be just pushed into the air; the area should be probed for the strongest signals, up, down, sideways, and front and back. An antenna or array may be placed on top of a nearby hill and lines run as much as a couple of thousand feet, using amplifiers, to the tuner. These techniques should not be undertaken lightly. Write to an antenna or preamplifier manufacturer for their recommendations before going ahead.

Survey and probing work should be done only in the afternoon; signals are worse during this time of day. Survey should be made over an extended period so that a bad day doesn't fool you. Remember that fringe signals fade out, and they have short-term and long-term fades.

If all else fails, you can always move in closer to the transmitter!! Æ

LETTERS

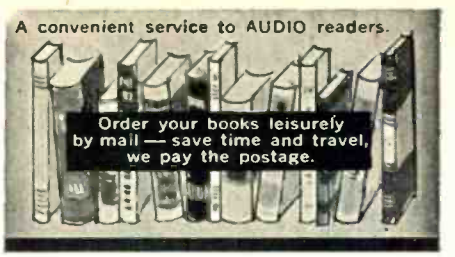
(*from page 6*)

with changes of mechanical load.

The question of effective pulley diameter has only theoretical significance, since belt slippage requires that the final diameter be determined experimentally in any case. Recognizing that there is slippage has practical significance; it leads to the understanding that synchronous motor performance combined with correct pulley diameter does not guarantee accurate speed over a given operational range of mechanical load. Speed accuracy must be proven in a test like the "nickel test" proposed in the article.

As for slippage causing an increase of speed (by a sort of ratchet action of the pulley), it seemed logical in the absence of Mr. Subber's more standard explanation. If ratchet action is ever an influence, it is unproven, and I withdraw it.

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



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AUDIO ETC

(from page 14)

of years after I began this long stretch, now amounting to thousands of hours of broadcast experience, I started the brave attempt to make a partial living out of my work. As soon as the war ended I was on the full-time staff of the old WABF, one of the earliest FM stations, as paid "music director." But the funds ran dry and the enthusiastic workers, all set for the great FM expansion, were let go. Culture wasn't going to come that way. As we all know, FM, the ideal medium for "cultural radio", very nearly died then, until rescued by the LP, tape, and home hi fi.

In all the years since, in spite of a number of fairly major efforts to launch a program for pay (one effort generously sponsored by this magazine) I have not been able to buck the system. True, a few pleasing sums came my way during brief sponsorship. Not enough, really, to pay for tape and postage, let alone equipment. True, a number of stations have accepted my programs for varied runs on the usual basis—i.e. for the prestige it gave me. (It did, of course.) But by and all, I have had to finance my broadcasts myself, from tape to postage to Ampexes, like the poet who prints his own poems.

My material, of course, comes to me gratis—for I review records! In that respect alone I am a good cog in our system; for I benefit all concerned: myself, the station, the listeners, and the record companies. Also the musicians (who are paid, so to speak, at the source by the union's very practical recording fund arrangements and who gain the usual measure of acclaim and publicity by my broadcasts of their efforts).

But as for cash—no. And over the years as the die began to harden, the situation to crystallize, I came to feel that though in many ways the system is excellent and gives us all our moneys' worth in culture and prestige—otherwise I would have long since given up—nevertheless a fundamental wrong is being perpetrated on American cultural talent by the permanent denial of a man's right to earn his living in the best way he can. That I do not like, for myself and for others in my position, including Professor Woodworth at Harvard.

And so I have made myself, after all these years, an unofficial law, a compromise. To use an old and hard-bitten saying, you can't get blood out of a stone. As things are now set—and they are very set—there simply is no major source of cash for cultural talent on the air, always excepting celebrities and symphonies on networks, and excepting a small number of successful commercial broadcast operations like that of WQXR and its network in New York. (Also, of course, excepting those regular staff employees who produce programs as part of their jobs via many small FM stations.)

For Dear Old WNYC . . .

My compromise is simple. For dear old WNYC, New York, which I love for all its comfortable faults and because of its many superb virtues, I will go on providing material for ever and ever, as long as it is wanted. I have shelves and shelves of back tapes already. When inspiration fails, or time forbids, I can dip into these for useful repeats, and often do. They seem to be appreciated. But for other outlets I stand upon my dignity; I demand at least a token fee—to establish the fact that the station is getting something out of me. Token is what I mean. Enough, say, to pay for postage and a roll of tape and allow a few dollars over. That at least establishes the ethical principle that interests me—that talent, all talent, which is good enough to broadcast is good enough to be paid for. The principle, as far as I know, is universally respected in other countries. We seem to think that either "culture" or government ownership implies no remuneration. We shouldn't.

Unhealthy Situation

So you see, FM's culture has now reached the point where its dependence on free talent is very nearly 100 per cent. Indeed, the implication is, a program of personal

commentary should bring with it a cash donation—a sort of performers' radio—to help sustain the broadcast! And the worst of it, for me, is that this is probably the truth. It costs a fabulous sum to keep a station on the air, even without stereo. We can raise the cash—for that. But we depend, so to speak, on sheer charity to give our stations a voice. Frankly, I don't think this is a healthy situation. It promotes a false relationship between commercialism and culture that is already the bane of American life in too many other areas. It is doubly false, here, because many of our FM listeners continue to believe, naively, that all radio talent swims in luxury, ladling up the radio gravy! They are right in so assuming. It is right to assume that people who have talent and who work hard are getting paid.

