

AUDIO

ANNUAL PRODUCT REVIEW

AUGUST, 1961
50¢

...the original magazine about high fidelity!



Announcing

NOVAR

FOR HIGH-FIDELITY
AUDIO OUTPUT



NEW RCA-7868 NOVAR POWER PENTODE OFFERS OUTSTANDING DESIGN ADVANTAGES

With this new tube RCA brings all the advantages of novar design to high-fidelity circuitry.

RCA-7868 is a high-perveance 9-pin novar power pentode for output stages of hi-fi audio amplifiers, phonographs and radio receivers. You'll get up to 44 watts of power output from a pair of them in Class AB₁ push-pull service in audio amplifiers.

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Wider spacing between pins (0.172")—to minimize the possibility of voltage breakdown; hence greater reliability.

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FM
STEREO
MULTIPLEX
RECEIVER



the S-8000
64 watts \$299⁵⁰

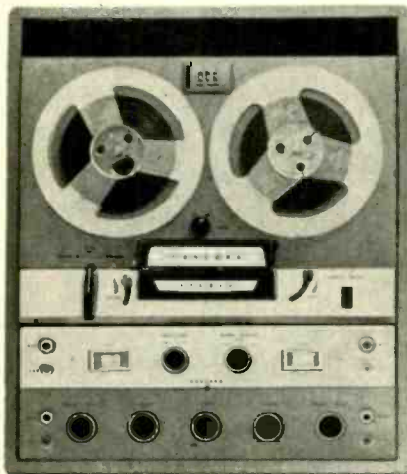
only for those
who want the ultimate...



At last, Stereo Multiplex is here... and, once again, Sherwood is first... ready immediately with a brilliant combination of Sherwood's "high rated" FM tuner design plus all circuitry necessary to receive the new FCC-approved FM multiplex stereo... two 32-watt amplifiers, two phono/tape pre-amplifiers and all controls necessary for playing records, tape or TV. The S-8000 Receiver needs only the addition of speakers to complete a basic system for FM stereo listening enjoyment. Overall size, just 16 x 4 x 14 inches deep. Sherwood's dramatic Correlaire Furniture Modules are the perfect setting for your Sherwood hi fi components. Choose from sixteen interchangeable modules, styled with a contemporary flair in hand-rubbed Walnut and Pecan woods. Have truly flexible room arrangements. A beautiful four-color brochure is yours for the asking. Sherwood Electronic Laboratories, Inc., 4300 N. California Ave., Chicago 18, Illinois.

For Complete Technical Details Write Dept. 8A

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Record stereo... play stereo... with the new Concord model 401

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The Concord 401 stereo tape recorder offers superb sound quality in an advanced design precision instrument. The 401 contains both stereo record and playback pre-amplifiers. Records stereo anywhere, plays through any high fidelity system.

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Dept. A-8, 809 N. Cahuenga Blvd., L. A. 38, Cal.

AUDIOclinic



JOSEPH GIOVANELLI*

Dear Reader—

I really must congratulate you. You have been very good about enclosing stamped, self-addressed envelopes with your letters. This helps me to get answers back to you in the shortest possible time. You see, I answer all letters, even when your question is used in "Audioclinic." If I did not follow this procedure, some of you would wait a long time for your answers because of the delay between the receipt of a letter and the publication date of the material in that letter.

I note, too, an increasing interest in my other column, "Audio Techniques." I have quite a number of suggestions and they will make interesting reading, I believe. Newcomers to AUDIO probably don't know about this feature which appears intermittently. The purpose of "Audio Techniques" is to allow readers who have found short-cuts in building electronic equipment, have developed unusual test procedures, or ideas which can make experimentation with electronics a little easier, can share their ideas with other readers. Send any such information to me at the address shown; many others will profit from your knowledge. J. G.

Ignition Noise Reduction

Q. I use an AM-FM tuner. I live on a busy street and I get a lot of ignition noise when listening to FM. The station I listen to is about 90 miles away. I use a TV antenna, a yagi with a rotor, which I direct towards the station. Is there any modification I can make in the tuner to stop ignition noise? If I use 72-ohm coaxial lead-in, how can I make an impedance match to the 300-ohm balanced input on my tuner? William T. Cramer, Stockton, California.

A. There is no internal modification which can help the tuner to reduce the noise output when the signals are too weak to saturate the limiters.

However, there are external changes which may help. You can add an FM booster to increase the strength of the desired signal, giving it a better chance to saturate the limiters. You could try using 300-ohm shielded twin lead. This cable has properties somewhat like those of the 72-ohm coaxial line you mentioned.

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

with the added advantage that the cable is still balanced.

If you prefer the 72-ohm line, you must use a matching transformer at the antenna and another one at the receiver in order that the required 300-ohm impedance will be met at both places. (Such transformers are available from your local parts jobber.)

Moving the antenna as far from the street as possible will sometimes reduce ignition noise in the tuner.

It may even be necessary to use an antenna cut exactly to the frequency you most wish to hear in order to obtain maximum gain at this dial setting.

R. F. Interference in Home Music Systems

Q. I have constructed an integrated stereo amplifier-preamplifier. I am experiencing some trouble, however, in that, with the amplifier operating, I get an interfering station in the background. Am I correct in assuming that I have a ground loop or a tuned circuit somewhere in the hookup? The interference exists with no input to, or after, the preamplifier stage. By switching to only one preamplifier and feeding through both amplifiers, I still get it. My question is how shall I trace this down and eliminate the trouble? William H. Ross, Dearborn, Michigan.

A. This question is really one which deserves an entire article. All I can do here is to point out some of the places which are likely to cause interference and you will have to do your best to trace the particular cause associated with your equipment.

Oxidation is a major cause of interference. Such oxidation can occur in switch contacts, tube socket contacts, and poor soldering connections. These latter troubles are especially common in ground leads. Oxidation can also occur at the contacts of the input connections. Use contact cleaner on switches and tube sockets, and check all solder connections.

Some interference can come directly into the heater string and be coupled into unbypassed cathodes. This string, in turn gets its signal from the power line via the power transformer. Bypass the heaters to ground with 0.01- μ f capacitors. (Any capacitors associated with interference elimination should be of either mica or

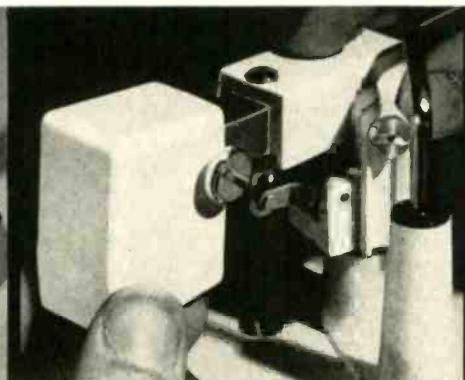
Here very simply is why
 Garrard's LABORATORY SERIES Type A
 Automatic Turntable
 has become America's
 number one record player
 in only nine months



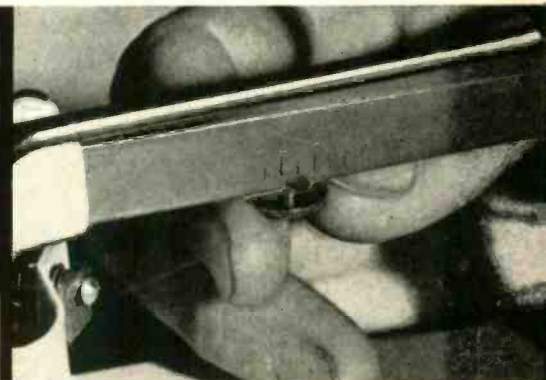
Garrard has combined a dynamically balanced tone arm; a heavy, full-size turntable; a laboratory-balanced precision motor... plus the convenience of the world's finest automatic record-changer (to use when you desire). Each is a precision device comparable to professional equipment of the kind which, up to now, you would have had to buy separately.



Garrard's Type A Automatic Turntable gives you a true dynamically-balanced tone arm, with the extremely important, heavy adjustable counterweight.



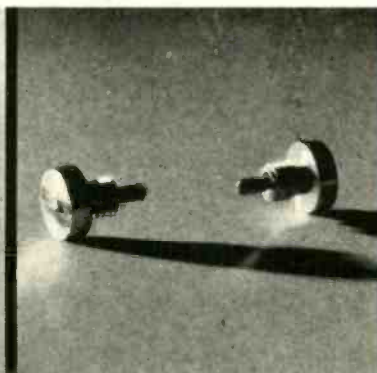
Thus, to adjust the stylus tracking force, you simply move the counterweight until the arm is in perfect balance, at zero pressure.



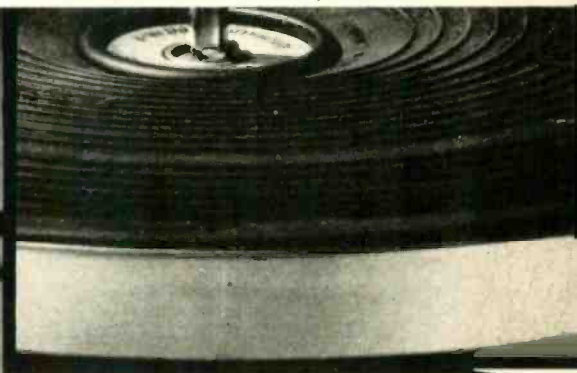
Then, the scale built into the arm enables you to set the lightest tracking force prescribed for any cartridge, even those labelled "professional."



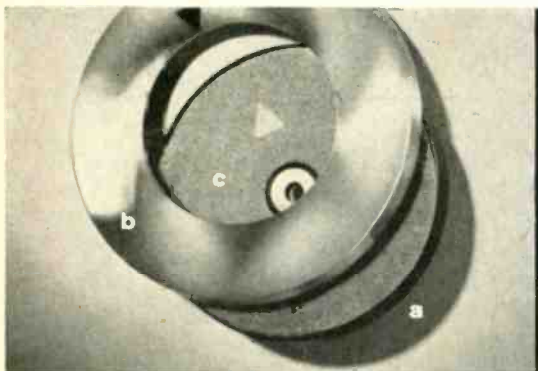
Once balanced and set, the Type A tone arm will track perfectly each side of the stereo groove, even if the record player is intentionally tilted or the record warped.



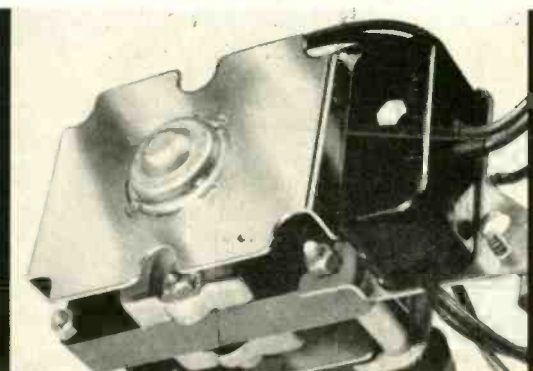
Perfect performance also requires minimum swing friction... guaranteed by the pair of needle pivots holding the arm.



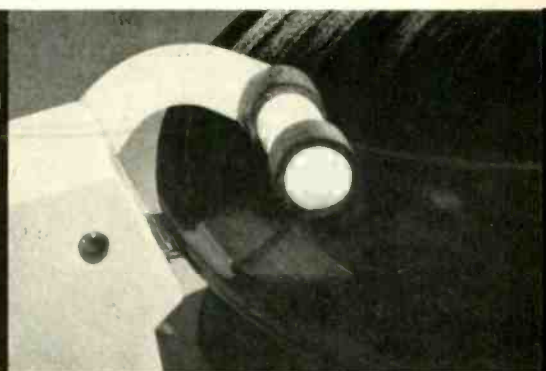
Another important feature is Type A's non-magnetic turntable... heavy-cast, full-sized, and balanced. Weight: 6 lbs.



Turntable is an exclusive sandwich design, (a) drive turntable inside; (b) heavy, polished, cast metal turntable outside and (c) a resilient foam barrier between.



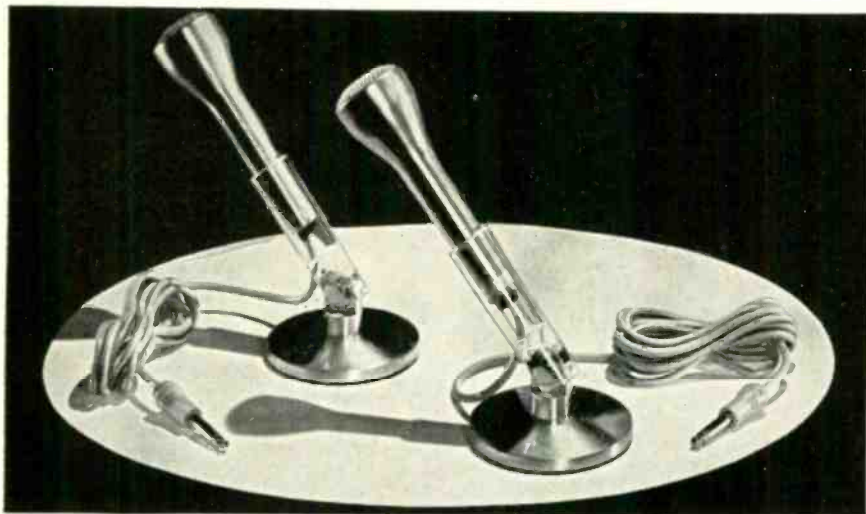
Driving heart of the Type A is Garrard's Laboratory Series motor with top and bottom shielded by specially designed plates, eliminating any possibility of magnetic hum.



Garrard's exclusive pusher platform record changer mechanism is foolproof... gives the Type A the tremendous convenience of automatic play.

An extravagant concept, yes... but the price of the Garrard Type A Automatic Turntable is exceedingly modest... only \$79.50. For literature, write Dept. GK11, Garrard Sales Corp., Port Washington, New York.

Garrard
 world's finest



"MATCHED TWIN" CERAMIC MIKES... for superior stereo recording!

Now you can capture live stereo sound at its natural best... with Sonotone's new, improved "Matched Twin" ceramic microphones. These superlative new matched mikes... Model "CM-T10A"... were designed to give you the greatest possible clarity in your stereo recording.

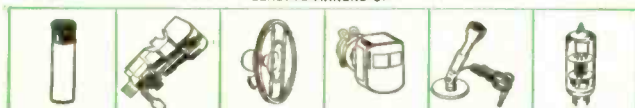
Here's how. Each mike in a "Matched Twin" set has a rugged, rubber-encased ceramic transducer that's immune to temperature and humidity extremes; plus a lifetime damping grid. Every "CM-T10A" pair is acoustically matched at the factory to a tolerance of ± 2 decibels. Jacked into any stereo recorder, they feed flat 50 to 11,000 cycles signal at professional quality output level of -56 decibels. Sonotone's "Matched Twins" are easy to handle, too.

For stereo sound at its natural best, buy "Matched Twin" mikes by Sonotone. Unequaled for performance... and for true stereo enjoyment. (For even greater sensitivity, buy Sonotone's matched twins—CM-T11A—with frequency range of 80-9,000 cycles and an increased sensitivity of -53 decibels.) Both models retail at \$35.50 per matched pair. Matching Table Stand: \$4.00 each.

Sonotone[®] CORP.

ELECTRONIC APPLICATIONS DIVISION, ELMSFORD, N. Y., DEPT. P26-81.
IN CANADA, CONTACT ATLAS RADIO CORP., LTD., TORONTO

LEADING MAKERS OF



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ceramic construction because such units are not inductive at radio frequencies.) If both sides of the heater string are above ground, each side must be bypassed to the chassis. Chokes of about 10 turns can be wound on high-value 2-watt resistors, and these chokes can be placed in series with the offending leads.

Some manufacturers omit the use of line bypass capacitors in their equipment in order to eliminate shock to the user if he should inadvertently come into contact with the chassis of this equipment and a ground, or with another chassis. Use the bypass capacitors even though the possibility of shock is then likely. Such shocks are not dangerous and may be avoided if connections are made or broken with the a.c. line cord removed from the socket.

In addition to bypassing, interference filters are often of help. Be sure that the filter you use is a good one. I have seen some which are nothing more than straight-through connections between input and output, with some plaster-of-Paris as weight. (This latter attribute is the only useful thing about such filters, for they are then useful paperweights.) There are two types of interference filters. One is the brute-force type and one is the tunable type. This latter is to be preferred if its tuning range includes the frequency of the interfering station.

Connect the equipment to a good ground—radiator or water pipe. This may help, but it may also increase the interference. This is the case when there is oxidation present at joints of the piping.

One method of determining the source of the interference is to short out successive grids starting from the input of the preamplifier stage and working right up to the output. During this process you may find one which, when shorted, eliminates some of the trouble, but also leaves some residual unwanted signal. This will indicate that the interference is coming in to at least two grids. If there is any direct coupling between stages, short this circuitry by means of a large capacitor, but remember that this capacitor must be mica or ceramic. (This is necessary in order to prevent B-plus from being shorted out, possibly damaging the amplifier.)

After the offending stage(s) has been discovered, try a bit of shielding if none is employed in this circuitry. Shorten up on the leads from the coupling capacitor as much as possible. If the foregoing is unsuccessful, you will have to get somewhat fancier.

What is the impedance of the offending stage (input impedance)? Let us say that it is a quarter meg. Choose a grid bypass capacitor whose reactance at 50,000 or 100,000 cps is also equal to a quarter megohm. If its use still does not help you, or at any rate not enough help, put an inductance in series with the offending lead which is equal to a quarter megohm at 50,000 or 100,000 cps. If this too does not work, then resort to series tuned circuits across the grid load and/or parallel tuned circuits in series with the grid circuit. (The tuning of these circuits will depend upon the frequency of the interfering

(Continued on page 102)

two problem-solvers from AKG:



for multiplex...

AKG D 88 Duplex Dynamic Cardioid Microphone, for stereo announce and control-room use, puts the voice square in the middle of the two channels. Two matched dynamic systems in a single housing deliver equal inputs to both circuits (X-Y) with very smooth response, making D 88 the only single answer for economical, quality multiplex announcing. D 88/200 (for 200-Ohm inputs) only \$46.50!



for quality remotes...

AKG C 60 Miniature Condenser Microphone, with light-weight DC Power Pack and capsules for omni and cardioid modes.

If you've always wanted condenser quality in the field, but have been discouraged by its cost and the inconvenience of AC power supply — those days are over!

C 60 breaks the price barrier, cuts loose from AC cables, and in performance equals mikes costing far more. Capsules for omni (CK 26) and cardioid (CK 28) are instantly interchangeable — response is smooth from 20 to 30,000 cycles — special head circuitry gives freedom from blasting, even with close-mike overloads at high levels.

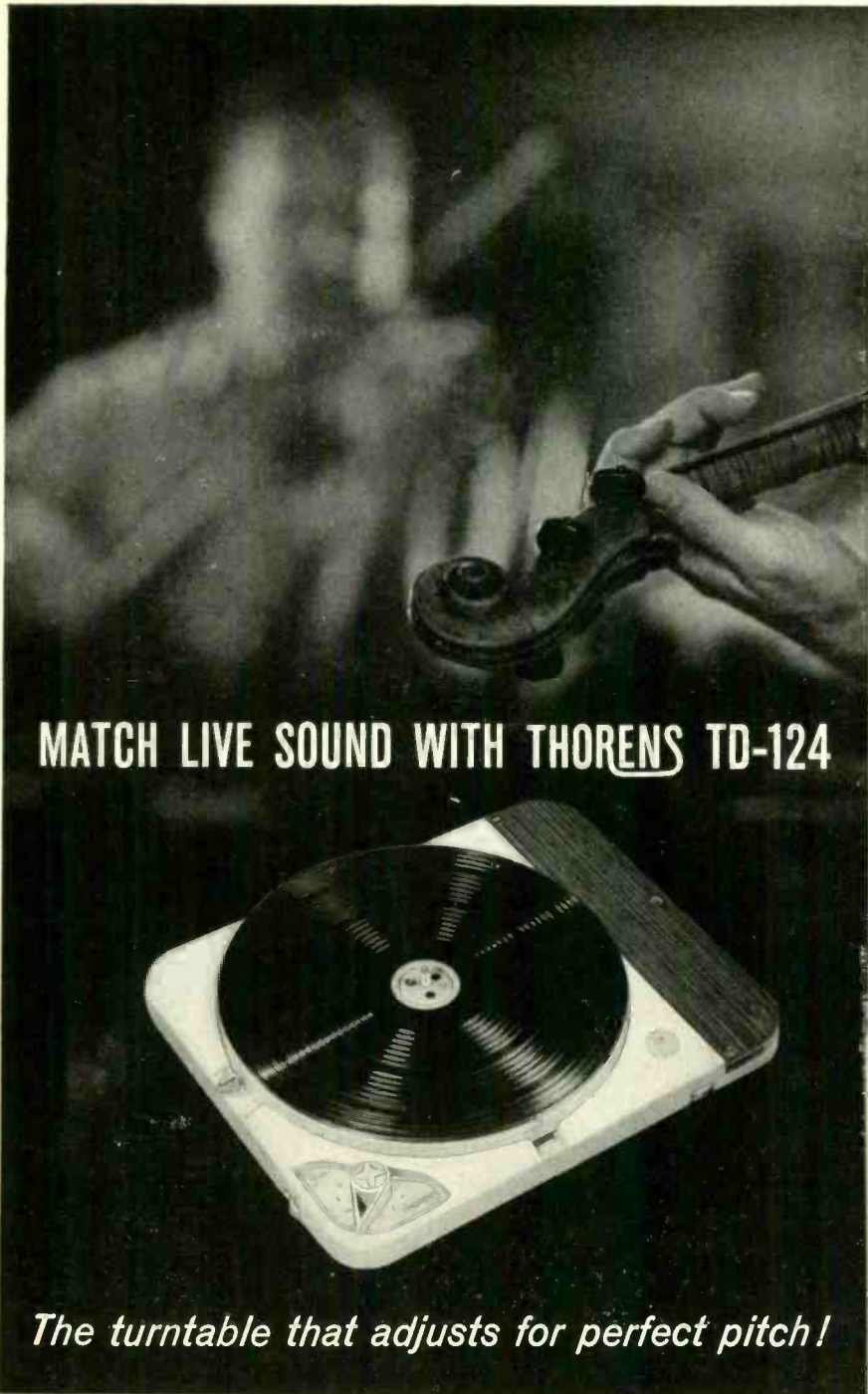
B 60 DC transistorized Power Pack weighs a pound, serves many hours on a single recharge. Alternately, N 60 EA AC Power Supply is for indoor use.

Price? C 60 with either capsule, plus B 60 or N 60 EA Power Supply, with necessary cables — only \$259.50.

For added versatility: effective windscreen W 60 — long-arm fishpole FP3 — resilient suspension hanger H 60 — and shoulder strap for Power Pack in remote pickups. For indoor use: rack-mounting AC Power Supply N 60 R4 for close-mike techniques, economically powers four C 60's from a single panel with outputs High Unbalanced, plus Balanced 600, 200, and 50 Ohms.

A-B test a C 60 in omni or cardioid mode against any other mike at any price at your AKG Dealer — and you'll want several! For further information, write USA import and service agents: Electronic Applications, Inc., Stamford, Connecticut/(203) DA 5-1574.





