AUDIO

APRIL, 1962
50¢

 page 32

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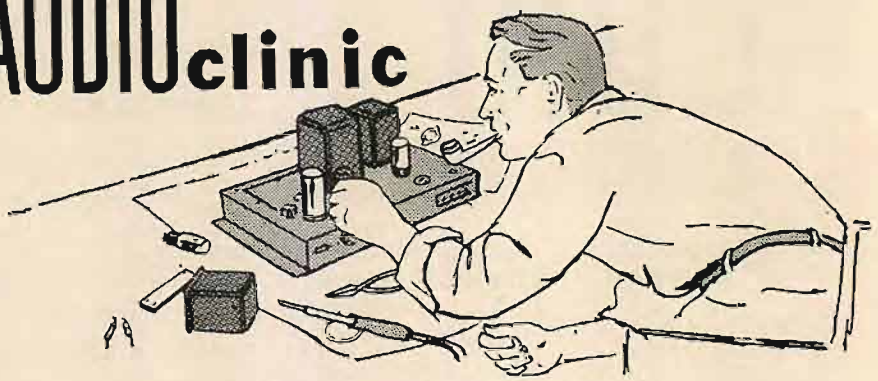


JOSEPH GIOVANELLI*

Recording Off the Air or from Discs

Q. When recording off the air, will I obtain better results with my tuner connected directly into the appropriate input of my tape recorder, or with the tuner connected to my preamplifier and the tape recorder connected to the tape output connection on my preamplifier. When recording from discs, will I obtain better results with the tape recorder connected directly to the pickup terminals, to the output of my preamplifier or across the speaker terminals connected to my power amplifier? Joseph Diaz, Jr., Bridgeport, Conn.

A. You can probably get best results with least problem of duplication of controls by going either directly from the tuner into the tape recorder or by using the "tape out" connection of the preamplifier. This connection is virtually the same as a direct connection to the tuner. If, however, you wish to correct for some deficiency in the program's audio, you might find it advisable to feed the cathode-follower output of your present unit into the recorder, giving you the ability to adjust the tone controls for best audio quality.

As for recording from phonograph records, the type of cartridge you have will influence my answer to some degree. If the cartridge is of the magnetic variety, it must be connected to the preamplifier and the tape recorder can be fed from the tape output connection or from the cathode-follower connection, depending upon the need for compensation via the tone controls. You must not connect the cartridge directly into the tape recorder because the cartridge will not be properly equalized and poor sound quality will result. Also, if you were to feed the magnetic cartridge output directly into the tuner input of the tape machine, you would not have sufficient signal for recording because of the low output from this type of cartridge.

If the cartridge is of the crystal or ceramic variety, it is possible to connect it directly into the tuner input of the tape recorder, to the preamplifier's auxiliary input, and with the tape machine connected to either the tape output or to the cathode-follower output as has been discussed.

The tape recorder should *not* be connected across the speaker terminals when finest results are required. The characteristics of the speaker and its reflected impedance, together with a considerable amount of hiss which usually is present, will contribute to poor results. This hiss level will depend upon the settings of the various volume and tone controls, and, therefore, may not always be a factor. However, if the level of hiss is low, it probably means that the amplifier is developing quite a bit of output. Therefore, do not run the equipment in this manner unless there is a load in the form of a speaker or resistor whose impedance is equal to the speaker, connected across the amplifier's output.

The Bauer Circuit

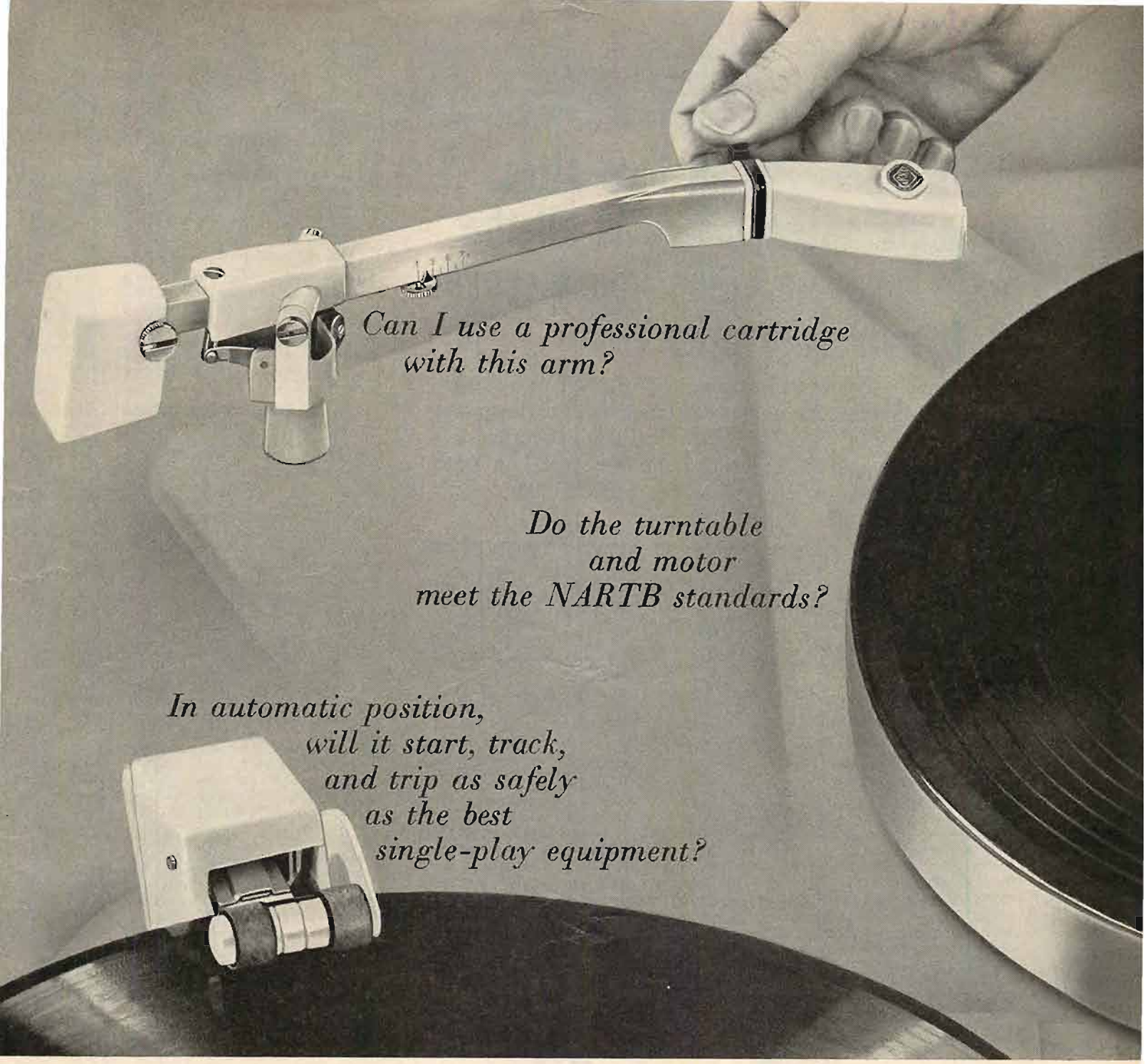
Q. I am interested in the remarks Mr. Canby has made on the Bauer circuit pertaining to stereo—or should I say binaural —earphones? The circuit is published with values in the October, 1961 issue of AUDIO. *I intend trying it. Could you give me a crude idea of the approximate workings of the circuit? I gather that the object of the thing is to recreate stereo by way of phones fed from a stereo program source (as opposed to binaural source, since none exists commercially). Because the phones inherently are binaural the circuit apparently is an attempt to make them reproduce in a true stereophonic fashion— as a two-speaker setup does—by discretely mixing some channel A with channel B, and vice versa. Where the speaker sounds are mixed accoustically in the room, the Bauer circuit mixes them electrically.*

Also, the air core chokes are apparently non-standard values, according to my catalogs (9 and 11.4 mh). Any idea on where to buy them or how to make them? Michael N. Wildemann, West Hartford, Conn.

A. Have you ever heard stereophonic sound as represented in headphones? It is a rather dramatic sound, but it is not at all a true picture of the sound as heard at a concert or as heard from two speakers. This is because the signal transmitted to the left ear is completely isolated from the right ear; the signal transmitted to the right ear is completely isolated from the left ear. It is obvious from this that some kind of blending is required so that some of the signal from the left channel should be introduced into the right earphone and some of the signal from the right channel should be introduced into the left earphone.

This could be done with resistors, with the user adjusting the arrangement for best balance. However, this would still not simulate what happens in a living room when the listener is hearing two different speaker sources, separated by some distance. Not only does the ear hear something from each speaker, but the ear also hears this something with time delay between the time he hears the sound from one speaker and the time he hears the sound corresponding to this from the other channel. This time delay cannot be introduced with the resistor method. This fact accounts for the use of the inductances in

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



THE ANSWER: *Absolutely Yes!*

These are some of the questions people ask their dealers when they learn, to their surprise, that the Garrard Type A Automatic Turntable costs only $79.50. Some have assumed this must be the price of the turntable alone... certainly not the complete unit. These are intelligent questions, since a few dollars do not really matter when you are investing hundreds in a high fidelity system, expecting to be able to enjoy music free of distortion, and to protect your substantial investment in records. ☐ Chances are, for example, that you may want to use one of the ultra-sensitive cartridges developed originally for separately-sold tone arms because of their high compliance. Now, Garrard has integrated precisely such an arm into the Type A. It is counterweighted and dynamically-balanced... will bring out the best in the cartridge of your choice... tracking at the lowest stylus force prescribed by the cartridge manufacturer. Best proof of its capabilities is that the Type A tone arm is on the recommended list of every important manufacturer of professional-type pickups. ☐ The Type A turntable and its double-shielded motor were designed for each other. The cast turntable itself is something special... full-size, heavy (6 lbs.), balanced and non-magnetic. You will hear no wow, no flutter, no vibration. ☐ Many people consider Garrard's pusher platform the most important exclusive Type A feature. This is unquestionably the gentlest device ever designed for its purpose, and gives you the incomparable convenience and pleasure of automatic play whenever you want it. ☐ With all this to offer, it is small wonder indeed that Garrard's Type A, in a single year, has become America's number one high fidelity record playing unit. It is proudly owned by a growing legion of discriminating people who, originally amazed at the price, have come to realize this superb instrument could have been expected only from the Garrard Laboratories.

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the circuit. Unfortunately, you will have to build them and check them out. If you have no facilities for doing this, you will not be able to make this device work as Bauer intended it should. Fairly precise values of components are important.

The Use of Line-Bypass Capacitors

Q. In amplifier and preamplifier circuits, I have noted the use of capacitors of about 0.05 μf placed between one or both sides of the 117 volt a.c. line and ground. What is their purpose, and which is the preferred arrangement, one capacitor or two or none? Edgar H. Berg, Parsippany, New Jersey.

A. The purpose of the line-bypass capacitor is to eliminate, or at least minimize, the effects of the line transients on the performance of high fidelity or other equipment in which they are employed. In other words, a refrigerator or oil burner might start up. A sudden change in line voltage of very short duration would then be caused. This would be reflected in the amplifier as a click or pop. The capacitor to ground would shunt this kind of transient material around the transformer.

However, sometimes these capacitors can introduce troubles of their own. Suppose you have two amplifiers, and each has such a line-bypass capacitor. The amplifiers are coupled together for stereophonic use. The values of the bypass capacitors may be somewhat different from one unit to the other. This situation will cause a voltage difference between the two chasses. This voltage gradient may show up as hum when the units are connected together.

Further, there is a shock hazard when such capacitors are used. Suppose that such a capacitor is used in an FM tuner and in a preamplifier; suppose each has only one line-bypass capacitor; suppose, further, that the tuner is plugged into the wall socket in such a manner that the side of the line to which the bypass capacitor is connected is the ground side of the line. Suppose that the preamplifier is plugged into the wall in such a way that the side of the line containing the capacitor is connected to the "hot" side of the line. Suppose that the operator of the equipment wished to connect the two with a standard phono cable. He plugs the cable into the preamplifier, but as he touches the tuner and the cable at the same time, preparatory to plugging the cable into the tuner, he receives a shock because the two chasses are at different potentials. He would have to turn one of the plugs around in order to reduce the likelihood of this shocking situation. There is almost nothing you can do about the shock problem when two such capacitors are used. In those instances in which equipment is to be connected and disconnected many times, the only manner by which this can be done and still avoid the shock hazard is by running a permanent, heavy ground strap between the two chasses. (Such a strap is usually a good idea in any case.)

However, two such units are probably better in terms of their efficiency as removers of annoying line transients because less attention to polarity of the wall plugs will be required. Unfortunately, though, the use of a bypass capacitor on each side of the line increases the possibility of hum. The best arrangement is to connect all chasses to a good ground and to use one line-bypass capacitor. The polarity of each a.c. input should be so arranged that the "hot" side of the line is connected to the terminal to which the bypass capacitors are connected. This will automatically place the other side of the line at ground potential. Æ

slurp

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LETTERS

The Author Replies

Sir:

I challenge Mr. Dorf's statements on the equal-tempered scale. The twelve-tone scale, $\sqrt[12]{2}$ apart is artificial. The ear does not hear that methodically at all. An octave (which the ear does not hear) is divided into 1200 parts for analysis, each part being designed as a cent. The ear, over the middle octaves, can just detect two cents. I refer you to Table I, page 453 of Helmholtz's "Sensations of Tone." The approximate interval relationships between the fundamental and each cent is rather involved. The scale intervals are arrived at by agreement of the culture. Western culture has over the years disagreed as to what frequency the musical notes C or A should have. At the present time we accept 440 cps as the musical note A. We divide the octave into approximately twelve equal intervals and detune the fourths and fifths purely as a matter of taste. Although Helmholtz's book runs to 556 poges of fine print, and although there are detailed studies of the scales used by different cultures, there is no evidence presented that the ear hears a scale as $\sqrt[12]{2}$. The fact is that some musicians, especially those playing stringed instruments, choose a personal scale which differs from the conventionally accepted one. The entire subject is complex, physiological, psychological, and personal. However, by today's convention, fourths and fifths are detuned in most of today's keyboard instruments.

DAVID WOLKOV,
Syosset, L. I., N. Y.
10 Sunbeam Road,

Organ Pipes

Sir:

Mr. Dorf is not correct when he states that a 16-foot register begins with a note of 32.7 cps, produced by a 32-foot pipe. A 16-foot register can begin with a 16-foot open pipe, from which it indeed derives its name, or a 16-foot register can begin with an 8-foot stopped pipe, or certain reed pipes which are much less than 8 feet in length. If the lowest note of a standard AGO keyboard is 32.7 cps, it is then a 16-foot register regardless of pipe length. Pitch is given in terms of length of an open pipe for the same reason that an organ contains mostly open pipes. Next, I would like to emphasize that the traditional pipe organ builds its tone by synthetic means. If we examine the stop list of several such organs, we will find stops of the following pitches (although probably not on every instrument):

On the Manuals

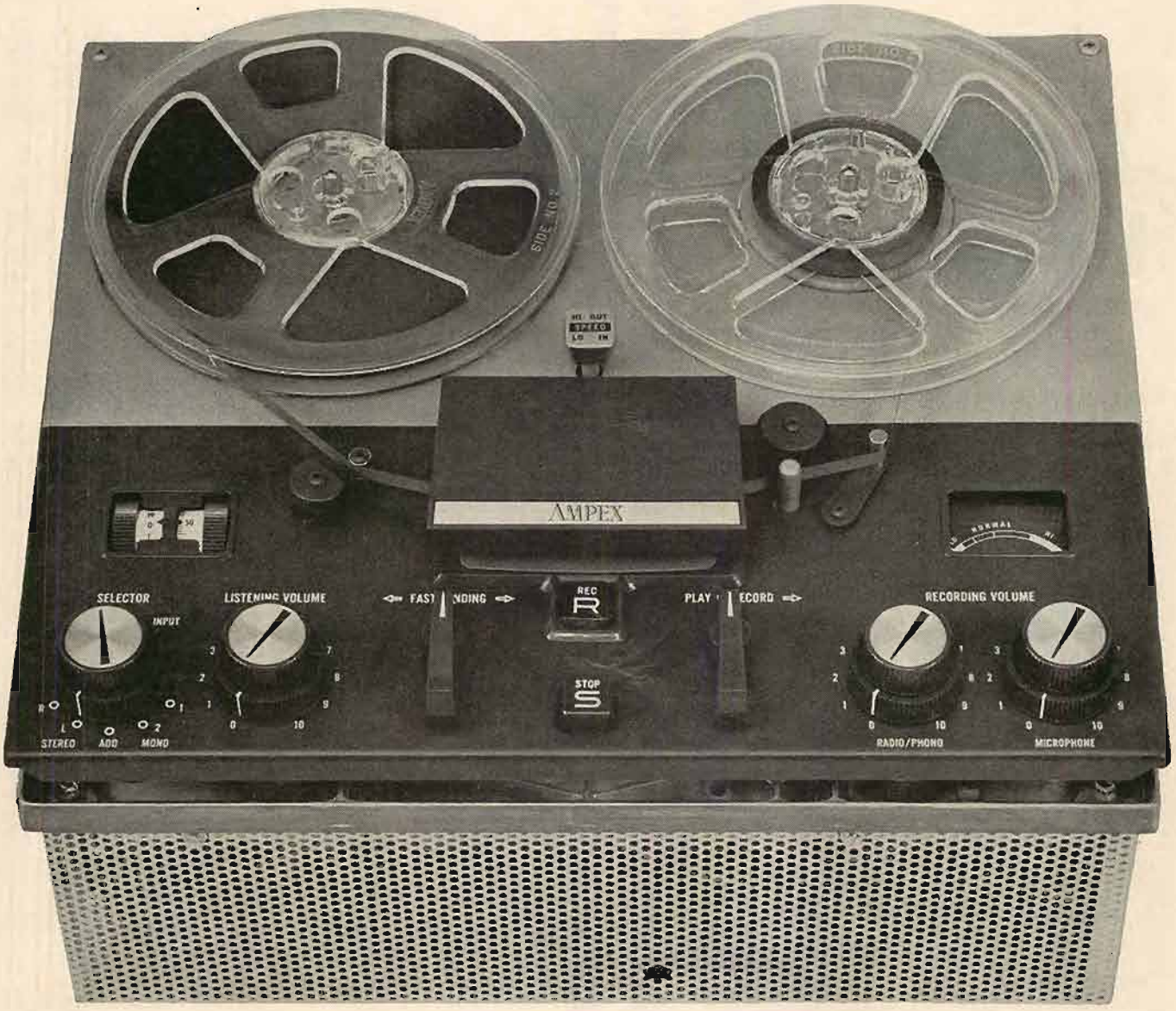
Stop pitch	Corresponding harmonic
16 feet	Double
8	Fundamental
4	2
2-2/3	3
2	4
1-3/5	5
1-1/3	6
1-1/7	7
1	8

On the Pedals

Stop pitch	Corresponding harmonic
32 feet	Double
16	Fundamental
8	2
5-1/3	3
4	4
2-2/3	6
2	8

Notice the rather complete harmonic series. Is it any wonder that the pipe organ of tradition can produce so many different effects and tones in spite of the fact that its pipes fall into only four main tonal families? I think that the art of the electronic organ will be greatly advanced when more builders and players learn to use stop of other pitches in addition to the usual 16, 8, 4, and 2 foot pitches.

GEORGE S. SPRATT,
452 W. Bel Air Ave.,
Aberdeen, Maryland.



The new Fine Line Ampex 1200

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Now, for those who insist upon the very finest in 4-track recording: the new Fine Line Ampex 1200. This precision recorder completely eliminates cross-talk common among ordinary 4-track machines. And gives you studio quality performance in your home. The reason: the Ampex 1200 is built to professional standards—with over 170 engineering advances. ☐ The first three advances: three new heads to permit precise narrow track recording, playback and erasing. (They're made like those in Ampex professional and scientific recorders.) ☐ Fourth advance: a new tape guidance system to keep the tape in precision alignment from supply reel to take-up reel. We call this: fine line alignment. It prevents cross-talk and gives you full frequency response. (It can't be jarred away, either. Both system and heads are mounted on a micro-milled die cast frame to insure stability for the long life of the machine.) ☐ Advancement five: low signal-to-noise ratio. Comparable to broadcast recorders. ☐ These—and other advances—are the many reasons why the Fine Line Ampex 1200 is your best buy among 4-track recorders today. See and hear it at your local Ampex dealer. Prices start at $499.50. Ampex Corporation, 934 Charter St., Redwood City, Calif.

CONSERVATIVE SPECIFICATIONS: Records 4-track stereophonic 4-track monophonic. Plays 4-track stereophonic, 2-track stereophonic (optional), 4-track monophonic. Speeds: records and plays at 3¾ and 7½ ips with up to 8 hrs. 32 mins. of monophonic recording or playing. Recording inputs: high impedance inputs (radio-phono-TV-auxiliary) approx. 0.25 volts rms for maximum normal recording level; high impedance microphone inputs. Playback outputs: approx. 0.75 volts rms from cathode follower with tapes recorded to maximum normal recording level. Frequency response: 50-15,000 cps ± 2 db at 7½ ips; 50-8,000 cps ± 2 db at 3¾ ips. Signal-to-noise ratio: better than 55 db at 7½ ips; better than 50 db at 3¾ ips. Flutter and wow: under 0.2% rms at 7½ ips; under 0.3% rms at 3¾ ips. (Measured according to American Standards Assoc.) Timing accuracy: perfection of pitch to within ⅓ of a half-tone. Models: 1250—without case, 1260—portable, 1270—portable, built-in amplifier-speakers.

AMPEX

CHESTER SANTON*

Titans of the High Iron Riverside 95512

Stereo recordists have been racing against time in order to preserve the sound of the last of the steam locomotives. Steam is still abundantly represented in the mono catalog but very few engines of that type are available for recording in present-day stereo. In recent years, a tiny corps of specialists has come into existence: a group concentrating on the problems of outdoor stereo recording of steam locomotives in action. In many cases, railway officials have worked in close cooperation with these recording crews in order to get the best possible documentation of an era on rails that has almost vanished. Three lines located in the states of Pennsylvania and Michigan furnished the cast of iron starred in this release. Reading Railroad and the narrow gauge East Broad Top Railroad Co. are the Eastern roads; Grand Trunk Western, working out of Detroit represents the Mid West stronghold of the Iron Horse. Top quality studio-type microphones were used by Ralbar Productions in making this recording for Riverside. It may come as a surprise to some readers to learn that studio condenser mikes can be used out in the field right next to the smoke stacks of steam locomotives. Many stories used to circulate about the finicky temperament of these mikes during their first years in this country until the Cinerama movie productions of the mid '50s proved that these microphones could go anywhere and still bring back a terrific multi-channel sound track.

The trains recorded here put on their best stereo act as they rumble past with soul-satisfying lows but the most haunting sequences are the distant takes when the whistles have a chance to echo throughout the rolling hills of Central Pennsylvania. High-grade sound in all the bands of this record makes this item ideal for stereo fans who like to run their volume control at full throttle.

Subways Are For Sleeping (Original Broadway Cast) Columbia KOS 2130

Some of the musical theatre's best friends and closest observers have put forth the theory that prosperous times seem to reduce Broadway's creative vitality. If the idea holds water, "Subways Are For Sleeping" signals another upturn in our general prosperity. A good-sized truckload of capable professionals have been involved in this production but the point and flavor of the story registers lightly in the recording by the original cast. The story, admittedly, is not an easy one to set to music yet the Jule Styne score presents only one or two tunes that I would go out of my way to hear again. The idea that triggered the show is an appealing one—how to scrounge a living in a big city through imaginative use of work-shirking brain power in order to avoid the perilous stresses and strains that burden the normal wage earner. The book and lyrics by Betty Comden and Adolph Green transmit only fleetingly the engaging charm of the oddball characters who peopled Edmond G. Love's best selling book. The vocal honors favor the distaff side of the cast. Carol Lawrence, in the leading role of a magazine writer gathering first-hand material on the finer points of a hand-to-mouth existence, has the good fortune to be involved in the show's two best songs—*Ride Through the Night* and *Comes Once in a Lifetime*. Orson Bean and Phyllis Newman (Mrs. Adolph Green) make the most of an animated good-for-stereo telephone conversation in *Strange Duet*. Sidney Chaplin's relaxed baritone complements the lyrics of *I'm Just Taking My Time* but the intricate melodic line of *How Can You Describe a Face* gives him a difficult course to steer in matters of pitch. The entire cast works hard in this show. Unfortunately "Subways" has failed to come in on the upper level.

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

Esquivel: Latin-Esque RCA Victor LSA 2418

Each album by Esquivel, the Mexican Madcap, is apt to leave the listener with the impression that the limit of instrumental ingenuity has now been reached. This feeling, as we have learned over the years, persists only until the release of his next collection of mayhem in Latin tempo. Here Esquivel converts the madder aspects of a gag by Ernie Kovaes into orchestral arrangements that would gladden the heart of Rube Goldberg. For the latest release in the Stereo Action series, he has talked the RCA management into permission to use two studios simultaneously for the production of Latin-Esque. One half of the orchestra was placed in Studio 1 of the RCA Building in Hollywood and told to put on its headphones. The other musicians were assembled in Studio 2, about a city block away, and told to listen to their erstwhile companions in a similar fashion. A certain Mr. Wilson was put in charge as guest conductor in Studio 2, leading us to believe that the brunt of the party took place in Studio 1 where Esquivel could oversee it. Four engineers were assigned to the split session—the fourth man probably charging back and forth between studios in order to live up to his imposing title of Communications and Maintenance Engineer. I suppose this is one way to reassure some listeners that they are getting maximum separation but the gag has by now lost much of its freshness following a succession of Phase Four releases on the London label. In addition to the usual channel switching, Latin-Esque makes considerable use of reverberation achieved by means of a tape loop. Xylophones and percussion are given seemingly infinite repetition as enhancement for Esquivel's piano in the title tune of the album, *Cachita* and *You Belong to My Heart*. A bass accordion only inches away from a mike produces woofer frequencies that may prove more surprising to your ear than the album's most outspoken tympani passages. Speaking of surprises, watch out for the *Scratcher*—the gourd with grooves across its top—as it rasps its way from one speaker to the other at the very beginning of the record.

Bing and Satchmo M G M (UST) STC 3882

Johnny Mercer deserves equal billing with Bing Crosby and Louis Armstrong in this informal reunion of two of the nation's most enduring talents. If the passage of time is evident anywhere in this tailored-to-measure travelogue through great old tunes, it shows up in the relatively sedate sound of the Armstrong trumpet. Three songs by Mercer show up in the course of the program but his work in adapting most of the other tunes gives this reel an unmistakable flavor. Billy May and Bill Thompson have charge of the orchestra and chorus respectively but the rest of the cast quickly fades into the background as soon as the stars appear. Bing and Louis dominate the spotlight in much the manner of an old vaudeville team. Between the two of them, someone is "on" all the time. When a vocal duet is not in progress, one partner busies himself in an assisting role.

A typical rundown may be found in a tune such as *Sugar*. Bing starts the ball rolling and then offers comments of pertinent whimsy while Louis proceeds to grind down a chorus; the vocal spot then returns to Bing during the Armstrong trumpet chorus before the tune is bounced off with a vocal duet. The old Armstrong staple *Brother Bill* is a logical candidate for a gathering such as this. *Dardanella, Muskrat Ramble,* and *Bye Bye Blues* flourish nicely under the affectionate treatment they get here. Among the Mercer compositions, *Rocky Mountain Moon* gives Crosby his best chance to croon while the song writing trade takes a gentle ribbing in the seldom heard *Little Ol' Tune*. Today's youngsters may consider these performers a bit old hat but they'll have to admit the angle of the chapeau is still a rakish one.

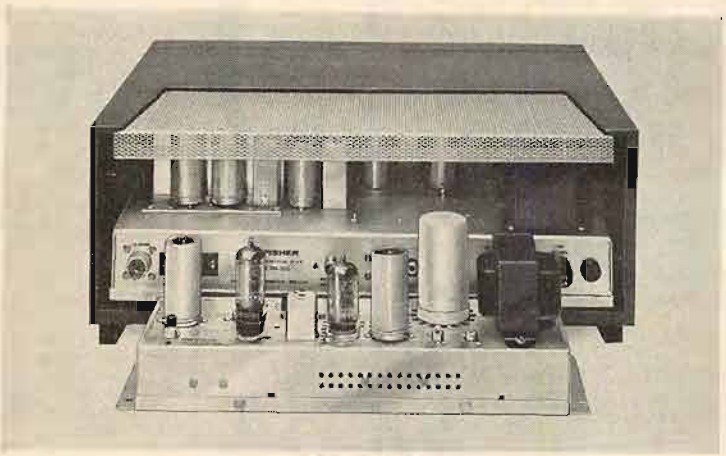
David Rose: Spectacular Strings M G M (UST) STC 3895

It would seem that David Rose has decided strings alone are no longer the drawing card they used to be. This is quite an admission from one of the leading exponents of the strings-can-do-anything school. In an understandable effort to go spectacular in this tape, Rose has added mild-mannered percussion which he uses to best effect in *Misirlou, Slaughter on Tenth Ave.* and music from *Kismet*. A tune called *Happy Bow* and a novelty based on the "Kreutzer Sonata" give the strings the sort of workout we've come to expect from David Rose. *There's a Small Hotel* spotlights a smoothly handled piano at left of center. *Silent Thunder,* of all the sweet tunes in the album, seems to offer the best possibilities for future growth. A touch of echo has been introduced in this reel but not enough to cause distress on a big system. Once they get used to the slight intrusion of percussion instruments, David Rose fans should find much to praise in this reel.

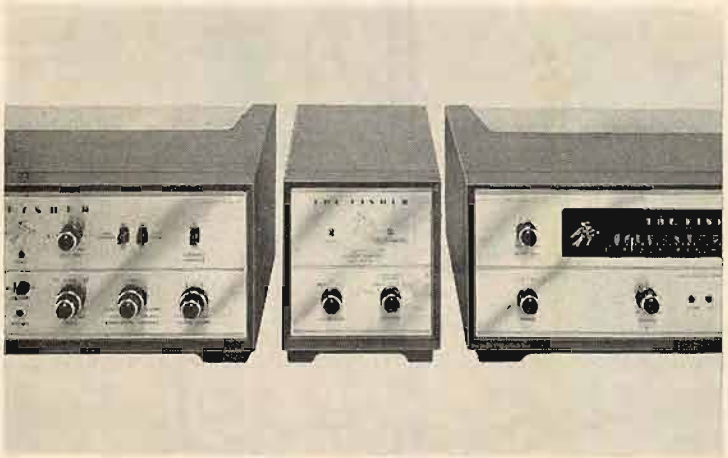
Lena on the Blue Side RCA Victor LSP 2465

The effect I get in this latest Lena Horne disc is that of a stage appearance instead of the crowded night club suggested in some of her previous releases on the Victor label. Even when allowance is made for the extra margin of depth I'm getting on most records these days with my current stereo pickup, this performance in an azure spotlight is the best stereo appearance Miss Horne now has to her credit. An improvement immediately noticeable in this set is the control of sibilance now that mike distance has been increased. In *Paradise,* the first song on side one, we get a good illustration of the record's many fine points as the violins of Marty Gold's orchestra imitate Lena's style as she slides up the scale during some wordless passages. I'm sure I'm not the first one to discover that a phrase without words from Lena Horne can send more meaning through a sensitive amplifier than a whole lyric delivered by most other singers. Going through varying shades of blues, Miss Horne brings a refreshing touch to several old favorites. In *It's a Lonesome Old Town* there's a sly suggestion that the loneliness may not last forever. Rodgers and Hammerstein's *It Might As Well Be Spring* has an undercurrent of optimism not normally associated with the tune and *The Rules of the Road* finds Lena happily heaping scorn on a befuddled suitor. If you happened to miss some of this artist's earlier stereo releases that have already been withdrawn ("Give the Lady What She Wants," LSP 1879 and "Songs by Burke and Van Heusen," LSP 1895), you'll find this item eminently worthy of a place beside previous albums that were made at the Waldorf and the Sands.

We have nothing to hide



except this new concealable version



of the Fisher universal Multiplex adapter.

There is nothing secret about Fisher components — in specifications, circuitry or construction details. It's easy to come out in the open when you have the best of everything.

But there are quite a few FM tuner owners who don't find it easy to have a Multiplex adapter out in the open. No matter how eager they are to receive the thrilling new FM Stereo broadcasts with the finest possible equipment, they simply don't have room for another control panel out front. For that reason they have been unable to take advantage of the superb Fisher MPX-100, until now the only truly universal Multiplex adapter—the only instrument capable of converting any high-quality FM tuner or receiver of any make or model to FM stereo operation.

The new Fisher MPX-200 now provides an alternative. It can be conveniently hidden anywhere, up to three feet from the FM tuner or receiver, and it completely duplicates the MPX-100 in electronic performance—including universal compatibility, freedom from distortion, unusually great channel separation and a high signal-to-noise ratio.

There's only one essential difference between the MPX-100 and the MPX-200: the former incorporates the exclusive Fisher Stereo Beacon. This ingenious Fisher invention automatically lights a signal to show whether or not an FM station is broadcasting in Multiplex and automatically switches the equipment to the correct mode of operation, Mono or Stereo. Stereo Beacon necessarily requires a front control panel.

The Fisher MPX-100 universal Multiplex adapter, less cabinet, is priced at $119.50*; the Fisher MPX-200, less cabinet, at $79.50*.

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FREE! $1.00 VALUE! Write for the 1962 Fisher Handbook, a 40-page illustrated reference guide and component catalogue for custom stereo installations.

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A406

Noel Coward: Sail Away **Capitol SW 1667**
Ted Straeter: Dance to Music from Sail Away **Capitol ST 1666**

In effect, Noel Coward's latest record takes us backstage during the days when he was rehearsing his latest Broadway show. Hearing him sing the songs from "Sail Away" gives theatre fans a rare opportunity to eavesdrop while Coward demonstrates how each tune was meant to sound. Show albums featuring a composer handling his own songs are no longer an absolute novelty but Coward's "Sail Away," more than most musicals, reveals the true bite of its original intent when the composer takes the helm. The lyrics take on a crackle that was scarcely suggested in the original cast album. The music provided by an orchestra under the direction of Peter Matz amounts to little more than a formality in this recording because the words are the composer's real ammunition; his delivery the weapon at hand.

There's a mixture of Cockney and "Mad Dogs and Englishmen" accent in the *Passenger is Always Right*. Of the ballads, only *Something Very Strong* sustains a steady melodic line. The salient points of entertainment appear in the clipped *Useful Phrases* and the Calypso rhythms of *When You Want Me* and *Beatnik Love Affair* where Coward's voice takes on some of the staccato beat of a bongo.

Ted Straeter's versatile dance music is a highly appropriate medium for an instrumental treatment of the "Sail Away" score. His piano and orchestra have long been favorites at the smart Persian Room of New York's Plaza Hotel. Unlike some of the best-known society bands appearing on records these days, Straeter scales his orchestrations to a level designed for home listening instead of the hubbub of a crowded ballroom. Capitol's stereo conforms, however, to the pattern of wide separation that orchestras of this type generally prefer. The brass section is clearly defined on the left, strings and reeds on the right.

Strings on the March Riverside RLP 7518

It's getting so a recording engineer on either side of the Atlantic scarcely knows what to expect on his assignment board at the start of a working day. We can only guess what some chap in Great Britain had to say when he discovered that he was expected to record an album of marches played by a large orchestra of brasses, rhythm, and (of all things) strings. The catch in this particular assignment was the unusual wish of the recording director that the Knightsbridge Strings dominate the brass during the melody. The success of the project leads one to suspect that the engineer on duty had probably worked with the Knightsbridge Strings in former recordings made for the Top Rank label. Now that the Rank organization's label is no longer being circulated in this country, Riverside Records has taken this unorthodox orchestra under its wing. If you don't believe that banks of violins and cellos can take on a march rhythm, listen to what these strings do with *British Grenadiers, Under the Double Eagle,* and *Colonel Bogie March.*

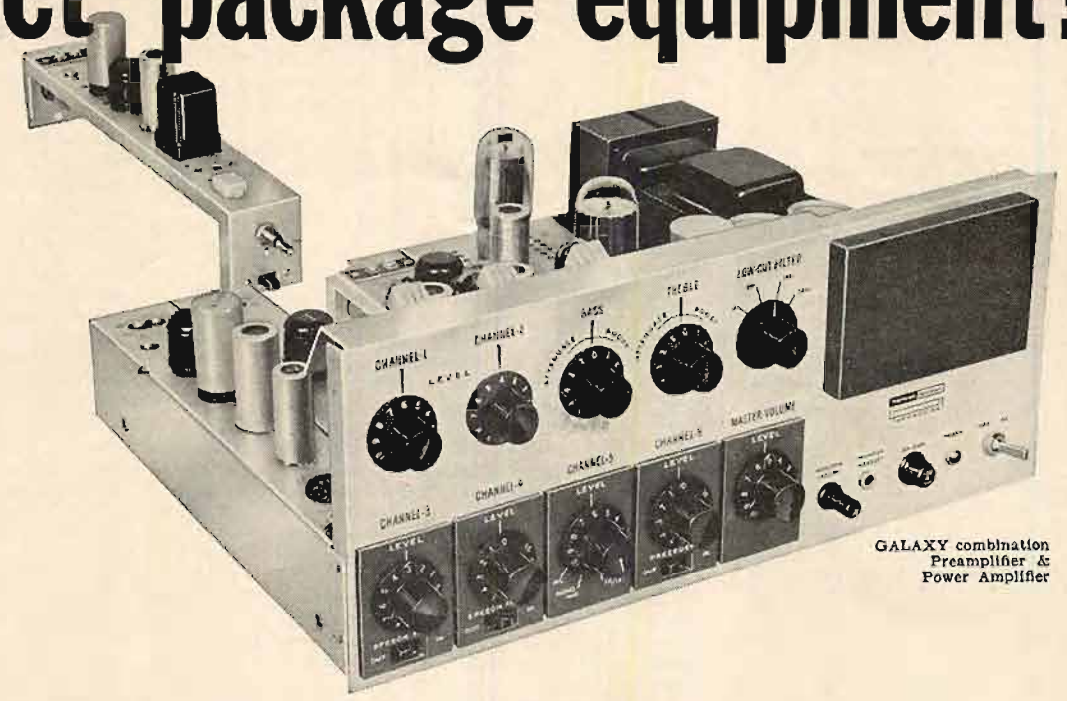
Dinah Shore: Dinah, Down Home! **Capitol ST 1655**

Has anyone ever spelled out just how much a record reviewer is supposed to enjoy his work? Listening to some of the forlorn gems that occasionally manage to reach the market, I sometimes wonder about the record industry's real concern in this matter. All too often these days a release is thrown together solely to counteract a gimmick being touted by the opposition. This latest record by Dinah Shore, I'm happy to say, blithely ignores the industry's inner problems and concentrates instead on a form of entertainment that only Dinah can provide at the present time.

This disc is nothing less than an attempt to revive the sound of one of the great radio shows of the past that featured Dinah Shore in songs of the South—"The Chamber Music Society of Lower Basin Street." Revive it they do with the help of Jack Marshall's arrangements that provide a subtle Dixieland

(*Continued on page 71*)

The quality and versatility of custom sound with the installation ease of compact package equipment!



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AUDIO ETC.

Edward Tatnall Canby

WIDER REPORT

If he'll let me, I'm going to jump the gun on one of the Editor's new ideas here, a policy that is likely to begin shaping up as we enter our fourth five-year plan this May. I'm jumping, because the idea seems to me good.

No matter how often I repeat, here, that this department does *not* do instrument-testing and is not an equipment report, I still find myself taken as an equipment reporter, by readers and—worse—by manufacturers. Yes, in a way this column could be called an equipment review; for I do talk about hi-fi stuff as it comes out. But the intention is—or was intended to be—what you might call a significance-report. The product itself is supposed to have two characteristics here: (a) It is evaluated as Something New, a significant, or interesting, or amusing, or dangerous, or unfortunate development, or "Just what the Doctor Ordered." (b) It is a characteristic product, typical of a whole range of hi-fi equipment.

Strings

Now it's on this latter kick that I get strung up. A new type of product is easy. There's only one of them to talk about, or maybe even two or three, or four. At least when I do *my* talking. When LP appeared, there were only Columbia records. When stereo came in, only RCA had tapes, at the beginning. The bookshelf speaker existed at its first appearance in just three models —and I tried two of them. I borrowed one of the very first Fairchild stereo pickup cartridges in the spring of 1958—and there wasn't much available competition at all. My first stereo sound came through two separate amplifiers—what else? There weren't any stereo amplifiers, then.

But when the strikingly new begins to merge into the characteristic-of-a-type, I'm in trouble. Strings get themselves attached.

I talk about a "typical" stereo amplifier —and all the dozens of other makers of equally "typical" amplifiers get interested too, for perfectly good reasons! Howcome you haven't mentioned *our* amplifier?

I've had to swear off new bookshelf-size speakers recently because the competition is too stiff. My house would be loaded to the ceiling with them if I tried to try them all. The same with other products. It's getting tough for me to mention stereo amplifiers, FM-stereo (multiplex) tuners, magnetic cartridges, and so on, for the same reasons.

Sometimes I get almost desperate, looking for something really "New and Significant," and unique as well. Something I can write about usefully, with enthusiasm and with pleasure, without expecting a dozen other brands in the very next mail. Ours is a big business now.

My "testing" of any equipment is via routine and leisurely use, preferably incidental to other work, like judging the music on records.

If I "test" a cartridge, it simply goes into my system and is put to work; I forget about it as fast as possible. I prefer to let it tell its own story and if my attention is called to it, the reason is likely to be a very practical one. A brand new recording from so-and-so company seems strident in the loud parts; or the record grooves aren't deep enough—the stylus skips. Or maybe it's just a bad scratch? Only after some time do I begin to think—hey, maybe it's the *cartridge*. Now let's see, what cartridge *is* there in that arm? I can't for the moment remember. And the same when the sound is unusually fine. I'm likely at first to credit the recording in my mind.