It is even healthier to find people whose work is that of sheer dedication. The world would be a sadder place if everybody got paid for everything. But the true basis for work that is done out of love and enthusiasm is found in working *together*— in co-operation. It still makes the world go 'round, whether it's called fellowship, or amateurism, or volunteer work or even patriotism.

We in this country have not found comfortable ways towards this co-operation, between paid and non-paid efforts. We pay our teachers too little and our public relations men too much. We assume our rights to a profit here, and yet take for granted a loss there. We hire paid professionals for charity fund-raising and give them their profit as their right. Sometimes, it becomes a bit too large. Inevitable—yes! The profit motive is potent but so is the non-profit impulse, which as we all know can loom as the greatest force in human society when the occasion demands. But though the need for profit can always be taken for granted, the non-profit impulse is *never* that way. For it must be paid, too, in satisfactions that are much more subtle than mere cash. You cannot take it for granted at all. Not even for "publicity value."

I do not like the present situation in FM "cultural" broadcasting because, for all its practical workability, it reflects that same uneasy, false uncertainty as to who is paying whom (in terms of satisfactions) that leads us to pay industrialists more than teachers for equivalent work, that makes us believe, more and more, that things of the mind and of art must be taken care of by foundations; whereas "practical" things are paid for in cash.

What do I suggest, instead? I wish I could tell you. My best suggestion is simply *awareness*. The more of us that know the details of our present setup, the better it will be for all and the sooner, maybe, will culture find a pay-as-you-go basis on the FM air. As for m'self, I'm quite happy and still enormously enjoy the radio programs I turn out. I do what I can. Wouldn't you? Æ

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Industry Notes . . .

• **Sherwood Shows Experimental Transistor Unit.** At the recent New York High Fidelity Show, Sherwood showed an all-transistorized stereo "Receiver-of-the-Future." In the advanced experimental design stage, Sherwood's receiver, known as Model XP-1, features not only FM-stereo multiplex and AM reception but also dual 100-watt (music power) output. Other unique features are timer-clock control, push-button speaker-system selector, dual tuning meters and self-contained, motorized fan to cool the output transistors and power supply. Edward S. Miller, its designer, said "Although this design may not be produced as such, many of its design features undoubtedly will be included in the all-transistorized amplifiers and tuners expected to be mass-produced by Sherwood in 1963."

• **Rossman Comes Back.** Irving Rossman, former President of Pentron Electronics, has re-entered the electronics field by acquiring a controlling interest in Universal Audio, manufacturers of sophisticated electronic equipment for the sound, industrial, and recording industry. Mr. Rossman was in town to introduce new products for the company during the recent AES convention in New York. Rossman says that the company will round out its line in the near future with stock products for consumer purchases as well as additional professional items.

• **Burgess Battery Company Appoints.** Burgess Battery Company has appointed Charles H. Donahue, Jr. to the newly created post of Magnetic Tape Sales Director. According to Fred Kirkman, president of Burgess, the appointment of Donahue is an important step in Burgess' program to build a national sales organization to market the company's line of audio tape through regular tape distributor outlets. He indicated that Donahue will also be responsible for developing tape markets with original equipment manufacturers, professional broadcasters, and tape duplicators.

• **Gotham Represents Tuchel-Kontakt.** Gotham Audio Corporation announces its appointment as exclusive U. S. representative for the Tuchel-Kontakt GmbH of West Germany—manufacturers of audio and power connectors—for the distribution of replacement connectors. Gotham Audio will stock in New York all those connectors which are found on equipment imported from West Germany and such other European countries using the Tuchel line. Among the manufacturers of imported equipment using these plugs are such names as Arriflex, Beyer, E.M.T., Grundig, Leitz, Lyrec, Neumann, Telefunken, and many others. A short form catalogue of connector types is available from Gotham Audio.

ADVERTISING INDEX

Acoustic Research, Inc. 11
Acoustical Technology Laboratories, Inc. .. 31
Airex Radio Corporation 73
Allied Radio Corporation 51, 52
Altec Lansing Corporation 56
Ampex Corporation 5, 7
Apparatus Development Co. 75
Audio Bookshelf 72
Audio Fidelity Records 49
Audio Unlimited 75

Barkes Sales Company 75
Barker & Williamson, Inc. 65
Benjamin Electronic Sound Corp. 47
Bozak 58
British Industries Corporation . 3, 33, 34, 75
Burgess Battery Company 62

Carston Studios 75
Classified 74
Concord Electronics Corporation 76

Dynaco, Inc. 45

EICO Electronic Instr. Co., Inc. 13
Electro-Voice, Inc. ..... Cov. IV
Electro-Voice Sound Systems 75
Electronic Applications, Inc. 63
Elpa Marketing Industries, Inc. 69
Empire Scientific Corporation 27

Fairchild Recording Equipment Corp. 6, 64, 69, 70, 74
Fidelitone 71
Finney Company 70
Fisher Radio Corporation 9