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The turntable that adjusts for perfect pitch!

Thorens compensates for variations in house current and recording systems; gives the truest reproduction with all your records, old or new. Adjustment is so fine that records can be used to accompany *live* vocal and instrumental performances. Swiss precision engineering ensures longer record life, performance to match the finest components you will ever own. See your Thorens dealer soon for expert attention and high fidelity service.

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LETTERS

Unhappy Recordist

SIR:

Here is your card for the tape survey. Yet you do not have any space to ask why I do not buy more recorded tapes, assuming I have two \$500 "tape recorders."

The reason is that it is too much nuisance to turn the tape over at the end of a short reel. Years ago I had a recorder that reversed automatically with a piece of tin-foil on the tape.

There is no reason why in this advanced age of tape machines we cannot have what was had ten years ago. Let's have a tape player that plays the tape one way, then reverses and plays it the other way with another head, and when this is done, let it shut itself off.

Manufacturers keep trying to sell tape recorders, never realizing that we may have one already and there is nothing to record anyway.

KEITH LA BAR,
179 N. Martel Ave.,
Los Angeles 36, California

(There is at least one machine on the market which will play both directions automatically. Probably the reason there are not more of them is that enough people do not think it important. We agree with you, however. As to having nothing to record, though, we cannot agree. ED

Center Fill and Phasing

SIR:

I have been reading and enjoying AUDIO regularly, but mutely, for the past twelve years. I can no longer hold my silence.

E. A. Snape III composed an interesting and informative article about loudspeaker phasing, but he omitted two points that I feel belong in any such piece.

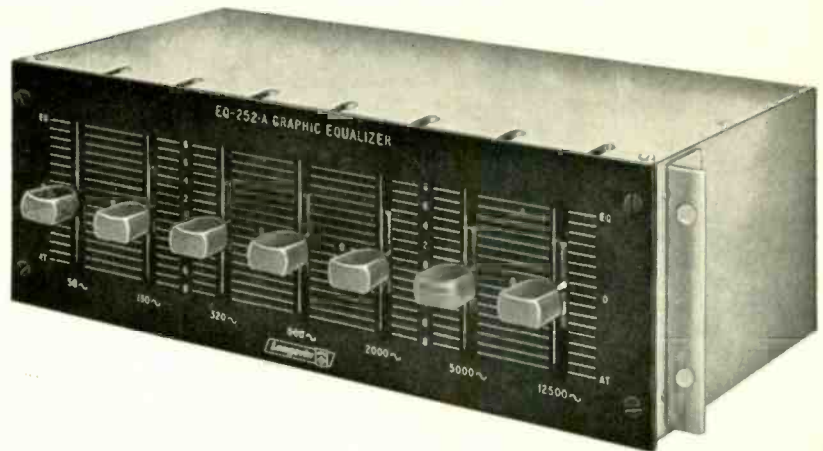
First, stereo "localization," or "center fill," or "the curtain of sound," or whatever we choose to call it, is not the only thing affected by misphasing. Regardless of the number of microphones used in recording, and the resulting upper-range distortions resulting from multimultimiking, low frequencies are generally in phase on stereo discs. If they weren't, the vertical modulations for deep, heavy bass tones would be too much for many pickups to cope with, and might even dig through the disc's lacquer surface (on the original master) into its metal base. So, while the upper ranges may not appear to be significantly affected by misphasing, cancellation of low-bass response is noticeable when playback speakers are out of phase.

Secondly, listening for center fill-in (or bass response) is, as Mr. Snape points out, a perfectly legitimate way of phasing speakers, but there is a much simpler and surer phasing check that can be used for any speakers that are small enough to move. Simply shove the speakers face to face, as close together as possible, play a mono recording through both channels (with their levels balanced), and disconnect one wire from either speaker. If they are in phase, disconnecting the wire will cause a slight reduction in the volume of sound coming from between the speakers. If they are out of phase, though, the speakers will be cancelling each other's output quite effectively, so disconnecting one will cause a pronounced increase in their combined sound output. If volume increases when one speaker is disconnected, reverse the connections to it; otherwise, just restore the disconnected lead.

J. GORDON HOLT,
Golf View & Rose Valley Rds.
Wallingford, Pa.

Langevin

MODEL EQ-252-A GRAPHIC EQUALIZER



7 POSITIONS FOR ULTIMATE CONTROL OF SPECTRAL QUALITY IN RECORDING, TV-BROADCAST AND MOTION PICTURES

FEATURES

- 7 Selected Positions of Variable Hi-Lo Equalization and Attenuation.
- Gold plated, Noise-free, Switching through ± 8 db in 1 db steps during active use.
- Hum-free performance through toroid coils from -70 to $+24$ dbm.
- No tubes or power required—all passive Bridge T circuits in one integrated unit.
- Small size: $3\frac{1}{2}$ " x $10\frac{1}{2}$ " x $5\frac{3}{4}$ " deep.

The Langevin Model EQ-252-A Graphic Equalizer fulfills the critical need for multiple control at the subjectively important points of the audio range. It employs miniaturized, military quality, gold plated, etched circuitry in each of the 7 plug-in filter units, resulting in a passive assembly requiring no tubes or power supplies. Only input and output connections are required. Sliding Levers permit 8 db of equalization and 8 db of attenuation in 1 db steps at 50, 130, 320, 800, 2000, 5000 and 12,500 cps during the program through noise-free gold-plated switching. Modern controls give quiet operation at -70 up to $+24$ dbm.

Filter assemblies use sealed toroid coils for hum-free operation. Careful design delivers $\pm \frac{1}{2}$ db accuracy. Overlap from one filter to the next gives combined flat output when levers are in a straight line in any equalized or attenuated position (see curves). Special frequencies are available to order; overlap may or may not provide combined flat output between adjacent positions as the standard frequencies shown have been calculated for this effect. In zero position each or all filters are flat (resistive only, 16 db loss) from input to output. Because all passive circuitry is used there is no distortion when operated up to plus 24 dbm. Impedance is 600 ohms in and out; for other impedances use Langevin line to line transformers, Model TF-602-C. The model EQ-252-A is limited to 600 ohms impedance for the reason that lower impedances would double the size of the equalizer components every time the impedance is halved.

SPECIFICATIONS

Circuit: Bridged T; Impedance: 600/600 ohms; Insertion Loss: 16 db; Operating Level: -70 to $+24$ dbm; Positions: 7, with 8 db of equalization and 8 db of attenuation at 50, 130, 320, 800, 2000, 5000 and 12,500 cps in 1 db steps; Distortion: none; Coils: Sealed toroids; Power Requirements: none; Response: See curves; Panel Finish: Black, satin finish, non-halation, anodized aluminum; Terminals: solder type, turret; Filter Sections: 7 plug-in, printed circuit type; Size: $3\frac{1}{2}$ " high by $10\frac{1}{2}$ " long by $5\frac{3}{4}$ " deep overall.

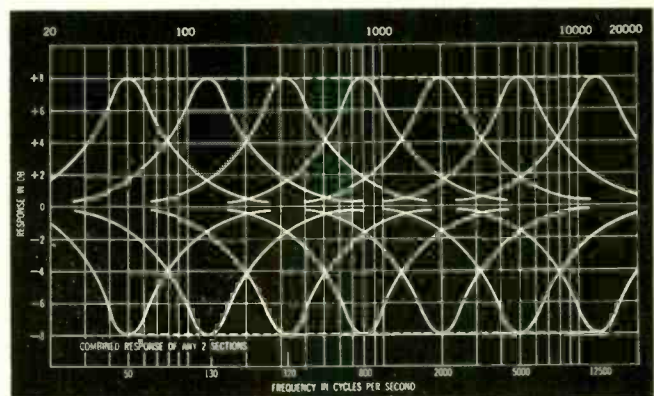
ORDERING INFORMATION

Model EQ-252-A Graphic Equalizer equipped with red knobs, complete with mounting hardware and instructions. Weight, net 9 lbs.; 14 lbs. shipping. Price, Net \$475.00.

Recommended Accessories

When lower impedances than 600 ohms are required, use the following matching coils in and out:

Model TF-602-C Line to Line Transformer, Weight, Net, $2\frac{3}{4}$ lbs.; $3\frac{1}{2}$ lbs. shipping. Price, Net, \$25.50.



"Over thirty-five years of audio progress"

Langevin 

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FREE Write Today! \$1.00 Value—84 Page Professional Audio Equipment Catalogue covering Low-Level Amplifiers, Limiters, Power Amplifiers, Variable and Fixed Equalizers, High and Low Pass Filters, VU Meters and Panels, Plugs, Patchcords, Jacks and Jackstrips, Telephone Keys, Transformers, Precision Instrument Switches and complete line of new Langevin Attenuators, Pan-Pots, Straight Line and Rotary Mixers, VU Range Extenders and many others.


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Light LISTENing



CHESTER SANTON*

The symbol  indicates the United Stereo Tapes 4-track 7 1/2 ips tape number.

Bernie Green: Futura

RCA Victor LSA 2376

This release in the "Stereo Action" series is more venturesome than the earlier RCA examples of sound in motion. The first recordings in this group simply shoved around the solo instruments by electronic means while the orchestra ran through fairly conventional arrangements of standard popular songs. In "Futura," we are invited to probe deeper into the recesses of the scientific mind bent on clobbering the competition with a new gimmick. The device introduced for this purpose is something called a "Tonalyzer." A musical tone, when piped through this contraption, can be made to scamper up or down the scale in a pleasingly skittish fashion. The tones are broken into fragments and deflected in an upward or downward direction in much the same manner that a stream of water from a garden hose might be scattered by a sudden gust of air.

The other idea set forth is more an example of almost inhuman patience in tape splicing than it is an example of entertainment value. 778 splices were required in the solo track made by trumpeter Tony Greenwald in order to give each note a different location throughout the listening area covered by a stereo speaker array. If a dozen splices seem like a lot of work in one of your own reels, just the thought of the patient drudgery that went into this one selection may dampen some of your listening spirits. Bernie Green, who first established a national reputation as a novelty arranger on the weekly Henry Morgan radio show in the late Forties, favors liberal use of vibes and electric guitars in his scoring.

The Happiest Girl in the World (Original Broadway Cast) Columbia KOS 2050

Periodically, Broadway turns to the music of past generations for inspiration or, as in this case, downright confiscation. Where would "Song of Norway" be without the prior efforts of Edvard Grieg? Or "Kismet" without the compositions of Borodin? Some theatre buffs claim that a borrowed score is not always an unmixed blessing. In some instances it can be a source of distraction during the action on stage. The listener familiar with the output of a man like Borodin or Grieg may follow the above shows with only one ear while trying to recall the name of an original selection. The "Happiest Girl in the World" is based on the music of Jacques Offenbach. In this case, the conversion to modern theatrical fare is easier because Offenbach wrote shows of this type in Paris during the late 19th Century. Since his operettas were a sellout, the main task facing the producers of "Happiest Girl" was the selection of a lyricist who could provide the crisp and smart verses the music de-

erves. E. Y. Harburg was a happy choice. With a long list of credits that includes such shows as "Life Begins at 8:40," "Bloomer Girl," "Flinian's Rainbow," and "Jamaica"—not to mention great films such as "Cabin in the Sky" and "The Wizard of Oz"—Harburg has turned out lyrics for "Happiest Girl" with just the right kind of rakish air. Of course the star and director of the show, Cyril Ritchard, deserves most of the credit for the zany archness with which the show treats a tale based on Aristophanes' comedy. *Lysistrata*. Ritchard has one trait that comes in handy here. No other musical comedy star of the moment can deliver a brittle witticism with such an appearance of surprise improvisation. Since this is a spoof of one of the juiciest morsels in Greek mythology, Ritchard had a field day in the recording studio. Another advantage enjoyed by this show is the fact that Cyril Ritchard produced and starred in Offenbach's "La Perichole" and "Tales of Hoffman" at the Metropolitan Opera House. As for the music itself, perhaps the major surprise for the uninitiated will come in the first appearance of a tune we now know as the Marine's Hymn *From the Halls of Montezuma*. Not many show fans are aware of the fact that this melody first saw the light of day in Offenbach's "Grand Duchess of Gerolstein." Assisting Ritchard are Janice Rule, Dran Seitz and Bruce Yarnell. They negotiate with dexterity the tricky rhythms we usually hear in orchestral garb. The familiar *Barcarolle* is only one of several melodies now pressed into service as ballads but the patter songs, delivered with a well-nimed leer by Ritchard, are the highlight of the show. Columbia's sound, in a tradition that dates back to the first smash show albums on LP, is as clear as the air on Mount Olympus used to be.

Donnybrook (Original Broadway Cast)

Kapp KDL 8500

Toward the close of a Broadway season that has seen only a handful of shows displaying a profit, two musicals have perked up the customers. There are "Carnival," the top hit so far, and "Donnybrook," a late entry on the Kapp label. It is coincidence that this recent production, like "Carnival," is based on a successful motion picture? In this case the movie was "The Quiet Man," with John Wayne, Maureen O'Hara and Barry Fitzgerald. The original story was the work of the novelist and *Saturday Evening Post* writer, Maurice Walsh. The music written for the film by Victor Young was released some time ago by Decca Records and is still listed in the LP catalog. Young's treatment of this beguiling Irish story followed the standard Hollywood pattern—quaint and subdued themes for background color. It wouldn't be too difficult to guess how Broadway might have translated this story into musical terms a generation ago. As it emerges now in the music and lyrics of Johnny Burke, "Donnybrook" displays a gratifying absence of cliché. The whimsy is there but it isn't strained to the bursting point. For example, this recording has only one tune for a typical Irish tenor and it has no great importance in the plot. The sly and gentle humor of Eddie Foy is the al-

bum's outstanding attraction. A survivor of a famous song and dance family in the days of vaudeville, Foy makes no attempt to emulate Barry Fitzgerald in the role of a County Kerry marriage-broker. He does, however, manage to raise meddling in other people's affairs to a fine and thoroughly ingratiating art. His two main songs are great. *Wisha Wisha* finds him and fellow conspirators deeply entangled in efforts to bring about the marriage of the native colleen and the retired prize-fighter who has returned to his homeland after many years in America. *Delightful is the Word* carries a reluctant Foy over the brink into a duet of commitment with the town's wealthy widow, played with solvent independence by Susan Johnson. Miss Johnson and Art Lund, the play's Americanized hero, had prominent parts in the original cast recording of Frank Loesser's "Most Happy Fella." Seasoned record collectors may recall the days when Lund sang with Benny Goodman's orchestra. Joan Fagan, in the heroine's role, has the pleasant assignment of delivering the show's best ballad, *He Makes Me Feel I'm Lovely*. "Donnybrook" would seem to be the closest Broadway can come these days to the tradition of shows like "Brigadoon."

Frank Sinatra: Ring-a-ding ding

Reprise R 1001

Sinatra makes his first appearance here on the label he has recently organized. It may be the miking or the studio but there is a raw hard drive in his work and that of the accompanying orchestra conducted by Johnny Mandel. Sinatra's latest approach also makes heavy use of the talents of noted West Coast sidemen. Prominent in the band's lineup are Don Fagerquist, Bill Miller, Frank Rosolino, and Bud Shank. The album represents quite a departure from the glossy carefully constructed arrangements one formerly found in Sinatra releases. I haven't heard the stereo version but the audio quality in mono does not come out up to the standard of smoothness that FS was able to take for granted in his Capitol releases.

King Curtis: Azure

Everest SDBR 1121

Everest has elected to spotlight a tenor sax in this background album that runs to a deep shade of blue. In stereo of exceptional impact, the robust tone of the King Curtis instrument takes up much of the stage. A pleasant background of strings in settings by Samuel Lowe blends easily with the soloist and the Malcolm Dodd Singers. Voices are used rather sparingly. Everyone other than Curtis is kept in a subordinate role in order to point up the soaring line of the sax. The featured artist melts down to a state of blues such relatively innocuous pieces as *Close Your Eyes, Sweet and Lovely*, and *Nearness of You*. As transferred directly to disc from 35mm magnetic film master, this is one of the few mood releases to offer sturdy sound.

Roger Wagner Chorale: A Song at Twilight
Capitol SP 8543

Several choirs have recorded the campfire favorites included in this relaxing release. Roger Wagner has wisely decided that there should be no room for self-conscious virtuosity in the treatment of these perennials. They're all here—*Love's Old Sweet Song*, *In the Gloaming*, *Flow Gently Sweet Aston*, etc. A light touch of harp and the occasional purr of an accordion are the only instrumental sounds to break the placid surface of the vocal line stretching from speaker to speaker. Add to the performance a miking job of comparable restraint and you have a pleasant antidote for today's hurried pace.

Bobby Montez: Viva!

World Pacific S 1404

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
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entire process was still in a primitive state. That was the period when most of us were debating how far to plunge in the cost of a second channel and making our decisions on the basis of the stereo sound then available on the best of the two-track tapes. By the time the moving-magnet pickups came along, stereo discs began to show some promise—particularly in the jazz and pop field where the groove was coping with only a small group of instruments. World Pacific is one label of that period that deserves credit today for some of the very first clean, wide-range stereo discs.


The latest releases from the West Coast prove that World Pacific still clings to a front position. As Bobby Montez and his quintet of Latin instrumentalists whisk through their streamlined interpretations of Mambo and Cha-Cha, any decent system will reveal some very interesting audio features. The Montez vibes have none of the thick, tubby sound generally associated with the instrument in normal recordings. Even more impressive on a top-notch system is the definition of Ray Rivera's conga drums and the timbales of Mike Gutierrez. It's no great trick to maintain the individual identity of these instruments when they're situated at the outer edges of the stereo layout. Only an extremely good stereo disc can bring out this sort of definition when the two instruments are almost side by side in the studio. The occasional vocal accompaniment is more concerned with release of the group's good spirits than it is with the presentation of understandable lyrics. If a suggestion is in order now that most of the problems of the stereo disc have been worked out, this is a record that could be kept on hand to check separation even if you're not interested in Latin music.

Doris Day: Bright and Shiny

Columbia  CQ 377

Always a resolute source of good cheer on records, Doris Day has enough extra impact on tape to warrant a word of caution. There may, after all, be days when you are not in the mood for all the concentrated happiness Miss Day radiates in front of stereo mikes. Perhaps the first and last tunes in this collection illustrate this point to best advantage. Imagine the reaction of a real grumpy shopper-for-tapes when he checks a list of tunes that starts with *Bright and Shiny* and ends with something called *Twinkle and Shine*. Luckily, the rest of the lineup offers some favorites with more reassuring titles—*Singin' in the Rain*, *On the Sunny Side of the Street* and *I Want to Be Happy*. Neal Hefti is in charge of a small and indeterminate orchestra that is kept pretty much in the background. Listeners who have associated Hefti only with the bands of Woody Herman and Count Basie may be puzzled by the use of an electric organ in the arrangement of *Keep Smilin'*—until they realize that exceedingly few Doris Day recordings are purchased on the basis of their accompaniment.

Benny Goodman Swings Again

Columbia  CQ 359

The sound in this recording was no better than average when it first came out in disc form. Tape shows a slight improvement in a session miked on-the-spot before an audience at Crio's in Hollywood. There is a heightened sense of presence such as one usually gets in tape playback—despite the acoustics of a room of only indifferent quality. In his latest swing around the nation, Benny Goodman is really traveling light these days. Backed by a versatile nine-man group, he is now in a position to meet his payroll while working almost any location. Many of the tunes heard in this reel will conjure up memories of the heavily-manned Goodman bands of former days. The most effective recreation of the past occurs in the old favorite *Sing, Sing, Sing*. In his latest arrangement, Benny relies on ingenuity and the imaginative use of fewer instruments to get over his points. This performance, deft though it is, can never erase the overwhelming effect of the spine-tingling power he had

(Continued on page 99)

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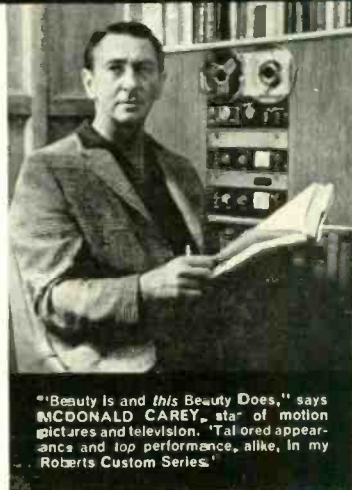


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Edward Tatnall Canby

BELTONE'S BINAURAL

A few months back I renewed an old discussion in this column concerning binaural sound, mentioning that in 1949 I had conceived idly of the then somewhat impractical idea of a binaural hearing-aid, a double one that for many people might restore two-eared hearing. Two of the old bulky hearing aids would indeed have been an impractical and expensive chore for most deaf people. So I passed up a patent application and forgot about it.

In the mid-fifties, along with transistor technology and miniature batteries, came the eyeglass type of hearing aid and, inevitably, the two-sided binaural hearing aid, one complete system in each wing of the spectacles.

A Beltone executive read my article and wrote with some enthusiasm to say that their binaural glasses dated from as far back (if I remember rightly) as 1956; I wrote right back and said, let me try one; he wrote back and said I'm sending you one.

So for some odd weeks, on and off, I've been trying to act like a deaf person with a Beltone Bolero binaural hearing aid. Black-frame glasses and people won't believe there are no lenses in them until I poke a finger through the lens holes. No lenses, but two complete hearing systems, one for each ear, with separate mikes, amplifiers, sound transducers, separate volume controls and on-off switches. This Bolero that I have been trying is not the latest model, and it is one of two alternative types that are available from Beltone, this one conveying sound from a transducer inside the glasses frame via a plastic tube to the ear. The other type puts the transducer itself into the ear in a small unit, connected by a thin electrical cord. I gather it costs more, though prices were not mentioned in my Beltone correspondence.

(I suppose that a third type might be the bone conduction arrangement, but I have not yet tried a binaural model of this type.)

Not Deaf Enough

I must say first that the main trouble for such people as me is to act deaf enough. I'm not deaf, or not so you'd notice it. I don't need high amplification, and I quickly found that when the Beltone plugs were firmly in my ears I could restore approximately normal sound volume by turning the units just barely beyond the zero point on the volume controls. Higher levels—they went very much higher—produced appallingly loud noises (and sometimes feed-back when the ear plug was a bit loose) which were more than I could take. At top volume, my own voice roared at me, a slight scrape of a pencil on a piece of paper was a monstrous sound, and to drum one's fingers idly on a wooden desk was to set off machine gun

rat-a-tat-tats. A loudish sound like a door closing or a book dropped a foot or so on the floor practically burst my ear drums. Some gain! (There are other models with even more gain.)

I tried ramming cotton in my ears, with the earpiece on top, but the difference was not important. Same effects, though I could turn the volume up a bit higher. Maybe wet cotton soaked in oil—but this was going to far. I want to keep my ears intact and unoiled.

A preliminary observation. For the normally comparative ear, such as mine, a natural binaural effect was achievable only when the volume was almost literally the same as the "natural" one. Higher volume not only did monstrous things to normal sounds but also exaggerated the perception of room-echo and other semi-extraneous noises. Binaural perception was exaggerated too, of course, but not in a helpful way, as far as I could figure.