Equipment Profile

The editor's idea is that these in-use judgments, from the home viewpoint rather than the engineer's analysis, from the musical viewpoint, too, are reasonably a part of an equipment report. And so we are thinking of draining off some of my evaluations, to be directly added to the equipment reports, the whole thing all in a piece. The main intent will be to widen the scope of the present "Equipment Profile" department and to leave me more room for the things which seem to be more directly appropriate to this space—new things, significant things, trends and so on.

I fear this won't allow me to evaluate quite all of the equipment on the market, even so! Not even the Editor, nor the Publisher, can manage that. I still can't find a way to play more than one record at a time, using one pickup, one amplifier, one pair of speakers (identical). Now if only I could play all those records at 78 and absorb their intelligence more than twice as efficiently . . . If only I had an automatic cartridge rotator, that would switch in a different cartridge every thirty seconds while my records played, throwing the brand-name on a screen handy to my living room chair. If only—when you come down to it—I could listen to cartridges, speakers, amplifiers *and* music all at the same time.

I can't, and that is that. Not consciously, that is, nor on short time rations. But in the long pull, you see, this is exactly what I do manage to do.

I hear the whole system, from composer to performer to recording to hi-fi sound, as one huge super-unit of home entertainment. The functioning parts of this huge whole get themselves sorted out in my mind in due course. But I've never been able to do the sorting under forced mental draft. I just get confused. My ears go dead. My judgment, whether of music or hi-fi, gets positively addled. I sink into a state of hi-fi apathy bordering on imbecility. And I end up having a glass of beer or Ovaltine and going to bed for a good sleep.

That's the best way of all to evaluate music and equipment. Sleep on it. Night after night. Works wonders. Takes time, too.

SHARPLY RECTANGULAR

Just as well, said I to myself. The Editor had observed that I'd written too much again, for the March issue, and he'd have to hold over part of it. Just as well, I thought, since there's a paragraph in there I'd wanted to change anyhow. New info. So when the March issue came out and I'd managed to extricate it from my mailbox as usual with the cover half torn off, I read contentedly through "Audio, ETC" (checking up on myself) to the little AE that means "the end," bottom of page 14, then got out the leftover stuff on the Automatic Arm and began to fix it up for April . . .

Coupla hours later . . . well, look on page 62 for March. (Guess they decided to separate the "Audio" from the "ETC" or something.) Was I surprised.

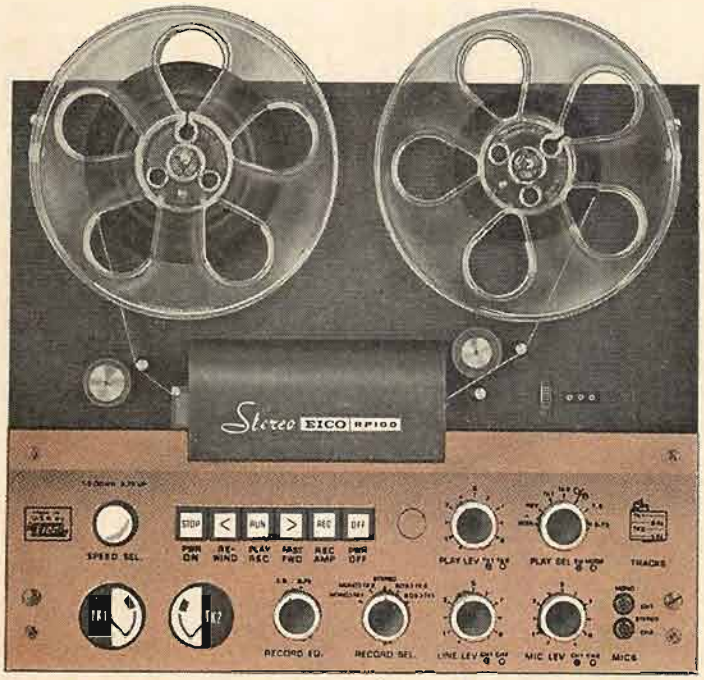
The changeable paragraph was incidental and merely had to do with my li'l illustration of how a lightweight arm turned out to be too light for a lightweight cartridge by the same maker. I was wrong—quite wrong. That is, sort of. My assistant had put the new cartridge in the arm and had told me he had found it necessary to add pennies to bring the thing down to earth with the company's new ultra-lightweight cartridge in it. Then I sent him out to buy a second shell for the arm, to AB another cartridge—and we discovered to our slight embarrassment that the new shell had not one, but two little flat weights supplied with it. The old one had a single weight, not enough. Question: did it come that way originally, or did I lose the second weight? Very likely I did.

Anyhow, the arm and cartridge were both out of Shure Bros. The arm was the relatively middle-aged Shure M-232, of a year or so ago. The cartridge was the more recent M-33, ultra-light and ultra-compliant. With only only one of the weights in the cartridge shell, the M-33 floated in the air with the spring tension for stylus force at maximum. Hence the pennies on top.

Well, let it be said that with the presently-supplied dual weights in its head the Shure arm *will* accommodate the new Shure cartridge, and that is that. What is more important, here, is to cite this particular arm as a special example of the newly popular dynamically balanced design, the free-float arm that is brought to proper stylus force by a spring instead of via old-fashioned gravity; Shure's is a relatively simplified version adapted to mass production. (The Grado arm, as of last month's unexpected addendum on page 62, is a sample of the more elaborate and semi-handmade approach to the same basic idea.)

The Shure arm is a metal tube with very light plastic detachable head and a base assembly made of the same black material, the design sharply rectangular and generous in length. The head uses a version of the Danish screw connector with four contacts, also to be found, though not quite interchangeably, in such arms as the Empire, the SME, ESL, and in a similar arrangement in the Rek-O-Kut.

Considering the simplifications in it, the Shure arm works extremely well, or has for me. The ultimate in refinements are inappropriate here and are absent. No tricky hair-springs for stylus force, just a good old-fashioned plain miniature-door-spring affair, with a little knurled knob to bring it up tighter. A sensible trick: you can unhook it while you bring the main arm to the zero-weight balance via the rear counterweight. Saves screwing the spring all the way down to slack each time, then screwing it back to the required tension. Not exactly



9 New Features Now In The New 1962 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.
9. Shock-absorbent helical spring tape lifters practically eliminate tape bounce at start of fast winding.

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

Factory-assembled: Handwired throughout by skilled American craftsmen $399.95

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

Carrying Case $29.95
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FM-AM Stereo Tuner ST96
Kit $89.95 Wired $129.95
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70-Watt Integrated Stereo Amplifier ST70
Kit $94.95 Wired $149.95
Includes Metal Cover

40-Watt Integrated Stereo Amplifier ST40
Kit $79.95 Wired $129.95
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FM MULTIPLEX AUTOADAPTOR MX99 (Patent Pending)
Kit $39.95 Wired $64.95 Cover Optional $2.95

An original EICO contribution to the art of FM-Multiplex reception

The MX-99 employs the EICO-originated method of zero phase-shift filterless detection of FM Stereo signals (patent pending) described in the January 1962 issue of AUDIO Magazine (reprints available). This method prevents loss of channel separation due to phase shift of the L−R sub-channel before detection and matrixing with the L+R channel signal. In addition, the oscillator synchronizing circuit is phase-locked at all amplitudes of incoming 19kc pilot carrier, as well as extremely sensitive for fringe-area reception. This circuit also operates a neon lamp indicator, whenever pilot carrier is present, to indicate that a stereo program is in progress. The type of detection employed inherently prevents SCA background music interference or any significant amount of 38kc carrier from appearing in the output. However, very sharp L-C low pass filters are provided in the cathode-follower audio output circuit to reduce to practical extinction any 19kc pilot carrier, any slight amounts of 38kc sub-carrier or harmonics thereof, and any undesired detection products. This can prove very important when tape recording stereo broadcasts. The MX-99 is self-powered and is completely factory pre-aligned. A very high quality printed board is provided to assure laboratory performance from every kit. The MX-99 is designed for all EICO FM equipment (ST96, HFT90, HFT92) and component quality, wide-band FM equipment.

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The Pro's Nest

Saul J. White
Chief Engineer, Audax, Inc.

NO. 9 — A CORRECTION

In my last column I discussed a class of radio station whose broadcasts filled me with nausea. The column dealt with stations featuring exclusively rock and roll, jazz, noisy commercials and the sonic discharge of wild disk jockeys and announcers, whose only talents are gifts for noise, fast talk and incitement to juvenile delinquency. Two airliners collide, 128 persons die, Brooklyn is burning and through it all these stations continue their salvos of brassy nerve-shattering frantic jazzy music.

There comes a time in every writer's life when he throws caution to the wind and gives vent to his pet peeve. This was my state of mind when I wrote my December 1961 "Pro's Nest" entitled: *"The Age of the Screaming Brass."* Perhaps it was the unreality of the season with the City ablaze with Christmas decorations, the streets filled with music, the evenings devoted to holiday festivities that produced a devil-may-care attitude.

For years I had been tortured by sonic bombardments and screechings from some of our radio stations. I resented the machine gun firing of weather reports, time announcements and call letters interspersed with deafening commercials. With no holds barred, I expressed what had been gnawing at my innards for these many years.

I had no intention to single out any particular radio station and thinking I was picking a fictitious station, I chose the letters "WXYZ-AM" as my target. I could not imagine any better call letters for a mythical station. This time imagination was as good as reality. Believe it or not, dear readers, there is a real, live station "WXYZ" in Detroit, Michigan.

No particular station was in my mind when I described a form of broadcast that was equivalent to a sustained toothache or a spike driven through one's eardrums. I knew nothing of the character or programming of the real "WXYZ" and I certainly had no intention of damaging the reputation of that station or any other *specific* station. Therefore, I call the attention of all readers to the fact that my column of December 1961 must not be identified with "WXYZ" or "WXYZ-AM."

Allow me to proffer my apologies. I know it is no comfort to you, "WXYZ", that I thought your call letters were a figment of my imagination. I know now that you are a good station giving service to millions of devoted listeners in your area. Indeed, I realize how provincial my radio listening has been, but I never did get you on my radio in New York, though I did get quite close with a Canadian station coming in one night when I was hunting for a program to help with my insomnia.

I am sure, "WXYZ," that you are a well-mannered station. You have a balanced program catering to all tastes, a little rock and roll, for the youngsters, a little dinner music for the oldsters, and perhaps a symphony for the long hairs, I know you give the time and weather reports without hysteria and your commercials are properly interspersed and presented with refined modulation.

Since I have been writing the "Pro's Nest", I have been threatened with libel suits by networks, publishers, authors, hearing aid manufacturers and dog haters. My boss is getting pretty tired of all this. If I don't get occasional letters of praise and support for my straight-shooting, the monthly budget for this column will be dropped. If I can't project the right kind of image for Audax, it will be back to the drawing board for me! After all, we must get a little of our money's worth.

If you want the "Pro's Nest" to continue, please send us your sympathies, congratulations, sneers and arguments, as long as we know you are out there. Anything will help. I will send you our catalogs and my personal thanks.

a precision device, this door-spring, but it works OK, give or take a half-gram or two. This arm doesn't bother either with sidewise dynamic balancing—but then, neither have most of the billion arms that have played the billion-odd records of recent decades.

One minor cybernetic problem in longish free-riding arms is solved here intelligently. Should your arm pivot all the way 'round and 'round, or should you try to keep people from letting it go too far via an arm stop of some sort? One arm I recently wrote about has a delicate spring inside and no arm stop; if you just happen to wind the arm around in a complete circle, the spring is going to break and must be factory-replaced. Wonder I didn't do this myself; but I managed not to. Shure has a trick compromise, an arm stop that can be pushed along if you push harder. Good. Any device that stops the arm's movement at a given place must be adjusted somehow so that the arm moves over the piece of arc you need, and not some pie-shaped wedge, say, neatly centered over the record spindle or off in space a foot or so away from the turntable. This has to be set, ordinarily, during the arm installation, and five out of ten installers will forget about it and have to re-mount the arm. Shure's you just push, until it's where you want it. But the arm won't suddenly free-wheel around in a dizzy circle by accident.

I note one welcome feature of the Shure arm—extra cartridge shells can be had at a quite reasonable price. I must say, I wince at paying five bucks or so for each extra shell I buy for some other arms, to accommodate alternative cartridges. Probably worth it; but even so, I'd say that a low profit margin might be wise on incidentals of this sort. Very good for morale and for sales of the main product, the arm itself.

SIDE-SENSITIVE

Out in the country, this early spring is the season when outdoor aerials go bust, and there isn't anything you can do about it until the thaw gets over with and spring is really here.

Mine really played tricks on me this March. Up until the snow, sleet, and ice began, it had worked normally enough: a directional yagi affair mounted on top of a rotator, it brought in my New York stations when I aimed it South by a bit West, and when I wanted the Travelers Weather Service, in Hartford, off slightly Nor'East —the Travelers is the only intelligent weather service in the country, fit for an unknowing but sensible listener with an IQ of, say, 99 or above—well, I rotated the aerial with my switch box in the house until the meter registered East and in came the Weather, complete with probability estimates, like 3 out of 10 chances for snow by evening, 6 out of 10 later on, lowering to 2 out of 10 by morning . . . Full limiting at the easterly setting; yet at the southerly setting, for New York, the weather is barely audible at all. Off the beam.

Come March, we had 15 inches of snow followed by what seemed like several feet of dense sleet, mixed intermittently with rain, all below freezing. About five storms' worth. Then a thaw—34 degrees. And a re-freeze, for a crust that you couldn't break with a sledge hammer and a mass of twisted, bumpy solid ice on my road, heaved into ruts and rocky hummocks.

On my roof there was lead-like sleet, merging all around the edge into a layer of clear ice about eight inches through. Off the edge, seven-foot icicles formed, to be knocked down every day or so. Right through the middle of that clear ice went my dipole FM lead on one side of the house and on the other the four-wire leads to the rotator.

For three weeks in a row I got practically no signal at all, no matter where I rotated. Seems something must have been leaking into the ice. Then things got zanier. I found that the rotator did make a difference, but the strongest signals came when the antenna was *side-on* towards the source of the signal. New York came in OK when the thing pointed due Northeast, broadside; but the Weather, straight ahead, couldn't be heard at all. Drowned out by New York, twice as far away. Finally, at ten below, the rotator stopped rotating. Then it began, very slowly, in one direction only. The other direction just made the meter jump to the pin and go zzzzzz. Short. Since then, I've been stuck at due West. No weather, no New York.

Then suddenly, after a week, New York came back, followed all of a sudden by Weather, at the rear of the stuck antenna. Clear as a bell. New York faded out again; Weather stayed. So it looked as though maybe nature was beginning her spring cleaning, the radio beams were returning to the rule of reason, and maybe after another few weeks I might get up on the roof there and figure out what had happened.

The antenna? Still the FM/Q, until this zany winter a highly directional, *reliably* directional affair that never failed to distinguish between the points of the compass. Don't ask me what made it suddenly go side-sensitive. If you ask me, I think it was the radio signals themselves, taking a winter detour. Æ

THIS MONTH'S COVER

Most of the time nowadays when we consider equipment and speakers for home installation, we tend to think about the bookshelf-sized units in order to conserve space. On the other hand, there are many people who have both the space and inclination to encompass more elaborate systems. Here is a system intended for the latter type of person. Obviously, the focal point of the installation—and certainly the most space consuming—is the JBL "Paragon" loudspeaker system; it is both the sound and visual center. The rest of the equipment is housed in a Rockford furniture cabinet and consists of the following:

Tandberg Model 6 stereo tape recorder
Garrard Type A automatic turntable
Empire 108 stereo cartridge
Sherwood Mark 4 tuner
Sherwood Model 5000 amplifier

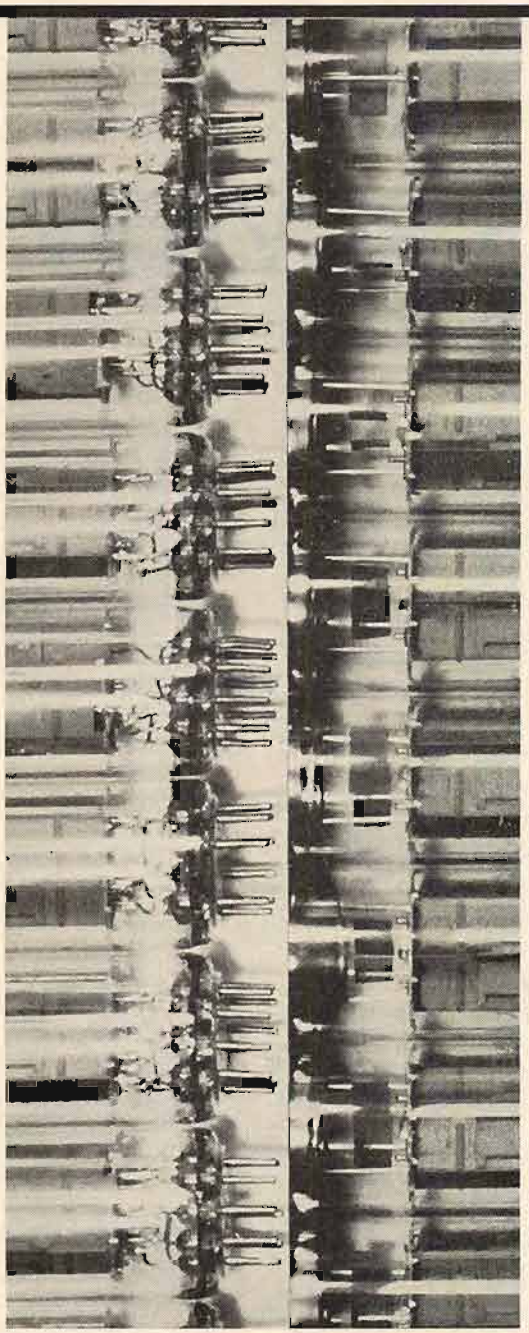
An interesting decorative note is the Buddha on top of the Lansing speaker system. It is an authentic reproduction of an ancient Buddha which serves as "mascot" for Empire. The painting on the left wall is by an Italian artist by the name of Milo, and the photograph was taken by Mort Weldon. This room setting is arranged at the main showroom of Airex Radio Corporation, 85 Cortlandt Street, New York 7, N. Y.

EXQUISITE HI-FI SOUND!

32-watt
FM/AM-AM/SW
Stereo Tuner Amplifier

SM-G204

The SM-G204 can produce an output of 32-watts (16/16w). 6GW8 (ECL86) suppling this output is a new output tube. Its triode is provided with adequate prevention against hum, while its pentode has been greatly improved in output sensitivity. Through the adoption of this high-performance output tube and tone-quality-first designing, the new SM-G204 can produce wonderful distortion-free HiFi tone.



The greatest care was taken to make this stereo amplifier easy to operate. To achieve this end, the number of knobs has been reduced, and the jacks for connecting record players and loudspeakers have been marked clearly by indicating plates. These considerations have certainly simplified the handling of a complex mechanism like the stereo amplifier. The SM-G204 has four high-sensitivity tuners—2 for AM (535—1605kc), 1 for SW (3.8—12mc) and 1 for FM (80—108mc) bands—and a preamplifier which allows the use of cartridges from the low-output high-quality type (2.5mV). The use of this amplifier transforms radio broadcasts, records and tapes into wonderful stereo reproductions.

If Pioneer's FM multiplex adaptor is connected to this amplifier, the tone quality of stereo FM broadcasts will be exceptionally fine.

New Product

High-Quality FM MPX Adaptor **MXA-1**

Pioneer is proud to announce its new, superb MPX adaptor for the greatest realization of FM stereo. The MXA-1 is:

1. Provided with a built-in power source.
2. Capable of noise-free reproduction because of attached noise filter.
3. Excellent in channel separation, achieving the finest stereo presence.

Enjoy more effective FM stereo reproduction by combining the MXA-1 with Pioneer's FM Stereo Tuner Amplifier.

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EDITOR'S REVIEW

RANDOM THOUGHTS

ISN'T IT ABOUT TIME that doubts about the value of stereo were laid to rest? We still hear relatively well informed people making the relatively uninformed statement that only the very critical and experienced few can tell mono from stereo. What they mean to say is that some stereo recordings are not as good as others; a good stereo recording gives depth to the music so that one can locate the source as well as the character of the sound. On the other hand, a bad stereo record doesn't permit one to locate the source—in essence no better than a mono record. Of course, in many cases the issues are clouded by a variety of subtle and not so subtle points: differences in quality, dynamic range, and the so-called "ping-pong" stereo. None of these things, however, can really obscure the fundamental fact that stereo can be markedly different from mono if done properly (and there are many, many recordings available where it has been done properly); as different, say, as two different interpretations of an orchestral composition. Naturally, one has to know both versions in order to distinguish between them. Similarly, one must know what *depth* and *location* mean in a musical performance. We might liken monophonic reproduction to paintings and stereophonic reproduction to sculpture. Both are art, but the former is two-dimensional and the latter is three-dimensional.

ISN'T IT TIME that the IHFM started to think about re-evaluating amplifier standards, in view of the appearance of transistor amplifiers? We are referring specifically to the requirement that measurements be made with a *very* well regulated *external* power supply. Considering the unusually interdependent relationship between the power supply and amplifier in transistorized units, it might be well to consider modifying the standard to accommodate this contingency. Isn't it also time to rethink the music-power rating? The horsepower race does seem to be about over.

ISN'T IT ABOUT TIME the weather started to turn warmer?

ARE ALL-NIGHT CONCERTS going to replace rock-and-roll? On February 24, Radio Station WGMS of Washington, D. C., broadcast the nine symphonies of Beethoven in a continuous cycle, ending at 6:00 a.m. Sunday, February 25. The all-night program was in tribute to Conductor Bruno Walter, who died on February 17. With examples like this, perhaps more sophisticated music will eventually supplant rock-and-roll. Anything is possible.

ISN'T IT ABOUT TIME that FM-AM stereophonic broadcasts were halted by the FCC? Now that FM stereo by means of multiplex transmission has been approved by the FCC, it seems rather incongruous that FM-AM stereo is still permitted. It can only serve as an obstacle to the acceptance of FM stereo by the general public. Why don't we all sit down and write to the Federal Communications Commission, Washington 25, D. C., and suggest that it call a halt to this basically inferior method of stereo broadcasting. By halting simulcasts, the stations now broadcasting stereo by this method may very well switch over to FM stereo.

TAPES NEEDED

Every now and again we run across a situation wherein people who would seem to have enough problems of their own are engaged actively in helping others. Just such a situation exists at the Veterans Administration Hospital in West Roxbury, Mass. A group of paraplegics at the hospital, who are studying a variety of subjects by reading and discussing amongst themselves, have decided to help blind students by reading entire textbooks and other appropriate literature aloud and recording them on tape. Hence the name of the project, "Textbooks on Tape."

Not content to do just a little, the group has decided to talk 500 tapes worth this year—that is, 500, ¼-inch, 7½-inch reel tapes. They would like any of us who wish to contribute reusable or new tapes to send them to "Textbooks on Tape," c/o Herman H. Scott, 111 Powdermill Road, Maynard, Mass. A good use of used tape—and new tape too, for that matter.

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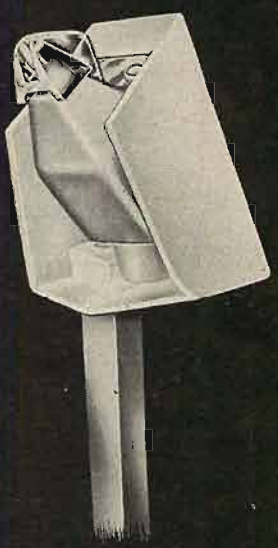
No matter how you look at it . . . the STANTON Stereo Fluxvalve is *different!*



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"FOR THOSE WHO CAN HEAR THE DIFFERENCE"
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The hermetically sealed STANTON Stereo Fluxvalve is warranted for a lifetime and is covered under the following patents: U.S. Patent No. 2,917,590; Great Britain No. 783,372; Commonwealth of Canada No. 605,673; Japan No. 261,203; and other patents are pending throughout the world.

Single–Speaker Stereo

L. H. GARNER*

Since the ultimate in stereo is illusion, and here is the ultimate illusion of stereo, it follows therefore, that this system is the ultimate in stereo?

THE DESCRIBED STEREO SYSTEM was proposed for the purpose of allowing a slight alleviation in the space problem, so often encountered with the installation of two-speaker systems for stereophonic usage. It will become evident, as my plan unfolds, a decrease in cost is not the prime objective. The methods utilized take advantage of tried-and-proven engineering principles, and are presented herein, in a non-complex form. What is new is the way these principles are used.

Referring to the over-all diagram in *Fig.* 1, it can be seen that an FM tuner is used as a signal source. Of course, any other stereo signal source may be used. From the "multiplex" output jack the signal is fed into a stereo adapter and the resultant two channels are fed to the preamplifier. Up to this point, there is no deviation from standard practice. The preamplified signals are now fed to an electronic switch, operating in a free-running mode at approximately 100,000 cps.

In the electronic switch, the two signals are sampled at the 100,000-cps rate, and the resultant composite signal goes to the power amplifier. (The basic concept of the electronic switch is illustrated in *Fig* 2.) It will be noted that a single power amplifier is used, a second amplifier not being needed, as in conventional systems. At the same time, synchronizing pulses are fed simultaneously from each half of the electronic switch (alternate cycles) to a servo amplifier and electronic strobe.

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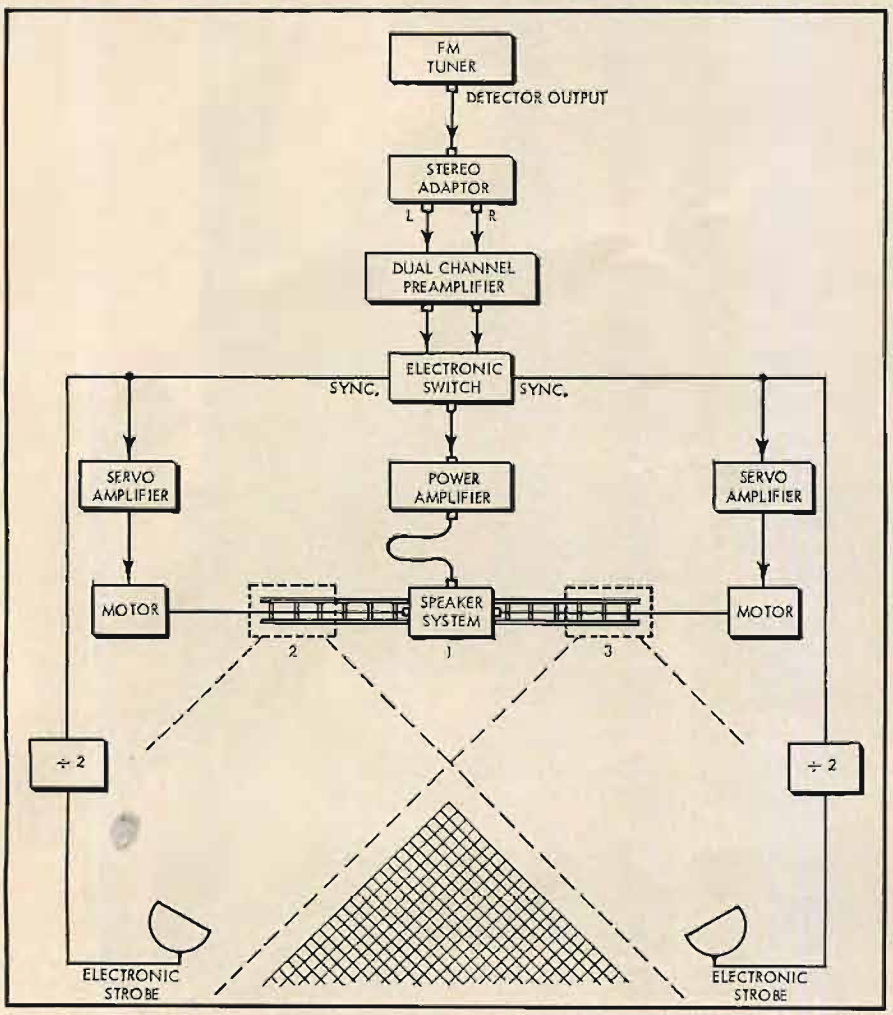

Fig. 1. The linear-track system.

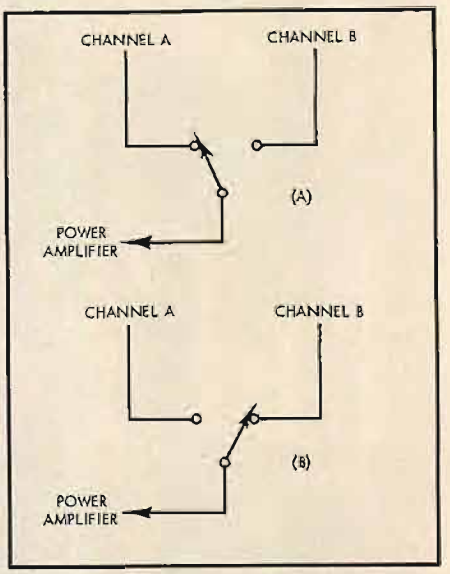

Fig. 2. The electronic switch performs the same function as a mechanical switch but at a greatly increased rate. Channel A is sampled in (A) and Channel B is sampled in (B). This is repeated 100,000 times per second.

Treating each of these individually, we find that the sync pulse is used to trigger the servo amplifier, which provides power to the servo drive motor, which, in turn, provides motive power to position the speaker system to one extremity of the guide rails. It goes without saying that extremely rapid amplifier and servo motor response is necessary for this operation. The other sync pulse goes to a binary divide-by-two device, which reduces the effective output pulse repetition rate to 50,000 cps, causing the strobe circuit to flash at this rate. The halving of the trigger frequency is necessary to provide time to move the speaker system from position 2 to position 3, or vice versa. The strobe systems illuminate the speaker at positions 2 and 3, providing the illusion of two separate and distinct speakers. Since the ultimate goal of stereo is illusion, by achieving illusion it can be said that we have created stereo.

During monophonic operation the servo system is disabled and the speaker remains at rest at position 1.

At this time it should be noted that in stereo operation effectively two speaker systems are in use; it would be a good idea to install a warning sign somewhere on the stereo system, for the

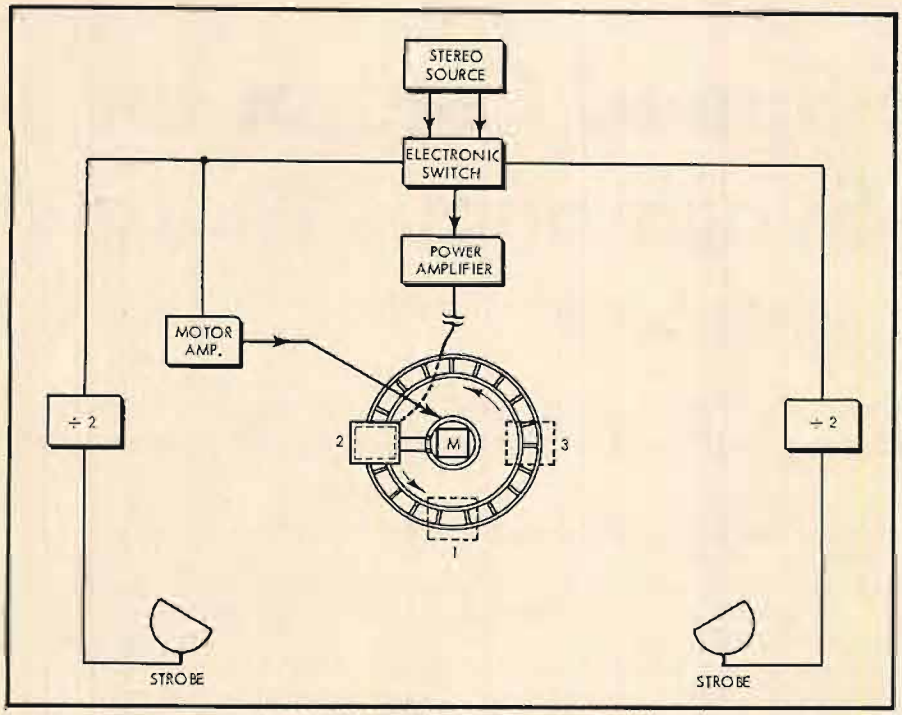

Fig. 3. The circular-track system.

unitiated. The sign could read as follows:

"DURING STEREO OPERATION DO NOT WALK BETWEEN SPEAKERS"

The basic waveforms associated with the switching process are illustrated in *Fig.* 4, and should be, at this time, self-explanatory.

Once the system has been installed and all preliminary adjustments made, the over-all maintenance should be extremely low. Periodically the speaker guide rails should be lubricated with a good low-friction lubricant, such as one of the generally-available molybdenum disulphide (MoS_2) compounds. This should be approximately every 25 stereo hours, or when squeaks and sparks are noticed. This, of course, would also depend on the over-all weight of the basic speaker system utilized, and would be at the discretion of the user. Aside from the low maintenance involved, it should be noted that the speaker system chosen must be one which is capable of handling the "g" forces involved during the starting and stopping of stereo operation.

Modifications

An alternate system, utilizing the same basic approach, could be set up on a circular track. This is illustrated in *Fig.* 3. Although the circumference of the circular track is twice the length of the linear track it would not provide as great a distance between speaker positions 2 and 3. Of course, the size of the track could be made large enough to provide equivalent separation, but again, the space problem is encountered. In spite of the space difficulties, the circular track does have some definite advantages over the linear track:

1. Continuous motion without the stop-and-go problems.
2. Need for only one amplifier and a single synchronous drive.

However, as sad as it may seem, the circular concept was abandoned due to the definite audiophilitic advantages inherent in the linear system.

Returning to the linear system, it can be seen that by providing a remote separation control (at the end of, say, a 25-foot cable), and by using this control to vary the switching rate, and more important, the strobe sync, we can easily provide virtually an infinite number of visual speakers. Therefore, by increasing the rate at which the strobes illuminate the system, we can provide 6, 8, 10, or even one *continuous* speaker system covering the entire distance between positions 2 and 3.

Conclusion

The feasibility of a stereophonic sound system utilizing a single speaker has been shown; Q.E.D. Certainly, many modifications and variations of this basic concept are possible, and are, in reality, limited only to the imagination of the users. To paraphrase the words of the immortal Lengthfellow:

Breathes there a man with soul so dead,
Who never to himself, hath said,
Man, like this is way out!

Æ

ACKNOWLEDGMENT

I wish to acknowledge the often helpful (often derogatory) assistance given to me by the following colleagues, without whose remarks, this treatise would have been much easier: M. S. Chrupcala, D. L. Patillo, D. L. Wirth, C. L. Hallmark.

L.H.G.

For those who hadn't guessed it already, we will point out the obvious—IT'S APRIL!!

Of course there is no reason to believe that the one-speaker stereo system described couldn't be made to work; it is within the realm of the possible. On the other hand, considering the probable development cost, it might be easier to hire an orchestra and rebuild your home in the form of an auditorium. If anyone does succeed in building an acceptable version, please send photographs. WE GUARANTEE PUBLICATION OF THEM!!

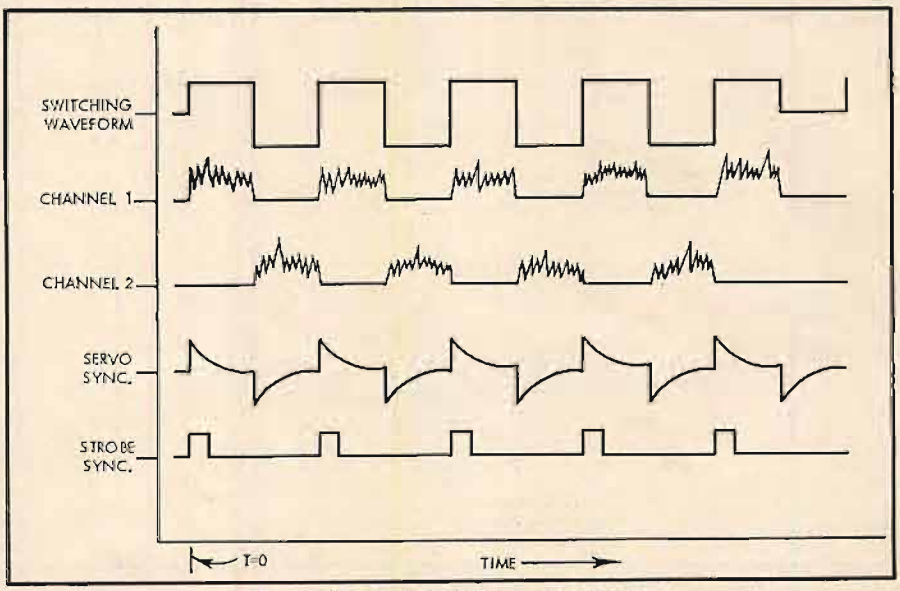

Fig. 4. The basic switching waveforms.

Electronic Speed Control for Hysteresis-Synchronous Motors

HAROLD D. WIEBE*

This article describes design features of a power supply for small induction motors which converts normally fixed-speed motors, driven from the 60-cps power line, into variable-speed motors.

TWO-PHASE HYSTERESIS-SYNCHRONOUS MOTORS are usually used in critical applications because of their smooth torque. These motors depend on an electrical phase difference between the currents in the two-phase windings for rotation. As this phase angle increases from zero to 90 deg., the torque increases from zero to a maximum value. The shaft speed in a correctly used motor is independent of the voltage source, but dependent on the frequency of the source. The magnetic field set up in the armature makes one revolution each electrical cycle, and the armature lags this rotating field by an amount depending on the load.

A power supply to drive such a motor at variable speeds should provide a constant 90-deg. phase difference between the currents supplied to the two-phase windings, and this current should be variable with frequency for varying the shaft speed. The phase currents should be reasonably constant for uniform torque at different speeds, but the frequency source must be stable at any frequency setting because the speed is only as stable as the driving frequency. In addition, the frequency source should be variable over a range corresponding to the desired speed variation.

Where only a vernier adjustment around the desired speed is needed, the power supply shown in *Fig.* 1 can be adapted to individual applications. A Wien-bridge oscillator is used as the frequency source. In the frequency-selective feedback network, most of the resistance is fixed, with a small part variable in the form of a ganged potentiometer. The capacitance in this network is a fixed value and should be stable, of good quality, and free from drift. If available in the higher capacitance values, mica units should be employed. The ganged potentiometer normally will not track exactly, but it may be calibrated in actual application. However, large changes in the amplitude of oscillation may occur since this non-tracking resistor affects the feedback factor. To minimize this, and to keep the output frequency free from changes due to gain and phase-shift variations in the amplifier, the amplitude-sensitive negative-feedback section of the Wien bridge should be adjusted very close to the balance point. The amplifier itself should be high-gain to provide sufficient feedback to maintain oscillation. This is accomplished by using a high-mu dual triode with a cathode-follower output to isolate the gain-lowering effects of the bridge. An additional advantage of this cathode

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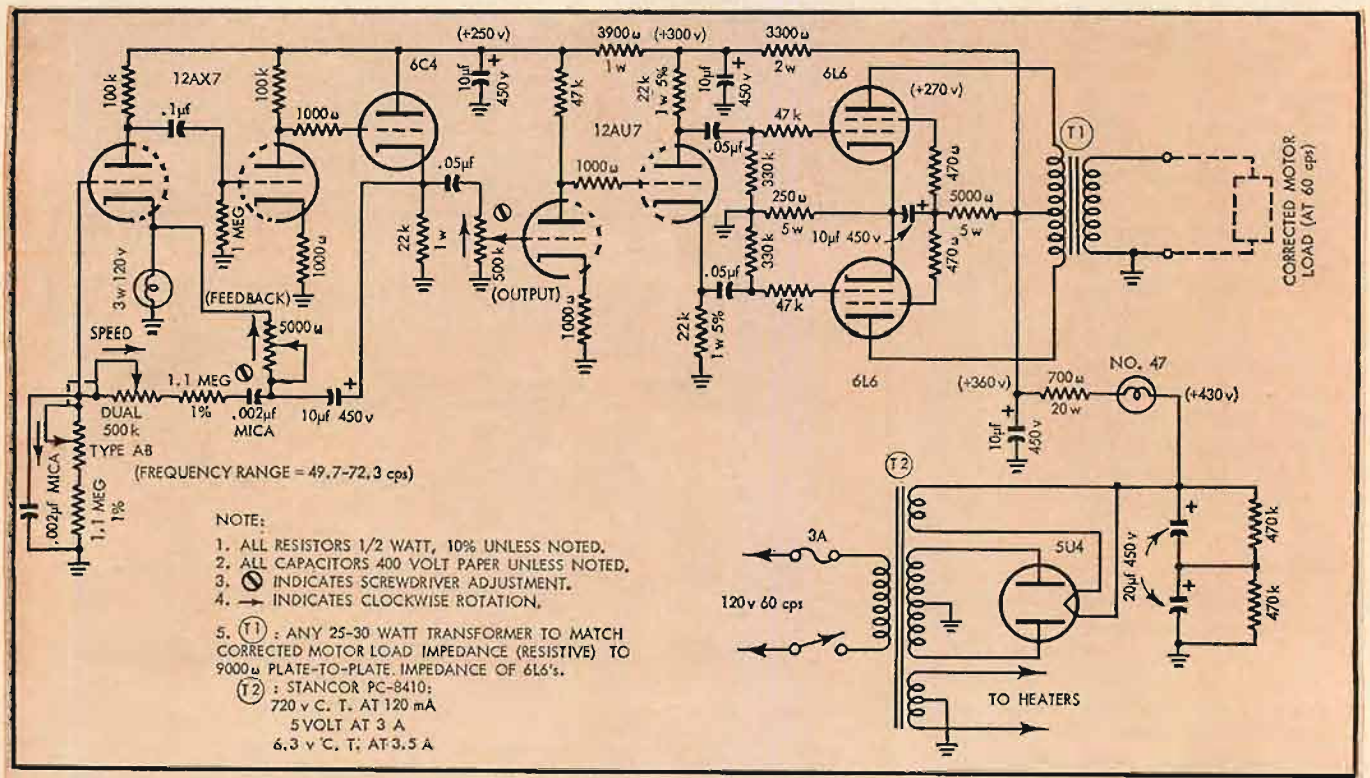

Fig. 1. Schematic of the vernier speed control.