Garrard Sales Corp. 3, 33, 34
Goodwin, C. C. (Sales) Ltd. 75
Gotham Audio Corporation 50
Gray Research & Development Co. 75
Grommes, Division of Precision Electronics, Inc. 4

Harman-Kardon 25
Heath Company 38, 39
Hi Fidelity Center 75

Jensen Manufacturing Co. ..... Cov. II
Jerrold Electronics Corp. 1

Key Electronics Company 74

Lafayette Radio 65
Lansing, James B. Sound, Inc. 43

North American Philips Co., Inc. 71

Pickering & Company, Inc. 17
Pilot Radio Corporation ..... Cov. III
Pioneer 15

Quarante Cinq Records 73

Rek-O-Kut Co., Inc. 14
Roberts Electronics, Inc. 57
Robins Industries 71
Rotron Mfg. Co. 59

Scott H. H., Inc. 67
Sherwood Electronic Laboratories, Inc. ... 18
Shure Brothers, Inc. 37, 55
Sonotone Cartridges 10
Sonovox Co., Ltd. 73
Superscope, Inc. 41

Tandberg of America, Inc. 60, 61
Technical Appliances Corp. 2

Weathers Division of TelePrompTer 70
Winegard Antenna Systems 68

'The finest FM Stereo Tuner ever built for the home'

says Martin Gersten, chief engineer of WNCN, The Concert Network

Mr. Gersten talks from experience —both as an FM broadcaster and as a high-fidelity authority and enthusiast. And in all his experience he has never heard an FM stereo tuner that compares with the PILOT 780.

He first heard the PILOT 780 in September, 1962, at the New York High Fidelity Show.

He says: **"The Concert Network station in New York City, WNCN, 104.3, was broadcasting music and interviews with manufacturers and dealers directly from the Show. We tried to monitor our station on several FM tuners. None of them, including the most expensive ones, could produce a satisfactory signal, that is, until we walked into the PILOT exhibit and tried the 780. The exceptionally clear, noise-free signal it produced was a revelation. Subsequent tests convinced me that this was the finest FM Stereo tuner ever built for the home. Today, I use this tuner in my home and, as far as I am concerned, it is in a class by itself."**

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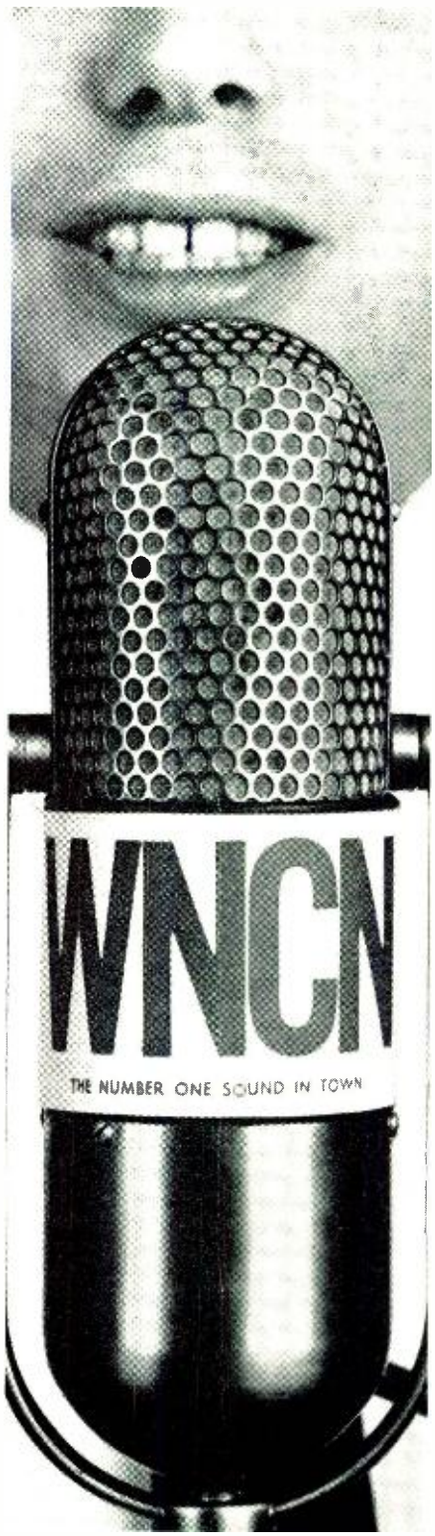
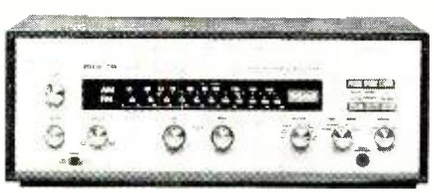


The PILOT 248B, companion to the 780, is a 74-watt Integrated Stereo Amplifier with a frequency response (± 1 db) of 5-50,000 cps and only 0.1% harmonic distortion (IHFM). Given an excellent rating by HiFi/Stereo Review, the 248B features outputs for tape and headphones, 7 pairs of inputs and a total of 13 front and back controls and switches. Price (less enclosure): $269.50.



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