Just how a habitually deaf person would react to these factors I don't know, and am intrigued to find out. I had thought of an objective level-setting test, say a clock ticking, with adjustment for threshold audibility at a certain distance. (The deaf person really doesn't know what is a "normal" volume and in any case must learn to live with any sound as though it were a brand new experience.) But, so far, I have not run into a properly objective deaf person—my only local candidate is 86 and frail; I decided that he was not a fit person to perpetuate harsh experiments upon.

Now at this point I must indicate clearly that my experiments with these hearing-aid glasses are intended merely to find out for me whatever I happen to find out, in purely personal terms. I am not in a position to study the vast amount of professional work that has been completed in the hearing field (nor are you likely to want to read it); I am interested as you are, in the idea of binaural hearing, in the practical results of this ingenious approach to a semblance of natural two-eared sound, in the implications and side implications for the non-deaf. That's plenty.

If I merely have discovered personally what is well enough known to the experts in the field, well, I'm happy. If by chance I run into something solid and constructive—the outsider who may just possibly see the forest because he doesn't even know about the trees—then I'm even more than happy. 'Nuff said, and thanks to Beltone for giving me a chance to play.

Normal and Loud

Yes, there is no doubt that this Beltone aid does provide a considerable measure of true binaural hearing discrimination. And this even though the response curve of the system is highly eccentric, with a

cut-off not far above 4000 cps and a rolled-down bass end. Even so, there is enough left to make the essence of binaural hearing available—the sense of normal spatial liveness, of direction (along with the coordinated eyes), the clearing-up of noisy confusion when multiple sound-sources are experienced all at once, as in a restaurant or a discussion between numerous people.

I can say this safely, I think, even though it is true that some sound, mainly low tones, gets by the ear plug and directly into my ears for a partially "natural" binaural hearing. I can say it even though my own perceptions are directly related to the natural hearing I use for comparison; whereas a deaf person has variably little to go on, as mentioned above, and must interpret the effects of the glasses without any direct comparison at all, or with variably vague memories of past binaural experience as his only guide.

I was able to wear my glasses, set at a reasonable sound level, for an hour or so at a time, and though the sound is not at all natural in tone quality due to the special curve lacking in lows and highs, I found I could actually forget the glasses after awhile, even in conditions of complex sound—I conducted my 17-voice chorus, for instance, in a smallish room, keeping the glasses in operation for mixed poly-conversation during breaks in the singing. No trouble at all, at any distance.

To my amusement, I was even able to listen to a stereo record and hear true stereo via the binaural glasses! Amusement, because here was the ultimate illustration of the difference between binaural and stereo! The stereo effect, via two separated loudspeakers, may actually be perceived via a binaural hearing aid, through microphones set ear-distance apart. Interesting. I could easily distinguish the right-speaker material from the left-speaker sound and the blend was wholly natural, in spite of the relatively poor response curve of the hearing aids. Could the difference between stereo and binaural be made plainer?

I tried for awhile to see whether I could adjust over a period of time to abnormally loud listening volume. I found that I could—after a fashion. But not without a rather frightening extreme of ear-fatigue and general physical exhaustion. Dreadful strain. I now can understand how the monaurally perceptive deaf person can so quickly become tired in confusing sound-situations, why so many deaf people prefer to turn off their hearing aids most of the time and rely on guesswork and/or lip reading. The extra-loud volume was harsh, distressingly unlovely, really painful when any strong sound came along; I soon learned to wince and shudder even at the possibility of a loud noise about to happen.

It is well known, I think, that in their efforts to compensate for the inadequacies of one-ear mono hearing, most deaf people tend to turn their hearing aid volume levels much too high. This helps in a way—but it also leads to quick pain and exhaustion.

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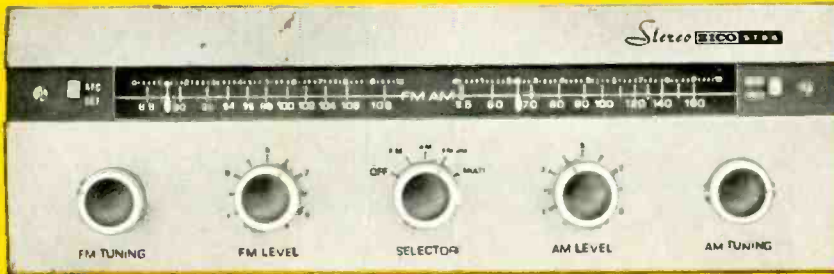
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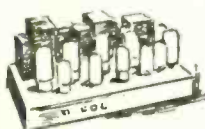
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Specification:

Turntable; 12" diameter
aluminum diecasting
Speed; 16-3/4, 33-2/3, 45, 78
rpm.

Power consumption; 15 watts
S/N; 45 db, minimum
Wow; 0.25% maximum

NEAT

NEAT ONKYO DENKI CO., LTD.
4-1chome, Kanda, Hatago-cho, Chiyoda-ku,
Tokyo, Japan

nearby orchestras, to compensate for mono loss of literal realism. We, too, can become aurally exhausted with too much and too loud hi fi listening.

It is pleasant to know that the Beltone people are seriously concerned with the real attributes of binaural hearing—they have to be. They must be strictly realistic, where we with our "stereo earphones" can afford to use euphemistic language. Beltone's instructions, for instance, are refreshingly definite. "Never turn the volume on louder than necessary. This will only detract from the naturalness with which you may hear." Just how one discovers the proper volume is not made too clear in these same instructions, but this is understandable, since each deaf person is a law unto himself. Presumably the Beltone hearing aid dealer is the man who takes care of this problem in direct terms for each individual.

Hearing Education

Beltone is particularly aware of the problem that interests me most of all in binaural hearing, that of education. The biggest difficulty with any hearing aid system is that the user must be *educated to make use of it*. Sound, heard again after long deafness, must be re-learned. Lost discriminations must be re-cultivated, sometimes as though one were born anew. Mental distress at what may at first seem only hideously confusing noise is virtually inevitable for those who are really seriously deaf—and all the more so for people who have never had normal hearing at all. Unfortunately so, and the worse because glib advertising can so easily persuade deaf people that they can enjoy all the wonders of full hearing in a trice!

Their first reaction is almost bound to be one of hideous distress, and so much the worse if the naive listener has been led to expect heaven-in-an-instant.

Orientation and re-orientation are major problems for education in every area where our acquired sense interpretation has been in some way stunted or damaged. Like learning to walk for a polio victim, learning to hear again after a hearing loss is a painfully slow and most unpleasant process. It should never be otherwise described.

Thus Beltone, succumbing a wee bit to the need for advertising's characteristic "positive values," starts off with a joyous plug—"... you'll soon discover (*ugh, that fatal word*) that your new Bolero... opens up wonderful new ways to the enjoyment of a full life—even if you thought you were previously too deaf to be helped." OK, true enough as far as it goes. But Beltone gets down to specifics very quickly. No instant results.

"*First two weeks* listen carefully to one person for at least fifteen minutes each day. With practice you'll hear and understand more easily every day. . . . *Watch* as you listen to the person speaking to you. This will help you understand more easily. . . . *Church and theater*. Don't use your Beltone at either of these places for at least the first two weeks. . . . *It takes time* to become completely adjusted to your aid (perhaps as long as 60 days): Be patient . . . be confident . . ."

In other words, a new user of a binaural hearing aid may have to keep at it for two full months before he begins to settle down to true binaural living. That is a realistic estimate of the terrible agony of adjustment—worth it in ultimate rewards—which is factually necessary for most people who really want to re-learn to hear in the normal manner. A sobering thought, but a realistic and hopeful one. Sixty days

is nothing after perhaps years, an eternity, of virtual deafness, or of one-eared mono hearing with all its distressing jumble of indiscriminate noisiness.

Naturally, I myself have not had to learn anything, except perhaps to adjust to the inevitably less perfect binaural effect of the hearing aid as compared to my own functioning ears. My experience is all *comparative*; the deaf person's is all sheer learning-from-scratch. To learn binaural hearing with these glasses is like the learning of a language by a child—direct, without either comparison or translation.

Peaks and Whistles

I do not want to underestimate the enormous ingenuity of these hearing aids. Astounding—even in this somewhat out-of-date model that I am at this very moment wearing (and listening binaurally to the loud clatter of my typewriter). A battery half the size of a dime, an amplifier in the thin part of the spectacle frame up front, a microphone like a quarter-cube of sugar in the end of the frame behind the ear, a tiny plastic tube that carries the relatively huge sound to the ear plug. Unbelievably compact, though other models are still smaller; remarkably long-lived (I haven't used up my first set of the tiny batteries yet) and extraordinarily powerful. When the thing goes into feedback you can hear the whistle fifteen or twenty feet away. Even with no more than rudimentary sound, this double-eared gadget would rate as a technological miracle.

And so I would like to proceed to a few questionings, always keeping this last miraculous achievement in mind. I tried the glasses out on my consultant friend Jan Syrjala, a pretty sharp electrical-audio engineer, and we came to some common thoughts, combining observations.

Why the highly restricted, strongly peaked tonal response? No highs, no lows, and a peak that is so pronounced that I can actually whistle the pitch at which all sound "rings"—including these typewriter keys as I type and listen through the hearing aid. A high "wheeee," slightly metallic and shrill. It's even hard to determine the level of transistor noise (some is inevitable with such high gain) because of the persistent ringing sound added to everything. Several possible explanations occur as to this curve.

1. The curve is at least in part premeditated. Most people lose their hearing from the top down. As in low-cost phonographs and the like, a mid-range peak makes for maximum conveying of intelligence minus higher highs.

As an argument, I don't like it. Remember the days when phonograph records were limited in tonal range and/or peaked in response? Nowadays, the records are cut to standard curves and the adjustment if any is left to the playing equipment. The same, I'd say, might be true in a general way for hearing—and I've heard say that the idea of individually "tailored" hearing aid curves is losing ground.

In any case, the loud whistle, the metallic "edge" of tone is to me very tiring, and strains the ear with extra-peak volumes in the peaked range.

2. With the requirements of maximum gain and maximum miniaturization through transistors, it is easy to imagine that a flatter response simply is not practical. Better a large gain and a peaky sound than not enough gain for practical use.

FULLY ONE YEAR BEFORE FCC FM STEREO APPROVAL...

THE FIRST NEW ALTEC 250SU STEREO CONSOLE WAS ALREADY IN OPERATION



The Altec 250SU Stereo Console was developed and operating well before FCC made FM Stereo a reality. Today, many 250SU Consoles successfully serve stereo and monophonic operations in AM, FM, TV, and Recording Studios.

If you are converting to Multiplex Stereo, let the testimony of time help you select your new stereo console. It's a good way to know that the "bugs" are out... a good way to know that every important feature and convenience has been added. A few are listed below.

- **MINIATURE PLUG-IN COMPONENTS:** Preamplifiers, amplifiers, and utility input devices are of the same size to readily fit the built-in pre-wired mounting trays on the Console. These units are also available separately for special requirements.
- **INPUT LEVEL SELECTION:** The 250SU has ten input positions, each with a "bus" switch and mixer attenuator. Any of these positions may be used for high level, low level, or any combination of sources by plug-in of proper Altec input device.
- **SELECTABLE OUTPUT FUNCTIONS:** The Console comes wired for universal service with single channel, dual channel, or two/three channel operation. The desired functions are obtained by using the necessary number of Altec plug-in amplifiers.
- **HIGHEST STUDIO QUALITY:** 250SU performance exceeds FCC, NAB, EIA, and all recording standards. Plug-in components are tube operated for optimum studio quality and greatest dynamic range at lowest noise levels. The premium tubes used are pre-aged and may be tested individually by push-button facilities.
- **INTERCHANGEABLE PLUG-IN AMPLIFIERS & ACCESSORIES**
- **LOW IMPEDANCE MIXING**
- **SPEECH-MUSIC FILTER**
- **DC HEATER SUPPLY**
- **UNTERMINATED MICROPHONE INPUTS**
- **UTILITY INPUT DEVICES FOR TAPE, DISC, LINE, NETWORK, ETC.**
- **TUBE TESTING PROVISIONS**
- **EXPANDABLE TO JACK FIELDS, EQUALIZERS, ETC.**
- **1, 2, OR 2-3 CHANNEL OPERATION**
- **ILLUMINATED VU METERS**
- **COLOR CODED CONTROLS**
- **EXTERNAL POWER SUPPLY**

For Precise Balance of Stereo Pick-Up...

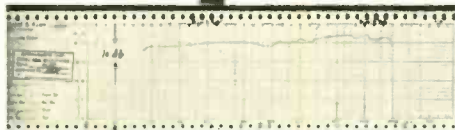
INSIST ON MATCHED ALTEC STUDIO MICROPHONES

Each Altec 684A Omnidirectional Studio Dynamic matches the performance of any other 684A Microphone. This match in performance is also inherent in Altec 685A Studio Cardioids. Hence, any pair of 684A or 685A Microphones pro-

vides the balance essential for stereophonic operation. *An individual certified calibration curve is supplied, free of charge, with each 684A and 685A Microphone as concrete visual proof of this remarkable balance!*



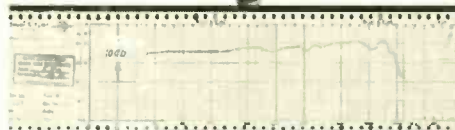
ALTEC
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Features uniform frequency response from 35 to 20,000 cycles. Incorporates new Altec "Golden Diaphragm" and exclusive sintered bronze filter that bars entry of iron dust and foreign matter. Output impedances of 30/50, 150/250 ohms selectable at cable plug.



ALTEC
685A
\$96.00 net



Offers flat frontal response from 40 to 16,000 cycles with average front-to-back discrimination of 20 db. Incorporates new Altec "Golden Diaphragm" and exclusive sintered bronze filter. Impedances of 30/50, 150/250 ohms selectable at cable plug.

Other Altec Microphones are priced from \$36.00 to \$334.00. Ask about the exclusive Altec Microphone Exchange Policy that permits immediate replacement of inoperative units at a fraction of original cost.

For complete specifications and technical details on the Altec 250SU Stereo Console and matched Altec Microphones, call your nearest Altec Distributor (listed in your Yellow Pages) or write Dept. A-8-M.

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for better, clearer,
more natural
sound



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STEREO PLAYBACK
TAPE DECK \$199.50

A proud new achievement! For pure playback of 2 and 4 track stereo and monaural tapes. Superb frequency response. Installs in hi-fi systems. Has facilities for adding erase and record heads; 2 outputs for plug-in preamplifiers. Adaptable for language lab and industrial use.



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Ask any owner about this magnificent instrument! Incorporates into hi-fi systems. Records 4 track; plays back 2 and 4 track stereo and monaural tapes. Has 3 separate heads and offers Add-A-Track, Sound-On-Sound, Direct Monitor, Silent Pause, Push Button Control. Remote control "F" model available.

SEE YOUR DEALER OR WRITE DIRECT

Tandberg of America, Inc. 8 Third Ave., Pelham, N. Y.

3. It would seem likely that the plastic tube used in my pair of hearing aid binaural glasses is a highly restrictive acoustic conductor. Perhaps it is impossible to get a better response via such a tubular system—which no doubt has other advantages including that of simplicity and reasonable cost. Beltone's fancier system, again, uses an earplug transducer feeding directly into the ear itself, with no plastic tubes. Perhaps the response is better in that model. It should be worth the extra cash if so—if you have the proper response yourself. (But remember that the essentials of binaural separation do come through this tube system, peaks or no. For a person with no binaural hearing and no high response, this relatively ugly sound could be worlds better than no hearing at all.)

Listening to the Rear

I wonder about the mike positions in these glasses. They are placed so that in effect you hear backwards, out of the back of your head. The spectacle arms curve sharply inward, above and behind the ears, the mike faces out sideways and angled to the rear, at about a half inch from their extreme ends. Jan Syrjala was sitting with his back to an open window that faced on a noisy city street when we noticed this. He remarked that he heard entirely too much street noise and not enough of my voice—I was speaking directly towards him and towards the window at his back.

In effect, his ears were reversed. They "looked" backwards, toward the rear, out the window.

It would seem as though the pair of mikes could be mounted somehow further forward, and preferably out in front near the eyes, to exaggerate the direct, person-to-person front reception in a conversation and minimize the rearward pickup of incidental noise. Whether this is feasible in a practical sense I do not know. It may have been done in other models.

Stereo

I have a final generalization to make concerning ear-education. It is necessary to re-learn to hear, when you are deaf, learn to make "normal" discriminations between desired sounds and background interference via the binaural facility. You have the facility itself as soon as you put on your binaural glasses. But at first you cannot use it, as a person who has had two-eyed vision restored to him is at first unable to fuse his eyes' two images and cannot judge distance accurately. The growing baby learns these things too—from scratch. Wholly new experiences, newly discovered sense facilities, and at first no ability at all to use them. The small infant reaches for things a room's distance away: his eyes roll, he sees cross-eyed, learns to gauge depth and distance only by slow degrees. So it is with the re-learning process as well.

Now I have been thinking a lot lately that this very factor applies to stereo listening and can account for a large part of our misunderstandings as to stereo's value. We just don't hear it. We haven't learned.

Of course you think you can judge stereo sound right off, the very first time. Aren't you musical? Haven't you listened to records for years? I say that you can indeed judge a large part of a stereo sound—the mono part. That's considerably more than half the sound in most records and often a lot more still.

We can be quite specific here. Every bit of sound that is cut *laterally* into the stereo disc groove is entirely familiar to your ears after long listening practice. The sum-signal, cut laterally, includes all the mono elements in the recorded sound—most of the sound. Of course you can judge it.

But what of the *vertically* cut sound, the difference signal, the stereo increment?

Well, a lot of people say they can't hear any difference between mono and stereo records. It could be the equipment, of course, especially when the two loudspeakers are not more than three feet apart. But more likely, I say, is the simple lack of discrimination in the listener's mind—perhaps an experienced music listener whose ears have never experienced this particular set of recorded-sound clues before. Naturally, they don't operate for him as they should, given extended listening practice. He just doesn't hear the stereo part. Not unless it is crudely "ping pong." Our stereo demonstrations have joyfully taken care of that sort of all-out whacking-of-the-ears; the discriminating music listener still has to go out and learn to hear real stereo in its own best terms, which are not ping-pong at all.

How about learning to hear binaural recordings, made exclusively for earphone listening? No problem! You have virtually nothing to learn, for your binaural recording is merely a reproduction of the sound you could have heard on the spot. Only the sense of time—the "present"—and of location—where you "are," and most important, the concurring sense-elements of sight and even of touch, are missing. These lacks can throw your sense of direction off, but they can't spoil the natural liveness and distance-perception of true binaural hearing.

Now if the deaf person can only understand that he, too, may achieve a semi-natural hearing perception if he'll work hard at learning it, Belltone will be assured a whale of a future.

Shrieking Birds

P.S. On an impulse, I suddenly decided to try the Bolero binaural hearing aid out of doors—with interesting results.

It was a warm, balmy evening and first I set about mowing the lawn with my hand mower. After some hasty volume adjustments I got the mower into proper aural perspective and went to work full tilt. It still sounded like a mower, and the familiar noise of mower wheels banging against rocks or clanging over flagstone was quite normal and comfortably familiar via the ear plugs. But there was at the time a bird song contest going on overhead—the nesting season, and a band of rival tootlers (were they chestnut-sided warblers?—well, warblers anyhow) were out rivaling each other as hard as they could.

I soon became aware that the birds, via my hearing aids, were unusually potent. Their songs positively glowed with warmth and I found quickly that I could easily distinguish between their various locations, this tree and the next. Binaural, all right, and very loud. Of course! Their songs fitted right into the area of peaked response on my earphone glasses, somewhere above 3000 cps fundamental. (You can't generally hear more than the first overtone on small-bird calls anyhow, so not much coloration was absent.)


I tried turning up the volume, and the lawn mower became a small diesel tractor.

(Continued on page 96)

ALNICUS!



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ALNICUS... broadens the scope of magnet use for the Military and all industries.

For example—with commercially produced ALNICUS it is now possible to have higher magnetic energy with no increase in unit size or weight... or, retain the same magnetic energy with a smaller, lighter unit.



ALNICUS is a new kind of permanent magnet material that affords the design engineer in modern industry the widest latitude and greatest flexibility because—it is **commercially produced**... it has the **highest magnetic power ever**... it is **not limited to plugs, rectangles or other prismatic shapes**. In plain truth—ALNICUS makes it possible to **commercially produce** permanent magnets with the highest energy level ever achieved in **virtually any size or shape**, and ALNICUS will maintain this high magnetic power in all configurations!

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should be picofarad

EDITOR'S REVIEW

PRODUCT PREVIEW TIME

AUGUST HAS BECOME the traditional month for our annual Product Preview issue which has been hailed by both manufacturer and audioman as a goldmine of information. We are pleased to continue the tradition with this issue, and trust it will meet with the same hearty acceptance.

For those who like to have a compendium of information such as this Product Preview all in one place, and possibly of a more convenient size, we are offering a reprint of this entire section in the form of the new **AUDIOGUIDE**, which will be published on September 1. And in addition to the Product Preview, the **AUDIOGUIDE** will contain reprints of all the articles on FM-stereo that have appeared in the magazine itself for the last three months. This impressive total of eight articles is by far the most complete coverage of the subject that has appeared anywhere, and some of the material contained in these articles has never been published anywhere else at all.

We believe that the **AUDIOGUIDE** will become a welcome and useful and convenient addition to your library.

THE HIGH FIDELITY SHOWS

Comes now the time of the year when the hi-fi shows begin to appear, interest gets greater, and the average audioman looks forward to the fall season and plenty of new equipment which he has planned, during the summer doldrums, on adding to his lineup. This year, of course, there is the "something new has been added" in the form of FM-Stereo. So far there have not been enough stations on the air to bring forth a number of do-it-yourself projects with home-constructed adapters, but we look forward to some new and interesting circuitry when the stations finally catch up with the manufacturers.

The first of the fall hi-fi shows is to be held in Chicago, August 25-27, at the Morrison Hotel. The second, and the largest for the season, is New York, opening to the public at the New York Trade Show Building on September 14 and running through the 17th. This show is presented by the Institute of High Fidelity Manufacturers, and is expected to coincide with the inauguration of FM-Stereo broadcasting in New York.

The next show after New York is in Toronto, and is to be held October 18-21, and this is followed by one in Philadelphia at the Benjamin Franklin Hotel October 27-29. The last show of the year is at Minneapolis November 16-18 at the Dyckman Hotel. This show is sponsored by the Audio Division of the Paul Bunyan Chapter of the Electronic Representatives Association.

As usual, **AUDIO** will be represented at all of them.

THE PICAFARAD

Ever since **AUDIO** first appeared—more than fourteen years ago—the form " $\mu\mu\text{f}$ " has been used to indicate micromicrofarads. Many other publications have used this term interchangeably for the more common " mmf " but **AUDIO** has always tried to be consistent with the use of the Greek μ . European publications have long used the form " pf " for the same quantity, with these letters representing "picofarads".

The picofarad has been accepted in the U. S. as the standard form for one millionth of one millionth of a farad since it is simpler to use and it follows a whole series of prefixes covering the multiple powers of 10.