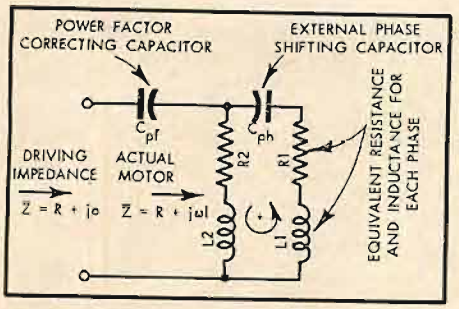

Fig. 2. Simplified equivalent circuit of motor load.

follower is that it isolates the high output impedance from the bridge, thus eliminating variation in the output impedance as an output frequency or amplitude affecting factor. The output is taken off at this point, again for isolation reasons.

Occasionally low-frequency modulation of the output is noticed, usually around 2–3 cps. This is due to phase shift in the lamp's thermal cycling reacting with phase shift in the amplifier at some low frequency so that the loop gain is one. The remedy is to change the amplifiers' phase shift. If the capacitors in the feedback loop and between stages are increased in value, the lamp will be the dominant element, causing these subaudible oscillations to die out. This also makes phase shift negligible at the desired oscillation frequency, further isolating the amplifier's parameters from determining the output frequency.

When correctly adjusted, the oscillator is virtually insensitive to tube and supply voltage variations. The version shown, when oscillating at 100 cps and 10 volts output amplitude, showed less than 0.5 cps variation for 20 per cent variations in heater, plate, and output voltages, or 30 per cent variations in tube plate resistance. No means were available for measuring harmonic content, but it should be under a few per cent at frequencies above the lamp's thermal time constant of one-half second or so, that is frequencies above 25–30 cps. The unit has less than 2 db variation over a frequency range of 16 to 2200 cps, with the high-frequency oscillations rolling off above the upper limit. This is probably due to the heavy loading of the cathode follower by the bridge, and reduction in bridge capacitors produce oscillations well above anything needed to drive motors normally powered from 50, 60, or perhaps 400 cps. All these points are discussed to enable the reader to adapt the circuit to his own applications, and to foresee any changes which might have to be made.

The signal from the oscillator is then fed through a level-set potentiometer to the grid of a conventional triode amplifier. The unbypassed cathode resistor here provides gain stabilization. A split-load phase inverter is directly-coupled to the triode amplifier's plate. The small series resistor stops any parasitic oscillations resulting from the possibly negative input impedance of the phase inverter. The push-pull output is coupled to the grids of a conventionally-connected output stage. Series resistors limit operation to class AB_1.

The load impedance, equivalent to an inductance and resistance (for one phase) in parallel with a capacitor, inductor, and resistor, presents a complex load to the amplifier. The imaginary part of this load impedance may be eliminated by adding a capacitor in series with the paralleled phases. The value of this capacitor, and the value of the capacitor which provides the 90-deg. phase shift necessary (for maximum torque) between the two phase currents, can be found in the following manner.

The complete equivalent circuit for a two-phase motor is shown in *Fig.* 2. (This is for constant-load constant-input voltage frequency, since these equivalent inductances and resistances are "lumped" together from physical components which change with load.) The motor should be driven at the speed desired, but measurements can be made at, say, 60 cps for convenience. When the torque output is maximum, the phase difference between the phase currents is 90 deg. But if the small current-sampling resistors are inserted in series with each phase, and these currents compared on an oscilloscope, the current is so nonsinusoidal as to make the familiar circular 90-deg. pattern very doubtful indeed. So, attacking the problem from the other end, the phasing capacitor should be adjusted to give the maximum torque. The value which allows the motor to start, under load, with the least value of input voltage will be the desired value. All other factors must be constant for this method to work well. Then the value of capacitance will equal the value determined times the ratio of the measuring frequency to the desired frequency. This capacitor will usually be between 1 and 10 μf, and it should have a working voltage of at least 300 volts for use on the nominal 110-volt supply voltage.

Now that the correct phasing capacitor value is determined, the complete motor will have an inductive characteristic. To permit the power supply to provide an appropriate value of resistive load for the pentode output stage, a capacitor is placed in series with the complete motor. When this capacitor is of the correct value, the current supplied by the output stage will be entirely real, so that the total current supplied, which ordinarily would have both real and imaginary components, will be at a minimum. This power-factor correcting capacitor will normally have a value near the phasing capacitor value. An accurate determination involves measuring the supply current and adjusting the power-factor correcting capacitor for minimum indicated current as shown on a conventional a.c. ammeter or an a.c. voltmeter measuring the voltage drop across a small resistor. If the total supply voltage is known, the composite load impedance (purely resistive) can be found by dividing the supply voltage by the indicated current. This value is usually between 100 and 3000 ohms. The method described for converting the value of phasing capacitor found at a convenient measuring frequency to that value needed at the desired frequency maybe used here. It should be noted that this conversion method is not exactly valid, since some of the phase parameters change with frequency. If the method is applied between frequencies with ratios of about 3 or less, the results are close enough to work well. The impedance (when the correct power factor is obtained) will also vary slightly with frequency, but the value obtained at the measuring frequency can be used successfully.

The above method depends heavily on the desired range of operating frequencies, corresponding to the desired speed range, being small—say, plus or minus 5

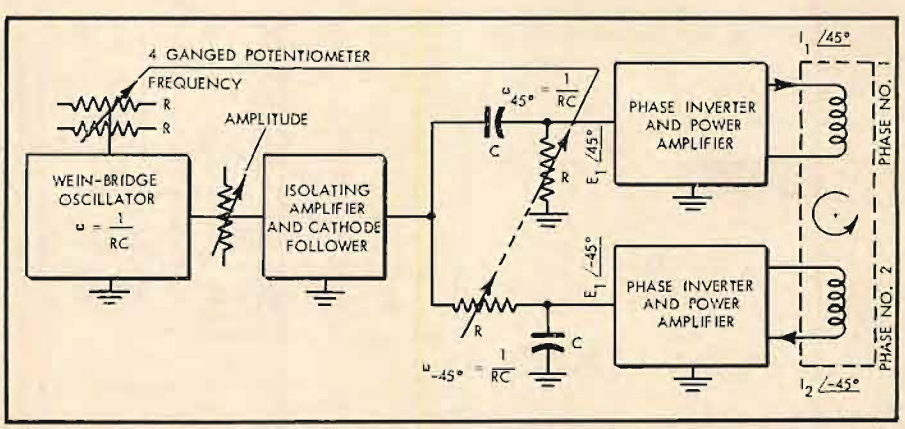

Fig. 3. Extended-range speed control.

to 10 per cent—and centered about the value to which all calculations were referred. Certain compromises can be made to cover a wider range with one set of values, but these have to be made experimentally with particular attention to reactive loading of the output stage, loss of torque, and other more insidious problems. Even the experimental methods described for a single frequency are far from rigorous, but they have the advantages of simplicity and practicality.

A different approach is needed to cover a more extended speed range. A block diagram will illustrate the basic approach, as shown in *Fig.* 3. Rarely is more than a 5 to 1 ratio of speeds desired, and so the same basic Wien-bridge oscillator serves very well as the variable-frequency source. One of the problems encountered is that of keeping a constant phase difference between the two currents. The phase shift through a single-section RC low-pass filter is plus 45 deg. when

$$\tan^{-1}\omega RC = 45 \text{ deg.} \qquad Eq.\ (1)$$

or

$$\omega = 1/RC$$

The ratio of output to input voltages, or the voltage gain, is

$$A = \frac{1}{1 + j\omega RC} \qquad Eq.\ (2)$$

or, when the phase shift is 45 deg., the voltage gain is

$$A = \frac{1}{1 + jl} = 0.707/\underline{45 \text{ deg}}$$

A similar technique shows that a single-section high-pass filter has the same gain of 0.707, but the phase is −45 deg. when ω has the same relationship to the RC product as before.

When both a high-pass and a low-pass filter are driven from the same source, the outputs will be equal in magnitude but 90-deg. apart. For this to be true over a range of frequencies, the RC product must be varied in step with the oscillation frequency. But the angular velocity, ω, produced by the oscillator with the bridge resistors and capacitors separately equal is $1/RC$. If R is varied in the two-phase shifting networks along with R in the oscillator bridge arms, and all associated C values are equal, then the phase shift will be a constant 90-deg. for any frequency. Physically, these resistors are four sections of a four-ganged potentiometer, and because of manufacturing tolerances, they will not "track" exactly. This error is negligible as long as the ganged potentiometer is kept in the center of its range without using the upper or lower resistance limits.

The signals developed at the inputs of the two power amplifiers are constant amplitude, variable frequency, and 90-deg. apart. These power amplifiers have the task of providing constant current through the two separate phases, which present a partially inductive load to the amplifiers. Power-factor correction is not very useful here, since the capacitors would have different values at different frequencies. The loadline will be an ellipse. A triode push-pull output stage accepts a reactive loadline fairly well, but its output has more of a constant-voltage characteristic than constant-current. This, plus the low-efficiency and low-output available from conventional triodes, made a push-pull pentode or beam tetrode circuit more attractive. The high

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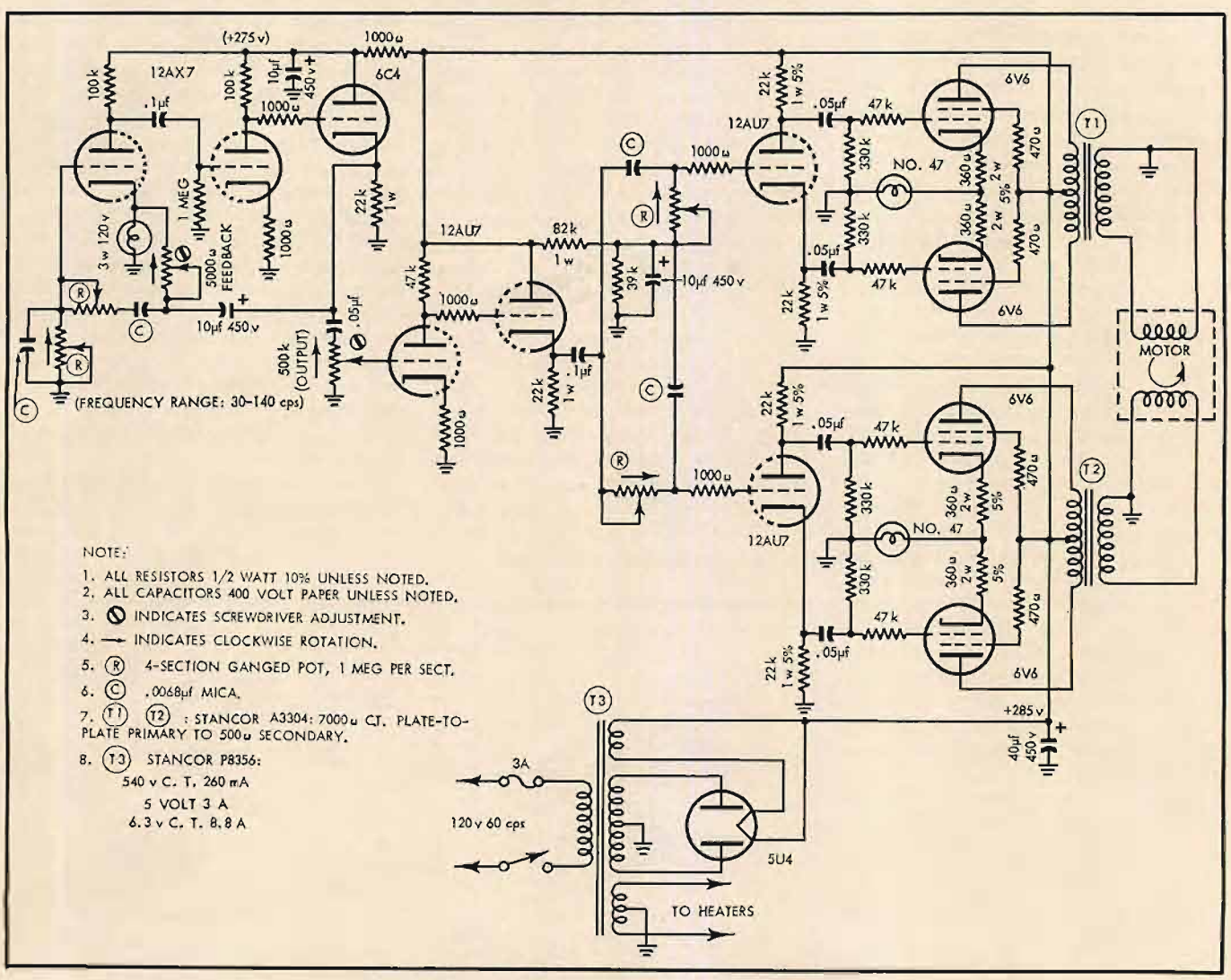

Fig. 4. Schematic of an extended-range speed control.

Protection of Trade Secrets

ALBERT WOODRUFF GRAY*

A trade secret differs from a patent in that as soon as the secret is discovered in some honest way, the discoverer has full right to use it.

A NEW JERSEY court recently stated a definition of the illusive phrase, trade secrets, that has since then been generally adopted in defining the boundaries within which the courts will afford protection to such features of business.

"A trade secret, within the rules pertaining to the rights that can be protected by injunction, is a plan, process, tool, mechanism or compound, known only to its owner and those of his employees to whom it must be confided in order to apply it to the uses intended.

"It differs from a patent in that as soon as the secret is discovered, either by an examination of the product or in any other honest way, the discoverer has full right to use it."

To this the court added in this instance the further comment, "It is also a generally accepted rule of law that one who by reason of a confidential business relationship with the owner has gained knowledge of his trade secret, will be restrained by a court from betraying the trust imposed in him by using the secret for his own gain and a confidential relation within this rule is one which gives rise to a duty not to use or divulge the secret to the detriment of the owner."

Then of the limitations imposed by the courts on this protection of such material, "Trade secrets are not given protection against all the world or persons who have not learned the secret by improper means or by virtue of a confidential relation.

"All that the owner of a trade secret is entitled to is protection from a breach of contract or confidence against one to whom he has confided the secret and those to whom such person may divulge it and anyone who honestly and fairly comes into possession of the secret has the right to use, disclose, or sell it without being subject to restraint by injunction."[1]

Recently, before a federal court, a manufacturer of silicon rectifiers that operate in an electrical circuit to convert alternating to direct current brought suit for an injunction against a competitor from disclosing to anyone whomsoever the restricted, confidential, and secret information set forth by the manufacturer in this action, for damages of one million dollars and a similar amount for punitive damages with an accounting of the profits realized by this competitor in its sale of these rectifiers.

In its defense to this action the competitor maintained that such radio parts were manufactured by more than two dozen companies throughout the United States with the further assertion that the materials, methods, and products which this manufacturer had developed and were challenged in this action had not only been generally known in the industry itself but described in detail in widely circulated periodicals, text books and government reports.

Among those in this organization who had allegedly betrayed their trust by a disclosure of these secrets was the manager of the company in addition to a group of seven engineers and technicians.

Of the law and its application to circumstances such as these the federal court said, "One who discloses or uses another's trade secret without the privilege to do so is liable to the other if,

"(a) He discovers the secret by improper means, or,

"(b) His discovery or use constitutes a breach of confidence reposed in him by the other in disclosing the secret to him,

"(c) He learned the secret from a third person with notice of the fact that it was a secret and that the third person discovered it by improper means or that the third person's disclosure of it was otherwise a breach of his duty to the other,

"(d) He learned the secret with notice of the fact that it was a secret and that its disclosure was made to him by mistake."

With its decision that here there could be no recovery by this radio parts manufacturer the court added the reasoning underlying this conclusion, "Trade practices to come within the obligation of secrecy must be secrets. While they need not amount to invention in the patent law sense they must at least amount to discovery.

"It follows that matters which are generally known in the trade or readily discernible by others in the trade cannot be made secret by being so labelled in an agreement. Equity has no power to compel a man who changes employers to wipe clean the slate of his memory."[2]

Another incident involving this feature in the production and marketing of auditory devices was the subject of an action for infringement when, according to the owner of the patent, patterns were delivered to a machine shop operator for castings to be used in bomb microphones.

Under the agreement with the owner of these patterns, the machine shop operator was to make no castings other than those ordered by the owner of the patterns. In violation of this agreement dies from these patterns were made and sold by the machinist throughout the trade until these activities ended in this action. The machine shop owner contended that these patterns were no secret invention and for that reason their owner was entitled to no recovery.

"We have here a relationship created by contract where the manufacturer took into his custody certain patterns created by the inventor for the purpose of manufacturing castings from them for the inventor.

"This man did not acknowledge the dominance of a fundamental precept of honesty and fair dealing enjoined by the Decalogue and supported by prevailing moral concepts. 'Thou shalt not steal' applies with equal force and propriety to the industrialist of a complex civilization as to the simple herdsmen of ancient Israel."

The court then quoted from a famous decision of the U. S. Supreme Court in which Justice Holmes said of a breach of confidence of this sort by an employee, "The starting point is not property or due process of law but that the employee stood in confidential relations with his employers or one of them.

"Whether the employers have any valuable secret or not, the employee knows the facts, whatever they are, through a special confidence that he accepted. The property may be denied but the confidence cannot be.

(*Continued on page 65*)

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

[1] Boost Co. v. Faunce, 86 Atl. 2d 283, N. J., Feb. 6, 1952

[2] Sarkes Tarzian v. Audio Devices, 166 F. S. 25, Cal., Sept. 8, 1958

The Transistor Amplifier, Economy Model

GEORGE FLETCHER COOPER

By judiciously selecting a composite signal, the amplifier may be operated close to cutoff thus reducing current drain and heat generation.

In February I described a two-stage transistor amplifier configuration for which I have found several jobs at different levels recently. The circuit is simply a grounded-collector grounded-emitter arrangement with direct coupling between the stages but it lends itself beautifully to a very simple design routine in which all the resistance values work out absolutely painlessly. One example I chose, though I did not carry it through to completion, was a 10-watt amplifier: the current drain for a 10-watt class-A amplifier is rather over 2 amps from a 12–14 volt supply, which one might accept but it does mean the output transistor has to get rid of a lot of heat.

Recently I had occasion to study an amplifier for public address work which was to be quiet most of the time but has to sit around, working from batteries, in case anyone wanted to say anything. There is a whole host of applications for this sort of thing for the non-professional user. You and I are quite happy working a press-to-talk switch but a whole lot of people who need to make announcements, the president of the World Federation of Skunk-breeders for example, do not always remember to press before speaking (and if there is a W.F. of S-B, and if it has a president, and if he does, my apologies to you, Sir).

I don't like carrying heavy weights, either. In case you wonder why a man who keeps writing he doesn't like carrying, computing or connecting seems to spend his time writing, the answer is easy: I like the money so that I can get someone else to do these things. However, back to the job. If the amplifier is to be switched on all day you cannot afford to have a steady drain of 2 amps unless the battery really is quite a big one. You know the classical answer, you use a class-B output stage. I am not going to suggest that you cannot make a very good and efficient amplifier with a class-B push-pull output stage. All I offer you here is an alternative which seems to work out much cheaper to build, quicker to build, too, and which is rather more flexible in adjustment to the best compromise between economy and protection from temperature effects.

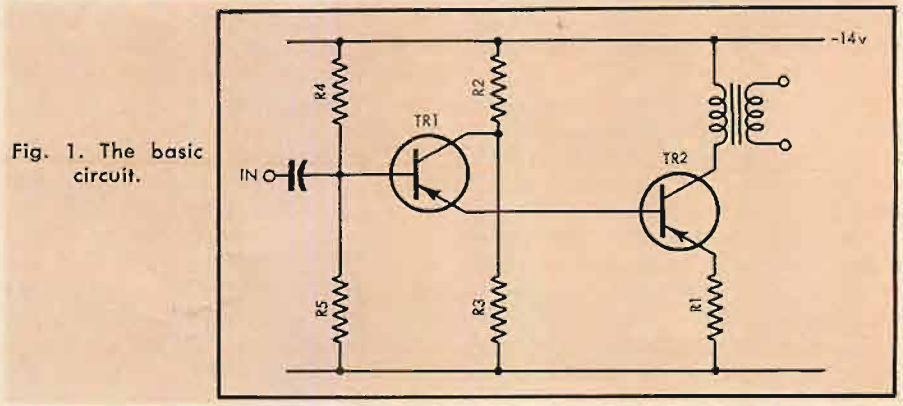

Fig. 1. The basic circuit.

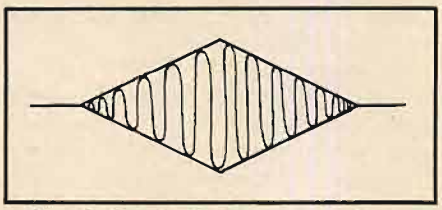

Fig. 2. Standard speech wave form.

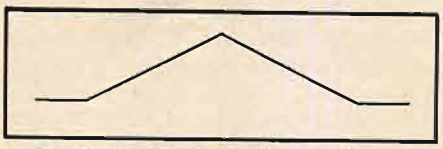

Fig. 3. Rectified speech wave form.

Just to remind you of the simplicity of the basic circuit which I described in the previous article we can look again at *Fig.* 1. Typically the gain is around 30–40 decibels so that a high-quality microphone will need a preamplifier though a carbon microphone will give enough to drive up into the watts. But that preamplifier will only take, well, 10 milliamps would be more than enough. The basic amplifier, however, needs a few additions to turn it into the economy model and before discussing these additions we might think a little about the sort of signals we are to handle.

There cannot be very many readers who have never seen a speech wave-form on an oscilloscope. You will remember that it is mostly pretty low level stuff with rather occasional bursts of high level. In fact the average level is somewhere around 15–20 decibels below the maximum. Here I will choose a special sound, ₒₒOOₒₒh, and use this as typical speech. This makes the diagrams easier to draw, and as I keep saying, I'm a lazy man.

The standard speech waveform, then, is shown in *Fig.* 2. This is a sine wave of let us say 400 eps modulated by a single triangular wave corresponding to a frequency in the region of perhaps 2 eps. Speech has this sort of general characteristic, the audible frequencies in the region from say 100 eps upwards being modulated by the syllabic frequencies of say 10 eps downwards.

In setting up the idea of our economy amplifier I have found it very useful to introduce the concept of a composite signal. I did this because it seemed to make the design drill simpler, not because I want to bring in complicated ideas. The first step is to rectify the actual speech and smooth out the peaks, leaving just the syllabic component. This gives us the very simple wave-form shown in *Fig.* 3.

Suppose now that we add these two signals together. We can use different proportions of the two basic signals and thus obtain any one of the three forms shown in *Fig.* 4. In (A) of *Fig.* 4 we have rather too much syllabic component, while in (C) of *Fig.* 4 we have too little. The careful balance in (B) of *Fig.* 4 shows that by the use of the right proportions we can keep the bottom of the composite signal at the same level throughout.

It does not require much thought to

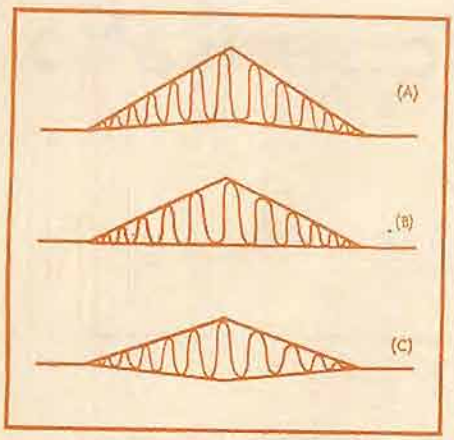

Fig. 4. Adding the signal to its rectified envelope with (A) too much, (B) the right amount, and (C) too little of the envelope signal.

see that if we apply this composite signal to the base of a transistor the current will swing up and back, but will never swing down. We do not need to leave any room on the characteristic for down-swings because we have got rid of them. As a result the transistor can sit near cut-off until there is a signal, secure in the knowledge that the signal will not drive it into cut-off and produce distortion.

There are two advantages to be gained here. First of all the transistor is taking only just enough current for the job it has to do, which means that the battery delivers no excess power. (There are some minor subtleties here that I prefer not to discuss.) Secondly the transistor and its heat sink are kept cool. During loud signals, of course, they start warming up, but the intermittent nature of the heating means that the mass of the heat sink as well as its area come into the picture. The heat sink takes time to warm up and can release the heat in the breaks.

This circuit system is sometimes called a floating-bias or sliding-bias circuit. What I have called a syllabic signal which is added to form a composite signal is then called floating or sliding bias and is traced independently through the circuit. The way of thinking is that for any actual level the transistor bias is automatically adjusted to give just the right working conditions. I find that with the composite signal treatment there are a few details which are much easier to understand: in fact I did not understand them properly until I had worked out the composite signal approach. No doubt someone else thought of it first but I just don't remember seeing it described.

All this talk about composite signals is very well, but where is it to come from? The sort of amplifier we are talking about needs a milliwatt or so of input to give some watts output. From (B) in *Fig.* 4 we can see that the syllabic signal is of the same order of magnitude as the speech signal. Therefore if we can join up the composite signal at the input we shall need only milliwatts of the syllabic component. At the output we have watts, and we shall not miss a few milliwatts if we drain them off and rectify them. This much is clear, we are to rectify and smooth part of the output and feed it back to the input. In the circuit of *Fig.* 1 we get it back to the base of the first transistor, Tr_1. You will perhaps appreciate the advantages of this amplifier when you think that it is not only a directly coupled amplifier, which means that the syllabic components right down to the lowest conceivable frequency are handled through to the collector of Tr_2, but also because there is no phase reversal in Tr_1 both transistors are driven upwards by the composite signal.

At the collector of Tr_2 we have the composite signal, both the speech signal and the syllabic signal. We are going to rectify this to produce the syllabic signal and we are in danger of chasing our tails. Here the output transformer comes to our rescue. Provided we design it properly we can call it a first-order filter, that is a filter with only one reactance and use it as a high-pass system to let through the speech and lose the syllabic. Since the speech is 100 cps upwards and the syllabic is 10 cps downwards we need only choose a transformer inductance giving us 3 db down at 100 cps to be sure of being 20 db down at 10 cps. This turns out to be perfectly satisfactory.

In the same way we must think about the speech signal which goes back through the rectifier from the output to the input. We shall provide smoothing of the rectified signal and the 10:1 frequency separation will again give us some 20 db of protection but it is prudent to connect the rectifier in such a way that any feedback is negative, not because this improves the quality but because the alternative may lead to instability.

Two practical amplifier circuits are shown in *Fig.* 5 and 6. The first, *Fig.* 5, is described by Pawling and Tharma in *Mullard Technical Communications,* Vol. 4, No. 31, July 1958. The nominal output available from this amplifier is 4.5 w, though the distortion is about 4 per cent at 3 w. It will be seen that the emitter resistance of the OC16 is decoupled, which means that we need the increased syllabic signal compared with the basic signal to which reference has already been made. In fact the designers call for 3.9 volts a.c. peak across the rectifier winding of the output transformer. The design peak signal current in the OC16 is 1A, which with a 10-ohm load gives us 10 volts, so that the transformer ratio is 1:0.39. The inductance does not seem to be specified: this is probably because of the way the circuit has been considered, without the varying bias being treated as a second signal. We know that we want the transformer to start rolling off in order to attenuate our syllabic signal. If we choose 80 cps as the 3db point we shall have $\omega L/R = 1$ when $\omega = 2\pi.80 = 500$ and $R = 10$ *ohms,* so that $L = 20$ *mH* for the collector winding.

The components R_5 and C_3 provide about 6 db of negative feedback at signal frequencies when the source impedance seen looking back from the secondary of the input transformer is around 600 ohms.

In this particular design there is a bleed current of about 300 mA and a total quiescent current of about 500 mA. When run at full level with ordinary program material, speech and music, the average current rises to 700 mA. The chief advantage of this particular arrangement seems to be that the dissipation in the output transistor is only

(*Continued on page 60*)

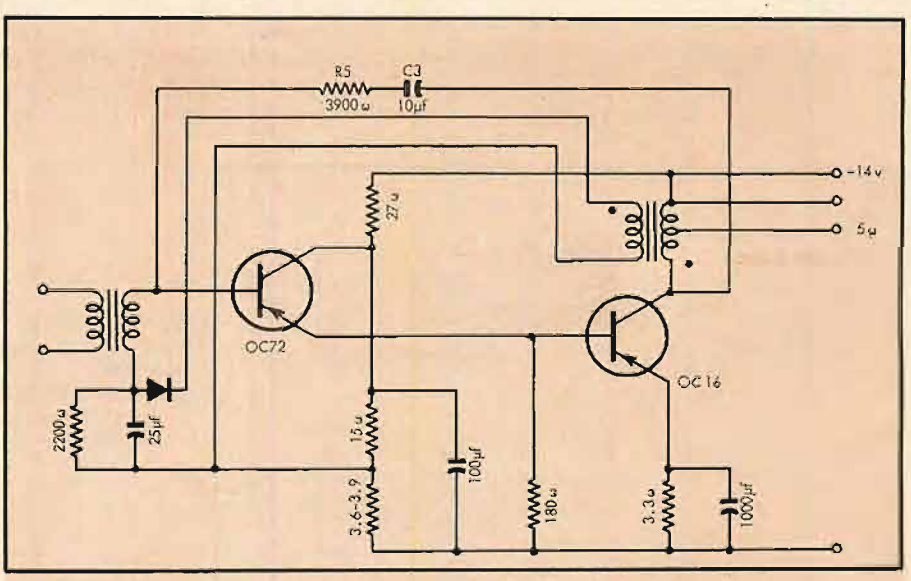

Fig. 5. Mullard 4.5-w sliding-bias output stage.

Evaluating Signal-to-Noise Ratio

HERMAN BURSTEIN*

Signal-to-noise ratio is an indicator which can help the audiofan select compatible components.

ALONG WITH GOOD FREQUENCY RESPONSE and low distortion, a high signal-to-noise ratio is one of the pillars of high fidelity. Of the three, signal-to-noise ratio probably gets talked about least. Yet it would be difficult to argue that noise is much less a consideration in pleasurable listening than are distortion and frequency response. Anyone who has had to endure an insistent hum or frying sound during the soft passages of a musical program will attest to this.

Therefore in assembling, enlarging, or otherwise modifying an audio system the audiofan and those who give him counsel—the salesman, the technician, and well-meaning friends—should carefully evaluate the signal-to-noise ratio of each component. This is not simply a matter of reading a component's specifications and deciding on this limited basis whether the signal-to-noise ratio is high enough. Such a procedure is apt to contain a booby trap. This is certainly not meant to imply that manufacturers' specifications are exaggerated. Quite the contrary. The writer's experience in testing many pieces of equipment is that manufacturers' ratings are usually met or exceeded. However, signal-to-noise specifications are based on the premise that maximum signal will have a certain value or that the maximum input signal will have a certain value. But in practice the actual output or input signal may differ appreciably from the presumed value. Taking this factor into account plus other factors bearing on the gain and distortion characteristics of the component in question, one often finds that the rated value of signal-to-noise varies appreciably from the *effective* value.

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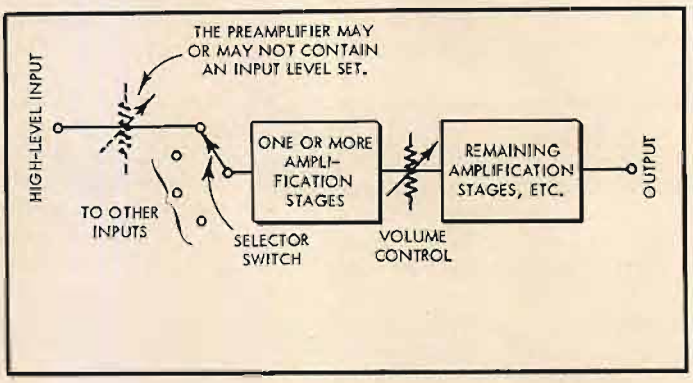

Fig. 2. Configuration wherein the high-level input signal is reduced after in level after amplification.

Meaning of Signal and Noise

Signal denotes the *desired* audio information, usually music or speech but sometimes other sounds, such as that of racing cars, jet airplanes, rockets, waterfalls, breaking glass, and so on.

Noise refers to *undesired* sounds produced by, or in, the audio equipment. Its chief forms are hum and hiss. Hum is 60 cps (the line frequency) and its harmonics, principally 120 cps (ripple in a full-wave detector) and 180 cps (odd harmonic distortion of a power transformer). Hiss consists of random frequencies throughout the audio spectrum. Because there are more frequencies in the upper octaves than in the lower ones, and because each frequency contains about the same amount of energy, this form of noise has the high-pitched characteristic that we call hiss. Noise takes additional forms, such as clicks, pops, crackles, squeals, and so forth.

Distortion also consists of undesired sounds. How then do we differentiate between noise and distortion? The difference lies in the fact that noise is always present, whereas distortion arises only as a consequence of audio signals. In sum, noise consists of undesired sounds whose existence and level is independent of the audio signal.[1]

Accordingly, the signal-to-noise ratio designates the magnitude of the desired audio signal relative to the magnitude of the undesired noise, expressed in decibels.

In measuring signal-to-noise, consideration is sometimes given to the ear's reduced sensitivity to low and high frequencies compared with the mid-range. Therefore the various noise frequencies are given varying weights in accordance with the ear's sensitivity to them. The weighted value is higher than the unweighted value. For example, if noise consists principally of 60-cps hum and if account is taken of the ear's lower sensitivity to 60 cps than to 1000 cps, the weighted signal-to-noise ratio is a "better" figure than the unweighted ratio.

Most often, however, the signal-to-noise ratio is stated on an unweighted basis, and the following discussion shall proceed on this basis. There are good reasons for preferring the unweighted rating in evaluating a component. For one thing, while hearing sensitivity varies

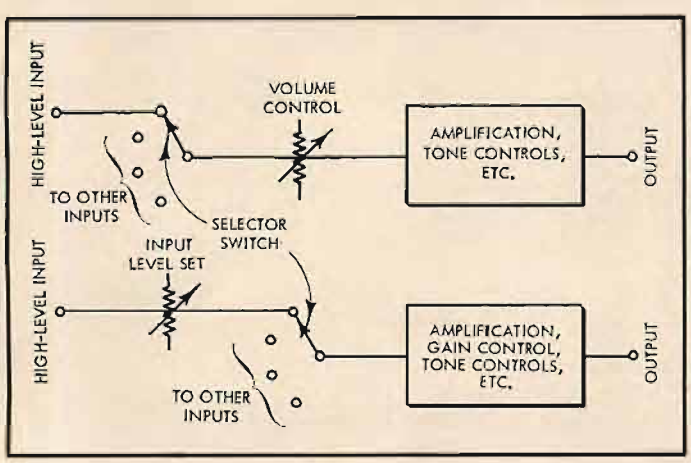

Fig. 1. Configurations wherein the high-level input signal is reduced in level prior to amplification.

[1] There is a minor exception. Tape modulation noise varies in intensity with the level of the audio signal. It is caused by variations in thickness of the tape's base and/or coating and by variations in the magnetic oxide. Modern high quality tapes, however, produce very little noise of this sort.

with frequency, there are considerable differences between individuals as to the degree of variation. Second, even though a given noise frequency may be completely inaudible, it may nevertheless produce distressing results. For example, assume that a defective power amplifier pulses strongly at the rate of 10 cps (motorboating). The resulting large excursions of the speaker are of course inaudible in themselves, but they may take the cone so far out of its linear travel-path as to cause considerable and audible distortion of program material. Similarly, oscillation at a supersonic frequency will be inaudible but can give rise to distortion of audio frequencies.

High Fidelity Requirements

Using program peaks as a reference level, it may be said that noise should be at least 55 db below the peak audio signal to justify the designation high fidelity. In other words, the minimum signal-to-noise ratio for high fidelity is about 55 db. Inasmuch as the dynamic range—distance between the maximum and minimum levels—of discs, tapes, and FM seldom exceeds 55 db and is often 50 db or less, a signal-to-noise ratio of 55 db may be considered acceptable.

Assume that the signal source has a 55 db signal-to-noise ratio. This does not mean that it is purposeless having a preamplifier (and power amplifier) with a signal-to-noise ratio greater than 55 db. Quite possibly, the principal noise components of the preamp fall in a different part of the audio spectrum than do the chief components of noise in the signal source, so that noise of the preamp may be distinct unless its ratio is appreciably higher than 55 db.

A ratio of 60 db offers a worthwhile bit of margin, and higher than 60 db is all to the good. Ratios of 65 and up put the listener really "in the clear."

It is desirable that each component in an audio chain have a higher signal-to-noise ratio than the preceding component so that performance of the earlier component will not be degraded. To illustrate, assume that a preamp can achieve an enviable 70-db ratio at the magnetic-phono input. It would be a shame to be profligate with such performance by feeding the preamp signal into a power amplifier having only a 60 db ratio.

Power Amplifiers

The signal-to-noise ratio of a power amplifier is almost invariably stated on the basis of the amplifier's maximum rated output. For example, if the amplifier can produce up to 60 watts at low distortion, the manufacturer will specify a signal-to-noise ratio on the basis of 60 watts output; a typical rating might be 80 db. However, the rated signal-to-noise ratio may be much higher than the effective ratio, as we shall soon see.

(It is difficult to obtain a precise quantitative statement of the effective ratio, but for purposes of discussion we shall put numbers on the factors we are discussing.)

The effective signal-to-noise ratio must take into acount: (1) the efficiency of the speaker which is used; (2) the level of room noise, which may or may not mask amplifier noise; and (3) the maximum power to which the amplifier will actually be driven, which is dependent in part upon speaker efficiency and room noise, and in part upon room size and the audiofan's preference as to volume level.

The efficiency of typical speakers varies roughly from 1 to 20 per cent, a range of 13 db. The less efficient the speaker, the more it cuts down the noise issuing from the amplifier. But it also cuts down the audio signal, so that the amplifier must be operated at greater output in order to obtain the desired acoustic level. Therefore we have more audio signal at the amplifier output but the same amount of noise as before, which means an improvement in effective signal-to-noise. The converse is true for an efficient speaker.

Using the minimum audible sound at 1000 cps as a 0 db reference, room noise may vary from a low of possibly 20 db (night-time in the country) to about 50 db (daytime in the busy city). Forty db is fairly typical. The higher the noise level, the more likely it is that the audiofan will want to operate his sound system at higher power in order to get above the room noise. Correspondingly, the effective ratio goes up.

Depending on speaker efficiency and room noise, plus the listener's taste in volume level, a 60-watt amplifier might be operated so that program peaks require from as much as 60 watts to as little as 1 watt or less. Assume that a maximum of 1 watt is used because of a 20 per cent efficient speaker, low room noise, and the desired acoustic level. Then the effective signal-to-noise ratio is 18 db below the rated value; 18 db is the ratio of 60 watts to 1 watt. Thus a rated figure of 80 db becomes an effective figure of 62 db, which does not offer very much margin above the 55 db minimum. An effective ratio of 62 db for a power amplifier may fall below the effective value for a fine preamplifier.

To make all the more clear why there is a decrease of 18 db in the effective value, let us approach the above example in another way. Noise is rated 80 db below 60 watts, which means that noise output is .0000006 watt, or .6 microwatt. Since maximum output signal is 1 watt, the ratio between signal and noise (1 watt/.6 microwatt) is 62 db.

On the other hand, assume that a 1 per cent efficient speaker is substituted in our example. This speaker produces 1/20th as much volume as the 20 per cent efficient speaker, so that maximum power required from the amplifier rises to 20 watts; 20 watts of signal compared with .6 microwatt of noise yields an effective ratio of 75 db, which is very respectable.

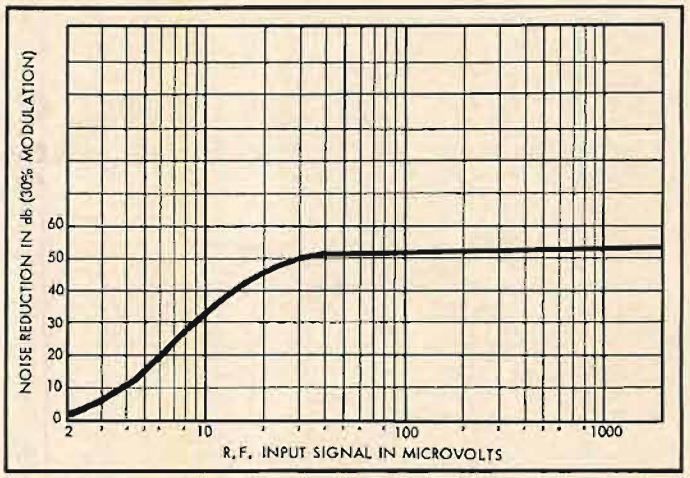

Fig. 3. Quieting characteristic of an FM tuner.

In sum, the less one employs of maximum power, the more one must downrate the amplifier's rated signal-to-noise ratio in order to arrive at the effective value.

Another factor to be taken into account, and again difficult to put into quantitative terms, is the relative smoothness of the speaker system to be used in conjunction with a given power amplifier. A speaker that peaks at the hum frequencies will deteriorate the amplifier's ratio. To illustrate, a certain large horn-loaded speaker has prodigious but smooth ability to reproduce bass. Connected to almost any high-fidelity amplifier, this speaker reproduces little or no audible hum. Another speaker, contained in an enclosure of less than 2 cubic feet, has about the same over-all efficiency in the mid- and treble range but is far less worthy a reproducer of bass. Nevertheless, because of an unlovely peak, it delivers audible hum when connected to all but the very finest

power amplifiers.

Similarly, amplifier hiss is more apparent when the speaker has rough rather than smooth response in the treble range.

Preamplifier: High-Level Input

Preamplifiers generally have a rated output of at least 2 volts. Usually they can deliver 2 volts at less than 1 per cent IM distortion. Some can do so at .1 per cent IM or less. A few can come up with even 3, 4, or 5 volts without exceeding .1 per cent IM.