Although not the first to make a studied attempt to follow the new standard, **AUDIO** now moves in that direction. Henceforth, the abbreviation " pf " will be used in all articles and schematics to indicate this value. There is, however, one possible exception to this rule—some articles are already in type and the schematics have already been drawn and the line cuts made. In short, for some three or four articles which are ready for inclusion in coming issues it is possible that the old form may appear. But all new material will bear the designation " pf " whenever applicable.

It will, that is, unless there is another epidemic of gremlins which always seem to show up whenever we announce a forthcoming change.

CONTOUR CONTROLS

We were recently intrigued by the announcement by one of the larger package manufacturers that they had a "New for 1962" exclusive development which was described as being a "full fidelity background listening control." This device is purported to eliminate bass loss, treble cut out, and low-level fade out. The advertisement said further that "ordinary hi-fi loses bass at low levels—ordinary hi-fi loses treble at low levels." Without question, an earthshaking discovery—by a package manufacturer.

All us high fidelity component people have known about Fletcher-Munson compensation, contour control, or whatever it may be called, for years. The methods of providing the compensation and the reasons therefor were first described in the May, 1948, issue of this magazine in an article by David Bomberger, and further elaborated on as a continuous control in the February, 1949, issue. Since then various other articles have presented the same principle with different "hardware."

Seriously, though, we believe that the loudness control did more to put high fidelity into the living room than any other single element. Prior to it, all hi-fi fans played their rigs at performance level to achieve the proper balance, and performance level is too high for most people.

It's good to know that at least one of the package companies has found out about this, though.

Exclusive Assurance of Quality

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

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

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

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

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

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

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

FOR THOSE WHO CAN HEAR THE DIFFERENCE



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

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



Professional
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 City _____
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 Must be supplied with your guarantee.



In testimony whereof
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Attest:

 Paul H. Osburn
 Acting Officer

FM-Stereo: Time-Division Approach

CARL G. EILERS*

Here is an explanation of time-division FM-stereo by one of the innovators of the approach. He explains the approach in mathematical terms as well as by means of a specific FM-stereo demodulator.

THE SYSTEM of FM stereophonic broadcasting which has been adopted by the Federal Communications Commission had its inception in a time-division multiplex switching system between left and right stereophonic program sources.

In a time-division multiplex switching system a switching rate is chosen to be at least twice the highest frequency of modulation to be transmitted. If one analyzes the signal mathematically it becomes apparent that the signal basically consists of sum $(L+R)$ and difference $(L-R)$ components. If the switching waveform is a square wave, as shown in Fig. 1, then the sum of the left and right stereophonic channels appears as audio modulation on the main radiated carrier and the difference between the left and right stereophonic channels appears as a suppressed carrier amplitude modulation of a series of odd harmonics of the switching rate.

Equation (1) describes the resulting modulation function of the radiated carrier:

$$\frac{(L+R)}{2} + \frac{2(L-R)}{\pi} \cos \omega_{sc} t - \frac{2(L-R)}{3\pi} \cos 3\omega_{sc} t + \frac{2(L-R)}{5\pi} \cos 5\omega_{sc} t - \dots = M(t) \quad \text{Eq. (1)}$$

* Research Engineer, Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

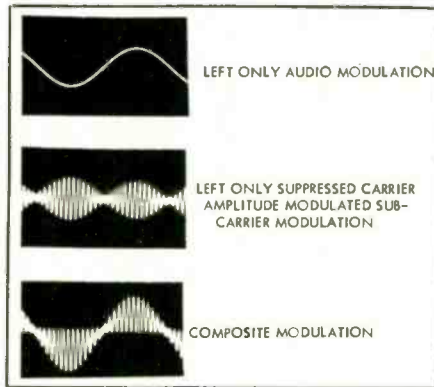


Fig. 2. Illustration of interleaving effect of sum and difference signals (left only).

where: $M(t)$ is the composite modulation
 L is the left channel audio
 R is the right channel audio
 ω_{sc} is the subcarrier angular frequency

Since the fundamental subcarrier term contains all the necessary stereophonic information in the form of $(L-R)$ modulation and, in order to prevent radiation outside the 200,000 cps channel and, further, in order to allow for the possible addition of an SCA background music channel, it is desirable to limit the spectrum of the modulation to the necessary stereophonic com-

ponents. We can then describe a new composite modulating function:

$$(L+R) + (L-R) \cos \omega_{sc} t = M'(t) \quad \text{Eq. (2)}$$

where: $M'(t)$ is the new modulating function

It will be noted that the maximum peak-to-peak amplitudes of the sum $(L+R)$ audio and the difference $(L-R)$ modulated subcarrier are equal. It is also true but not obvious that the composite modulation function maximum peak-to-peak amplitude is equal to the maximum of either of the components alone. Thus, the FM transmitter may be fully modulated with $(L+R)$ audio and then fully modulated with the $(L-R)$ subcarrier without having to reduce the modulation percentage for either component as applied to the radiated carrier. This interleaving property of the sum $(L+R)$ and difference $(L-R)$ signals is directly related to the original concept of time-division multiplexing between left and right stereophonic signals.

The photographs of Fig. 2 illustrate the concept of interleaving. The upper photograph displays the sum $(L+R)$ audio component of the composite modulating signal. The radiated carrier deviation is $\pm 75,000$ cps. The center photograph displays the difference $(L-R)$ subcarrier component. In the lower portion of the photograph is shown the result of the addition of these two components which make up the composite modulating signal. It is evident that the maximum peak-to-peak amplitudes are identical for all three photographs.

The photographs of Fig. 3 show the makeup of the modulating signal when a left only signal is applied to the FM transmitter. For this illustration the audio modulating frequency was higher than that of Fig. 2, so that the actual subcarrier cycles may be viewed. It may be noted that the subcarrier reverses phase each time the zero axis is crossed. This shows that the suppressed carrier type of modulation is taking place.

For clarity, the pilot subcarrier is not

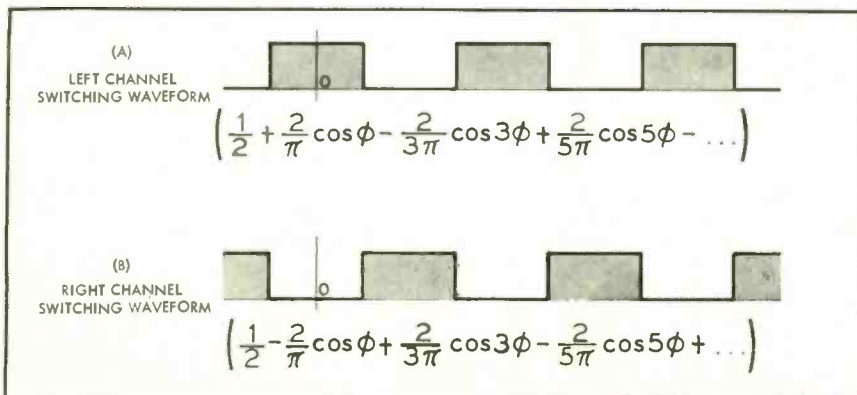


Fig. 1. Multiplexing functions for left and right channels.

included in the photographs of Fig. 2 and Fig. 3.

Stereophonic Subcarrier Demodulation Methods

Since the stereophonic system that has been described is a sum and difference system, the left and right signals may be derived by demodulating the stereophonic subcarrier by the use of a synchronous detector for recovery of the (L-R) modulation and then matrixing at audio frequencies with the main channel (L+R) modulation.

Left and right signals may also be derived directly in one operation of the composite modulation. In order to illustrate this method of demodulation refer to Fig. 4.

(A) of Fig. 4 shows the composite waveform of a time-division multiplexed signal. The envelopes of both the left and right signals are clearly discernable. (B) shows the difference (L-R) component of the time-division multiplexed signal with a superimposed suppressed carrier amplitude modulated subcarrier being modulated by difference (L-R) audio. The similarity between the two waveforms is evident. (C) shows the sum (L+R) component of the time-division multiplexed signal. The addition of the suppressed carrier component of (C) results in the waveform shown in (D). Once again, the envelopes of both the left and right signals are clearly discernable.

If the composite waveform shown in (D) of Fig. 4 and repeated in (A) and (C) of Fig. 5 were sampled with two interleaved unit impulse functions, as shown in (B) and (D) of Fig. 5, synchronized to 38,000 eps, the carrier tips of the left signal would be followed by one of the interleaved set of unit impulse functions and the carrier tips of the right signal would be followed by the other set of unit impulse functions. Thus, it is possible to recover the left and right stereophonic signals from the composite waveform using a direct method of demodulation.

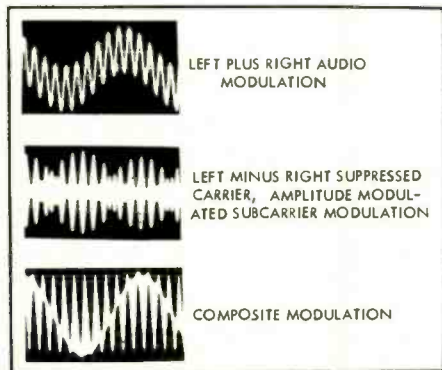


Fig. 3. Illustration of interleaving effect of sum and difference signals (left plus right).

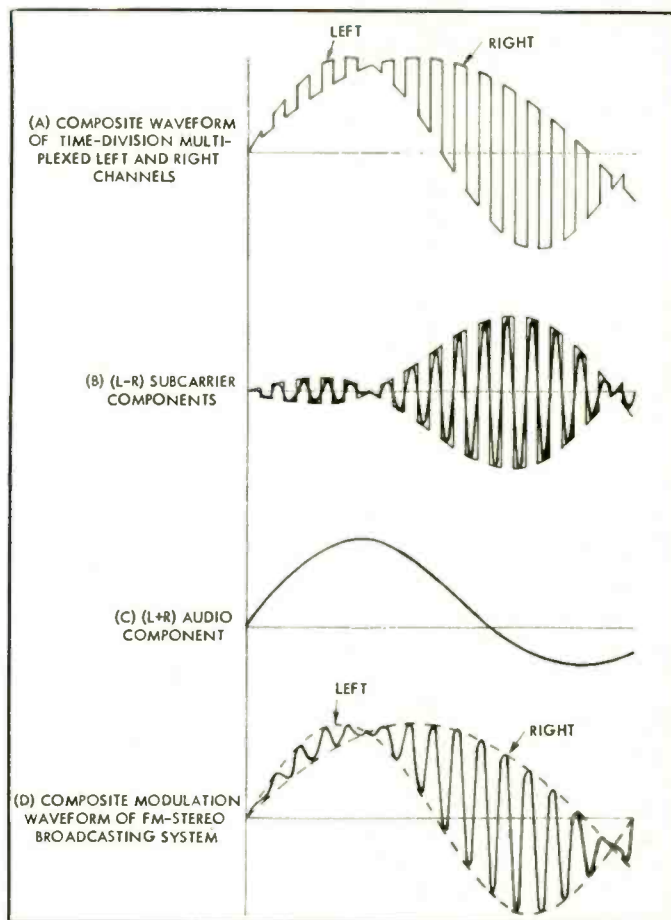


Fig. 4. Relation of time-division multiplexing to FM-stereo broadcasting.

We will now illustrate a method of left and right stereophonic signal derivation using partial demodulation and partial matrixing. This method is directly related to the original concept of time-division multiplex demodulation. If one multiplies the composite modulating function $M'(t)$, as shown in Eq. (2) with: $1 + 2\cos\omega_{sc}t$, the result would be demodulation for recovery of the left channel:

$$\begin{aligned} & [(L+R) + (L-R)\cos\omega_{sc}t] [1 + 2\cos\omega_{sc}t] \\ &= (L+R) + 2(L-R)(\cos 2\omega_{sc}t) + \dots \\ &= (L+R) + 2(L-R)(\frac{1}{2} + \frac{1}{2}\cos 2\omega_{sc}t) = 2L \end{aligned} \quad \text{Eq. (3)}$$

If one multiplies the composite modulating function $M'(t)$ with: $1 - 2\cos\omega_{sc}t$, the result would be demodulation for recovery of the right channel:

$$\begin{aligned} & [(L+R) + (L-R)\cos\omega_{sc}t] [1 - 2\cos\omega_{sc}t] \\ &= (L+R) - 2(L-R)(\cos 2\omega_{sc}t) + \dots \\ &= (L+R) - 2(L-R)(\frac{1}{2} + \frac{1}{2}\cos 2\omega_{sc}t) = 2R \end{aligned} \quad \text{Eq. (4)}$$

There is no electronic waveform which corresponds to the multiplier: $1 + 2\cos\omega_{sc}t$. However, a square wave may be used which corresponds to the multiplier:

$$1 + \frac{4}{\pi}\cos\omega_{sc}t. \text{ A half sinewave may also}$$

be used which corresponds to the multiplier: $1 + \frac{\pi}{2}\cos\omega_{sc}t$. Since the square-

wave function is easily derived electronically, this would seem an appropriate multiplier to explore further.

If one multiplies the composite modulating function $M'(t)$ with $1 + \frac{4}{\pi}\cos\omega_{sc}t$,

the result would be partial demodulation for the left channel:

$$\begin{aligned} & [(L+R) + (L-R)\cos\omega_{sc}t] [1 + \frac{4}{\pi}\cos\omega_{sc}t] \\ &= (L+R) + \frac{4}{\pi}(L-R)\cos 2\omega_{sc}t + \dots \\ &= (L+R) + \frac{4}{\pi}(L-R)(\frac{1}{2} + \frac{1}{2}\cos 2\omega_{sc}t) \\ &= (L+R) + \frac{2}{\pi}(L-R) \end{aligned} \quad \text{Eq. (5)}$$

It is obvious by examining this result that the sum (L+R) signal is somewhat larger than the difference (L-R) signal, thus resulting in mostly left but some right signal in the left channel.

If a sum (L+R) signal having an amplitude: $-1 + \frac{2}{\pi}$ is added to the above partially matrixed left channel, the result would be:

$$(L+R) + \frac{2}{\pi}(L-R) + (L+R)(-1 + \frac{2}{\pi}) = \frac{4}{\pi}L$$

This $(L+R)(-1 + \frac{2}{\pi})$ signal is readily

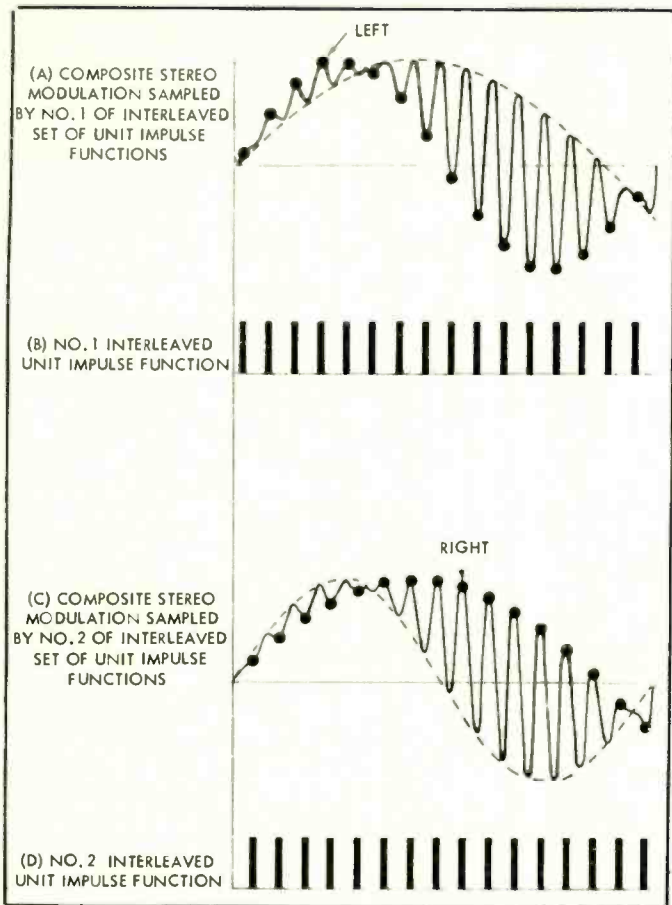


Fig. 5. Direct method of deriving left and right signals from composite stereophonic modulation.

available because it is an inverted main channel signal.

Likewise, if one multiplies the composite modulating function $M'(t)$ with:

$$1 - \frac{4}{\pi} \cos \omega_{sc} t, \text{ the result would be partial demodulation for the right channel:}$$

$$[(L+R) + (L-R) \cos \omega_{sc} t] [1 - \frac{4}{\pi} \cos \omega_{sc} t]$$

$$= (L+R) - \frac{4}{\pi} (L-R) \cos 2\omega_{sc} t + \dots$$

$$= (L+R) - \frac{4}{\pi} (L-R) (\frac{1}{2} + \frac{1}{2} \cos 2\omega_{sc} t)$$

$$= (L+R) - \frac{2}{\pi} (L-R) \quad \text{Eq. (6)}$$

Again, the sum $(L+R)$ signal is somewhat larger than the difference $(L-R)$ signal, thus resulting in mostly right but some left signal in the right channel.

Once again, if a sum $(L+R)$ signal having an amplitude: $-1 + \frac{2}{\pi}$ is added to the above partially demodulated right channel, the result would be:

$$(L+R) - \frac{2}{\pi} (L-R) + (L+R) (-1 + \frac{2}{\pi}) = \frac{4}{\pi} R.$$

Multiplication by a square wave may be accomplished using an electronic switch operated in synchronism with the modulated subcarrier signal, thus becoming a synchronous demodulator. Such a demodulator may take on many

forms—one of which is shown in Fig. 6. In this case the synchronous demodulator is a beam deflection tube, 6AR8A, which has: one electron stream, two anodes, two deflection plates, and one control grid. The composite stereophonic signal is applied to the control grid after any SCA background channel which may be present has been removed with a low-pass filter type of trap.

The deflection plates of the beam deflection tube are driven by a push-pull sinewave source generated by an oscillator-doubler circuit having an output frequency of 38,000 cps. A sufficient amount of sinewave drive is applied so that switching of the beam results in

essentially a square wave of anode current. In this way the products of the two polarities of square wave and the composite stereophonic signal are generated.

At one anode the product of one polarity of square wave function and the composite stereophonic signal appearing at the control grid is formed for the left channel, as shown in Eq. (5). Similarly, at the other anode the product of the opposite polarity of square wave function and the composite stereophonic signal appearing at the control grid is formed for the right channel, as shown in Eq. (6). The addition of a sum $(L+R)$ signal having an amplitude: $-1 + \frac{2}{\pi}$ is accomplished by the 500 ohm variable matrix adjustment in the cathode circuit of the beam deflection tube demodulator, as shown in Fig. 6. Thus, the combination demodulator and matrix network accomplishes the complete derivation of left and right signals. The necessary deemphasis in left and right channels is achieved by simply adding a 1500 pF capacitor at the matrix outputs.

The push-pull sinewave drive which is applied to the deflection plates of the beam deflection tube demodulator tube is generated by an oscillator frequency doubler combination, as shown in the carrier regenerator portion of Fig. 6. The oscillator operates at a frequency of 19,000 cps. The anode circuit of this carrier oscillator is tuned to the second harmonic, or 38,000 cps. The tube acts as an electron-coupled oscillator and frequency doubler.

Magnetically coupled to the oscillator tank circuit is another parallel resonant tank which is in the anode circuit of the modified cathode follower, shown at the left in Fig. 6. This parallel resonant circuit is tuned to the 19,000 cps pilot subcarrier frequency, thus forming a tuned amplifier for extracting the pilot subcarrier from the composite stereophonic signal appearing at the grid of the cathode follower.

(Continued on page 96)

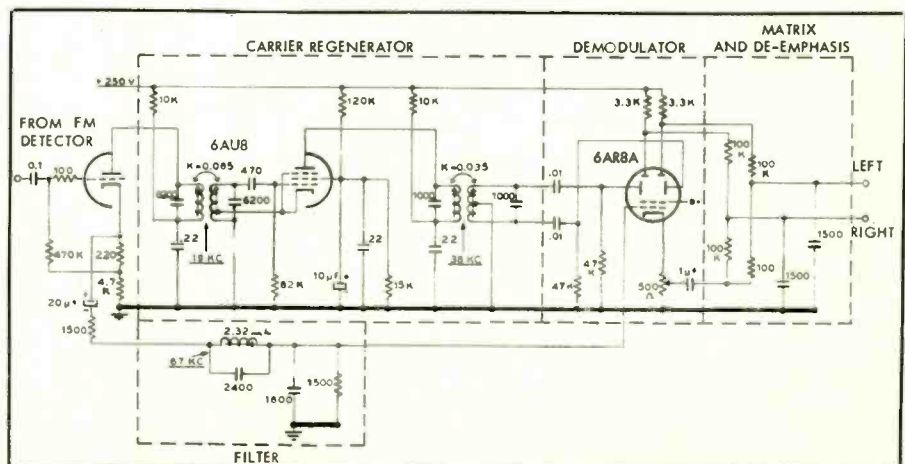


Fig. 6. Schematic diagram of FM-stereo demodulator.

Product Detector for FM-Stereo

F. L. MERGNER*

Borrowing from single-sideband techniques, this adaptor uses a product detector to achieve almost infinite selectivity with little phase shift.

DURING STEREOPHONIC TRANSMISSIONS the monophonic signal, comprising the sum of left and right channels is available without further demodulation at the discriminator or ratio-detector output of an FM tuner. Several different methods, however, can be employed to recover the L-R subcarrier information. Either time-division multiplex or AM detectors of various types may be used to recover this information. In an audio matrix, using a resistive sum and difference network, the final L and R channels are derived and after proper de-emphasis fed to an audio amplifier. In addition to the stereophonic program, the newly approved multiplex system permits the transmission of an SCA channel for background music and similar information. The SCA channel, frequency-modulating a carrier of 67,000 cps, contains information which is in no way related to the adjacent stereo programs transmitted at the same time over the same station. To avoid interference like "spitting" and "whistling" between both programs, the F.C.C. requires the transmitting stations to maintain at least 60-db separation, even under conditions of maximum modulation. On the receiving end this value should be maintained because 60 db of protection (equal

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to a voltage ratio of 1000:1) can be considered just high enough to prevent annoying crosstalk of the SCA channel into quiet passages of a stereophonic program (and vice versa). As the SCA channel is adjacent in frequency to the upper sidebands of the L-R subcarrier, ways must be found to secure a high degree of selectivity between both channels. Band-pass filters with a sufficient number of sections can be designed to achieve this end, but they are costly and bulky. In addition they introduce in the L-R channel a large amount of phase shift, which must be compensated for, in order to achieve in-phase matrixing with all frequencies of the L+R channel for a high degree of stereo separation.