Two volts is enough to drive virtually any power amplifier to full output. If the preamp can provide more than 2 volts at low distortion, and if it has sufficient gain to do so on the basis of the incoming signal level, the effective signal-to-noise ratio is higher than the rated value. To illustrate, assume that on high level input the preamp is rated at 70 db. Assume that the preamp can produce 4 volts before distortion rises appreciably above .1 per cent IM, and that its sensitivity is rated at 100 mv for 2 volts output. Accordingly, an input of 200 mv is needed for a 4 volt output. If the high-level signal source, say an FM tuner, can deliver at least 200 mv on peaks (most FM tuners can furnish 1 volt or more on peaks), the preamp will have no problem producing an output of 4 volts. Therefore the effective signal-to-noise ratio can be based on an output of 4 volts rather than 2 volts. Since 4 volts is 6 db more than 2 volts, we can add 6 db to the 70 db for a total effective value of 76 db.

Of course, an output of 4 volts is not actually usable, because this would drive any power amplifier into clipping. But the 4 volts can usually be reduced at the input of the power amplifier via a level set. Preamp audio signal and preamp noise are simultaneously reduced, so that the preamp's effective signal-to-noise ratio remains the same as calculated on the basis of an output of 4 volts.

However, if the power amplifier lacks an input level set, the preamp's signal must be reduced at some stage within the preamp. If this reduction occurs at the very input via the volume control or a level set, as shown in *Fig.* 1, the effective value cannot exceed the rated value. But if the volume control follows a stage of amplification, as shown in *Fig.* 2, the effective value of signal-to-noise can exceed the rated value to the extent that the control reduces the noise of the first stage, which is ordinarily the principal source of preamp noise.

Now assume that we have a preamp with a rating 70 db based on an output of 2 volts, and that its sensitivity is rated at 200 mv input for 1 volt output. Further assume that we plan to use an FM tuner having a ratio detector *not* followed by a stage of audio amplification, and that the peak output of the tuner is apt to be about 200 mv on weak stations (output of a ratio detector varies with signal strength). Therefore the most signal we can expect out of the preamp is 1 volt, and we must calculate the effective signal-to-noise ratio on the basis of an output of 1 volt. Since a 1 volt output is 6 db less than 2 volts, we subtract 6 db from 70 db, leaving an effective signal-to-noise ratio of 64 db.

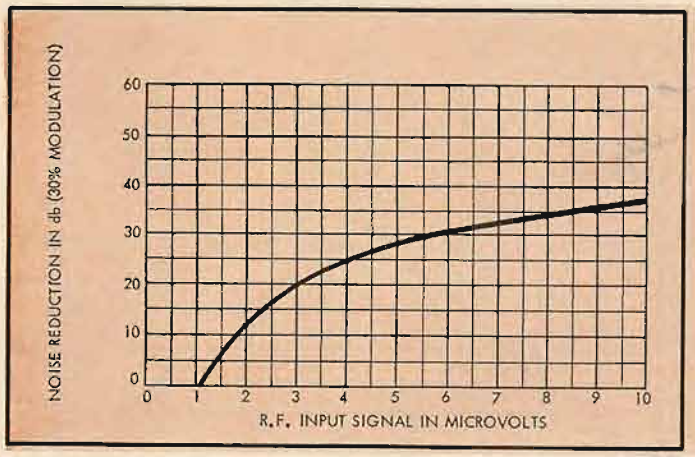

Fig. 4. Quieting characteristic of an FM tuner over a limited range.

Some people might quarrel with downrating the preamp, feeling that the problem actually lies with the tuner, which has relatively low output as tuners go. This is a matter of viewpoint, but the writer feels that the blame really belongs to the preamp because of its low sensitivity. Another preamp, as in our earlier example, would have sufficient sensitivity to convert a 200 mv input to appreciably more output than 1 volt.

Until now we have presumed that 2 volts are needed to drive the power amplifier. In most cases this is unrealistically high, not only because a somewhat smaller voltage will ordinarily drive the amplifier to full output but also because we do not want ordinarily to utilize more than a fraction of the amplifier's maximum power, even on signal peaks. To that degree that less than 2 volts is needed to drive the power amplifier on signal peaks the preamp's effective signal-to-noise ratio is increased, assuming that the preamp's output will be reduced by an input-level set in the power amplifier.

For example, assume that a 40-watt power amplifier requires 1 volt to be driven to full output, but that 10 watts peak output will be quite adequate for the speaker that is used. For 10 watts output, only .5 volt input is needed (input voltage varies as the square root of the output wattage). Assume that we are dealing with the same preamp as in our first example, which has an effective signal-to-noise ratio of 76 db—based on 4 volts output which can be reduced to 2 volts by the power amplifier's input-level set. Since we can tolerate a reduction to .5 volt output, which is 12 db below 2 volts, we can add 12 more db to the effective value, for a total of 88 db.

On the other hand, the absence of an input-level set in the power amplifier can cause the preamp's effective value to be less than its rated value. For example, assume as before that the preamp's rating is 70 db based on an output of 2 volts, and that we desire only .5 volt to drive the power amplifier. Further assume that the preamp's volume control is located right after the input jack. Therefore the only way to reduce the preamp's output signal to .5 volt is by cutting the input signal, using either the volume control or the preamp's input-level set if there is one. The preamp's output noise is unaffected by these maneuvers, but its output signal is now .5 volt instead of 2 volts, a reduction of 12 db. Therefore the effective value is 12 db below 70 db, or 58 db.

Preamplifier: Magnetic Phono Input

To calculate the effective signal-to-noise ratio on magnetic phono input, we must know how much peak signal can be expected at 1000 cps from the magnetic cartridge to be used. The effective ratio can then be calculated on the basis of input signal to the preamp or on the basis of output signal from the preamp. The first method is used when the preamp's signal-to-noise ratio is stated in terms of input signal and the second method is used when the ratio is stated in terms of output signal. To illustrate:

1. Assume that the cartridge to be used is rated at 5 mv output at 5 cm/sec groove velocity, which is a fairly typical rating. Peak levels on a phono disc are apt to reach around 15 cm/sec at 1000 cps, so that the cartridge's peak output may be estimated at 15 mv. Assume that the preamp's rated signal-to-noise ratio on magnetic phono input is stated as 60 db below 10 mv input signal (at 1000 cps). Accordingly, the effective signal-to-noise ratio is 63.5 db, because 15 mv is 3.5 db higher than 10 mv. On the other hand, if one were to use a low-output cartridge with a peak output of, say, 5 mv,

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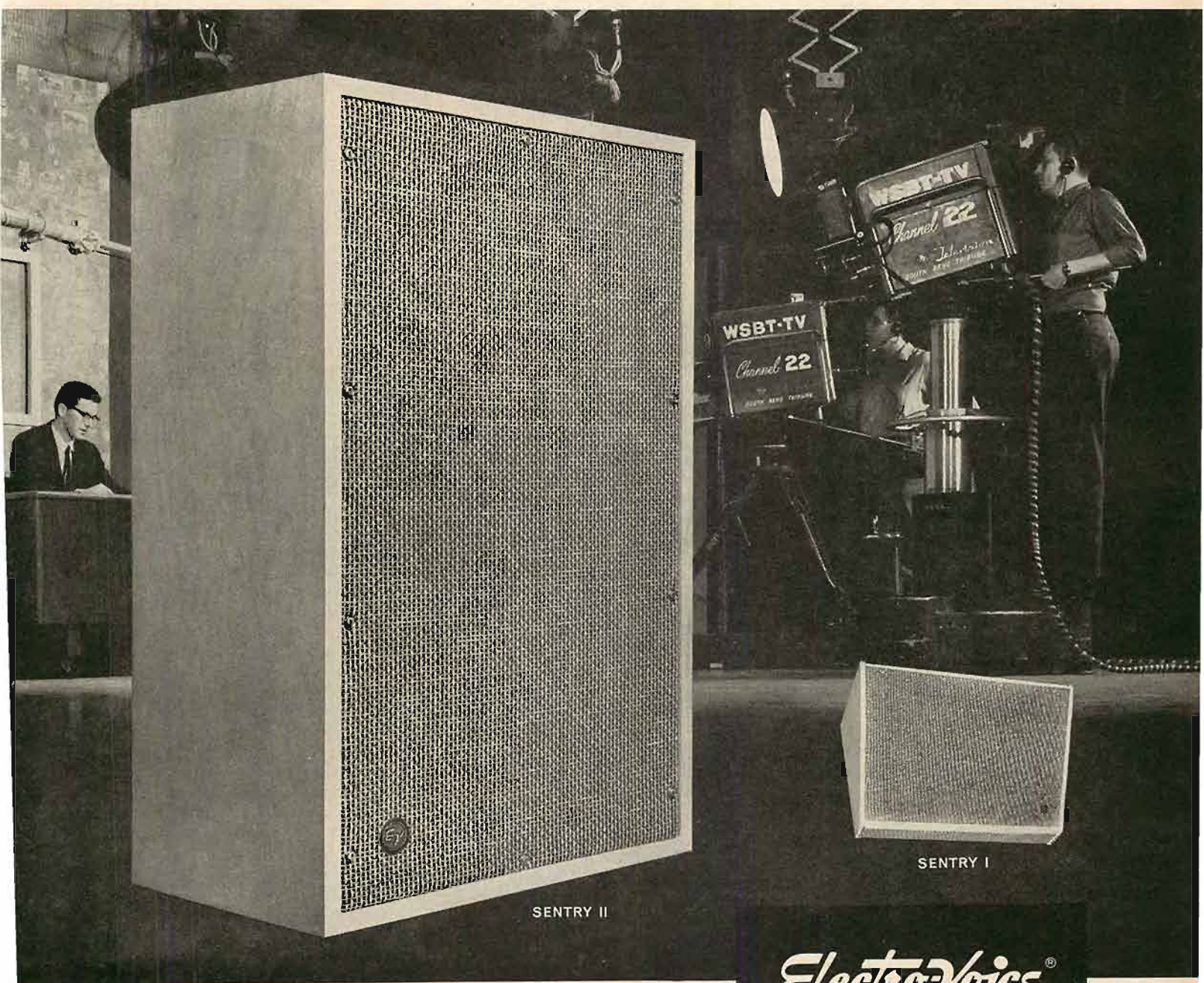

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the effective value would be only 54 db, because 5 mv is 6 db less than 10 mv.

2. Assume again that the cartridge has a peak output of 15 mv. Assume that the preamp is rated at 60 db below an output of 2 volts. This translates into a noise output of 2 mv. Next we must consider the preamp's sensitivity on magnetic phono input, which we shall assume to be 4 mv for an output of 2 volts at 1000 cps. Therefore the gain is 54 db. Accordingly, a 15-mv input translates into an output of 7.5 volts. The ratio of 7.5 volts of signal output to 2 mv of noise output indicates an effective signal-to-noise ratio of 71.5 db. True, the preamp is apt to run into excessive distortion because it can't turn out 7.5 volts. However, we assume this output level only for calculation purposes. In practice, we would turn down the phono level set, or else the volume control, to prevent signal output from climbing up to 7.5 volts. Since the noise figure is principally due to the first stage of phono amplification, turning down the phono level set or the volume control serves to reduce noise.

There is a limit to the increase of the effective value as cartridge output increases. This limit, which varies with the design of the preamp, lies in the fact that excessive input to the phono preamplification stage will cause excessive distortion. Therefore some preamps incorporate two input jacks for magnetic cartridge, one marked "high" and the other "low." The "high" jack is for high-output cartridges; the cartridge signal is attenuated by a voltage divider before it reaches the first phono amplification stage. If it is necessary to use the "high" jack, one should take into account the degree of signal attenuation in calculating the effective signal-to-noise ratio. For example, assume that the peak output of the cartridge is 50 mv, and that the effective value based on this much signal is 80 db. But suppose that the cartridge signal must be fed into the "high" jack, where it is reduced 10 db. Therefore the effective value comes down from 80 db to 70 db.

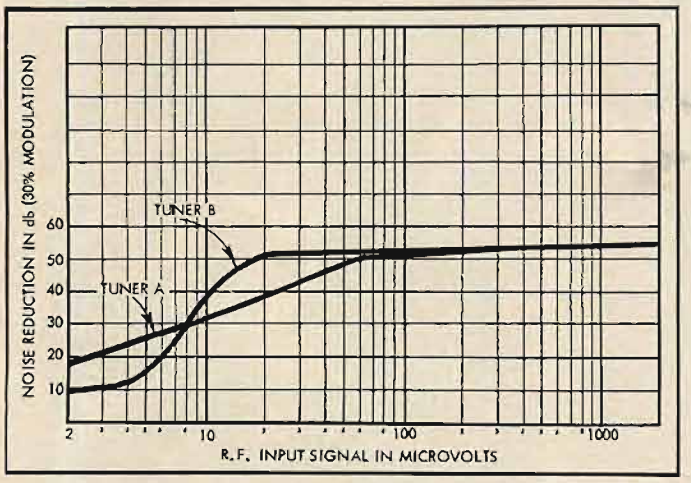


Fig. 5. Comparison of the quieting characteristic of two different FM tuners.

Preamplifier: Tape Head Input

Evaluation of signal-to-noise ratio proceeds exactly the same way for tape head input as for magnetic phono input. However, it is necessary to recognize the following fact of life. The effective value tends to be at or below the minimum amount consistent with high fidelity, namely 55 db, because of the very low output of a tape head. At 1000 cps a tape play-back head operating at 7.5 ips on a quarter-track basis—the generally accepted mode of operation today for home use—and reproducing a tone recorded at a level producing 3 per cent harmonic distortion (commonly accepted as the maximum tape recording level tolerable to the ear), will typically deliver no more than 1 or 2 mv. A high-inductance head[2] (usually 1 to 2 henries) will produce more signal than the head having a typical inductance of about .5 henry; the difference between them is 3 to 6 db of signal output.

For the following discussion, let us suppose that the peak output at 1000 cps is 1 mv. Assume that the rating of a preamplifier for tape-head input is 54 db below an output of 2 volts. Accordingly, noise output is 4 mv. Assume that the gain on tape-head input is rated at 60 db at 1000 cps. Therefore a 1 mv input produces an output of 1 volt. The effective signal-to-noise ratio—1 volt signal/4 mv noise—is only 48 db.

In the case of another preamplifier, equivalent noise input is rated at 3 μv for tape-head input. With a 1 volt input from the tape head, the effective value—1 mv/3 μv—is 50 db.

On the other hand, if a high-inductance playback head is employed, the peak signal input may be from 3 db to 6 db greater, with a corresponding improvement in the effective value. If high-output tape is used for recording, the increased output in playback may add another 6 to 8 db to the effective value.

[2] The term "high-impedance head" is usually employed.

FM Tuner

More often than not, FM tuner specifications say nothing about signal-to-noise ratio. Occasionally one may find a specification such as the following: "Noise and hum are 60 db below full output." Full output is the peak audio signal, corresponding to 100 per cent modulation (±75,000 cps) of a strong incoming signal. Full output is typically between 1 and 3 volts.

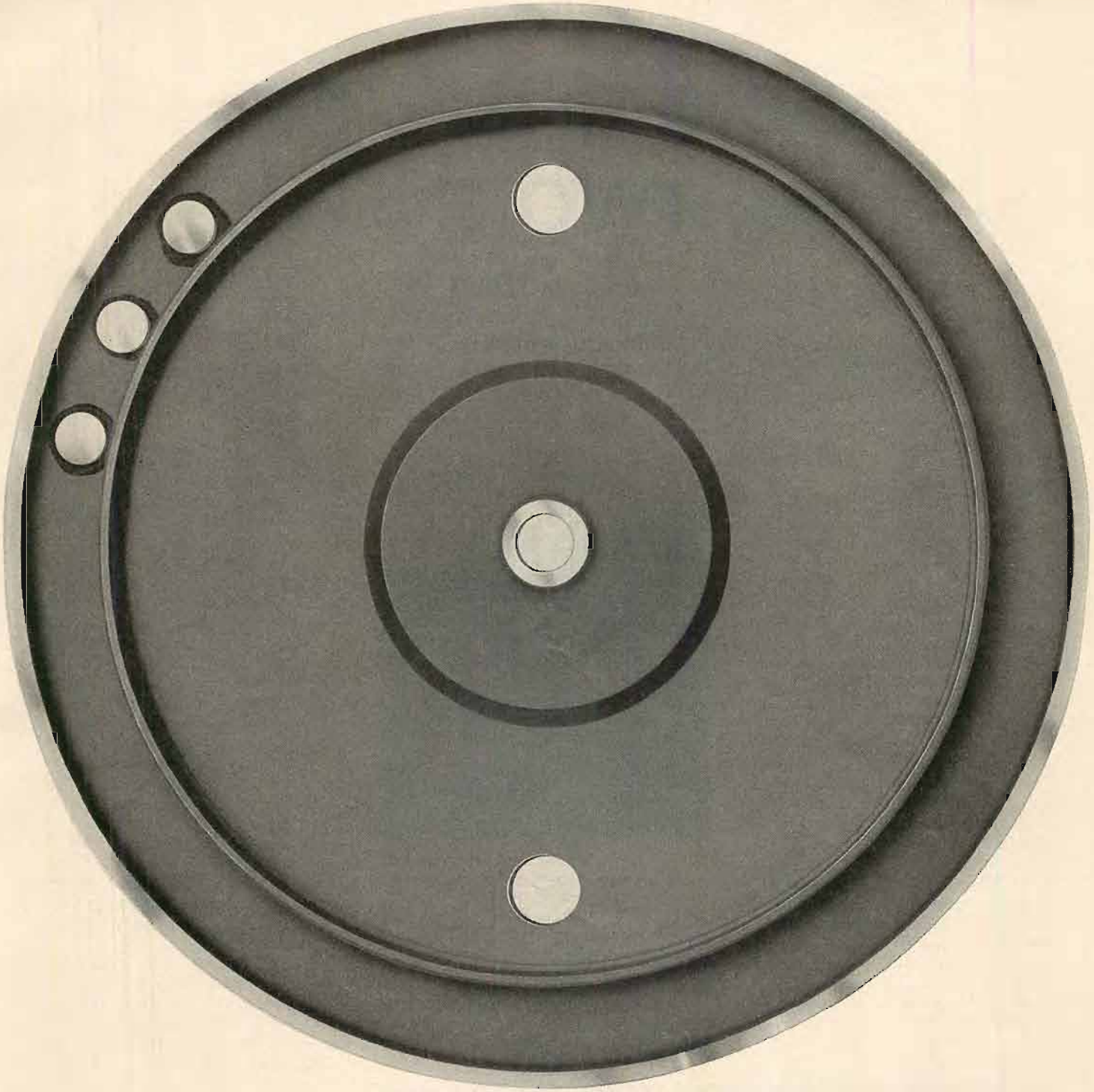
In the absence of a specification, how does one evaluate the signal-to-noise ratio of an FM tuner. One way is to write to the manufacturer. Another is to refer to his chart that shows the tuner's quieting characteristic as the r.f. signal is increased; this chart is frequently supplied in the instructions or service manual accompanying the tuner. *Figure* 3 shows a typical quieting characteristic. The principal purpose of such a chart is to show how small an r.f. signal is required to produce a signal-to-noise ratio of 20 db or 30 db, based on 30 per cent modulation. By following the quieting characteristic to its extreme, one can discover the maximum quieting, typically 50 to 55 db. Since this is based on 30 per cent modulation, we can add another 10 db to arrive at the effective signal-to-noise ratio based on 100 per cent modulation. The tuner represented in *Fig* 3, which shows about 55 db maximum quieting, has an effective value of 65 db on a strong incoming signal.

Unfortunately, the quieting chart does not always extend far enough to indicate maximum quieting. For example, the chart of *Fig.* 4 shows quieting only for r.f. signals up to 10 μv. From the slope of the characteristic at 10 μv, it is obvious that maximum quieting is appreciably higher than the maximum value appearing within the confines of the chart. But how much higher? Write to the manufacturer.

Quieting characteristics are usually based not on 100 per cent modulation (±75,000 cps) but on 30 per cent modulation (±22,500 cps), in accord with the IRE standard. This entitles the tuner to be credited with an effective signal-to-noise ratio 10 db higher than maximum quieting, as in the case of the tuner represented in *Fig* 3. In the absence of information to the contrary, one may *suppose* that the reference is 30 per cent modulation, but one can't really be sure. For example, the quieting chart for a certain tuner expressly states that the reference level is ±75,000 cps modulation. In the case of another tuner, discussion by the writer with the chief engineer revealed that quieting is based on 100 per cent modulation. In these cases, the effective value is the same as maximum quieting.

Evaluation of a tuner's signal-to-noise

(*Continued on page 64*)



no two are alike

Look at a row of Miracords, and take note of the turntable platters. They appear as identical as peas in a pod. Yet, no two are alike.

They all started out as heavy, one-piece aluminum alloy castings bearing only slight resemblance to the finished product. Each was then secured to a precision lathe, and cut to shape. Layer after layer of metal was shaved from the form until the precise design dimensions were obtained.

At this point, the turntables were as identical in shape, size, weight, finish and appearance as modern technology can achieve. We could have stopped here, pleased as punch with the smooth, glistening results of our efforts. But, the standards of Miracord performance demand more than apparent quality—greater accuracy than dimensional measurements alone can reveal.

And so, each individual gleaming platter was put to test for dynamic balance. And each was individually corrected to assure the balanced distribution of mass that gives the Miracord turntable its smooth, unwavering motion.

Remove the turntable of any Miracord, and examine the under-side. You will see where metal discs were affixed, adding just a little more weight to one point or another to achieve this perfect balance in motion. Now, look at another Miracord platter. This one may have more or fewer discs, and at different points. You can look at a thousand. Each will reveal the individual attention it received. No two will be alike.

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The Miracord is a modern, high quality record playing instrument—the only one with dynamically balanced turntable and mass-balanced transcription arm which you can play manually or as automatically as you please. The 10H with hysteresis-synchronous motor is $99.50; model 10 with 4-pole induction motor, $79.95. Prices do not include cartridge or base.

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AUDIO Goes to Paris for TWO Shows

C. G. McPROUD

Always looking for information wherever it may be found, we turn to France and the components exhibition for a professional show and to the Festival of Sound for a typical hi-fi show.

IT WAS A COLD, SLEETY NIGHT in New York on February 16th as Pan American Flight 114 took off at 7:30 p.m. on its nightly run to Paris with every seat filled. It was a comfortably warm plane with plenty of anti-freeze for those so inclined and plenty of good food for everyone—twice, since both dinner and breakfast are served on that flight.

It was a bright, sunshiny morning at 8:30 the next day in Paris when the same plane sat down smoothly on a runway flanked by green turf, and the new Orly Airport was filled with flowers and—unusual for airports until the last year or so—thoroughly understandable (the English announcements, at least) sound from a superb public address system.

The occasion? AUDIO'S visit to the Fifth International Exhibition of Electronic Components and the Fourth International Festival of Sound. With the shows only two weeks apart, it was easily possible to cover both without being away too long, and to leave a space between for a bit of a vacation, and after visiting the first show thoroughly, one needed a rest.

M. Pierre Aujames, secretary general, seated, with public relations counsel Maurice Ruby, and general manager Robert Foucoult.

The Electronic Exhibition

The Salon International des Composants Électroniques, to give it the full official name, is organized annually by the Syndicate of the Industries of Radioelectric and Electronic Parts and Accessories—a rough translation—with the cooperation of five manufacturers' organizations, and is apparently the largest electronic exhibition anywhere. To describe it in terms familiar to U.S. readers, it is essentially like our own I.R.E. Shows, but we recognized one or two advantages—the most important being that the floor was carpeted with a heavy material which was much easier on the feet than the painfully solid floors of the Coliseum. Lighting was more attractive than in the U.S. shows, and the booths were more uniform throughout which gives an integrated appearance to the entire exhibition. There were 595 booths, and all were occupied, 206 of them by foreign exhibitors. Of these 206, 67 were from West Germany, 57 from U.S.A., and 32 from the United Kingdom. Most of the exhibitors were European companies, but there were still many familiar names, as will be seen later.

While the Exposition is listed as the Fifth Salon International, it is actually the twenty-fifth salon that has been held in Paris. The original organization involved in radio electricity was founded in 1922 under the name of Syndicat National des Industries Radioélectriques, or S.N.I.R. In 1924, this organization combined with the Chambre Syndicale de la T.S.F. (Telegraphie san Fils—telegraphy without wires, and hence, wireless) under the new name of Syndicat Professionnel des Industries Radioélectriques, or S.P.I.R., and it was in 1924 that the first salon was held. This salon was essentially a public radio show.

In 1930, with the appearance and general use of indirectly heated cathodes, it began to appear that the visitors to the shows were composed of almost equal parts of laymen and professionals, and by 1934 there were two shows—one for the public and one for manufacturers of radio-electronic equipment—the latter being known as a salon of "Pièces Détachées." Detached pieces were then exhibited in the French equivalent of the parts show, and with

Over-all view of one portion of the Components Exhibition. Note the uniformity of the booths, the attractive lighting, and the carpeted floor.

small speakers for small rooms?

These two AR-3 speakers provided Christmas music last year for Grand Central Terminal's main concourse, whose capacity is several million cubic feet. Carols and organ music were played in stereo at natural concert volume. Passers-by were often seen looking around for a live chorus or pipe organ.

Relative size does not determine the suitability of small, medium, or large speakers to small, medium, or large rooms. The only criterion by which performance may be judged is the ability of the speaker to reproduce music naturally, without coloration.

The price of AR speakers ranges from $89 for an unfinished AR-2 to $225 for an AR-3 in walnut, cherry, or teak. A five-year guarantee covers parts, labor, and reimbursement of any freight charges to and from the factory. Catalog and a list of AR dealers in your area are available on request.

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

Many familiar names in the high fidelity field appeared on booths at the Components Exhibition. These are a few of them.

the continued growth of the electronic industry it became more and more of an exhibit for manufacturers, and so it remains to this day, though many of the exhibitors offer equipment that primarily belongs in a public show, because engineers still buy hi-fi equipment for themselves. By 1934, there were many magazines in the field—*Le Haut Parleur, L'Onde Electrique, Radio-Pratique, Radio Professionnelle, La Semaine Radiophonique, T.S.F. Phono Cine, La T.S.F. pour Tous,* and *Toute la Radio,* to name those that are still in existence.

The first book of standards applicable to radio-electric materials and accessories was published in 1928, and the French radio-electronic industry has been most active continuously since those early years in the field of standardization.

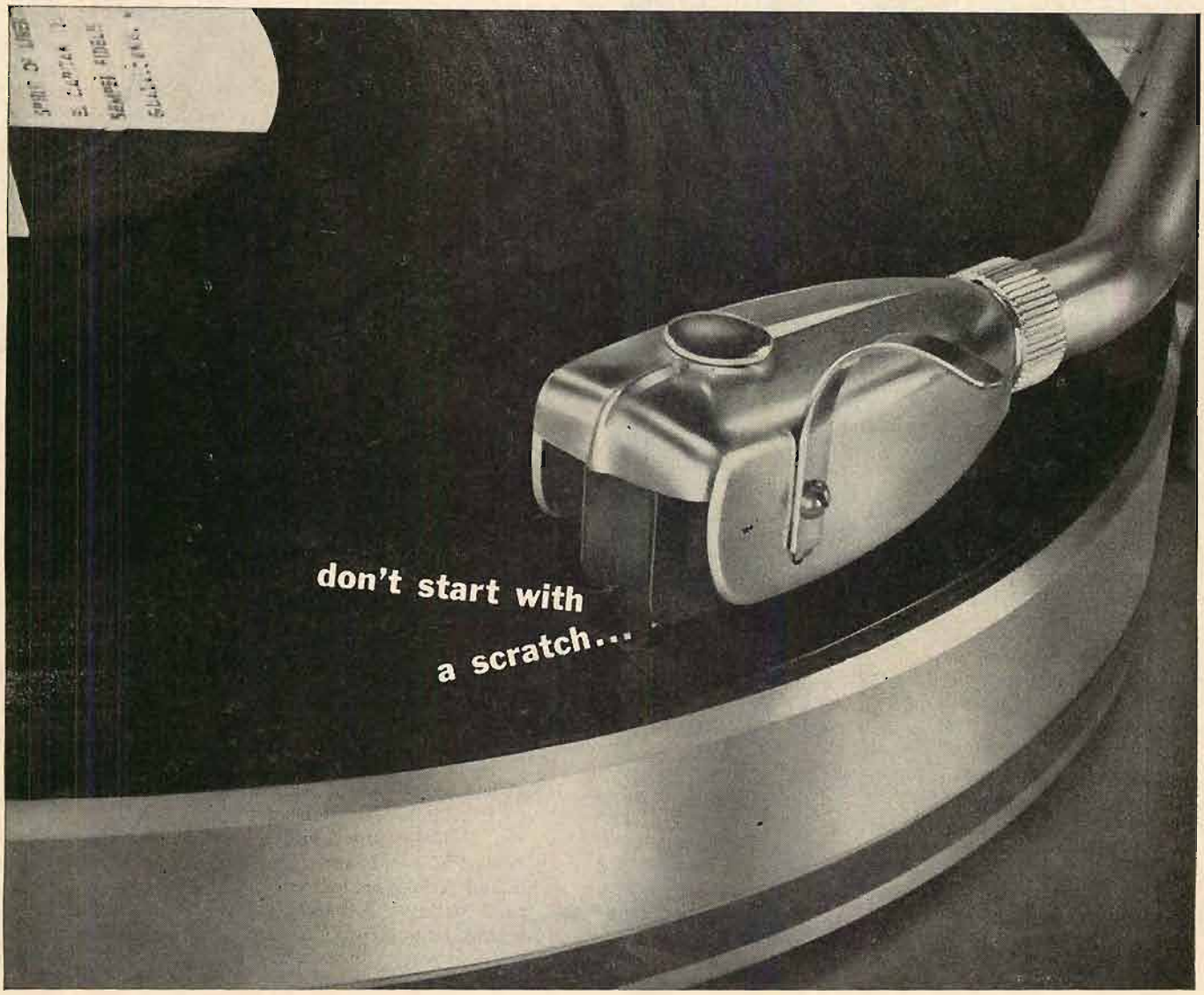
The series of shows was interrupted in 1940 by some more important activities, and only resumed in 1946—this time with 116 exhibitors. The 21st Salon became the First Salon International in 1958, with the new name necessary because of the evolution of the technique, and the present title—Salon International des Composants Électroniques—continues. The French electronic industry employs some 80,000 people, and 30,000 of these are in the component industry alone. The value of the products of the component industry is in the vicinity of $800 million. The actual show organization is the Société pour la Diffusion des Sciences et des Arts (S.D.S.A.) under the secretary-generalship of M. Pierre Aujames.

Harvey Gernsback, **Radio Electronics** editor, chats with E. Aisberg, editor of the French **Toute le Radio.**

M. Robert Foucault is general manager, and M. Maurice Rubý is the public relations counsel.

The Salon was opened officially to the press on the 15th of February, followed by the inevitable reception. On the 16th, the doors were opened to the public. Most complete arrangements were made for visitors, with special times for members of the Palais des Congrès, a group of U.S. industrials, groups of students, groups from the army, and various other groups from foreign countries.

The over-all arrangement of the Salon was superb. The booths were equipped and furnished, and all the exhibitors had to do was to install their products. Interpreters and steno-typists were available, as were banking, travel, post-office, foreign exchange, and conference rooms. Bars, restaurants, and tobacconists (tobacco and matches are a government monopoly in France) were in abundance. Visits to manufacturers' plants were scheduled for the three days following the show. Admission was free, but limited to people in the electronics field, bearers of invitation cards, and to foreigners giving proof of nationality.



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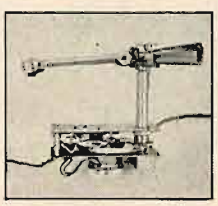

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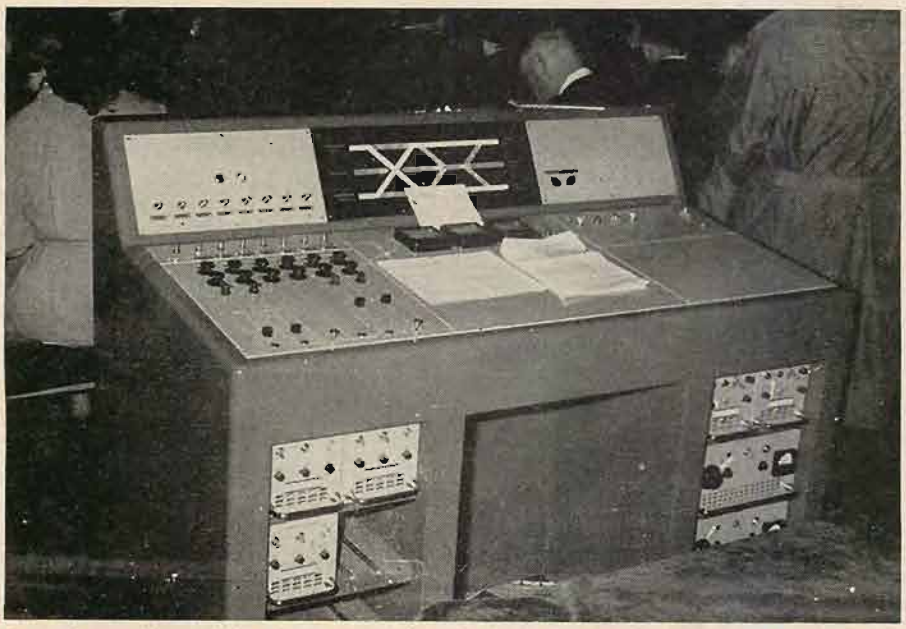
M. Lunet de la Malène, Chargé de l'Information of the French State Department, (left), tours the show with Marc Boissinot, secretary general of the S.I.E.R.E.

The Salon was held at the Parc des Exhibitions, which is located at the Porte de Versailles and easily accessible by the Metro and by three bus lines. By taxi it was only about $1.50 from the central part of the city. Adequate parking facilities were provided for anyone coming in a private car. No figures were given for the number of visitors, but we would estimate well over 50,000 by comparison with other shows we have attended where such figures were available.

The Hi-Fi Show

The hi-fi show in Paris goes under the impressive title of Festival International du Son, and a subtitle of Salon du Matériel Haute Fidélité-Stéréophonie. In keeping with the high tone of the show itself, it was under the patronage of M. Andre Malraux, Cultural Chargé des affaires of the Ministry of State. The show was presented by the Syndicat des Industries Électroniques de Reproduction et d'Enregistrement (S.I.E.R.E.) with the concurrence of the Fédération Nationale des Industries de l'Electronique and French Radio and Television department. Also participating were six foreign radio organizations —B.B.C., Nederlands Radio, Nippon Hoso Kyokai, West German, Italian, and Swiss radio broadcasting groups.



Control console used in the Grand Salon of the Palais d'Orsay Hotel for demonstrations. This unit is arranged for three channels, and the pattern at the top shows the channel routing at any given control settings.

Management of the festival was in the hands of M. Marc Boissinot, Secretary General of the S.I.E.R.E., and for the industry groups the administration was again under M. Pierre Aujames. Both of these shows are free from the appearance of any commercialism on the part of the producing organizations, but gave the over-all impression of an official exhibition such as a World's Fair. As usual, the opening to the press preceded the official inauguration —the former taking place on the evening of March 8 and the latter on the following afternoon. The official inauguration was by M. Christian Lunet de la Malène, Chargé de l'Information for the French State Department; he appeared right at the appointed time, toured the show, signed the big red guest book, and entered the opening reception. As the only U.S. magazine representative present, we signed the guest book next, and following right into the reception.

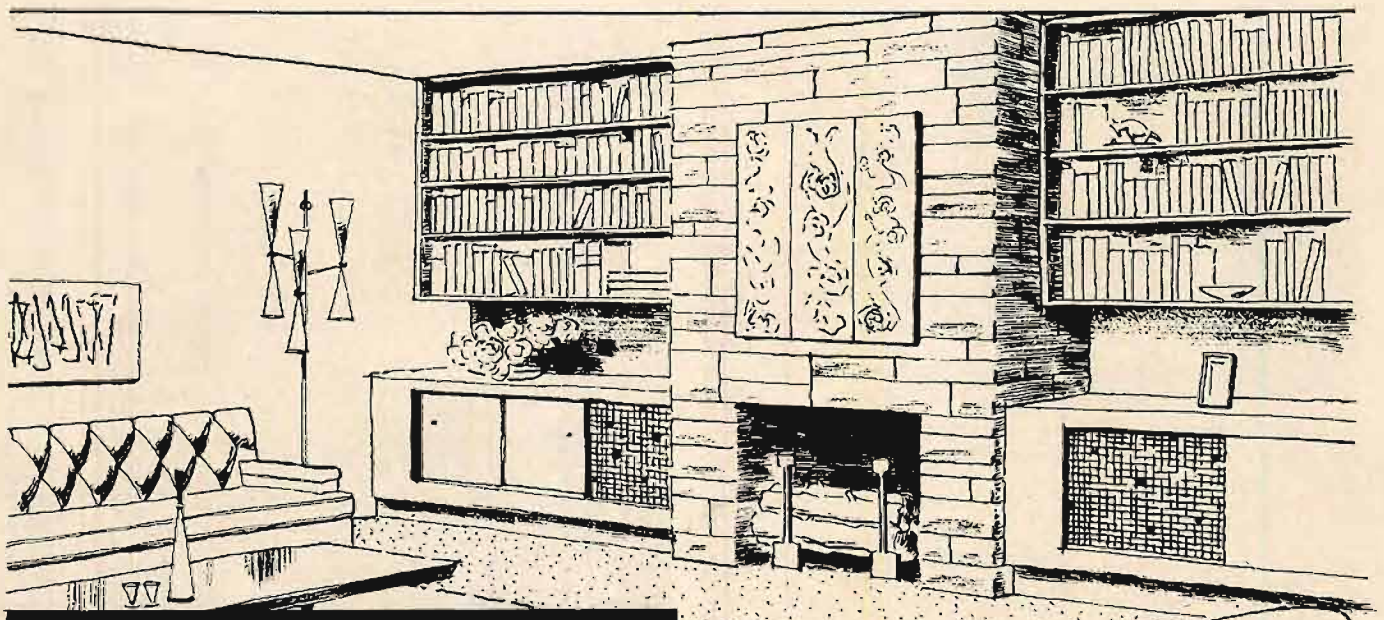
Exhibitors and Exhibits

The show comprised 36 exhibitors with 68 brand names of the equipment shown. Twenty-two U.S. manufacturers had their products at the show, and many of the other names are equally familiar to U.S. readers. Actually there is very little French hi-fi equipment imported into the U.S., and only recently has it been possible for U.S.-manufactured hi-fi products to be imported into France. The U.S. manufacturers represented were: A.D.C., Ampex, Acoustic Research, Bell Sound, Concertone, Cook, DeWald, Dynaco, Granco, Grommes, Harman-Kardon, Heathkit, Jensen, Knight Kit, Marantz, Philco, Revere, Scotch (M.M.M.), H. H. Scott, Sherwood, Shure, and Westrex.

Almost as familiar to U.S. readers are such names as: A.K.G., Brenell, Connoisseur, Ferrograph, Garrard, Goodmans, Grundig, Leak, Lenco, Lowther, Ortofon, Philips, Quad, Sony, Tandberg Telefunken, Thorens, Truvox, and Wharfedale. Teppaz is, we believe, the only French manufacturer actually sold in the U.S.

The show itself was divided into two sections—the "static" exhibits in the entrance hall, and the demonstrations spread over three floors of the Palais d'Orsay Hotel. Ceilings were high throughout the rooms (about 12 feet), and most rooms were large enough for good sound. Probably the most outstanding French product was the Orthophase loudspeaker, which has been described in some foreign publications heretofore. The U.S. Bogen-Rich loudspeaker seems to derive from the Orthophase in some respects, but the latter is frightfully expensive, even by our standards.

We met many old friends—and, we



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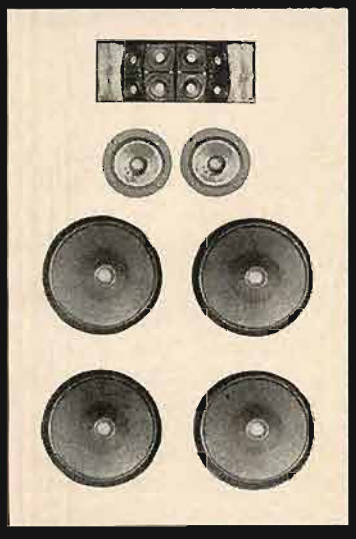
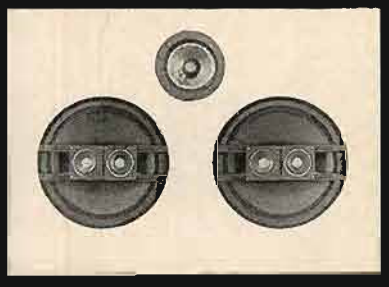


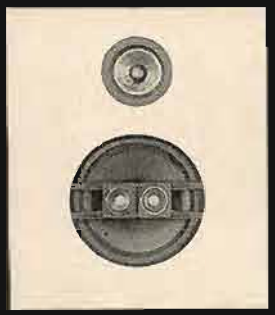
P-310AP

- dimensions: 47" high x 31" wide thickness: 1½"
- cavity required: 16 cu. ft.
- contains: four B - 199A's, two B - 209A's, one B - 200XA, and cross-over network



P-305P

- dimensions: 24" high x 34½" wide thickness: ¾"
- cavity required: 8 cu. ft.
- contains: two B - 207A's, one B - 209A and cross-over network



P-302AP

- dimensions: 27" high x 23" wide thickness: ¾"
- cavity required: 5 cu. ft.
- contains: one B - 207A, one B - 209A and cross-over network

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George H. Duarte, export manager for Bell Sound and only U.S. manufacturer represented in person.

Radio - oldtimer Louis Fischoff in his demonstration room. Almost hidden is Richard Merrick, Ferrograph manufacturer.

hope, made some new ones. On our first trip to Paris in 1953, we became acquainted with M. Charles Boubet who operates a hi-fi and commercial sound organization in Paris, as well as E. Aisberg, editor for many years of the French magazine, *Toute le Radio,* and we renewed both of those acquaintances, as well as that of Louis Fischoff, very early pioneer in the U.S. radio scene and now a resident of Paris and still in electronics. We also talked briefly with M. Georges Gineaux, publisher of *T.S.F. por Tout, Revue du Son,* and several other magazines. Harvey Gernsback, editor of *Radio Electronics* was the only U.S. editor we encountered at the shows, but we did meet Lewis Goodfriend—for many months a contributor to AUDIO in the early days and now an acoustic consultant—walking down a Paris street in pursuit of his present profession. Only U.S. manufacturer represented personally at the hi-fi show appeared to be Bell Sound, with export manager George Duarte on hand. Charles Frank of Ercona Corporation was a visitor, and one of our pictures shows Richard Merrick, Ferrograph Manufacturer almost hidden behind a visitor to the show. (That was one of the two pictures we did not take personally—the other being the over-all scene at the Components Exhibition.) All of which proves that it is a small world, especially now that it takes only eight hours to fly from New York to Paris or back.

The End

All good things come to an end some time, and since the London hi-fi show does not come up until the end of April, we had to come back to the "grind." After all, the life of a publisher is a tough one—people feed you too much, keep you out too late, drag you to night clubs, and you still have things to do. But then, it is better than working.

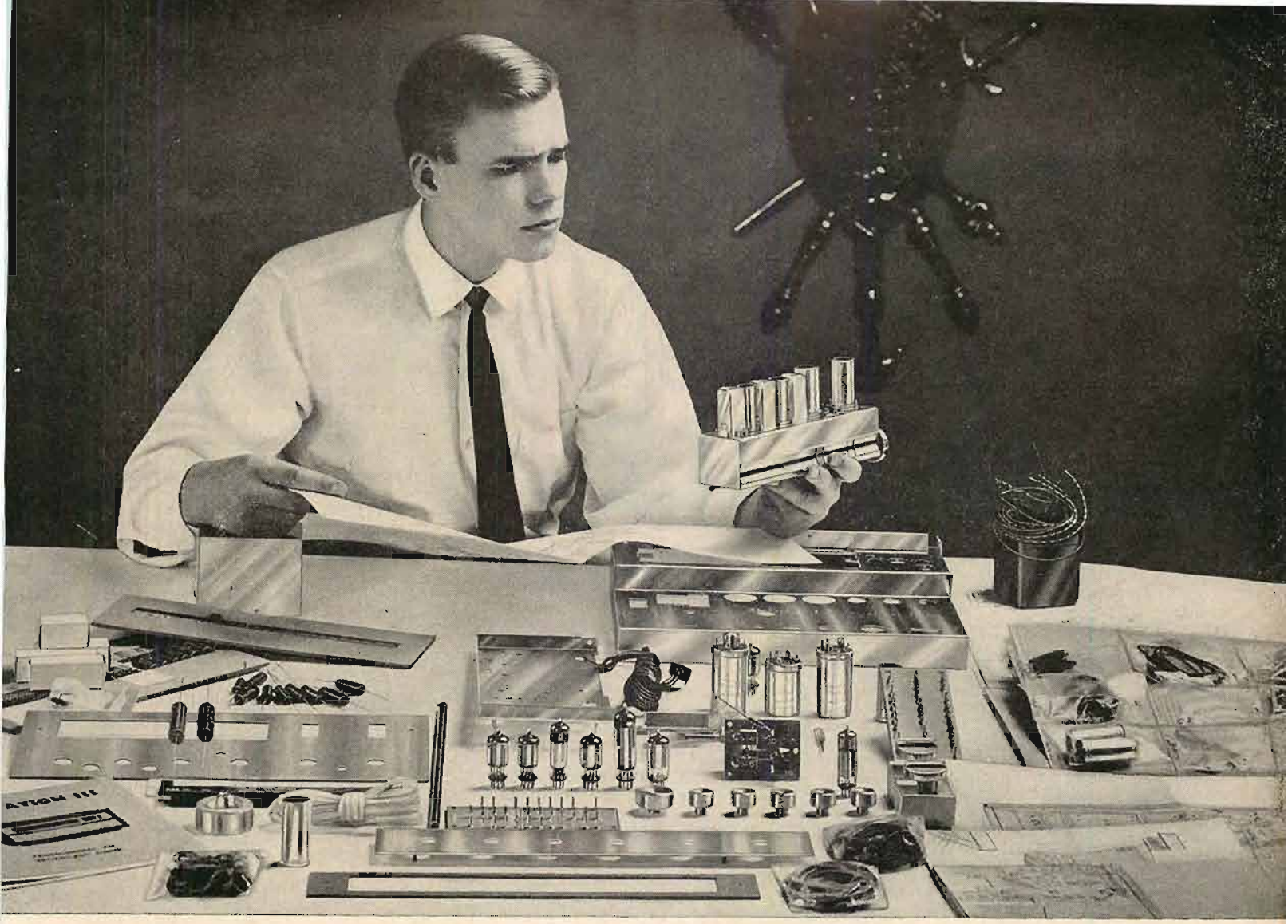
And so, back to Orly and another of Pan Am's DC-8's, and eight hours and two meals later, Idlewild and the typewriter. We think that there should be enough people who would like to attend the foreign shows that a special flight should be arranged for them, and if enough of AUDIO's readers feel the same way we will start the ball rolling for next February's Paris shows.

All right, everybody, let's go! Æ

M. Levy at Film et Radio's static exhibit on the hotel's ground floor. Note U.S. and British manufacturers represented by his company.

New loudspeaker developed by Raymond Cooke, formerly with Wharfedale. Speaker is expected soon in the U.S. Unit incorporates rounded-corner 12 × 16 in. poly-sandwich cone woofer, 3 × 5 in. midrange cone of similar type, and dome tweeter.

Unique hi-fi "chain" comprising 4-foot-high enclosure which also incorporates FM tuner and amplifier. Sloping reflector has conical depressions for diffusion.



Can You Afford 15 Hours to Build The World's Best FM/Multiplex Tuner?

Fifteen hours. That's all it takes to build the world's best FM/Multiplex tuner.

Citation has the "specs" to back the claim but numbers alone can't tell the story. On its real measure, *the way it sounds*, Citation III is unsurpassed. And with good reason.

After years of intensive listening tests, Stew Hegeman, director of engineering of the Citation Kit Division, discovered that the performance of any instrument in the audible range is strongly influenced by its response in the non-audible range. Consistent with this basic design philosophy – the Citation III has a *frequency response three octaves above and below the normal range of hearing*. The result: unmeasurable distortion and the incomparable "Citation Sound."

The qualities that make Citation III the world's best FM tuner also make it the world's best FM/Multiplex tuner. The multiplex section has been engineered to provide wideband response, exceptional sensitivity and absolute oscillator stability. It mounts right on the chassis and the front panel accommodates the adapter controls.

What makes Citation III even *more* remarkable is that it can be built in 15 hours without reliance upon external equipment.

To meet the special requirements of Citation III, a new FM cartridge was developed which embodies every critical tuner element in one compact unit. It is completely assembled at the factory, totally shielded and perfectly aligned. With the cartridge as a standard and the two D'Arsonval tuning meters, the problem of IF alignment and oscillator adjustment are eliminated.

Citation III is the *only* kit to employ military-type construction. Rigid terminal boards are provided for mounting components. Once mounted, components are suspended tightly between turret lugs. Lead length is sharply defined. Overall stability of the instrument is thus assured. Other special aids include packaging of small hardware in separate plastic envelopes and mounting of resistors and condensers on special component cards.

For complete information on all Citation kits, including reprints of independent laboratory test reports, write Dept. A-4, Citation Kit Division, Harman-Kardon, Inc., Plainview, N. Y.

The Citation III FM tuner—kit, $149.95; wired, $229.95. The Citation III MA multiplex adapter—factory wired only, $79.95. The Citation III X integrated multiplex tuner — kit, $219.95, factory wired, $299.95. All prices slightly higher in the West.

The Citation III

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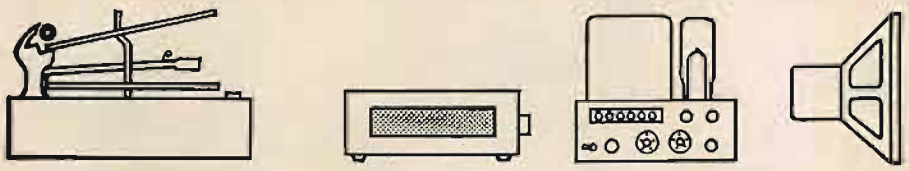
EQUIPMENT PROFILE



H. H. SCOTT STEREO AMPLIFIER KIT, MODEL LK-48.

The H. H. Scott Model LK-48 stereo amplifier kit encompasses a 24-watt (IHFM) stereo amplifier, a stereo preamplifier, and a stereo control center, all integrated on one convenient chassis. The control center contains the usual complement of controls and switches required to direct the variety of audio sources this unit will accommodate into the appropriate speaker-bound path. In addition, there are a few extra and worthwhile features. For example, the Stereo Selector control has a Bal A and also a Bal B position. In the Bal A position both channels coming into the LK-48 are combined and sent only to the left speaker. Conversely, in the Bal B position they are sent only to the right speaker. With these switch settings plus the Stereo Balance control, it is possible to compensate for differences in speaker efficiencies, room acoustics, and other sources of inequality between the two channels. Another feature of the LK-48 is the monophonic record position on this Stereo Selector. In this position the output of a stereophonic cartridge being used to play monophonic records is automatically combined thus effectively cancelling out vertical rumble in the signal.

The LK-48 will accept inputs from a magnetic cartridge, a tape deck, an AM tuner, an FM tuner and an FM-stereo tuner (not simultaneously with the mono AM and FM tuners). In addition, it will accept the stereo input from almost any high-level source. An additional low-level magnetic input is provided for tape heads so that a tape recording may be monitored while the actual recording is taking place. Of course, this is only usable with tape decks with separate record and playback heads. Outputs are provided for the tape recorder and a derived center channel. One switched convenience outlet is provided which may be somewhat inadequate if one is to accommodate the variety of audio signal sources which this unit is capable of accepting. It would be desirable to have one or two more, one of them not switched (for the turntable).

As expected, the H. H. Scott LK-48 is a well-designed integrated stereo amplifier consisting of high-grade components.

Circuit Description

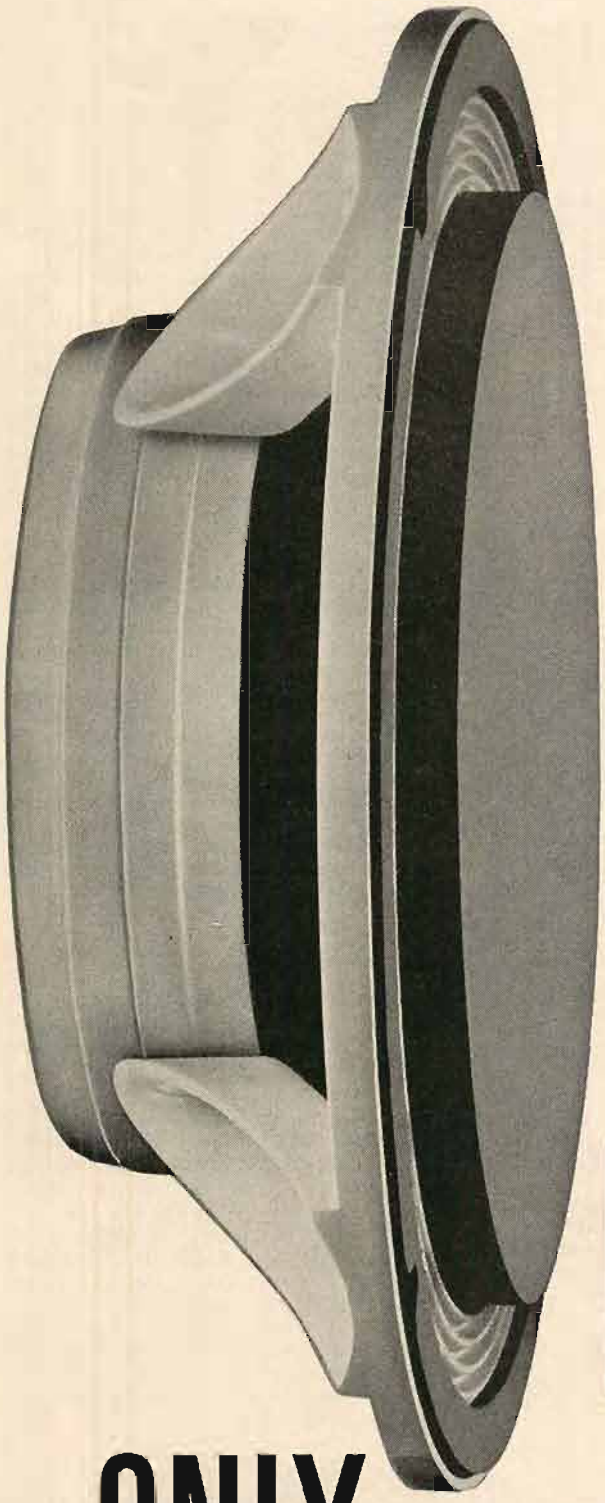
There are two low-level inputs, magnetic high and magnetic low. The magnetic high is intended for phono-cartridge inputs and magnetic low for tape-head inputs. The magnetic high input is reduced in level by means of a 100,000-ohm resistor before it joins the magnetic-low input path. It should be noted that since both inputs feed the same line they cannot be used simultaneously. Then the signal goes to the preamplification stage which is a 12AX7. Equalization (RIAA or NAB) is introduced through a feedback path between the plate of the second section of the dual-triode and the cathode of the first section. After being preamplified, the low-level signals enter the first audio amplifier stage as do the high-level signals (tape, tuner, high-level ceramic cartridge). This first amplifier stage is a 12AX7 which functions both as amplifier and tone driver. Here again the feedback is used to achieve tone compensation (actually the equalization networks in the preamplifier stage are tone correcting networks to compensate for the recording curve). A scratch filter is included at this point. After this first stage of audio amplification, the signal is fed through the volume control. Here a selector switch permits a Fletcher-Munson compensating network to be inserted (boosts low frequencies). The next stage is a driver and phase splitter consisting of a 7199 triode-pentode. The pentode section is the driver and it feeds the triode stage which is the phase splitter for the output stage. The input to the grid of the driver sections of both channels go to opposite ends of a stereo-balance potentiometer. The wiper arm is grounded. When the wiper arm is moved, it simultaneously raises the gain of one channel and reduces the gain in the other. Each output stage utilizes two 7189 pentodes operated in push-pull. The bias is fixed and d.c. balance is achieved by means of a potentiometer across the two grids. This insures precise balance of the output tubes. The procedure for obtaining d.c. balance is rather simple consisting merely of placing a 16-ohm resistive (and non-inductive) load at the proper terminals of the output transformer, connecting a 'scope (or a VTVM) to the same terminals as the resistor, removing the phase-splitter tube and adjusting for minimum 120-cps hum pattern on the scope (or minimum reading on the VTVM). The power supply consists of a 5AR4 rectifier which supplies B+ for all stages and a selenium bridge rectifier which supplies the fixed bias for the two output stages plus d.c. for the filament of the 12AX7 tubes in the preamplifier and first audio amplifier stages. A separate winding on the power transformer supplies filament current for the driver and output stages.

This circuit holds few surprises and is designed primarily for reliability. The output stage is operated at about 75 per cent of the "design average" values thus ensuring long tube life and generally superior performance. It should be noted that the LK-48, in common with all H. H. Scott amplifiers, incorporates a low-frequency rolloff below 20 cps. The reason for this is to prevent the amplification of low-frequency rumble such as produced by a turntable or record.

Construction

It required eighteen hours and fifteen minutes to construct the LK-48. Approximately one hour of this time was spent getting familiar with the instruction manual and checking the parts. The use of full color in the instruction manual, plus unusually well thought out and simplified procedures, makes it so easy to build the LK-48 that the only conceivable reason for the unit not operating properly upon completion is carelessness. Even the novice kit builder can construct this unit without difficulty. The step-by-step layout of wiring and parts is on a left-to-right basis (wonder what would happen if the constructor were left-handed?). The only difficulty we experienced was the complete absence of one small wire and another wire being shorter than it was supposed to be. On the other hand, all other parts and wires were appropriate for their location and of proper size. Considering the large number of individual pieces in this kit, it is a remarkable feat of production that everything measured so beautifully. As a suggestion to the manufacturer, we felt that it would be valuable if the prices for replacement parts were included. A final suggestion (in keeping with the editorial in the February issue), we feel that it would be extremely helpful if information were included as to why certain leads must be kept

Fig. 1. H. H. Scott amplifier kit, Model LK-48.



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One thing you won't find in 3-P systems is "bass-boom". The low end is so clean, so highly damped that exaggeration of sounds is impossible . . . every note, down to the extreme bottom, is reproduced with rare accuracy.

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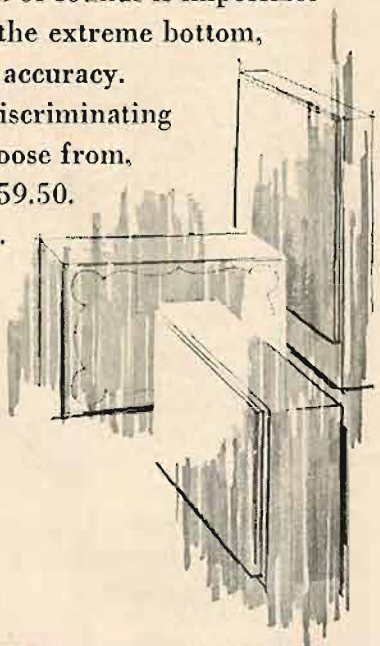

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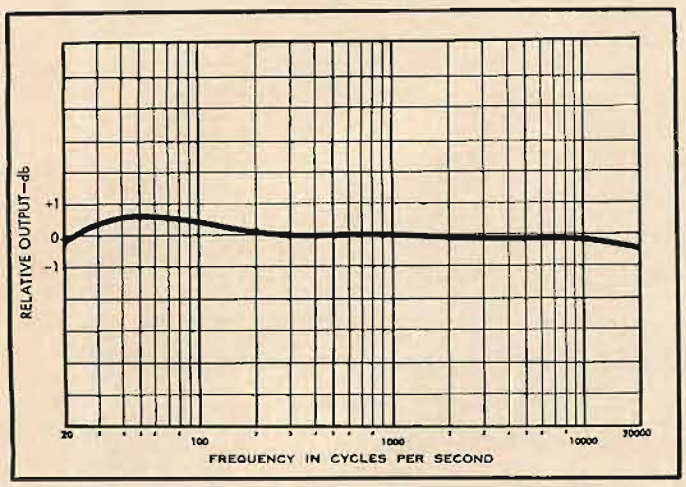


Fig. 2. Frequency response of the LK-48.

to a minimum length and why certain sections must be shielded.

Performance

The performance of the LK-48 is quite excellent. *Figure* 2 shows the frequency response at normal listening levels. The poer bandwidth at rated distortion (IHFM method) was at least 20–20,000 cps and perhaps even greater. (Our test equipment wouldn't permit further exploration.) The IM distortion at an output of 12 watts (half power) was 0.5 per cent. Harmonic distortion at this power was 0.6 per cent. Sensitivity at the high-level input was 0.41 volts. The RIAA and NAB equalization curves were respectively within 1.5 and 2 db of the standard curve at all points.

In summation the H. H. Scott LK-48 stereo amplifier kit is easy to build, easy to buy, and well worth consideration by the kit-building audiofan who requires a stereo amplifier. **D-20**

H. H. SCOTT FM-STEREO TUNER KIT, MODEL LT-110

In February, 1961, we had occasion to report on the then new LT-10 FM Tuner Kit. Several months later, the FCC permitted multiplex broadcasts so that we could enjoy FM stereo and, naturally, it was inevitable that the kit we thought so highly of then should be modified for reception of stereo broadcasts. In essence, the LT-110 is that very same LT-10 with the addition of the H. H. Scott multiplex circuitry. Of course, there have been some improvements in the basic circuit, plus changes which were necessitated by the necessity to handle stereo signals.

Before proceeding much further, we should note our appreciation for the excellent thinking that went into this kit. We were favorably impressed when we built its forerunner, the LT-10, and we are still impressed. In comparing the earlier model with the LT-110, we did note several improvements in the manual. Also, and surprisingly, considering that the basic circuit is unchanged, the sensitivity of the tuner has been improved.

A New-Old Circuit

Although the circuit of the LT-110 is almost exactly the same as its forerunner, the LT-10—and we described the latter in February, 1961—we will repeat the description and point out the very few differences.

Starting from the tuned antenna input circuit, the signal is fed to a cascode r.f. amplifier consisting of a 6BS8/6BQ7A. The tuning meter samples the output of the first section of the r.f. amplifier. After leaving the r.f. stage, the signal goes through the tuning circuit and into the grid of the mixer tube, which is the pentode section of a 6U8. The triode section of this 6U8 is the local oscillator. After leaving the mixer, the signal goes through two i.f. stages consisting of the coupling transformers and a pair of 6AU6 i.f. amplifier tubes. From there it goes through the limiter, which is also a 6AU6 (in the LT-10 the limiter was the pentode section of a 6U8). Then the signal goes through the detector transformer and into the ratio detector which consists of a pair of 1N294/-1N541 diodes. After leaving the ratio detector, the signal is then fed into the multiplex adapter. The multiplex adapter in this kit is preassembled and requires only a few connections to integrate it with the rest of the tuner. We won't describe the circuitry of this adapter since it was described so well by Daniel R. von Recklinghausen in our June, 1961, issue. The schematic was shown in our August, 1961, issue. The audio output of the adapter is by means of anode followers, thus permitting up to 70 feet of cable, with a maximum capacitance of 1000 pf.

The only other change, except for some obvious ones in the power supply (to accommodate the four extra tubes), is the inclusion of a switch in the a.g.c. circuit to permit the tuning meter and a.g.c. to be more sensitive for the lower signal levels normally encountered in stereo transmission. Again, in common with all of the H. H. Scott FM tuners, the LT-110 does not provide a.f.c. And, again, it didn't need it.

A New Alignment Procedure

The H. H. Scott engineers have demonstrated their ingenuity once again by devising a new detector alignment procedure. The i.f. "cans" are tuned in the usual manner. That is, the tuning slugs are turned in or out, as necessary, to achieve maximum indication on the tuning meter; in other words they are "peaked." It is in tuning the detector that the new *piece de resistance* is revealed. The procedure simply involves injecting hum from the filament of the first i.f. tube to the grid of the same tube through a .05 μf capacitor, and adjusting the tuning slug on the detector transformer until minimum hum is achieved. That's all there is to it; we are simply adjusting the detector for maximum limiting. In spite of the simplicity of this method, we found that it worked quite well. Only the barest whisper of a touch up was required.

Still Easy to Build

We won't go into a long explanation of the construction techniques because the ease of construction of these very well designed kits is well known by now. The full-color illustrations, the Part-Charts on which all of those parts are mounted corresponding to a particular page in the manual, the clear and full instructions, and the easy-to-build-in box, make the LT-110 so simple to build that we unhesitatingly recommend it for even the novice.

It took us some eleven hours to construct the LT-110 and perhaps it would have taken us somewhat less if the part numbers on the check list had been organized in the same sequence as the parts on the Part-Chart.

Performance

As we noted previously, the sensitivity of the LT-110 is better than its forerunner. We found that the useable sensitivity (IHFM) was 2.1 μv, which is 16 per cent more sensitive than the LT-10. Of course, this added sensitivity is of great value in multiplex reception, inasmuch as the signal levels in this mode are usually lower than the standard FM reception. The audio output was 1.7 volts. The capture ratio was 6 db, which means that it would reject signals which were of the same frequency but 6 db lower in level than the desired frequency. Stereo separation was better than 31 db.

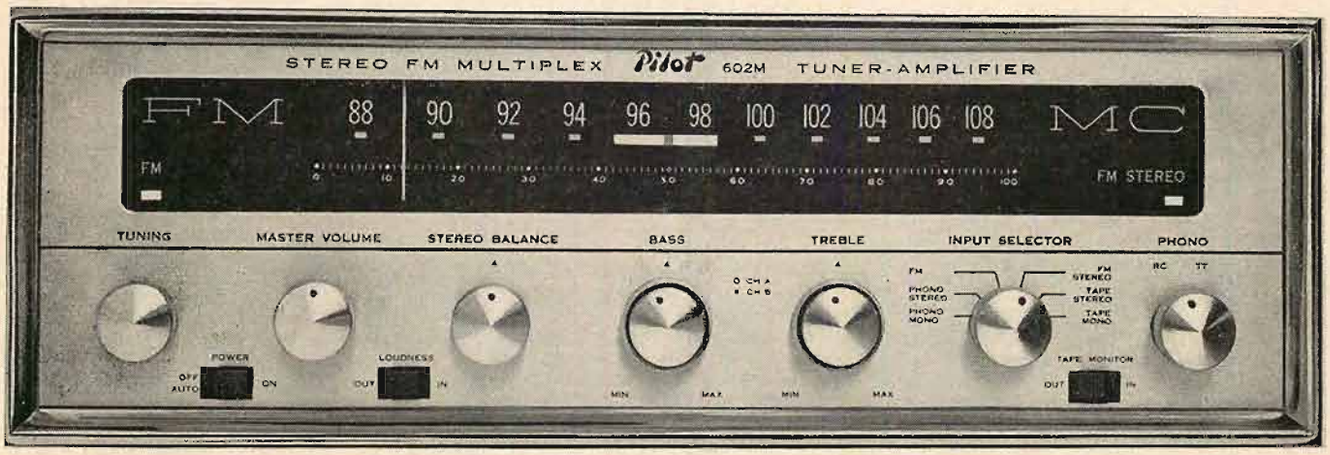
Altogether, the H. H. Scott Model LT-110 FM-stereo tuner kit is both a fine stereo tuner and an unusually easy kit to build. **D-21**

Fig. 3. H. H. Scott FM-Stereo tuner kit, Model LT-110.

Only these FM Stereo Receivers have Pilot's unique signal-sampling multiplex circuit*

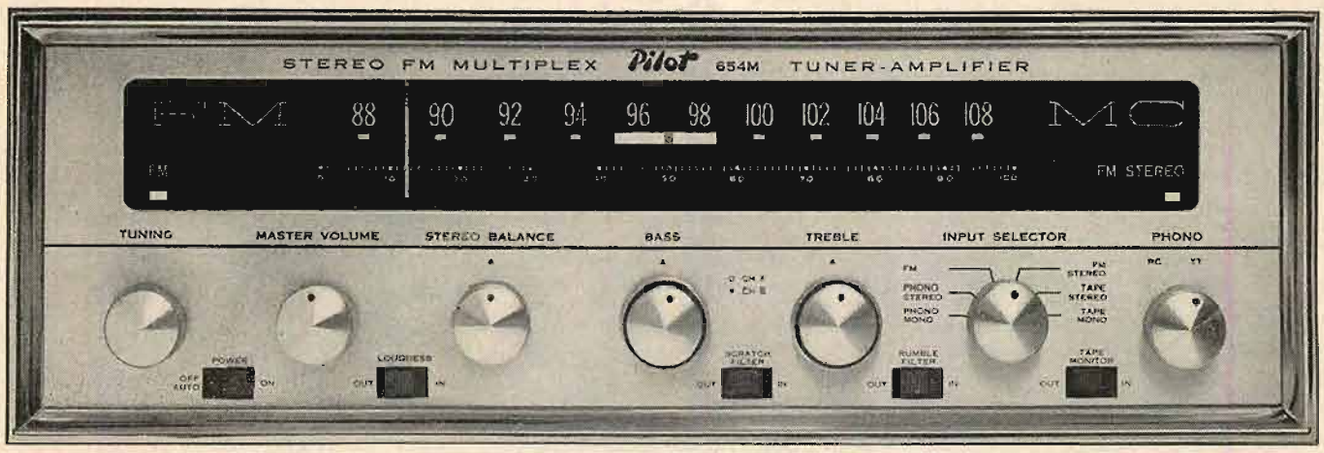
You get the best possible FM Stereo reception because PILOT's unique signal-sampling multiplex circuit gives you maximum separation (30 db or better) across the entire audio spectrum. It is the simplest, most effective, most trouble-free circuit presently being manufactured for stereo demodulation. There are no troublesome frequency separation filters and matrices or extra controls as are required by other multiplex circuits. This is just one of the many features that make PILOT Stereo Receivers the perfect electronic "heart" for your high-fidelity system.

*Patent Pending



PILOT 602M...30 watts music power...frequency response 20-20,000 cycles, ± 1 db...harmonic distortion 1% at full power...12-control flexibility...FM sensitivity 3 uv IHFM...wide band RF and IF circuits for undistorted reception at full modulation...6 inputs...5⅛" high x 14⅝" wide x 10¾" deep. With cover... **249.50**

(Also available with added AM as Model 602S. Complete, 299.50)



PILOT 654M...60 watts music power (IHFM mid-band rating)...frequency response 10-50,000 cycles plus 0.5 db or minus 1 db...hum and noise: completely inaudible (80 db below full output)...intermodulation distortion: less than 0.3% ...14 controls, including rumble and scratch filters...6 inputs...**plus** a fully automatic stereo indicator that lights on stations broadcasting FM stereo...5⅛" high x 14⅝" wide x 12¾" deep. Black and brass styling. With cover... **329.50**

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MR. FREDRIC MARCH AND MR. DOUGLAS CAMPBELL IN A SCENE FROM GIDEON. PHOTO BY ARTHUR CANTOR

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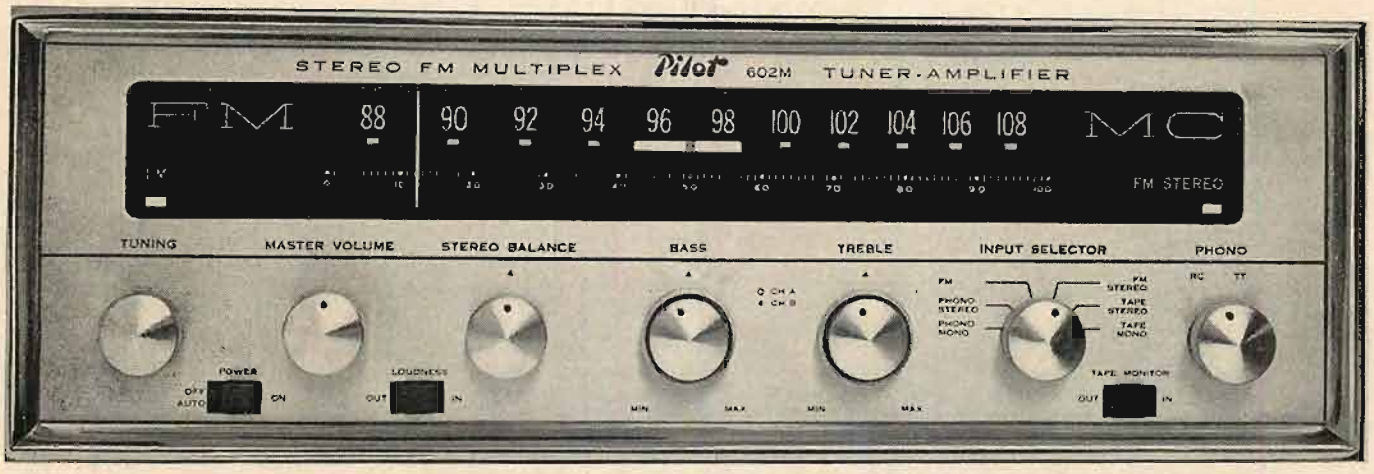

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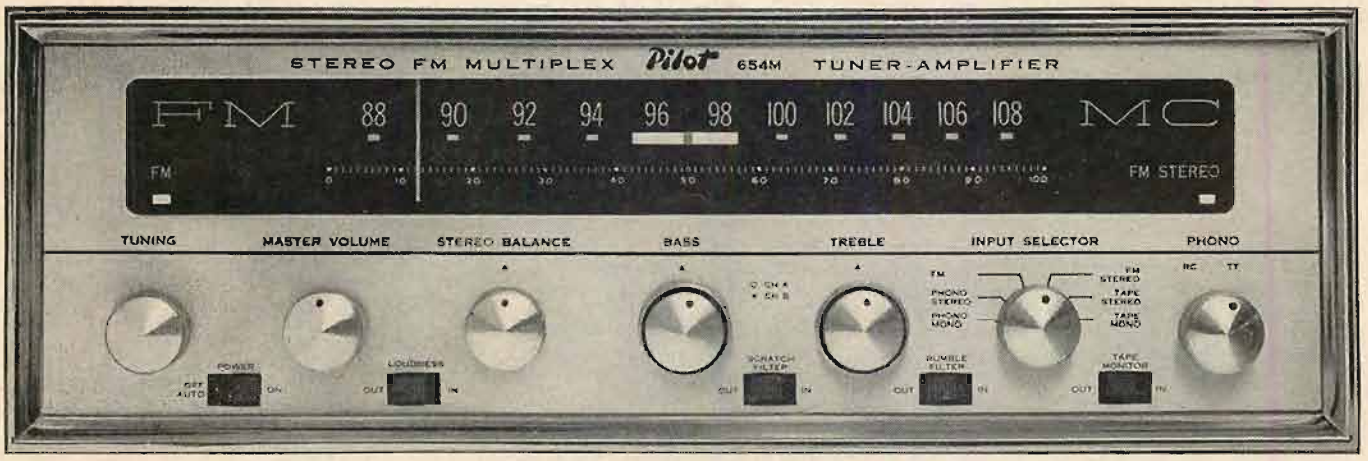

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MR. FREDRIC MARCH AND MR. DOUGLAS CAMPBELL IN A SCENE FROM GIDEON. PHOTO BY ARTHUR CANTOR

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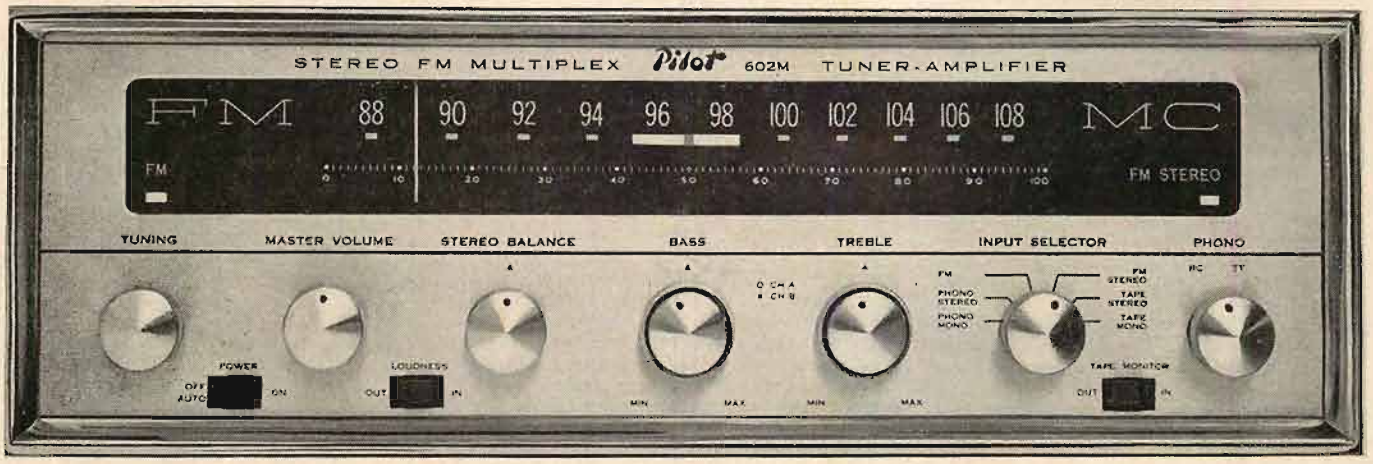

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Fig. 4. Sherwood "Ravinia" speaker system, Model SR3.

SHERWOOD SPEAKER SYSTEM, MODEL SR3

The Sherwood Model SR3 "Ravinia" is a 3-way, 3-speaker system, housed in a modestly-sized ducted-port enclosure. The speaker complement consists of a 12-inch woofer, an 8-inch closed-back midrange unit, and a 3½-inch ring-radiator tweeter. An LC crossover network is included and the crossover points are 600 cps and 3500 cps. Controls are provided to vary the midrange and tweeter proportions, to compensate for room acoustics.

There are several features involved in the enclosure above and beyond its decidedly handsome appearance. First of all, it is an unusually rigid and well constructed enclosure, which weighs some fifty odd pounds, a fact we can attest to by virtue of a strained back. The grille-cloth panel is easily removable for the purpose of replacing the grille cloth, or for obtaining access to the speakers. All of the speakers are removable from the front. The dimensions of the enclosure are 15-in. × 26¼-in. × 13-in. deep.

The crossover network is accessible after the midrange speaker is removed and consists of a 12-db-per-octave network at 600 cps and 3500 cps, as shown in *Fig.* 5.

How Does It Sound?

The Sherwood "Ravinia" Model SR3 is a fine sounding speaker system, with a solid non-boomy bass, smooth midrange with good presence, and clean highs. The midrange and tweeter level controls (the 25-ohm potentiometers shown in *Fig.* 5) provide a good range of control to modify the

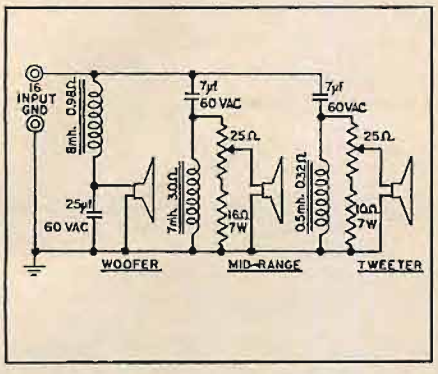


Fig. 5. Crossover network for Sherwood "Ravinia" speaker system.

midrange and highs for room acoustics. For example, the first room in which we listened to these speaker systems was one of those bright, modern rooms, with a lot of glass, plaster walls, no drapery, and so forth; in other words, a very live room. We found it necessary to turn the tweeter control all the way down; and, in addition, the midrange control had to be turned down some too before the system sounded right, *but we were able to do it.* The ability of the system to handle transients is quite good, as indicated by its response to several forceful piano selections. Although a very good sounding speaker system. Worth investigating. **D-22**

MARK-Q-MATIC TAPE RECORDER-SLIDE PROJECTOR SYNCHRONIZER, MODEL MQM-1

For those of us who have occasion to enhance slide showings with sound, music as well as voice, the Mark-Q-Matic Model MQM-1 is a convenient and simple device to accomplish it.

Designed to operate with slide projectors (or film-strip projectors), with automatic advance, the Model MQM-1 will allow a completely unattended and coordinated slides-with-sound program. One of the most significant features of this unit is that the cueing does not require tape splicing or pasting down of a cueing strip on the magnetic tape. Instead, all that is required is a soft-pencil mark at the appropriate place on the tape. The beauty of this system is that if a mistake in cue location is made, one need merely erase the pencil mark and properly locate it, and with no harmful effect to the recorded tape. Apparently, when the pencil mark bridges the two steel rods in the head of the MQM-1, an electrical path is set up which permits a relay to close and send current to the advance mechanism of the slide projector. Although we were not able to determine the exact circuit, most likely the pencil mark path acts as a trigger for some circuit which can supply the energizing current to the solenoid. It should be noted that special

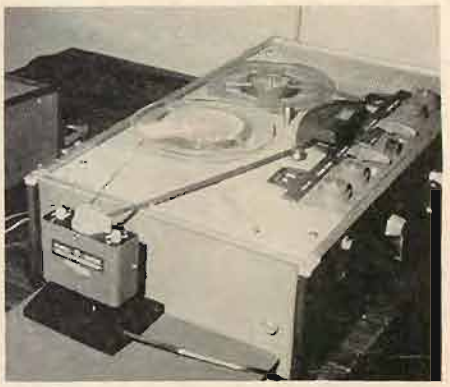


Fig. 6. Mark-Q-Matic tape recorder-slide projector synchronizer.

pencils are provided with the unit, most probably with leads which have very high graphite content.

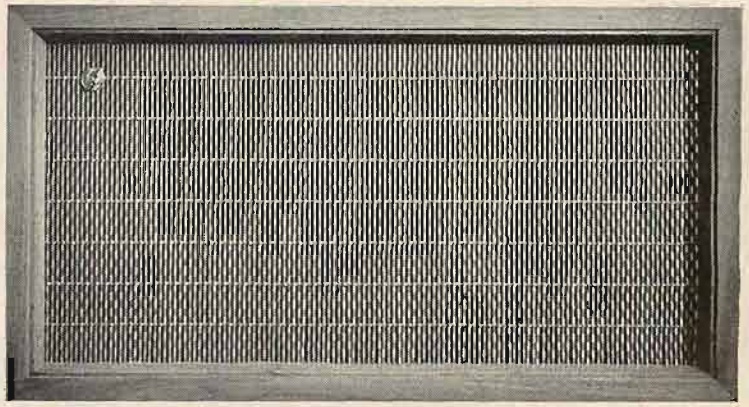
Operation

Getting this unit in operation is a rather simple, essentially 3-step procedure. First of all, the synchronizer has to be physically located so that its head is in the same plane as the supply reel (the take-up reel may be used but normally the greater variations in tension of tape at this reel may make it more difficult to operate). Secondly, the synchronizer has to be interconnected with the control mechanism of the slide projector. Here it should be noted that there are a variety of special cables available which permit this unit to be operated with, or instead of, a remote control. Those remote controls which contain focusing and other provisions may still be used with this unit. On the other hand, if the remote control only permits advancing the slide, the Mark-Q-Matic may be used instead of it. Preferred procedure is a simple and straightforward playing of the tape with the slide projected and marking those places where a slide change is desired. In relation to the claim that pencil marks can be erased from a recorded tape without damaging the sound quality, we tried the procedure several times and found no harmful effects. Of course, we were careful and it is possible that uninhibited erasing may go right through the oxide coating.