Demodulating the Subcarrier Signal

The problems mentioned above made it necessary to investigate other means of achieving sufficient selectivity without introducing excessive phase shift. Linear or square-law demodulation of the subcarrier permits an improvement in selectivity equal to the square of the ratio of both carrier amplitudes. Logarithmic demodulation and product detectors, however, have in theory inherent selectivity equal to infinity. The first type is rarely used because in practice it is very difficult to achieve good loga-

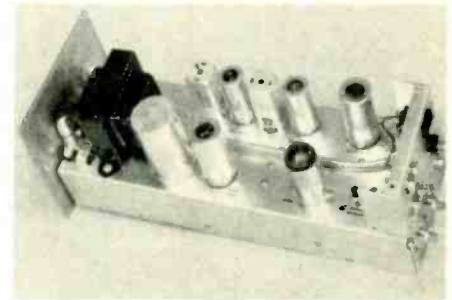


Fig. 2. Rear view of adaptor.

rithmic demodulator characteristics. Product detectors, however, are widely used in single-sideband receivers, where they contribute greatly to superior performance. This detection process requires a tube with two separate grids and with linear V_g/I_{p1} characteristics. The recovered subcarrier of 38,000 cps is fed to one grid, the L-R sidebands to another. As long as the above requirements on the detector linearity are met, no demodulation of interfering frequencies will occur. In practice, however, some slight deviation from a perfectly straight characteristic is unavoidable, which might lead to a small amount of cross-modulation between the subcarrier and SCA channels. In spite of these practical limitations, the degree of selectivity afforded by the product detector is still superior to other methods of detection. Therefore, a simple two-section filter having a band-pass from 23,000 to 53,000 cps for the L-R sidebands provides sufficient crosstalk protection. In addition, the series arm of the band-pass filter can be tuned to an anti-resonance at 67,000 cps, the center frequency of the SCA channel, to steepen the response of this filter at frequencies above 53,000 cps.

A short mathematical discussion of the demodulation process in a product detector might be of interest. The composite stereophonic signal available at the multiplex of an FM-tuner is:

$$E(t) = [A(t) + B(t)] + [A(t) - B(t)] \cos \omega_s t$$

Where $A(t)$ = instantaneous left channel signal,

$B(t)$ = instantaneous right channel signal,

$$\omega_s = 2\pi f_s \quad f_s = 38,000 \text{ cps}$$

The 23,000 to 53,000 cps band-pass



Fig. 1. Front view of Fisher multiplex adaptor, Model MPX-100.

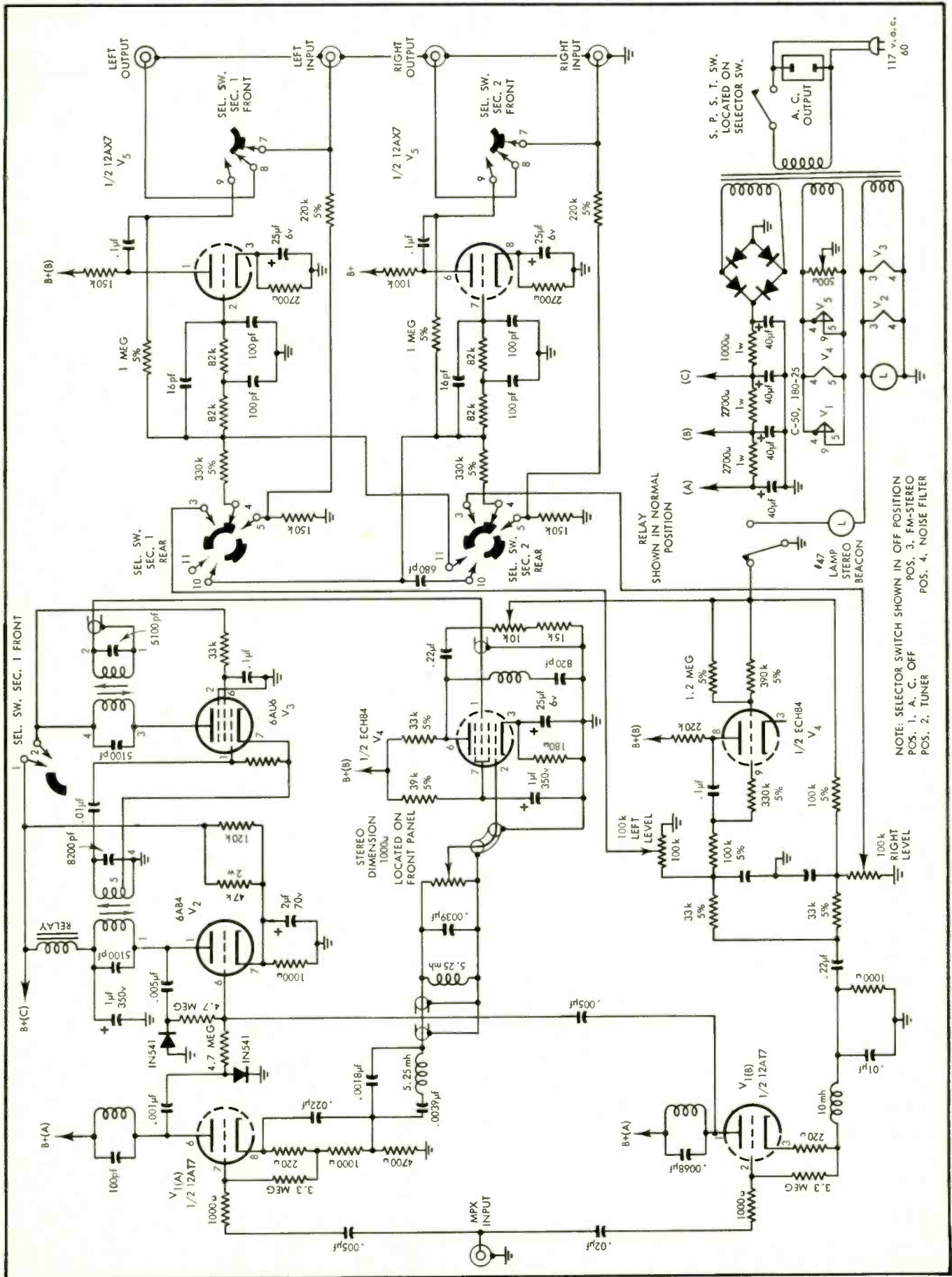


Fig. 3. Schematic diagram of MPX-100.

filter passes the A-B information only, therefore the signal at grid No. 1 of the product detector is:

$$[A(t) - B(t)] \cos \omega_s t$$

Signal at grid No. 3 of the product detector:

$$\begin{aligned} & \cos \omega_s t \\ \text{Product of both signals:} \\ & = \cos^2 \omega_s t [A(t) - B(t)] \\ & = 1 + \cos 2\omega_s t [A(t) - B(t)] \\ & = \frac{[A(t) - B(t)]}{2} + \frac{\cos 2\omega_s t}{2} [A(t) - B(t)] \end{aligned}$$

The underlined portion of this equation, containing the second harmonic of ω_s can be filtered out. Because of the 180 deg. phase reversal in the product detector tube, the remaining demodulated signal becomes:

$$-\frac{1}{2} [A(t) - B(t)]$$

This signal is then matrixed directly 180 deg. out-of-phase with the L + R signal to produce the final stereophonic information.

The Adaptor

The Fisher multiplex adaptor, Model MPX-100, is shown frontview in Fig. 1 and rearview in Fig. 2. The schematic diagram is shown in Fig. 3 and the block diagram in Fig. 4. The signal from the multiplex output of the FM tuner reaches two modified cathode followers (V_1), one of which feeds a 15,000 cps low-pass filter and passes the L + R signals only to a matrixing network. The tuned plate circuit of the same cathode-follower filters and amplifies the 19,000 cps pilot carrier, feeding it to a second high gain amplifier (V_2). This in turn

synchronizes a 19,000 cps Hartley oscillator (V_3), whose double-tuned plate circuit filters out the 38,000 cps carrier required for the detection of the L-R sidebands. A band-pass filter connected to the second cathode-follower, permits only the L-R sidebands to reach grid No. 1 of the product-detector tube (V_4). At the detector output a sharp series-tuned filter removes the 38,000 cps carrier and only the demodulated L-R audio signals are passed to one arm of the resistive matrixing network. The other arm receives and R-L signal of equal amplitude through a wide-band phase inverter stage (V_4). The 75 μ s. de-emphasis network separating both sections of the balanced matrix equalizes the frequency response and removes any remainder of the 38,000 cps carrier. Careful alignment of all tuned circuits and correct setting of the balance control as well as the selection of close-tolerance parts will ensure equal levels and minimum phase shift between main and subcarrier modulation frequencies. This is of prime importance, because only 3 deg. of phase difference and ± 0.3 db of amplitude variations between the main channel signal and the subcarrier sideband envelope will result in not more than 29.7 db of separation. These, for example, are the values, which the F.C.C. requests all stations to maintain during stereo transmissions. It is only natural that the adaptor should not deteriorate the stereo separation.

A closer look at the schematic diagram, Fig. 3, reveals an interesting feature of the MPX-100. A front panel light, designated "Stereo Beacon," is lit whenever a station transmits a stereo program. Reverting back to the block diagram it can be seen that this light is

connected to a 19,000 cps amplifier and relay stage. The pilot carrier is transmitted only during stereo programs and activates a relay, which in turn switches on the light. The same switch also opens the L-R audio channel connected to the matrixing network. The advantages of this circuit are obvious. When tuning from station to station the lamp is lit only when a stereo program is on the air. There is no need to switch back and forth between mono and stereo positions on your amplifier and listen to the speakers, to determine the nature of a program. The switch, therefore, can be left in the FM-stereo position at all times and the MPX-100 will automatically provide the correct signal. During stereo transmissions, the light is on, the switch open and the L-R signals will reach the matrixing network, to form together with L+R signals the final L and R stereo information. During monophonic operation, because no pilot signal is present the relay is not activated the light is off, the L-R channel switch is closed, and only L+R monophonic signals will reach the output. But here one problem still remains. When tuning between stations, hiss and noise is high enough in amplitude to activate the relay in the same way as does the 19,000 cps pilot carrier. To prevent the relay amplifier from being affected by this noise, a portion of it is amplified in a stage, tuned to 100,000 cps, rectified and fed to a bridge circuit, where it blocks the relay tube completely. On station, the noise disappears and the voltage derived from the rectified 19,000 cps pilot carrier is high enough to unblock this stage.

A few more circuit refinements are incorporated in MPX-100. Feed-through
(Continued on page 102)

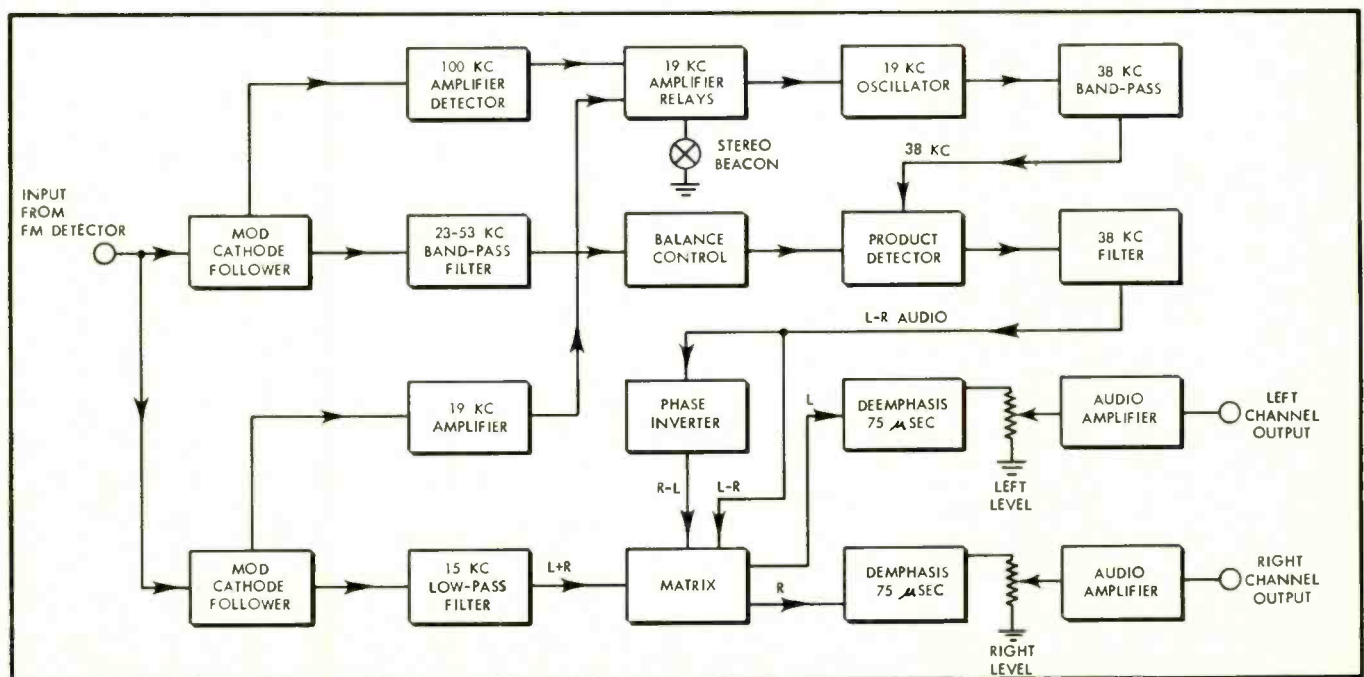


Fig. 4. Block diagram of MPX-100.

Filters For FM-Stereo

NORMAN H. CROWHURST*

When the regenerated subcarrier and the main carrier are rejoined in the FM-stereo decoder they must be in phase with each other within 3 degrees. In order to effect this, several of the filters and circuits must be phase-linear.

THE CHOICE OF SYSTEM for FM-stereo caught many people in the industry by surprise and, whichever variety of receiver circuit individual designers may fancy, they have been finding themselves in filter design problems, somewhat different from problems encountered before in audio circuitry. Of course, the basic design of a stereo adapter is audio, although the tuner end is r.f. But, given a wide-band tuner, that can demodulate the FM carrier linearly when it carries modulation frequencies up to 53,000 cps (without SCA subcarrier, or 75,000 cps with a subcarrier), the handling of that demodulated signal to reconstruct undistorted stereo is a problem in audio engineering.

Other articles have explained basic approaches used in receiver adapter circuits. What we are concerned with here is solving the various problems posed by the filters that will be needed. Audio engineers have long been familiar with crossover filters, and to some extent with band-pass, band-reject, and m-derived filters; but time delays, the requirement of phase-linearity and the phase adjustment of regenerated subcarriers is a new subject to them.

Time Delays

Time delays filters are needed to equalize for delays, either along lines, or in other filters. Delay filters to compensate for difference in the transmission time along lines, are a transmission man's headache, and need not be considered here. At the transmission end, the problem is simpler in one respect: the filter can be of standard form, using as many components, with whatever cost and precision, is necessary for the job. At the receiver, the cost of this kind of filter would price the receiver or adapter out of the market, so other methods are sought. Fortunately, as we shall see, phase compensation is relatively simple, once the basic requirements of phase linearity have been met.

Basic Design: Low-Pass Filter

Considering the low-pass filter first will clarify some of the issues involved, such as what is meant by phase linear and how to achieve it. Let's consider first

a simple "half-section" arrangement, as shown at Fig. 1. The half-section designation derives from classic filter design

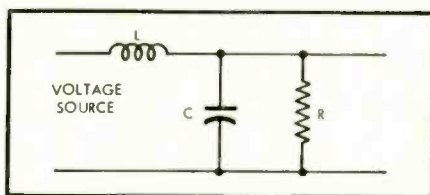


Fig. 1. Basic low-pass filter section, values for which are discussed in the text.

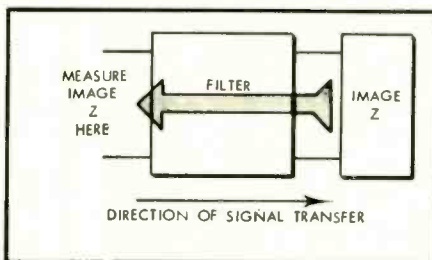


Fig. 2. Conventional filter design is based on a hypothetical image impedance, which is not a simple value; this means the results obtained are only approximate.

approach, using the *image impedance* concept. For such a filter to realize its theoretical response, it must be terminated at a specified end, say the output, with a theoretical impedance value; when this is done, the impedance reflected to the input terminals is an identical one (Fig. 2).

What is usually overlooked in this approach is that this image impedance is a resistance of *almost* constant value through the pass range, passing through zero or infinity (according to configuration) at cut-off frequency, to become a reactance in the rejection or attenuation range. Only by terminating such a filter with an impedance that fulfills this condition, would its calculated response be achieved.

This is usually overcome by terminating a filter with sections whose image impedance shows minimum deviation from constant up as close as possible to cutoff frequency, so that termination with a constant resistance will minimize deviation from calculated response. In effect, we finish up with a double approximation situation.

The approach is made much simpler

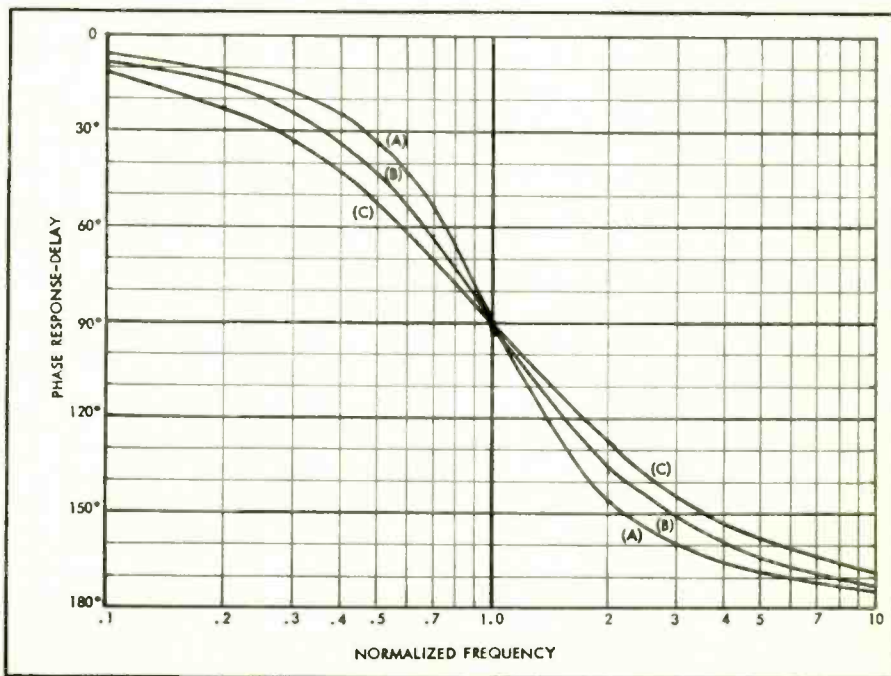


Fig. 3. Phase response of three low-pass filters, using the configuration of Fig. 1 with different values. At the reference frequency (cutoff) the reactance of L and C each is: Curve (A), equal to R; Curve (B), equal to 1.414 times R; Curve (C), equal to 2 times R.

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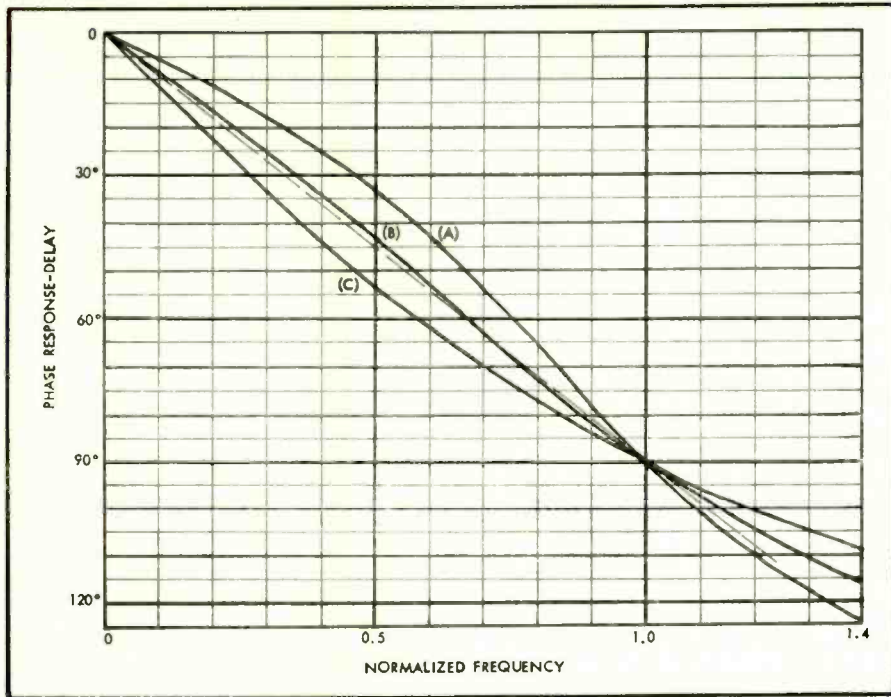


Fig. 4. Plotting phase response to linear frequency, as well as degree scale, shows how the values for curve (B) optimize phase-linearity up to cutoff frequency.

by being more direct. Instead of starting with an assumed terminating impedance which can never be realized, only approximated, we start with an assumed terminating resistance, which we can eventually put a value to, and get out of the resistor box.

First let's clarify what we mean by phase-linear. The usual response is plotted against the usual frequency scale, which is logarithmic. To these scales, any low-pass filter will have a curved "tangent-law" response, of the type shown at Fig. 3. The curves are for

three sets of values, each with the same 90 deg. phase reference frequency. At this frequency, the value of each reactance is identical and the relation to the terminating resistance at this frequency can identify differences in response. Curve (A) is for reactances each equal to terminating resistance at cutoff curve (B) is for the constant resistance case, where each reactance is $\sqrt{2}$ times the terminating resistance; curve (C) is for reactances each twice the terminating resistance.

Plotted this way, none of the phase re-

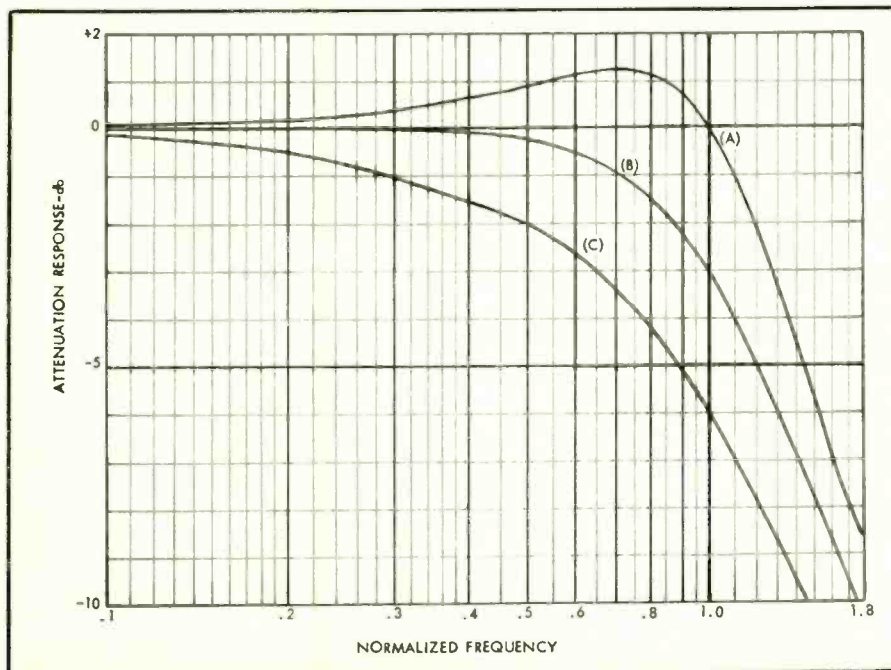


Fig. 5. Attenuation responses of filters using same values as for the phase responses of Figs. 3 and 4.

sponses is linear. But we are concerned with phase linearity from the viewpoint of the relations between various side-bands of a subcarrier, which are determined by their sum and difference from the subcarrier frequency. So we must use a linear frequency scale, if we want to represent corresponding pairs of side-bands as equidistant on either side of the subcarrier.

Replotting phase responses this way, we take the same three sets of values and the results are shown at Fig. 4. The corresponding amplitude or attenuation responses, using a db against log frequency scale, are shown at Fig. 5. Notice that the middle curve (B), using the so-called "constant-resistance" values, maintains maximum flatness up to the 3-db rolloff point (or cutoff frequency) and deviates from phase linearity by considerably

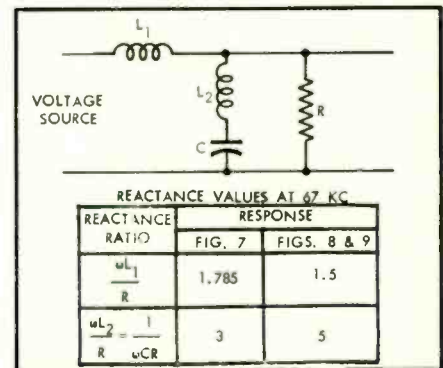


Fig. 6. Circuit of so-called m-derived filter configuration, used in this article to develop a phase-linear filter with a rejection frequency.

less than 2 deg. over the range from zero to cutoff frequency.

The phase linearity, as well as the attenuation response, deteriorates when this condition is deviated from. However, the fact that only three basic circuit elements are used, one of which is the terminating resistance, means that reasonable deviation, say by using 5 per cent values, will result in a filter that will easily stay within 3 deg. deviation from phase-linear.

Where the filter operates from a cathode follower into a resistance load many times the source resistance of the cathode follower these basic values can be used. Where the filter is interposed between two impedances, both of which must be regarded as finite for design purposes, these basic values need changing, in accordance with design data we have given elsewhere.

Low-Pass Filter, M-Derived

Some may criticize this designation of the next type of filter. The term "m-derived" has been applied to a good many ways of deriving a filter, which do not conform to the classic method, so we trust one more will be permitted. Our

reason for using the term is that the configuration is identical with the classic m-derived form (Fig. 6), but the values are very different.

The first step may be regarded as somewhat similar to m-derivation in concept. We use a value of series L identical with that for the constant resistance type filter and with the same cutoff frequency, in this case 53,000 cps, we select values for L_2 and C that will (a) resonate at the rejection frequency, in this case 67,000 cps, while (b) providing the correct capacitive reactance at cutoff frequency.

Plotting out the phase response of these values (Fig. 7), we find it to be reasonably phase linear up to about 45,000 cps, which is not quite good enough. Obviously what is needed is a narrowing down of the margin between the basic cutoff frequency and the maximum rejection frequency.

To change our approach slightly, since the definitive point of this configuration is really the maximum rejection frequency, we use it as the reference frequency for design. On this basis, 53,000 cps is 0.79 times the maximum rejection frequency. Using this technique, we have only two variables to explore:

- (1) the relationship between each 'rejection' reactance and the terminating resistance at rejection frequency;
- (2) the value of the additional series inductance.

Exploring various possibilities in this way, we find the combination shown in Fig. 8 gives a good approach to phase linearity, being well within 2 deg. up to the required cutoff frequency. The corresponding attenuation response is shown at Fig. 9. Notice that the values (Fig. 6) are such that exact adjustment is not necessary for at least acceptable performance. It is recommended that the rejection pair be carefully tuned to 67,000 cps, after which the series element can be within 5 or 10 per cent, without serious change in performance. What changes is phase slope, within this range, to a much greater extent than phase linearity. Phase slope can be compensated for by slight readjustment of the subcarrier reinsertion phase.

As with the low-pass circuit, this design assumes zero source impedance with finite load impedance of known (design) value. If both values are finite, which approach may well save a stage in some circuit configurations, the filter design is a little more involved, but follows the general method outlined here.

Band-Pass Filters

Now all we have to do is apply this to band-pass filters. Unfortunately, it's not that easy. Remember that a high-pass

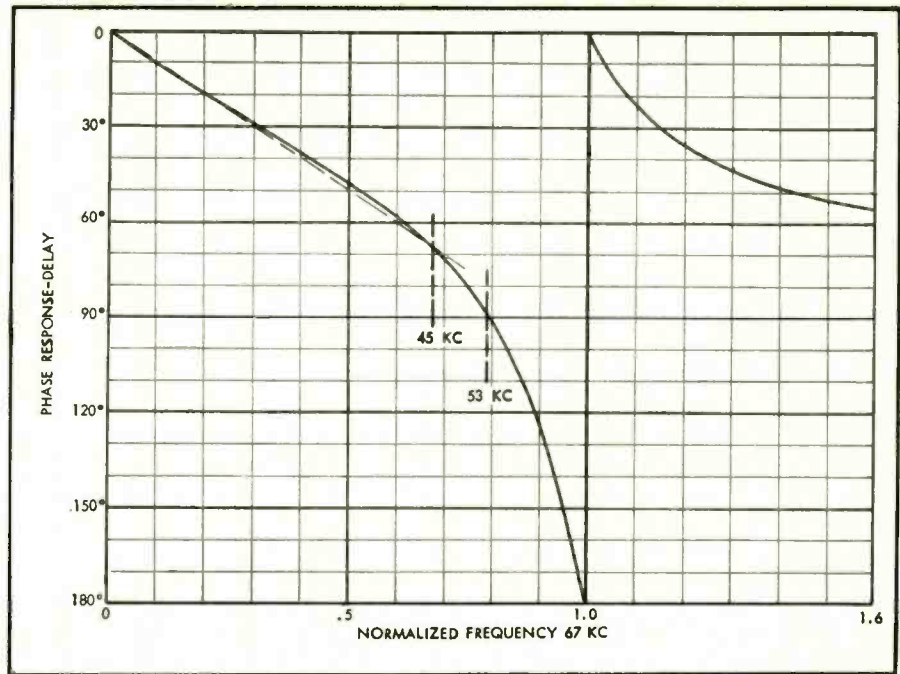


Fig. 7. Using a form of m-derivation from the constant-resistance values of Figs. 2 through 5, this is the phase response achieved.

filter always presents a phase advance, that is complementary to an equivalent low-pass filter, plotted to a logarithmic frequency scale, as at Fig. 2.

The combination of values that achieves such good phase linearity in a low-pass filter requires frequency to be plotted to an inverse scale for the phase response to look linear. To a linear scale, the rate of change is always greater nearer cutoff and falls away to zero at higher frequencies, approaching infinity.

A band-pass filter is essentially a combination of high-pass and low-pass action. In a narrow band-pass filter, the

range of absolute frequency is such that presentation on logarithmic, linear, or inverse law scale makes relatively little difference. Slight asymmetry in design could make the phase more nearly linear, if the departure is great enough to make the effort worth while.

But when the "carrier" is 38,000 cps, with sidebands from 23,000 to 53,000 cps, we are no longer narrow band. Only a linear frequency scale can provide 23,000 and 53,000 cps at equal distances from the 38,000 cps carrier. Some fudging might conceivably get phase linearity

(Continued on page 32)

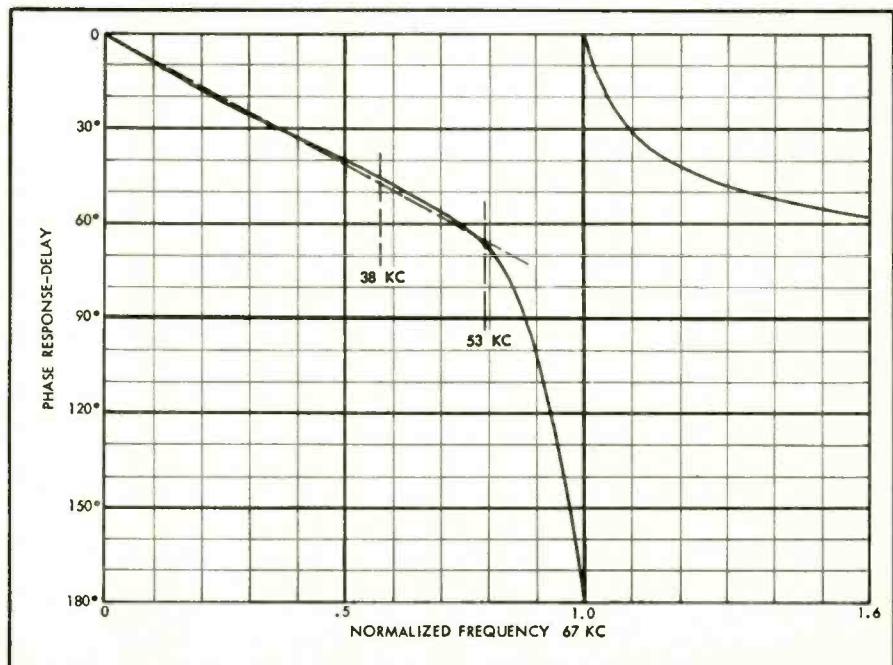


Fig. 8. Optimizing values for phase linearity over the desired range, this is the response achieved.

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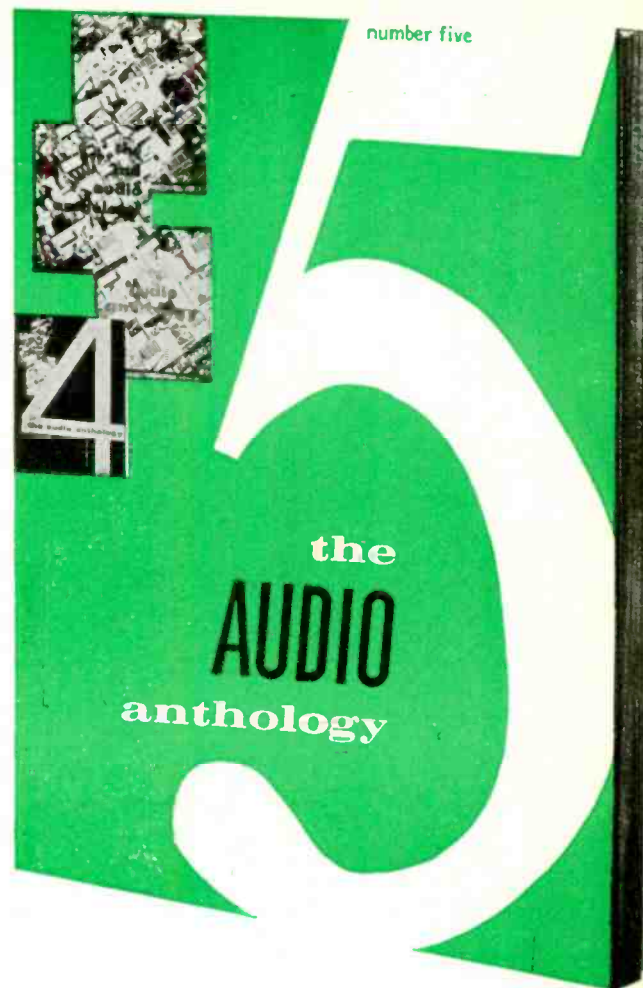
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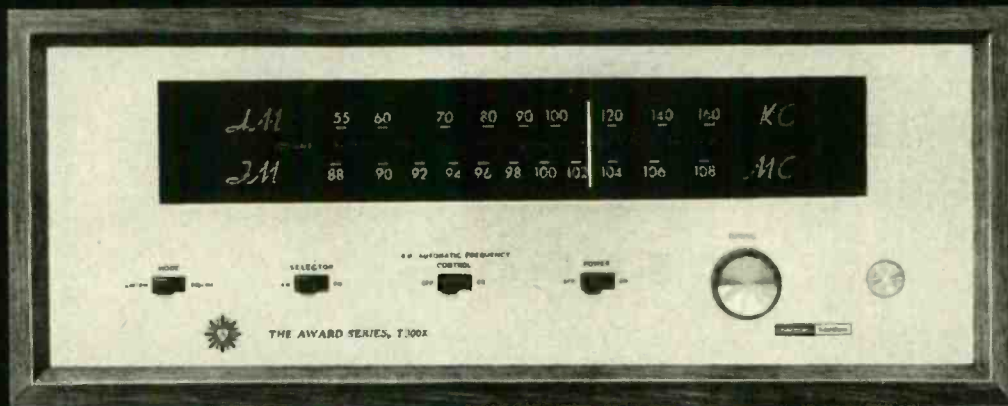
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The new T300X
Award Tuner
does not need
a multiplex
adapter



The T300X, AM/FM tuner, does not need a multiplex adapter. It has one. Right where it belongs—built-in. On the chassis and out of sight. The T300X is completely ready to receive multiplex (FM Stereo) broadcasts now.

What is the significance of multiplex? It represents a major technological advance in the technique of broadcasting. Now, for the first time, you can enjoy all of the color and genuine excitement of stereo with the fidelity that only FM can provide. And what a wonderful opportunity it presents for taping stereo selections right off the air.

The T300X is a striking example of Harman-Kardon's engineering leadership in the development of instruments for multiplex reception. It is designed with a wide-band Foster-Seeley discriminator and a 6BN6 limiter to insure freedom from distortion and noise. A total of 4 IF stages guarantee greater sensitivity. Automatic Frequency Control (AFC) with regulated voltage supply maintains oscillator stability regardless of line voltage variations. The T300X boasts superior impulse noise rejection plus uniform limiting and output at all signals. Here is a solid performer, rock stable and ideal for multiplex reception.

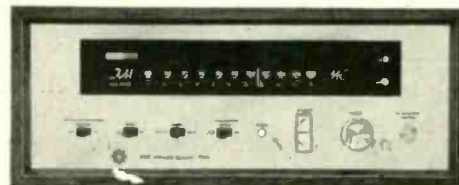
The T300X takes its place in the Award Series alongside the classic F500 tuner shown below. The F500 is a completely professional FM tuner designed with every provision for multiplex now or in the future. It has space on its chassis to accommodate the excellent MX500 wide-band, plug-in multiplex adapter. No spe-

cial controls are needed; no special adjustments. Just one simple connection converts the F500 into a completely integrated multiplex tuner.

Either tuner will provide outstanding performance with the Award amplifiers shown on the opposite page. Both are beautifully finished in brushed gold.

The T300X, AM/FM stereo multiplex tuner, is \$149.95; the F500, FM/multiplex tuner—\$129.95. The MX500 multiplex adapter for use with the F500—\$39.95. Optional enclosures, which fit both, include the CX50 (metal)—\$12.95 and the WW50 (walnut)—\$29.95. Prices are slightly higher in the West.

For complete information on the Award Series and other fine Harman-Kardon products write to Dept. A-8, Harman-Kardon, Plainview, N. Y.



harman kardon

The new A300
Award Amplifier
makes stereo
attractive and
inexpensive



The A300, 30 watt stereo amplifier, is a sparkling new addition to the widely acclaimed Award Series. Its strikingly handsome styling, professional features, solid performance and moderate price (\$99.95) make it clearly the best buy in a stereo amplifier.

It is designed with the same skill and precision reflected in the 50 watt A500—first of the great Award amplifiers. When the A500, shown below, was introduced it quickly established new performance standards for integrated stereo amplifiers. In its own power category, the A300 is certain to establish similar standards of excellence.

The A300 delivers 15 watts (Music Power) per channel with less than 1% distortion. Special grain-oriented cores in the output transformers provide wide-band response. At normal listening levels the frequency response is ± 1 db at 15 to 70,000 cps.

Its many features, unique for an amplifier in this price class, include: A zero to infinity balance control which permits balancing of speakers for virtually any listening position in the room; a variable blend control to eliminate undesirable "hole-in-the-middle" effect; ganged treble and bass tone controls provide 12 db boost and cut at 50 cycles and 10 db boost and cut at 10,000 cycles; dynamic loudness contour control; silicon diode power supply for excellent B+ regulation; RIAA phono and NARTB tape equalization controls; two tape outputs (after tone and loudness

controls) for recording; illuminated push-button on/off switch which permits unit to be turned on and off without upsetting carefully pre-set controls; stereo reverse/normal switch and rumble filter.

The A300 and A500 will perform superbly with either of the Award tuners shown on the opposite page. Both instruments are handsomely finished in brushed gold.

The A300 is \$99.95; the A500—\$159.95. Optional enclosures, which fit both, include the CX50 (metal)—\$12.95 and the WW50 (walnut)—\$29.95. Prices are slightly higher in the West.

For complete information on the Award Series and other fine Harman-Kardon products write to Dept. A-8, Harman-Kardon, Plainview, N. Y.



harman kardon

(Continued from page 28)

down to two "bites" of equal slope, but it could never achieve full linearity from 23,000 to 53,000 cps.

The band-pass filter has been "needed" to separate the subcarrier sidebands from the main or sum channel. If this matrixing method is used at the transmitter, no such filter is required. Maybe low-pass filters are used to ensure that the audio contains nothing above 15,000 cps, to cause interference between main channel and subcarrier sidebands. But the actual matrix needs no selective filters. So why should the second (reception) matrix need them? A little further thought reveals that it doesn't.

If we consider the composite of frequencies fed to the subcarrier detector, after reinserting the subcarrier, we have: 50-15,000 cps, main channel information; 23,000-38,000 cps, subcarrier lower sidebands; 38,000 cps subcarrier, which should be the biggest single component at this point; and 38,000-53,000 cps, subcarrier upper sidebands. (Fig. 10). If this is demodulated after the manner of an ordinary AM carrier, only the lower and upper sidebands will come out in the audio range; the 50-15,000 cps will be equivalent to asymmetric sidebands for modulation frequencies of 23,000-38,000 cps (inverted).

It's just as if an adjacent carrier of zero frequency carried this sideband. The separation of 38,000 cps between carriers ensures the sidebands of one are ultrasonic in the demodulation of the other.

There's just one snag: using ground reference, the detector gets the full 50-15,000 cps audio, unless there's a band-pass filter, without being able to tell it's

supposed to be related to a 38,000 cps carrier. In short, the presence of the 50-15,000 cps will act as variable bias on the detectors in handling the 38,000 cps and its sidebands.

But this is not difficult to overcome: the detector load needs unhooking from ground, so the proper bias can be inserted. In other words, the whole detector circuit "floats" at the main audio waveform (Fig. 11). There are undoubtedly other ways of doing this, but this illustrates the general method. Now we don't

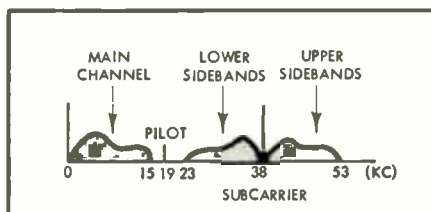


Fig. 10. Audio spectrum of demodulated stereo program; the main channel, as sideband of the subcarrier, is ultrasonic.

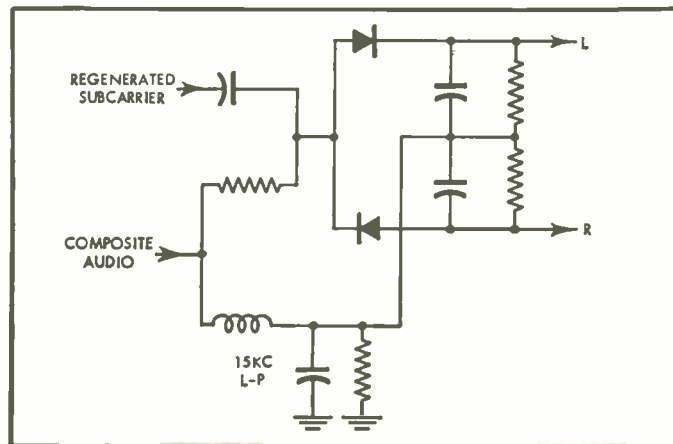


Fig. 11. A method of connecting the difference detector that avoids the need for a band-pass filter and makes matrixing more efficient.

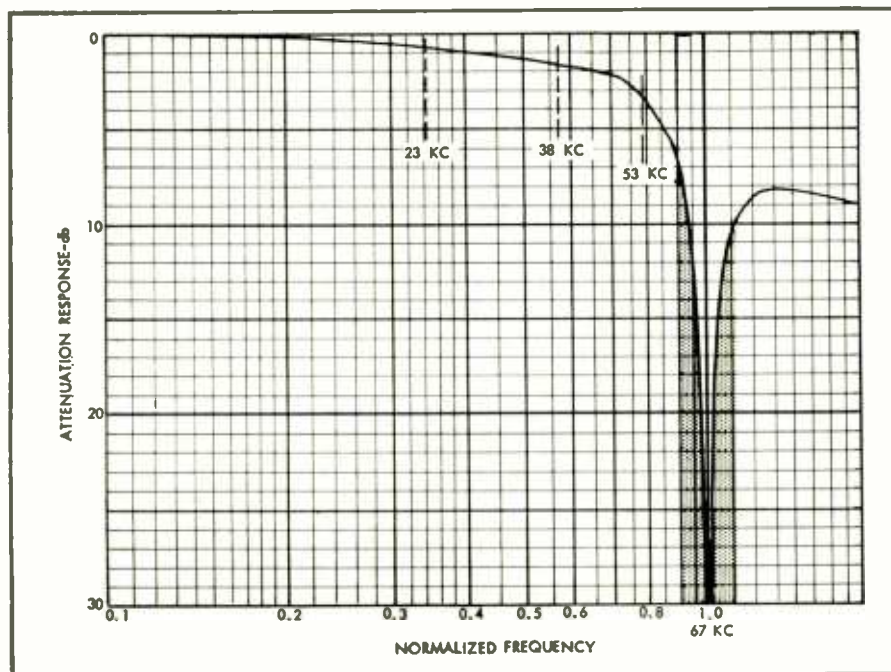


Fig. 9. Attenuation response of the filter whose phase response is shown in Fig. 8. Shaded area represents the maximum excursion an SCA subcarrier may make.

need the conflicting phase slope that is inevitable with a wide-band band-pass filter.

Relative Phase on Second Matrix

If phase linearity is maintained, the relative phase, between sum and difference, is simple to correct. The carrier needs inserting at the correct phase, along the phase slope of the sidebands (Fig. 8), so that a flat output, free from distortion, is obtained. Now the bigger time delay will be in the sum channel, which is equivalent to 90 deg. at 15,000 cps, or $16\frac{2}{3}$ microseconds (due to the 15,000 cps, phase-linear low-pass filter, Fig. 3).

If the m-derived filter is in the sidebands channel after the take-off point for the 15,000 cps low-pass, this will introduce a delay of almost exactly 45 deg. at 38,000 cps (Fig. 8) or 3.3 microseconds. So, depending on the location of the m-derived filter, the demodulator needs to introduce a delay of $16\frac{2}{3}$ or

13.3 microseconds, which can easily be arranged by means of the "r.f." (in this case 38,000 cps and harmonics) filtering and its time constant.