To sum it all up, the Mark-Q-Matic Model MQM-1, manufactured by General Techniques, is a useful and simple-to-use product for those requiring audio-visual synchronization of tape recorder and slide projector. **D-23**

We told you this was a dangerous loudspeaker!

In the fall of 1960 we introduced you to the EMI bookshelf speaker system and warned you about its dangers. ■ We told you that its effortlessly smooth, sweet, free-floating sound would be fatal to some of the bulkiest and most expensive loudspeakers by comparison—let alone other bookshelf speakers. We explained the psychological hazards of listening to the EMI Model DLS 529 after having purchased a larger, costlier, but not nearly as natural-sounding speaker system. And we cautioned you against the risks of exposing mediocre amplifiers, pickups or other equipment to the transient-perfect scrutiny of the EMI bookshelf unit. ■ Despite our warning, thousands of you went out and bought EMI bookshelf speakers anyway. The rest is high fidelity history. ■ Our loudspeaker turned out to be even more dangerous than we had thought possible. We knew we would come out far ahead of all competing designs, but we didn't really mean to start a massacre. When people get rid of three-hundred-dollar speaker systems and switch to our $159.00* unit, even we begin to feel a bit frightened. ■ Of course, there's nothing we can do about it at this point, except perhaps to put the blame on EMI's world-renowned Dr. G. F. Dutton. It was he who designed the fabulous drivers of the Model DLS 529. He is responsible for the exclusive, hand-made 13½" by 8⅛" elliptical woofer with aluminum cone and special plastic suspension. Not to mention the two specially designed 3½" tweeters, the high-precision 4,500-cps crossover network or the heavily reinforced and damped 24" by 13" by 12¼" enclosure. As for the magnificent walnut cabinet work, the superb finish on all sides (including the back!) and the elegant woven metal grille, certain highly skilled craftsmen must share the responsibility for that. So we have no choice but to go on living dangerously... ■ If you can now overcome your trepidation, we suggest that you listen to a pair of EMI's on good stereo material at your nearest dealer. Like climbing Mount Everest, it will be well worth the danger.



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MR. FREDRIC MARCH AND MR. DOUGLAS CAMPBELL IN A SCENE FROM GIDEON. PHOTO BY ARTHUR CANTOR

TRANSIS-TRONICS FM-STEREO TUNER MODEL FM-15MX.

TEC (the more commonly seen name for Transis-Tronics) has been making transistorized amplifiers and tuners for some years now. In the past we have had an opportunity to "look at" one of their amplifiers but this is the first opportunity we have had to examine a tuner. On top of that, it has built-in multiplex circuitry.

One of the most striking aspects of this unit, at first glance, is its unusual compactness; it measures a mere 3-in. high by 10⅛-in. wide by 8½-in. deep. Of course, this is one of the virtues of complete transistorization. In addition to being small in size, however, it is clean and uncluttered in appearance; a truly functional appearing design, gem-like in its simplicity.

Although it is small, it does not lack any of the necessary controls that a modern FM tuner needs. It has a tuning meter, plus switches to select multiplex or mono FM, a muting selector and an a.f.c. selector. The slide-rule type dial is surprisingly large and easy to read, considering the over-all size of the unit. Tuning action is smoothed by means of a flywheel, although it was a little stiff for our taste. A local-distant switch is located on the back panel which reduces the level of a strong signal by some 20 db.

One of the most impressive sights we have seen for some time (in equipment, that is), is revealed when the cover of this unit is removed; the mechanical layout is beautiful in its simplicity and indicative of a high order of intelligence. Our first inkling of this was when we removed the top cover. Lo and behold, we were staring at a printed circuit board across the entire top. The components were not revealed until we had removed the bottom plate (and observed them hanging upside down from the circuit board on top). Of course, there is no virtue in this upside-down arrangement as such; and indeed it is possible that this unit could have been constructed right-side up (with some loss in mechanical rigidity, in our opinion). What is indicative of good design, however, is the easy availability of almost every component and plenty of "breathing space" for all the heat-generating parts. Another interesting and useful idea is the easy availability of the i.f. slugs through holes drilled in the side (visible after the top cover is removed).

Circuit Description

The front end of the FM-15 contains the usual r.f. amplifier, oscillator, and mixer, respectively a 2N1742, a 2N1744, and a 2N1743. In addition there is an a.f.c. diode. A local-distance input circuit switch inserts a resistive network in the local position, which reduces the signal level by some 20 db (by measurement). The i.f. section and limiters consist of five 2N1745 transistors and one diode. The discriminator utilizes a pair of 1N60 diodes and the subsequent audio section contains four 2N213 n-p-n transistors. The power supply section is well regulated and utilizes four silicon diodes in a bridge configuration, two transistors, and a zener reference diode. The multiplex section contains eight transistors and three diodes in some sort of a time division arrangement although we were unable to get full details of this section. (It is the subject of a patent application.) The tuning meter is across the output of the discriminator section.

Performance

The TEC FM-15MX is quite good. The usable sensitivity by the IHFM method of measurement was 8.5 μv, and we found that we were able to pick up all stations within a radius of 20 miles with full limiting and they all sounded loud and clear. Interchannel hash was completely eliminated by means of the muting control. The threshold point of this control was adjustable with signals ranging from less than one μv to up to 100 mv. The capture ratio at 100 μv is 5.3 db.. Constant audio output was achieved for all antenna input signals greater than 6 μv. FM harmonic distortion (plus or minus 75,000-cps modulation) was less than 1 per cent for antenna signals greater than 15 μv and 0.8 per cent from 30 μv to 50 mv. The discriminator peak-to-peak separation was 580,000 cps for signals greater than 100 μv. The multiplex separation was better than 30 db at 1000 cps. A.f.c. action was quite efficient with approximately a 5-to-1 reduction of frequency deviation. Variations of power line voltage up to plus or minus 10 per cent had negligible effect on oscillator frequency due to the well-stabilized power supply.

Although not indicated by the measurements, the TEC FM-15MX sounds quite good, and has very little background noise. Considering its price category, performance, size, and extreme ruggedness (we accidentally dropped it five feet with no harmful effects) it would be well worth investigation by any audiofan in need of a multiplex tuner. **D-24**

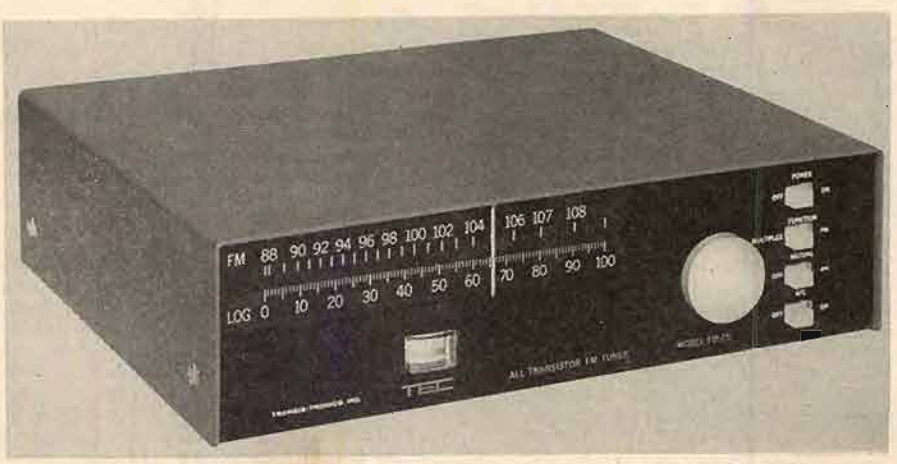


Fig. 7. Transis-Tronics FM-stereo tuner, Model FM-15MX.

HERMAN BURSTEIN*

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

1⅞-ips Equalization

Q. I own a brand new tape machine as well as several older ones. My new one yields very good frequency response at 1⅞ ips, and I would like to convert the older ones to operate at this speed with equally good response. I have already modified them to operate at this reduced speed, but I need advice on modifying the equalization.

A. So far as record equalization is concerned, you need more treble boost in the record amplifier. Possibly you can copy the circuitry of your new tape recorder. Otherwise you can try experimentally changing the value of one of the components—usually a capacitor—in the record equalization circuits of your older machines. Also, you will have to reduce the turnover point of your playback equalization; that is, bass boost should begin somewhere in the range of 800 to 1400 cps instead of at 3180 cps as in the case of the 7.5 ips speed. Again a change in the value of a capacitor would be involved.

But your biggest problem, I am afraid, will be the limited treble response in playback owing to the relatively wide gap of the playback head. The older machines usually have gaps of .00025-in. and even .0005-in. At 1⅞ ips, a gap of .00025-in. permits response only to about 4000 cps; a gap of .0005-in., only to about 2000 cps. Hence it will be necessary to replace the heads in your older machines with new ones having gaps on the order of .0001-in., which permit treble response to extend to about 10,000 cps.

4-Track Specifications

Q. I would like to know what, in your opinion, are the minimum technical and electrical specifications for a fully contained 4-track stereophonic tape recorder, that is, one which comes with necessary amplifiers and speakers to record and play back stereophonically. I speak in terms of good high fidelity performance. Please answer in terms of frequency response, distortion, hum, and so on.

A. Without trying to evade your question, I must nevertheless make the preliminary comment that your question is a highly subjective one. Apparently you have in mind not top performance, for which one pays top prices, but good performance, which still yields satisfaction at a substantial cost saving. However, what seems good to one person may easily appear only fair to a second person or possibly excellent to a third. Your question would be easier to answer if you asked about the performance that may be expected of a truly high fidelity tape recorder. All the same, let's have a try at approximating an answer to your question as presented. The following applies to a quarter-track machine operating at 7.5 ips.

Frequency response should be flat within 3 db between 50 and 12,000 cps (within 2 db between 30 and 15,000 cps for a top-grade machine). The signal-to-noise ratio should be about 48 to 50 db (55 db for a top grade machine) at a recording level that produces 3 per cent harmonic distortion at a frequency in the region of 250 to 400 cps. Wow and flutter should not exceed .25 per cent (.1 per cent for a top grade machine). Speed should be accurate with 2 per cent (.3 to .5 per cent for a top grade machine). Playback equalization should conform essentially to the NAB characteristic, namely having a 3180 cps bass turnover frequency, thereby assuring you of proper frequency response when playing prerecorded tapes.

The machine should have both low-level (microphone) and high-level (to accept a signal from an external audio source) inputs. The input sensitivity should be no less than .5 volt on high-level input and no less than 10 mv on low-level input. Although it may contain its own amplifier and speaker, the machine should provide an output for feeding an external sound system; the output should be at a point prior to the unit's power amplifier and speaker, thereby assuring best frequency response and lowest distortion. Means for easy azimuth alignment should be provided. The record and playback equalization should be automatically changed when tape speed is changed. A tape lift device should space the tape away from the heads during rapid forward and reverse winding, thus protecting the heads against undue abrasion. The record-level indicator should be of the magic-eye or meter type rather than a neon lamp, which is a go-no-go device that does not furnish intermediate indications of recording level; and it should be properly calibrated to indicate maximum recording level at the 3 per cent harmonic distortion point. A quarter-track machine should enable you to use all four tracks for monophonic recording, if desired.

The foregoing takes into consideration only the tape recorder proper, without the self-contained power amplifiers and speakers. The speakers, primarily, and the power amplifiers, secondarily, constitute obvious limitations on final performance. Very few self-contained tape machines can be rated as providing "good high fidelity." The few that can be so rated are those where the amplifier and speaker are in a separate case (usually matching the case which houses the tape recorder). So far the writer has not come across a self-contained tape machine which comes in a single case (including detachable wings) that can be rated as providing "good high fidelity."

I cannot suggest specifications for self-contained speakers, whether in the same case as the tape recorder or in a separate case. All I can say is the obvious thing, that they must sound good to your ears. If the speakers are in the same housing as the tape machine, at least one speaker should be detachable so that you can obtain suitable stereo separation. So far as the power amplifiers are concerned, they should be of the push-pull type rather than single-ended. Bass and treble controls of course are useful and desirable.

Setting up a System for Tape

Q. I am in the market for a versatile high quality preamplifier and amplifier and intend to add a tape machine to my system as the last of several components. The function of the tape setup will be to record and play back in both two- and four-track stereo and mono. I am interested in a non-portable unit with recording heads but without preamplifiers and amplifiers; and I would like to be able to record directly from a multiplex tuner.

With the above in mind, what features should I look for in an amplifier unit so as to obtain the maximum convenience and versatility?

A. Nearly every audio preamp on the market today has an input jack to accept the signal directly from a tape head, with the preamp providing the large amount of amplification and bass boost required for flat frequency response and sufficient voltage to drive a power amplifier. Therefore your plan to dispense with a tape playback amplifier is feasible.

But your plan to similarly dispense with a tape record amplifier is not feasible because to my knowledge there is no preamp yet on the market which provides the amplification, equalization (mostly treble boost), and high frequency current (bias) required for recording. Bias current, usually having a frequency of 50,000 to 75,000 ips, goes to the record head in order to keep distortion from assuming vast porportions, as well as to increase the amount of signal recorded on the tape. Bias current is also fed, in larger quantity, to the erase head so that the latter can perform its function.

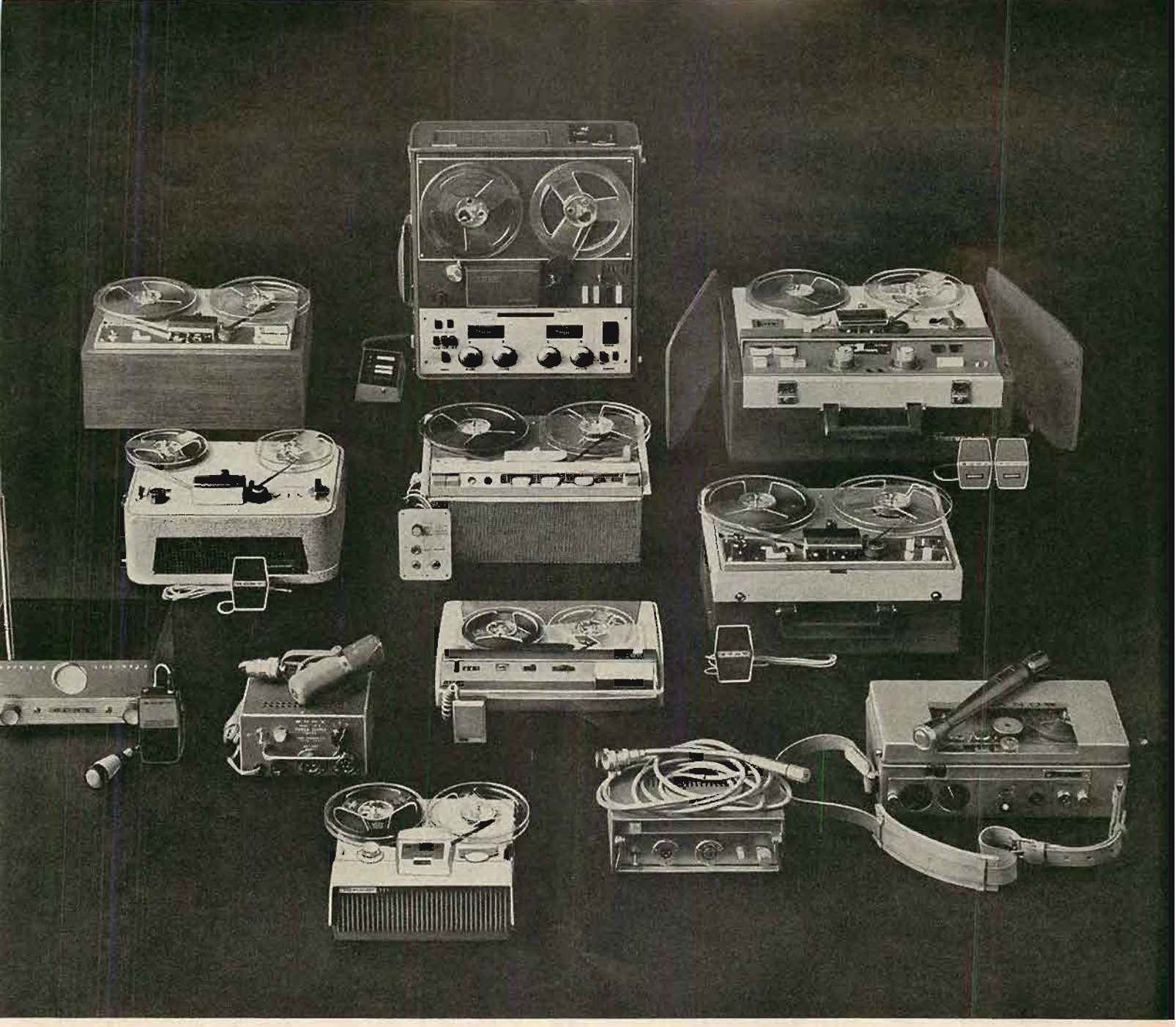
The preamp is already equipped to accept the signal from a magnetic phono cartridge, involving amplification and bass boost. Therefore it is a simple matter for the preamp to take on the additional task of accommodating a tape playback head in similar manner, because this involves only some elementary switching and a minor change in equalization accomplished by substituting a few resistors and capacitors via the switch.

But it is a much different matter for a preamp to take on the responsibilities of recording. To supply bias current requires quite a few additional components, including a tube and an oscillator transformer. Bias current requirements vary among record heads and among erase heads. Providing treble boost for recording is a problem for two reasons: 1. An additional stage of amplification, or perhaps more than one, is needed. 2. The required record equalization tends to vary somewhat from one tape machine to another. Finally, an additional tube or two is required to furnish the amplification and power to drive the record head.

You can see that in sum it is quite a task for an audio preamp, which already

(Continued on page 63)

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



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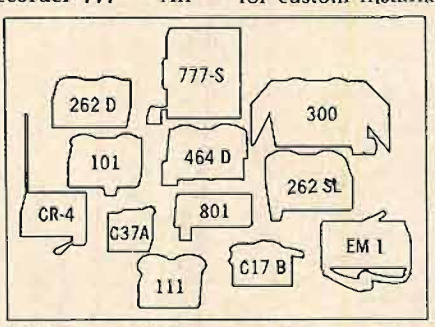

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AUDIO Teasers

AUDIO will pay $5 for questions or answers used. Send questions or answers to: Audio Teasers, P. O. Box 629, Mineola, N. Y.

NORMAN H. CROWHURST

Answers to Last Month's Teasers

Answer C-1. Output transformers with identical specifications giving different performance in amplifiers is not an uncommon complaint. In fact it would be more common if more people tried changing transformers! There are several possible reasons.

In the case quoted, the fact that the output used triodes working in Class AB_1 would lead to one particular suspected cause: notch distortion. The normal ratings of a transformer do not include the specification of relative coupling between primary halves, as compared with the coupling between primary and secondary. For Class A operation, the best design would aim at giving maximum coupling between primary and secondary. For Class AB_1, it is essential, to avoid notch distortion, for the coupling between primary halves to be much tighter than that between primary and secondary. So, although the *over-all* performance specs may be identical for two transformers, one designed for Class A operation would not be satisfactory for Class AB_1 operation, because it could cause spurious oscillation at crossover.

Other possible causes of difference are the internal parameters of the transformers, which could differ, even though the nominal performance specs were identical. A transformer's frequency response is measured in one of two ways: (a) between source and load impedances simulating those of the amplifier for which it is designed, (b) between matching impedances. To illustrate: the optimum load, plate-to-plate, may be say, 8000 ohms, while the plate resistance, per tube, may be 800 ohms. Each method would use a correct secondary load resistance, but (a) would use a primary source resistance of 1600 ohms, while (b) would use one of 8000 ohms.

Thus the condition for measuring frequency response may vary from the working condition. The same frequency response can be achieved with different internal parameters. For example, leakage inductance and primary winding capacitance are mainly responsible for high-frequency response. Different combinations of these parameters in the transformer may produce the same frequency response with one set of primary and secondary impedances, but quite different responses with another set. So, though the two transformers may measure the same under idealized test conditions, they may perform quite differently in an actual amplifier circuit.

This can compound with the feedback stability factor to make a very different performance from one to the other. At the low frequency end, only primary inductance contributes to response. But inductance can be frequency-sensitive—it may have different values at different frequencies and volume levels. Although the response may be *the same* over the measured range, the inductance value where it determines low-frequency stability may differ.

Those are just some more likely possibilities in this particular case.

Answer C-2. The nature of their composite program waveforms makes it necessary for considerably more program power *to be available* for a symphonic program to sound of equal loudness to that of a jazz combo. For this reason the 60-watt amplifier probably gave more than sufficient power to handle the jazz combo, while the 15-watt amplifier would produce detectable distortion at a corresponding level. But on symphonic music, the 60-watt amplifier did not have sufficient available power. Neither, of course, did the 15-watt amplifier. But because its effect under overload conditions was much less pronounced than the 60-watt amplifier's, the 15 watter's distortion was detectable, while the 60 watter's was objectionable.

Probably the 15-watt amplifier only clipped off peaks when it started to distort, leaving the rest of the waveform essentially undistorted, while the 60-watt amplifier would be momentarily disabled every time a peak pushed it over its 120-watt peak limit, resulting in a noticeable interruption of program, followed by a distorted ersumption of it at levels that might be well below the *normal* distortion limit.

This kind of difference between comparative tests on amplifiers is not at all uncommon.

Answer C-3. Here was another frequent cause of misinterpretation. The assumption is usually made that two systems are "otherwise identical," except for the difference intended, when there is no validity to such an assumption.

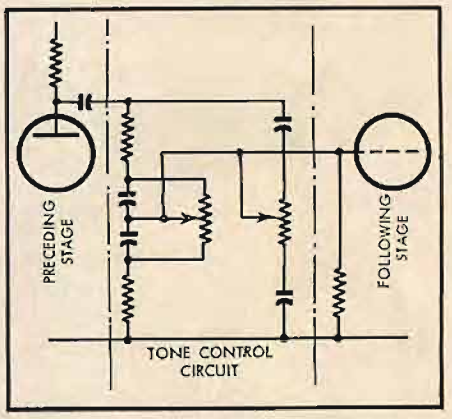
One case reported quite frequently uses filters to introduce the limitation in response, thus "guaranteeing" that the systems are otherwise identical. If the filters use a sharp rolloff, as they usually do, then the effect of a high-frequency cut-off is aurally similar to high-frequency distortion—regardless of amplifier performance —and will be judged as such. A filter with less drastic rolloff might reverse the impression. But even then the use of an external filter invalidates the "otherwise identical" assumption. The restriction should be introduced within the amplifier, as it would be changing the design, so as to change the feedback parameters, noise distribution, and so forth, in a manner representative of such a change in design.

In short, it soon becomes apparent that there is no such thing as the "otherwise identical" condition. There are too many variables in a system, that nothing can be changed without affecting something else. All that any individual comparison can show is which is the more acceptable, on various counts, of the two systems being compared, just as they are. To draw general conclusions about how these observations relate to relative frequency band, measured distortion, dynamic range, and so on, would require a great many more comparisons, and the taking into account of many more relevant factors.

This Month's Questions

Question D-1. An amplifier's frequency response is checked down below its desired response range, to prove that there is no low-frequency peaking before rolloff. Under test, the amplifier seems quite stable. But on program it seems to have a low-frequency flutter with consequent distortion. Its circuit uses a push-pull output stage with over-all feedback. What could be the cause of the program distortion?

Question D-2. A standard bass and treble tone-control circuit (*Fig.* 1) is connected between two amplifier stages. Although the values used are the same in each case, the



response produced in different amplifiers is not the same. In one amplifier the circuit produces more bass boost than treble boost, in another it is vice versa. Why could this be? Both amplifiers give flat response without the tone-control circuit inserted.

Question D-3. The phase response for a high-pass filter shows a phase advance, while that for a low-pass filter is a phase delay. In terms of time, rather than frequency, any filter produces a delay. How can a high-pass filter produce an advance in phase but a delay in time?

Readers' Answers

Feb. Q-1. The tweeter terminals *probably* should be connected in opposite manner to the woofer terminals. If the unmarked terminal of the woofer goes to ground, then the red dot terminal of the tweeter should probably go to ground.

Norman Crowhurst in the May 1953 issue of *Radio-Electronics* indicates that a constant-resistance, 12-db-per-octave, two-way crossover network will theoretically produce 180 deg. phase difference between the low-frequency and high-frequency outputs of the network. To compensate, the tweeter terminals should therefore be connected in opposite manner to the woofer terminals. For a wave-filter derived network, otherwise similar, Crowhurst indicates that the phase difference of the two outputs at the crossover frequency will be 219 deg. For minimum phase difference and therefore maximum output at the crossover frequency, the woofer and tweeter should again be connected in opposite fashion.

Norman Crowhurst in the October 1957 issue of *Radio & TV News* states: "With a 12-db-per-octave crossover, the two voice coils should be connected in opposite phase, otherwise at the crossover frequency they will be moving in opposite directions and cancel, producing a hole in the frequency response."

There are two possible reasons for not connecting the woofer and tweeter in opposite fashion.

1. The foregoing assumes that the woofer and tweeter voice coils are in the same vertical plane and therefore acoustically in phase in the absence of a crossover network. However, at the crossover frequency there may be a substantial acoustic phase difference between the woofer and tweeter due to different path lengths between voice coil and the front of the speaker cabinet (assuming the sound emerges from here for both speakers, which is not always the case). Thus it could be necessary to have the voice coils *mechanically* out of phase in order to have the speakers as nearly in phase as possible from the acoustic stand-

(*Continued on page 78*)

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ALTEC SOUND TALK

HOW TO DECIDE IF A FULL-SIZE SPEAKER SYSTEM IS FOR YOU

First, you must decide whether you are a *critical* listener. If you insist upon hearing the "full sound", the most subtle contribution of each instrument—then you are relentlessly bound to the full-size system by your own need for perfection. On the other hand, if you're willing to compromise for a lot less than the total effect, you can learn to live for awhile with the musical midgets of "bookshelf row". Compact speakers *do* serve a definite need, provided one lives in a closet.

WHERE THE DIFFERENCE BECOMES MOST APPARENT

Complex orchestral passages involving great masses of sound quickly demonstrate the obvious advantages of full-size systems. Here's where you will truly appreciate the effortless reproduction of large speakers that are free of the strain exhibited by small speakers undergoing excessive excursions.

The difference between the two may not seem great if you are listening to a string quartet where the range of pitch and dynamics is closely limited. But compare them via a full-scale composition that really shivers the timbres, such as the currently popular orchestrations of Marty Gold or the "1812 Overture", and the effortless majesty of the big unit immediately relegates the spunky little pretender to the bookshelf where it belongs.

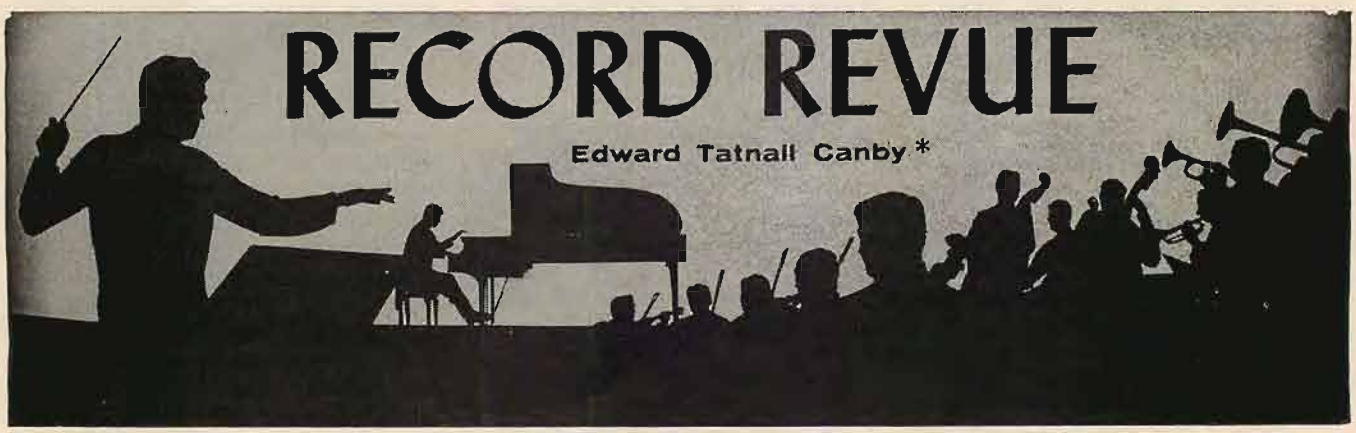
THE REASONS WHY . . .

Full-size speaker enclosures are needed to house the big "woofers" plus the multicell or sectoral horns and drivers employed in professional, two-way systems. Leading audio engineers agree that there is no known way to reduce cubic displacement of a cabinet without reducing sound quality. Only a full-size enclosure provides air volume equal to the larger bass instruments—the double bass viol, kettledrum, etc. For the first time, outside the concert hall, you hear the lowest tones in their pure, undistorted state. The large power-handling capacity and higher efficiency of these full-size, no-compromise systems permit reproduction of every dynamic peak without driving the amplifier into distortion and clipping. In short, advantages of the full-size system combine to reward the perfectionist with a lifetime of listening pleasure.

THE "PROBLEM" OF SPACE

If you are a critical listener, the alibi "I don't have room for full-size speaker systems" is meaningless. You'll *make* the room in order to achieve and enjoy sound without compromise.

Altec Lansing Corporation



RECORD REVUE

Edward Tatnall Canby*

PIANISTS

Oscar Levant at the Piano. Music of Chopin, Debussy, Ravel.
Columbia MS 6276 stereo.

They say Oscar Levant has been mainly a brilliant improviser all his life, in all his well-known activities. It's funny how well the concept fits his piano playing, though of course he doesn't actually improvise a note. They're all written down.

He's not really a standard-model professional pianist. On purely objective critical grounds he wouldn't stand up any too well. And yet there's an odd fascination—even on records—to this man's piano playing. It *is* improvising.

Somehow, you get the sense that Oscar is one of those characters who go to parties and then sit down at the piano and play, play, play, mostly to themselves, until nobody is listening any more; but still they go on, with that abstracted, absent-minded gaze that inveterate party-pianists always have. Even before the Columbia microphones, which ought to be fairly intimidating, Levant plays away to himself, sort of.

He doesn't miss any notes—or not many. He plays with a lot of finger skill, if with too much pedal. (It occured to me—did Columbia add reverberation, blurring harmonies that Oscar himself didn't blur at all? Possible.) He has a fine, if somewhat absent-minded, sense of style—the music fairly reeks of atmosphere. But it is a peculiarly Levant-like atmosphere, I must say. I enjoy it because I'll always prefer musical feeling, however misdirected, to mechanics of finger-technique, no matter how perfect. And Oscar's music is felt, not merely played. No two ways about it.

You'll hear the same. I liked his Chopin best; others prefer his Debussy. Take your choice.

Beethoven: Piano Sonatas Opp. 109, 110. Fou Ts'ong, pianist.
***Westminster* WST 17002 stereo**

How extraordinary, on this disc, to hear a young Chinese pianist, born in Peking, who studied music in China and made his debut in Shanghai, playing the very ultimate in Western musical expression, this pair of late-Beethoven piano sonatas!

This being a time for international music-making, one-world or two, it is not surprising to find that there is very little of the Chinese to be heard, but a good deal of honest youthfulness—a pianist of 27 playing the most profoundly mature works of the mature Beethoven.

He has a sure musicianship, in the Western idiom, a modestly poetic approach, a fine sense of phrasing and an impeccable ear for Beethoven's harmonies, Chinese background or no. After all, the musical ear is a world-wide phenomenon and the musical idiom itself is nothing that one can inherit; it is strictly environmental. This youth was brought up on Western music, and that was that.

I have never heard a young pianist who could play these works with the weight and concentration of a great and older executant, after perhaps forty years or more of experience; it is music that requires that sort of background. In all honesty, Fou Ts'ong cannot hope to play late Beethoven in the manner of a Schnabel, a Backaus, a Kempe, an Ernst Levy; but his interpretation, as far as it goes, is lovely and musical. It goes further than some of our domestic youthful pianistic hot-shots, let me tell you.

I notice only two faint hints of incipient exoticism. In Opus 110, Fou Ts'ong does not really grasp a typically German touch of drama—the operatic recitative, translated into instrumental terms. It was one of Beethoven's highest inspirations; but one must know the "Saint Matthew Passion," the Bach "Cantatas" and innumerable other German works as well as Italian to hear this piano-recitative in its vocal implications—as in the "Ninth Symphony." Aside from this, I merely cite a rather delicate, light touch on Fou Ts'ong's part, perhaps an instinctively oriental approach, opposite to the massive Germanic impact we ordinarily expect. Sort of nice, at that.

Ivan Davis—Haydn: Sonata in G; Five Scarlatti Sonatas; Mozart: Sonata in F, K.332. **Columbia MS 6295 stereo**

Ivan Davis, one of the brightest of the new young pianists, is still young enough here to fall into a classical trap that is always waiting for the nimble-fingered neophyte. It isn't that he shows disrespect for the relatively tiny works of Haydn and Mozart in the piano sonata form; he is too musical for that. But one can't help feel that, like so many before him, he is frankly baffled as to what to do with these little pieces to make them "sound." And so he turns on the drama and the technique, plus an inevitable, if *very* faint air of patronizing. Fainter than most, I'll admit.

Compared to such old hands as, say, the late Clara Haskil, or even the now-middle-aged Paul Badura-Skoda, Davis plays a too-loud, too-fast, too showy Haydn that will hurt the sensitivities of those who feel Haydn's greatness is revealed by simplicity. Mozart, for Davis, is better—a lot better. But not half what it can be when the outward demands of a fancy technique are put aside entirely in favor of inner simplicity and musical exactitude.

Scarlatti is fine for Davis—the brilliant little harpsichord show-pieces give him a splendid chance to play swift, brittle, beautifully styled piano versions of the same.

Schubert: Piano Sonata in D, Opus 53. Artur Schnabel. (Recorded Jan. 1939).
Angel COLD 83 mono

The old maestro keeps reappearing. I used to sit only a few feet from his box at the old New Friends of Music concerts on Sunday afternoons before the war at Town Hall in New York. Once, twice, he came to listen to us sing Palestrina at the Dessoff Choirs rehearsals, just sitting quietly in back throughout the long evening. He died early in 1951, and here I am listening to him again, as I did in my college days. It's an experience.

Schnabel, in "my time," was considered the most classical of big pianists, rigorously careful not to over-dramatize his music, making much of his self-effacing dedication to it and influencing a generation of newly great pianists towards the same high purpose. No fancy virtuoso mannerisms for him! No tearing of hair, no histrionics.

And so it's amusing to find that, with the passage of some 25 years, Schnabel's playing of this Schubert actually has a slightly old-fashioned flavor to it now, with more hesitations, more "Romantic" shaping than I would have dared expect. Tastes in playing have changed. But the old man is still a profound musician and powerful projector of high-level music. His Schubert is something to hear, and timeless, too.

Op. Jazz

Robert Prince: Ballet scores, "Events", "N.Y. Export: Op. Jazz". "Ballets: U.S.A." Orch., Prince.
RCA Victor LSP 2435 stereo

Ballet does strange things to the sound of music. Composers of ballet scores know it, if they are good.

These two ballets with the odd names—the second one perhaps the zaniest title ever to grace a successful and popular work, with its "Op." and its colon—have made immense impacts on European audiences and, in complementary successes, have sold out house after house in New York. Took me two weeks to get a pair of seats to the show "Ballets: U.S.A." of which they are a part. I saw "N.Y. Export: Op. Jazz" the first time it came 'round, too, and found it extraordinarily exciting both times.

Here is the accompanying music by itself. Utterly different effect. Where in the staged version I remember the driving, compelling human beat of music that went intimately along with the poignant 'teen-age-style stage presentation, kids acting like today's kids, high-tension, half grown-up and full of agony, half wildly, childishly playful, here the music seems cold, hard-boiled, calculated and full of ultra-modern conventionalities, in that semi-jazz idiom which began as "modern jazz" and now gets itself into everything from beer commercials to symphonies. Skillful stuff—enormously so. But chilly, mechanized, deadpan-daemonical. Marvelous for hi-fi.

Of the two scores, the more recent "Events" is the hardest-boiled, the most dissonant-dry and the least conventional. "Op. Jazz" has still a bit of corn in it, out of the Age of Bernstein (i.e. Bernstein-Jerome Robbins, of "Fancy Free," etc.). Simple, jazzy tunes, a mock-sappy theme for finale-variations, sort of a hepped-up musical scale, jazzing up, then back down again. Nothing as simple as that in "Events", which is all-dissonant, all-brass, screeching like the day of nuclear doom.

Just to hold things down to a common level, there's always that familiar *t'dahh, dm, t'dahh, dm* of the jazz cymbal, like any good dance band or night club combo. If you get lost in space, that'll bring you back.

EXPLORATIONS

Debut 1961: The Krainis Baroque Trio. (Recorders, gamba, harpsichord).

Elan 101 mono

I'm a bit late on this one—I wish records wouldn't date themselves so positively. Bernard Krainis is a top-notch recorder player and this is his trio and his record company too, launched as his own enterprise. Goes to show that small-company enterprise isn't quite dead yet; this is a quite stunning record of its type, the recorder sound soaring high into a gorgeous acoustic surrounding, accompanied sometimes by the harpsichord and gamba (continuo), sometimes joining one or the other in duet, or playing solo. Fantastic technique, a lovely tone color, opulent and always in tune and, in particular, a fine sense of rhythm that carries the Krainis music along with sweep and style.

The usual solo recorder is the alto, heard here in a familiar Handel "flute" sonata which, incidentally, is ornamented in improvisatory style by Krainis as was the proper way of performing in Handel's day. Telemann contributes a color-partita for the high soprano recorder; other music of an earlier time shows off the tiny sopranino, the bass recorder, the greatbass (an odd monster), the tenor. And the other players produce solo work minus recorder, for a good tonal contrast and performing variety. The music ranges from Dowland and Morley through Sweelinck, Marin Marais, Couperin. Barbara Mueser is the nice gamba, Robert Conant the excellent harpsichord; but Krainis is the big show with his numerous recorders. My friend Jan Syrjala did the engineering; my only anesthetic reservation: a bit too close to the harpsichord. A tough balance to hit, I'll admit, what with the violent peaks and inaudible valleys of the recorder dynamic range.

One economic squeeze: the recording was done in stereo but the company can't afford at the beginning to press both stereo and mono versions. The mono is plenty OK, and there might be a stereo tape, I'd guess, as an economical addition to the line, later.

Janequin: Choral Works. La Société de la Chorale Bach de Montréal, Little.

Vox STDL 500.710 stereo

Clement Janequin (Jannequin) was an engagingly pictorial Frenchman of the Sixteenth century whose specialty was composing word-pictures for voices, both humorous and serious, ranging from bird-song *fantasies* ("Le Chant des Oiseaux") to full-scale battles in music, complete with the equivalent of bang! bang! and rat-tat-tat-tat. But he was a good composer, which merely means that he did not allow the birds and the battles to get in the way of the music itself.

The Montreal Bach Choir, under its un-Gallic conductor George Little, is clearly at an advantage in this high-speed French, and its Frenchified sound-effects—*trrrr, trrrrr, frou, frou, frou, fanfrerelelen,* and the like, for there seems to be a solid quorum of French-speaking Canadien and Canadiennes in the group. It's their language. (My own New York Canby Singers have tried Janequin's birds and we foundered over the fancy syllable-work.) These singers toss off an entire LP of Janequin, short, middling and long, the birds and the battles too, and though the tone is a bit wobbly, the gusto and verve of the production makes it first rate of the sort.

Rossini: La Cambiale di Matrimonio. Soloists, Virtuosi di Roma, Fasano.

Mercury SR2-9009 (2) stereo

I don't suppose the Metropolitan Opera management knows it, but the biggest thing that is happening to opera these years in the proliferation of complete recordings—with librettl, translations and extensive background material as aids to listening.

Maybe you don't get the glamor of the golden curtain and the excitement of the stage, scenery, costumes and stars-in-the-flesh. But with book in hand, in such recordings, you can come enormously closer to the actual sense and intention of operas in foreign tongues than you ever will in the opera house—unless you are a knowing expert of a very rare sort. Moreover, on records, you'll hear (a) better performances and (b) a *much* larger range of operatic material.

Witness this excellent and amusing album. Rossini, one of the greats—but who hears *this* opera? It's not that this is a punk opera which therefore doesn't get performed. Rather, Rossini wrote too many operas for the Met, which keeps itself afloat mainly by plugging the big sales items in its catalogue. A "live" production of this kind of music, at least in the U.S.A., would be astronomically uneconomical, and anyhow, opera-goers wouldn't attend. They want "La Bohême" or "Aïda" for the thousandth time. But for recording, the opera is a natural. For you and me, not opera fanatics necessarily, it is worth an evening of great fun, and for Mercury, the producer, it is an operation that can be turned out in high style, with the best singers available—and maybe make a profit, at that.

Amusing? Well, you put this thing on your turntable and you'll hear a vast stretch of typical Rossini, that frothy, twittery, light-bodied champagne-type of orchestration and singing, out of Mozart but off the top of the head, so to speak. Sounds very classical and all that. Then you get out your booklet, a big thing here, complete text and background info, illustrated with delightful jet black silhouettes of the characters. And you find (in the transaction) something like this.