As there is a nice wide gap between the residual subcarrier components to be eliminated and the highest audio—15,000 cps—simple R-C combinations can care for this time delay and filtering (Fig. 12).

Subcarrier Phase

This part is more a practical item than a basic design item, but it's related to the rest of this problem, so here it is. Each way of regenerating the subcarrier will have slightly different methods of adjusting the phase to meet the requirements of the rest of the circuit.

Where the pilot frequency is just isolated and frequency doubled, extremely good isolation (with a high-Q circuit) is essential, so the tuning of the pilot frequency circuit should not be changed appreciably. In this case, probably the best compromise is to effect part of the phase compensation at 19,000 cps and

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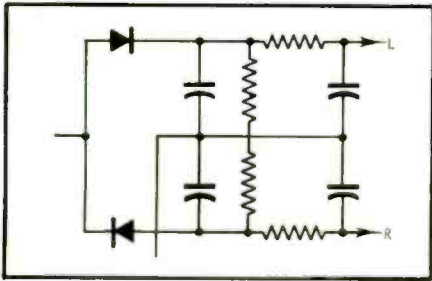


Fig. 12. Additional filtering of the subcarrier (as shown here), can, by correct choice of values (see text), correct for delay difference between sum and difference channels.

part after doubling, at 38,000 cps, because serious detuning of the 38,000 cps subcarrier can result in either asymmetry or distortion of the regenerated subcarrier.

Where the circuit uses a pilot-frequency oscillator, locked to the incoming pilot, slight adjustment of the

free-running pilot oscillator frequency gives good control of phase. The doubler is then left tuned to exactly 38,000 cps. Detuning it would only have slight effect on phase anyway.

Where the circuit uses a subcarrier oscillator, synchronized by the pilot frequency, appreciable shift of the 38,000 cps free-running frequency is not desirable, because it will result in inequality of alternate cycles of subcarrier, even if the pilot holds it. Slight detuning of the 19,000 cps pilot will do the best job, by changing the point at which the (true) 38,000 cps is locked.

Frequency Doubling

Some spurious components can be eliminated from the output by removing all of the 19,000 cps from the regenerated subcarrier. A simple tuned circuit will never do a perfect job. A relatively simple circuit that will is shown at Fig. 13. The 19,000 cps oscillator plate cur-

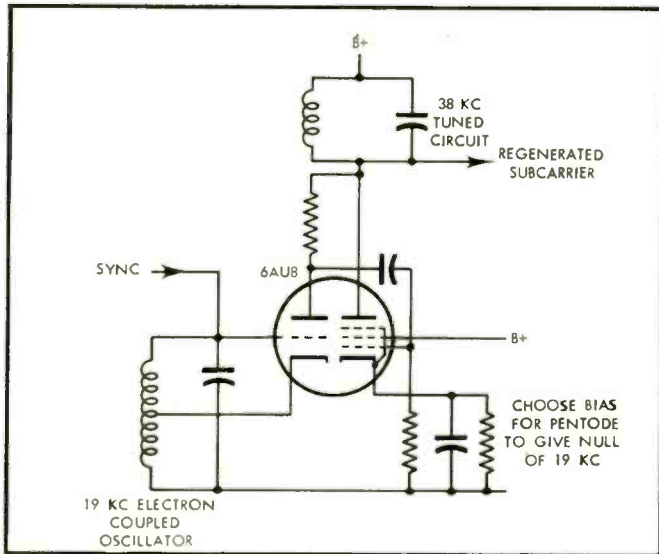


Fig. 13. A refined frequency-doubling circuit, that allows the 19,000-cps pilot to be completely nulled out.

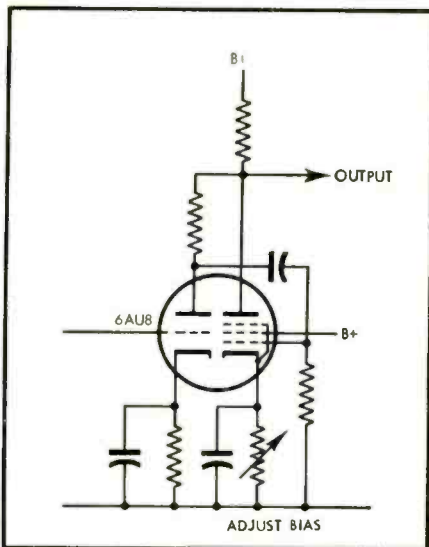
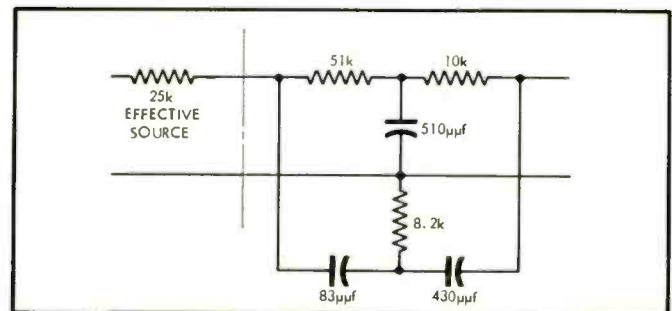


Fig. 14. With resistance coupling, the circuit of Fig. 13 will frequency-double any signal, and null out the input fundamental.

rent is drawn through the 38,000 cps tuned circuit in such phase as to neutralize the amplifier 19,000 cps component due to the doubler stage (pentode).

Careful adjustment of values (operating voltages and coupling values) can make this circuit produce almost pure second harmonic with no tuned circuits at all (Fig. 14). When a tuned circuit is used as common plate load, virtually complete rejection is possible with relatively uncritical setting.

Fig. 15. A useful asymmetrical twin-T filter that achieves deemphasis and 38,000-cps band rejection in the same circuit.



Output Filtering

By now, many will have discovered that the output, even with deemphasis, contains appreciable signal at 38,000 cps and its sidebands, which can be troublesome, if you want to tape record, particularly. A broad resonant circuit does not produce particularly good rejection. A narrow one, or a conventional twin-T filter, only takes the 38,000 cps and leaves most of its sidebands.

A very neat solution is a special twin-T that incorporates the deemphasis as well, provides a wide, deep null over the 38,000 cps region and requires values that are not nearly as critical as the normal twin-T circuit (Fig. 15).

Correct deemphasis is achieved by adjusting the total series source resistance (including matrix or diode load elements in their series-parallel arrangement) to an impedance (resistive) of 25,000 ohms for the values shown in the twin-T. Other values can be used if different circuit values have to be matched. In the original twin-T network design, the ideal values would be $a/c=7.5$, $b/c=1.15$. Using values $a/c=.6$, $b/c=1.2$ allows for some series source resistance.

The great advantage of this circuit is that all values are relatively non-critical. Changing any pair of values by 5 per cent retains a rejection of better than 40 db. In fact when this filter is used, it is found that there are second harmonics of 38,000 cps present, that were completely masked by the much larger 38,000 cps component previously.

If the 76,000 cps components should prove troublesome, these can be removed by additional R and C , using modified values so this can be part of the deemphasis too, and thus obtain some 30 db rejection of 76,000 cps. If more or better rejection is wanted, a similar twin-T design can be used, centered on 76,000 cps, with even greater latitude in tolerances.

This article has given the basic design data or approach, rather than completing any individual circuit design. This can be applied to any of the adapter circuits where such filtering is needed, by using the normalized design factors we have given, in whatever arrangement appeals to the individual designer. AE



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PRODUCT PREVIEW SECTION

Along about this time of year, the serious audiofan begins to think about improvements—converting to FM-stereo, adding a tape recorder, or whatever. So that he may have an advance glimpse of the new merchandise which will be available with the start of the traditional buying season, we present the Annual Product Preview Section.

WITH SOME TWO HUNDRED separate items, along with prices of many more items which are not described, the third Annual Product Preview is considerably larger than last year's, and is—we believe—more complete. In most instances, a single product is described in each category from each manufacturer. In some cases, this may be the only product of that manufacturer. When the manufacturer offers a wide variety of items—as do, for example, those who make loudspeakers—it is obviously impossible to list everything. However, for more complete data, it is suggested that the reader write the manufacturer directly—or to us—for specific information. Because of the large number of manufacturers represented in this section, they are not coded in the usual fashion on the Readers' Service Card. If the manufacturers of interest happens to advertise in this issue, you may use the card and encircle the corresponding number. If there is room, you may write the name of any non-advertisers on the card and mail it. We will forward

them your requests for further information.

Any compilation of this type is subject to omissions and errors. Any manufacturer not herein represented may be considered to have: (1), not been asked for information (our mistake); (2), the information was mislaid (ours again); or (3), he didn't send it (his). If we find enough such omissions, we shall try to fill in later. Since this is a catalog-type presentation, it must be pointed out that the statements made about the various products are the specifications as furnished by the manufacturer and are not the results of our own measurements or tests. Also prices may vary slightly between East and West (and vice versa).

We are sincerely grateful for the co-operation given us by all the manufacturers represented and by their advertising agencies. Without their concerted help we could not have prepared this material. We trust you will find it interesting and informative throughout the year.

AMPLIFIERS AND PREAMPLIFIERS

ACRO

● **120-Watt Amplifier Kit.** Adding to its already well-known line of amplifier kits Acro introduces the Stereo 120, which provides an output of 120 watts (60 watts per channel). Incorporating printed circuits, the Stereo 120 is exceptionally easy to construct and provides performance equal to the laboratory model. Claimed to be the first commercially available amplifier which combines ultra-linear operation with hybrid



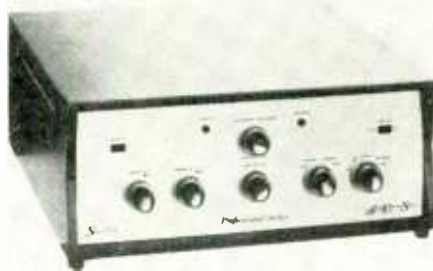
feedback for unusually low distortion and high stability. Intermodulation distortion is less than 1 per cent at 60 watts and less than 0.5 per cent at 50 watts output. Variable damping is provided on each channel for optimum speaker performance. Illuminated meter is provided for bias adjustment and circuit check. Price for the kit, including protective cover, is \$159.50. Acro Products Company, 369 Shurs Lane, Philadelphia 28, Pa.

Ultra-Linear II 60-w pwr ampl kit .. \$79.50
Stereo preamp kit 69.50

A.E.S.

● **50-Watt Stereo Amplifier.** Featuring jewelled lights to clearly indicate the stereophonic or monophonic setting of the mode

switch, the A.E.S. Model 225 amplifier has a solid heavy-brass front panel which may be mounted in its own cabinet, or separately mounted for custom installations. Frequency



response is stated as 20-30,000 cps plus or minus 0.5 db, with harmonic distortion less than 1 per cent at maximum output per channel. Intermodulation distortion is less than 0.5 per cent at normal listening levels. Channel separation is over 50 db. A.E.S., Inc., 3338 Payne Ave., Cleveland 14, Ohio. User net price \$159.50 (f.o.b. factory).

ALTEC

● **Stereo Amplifier-Preamplifier.** The Altec-Lansing Model 353-A, is a complete amplifying

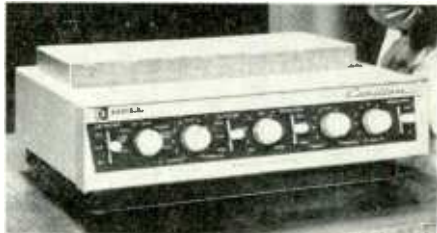


system, embodying two 25-watt stereo channels which may be combined for 50-watt

monophonic operation when desired. Among its features is a matrixing network for "three-channel" stereo. Circuitry includes feedback-type equalization plus feedback around all tubes for minimum distortion. All low-level tubes have d.c. on heaters. Fourteen inputs include two each for magnetic cartridge, ceramic cartridge, tape head, tape recorder, tuner, microphone, and multiplex. Frequency response is 20 to 20,000 cps \pm 1.0 db at 25-watts output; 10 to 30,000 cps \pm 0.5 db at 10 watts. Harmonic distortion is less than 1.0 per cent. Tone controls are ganged and provide 14 db of boost or cut at 50 and 10,000 cps. Rumble filter attenuates at the rate of 12 db/octave below 30 cps. Silicon rectifiers are used in power supply. Engineered to the professional standards of the Altec-Lansing equipment, the 353-A meets every criterion of the most discerning music lover. Altec Lansing Corporation, 1515 S. Manchester Ave., Anaheim, Calif. User net price, \$225.00.
345 60-w stereo ampl \$245.00
445A stereo preamp 189.00

BELL

● **Stereo Amplifier.** Developed for stereo from input to output, the Bell "Carillon" Model



6060 is conservatively rated at 30 watts output for each channel, with 60 watts of monophonic power available when needed. Frequency response is stated by the manufacturer to be 15 to 30,000 cps \pm 1.0 db. Hum level is 71 db below rated output. All operating controls of the 6060 are conveniently located

across the front panel. Bass controls permit 15 db rise and 18 db droop at 50 cps; treble controls afford 9 db rise and 18 db droop at 10,000 cps. Also located on the front panel are four lever-type switches which provide high- and low-frequency filter cutoff to eliminate hiss and rumble, stereo function control, and speaker selection for stereo in more than one room. A separate balance control adjusts the volume level between two stereo speakers. Continuously-variable loudness control compensates for bass and treble at low listening levels. Dial frame is extruded aluminum, while the panel has all the lettering etched for clarity. Vinyl tan cover is set off by the perforated thermal duct which provides ventilation. Bell Sound Division, Thompson Ramo Wooldridge Inc., 555 Marion Road, Columbus 7, Ohio. User net price, \$219.95.

2418 30-w ster ampl	.....	\$109.95
2420 34-w ster ampl	.....	129.95
2440 44-w ster ampl	.....	179.95

BOGEN

• **44-Watt Stereo Amplifier.** Designed to control all stereo sources—FM, AM, FM-stereo, tape recorder, phono or auxiliary, the Bogen AP-200 is a 44-watt stereo amplifier (22 watts per channel) which is one of the new "fun couple" series inspired by the novel "The Fun Couple." by John Haase. This series of components is matched in appearance and in performance to provide maxi-



mum efficiency from each unit in the series. Frequency response of the AP-200 is within 1 db from 20 cps to 20,000 cps. Distortion is 0.6 per cent at rated output. Hum and noise level is 60 db down at magnetic input, and 70 db down at the auxiliary and tuner inputs. Output impedance is 4, 8, 16, and 32 ohms. The front panel contains a coaxial volume control, treble and bass controls, and mode and input selectors; and five switches, rumble filter, scratch filter, loudness contour, tape monitor, and power. Bogen-Presto, a Div. of the Slegler Corporation, P. O. Box 500, Paramus, N.J. User net price \$154.95, walnut cabinet \$24.75, metal enclosure \$11.95.

AP-60 66-w ster ampl	\$249.95
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DYNAKIT

• **Stereo Preamplifier.** Available in both wired and kit form, the new Dynakit Model PAS-2 is a deluxe stereo control unit which features unusual versatility and flexibility, along with exceptionally low distortion and noise. Although as many as 7 stereo or 14 monophonic inputs can be utilized, the PAS-2 is simple in operation and uncomplicated in appearance. Construction of the instrument from the kit is greatly simplified by the use

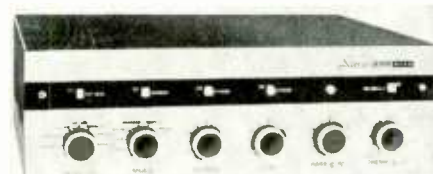


of two factory assembled, printed circuit boards, which include about three-quarters of the components. Average construction time is approximately eight hours. The built-in power supply enables operation with any power amplifier. Frequency response of the PAS-2 is 10 cps to 30,000 cps, plus or minus 0.5 db. Intermodulation distortion is below 0.05 per cent at sufficient output to drive an amplifier. Equalization characteristics are

closely controlled through the use of components of one-per-cent tolerance in the critical network. Dynaco, Inc., 3916 Powelton Ave., Philadelphia 4, Pa. User net price for the kit \$59.95, factory wired \$99.95.

EICO

• **Integrated Stereo Amplifiers.** Two new integrated stereo amplifiers, the 70-watt ST70 and the 40-watt ST40 (shown), have been introduced by Eico. Both amplifiers are able to handle any stereo program source: FM and/or AM radio, FM-stereo, magnetic cartridge, ceramic or crystal cartridge, tape head, or preamplified tape. Controls include selector switch, tape monitor switch, separate level and balance controls, balance check switch, scratch and rumble filters, loudness-level switch, and individual feedback-type bass and

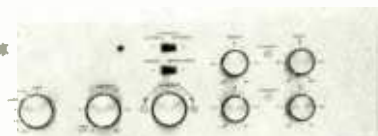


treble tone controls for each channel. The ST70 has, in addition, a tape-speed equalizer and a speaker phase-reversal switch. Frequency response of the ST70 is stated as plus or minus 1/2 db from 10 to 50,000 cps and harmonic distortion is less than 1 per cent from 25 to 20,000 cps. The dual power amplifiers of the ST40 are Williamson-type circuits employing voltage amplifiers and split-load phase inverters driving the output stage. Frequency response of the ST40 is stated to be plus or minus 1/2 db from 12 to 25,000 cps; harmonic distortion is less than 1 per cent from 40 to 20,000 cps. The ST70 sells for \$94.95 in kit form, \$149.95 wired. The ST40 sells for \$79.95 in kit form, \$124.95 wired. All prices include metal cover. Eico Electronic Instrument Co., Inc., 33-00 Northern Blvd., L.I.C. 1, N. Y.

HF85 ster preamp kit	.....	\$39.95
HF86 28-w ster ampl kit	.....	43.95
HF89 100-w ster ampl kit	.....	99.50

ERIC

• **40-Watt Stereo Amp and Control Center.** Intended to serve as a complete audio control center and 20-watt stereo amplifier, the Eric Model 3160-T uses two pairs of EL84/6BQ5's in the output stages. It features a transistorized preamplifier for magnetic cartridges, thus reducing hum and microphonics. Each channel has its own separate, calibrated (in db), bass and treble controls. Harmonic distortion at maximum power output is 1 per cent



per channel. Intermodulation distortion is 0.4 per cent at 17-watts output. Frequency response is 20-20,000 cps plus or minus 1 db at "normal" listening level. Hum level is 70 db below 2 watts. Panel dimensions are 13 3/4" x 4 5/16", depth is 10" excluding knobs. The panel comes in an attractive satin-gold finish. Eric Electronics Corp., 1823 Colorado Ave., Santa Monica, Calif. User net price \$106.20 (prices in East slightly higher).

3460P 10-w ster ampl	.....	\$ 80.00
3560T ster ampl	.....	149.95

FISHER

• **110-Watt Stereo Master Control Amplifier.** The Fisher X-1000 is a 110-watt stereophonic control amplifier designed for use in home installations incorporating the very finest equipment. Designed to the very highest technical specifications without restriction as to cost, the X-1000 incorporates a number of valuable new controls and control functions in addition to the full range of con-

trols to be found on previous audio control units. Special features include a newly developed tape monitoring system with an internal switching system enabling the tape recorder owner to employ the entire range of controls during playback, and still be able to monitor his tapes while recording. The X-1000 has complete facilities for center channel operation; center-channel speaker output; and a front-panel control which enables the user to turn off the center speaker without affecting the other two channels. Other special features are: stereo dimension control; built-in reverbation control; front-panel level controls for low level input. The amplifier section employs two pairs of matched EL-34's, and two 16 1/2-lb. output transformers of grain-oriented steel. The X-1000 is stable and is free from ringing under all loading conditions. Additional features include: earphone connections; rear panel input for remote control; total of 18 inputs; 3 outputs for loudspeakers; 8 outputs for other associated components; 5 jeweled lights across the front panel for clearly visible indication of mode of operation; extremely steep low- and high-pass filters; front-panel phase-reverse and loudness-



contour switches. The X-1000 has 3 d.c. power supplies. Harmonic distortion at 110-watts music power is 0.5 per cent; intermodulation distortion at 100-watts r.m.s. is 0.8 per cent; over-all frequency response is 20 to 20,000 cps plus or minus 0.5 db. The X-1000 has a handsome brass front panel. Fisher Radio Corp., 21-21 44th Drive, L. I. C. 1, N. Y. User net price is \$329.50.

X-100 36-W ster ampl-preamp	....	\$159.50
X-101 B 52-W ster ampl-preamp	....	189.50
X-202 B 75-W ster ampl-preamp	....	249.50
400-CX ster preamp	.....	199.50
SA-300 B 90-W ster ampl	.....	199.50

GROMMES

• **Stereophonic Amplifier.** The new Grommes 361PG is a stereophonic/monophonic preamplifier and 30-watt power amplifier all in one compact unit. Featuring ganged controls, two separate loudness contours, sum-signal speaker output, and silicon rectifiers, frequency response is ± 0.5 db, 20 to 20,000 cps at 1 watt. Harmonic distortion is 0.06% at 15 watts (1000 cps) and intermodulation distortion is 2% at 15 watts. Hum and noise



are 75 db down at the tuner input and 50 db down at the phono input (below 15 watts). Sufficient controls are provided to achieve wide range of adjustments. Sensitivity at the Aux and tuner inputs is 0.4 volt; magnetic phono 0.004 volt; tape head .0045; crystal phono 0.25 volt for rated output. Precision Electronics, Inc., 9101 King St., Franklin Park, Illinois. User net price, \$189.95, cover \$10.00.

LJ8 10-w mono ampl	.....	\$44.95
24LJ 20-w ster ampl	.....	89.95

HARMAN-KARDON

• **30-Watt Stereo Amplifier.** The latest addition to the Award Series is the Harman-

Kardon Model A-300, a 30-watt stereo amplifier. Although moderately priced, its styling and features clearly show its family resemblance to the more elaborate members of the Award Series. Among the features which make this unit so versatile are: a zero-to-infinity balance control which permits either speaker to be completely cut off so that the system may be balanced for virtually any position in the room; continuously variable blend control; ganged treble and bass control which provide 12-db boost and cut at 50 cps.



and 10-db boost and cut at 10,000 cps, illuminated pushbutton on/off switch. Other features include: stereo reverse/normal switch; rumble filters; dynamic contour controls; phono-RIAA and tape-NARTB equalization; two tape outputs for recording. Special grain-oriented high-permeability cores in the output transformers provide wide-band response. At normal listening levels the frequency response is plus or minus 1 db from 15 to 70,000 cps. The A-300 delivers 15-watts (music power) per channel at less than 1 per cent distortion. The price of the A-300 is \$99.95. Harman-Kardon, Plainview, N. Y.