Seems there's this Canadian businessman who has closed a deal with our hero, an Italian gent who has a daughter. The American is buying himself a wife, like a sack of potatoes. Papa sees a deal and takes on the purchasing job; he'll get his daughter married off and collect the commission too. The Canadian writes a business letter to Papa, and it goes like this—in an *opera*, mind you: *"Upon arrival in good condition, as per above, with this letter for identification, I hereby declare I will honor the signature and marry the bearer within two days of arrival or at*

(*Continued on page 74*)

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THE MADISON THE DALE

THE JBL MADISON

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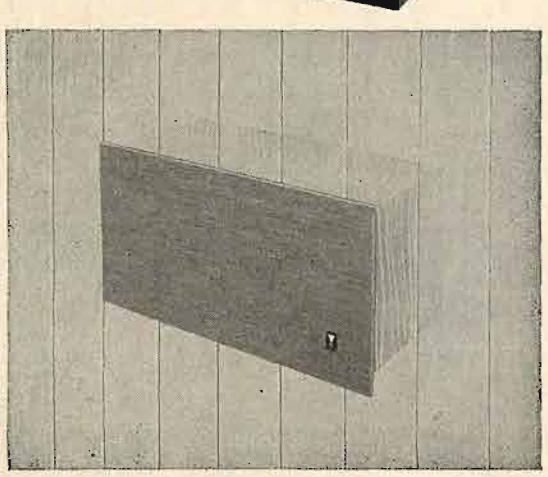

THE LANCER 66

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CHARLES A. ROBERTSON*

STEREO

Nancy Wilson/The Cannonball Adderley Quintet — **Capitol Stereo ST1657**
George Shearing and The Montgomery Brothers — **Jazzland Stereo JLP955**

Although the liner notes try to convey the impression these albums just happened, quite a bit of canny trading went on behind the scenes before the tapes started rolling. As manager of Nancy Wilson and the Cannonball Adderley quintet, John Levy plans to send both on a concert tour as a unit. A recorded appearance together was needed to help pave the way, but the recording contracts are held by different companies. At the same time, Riverside is busy building up its Jazzland subsidiary and would like to spread word of Wes Montgomery's guitar prowess beyond jazz boundaries. As Levy also handles George Shearing, one of the best name builders in the business and a headliner for Capitol, it can easily be seen how this four-way switch was completed, presumably to the mutual satisfaction of all concerned.

The association between Cannonball and Miss Wilson goes back four years to when the singer dropped in and did some tunes with the band at a club in Columbus, Ohio. When she came to New York to try and make it on her own, Cannonball saw that she was safely tucked under Levy's managerial wing. With two albums of a more popular nature to her credit, the step to a straight jazz groove comes at the right moment and is taken in relaxed and spontaneous fashion. In addition to such choice items as *Never Will I Marry, A Sleepin' Bee,* and *Happy Talk,* Miss Wilson sings the Curtis Lewis lyrics to Nat Adderley's *The Old Country.* The quintet's soul content remains at a high level in an accompanying role, and the newest member, Joe Zwainul, makes good use of his recent experience as pianist for Dinah Washington. Cannonball's alto sax leads the way on five instrumentals, including *I Can't Get Started.* The rest are originals representing the latest writing efforts of each respective member, excepting drummer Louis Hayes.

The meeting between Shearing and the Montgomerys will remind many listeners of The Mastersounds, a West Coast group of a year or so back which first drew national attention to the three brothers through recordings, even though Wes appeared on guitar only as a guest. Accused at the time of trying to imitate the Modern Jazz Quartet, the group was equally close to the sound of the George Shearing quintet. With no great gulf between them to navigate, they quickly give this date the friendly air of a studio reunion. The pianist goes right to the melodic heart of a tune as always, and the other soloists follow suit without any waste motion on *Love For Sale, Darn That Dream,* and *Love Walked In.* Buddy, who contributes two originals, limits his playing activities to vibes this time, and brother Monk is on bass. Shearing also brings along percussionists Armando Peraza and Ricardo Chimelis to spell drummer Walter Perkins on three Latin-styled numbers. The session took place at Hollywood's United Sound Studios, and Wally Heider's stereo setting is especially effective on Peraza's *Mambo in Chimes.*

Everyone profits from a deal of this sort, and there should be more John Levys around to give similar attention to other jazz artists. Capitol's boast on the album cover of "41 minutes and 59 seconds of jazz!" seems to put it slightly ahead of the game though, as Shearing completes his assignment in 38 minutes flat. The margin between the two performances is only a little wider than the difference in playing time. Riverside might ask for a full 42 minutes of Jonah Jones on the next trade.

Jimmy Smith: Midnight Special — **Blue Note Stereo ST84078**

When Jimmy Smith applies pressure and steps up the tempo, no jazz organist anywhere can top his blinding speed and astonishing technique. This album moves like a slow freight all the way, but Smith retains his distinctive touch at the throttle and keeps a full head of steam in the boiler for the long pull. Competition for other organists is a lot keener at this rate of travel, and all of Smith's skill and blues feeling come into play as he pulls out of the yard on the *Midnight Special.* Stanley Turrentine helps the trip pass enjoyably with appealing tenor sax solos on *Why Was I Born?,* and a relaxed work of his own titled *The Subtle One.* A downgrade allows the quintet to coast awhile, and drummer Donald Bailey increases the pace on *Jumpin' The Blues,* and *One O'Clock Jump.* Kenny Burrell, who keeps too busy in pit bands of Broadway musicals to worry about winning polls, goes along for a ride that should cause rival guitarists to look to their rating. All of Smith's recordings should be heard in stereo, and this one is no exception to the rule.

Jonah Jones with Glen Gray and the Casa Loma Orchestra — **Capitol Stereo ST1660**

The long wait for the reunion of Jonah Jones with a big band is over, but the trumpeter's admirers are bound to start clamoring for another before long. Glen Gray leads his present day Hollywood edition of the old Casa Loma gang in support on recreations of a dozen of the greatest trumpet specialties in jazz history. Arranger Benny Carter collaborates in settings that capture the spirit of the originals and allow Jones freedom to express his own sentiments on such famous recordings as Louis Armstrong playing *West End Blues,* Cottie Williams on Ellington's *Echos on Harlem,* and Harry James' version of *Two O'Clock Jump.* Also included are tributes to Rex Stewart, Roy Eldridge, Bunny Berigan, Clyde McCoy and Henry Busse. Jones blows his own horn to expand on *Baubles, Bangles and Beads,* and recalls Harlem during the swing era on Carter's new scoring of *Apollo Jumps.* All eighteen Casa Lomans hit the ensembles with precision, while stereo places Jones front and center in an excellent recording.

Gerald Wilson: You Better Believe It! — **Pacific Jazz Stereo 34**

As the recordings of Richard "Groove" Holmes playing electronic organ with small groups are a highly successful product of this label, the temptation to try using a big band for increased effect was apparently too great to resist. While the combination is nothing new in itself, never before have the results been quite so blues-drenched as this meeting between Holmes and Gerald Wilson's seventeen-piece studio band. Besides working in the trumpet section and conducting, Wilson designed the whole date around the organ, showing it off in solos and ensembles at different tempos and moods. Six numbers are Wilson blues originals, and the other his arrangement of George Stoll's *Yvette,* featuring the tenor sax of Walter Benton. Outstanding is *Blues For Yna Yna,* which takes its name from a pet cat and allows tenor saxist Harold Land to skate along in three-quarter time. Alto saxist Joe Maini romps on *Jeri,* trumpeter Carmel Jones risks *Straight Up and Down,* and Teddy Edwards' solo turn on tenor sax comes on *The Wailer.*

What counts, however, is the complete integration of the organ into the band, and only stereo and good equipment can do it justice. Playing the mono version on average equipment will tend to distort a stunning performance. Fats Waller would have loved it and given up one or two royalties for a similar chance.

Paul Desmond: Desmond Blue — **RCA Victor LSP2438**

RCA Victor has given George Avakian the green light to reactivate its jazz program, and the amounts rung up on the cash register for the first in the series will undoubtedly cause this album of superior mood music to look green instead of blue to some eyes. Also in prospect are releases from Sonny Rollins and Joe Morello. Bob Prince conducts woodwinds and strings in his own orchestrations, and they complement Desmond's lyric ballad style to perfection. The alto saxist floats through the melody in his usual detached manner, then loses his air of unconcern as he becomes involved in duets with guitarist Jim Hall. There are no other principal players, but Prince allots key parts to harp and French horn, with some of the main dialogue going to clarinet and oboe in reply to Desmond's improvised lines.

There are dreamy, romantic interpretations of *Body and Soul, My Funny Valentine, I Should Care,* and *I've Got You Under My Skin.* This is the stuff Desmond's reputation was made of, and he still approaches a tender phrase like John Barrymore meeting Dolores Costello for the first time. Hall's solos prove elusive enough to provoke the protagonist into a more strenuous effort at times. Besides the tunes selected for the album title, Desmond contributes the torchy *Late Lament.* No stereo gimmicks are needed to put this performance across, and engineer Ray Hall contents himself with giving the setting depth and breadth.

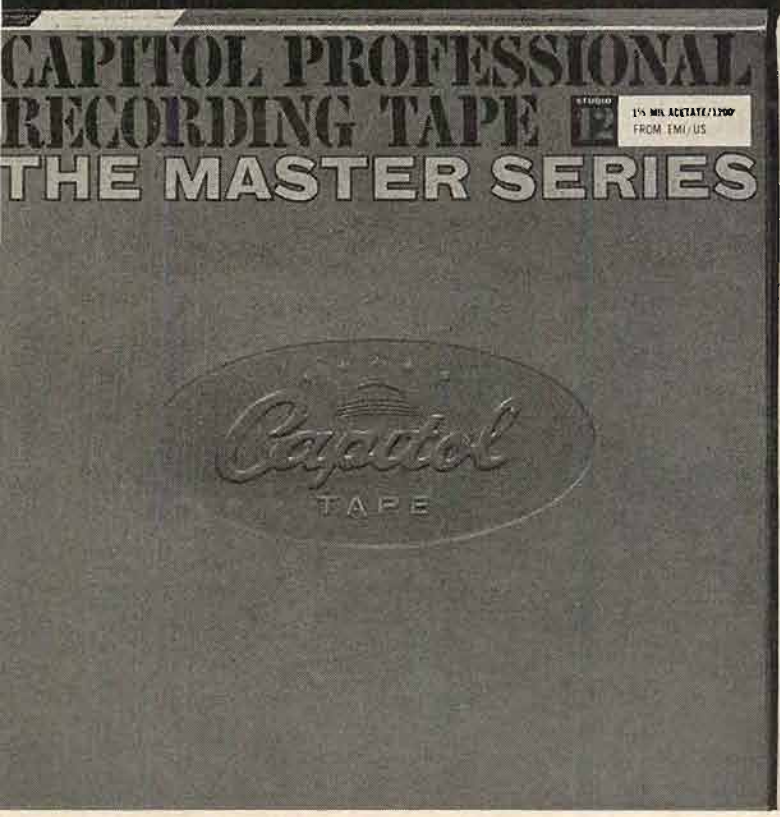
Charles Mingus: Mingus — **Candid Stereo 9021**

Since Candid was founded a little more than a year ago, Charles Mingus has made it the forum for his most challenging projects and advanced ideas. While other labels gladly issued the bassist's more conventional and commercially acceptable works, the freedom to be adventurous could best be enjoyed at Candid. For this reason alone, the news that Cadence has decided to keep its jazz subsidiary in existence for an indefinite period is indeed welcome. What policy changes will go into effect remain to be seen, but sessions already taped along with a volume of Texas field recordings now available in Great Britain, are due for release shortly.

To get by nowadays, a jazz label needs one or two artists capable of making up the deficit from slow selling albums. Although Candid obtained the services of prominent names, it did so by removing restrictions of any sort in the studio. This policy might pay dividends in time, especially after the artists involved get a few pressing problems off their chests. The present Mingus effort is a

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

while you've been recording...so have we!



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case in point, as it may seem an essential acquisition only to his confirmed fans now, but new converts are being made all the while. In the meantime, both Mingus and Max Roach should be pinned down to exerting some of their commercial potential in the label's behalf.

The first side of nearly twenty minutes is entirely devoted to *MDM*, a reworking of Thelonious Monk's *Straight, No Chaser*, Duke Ellington's *Main Stem*, and the leader's own *Fifty-First Street Blues*. Most labels would insist upon it being cut up into smaller portions, but stereo is the only digestive aid provided to help assimilate the interwoven themes. And the nine assisting players received no advance warning as to which Mingus would point a finger at next for a solo. The other Mingus piece, *Lock 'Em Up*, finds him in an irrascible mood on recalling a stay in Bellevue Hospital. The one bid for popular favor is a long, smoldering rendition of *Summertime*, and even this might be more palatable had featured soloist Eric Dolphy switched from alto sax to flute or bass clarinet for contrast. Mingus is brilliant in the bass passages, and they receive expert engineering attention from Bob d'Orleans.

Bobby Christian: Strings or A Space Age
Audio Fidelity AFSD5959

Space albums have gone into orbit briefly before, but now the signal is "go" all the way after Colonel John Glenn's historic flight. The musical race for space supremacy is just starting, and record companies can be expected to mount a maximum effort to get various projects on the launching pad. Bobby Christian times his first astral shot just right to coincide with the high point of events at Cape Canaveral, firing the sleek, powerful seven-stage *Space Suite*. An impressionistic account of the full span of a missile's life, the work passes quickly over earthly affairs to dwell at length on the mysteries of outer regions. Even before the busy days of preparation begin, armchair astronauts are introduced to a sirenlike chorus on *The Call*, an inviting theme which reappears at appropriate intervals to serve as beacon and lure. The large orchestra goes energetically about the mechanics of getting ready, increases tension as the countdown proceeds, and finally bursts into full glory at the blastoff. The empyreal strings take over during flight, or whenever the theme recurs, and the space capsule speeds smoothly along until the fireball re-entry. Christian's picture of the world of space is so enjoyable that the return to earth becomes an anticlimax, and the entire experience constitutes a rugged test of equipment.

In the advertisements for the latest Jo Basile album, Sidney Frey takes *Ping Pong* stereo to task and restates the case for true stereo recording. Here is another good example to prove his point, as any answering Pong would be a long time coming. Of course, the "Curtain of Sound" trademark should be abandoned momentarily for the more descriptive "Universe of Sound." Mr. Frey is alert as the next one to the newest wrinkle in stereo spectaculars, however, and snatches of electronic music are employed to create the effect of space and motion. Gimmick or not, designers of fashions in stereo are paying attention to electronic composers and using the results of their study whenever possible. If stereo really enters the Space Age in the next few months, the demand for electronic sounds is bound to increase. Besides knowing how to duplicate any given effect on request, engineers will need to be able to originate a few on their own.

Christian devotes the first side to preparing the listener by demonstrating the principle of astrophysics on such popular tunes as *Midnight Sun, Blue Star*, and *Out of This World*. The orbiting strings and electronic devices are introduced, and the sound throughout is A-OK.

Mariano Cordoba: Flamenco Virtuoso
Capitol Stereo SP8574
Carlos Montoya: Malaguena
RCA Victor Stereo LSP2380

Even those listeners who still believe all flamenco guitarists sound alike should readily distinguish between the contrasting approaches on these highly individual programs. That the musicians are citizens of this country residing on opposite coasts is hardly a reason for the points of difference this time, as both were born in Spain and studied in Madrid. Thirty-six-year-old Mariano Cordoba plays with youthful spirit and fire, but romantic thoughts seem foremost on his mind. He wears his heart on his sleeve and never misses a chance to end a phrase on a tender note. Both he and his wife, dancer Carmen Ruiz, toured for years with the Antonio and Rosario Company. They now live in the North Beach district of San Francisco, where they entertain at their own restaurant, El Patio Andaluz. While dancer's shouts and footstomping are barred, lively castanets occasionally move about to provide colorful stereo action, and the unbilled accompanist may well be the guitarist's wife. In addition to typical flamenca repertory, Cordoba visits Mexico to restyle Agustin Lara's *Granada*, and transform into a Bulerias the traditional melody *Cielito Lindo*. The liner notes admit two guitars are sometimes used, but the fine engineering successfully conceals the fact.

Carlos Montoya appears in a setting he feels is perfect for recording—in an informal concert before an invited audience in the ballroom studio at Webster Hall—and the results amply confirm his sentiments. While the master guitarist can speak for himself, a word should be said for the hall and the way its acoustics improve with the influx of a large body of humans. The atmosphere becomes warm and intimate, as in a small cafe, and engineer Lewis Layton reserves a choice ringside table for audiophiles. If RCA Victor wants the hall to sound as well again, more invitations should be mailed out. The electricity flowing between artist and audience can be all but heard, and Montoya erupts into the most volcanic and impassioned performance. The guests get out of hand every so often, but the guitarists's own foottaps are more exciting than a troupe of dancers when he changes the beat during the tricky

rhythms of *Jerez*. Also included are the tragic *Lamento De Triana*, and Ernesto Lecouna's companion to the title piece, *Andalucia*. Montoya's wife, the dancer Trianita, supplies the liner notes.

Juca Mestre: Carnaval do Brasil
Audio Fidelity Stereodisc AFSD5953
Jose Basso: More Argentine Tangos!
Capitol Stereo ST10303

It would be hard to say which is valued more highly, but both Carnival time and the tango mean serious businesss to South Americans. Preparations go on all year in Rio de Janeiro for the annual holiday, and everyone is ready to blow off steam by the time the three-day festivities commence. Numerous bands must be on tap to march in parades, mingle with the crowds, and play for dancing until after midnight. Endurance and a large repertoire are more important than skill o rprecision, and the Barsilerios of Juca Mestre typify the hardy, compact groups engaged to dispense the rhythms of marchas, frevos and sambas. The percussionsists are energetic and tireless, with the capacity to match the mounting enthusiasm of the celebrants. One of the busiest players mans that grandfather of the tuba, the ophicleide, and the horn has enough life left in it to give any woofer a workout. Recorded during last year's fete, the program includes current hits, as well as favorites from other seasons, in arrangements by Astor da Silva. To complete the carnival scene in realistic stereo, a large chorus sings along and urges the band to faster tempos and a wilder performance.

Jose Basso's orchestra has supplied Buenos Aires society with tango rhythms since 1947, and the reasons for such continued popularity are generously displayed on this import from the Pampas. The leader began studying piano at the age of five, served an early apprenticeship playing for dancers, and his touch at the keyboard is beyond reproach. Tango orchestras able to get by elsewhere might never last out the night in the Argentine. The tempos must be exactly right, melodies must sing, and the strings should dig a little deeper, if the climate is to remain favorable. Basso fills the bill admirably and receives the best attentions of the engineers in return. Only in his native country would he feel free to dedicate a work to a jockey and title it *Brazo de Oro*. Tucked in amongst the new crop of tangos are *La Cumparsita*, and *Adios Muchachos*.

Cal Tjader: In A Latin Bag
Verve VSTC261 (4-track UST tape)

Latin rhythms appear in just about any context these days, but the mere addition of paired bongos and conga drum to bolster a stereo spectacular or augment a jazz trio is no guarantee of a compatible mixture. Cal Tjader has worked on blending jazz and Latin styling since he was vibist with George Shearing nearly a decade ago, and by now anything he whips up is certain to go down as smoothly as hot buttered rum. To give an extra fillip, two other Shearing veterans and Paul Horn, flute and alto sax, are added on his latest concoction. Armando Peraza, bongos, and Al McKibbon, bass, join Johnny Rae, timbales, and conga drummer Wilfredo Vicente in extending the rhythmic dimensions for stereo. No wild outbursts or frantic exhibitions are indulged in though, as the percussionists go about their highly complex business subtly and with a rare understanding of the soloist's needs. The four-track tape is perfectly balanced, and stereo is used to satisfy the inquisitive ear rather than to create sound sensations.

The program itself is composed of measured portions of Tjader's Latin originals, jazz standards and mood pieces. Lonnie Hewitt, the group's regular pianist, complements the vibes expertly in bright unison passages. Horn's special contribution is *Half And Half*, a unique vehicle for tenor sax in 6/8 and 4/4 time.

Kai Winding: Kai Olé
Verve VSTC 263 (4-track stereo tape)

Many albums designed for stereo motion dispense with a mono version entirely, but those which feature jazz personalities are usually put on the market in both ways to gain the widest circulation possible. Realizing that quite a few record buyers still believe stereo to be a luxury where jazz is concerned, the record companies take no chances on passing up sales. The theory seems sound and should work to everyone's advantage in practice, but the current Kai Winding offering is a good example of how sales can be lost and a reputation damaged through release of a mono version. As the LP was released a month or so ago, the opinions of some jazz reviewers have already appeared in print, and they range from studied politeness on downwards. Although the fact that the album is supposed to be a sound spectacular is mentioned, none gives any indication of having heard the stereo version. On listening to the LP, this reviewer soon found his auditory nerves being dulled by an overabundance of trombones playing with a sameness of tone and style, so the 4-track stereo tape was received with no little skepticism. Surprisingly enough, the difference is as great as day from night.

With adequate space separating the choir of four trombones, the various members take on a certain amount of individuality and ensemble voicings gain appreciably in depth and color. As Winding writes the trombone parts to fit his own style, the degree of contrast brought out by stereo is a great help. Billy Byers and Tony Studd, on bass trombone, also share the solos, and Phil Woods steps out to represent the sax section. The two-man trumpet section of Joe Newman and Clark Terry is no longer buried. Of course, if Winding really wanted variety, he could always hire Vic Dickenson or allot additional solos to Terry, who shines brightly on *Surrey With The Fringe On Top*. Winding's Latin stylings are clever and quite danceable.

MONO

Barrelhouse Buck: Backcountry Barrelhouse
Folkways FG3554
St. Louis Jimmy: Goin' Down Slow
Prestige/Bluesville BVLP1028

In the days when recording crews journeyed from city to city, regular stops were made at St. Louis to see what the evening sun would bring out in the way of regional talent. Local artists were able to record at their front door until the depression, after which it became necessary to travel to Chicago or even further afield. Only a fortunate few could afford the trip, and those who stayed at home were almost forgotten by the time the current blues revival got underway. Both of these performers were active in the city during the 1930's, recording or working alongside such practitioners as Speckled Red, Walter Davis and Roosevelt Sykes, but neither holds a steady job in music today.

Barrelhouse Buck was rediscovered across the Mississippi, living as plain Thomas McPartland in Alton, Illinois, by Charles O'Brien, a blues collector who also happens to be a detective on the St. Louis police force. Buck's piano style is still primitive and country flavored, as he decided long ago that urban influences could only lead to his sounding like other players. A steady, rolling left hand testifies to an early career as drummer in Charlie Creath's band on Market St., and fast numbers move with all the rhythmic drive of an express train. When improvising a slow blues Buck often attains the classic simplicity that distinguished Jimmy Yancey, and his impromptu lyrics are equally direct. A salute to O'Brien is tossed of casually on *Lieutenant Blues*, and Buck talks informally for three minutes about old times. In fact, the whole affair benefits and suffers alike from being set up on the spur of the moment.

Sam Charters recorded Buck at their first meeting, utilizing a neighborhood piano which appears to bear the internal effects of river mist. Pillows placed in front of the piano only partially deaden Buck's stomping foot, the voice frequently wanders off microphone, and few collector's items sound more venerable. Buck feels right at home and hardly seems a type that a good piano would inhibit. Folkways should invest in a studio recording before another company gets the idea.

James Oden earned the title St. Louis

(*Continued on page 77*)

AMPLIFIER

(*from page 25*)

something under 6 w, so that it is much easier to prevent overheating than it would be with a conventional class-A stage.

The full economy of this class of circuit is probably to be found in its public address applications. The amplifier shown in *Fig.* 6 was designed to provide loud clear speech with the minimum possible current consumption and the lowest possible price and weight. The stand-by current consumption has been brought down to 200 mA from a nominal 12-volt battery, a drain of only 2.4 watts. The amplifier will, however, deliver about 8 watts at full drive and with a battery charged up to 14 volts will give over 10 watts. The design procedure turned out to be extremely easy. Allowing for 1 volt in the emitter resistance and 1 volt in the transformer and transistor we have about 10 volts swing available and thus for a nominal 10 watts we should need 2 amps. This fixes the emitter resistance at 0.5 ohms and also settles that we must use a transistor capable of handling 4 amps peak. We have a fairly wide choice of transistors which can do this and the Clevite SN1146 is actually capable of a good deal more. It has a very high gain in the region of a few amps so that the driver need only produce some 10–20 mA.

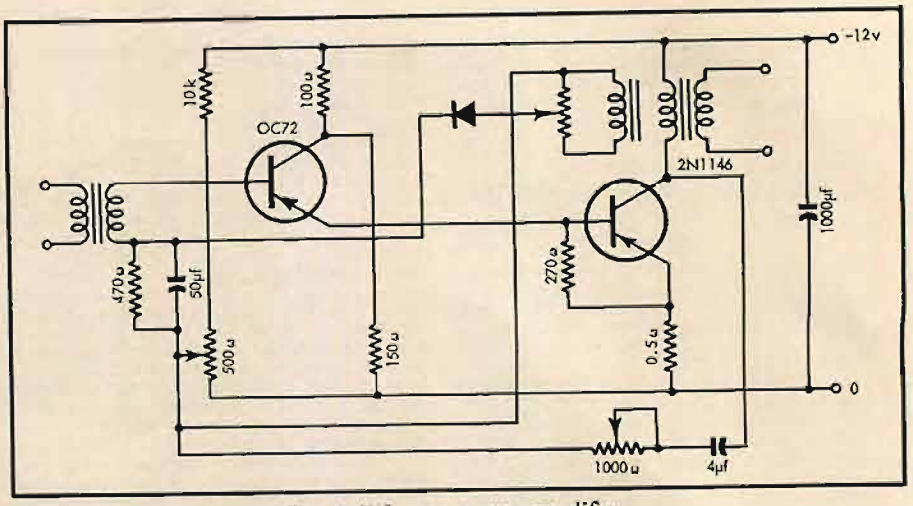


Fig. 6. 7.5 w economy amplifier.

Since we are after economy the bias of the first transistor is taken from the slider of a potentiometer and is adjusted to give the wanted standing current. The rectifier for the floating bias is also taken to a potentiometer tap and this is adjusted under full drive conditions to make sure that we get equal limiting at top and bottom. The adjustments are made on an oscilloscope using a resistive load: 8 watts of steady tone is really too much noise for the average laboratory if you leave a speaker connected.

Feedback is taken to the bottom end of the input transformer and thus provides a voltage feedback in series with the voltage developed across the transformer secondary. This raises the input impedance rather than lowering it. The circuit shown in *Fig.* 5 takes the feedback directly to the base, so that the currents add. However the result is that the feedback depends on the generator impedance and we did not have too much control over this. The amount of feedback can be adjusted to provide the required gain but if the amplifier is to be fully loaded with 1 milliwatt in there will be about 12 db of feedback.

The composite signal treatment is particularly helpful when, as in the circuit

of *Fig.* 6, the output emitter resistance is not decoupled. Here is a point at which we can actually observe the composite signal and check that it is properly matched up. It is desirable that the oscilloscope used should go down to zero frequency, since we must not lose any of the syllabic signal. There would not be much sense in trying to balance up the two components after a high-pass capacitor! You will not expect to get the full matching indicated in (B) of *Fig.* 4 because transients may catch the bias capacitor uncharged, whereas the end of the signal will be followed by the ordinary exponential decay. Another way of putting this is that you really have not got two quite independent frequency bands, one for speech and one for syllables and anyway, even if you had, the very simple separate network you are in effect using would not be able to sort them out.

In *Fig.* 6 you will note there is a good big capacitor across the supply. You need this in almost every transistor power amplifier because with the very low collector load impedances which you must use the battery leads and even the supply itself may constitute a serious part of the load. For this particular case let us settle for 160 cps so that $2\pi.160 = 1000$. Then the 1000 μf capacitor represents a 1-ohm source impedance and is undoubtedly rather meagre when you remember that the load impedance is only 5 ohms.

This brings up a point which can easily confuse you. It is much better not to try to draw a load line on the transistor characteristics in dealing with the composite signal but to consider only the steady state full signal and zero signal conditions. The load line for the syllabic component is an almost vertical line, because the transformer inductance is small, whereas we have the usual idea of the load line for the speech signal. At the collector of the output transistor you will see a waveform not too different from that of *Fig.* 2 rather than the one shown in (B) of *Fig.* 4. The latter current is there, all right, and can be watched at the emitter, but the transformer is doing its filtering job when you look at the volts.

When I first considered using this amplifier I rather expected that it would turn out one of those ingenious ideas which don't seem to come off in practice. It was a long shot, but time was rather tight and I needed a lot of noise for not much battery consumption. This circuit was tried while we waited for transformers for an old faithful class-B system. I suppose those transformers turned up some time but this amplifier was built and away long before we saw them. The mere fact that one can just trade economy against quality for any particular job made it a real general purpose amplifier. I hope you find the same. Æ

SPEED CONTROL

(*from page 22*)

dynamic plate resistance of a beam tetrode gives the output constant-current characteristics, and the additional power available can supply the reactive power required in most cases. The distortion produced by the effects of the reactive load is not as serious here as in an audio amplifier.

A complete circuit of a design using the approach outlined above is shown in *Fig.* 4 The basic oscillator is the same as described before, except that only about 180 deg. of the ganged potentiometer is used. Here, the output is developed at the cathode of a second cathode follower. This isolates the bridge feedback drive voltage from the loading effects of the phasing circuits. To obtain the correct biasing relationship for the two phase inverters, the phasing circuit must be returned to a decoupled positive voltage. Capacitor coupling from the cathode-follower driver and a return to this bias voltage at the input of the phasing network retains the proper d.c. operating point for both phase inverters without loading the phasing network outputs. The two power amplifiers are identical (since both phases are often the same). The only modification here is the use of separate unbypassed cathode resistors to enhance the constant-current properties of the beam tetrodes still further. The output transformers used should be identical, as is the rest of the power amplifier, to keep the relative phase shift of the two-phase currents equal to the 90-deg. difference at the phasing network outputs. Power transformers can serve quite well here, provided that they are not used above ¼–½ of their 60-cps volt-ampere rating. An efficient power transformer's core is usually slightly saturated under rated load at 60 cps, so that operation at, say, 30 cps requires about twice as much core material for the same load. Push-pull plate-to-line transformers having a conservatively high wattage rating and the proper turns ratios may be used. Motor characteristics vary somewhat, so that some trial-and error may be necessary to find the optimum output stage.

The power supply uses a conventional full-wave capacitor-input filter. Even though the plate supply for the output stage is obtained from the rectifier cathode, the 120-cps ripple here does not affect the continuously high-level output. Two pilot lamps indicate the relative amount of plate current drawn by the two output stages, and also serve as fuses to protect against a shorted output or tube shorts. A conventional fuse in the power transformer primary protects the power supply and filament circuits. Separate decoupling of the oscillator plate supply keeps the oscillator isolated from the rest of the circuit.

One physical arrangement possible is the separation of the oscillator and phasing network from the power amplifiers and power supply at the phase inverter grids. Then the "control" unit could be built compactly into a case or rack panel, or even into the turntable or tape deck mounting base. A multiple-conductor cable could connect the larger power amplifier and power supply chassis, located near other power amplifiers and better ventilation, to the oscillator chassis and nearby motor. Plate and filament voltages would be brought from the power supply to the oscillator, and the two pilot lamps could be located at the oscillator unit in the plate supply line.

The design approach described was used in the two units shown and can serve as a basis for adaptation to specific needs. The procedure followed in this article is based partly on compromise and partly on experimental vertification, which results in a practical method of speed control. AE

TAPE GUIDE

(*from page 45*)

has much to do, to undertake the additional functions of supplying a tape recorder with audio signal and bias current in the form required for recording.

Assuming that you have a conventional tape recorder with the necessary record and playback facilities, one suggestion I can offer concerning the preamp you purchase is that it have a tape-monitor switch, which is useful if your tape machine has separate record and playback heads, permitting simultaneous record and playback. The switch enables you to listen either to the incoming signal (say from the tuner) or the playback signal from the tape recorder, thereby making possible immediate comparison between the original signal and the signal copied onto the tape.

Of course, any preamp enables you to listen to tape playback. But the tape-monitor switch has two advantages: 1. You can continue recording (as from a tuner) while listening to tape playback. 2. The switch prevents a feedback loop and consequent howling or other racket as the result of a signal going from the tape recorder output into the preamplifier, thence into the tape recorder input, and from there to the tape recorder output again. The possibility of a feedback loop exists even though the tape recorder does not have separate record and playback heads, because in some tape machines the output jack is connected both in recording and playback to a common stage of audio amplification.

Another suggestion is that the preamp you purchase should have a low-impedance output jack for feeding a signal to the tape recorder. This is a matter of circuit design. An output impedance of 10,000 ohms or less should be satisfactory for all but extremely long cable runs between the preamp and the tape recorder. In some preamps the tape output jack is of relatively high impedance, so that a cable run of more than two or three feet may lead to treble losses.

There is no immediate relationship between your tape recording requirements and the power amplifier that you select. The latter should be chosen, in the usual way, on the basis of its power capability, frequency response, distortion, signal-to-noise ratio, stability, damping factor, cost, and listenability.

The question of recording directly from a multiplex tuner has been taken care of. You have to go through a tape record amplifier. While on the subject of recording from this source, let's spend a moment on the subject of the 38,000-cps subcarrier frequency generated by the multiplex tuner. This frequency may get into the tape recorder, where there is a good chance that it will beat with the bias-current frequency, resulting in audible beat notes. Therefore the 38,000-cps frequency must be filtered out. You must be certain that either the tuner or the tape recorder contains provision for filtering out the subcarrier.

That "Low-Frequency Sound" Again!

The second question in the January 1962 Tape Guide dealt with a "strange low-frequency sound" produced by a tape recorder

(*Continued on page 70*)

RATIO

(*from page 30*)

ratio should also take into account the slope of the quieting characteristic. The steeper the slope the more quickly the tuner attains maximum quieting and the more opportunity one has of enjoying quiet reception of weak r.f. signals. *Figure* 5 compares the quieting characteristics of two tuners. Tuner *A* can claim greater sensitivity because it attains 20 db quieting at 3 μv input, compared with 6 μv for Tuner *B*. But Tuner *B* may provide better listening on weak stations because it reaches near-maximum quieting at 20 μv while Tuner *A* does not attain near-maximum quieting until 60 μv.

The foregoing discussion has indicated that typical FM tuners have effective values of 60 to 65 db. On the other hand, the signal put out by the broadcaster seldom is better than 55 db. This does not mean that a signal-to-noise ratio better than 65 db is wasted on an FM tuner. For one thing, an occasional FM program, particularly a live broadcast, comes through with better than 55 db. For another, it may be expected that the quality of FM broadcasts will steadily, if slowly, improve, particularly as the result of FM stations having to introduce much better transmission equipment in order to cope with the exacting technical requirements of multiplex.

Tape Recorder

A tape recorder that can achieve a signal-to-noise ratio of 55 db or more, based on a maximum recording level producing 3 per cent harmonic distortion at 400 cps may be rated excellent in view of the present state of the art. Relatively few tape recorders achieve such performance. Quite a number do not exceed 50 db, and some fall below 45 db. Those that attain 55 db are usually the ones with separate record and playback heads, so that the playback head can be designed for maximum signal output (high-inductance head), without having to make the compromises required when a head has to serve for recording as well as playback (low inductance is preferable for recording).

Depending on how the specification reads, the rated value may not be the same as the effective value. A number of the less expensive machines are rated on the basis of a recording level that produces 5 per cent harmonic distortion (at 400 cps), which is very close to tape saturation and produces too much IM distortion for high fidelity purposes. Such a machine should be de-rated about 6 db to put its ratings on the basis of a 3 per cent harmonic distortion level. Thus if a tape recorder is rated at 54 db on the basis of 5 per cent distortion, its effective value, presuming the desire to make reasonably clean recordings, is only 48 db.

When a tape recorder has a VU meter, sometimes the rating is stated as a given number of db below 0 VU. Then we must know what recording level is represented by 0 VU. In some high quality machines, 0 VU represents a recording level that produces only 1 per cent harmonic distortion at 400 cps. This provides a margin of approximately 6 db to allow for the mechanical lag of the pointer on transients; that is, when the meter reads 0 VU on a transient, the actual level may be several db above 0 VU. If such a machine's signal-to-noise ratio happens to be rated on the basis of 0 VU, the effective value is 6 db greater than the rated value, because there is about 6 db difference between the recording levels that produce 1 and 3 per cent distortion.

If 0 VU corresponds to 3 per cent distortion, the effective value is the same as the rated value. If 0 VU corresponds to 5 per cent distortion, we should subtract 6 db from the rated signal-to-noise ration. Æ

TRADE SECRETS

(*from page 23*)

"The first thing to be made sure of is that the employee shall not fraudulently abuse the trust reposed in him. It is the usual incident of confidential relations. If there is any disadvantage in the fact that he knew the employer's secrets he must take the burden with the good."

To this quotation the court added, "While the inventor of any product of the mind may forfeit his ownership thereof when it becomes known to the public, yet such forfeiture does not deprive the other of his right to make contracts with reference to his product. Neither does this yield his right to have such contracts protected by the courts where a confidential relationship has been created on the basis of the inventor's secret."[3]

Owner of a secret formula for the manufacture of iron pentacarbonyl, or carbonyl, a yellowish liquid with its chief commercial value an intermediate product in the manufacture of powdered iron, an element used in the production of radio cores and radar, sued a competitive user for damages.

License was given by the owner of this process with a condition that the information be held by the licensee in secret. Subsequently employees of the licensee disclosed this discovery to another manufacturer against whom this suit was brought.

In awarding a judgment adverse to the owner of the formula on the ground that the process was no longer a secret when it was employed by this competitor the federal court said of this major feature in the protection of trade secret information,

"It should be remembered at the outset that the property in a secret process is the power and right to make use of it to the exclusion of the world. However, that property may fail to come into existence or may be lost, either through voluntary disclosure by the owner of the alleged process or because it is lawfully known or used by others in the trade.

"If the world knows the process then the property disappears. There can be no property in a process and no right of protection if knowledge of it is common to the world."[4]

When a year and a half later the appeal from this judgment came for review before the U. S. Court of Appeals it was said in sustaining the judgment of the lower court in its holding that there can be no property or trade secret in knowledge that is general to the world,

"One who invents or discovers and keeps secret a process of manufacture has a property therein which this court will protect against one who in violation of contract or breach of confidence undertakes to apply it to his own use or to disclose it to a third person.

"It appears then that the essential elements of a claim of this nature against a third person are:

"1. Existence of a trade secret.

"2. A substantial element of trade secrecy preserved,

"3. Disclosure to someone under an express or implied obligation to preserve secrecy,

"4. Disclosure by that person in breach of confidence,

"5. To a third party who acquires the information with knowledge of the claimant's rights therein and,

"6. Use by the third party to the detriment of the owner of the trade secret."[5] Æ

[3] Hollywood Motion Picture Equipment Co. v. Furer, 105 Pac. 2d 299, Cal., Sept. 3, 1940

[4] Ferroline Corp. v. General Aniline & Film Corp., 107 F. S. 326, Ill., June 13, 1952

[5] Ferroline Corp. v. General Aniline & Film Corp., 207 Fed. 2d 912, Ill., Oct. 21, 1953

NEW PRODUCTS

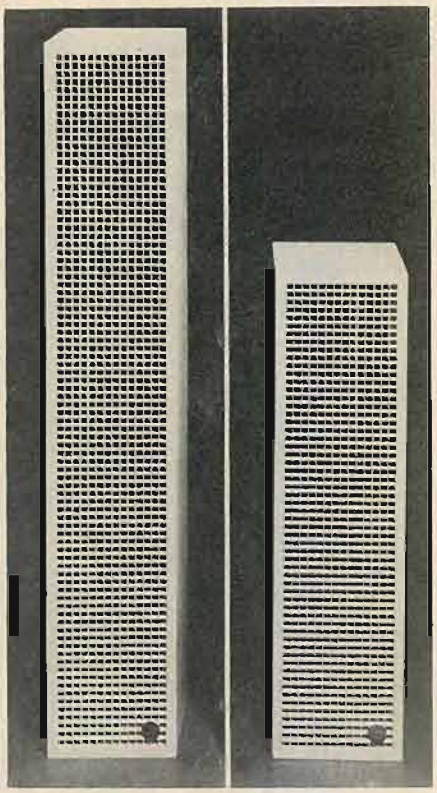
• **Laboratory VTVM.** Ballantine Laboratories has introduced a new VTVM, the Model 300H, capable of measuring voltages as low as 30 μv and as high as 30 v over a frequency band of 10 cps to 1Mc. The scale is logarithmically expanded and calibrated over its entire 5-in. length. Accuracy is 2 per cent to 700,000 cps and 3 per cent up to 1 Mc at any point on the scale. Unusually high feedback is used to ensure a life in excess of 5000 hours within

specifications. It is available in a 19-in. rack version. Price is $230.00. Ballantine Laboratories, Inc., Boonton, N.J. **D-1**

• **FM-Stereo Tuner.** Boasting a flat frequency response up to 75,000 cps, the new Bogen Model TP50 FM-stereo tuner features a moderate price. Created specifically for FM-stereo reception, the TP50 has a brushed gold front panel, functional control placement, a "simple scanner" dial, "Accutune" for increased precision in tuning, and dynamic a.f.c. Automatic gain control maintains audio level within 0.5 db with signals ranging from 10–10,000 μv.

A feature of the multiplex circuit is the built-in low-pass filter to avoid whistles during tape recording. Bogen-Presto Division of the Siegler Corp., Paramus, N.J. **D-2**

• **P. A. Sound Columns.** Offering the highest power-handling capacity in the columnar loudspeaker field and the widest frequency range, the new University Uniline sound columns provide effective control of sound distribution to reduce feedback and reverberation. The Uniline Models UCS-6 and CS-4 overcome power handling limitations of conventional sound columns by the use of efficient dual element speakers similar to types used in high fidelity sound reproduction. Small subsidiary radiators assure horizontal dispersion of the high frequencies while the main cones reproduce mid-range and base frequencies only and are therefore able to be large without sacrificing dispersion. For critical dispersion control University Uniline series offers exclusive "Acoustic Tapering." The vertical pattern of conventional sound columns tends to become too narrow at high frequencies. University's method prevents excessive high-frequency beaming by using speakers whose response rolls off at high frequencies at the ends of the sound column. Installation of this series is quick



and convenient with the hardware supplied. A simple arrangement is provided which permits flexibility of orientation so that the column may be tilted and rotated to direct the sound where it is needed. The Model UCS-6 is intended to reproduce music and speech and is a 60" column with a frequency range of 35 to 17,000 cps and a power handling capacity of 150 watts ipm. The Model SC-4 is also intended to reproduce music and speech and is a 40" column with a frequency range from 45 to 17,000 cps and has a power handling capacity of 80 watts ipm. The price of the Model UCS-6 is $179.95 and the price of the Model CS-4 is $129.95. University Loudspeakers, Inc., White Plains, N.Y. **D-3**

• **Public Address Mixer-Preamp.** The latest addition to the Commander series of public address equipment by Harman-Kardon is the DPR-7 combination mixer-preamplifier. Although popularly priced, the DPR-7 has a self-contained power supply which provides d.c. on all tube filaments to achieve extremely low hum levels. Frequency response and sensitivity are relatively high for this category. Seven inputs are provided: five low-level and two high-level. Channel 1 accepts either microphone or magnetic cartridge; Channels 2 and 3 each accept high-level microphone, or tuner, or tape, or crystal or ceramic phono cartridges; Channel 4 is another microphone channel which may be converted to a master volume control for all channels by means of a front panel switch. All inputs can be controlled from the front panel thus allowing the inputs to be used without rearranging input connections. The output of the DPR-7 is a cathode follower so that it may be remotely

located in relation to the power amplifier. Also, sufficient output is provided to drive several amplifiers. Price of the DPR-7 is $75. Harman-Kardon, Inc., Plainview, L.I., N.Y. **D-4**

• **Portable Tape Recorder.** Featuring a built-in AM radio and complete transistorization, the new Concertone Model 400 "Cosmopolitan" operates from four 1.5 volt flashlight batteries or external a.c. The Cosmopolitan operates at tape speeds of 1⅞ and 3¾ ips and accepts 5-in. reels.

The unit weighs under ten pounds, including the leather carrying case, and incorporates a dual-purpose meter to monitor audio level and show battery condition. Accessories include a microphone with built-in stop-start switch and earphones. An optional foot switch is also available. Battery life is rated at 15 hours of continuous use and the recording time available at the 1⅞ ips speed is 3 hours. Frequency range at this speed is 150–3500 cps; the frequency range at 3¾ ips is 150–7000 cps. American Concertone, Inc., Culver City, Calif. **D-5**

• **AM-FM-Stereo Tuner.** Providing AM, FM, and FM-stereo reception, the new Heath Model AJ-41 features an FM-stereo indicator light and individual tuning meters for AM and FM. An FM squelch cir-

cuit is incorporated to eliminate noise between stations while tuning across the band. A cathode-follower output provides low line impedance to minimize hum and high-frequency losses in the interconnecting audio cables. A multiplex phase control permits fine tuning for maximum

If you are after immediate savings you should not buy Scott components. They cost more. If, on the other hand, you are interested in the long-term economy of superb performance over many years of continued use, Scott is your wisest investment. Scott components cost more because they incorporate so many refinements and intangibles. Parts are carefully chosen. Specifications are always conservative. Engineering is imaginative and uncompromising. Quality control is implacable. The first Scott amplifiers were built in 1947 and many are still in use. Their owners take pride in choosing the very finest. For full information on new Scott amplifiers, tuners, speakers and kits, write for 20-page "Guide to Custom Stereo". H. H. SCOTT, INC., 111 Powdermill Road, Maynard, Mass.

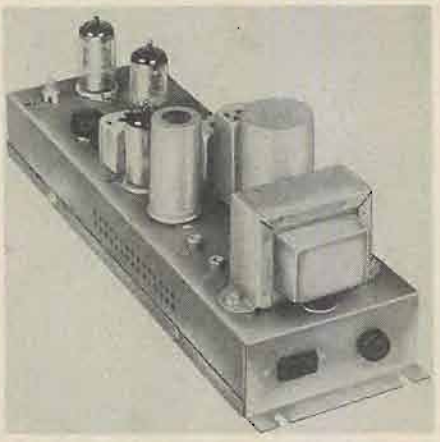
SOME PEOPLE SHOULD NOT BUY SCOTT

separation. Other features include: heavy die-cast flywheels; large slide rule tuning dial with refracted illumination to reduce glare; a.f.c. to eliminate drift on FM reception; and a switch to provide normal or maximum AM fidelity. The AJ-41 has modern styling which features a luggage tan, vinyl-clad, steel cabinet and polished anodized trim. Price of the Heath AJ-41 kit is $119.95 while the assembled (AJW-41) price is $189.95. Heath Co., Benton Harbor, Mich. **D-6**

• **Soldering Irons.** An industrial soldering pencil, weighing only three (3) ounces, and a new line of high-speed soldering irons are now available from the Vulcan

Company. The Vulcan "Dart" soldering pencils are especially valuable for repair or corrective touch-up of printed-circuit panels and other delicate soldering jobs. Heating elements and plug-type tips are easily replaceable. It is available in either 30- or 40-watt sizes and in both straight and angle models. The Vulcan high-speed soldering irons use tips that develop higher temperatures than conventional irons of equal tip size. To withstand the higher temperatures, the heating element used highest quality nichrome resistance wire and is insulated with the finest high dielectric strength mica available. Vulcan Electric Company, Danvers, Mass. **D-7**

• **Concealed Multiplex Adapter.** Designed for those who desire to conceal the multiplex adapter, the Fisher Model MPX-200 universal adapter is a self-powered unit which can be placed up to three feet from the tuner or receiver. The MPX-200 has two controls to ensure identical output levels from both channels. A selector



switch makes it possible to record stereo programs monophonically. A special control is provided to match the MPX-200 to the tuner with which it is used to insure maximum stereo separation. This control is set when the adapter is installed and need not be set again. A 15,000 cps low-pass filter is provided at the output of the adapter to eliminate whistles and other interference with tape recorders. Price of the MPX-200 is $79.50. Fisher Radio Corp., Long Island City, N.Y. **D-8**

• **In-Circuit Capacitor Tester.** Utilizing a Wien Bridge with a unique balancing circuit (patent pending), the EICO Model 955 Capacitor Tester will check capacitors in a circuit even when shunt resistances are comparatively low. It measures capacity from 0.1 μf to 50 μf in or out of the circuit and the accuracy is within 10 per cent at any point on the dial. The Model 955 also

performs very sensitive checks for short- or open-circuited capacitors. Indications are seen as sharp, bright, bar patterns on an eye tube. The Model 955 will operate on a.c. line voltages from 105–130 volts at 60 cps with a power consumption of 8 watts. A line-adjust control permits adjustment for maximum sensitivity at the available line voltage. Price of the kit is $19.95, the wired price is $39.95. EICO (Electronic Instrument Company, Inc.), Long Island City, N.Y. **D-9**

NEW LITERATURE

• **Kit-Builders Guide.** H. H. Scott, manufacturers of high-fidelity components, announces a new full-color kit-builder's guide for the do-it-yourself fan. This new kit brochure pictures Scott's complete kit line of amplifiers and tuners. It lists complete specifications for each kit as a guide in choosing the best kit for your needs. H. H. Scott, Inc., Maynard, Mass. **D-10**

• **New RCA Receiving Tube Manual.** The latest edition of the RCA Receiving Tube Manual (RC-21) is the largest issue to date consisting of a record 480 pages. This new edition has technical data on over 900 receiving tubes, including nuvistor, novar, and other new tube types. Data are also included for more than 100 types of black and white and color picture tubes. The manual's text material on electron tube theory, installation, application, and interpretation of tube data has been augmented in coverage in an easy to understand style. A new receiving tube chart has been added to aid in the selection of tube types for specific applications. The popular Circuits section has been expanded and now includes 26 circuits. This includes: several broadcast receivers; a 144-Mc receiver and a 10-meter nuvistor preamplifier for amateur radio applications; two 2-channel stereo amplifiers; five amplifier circuits, several using novar types; preamplifier, mixer, and tone control circuits; a code practice oscillator; an intercom set: and an electronic volt-ohm meter. Copies of the new RCA Receiving Tube Manual, RC-21, may be obtained from RCA Tube Distributors or by sending $1.00 to RCA Commercial Engineering Electron Tube Division, Harrison, New Jersey. **D-11**

• **Entertainment Center Building Guide.** The growing popularity of the built-in entertainment center as a do-it-yourself project has prompted Allied Radio Corp. of Chicago to offer a building guide for the home handyman or the contractor. From the standpoint of convenience, decor and space-saving, the floor-to-ceiling wall system of modular units has much to offer. Not only can design features and wood finishes be customized but such a system is excellent for grouping related equipment. Details of such an installation are explained in a new booklet just published by Allied Radio. It comes complete with 20" x 32" building plans and describes a wall project with provisions for a refreshment bar, a drop-leaf desk, bookshelves, and even a pull-down movie screen. Instructions cover the installation of an amplifier, tuner, tape deck, record changer, and TV chassis. General information is included on speaker matching, remote speakers, ventilation methods, and many other related topics. Wiring diagrams show how to install speaker systems with individual volume controls, stereo headphones, jacks for plugging in portable speakers and outdoor speakers. Tips for customizing and an explanation of multiplexed FM-stereo broadcasting are also included as well as a question-answer section on most common music wall problems. The guide titled "Built-In Hi-Fi Music System" (#39K241) is available at $.10 to cover handling from Allied Radio Corp., 100 N. Western Avenue, Chicago 80, Ill. **D-12**

• **Service Selector Catalog.** A new 40-page "Service Selector" catalog describing a complete line of capacitors, vibrators, rotors, decades, test instruments, and other standard line components is now available from Cornell-Dubilier. The new booklet includes selection data such as design features, temperature ranges, material construction, application, and price. It is of special interest to radio-TV service technicians. Cornell-Dubilier Electronics Division, Federal Pacific Electric Company, Newark, New Jersey. **D-13**

• **Sound-Effects Catalog.** The latest catalog of sound effects, Catalog 9-60, produced by MP-TV Services, Inc. lists over 1500 sound effects. The significant feature of these sound effects is that they are almost all recorded under the actual conditions in which the various effects are created. Sounds of animals, storms, crowds, planes, trains and so forth are recorded on the scene by engineers with experience in radio and movies. A variety of effects may be obtained from the same record by varying the speed of the turntable. Naturally the slower the speed the lower the pitch of the sound and the reduction in speed also reduces the tempo of the action itself. MP-TV Services, Inc., Hollywood, California. **D-14**

• **Audio-Visual Rental Catalog.** A new edition of the Audio-Visual Catalog, "See . . . Here . . . Mr. Businessman," the third edition, is now available for distribution. The catalog contains film and filmstrip listings with annotations of business-industry oriented materials. All film materials are available to schools, colleges, business, industry and civic groups at nominal rental charges. A mailing handling charge of $.20 (no stamps please) is charged for the catalog. It is available from the Audio-Visual Center, The City College, Bernard M. Baruch School of Business and Public Administration, 17 Lexington Avenue, New York 10, New York. **D-15**

• **Switch Selection Catalog.** The Daven Company has announced the publication of a new 48-page catalog on the selection and ordering of its switch line. The catalog is available, without charge, to anyone involved in the selection and ordering of switches. The opening pages of the catalog are devoted to a description of the applications, materials and characteristics of Daven switches. This is followed by a section instructing the user of the catalog on the Daven "shorthand" method of ordering switches of various operating characteristics. Described and illustrated in the catalog are standard switches such as single deck, shorting; single deck, non-shorting; multi-deck, shorting; multiple deck, non-shorting; as well as special switches like miniature ceramic switches, sub-miniature switches, pre-wired switch assemblies, terminal board switches, solenoid-operated switches, adjustable stop switches, progressive shorting-type switches, high speed switches, commutator-type switches, hermetically-sealed switches and spring return switches. For log, write to Mr. E. L. Grayson, The Daven a free copy of the new Daven Switch cata- Company, Livingston, New Jersey. **D-16**

• **Sound Absorption Booklet.** A new 12-page booklet, "GEOCOUSTIC . . . To Hear and Be Heard in a Room," has been published by the Pittsburgh Corning Corporation. The publication deals with the effectiveness of GEOCOUSTIC—the cellular glass acoustical unit which employs the "patch" technique—in a variety of applications ranging from classrooms to swimming pools. Information is contained which explains the necessity of sound control and the importance of sound absorption and diffusion. Actual job photographs, along with architecturally designed sketches, are included, emphasizing the design potential of GEOCOUSTIC. Also listed is the amount of treatment needed for average applications. Background data on the material itself, along with application procedures and specifications, is also included. Tne publication may be obtained from the Pittsburgh Corning Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania, by requesting Booklet GC-5. **D-17**

TAPE GUIDE

(from page 63)

in the record mode. The evidence seemed to point to the oscillator circuit. We are indebted to reader N. H. Reeve, 1411 Wisconsin Avenue, Racine, Wisconsin, for the following additional thoughts on this problem: "Ceramic capacitors can be very microphonic. He has ceramics in his oscillator circuit. He has mechanical vibration nearby: motor, belts, idlers, and what not. Could be?"

We shall be happy to have comments from other readers on questions that have been raised in the Tape Guide.

Recording Bias

*Q. I have a **** tape recorder that records mono and plays back either mono or stereo. I checked the playback response with the Ampex Test tape #5563B and an a.c. VTVM, and it was excellent, within 1 db from 50 to 12,000 cps. My trouble is in the record section of the tape recorder. I ran a record equalization test according to the manufacturer's instruction, and this too was very good, well within 2 db. But when I ran a record-playback test, I got a treble boost of about 7 db at 10,000 cps; the boost reached 3 db at 3000 cps. This seems to point to low bias current. There is a 100-pf variable capacitor in the oscillator circuit, which according to the manufacturer has to be optimized at 500 cps. I have followed the instructions for setting bias, but continue to get a treble peak of 7 db at 10,000 cps when recording and playing back a tape.*

I would like to ask the following: (1) Is there some way of checking the bias current on my machine? (2) If so, what should it be? (3) How do I change the value of bias current? (4) Is there any direct way (not by means of recording and playback) to check the linearity of the record head? (5) Do you think my trouble is in the record head rather than in the bias current?

A. In view of the excellent playback response and record equalization you obtain, it appears that the treble peak is due to insufficient bias current. Not being in the service business, I do not have schematics for all tape recorders. However, by chance I have a schematic for a **** model substantially similar to your model. To adjust bias, you would turn the 100-pf variable capacitor to which you refer; in my schematic this capacitor is marked "bias adjust." I believe it is necessary to remove your tape machine from its case in order to get at this capacitor.

I am not sure what you mean when you say that the variable capacitor has to be "optimized at 500 cps." Perhaps you mean that the capacitor has to be adjusted until record-playback response at 500 cps is maximum. This is a very common technique for adjusting bias current in a machine that has separate record and playback heads, such as yours. However, in some tape machines the specified frequency is 1000 cps and in still others it is 2000 or 3000 cps.

Since playback response and record equalization check out o.k., I think you can safely rely on the technique of adjusting bias current to give you the flattest possible record-playback response throughout the audio range. In your case this would mean increasing bias current somewhat, which has the advantage of also reducing distortion.

To answer your other questions. You can check bias current directly by disconnecting the ground lead from the record head (at ground), connecting a 100-ohm resistor between the head and ground, and measuring voltage across the resistor when the machine is in the record mode; calculate bias current by dividing voltage by the 100-ohm resistance (Ohm's Law); the proper value of current is best obtained from the manufacturer. I do not know of any way of checking the record-head frequency response (assuming this is what you mean by "linearity") without actually recording and playing back a tape.

Transmission Loss

Q. I feed the output of the tape playback head on my tape deck into an amplifier three feet away. Is there an appreciable loss in a 3-foot cable?

A. Whether your 3-foot cable causes appreciable treble loss depends upon the impedance of the playback head and the capacitance of the cable. Assume the playback head has an inductance of 500 millihenries, which is fairly typical, and that the cable has a capacitance of 100 pf, which is reasonable. If we ignore the input capacitance of the tape amplifier, treble loss will not commence until about 22,000 cps. On the other hand, if the head inductance is 1 henry, as may be the case when separate record and playback heads are employed (a head designed only for playback has a high impedance in order to increase its signal output, whereas a record-playback head is at a disadvantage in recording if its impedance is too high), and if the cable capacitance is 200 pf, which can easily happen if you are not using low-capacitance microphone cable, treble loss could begin as low as about 11,000 cps.

On the other hand, there are special techniques used by some manufacturers—involving a double-shielded cable and the use of feedback—which permit a fair length of cable without deleterious effect on treble performance. Through feedback, the capacitance of the cable is in effect reduced.

Tape Head Demagnetizing

Q. In using a demagnetizer for tape recorder heads, should the demagnetizer be moved horizontally or vertically in front of the heads?

A. Whether demagnetizing heads, tapes, guides, or any other object, the best course is to move the demagnetizer in circular fashion with respect to the object being demagnetized, at the same time drawing the demagnetizer slowly away. AE

LIGHT LISTENING

(from page 10)

background in bright tunes such as *'Way Down Yonder in New Orleans* and *Carolina in the Morning*. The langorous Dixie magic in Dinah's voice, unchanged over the decades, irradiates *Moon Country, Sunday in Savannah*, and *Do You Know What It Means to Miss New Orleans?* With this release, Capitol has performed a public service on both sides of the Mason-Dixon line.

Sasha Polinoff: Fastest Balalaika in the West — Elektra EKL 212

If the triangular string instrument called the balalaika does indeed get its name from the Russian word for "joke" or "babble," then Sasha Polinoff is a descendant of a long line of jokesmiths. Elektra is presenting in this release some of the few survivors still active in the balalaika trade now centered in restaurants such as the Two Guitars in New York City. Polinoff, a disciple of the fabled Alexander Dobrohotov, leads an ensemble that includes several models of domras, accordion, and bass balalaika. The domra has the same number of strings found on the balalaika (three) but its shape resembles an elongated mandolin. It was introduced into Russia by wandering jugglers in the 17th century, some two hundred years before the more familiar balalaika. Elektra's engineering has made good use here of its extensive experience in the specialized field of folk music. They've preserved a clean sound during the more roistering tunes without losing the warmth of the strings when the mood is pensive. If the balalaika makes a real comeback in the years ahead, this record can take a more than modest share of the credit.

Peter Nero: Young and Warm and Wonderful — RCA Victor LSP 2484

Will success subdue young Peter Nero? His first album (Piano Forte LSP-2334) revealed a fresh and highly imaginative piano style in an area of popular music that could certainly use one. Nero's third release for RCA Victor finds him settling down to a more predictable approach in a program that places its stress on ballads. This latest album may have been designed to balance the pyrotechnics of his earlier arrangements and Nero may yet return to the clever quotations from the classical repertoire that sprinkled his first keyboard work on records. It may well be that imaginative piano arrangements call for more time and concentration in their creation than a constantly touring artist can give them. At only one point in the album does Nero really tear loose. *Thou Swell* finds the piano pacing the Marty Gold orchestra in a headlong tempo that few practitioners of mood music would attempt these days.

Linger Awhile with Vic Damone — Capitol ST 1646

I wonder why it was decided to assign the voice of Vic Damone to one channel of this stereo release? He appears at far left with only a small part of the orchestra working behind him. The section of Jack Marshall's band completely in his corner is the softly swinging rhythm section. Some of the strings can be detected near him but most of them are bunched in the right channel. Everything else—reeds, brass, and so on works in the right channel. A setup such as this was tried on a few records during the early days of stereo but the idea failed to make much headway. From a listening standpoint, the effect is not bad once you get used to it. I suspect this bit of unorthodoxy was not cooked up merely to intrigue us with a novel placement of the vocalist. Damone's singing style would have to expand several notches before it could be described as a belting one. Some singers try to outshout a band. In his first album for Capitol since joining the label last September, Vic Damone wisely sticks to a moderate volume in tasteful swinging ballads associated with his recent nightclub appearances. It's easy to see why producer Dave Cavanaugh and the console man decided to give Damone a side mike rather than juggle the level of the orchestra in these particular arrangements. This doesn't mean that Damone's is a problem voice. Given a bland string background, he could easily work at the center of the orchestra. The studio acoustics to fill out some mighty indestructible tunes—*Deep Night*, Cole Porter's *In the Still of the Night*, and the Irving Berlin favorites *Change Partners, Soft Lights and Sweet Music*, and *Let's Face the Music and Dance*. AE

ABOUT MUSIC

HAROLD LAWRENCE

The Crisis in the American Orchestral World

A CELEBRATED MAESTRO once described conducting as a form of warfare in which the enemy was the orchestral player, and victory the latter's unconditional surrender. Conductors today generally disapprove of such a stern view of their profession, preferring to define the orchestral performance as a process of "artistic collaboration" between players and conductor. Sometimes, however, players resist more than they collaborate. At such moments, the conductor may be inclined toward the above military approach.

Attack on Strings

Hector Berlioz a century ago was outspoken in his criticism of orchestral players. Although no section was spared his pointed observations, the strings came in for his bitterest attacks. Violinists with a large quantity of rest bars, he reported, would not bother to count the passing measures, relying instead on their colleagues to give them the signal. "As a result, hardly half the section re-enters at the right time, while the others are still holding their instruments under their arms, gazing into space. The attack is thereby weakened, if not entirely ruined." When the score called for a tremolo, string players would replace it with a "dull repetition of the note, half and even three-quarters as slow as that which would have produced the tremolo. Undoubtedly the up-and-down movement of the bow arm necessary for a genuine tremolo required too great an effort."

While some musicians were not playing enough of their notes, others were adding some of their own to the score: "Flute players," continued Berlioz, "who were accustomed to dominating the other winds and would not concede that their parts could be written *below* (italics mine) the clarinets or oboes, frequently transpose entire passages an octave higher."

Exceptions

The flagrant lack of discipline from which orchestras of that period suffered was only accentuated by the exceptions of such conductors as Nicolai in Vienna, Costa in London, Habaneck in Paris (a frequent target of Berlioz), and Mendelssohn in Leipzig, all of whom anticipated the virtuoso conductors of the turn of the century.

Years of steady progress in instrumental techniques place the modern orchestral player on a higher plane than his 19th-century counterpart. He is a more fluent reader due to the vastly expanded repertoire for which he is responsible; he adapts himself with greater ease to music of varying styles and periods; and he is generally more responsive to cues from the podium. The radio and the phonograph help keep him on his toes by enabling him to compare his playing with that of his colleagues in the world's greatest orchestras. It is difficult to conceive of a more musical or well-oiled piece of symphonic machinery than, say, the Philadelphia Orchestra, or any one of a number of first-rate musical ensembles. To borrow a phrase from Hollywood, orchestras are better than ever.

A New Trend

At the same time that orchestral virtuosity reaches its high point in musical history, there are signs that the profession of orchestral playing is steadily losing its attraction for young musicians. From the music schools of America, hundreds of graduates pour annually into the cultural mainstream, some to embark on concert careers, others to teach, compose, conduct, or arrange, and many to enter the ranks of symphony orchestras. After a two- or three-year stint with an orchestra, however, economic pressures drive many instrumentalists to other more lucrative fields. Apart from the top symphonic organizations, in New York, Boston, Chicago, Cleveland, and Philadelphia, the average orchestral player probably earns some $3000 a year. Even without the responsibilities of a family, the salary is obviously below minimum living standards. Few of the elements of security which workers in nearly every other industry enjoy are given the orchestral musician. Consequently, he is forced to "moonlight." In a large Eastern city, for example, members of the local symphony orchestra supplement their meager pay by such various occupations as managing a record shop, selling insurance, driving a taxi, or working in a library.

Some Make It

Given the proper amounts of talent, ambition, and luck, an instrumentalist might be able to derive his income exclusively from music making. Some New York musicians shuttle back and forth between two worlds: the concert hall and

the recording studio, performing everything from cigarette jingles to Vivaldi concerti grossi. These peripatetic orchestral players include ex-N.B.C. Symphony members, New York Philharmonic players, and former virtuoso-soloists. A glance at the violin section at a recent large-scale "pop" session revealed no less than four ex-concertmasters. Outside of New York (the fountainhead of the American recording scene), and Chicago and Los Angeles, the number of musical jobs is limited, with the inevitable result that the reservoir of competent orchestral players is fast shrinking.

Tight Strings

Alarms have been sounding in recent years over the shortage of string players. Even our major orchestras are beginning to feel the pinch. One conductor of a full-sized symphony orchestra in America, for example, found himself short two violinists. After auditioning dozens of applicants, he still had not come up with replacements for the missing chairs, because none of the aspiring players could fulfill the minimum technical requirements. Rather than compromise his musical standards by taking on a pair of middling fiddlers who might have added weight to the string body, the maestro decided to bide his time. At this writing, the positions have not yet been filled.

The situation in other sections of American orchestras is equally critical. Orchestral managers compete as fiercely for top instrumentalists as baseball managers fight over star pitchers. Eventually, of course, our best players land in the "majors."

Not that the rest of America is an orchestral desert. Dedicated conductors and orchestra builders like Josef Krips and William Steinberg have raised their respective ensembles in Buffalo and Pittsburgh to high professional levels. The 87-member Eastman Philharmonia, which recently concluded a triumphant 13-week, 34-city European tour, is composed of students of the Eastman School of Music—living proof that orchestral training has not been neglected in our schools. Another fine organization calculated to season orchestral players is the National Orchestral Association. Although a training orchestra, it has a decidedly professional air about it, thanks to the splendid work of its conductor, John Barnett.

Economic Realities

The fact remains, that despite our orchestral prosperity and our many splendid educational and training institutions, economic realities will soon place even our front ranking ensembles in a dangerous position. *Is government subsidy the answer?* Æ

RECORD REVUE

(from page 54)

first sight, which ever is most convenient, and I send you my best regards. Sincerely, Slook of Canada." And the next thing you know, Mr. Slook himself arrives, fresh off the boat, to clinch the business deal.

The devastating comment on the crude, uncivilized traveling American businessman (of 1810) is as familiar as the image of the traveling GI today—and the nice thing is that the sloppy-mannered Mr. Sloop in the end turns out to be gently human. It is the Italian, the calculating Papa, who gets the short end of the deal. Mr. Sloop fondly presents the daughter to her young boy-friend, who is made heir to the Sloop millions.

You see what I mean—here, on records and via this handsome booklet, you'll find out what the opera really is about, which may not be quite what you would have thought. The album, incidentally, is one of the handsomest boxes I've laid eyes on, bright blue with a period wallpaper design in pinks and yellows set off against it. All-Italian cast, excellently chosen, and a superb small orchestra, the "Virtuosi di Roma."

And the composer wrote the darned thing at the age of eighteen!

Accordiorama. The Hohner Accordion Symphony Orchestra, Würthner.
Vanguard VSD 2105 stereo

Musicianship triumphs when it is powerful enough, no matter what the subject-matter. Here is the most unlikely of "orchestral" media, an all-accordion orchestra (well, *almost* all. They use a few outside instruments for extra polish) and its arrangements of warhorse repertory, major and minor, are played with such scintillating perfection, such sheer musicianship as well as incredible discipline, that one listens, all ears, with astonishment.

The high points for me are, naturally, the bigger and better pieces, notably the complete, uncondensed "Invitation to the Dance" of Weber and the *Overture* to "William Tell" of Rossini. Extraordinarily fine playing by any standards at all, accordion-schmordian! (Poddun me; that's a New Yorkism; but I love it.)

The rest of the music goes gently downward, via the Brahms "Hungarian Rhapsodies," "Dance of the Hours," "Hora Staccato" . . . a program of conventional Nineteenth century corn, and my only negative thought is that it's a shame these brilliant performers of the Hohner house-orchestra don't venture a bit further into other kinds of music. They are stuck back with Matthias Hohner, a century ago.

Russell Oberlin, Countertenor—Baroque Cantatas. (Telemann, Buxtehude, Handel.) A. Schneider, vl., G. Ricci, cello, B. Krainis, recorder, D. Williams, hps.
Decca DL 79414 stereo

A Russell Oberlin Recital. (St. Godric Songs (. 1150), Jones, Purcell, Schumann, Wolf.) P. Maynard, hps., J. Iadone, lute, Martha Blackman, gamba, D. Williams, pf.
Decca DL 710032 stereo.

Russell Oberlin has a most unusual voice, a beautifully polished and controlled ultra-high tenor, in the contralto range (countertenor). But the musical mind that operates it is not very imaginative.

The first and most recent of these two discs is optimum Oberlin and decidedly interesting. The floridly ornate Baroque music, full of long "runs"—passages in rapid notes—is exactly suited to his bright voice production and, indeed, he is one of the few living singers who can hope to articulate the fast notes with properly instrumental accuracy. These cantatas, for solo with groupings of colorful instruments, are vivid, strong music, the best that their respective composers offer; but the type has seldom been heard since its own day because of lack of a vocal instrument that could sing it (and until recently, of course, a dearth of harpsichords, gambas, recorders, for the instrumental parts)

First class stuff. But, alas, the singing and playing tends towards that typically American, hard, muscular pounding that is the very worst fault with our Baroque performances. Brilliant—yes. But curiously mechanical, lacking a poetry and plasticity of phrasing, driven forward with a rigidity that is more machine-like than expressive. It's not only Oberlin, either. The others contribute to this pell-mell mechanization. I find it distressing in an otherwise beautiful set of performances.

The second disc features Oberlin's first breaking away from "old" music towards the more familiar later Romantic song writers, with piano, as well as a brace of good British music on the first side. Again, the Oberlin voice is extraordinary and, in the Jones and Purcell unusually appropriate. (Purcell was himself a countertenor.) But again—it all sounds like Oberlin, century in and century out. Compared, for instance, to Alfred Deller's penetratingly musical singing of Purcell, Oberlin's is tasteless, superficial, unimaginative, in spite of some lovely tonal sounds. His voice is a more accomplished one than Deller's, more perfectly shaped and controlled. But there just isn't a big musical mind back of it.

BIG NAMES

Moussorgsky: Pictures at an Exhibition, orch. Ravel. Paris Conservatory Orch., Vandernoot.
Command CC 11003 SD stereo

An interesting recording here. Not only is it a fine technical job as in others of the Command series (and in a well-produced fancy album, too—cover by the famous Bauhaus man, Josef Albers) but, perhaps more important, a close-up demonstration of typical French playing, in a score arranged from the Russian by an impeccably French composer, Ravel.

French? Well, for one thing, the heavy, pompous quality of much of this familiar score, out of the original Russian music (piano), is deliberately played down, jazzed up. Things move fast. The "promenade" theme, between the musical sketches, walks almost too fast for comfort. A general streamlining for modernity, and at times I find it a bit distressing; the piece *is* pompous, after all.

Then there is the French orchestra, here in a most revealing close-up of that curiously squealing, out-of-tune quality that represents the highest French musicianship—no slur intended! Snarling woodwinds, "French" horns bleating like sheep, strings absent-minded and unblended. The French have other ideas in their symphonic heads, apparently; the Conservatoire does not turn out Philadelphia Orchestras and doesn't want to.

Once you get used to it, the sound is compelling. Worth a careful try.

P.S. Vandernoot is Belgian, works in Paris.

Haydn: Cello Concerto in D.
Boccherini: Cello Concerto in B Flat. Maurice Gendron; Orch. des Concerts Lamoureux, Casals.
Epic BC 1152 stereo

This is an intriguing disc—and not merely because of the magic name of the conductor, Pablo Casals (who here conducts another cellist for the first time on records—maybe on record). The recording isn't "just another" version of two ultra-familiar cello repertory pieces. At long last, these are both performed in their original shape, rather than in the standard Nineteenth century "arrangements," in one case by the Belgian, Gevaert, in the other by one Grützmacher, that cellists and, indeed, orchestral conductors, have been using without a second thought for a half century or more. And an added minor fillip—it seems, too, at long last, that Haydn *did* write the Haydn concerto, not one Anton Kraft! (It

one, completed, though there are moments of impatience and moments of disappointment. Like the famous cello second theme in the "Unfinished," which is played with such restraint as to have virtually no color at all. That's Reiner, who seems to have a horror of any sentimental excess, just as Stokowski has a leaning towards it. Sometimes, as in the first movement of the Fifth here, Reiner starts pulling things along faster than they'll naturally go; but only for fleeting moments.

The rest is really excellent, of its style, lean, transparent, no-nonsense, the themes stated sparely but, every so often, with a life-saving nudge, a phrasing that shows the master conductor. The "Unfinished" is free of all over-heaviness, but it is not too fast, either. Except for those slighted second-theme cellos (the tune *has* been dragged in the muck too often—like "to be or not to be"), the music speaks eloquently and with intelligence of what it was meant to say. As for the Fifth, it is a spritely performance and never a bit rushed (except at the beginning), still a bit on the Mozartean side in contrast to the new-wave playings, which blow these early Schubert works up to Romantic intensity.

This is not exactly blazing Reiner, nor blazing Chicago. But there's plenty here that makes more-than-routine warhorse listening.

Bartok: Violin Concerto No. 1 (Op. Posth.) Viotti: Violin Concerto No. 22. Isaac Stern; Phila. Orch., Ormandy.
Columbia MS 6277 stereo

This is a newly uncovered early work of Bartok, previously known only in part as a section of the "Two Portraits", *Opus 5*. One of those love-affair mysteries: the lady kept the manuscript and it was played only after her death. This dates from 1907, only two years after the somewhat insipidly styled "Rhapsody", but it surely is bigger stuff and shows Bartok finding his own idiom and his true musical strength of expression, even though the influences of currently notable musicians are easy to hear—one gets large whiffs of Richard Strauss, even of Rachmaninoff. (Indeed, a complete Rachmaninoff theme is "quoted" here note for note, if I am right, many long years before Rachmaninoff thought of it.) It's an absorbing work and it gets an absorbing performance from Stern, with Ormandy in his always-best role, that of accompanist to a strong soloist.

You can forget about Viotti; it's one of those pleasant violinistic fillers. Had to put *something* on the second side.

Bach: Cantata #170 ("Vernugte Ruh' "); Arias from the Christmas Oratorio. Aafje Heynis; Netherlands Chamber Orch., Goldberg; Vienna Symphony, Gillesberger. **Epic BC 1146 stereo**

A notable record for its soloist, who has a peculiarly dark, mild contralto voice, sometimes scarcely audible but always rich and fervently musical. She is one of those quiet personalities who conquer by sheer musicianship, not via vocal pyrotechnics, and those who worshipped Kathleen Ferrier will find Heynis very much to their liking. Two orchestral accompaniments here, a different orchestra on each side.

Bach: The Musical Offering, arr. Jansen. Münchner Instrumental Ensemble.
Vox BWV 1079 stereo

At long last—a really beautiful realization of the cryptic "Musical Offering" to King Frederick the Great, submitted by Bach after he had improvised in person on the "King's theme" before the great musical ruler himself. (It got Bach nowhere, as usual, but as usual he produced his very best in an effort to please and be paid for pleasing.)

Bach specified actual instruments for only a small part of this music; the rest is technically "eye music" or rather, music to be realized on whatever instruments happen to be convenient. The "Art of the Fugue", an even greater essay in the same sort of wizardry, offers the same problem—how to play it.

Here, at last, somebody has had the bright idea of dispensing with "modernization" in favor of a group of conventional but carefully chosen instruments of the time—strings, plus flute, English horn and keyboard (harpsichord). And here too, at last, the very musical playing is beautifully tailored to the work, consistent with other Bach playing by today's standards, sounding like Bach in his other works when they are properly performed. You can enjoy the ricercari, canons inside-out, backwards, forewards and the rest, the canonical fugue, the Trio-Sonata (specifically for flute, violin, and continuo) without any trouble at all from beginning to end in this suavely lovely performance.

JAZZ AND ALL THAT

(*from page 59*)

Jimmy during the twenty-five years he spent as partner to Roosevelt Sykes in local clubs. Later he went on the road with blues bands, but injuries from an auto accident five years ago forced him to start supplying new lyrics for Muddy Waters, Little Walter and other singers. This LP consists entirely of his own material and avoids trite or overworked blues phrases. Like most writers who attempt to promote their own songs, Oden gives careful attention to each word. It may surprise some collectors to discover that a blues singer can be intelligible on the first hearing and sound authentic as well. Oden prefers working with an accompanist, and the performance would undoubtedly be more impassioned had Prestige drafted Sykes for the date. Robert Banks, a church organist who has filled such assignments before, sits in and follows along faithfully on the blues before breaking into superb gospel piano to commemorate Mother's Day. With a similar tribute from Mance Lipscomb arriving the same month, blues singers are doing right by mother at last.

Mance Lipscomb: Trouble In Mind
Reprise R2012
Reverend Gary Davis: A Little More Faith
Prestige/Bluesville BVLP1032

The millenium for blues collectors is at hand when two record companies join in outbidding a private label for the services of a retired sixty-seven-year-old Texas fieldhand. Mance Lipscomb's old age benefits come in the form of workman's compensation for a near fatal accident, and every extra bit helps. Mack McCormick, who also was instrumental in starting Lightnin' Hopkins on a new career, discovered the singer living on the Brazos River some seventy miles northwest of Houston, where this LP was skilfully recorded. The debut album went to Arhoolie, but Prestige was beaten out for the second by a contract from Frank Sinatra calling for two more collections this year. Whatever the amount involved, Mr. Sinatra will get his money's worth, as at least one number on the present program is priceless. The liner notes claim Lipscomb wept on hearing the playback of *Motherless Children*, an archaic church piece he wanted to dedicate to his mother, and it quite possibly has the same effect on Mr. Sinatra. Using a knife on his guitar frets to extract a plaintive blues cry, Lipscomb delivers an intimate and heartfelt sermon of lasting beauty. Other choice items are an instrumental buck dance, *When Death Comes Creeping In Your Room*, and the autobiographical *Captain, Captain*. McCormick can take credit for a find as fully important as Hopkins, who now appears to be safely tucked under Prestige's wing.

Rev. Gary Davis, the Harlem Street singer, offers a sheaf of religious songs, and slips into the role of preacher on the title piece. Among the dozen selections is another reading of *Motherless Children*, and collector's will enjoy comparing the two current versions. Some may even carry research so far as to pluck Blind Willie Johnson's original recording for Columbia off the shelf.

AUDIO TEASERS

(from page 50)

point. In the final analysis, it could be the unmarked terminal of the tweeter that should go to ground after all.

2. A tweeter or woofer, or possibly both, may have an unpleasant peak in the crossover area. By having the woofer and tweeter acoustically out of phase, this peak can be reduced. If the choice is between a peak or a hole in response, it is generally agreed that the hole is preferable from the listening viewpoint. Besides, the acoustic cancellation between woofer and tweeter is seldom so profound as to leave a very serious hole, particularly if there was a peak to start with.

If the objective, as is normally the case, is to phase two speakers for maximum output at their crossover frequency, it seems that one should not put too much reliance upon red dots. This applies especially to the home constructor, who may employ any one of a myriad woofer-tweeter combinations in any one of numerous cabinet designs. The safest thing is to make a listening test, wherein the crossover frequency is fed into the audio system and the polarity of one of the speakers is alternately reversed and restored by feeding the leads to this speaker through a double-pole double-throw reversing switch. Or one can check acoustic phase by instruments; one might employ microphones fed into a sensitive meter or oscilloscope; or one could use the RCA Phase Checker, which is quite valuable in this application.

H. B.

Feb. Q.2. The answer lies in the waveforms created by an organ. In general, organ tones are quite rich in harmonics, and any electronic system which seeks to duplicate the effect of an organ with oscillators must, therefore, duplicate the harmonic content of a typical organ signal. One way to do this is to include in the organ circuit a device which, due to its nonlinearity either *creates or accentuates harmonics.*

When our audioman connected the organ speaker to his high fidelity equipment he quite naturally observed a substantial amount of intermodulation since the speaker was "crumby," a term that merely indicates that the motion of the cone is nonlinear with respect to speaker input. When he attempted the second part of his experiment and connected a good speaker to the organ the only harmonics he could possibly hear were those generated within the organ's electronics, since his good speaker did have a linear motion vs. voice-coil current characteristic. Now, intermodulation in loudspeakers is invariably accompanied by harmonic distortion (creation of harmonics that did not previously exist) so the "poor" loudspeaker, when connected to the organ, acts as an harmonic augmenter and makes the organ sound better. The manufacturer of the organ is to be congratulated for having found an inexpensive way in which to create the lifelike organ tones he desired.

J. L. B.

CLASSIFIED

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Industry Notes . . .

• **Kodak Enters Magnetic Tape Field.** Introduction of Kodak Sound Recording Tape marks the company's entrance into the audio tape field. The initial offering is ¼-in. tape in 1200- and 1800-foot lengths on 7-in. reels. It comes in 1½-mil and 1-mil thicknesses. It will be available from dealers selling Kodak photographic products.

• **Altec Names Two Vice Presidents.** Altec Lansing Corporation, a subsidiary of Ling-Temco-Vought, Inc. has announced the appointment of two new vice presidents in the fields of marketing and finance. **Mr. H. S. Morris,** formerly Altec's Marketing Director has been named Vice President of Marketing and **Mr. C. R. Rinisland,** the Corporation's Controller, has been appointed to the post of Vice President-Finance. Both men rose through the ranks of the Altec organization to their present position.

• **Russ Molloy Joins Orr Enterprises.** Russ **Molloy** has joined **J. Herbert Orr Enterprises, Inc.** as Marketing Manager for the Orr-Tronic Products Division. In his new position, Mr. Molloy will prepare and direct the complete marketing program for the Orr-Tronic Products Division. This will include both equipment and program material for the commercial and consumer market.

• **TEC ups Hasslar. Donald E. Hasslar,** Sales Manager of Transis-Tronics, Inc. has been promoted to sales and Marketing Manager with complete responsibility for advertising, sales promotion, public relations and sales management according to President, **Bernard D. Cirlin.** Hasslar formerly was Sales Manager of Special Products for Capitol Records Distributing Corp. of Hollywood.

• **New Sales Manager for Bel Canto. Mr. E. Herbert Mayer** has been appointed Sales Manager according to **J. A. O'Hara,** Marketing Manager of Bel Canto Recording. Before joining Bel Canto, Mr. Mayer held a key marketing position at Columbia Recording and handled that company's line of tapes.

• **Sherwood Appoints Asst. Sales Manager.** The new position of Assistant Sales Manager for Sherwood Electronic Laboratories has been filled by **Don Jacobson.** Prior to his appointment Mr. Jacobson was Customer Service Manager. **Harold Wiemerslage** has been named to succeed Mr. Jacobson as Customer Service Manager.

ADVERTISING INDEX

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