A-500 50-w ster ampl	.....	\$159.95
CIT I ster preamp kit	.....	159.95
CIT II 120-w ster pwr ampl kit	.....	159.95
CIT IV ster preamp kit	.....	119.95
CIT V 80-w ster pwr ampl kit	.....	119.95

KNIGHT

● **All Transistor 36-Watt Stereo Amplifier.** The Knight KN-400B is a 36-watt stereo amplifier which takes advantage of the rapid growth of transistor technology. It can be run continuously for extremely long periods of time without getting hot and it consumes an extremely small amount of power—only 25 ma when operating at normal levels, and



no more than 2 amps at full output. It will not be damaged if accidentally operated with no speaker connected to it. HiFM music power rating is 36 watts; frequency response is 20-20,000 cps, plus or minus 0.5 db; IM distortion is 0.9 per cent at rated output; harmonic distortion is 0.5 per cent at rated output. It employs 18 transistors and 7 diodes; no output transformers are used. Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. User net price \$99.50. Allied also has an extensive line of tube amplifiers and preamplifiers at all price levels.

LAFAYETTE

● **100-Watt Basic Stereo Amplifier Kit.** In keeping with the current trend towards quality, the Lafayette KT-550 Stereo Amplifier Kit achieves sound reproducing capabilities far in excess of the audible range—plus 0, minus 1 db from 2 to 100,000 cps. Utilizing multiple feedback loops, the KT-550 achieves extremely low distortion without evidence of ringing or instability. Total harmonic distortion is less than 0.5 per cent at 50 watts from 20 to 20,000 cps. Hum and noise are better than 90 db below 50 watts. Although rated at 70 watts the 7027-A output tubes are required to deliver only 50 watts thus ensuring long tube life. Other features include telephone grade electrolytics; very high quality capacitors; deposited metal-

film, glass-core resistors; two printed-circuit boards; and a step-by-step instruction manual with large pictorial illustrations. The KT-550 sells for \$134.50 and is available in

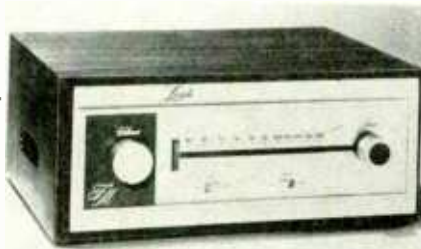


a factory-wired version, LA-550, at \$184.50. Lafayette Radio Corp., 165 08 Liberty Ave., Jamaica 33, N. Y.

KT-600A ster preamp kit	.....	\$34.50
LA-250A 50-w ster ampl	.....	99.50
LA-240 40-w ster ampl	.....	79.95

LEAK

● **Newly-Styled "Point One" Stereo Preamp.** Impressive new styling enhances the appearance of the latest version of the well-known Leak "Point One" stereo preamplifier. Decorator-designed, the new front panel offers changeable color panels for both faceplate and knobs, enabling the user to match the decor of any room. The new escutcheon plate is interchangeable with the present one, permitting present owners the option of inexpensive conversion to the new styling. The "Point One" includes provisions for playing stereo, stereo reverse, left channel only, right channel only, and monophonically. There are



five dual inputs for virtually any type of stereo or monophonic source, including microphone. Bass and treble controls permit boost and cut of 16 db at 30 and 15,000 cps, respectively. All controls are of the dual-ganged type, operative on both channels simultaneously. Distortion is less than 0.1 per cent for 1.25-volt output. A balance control allows for a great difference in sensitivity between speakers. This new unit has been expressly matched to all Leak power amplifiers. British Industries Corporation, 80 Shore Road, Port Washington, N. Y. User net price, less cabinet, \$119.50.

Ster 50 ster ampl	.....	\$199.00
Ster 20 ster ampl	.....	149.00

McINTOSH

● **Stereo Preamplifier-Control.** Designed as the Model C-20 Stereo Compensator, this McIntosh development is designed for the music lover who insists on the nearest possible approach to perfection. Full stereo flexibility is provided plus built-in protection of the user's investment in monophonic records. Frequency response is 20 to 20,000 cps \pm 0.5 db. Distortion is under 0.2 per cent at rated output over the entire frequency range. High-level input hum and noise level is 85 db below rated output of 2.5 volts. Six-position mode selector includes: stereo; stereo reverse; left channel on left speaker only; right channel on right speaker only; left channel on both speakers, and right channel on both speakers. For monophonic operation, the C-20 internally parallels and decouples a stereo phono cartridge to provide best possible reproduction from monophonic records. A 2-position high-frequency cut-off control (9 and 5 kc) is

provided for suppressing hiss. Rumble filter rejects low-frequency noise. Treble control provides 13 db boost and 18 db attenuation at 20,000 cps; bass control provides 16 db boost and 20 db attenuation at 20 cps. Fletcher-Munson-type "aural compensation"



control is continuously variable. The C-20 matches its impressive performance with handsome appearance. McIntosh Laboratory, Inc., 4 Chambers St., Binghamton, N. Y. User net price, 0234.00

MC-240 80-w ster ampl	.....	\$288.50
MC-60 60-w pwr ampl	.....	219.00
MC-30 30-w pwr ampl	.....	153.00

MARANTZ

● **70-Watt Amplifier.** A luxurious instrument by any standards, the Marantz Model 9 achieves an unusually high order of construction, quality, and reliability. Instrument-type precision construction is used throughout. The circuit is assembled on a rigid, heavy-duty, terminal board with machined, silver-plated, turret terminals. All wiring is neatly cabled. One of the unusual features of the Model 9 is the built-in test section. Incorporated in the instrument are complete facilities for self-testing and balancing of output tubes. The test circuit includes five screwdriver adjustments, a seven-position test switch, and an accurately calibrated d'Arsonval meter. Simple adjustments eliminate the need for matched output tubes.



Frequency response at full rated power is within 0.1 db from 20 cps to 20,000 cps; within 1 db, 10 cps to 40,000 cps. Harmonic distortion at full rated power is less than 0.1 per cent at mid-range frequencies; less than 0.3 per cent at 20 cps; less than 0.5 per cent at 20,000 cps. Intermodulation distortion is less than 0.5 per cent. Hum and noise are better than 90 db below 70 watts. Damping factor is seventeen and may be changed internally. It is supplied with a handsome heavy-metal front panel, with precision machined knobs. Marantz Company, 2514 Broadway, Long Island City 6, N. Y. User net price \$324.00 (slightly higher in West).

7 ster audio console	.....	\$245.00
8 60-W ster pwr ampl	.....	237.00

NEUMANN

● **Professional Stereo Playback Preamplifier.** Normally supplied as standard equipment with the Teldec stereo record cutting system, the Neumann WV-2 stereo playback preamplifier is now available for high fidelity applications as a stereo preamplifier. Premium non-microphonic 10,000-hour tubes are included within the advanced circuitry of the WV-2. A fully shielded dual input transformer provides a perfect impedance match for the Neumann DST stereo cartridge. Two low-impedance inputs are relay selectable. A low-impedance output insures compatibility with any existing power amplifier. Amplification

NO TOOLS... NO CONTROLS... NO SWITCHES... NO PROBLEMS...

FM MULTIPLEX RECEPTION AUTOMATICALLY WITH AMAZING PILOT 200



THE AUTOMATIC ANSWER TO FM MULTIPLEX RECEPTION—THE PILOT 200 MULTIPLEXER

The great beauty of stereophonic music till now has been confined to records or tape. NOW, with the Federal Communications Commission ruling on April 19th, 1961, all this great music can be broadcast over the air-waves. The Pilot 200 automatic Multiplexer is the easiest way to enjoy the new stereo Multiplex broadcasts. All connections are external, made with jack cords that simply plug in place. No controls. All switching is done automatically—when the tuned-to station is broadcasting stereo, the Indicator Light goes on and the Multiplexer automatically switches to stereo reception. And, it will not affect reception of monaural FM. Completely self powered. Measures 5" high x 3" wide x 14" long. Contains three tubes plus one rectifier. Housed in an attractive black and brass enclosure designed to match Pilot components. Complete with enclosure **\$7950**

PILOT 100 SEMI-AUTOMATIC FM MULTIPLEXER!

Completely self powered with only one operational control—a simple slide switch to put the Multiplexer into or out of the circuit. All connections can be made externally. Contains two tubes and one rectifier. Dimensions 5" high x 3" wide x 9" long in handsome black and brass styling. Complete with enclosure **\$4950**



FOR COMPLETE TECHNICAL INFORMATION ON THE PILOT 200 AUTOMATIC FM MULTIPLEXER OR THE PILOT 100 SEMI-AUTOMATIC FM MULTIPLEXER, PLEASE FILL OUT AND MAIL COUPON.

Pilot RADIO CORPORATION. 37-33 36th Street, Long Island City 1, N. Y.

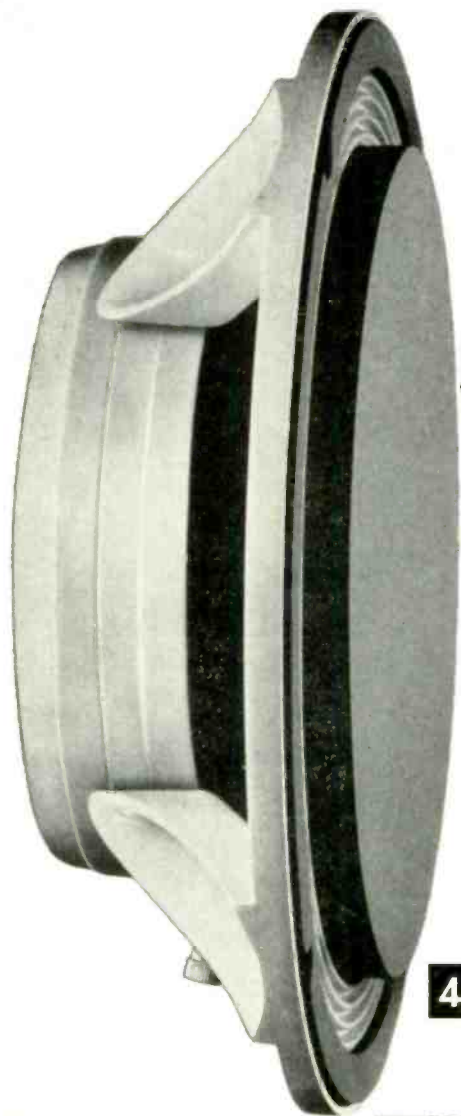
Please send me complete information on both Pilot FM Multiplexers. I presently own a (make & model) _____ Tuner or Receiver.

Name _____

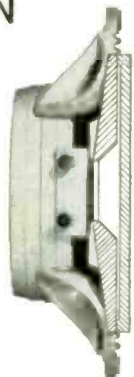
Address _____

City _____ State _____

Jensen's New 3-P Speaker Make Sound



1 3-P woofer has flat plane radiator. All the surface is 100% effective for efficient sound radiation.



2 Two layer molded POLYTEC* piston, with center-plus-edge drive, suppresses vibrational modes.

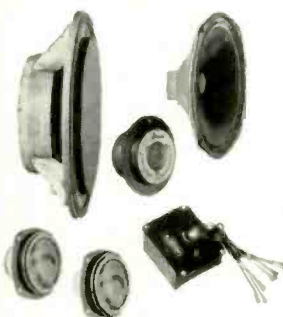
4 Woofer piston diameter precisely proportioned to match enclosure acoustics. Permits reduction in cabinet size.

3 Tiny beads, expanded under heat and pressure, give POLYTEC radiators a light, interlocking, rigid cell construction and tough surface. U.S. Patent No. 2,905,260.



Microphotograph of radiator section after expansion

6 Improved transient response is an important contributor to better sound quality. You'll marvel at the new clarity and transparency of 3-P speaker system sound.



5 Five all-new speakers (all with POLYTEC radiators) precisely complement each other for a new smoothly blended coverage of the complete frequency range. Includes the new 3-P* 10 1/4" Woofer, a special 8" midrange, two 3 1/2" tweeters, the sensational Sono-Dome* Ultra Tweeter, and crossover network. Available in kit form at \$97.50.

7 Flat piston and shallow SYNTOX*-6 ceramic magnet make possible unusually slim cabinetry combined with big speaker sound. This feature is fully utilized in the 3-P/2 Super Slim Panel System which is only 3 3/8" deep overall!



*T.M.

Systems Better 7 Ways!

When you buy a new high fidelity speaker system, you can be sure you are in the forefront of new developments with Jensen 3-P, the all new speaker development that makes sound better 7 ways!

Not only do you get new smoothly-blended transparent sound, coverage of the complete frequency range . . . with full bass capability . . . from the 5-speaker 4-way system with all-new components . . . but there's an exciting choice of decorator styled cabinetry in standard shelf size . . . or space-saving contemporary slim shelf and the super-slim panel version, a mere 3 $\frac{5}{8}$ " from front to back! Your 3-P system can match existing decor or be a revelation in inspired modern flexibility, adapting itself to your space and visual design for living.

SPECIFICATIONS

Components: 3-P/W1 woofer; M-80 midrange; two TW-40 tweeters; E-10 Ultra-Tweeter. **Frequency Range:** from as low as 20 cycles to beyond audibility. **Crossovers:** 600; 4,000; 10,000 cps. **Power Rating:** Speaker 25 watts. Higher rated amplifiers may be used when adjusted to reasonable room levels. Adequate living room level with 12-15 watt amplifier. **Impedance:** 8 ohms. **Control:** H-F balance.

WRITE FOR NEW CATALOG 165-G

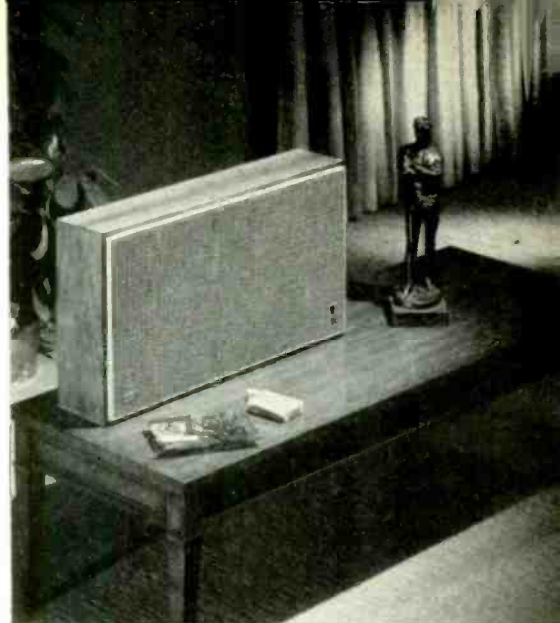
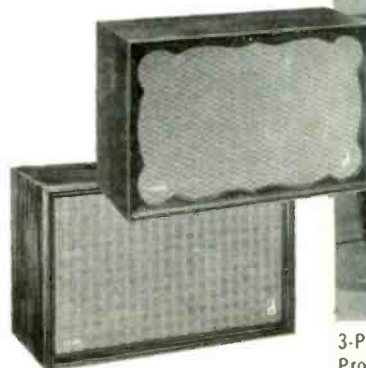


Jensen MANUFACTURING COMPANY
DIVISION OF THE MUTER CO.

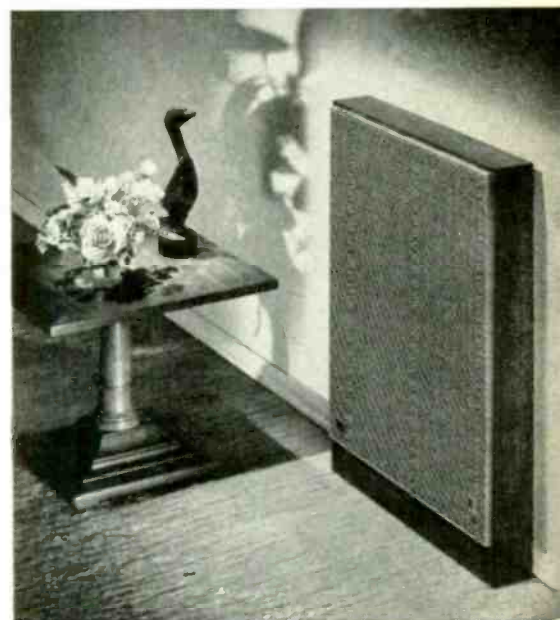
6601 S. Laramie Avenue, Chicago 38, Illinois

In Canada: Renfrew Electric Co., Ltd., Toronto

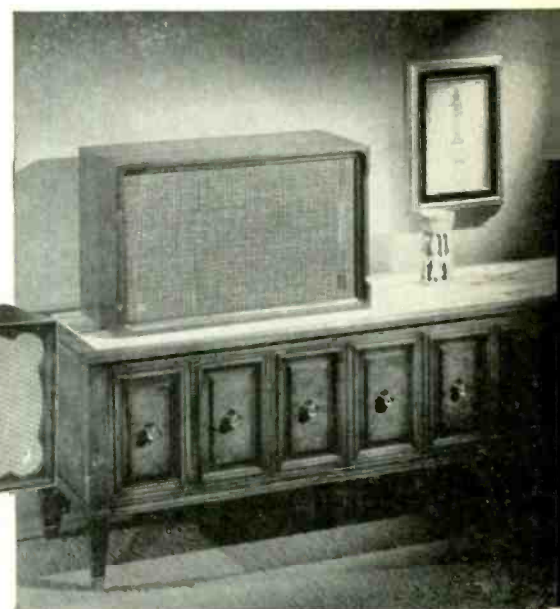
In Mexico: Universal De Mexico, S.A., Mexico, D.F.



3-P/1 Slim Shelf Oiled Walnut, 13 $\frac{1}{8}$ " H; 25" W; 5 $\frac{1}{2}$ " D
\$119.50

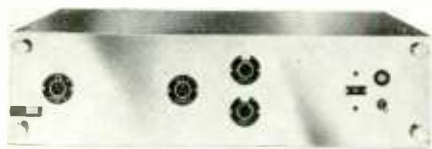


3-P/2 Super Slim Panel. Oiled Walnut, 28 $\frac{3}{8}$ " H; 21 $\frac{1}{4}$ " W;
3 $\frac{5}{8}$ " D—\$139.50



3-P/3 Decorator Shelf. Danish in Oiled Walnut, Cherry
Provincial, Mahogany traditional, 13 $\frac{1}{4}$ " H; 25 $\frac{1}{2}$ " W;
11 $\frac{3}{8}$ " D—\$159.50 Utility unfinished—\$129.50

is 50 to 70 db switchable, self-noise level is less than 1.5 mv, total distortion is less than 0.4 per cent rms. Channel separation is

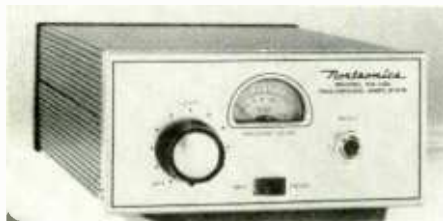


greater than 40 db, and output level is 1.55 volts. Distributed in the United States by the Nortec Audio Corporation, 72 West 45th Street, New York 36, N. Y. User net price \$645.00.

Width control for WV-2 \$125.00
PFB-150WD, 150-w pwr ampl 815.00

NORTRONICS

● **Recording Amplifier.** The Nortronics Model RA-100 is a high-quality recording amplifier which will supply any magnetic recording head with audio power and the required bias voltage. It also provides high- and low-impedance erase power for erase heads. It



has a VU-meter recording-level indicator which allows constant and accurate monitoring during recording. Means are provided for synchronizing the oscillators to prevent beating. Two RA-100 amplifiers are used for stereo recording. The RA-100 may also be synchronized with most popular tape recorders. The Nortronics Co., Inc., 1015 S. 6th St., Minneapolis 4, Minn. User net price \$57.50.

PACO

● **Stereo Preamp-Amplifier Kit.** The Paco Model SA-40 consists of two 20-watt amplifiers, each with its own preamplifier-control system, on a single chassis. It is mounted in an attractive gold and satin black case, with satin gold panel to blend harmoniously with all decors. The amplifiers deliver a true 20 watts output per channel due largely to a well-regulated low-impedance power supply. There is no clipping even on sustained high-level passages. Distortion is kept to a minimum because of the unique main feedback circuit which eliminates phase-shifting components. In addition to all the standard controls and switches the Model SA-40 includes: two dual phono inputs to permit the use of both record changer and manual turntable, special switching which affords selection of additional speaker systems anywhere in the home, and Balance-Right and Balance-Left test selector for a simplified aural check on



the balance of two speakers for best stereo results. Frequency response measured at 1.0 watt steady-state output is 30 to 90,000 cps \pm 1.0 db. Intermodulation and harmonic distortion are less than 1.0 per cent and 0.2 per cent, respectively, at full rated output. The SA-40 is supplied with step-by-step assembly instructions and giant-size wiring diagrams to ensure easy and successful assembly. PACO Electronics Company, Inc.,

70 31 84th St., Glendale 27, N. Y. User net price. In kit form, \$79.95; factory wired, \$129.95.

PILOT

● **Sixty-Watt Stereo Control-Center Amplifier.** The Pilot 248 is a fine stereophonic amplifier (harmonic distortion 0.5% from 20 to 20,000 cps at rated power) combined with a versatile control center. A total of 14 inputs for monophonic use or 7 pairs for stereo. Fifteen controls include a scratch filter, a rumble filter, and a tape monitor switch. The 248 has Pilot's Stereo-PLUS *Curtain-of-sound*, an ad-



ditional speaker connection which can be used for center fill-in for stereo or for monophonic listening in another room. Output is 30 watts per channel or 60 watts total; sensitivity is 1 volt for full output. Intermodulation distortion is less than 0.5% and frequency range is 20-20,000 cps. Each Pilot 248 is shipped with a certificate showing final test values for that particular instrument. In distinctive brass and black styling. Pilot Radio Corporation, 32-06 36th St., Long Island City 1, N. Y. User net price, \$249.50.

216A, stereo preamp \$199.50
240, 30-w stereo ampl 134.50
264, 60-w stereo pwr ampl 179.50
246, 60-w stereo ampl 199.50

QUAD

● **Stereo Preamplifier.** The Quad Model 22 stereo control unit is a comprehensive stereophonic, monophonic preamplifier utilizing a pushbutton arrangement to select a variety of possible combinations. The Quad 22 is designed to operate with the Quad power amplifier, either singly or in pairs. Frequency response is 20 cps to 20,000 cps, plus or minus 0.5 db. Distortion at 1.4 volts rms



output is 0.02 per cent at the most favorable arrangement of the controls. With the worst possible arrangement of the controls the distortion is less than 0.1 per cent. Total hum and noise is more than 70 db down. Channel separation is better than 40 db from 20 cps to 20,000 cps. The front panel is a die-cast and finished in a silvery color. Lectronics of City Line Center, 7644 City Line Avenue, Philadelphia 31, Pa. User net price \$150.00.
Quad II pwr ampl \$125.00

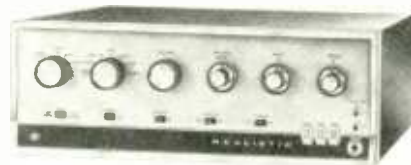
RAVENSWOOD

● **28-Watt Stereo Amplifier.** Designed such a short time ago that photographs are not yet available (at press time), the Ravenswood A-1000B stereo amplifier features 14 watts (music power) per channel at a distortion of less than 0.5 per cent at normal listening levels. Frequency response is plus or minus 1 db from 20 cps to 20,000 cps. Hum level is 8 db below rated output. A standard complement of controls are provided. Ravenswood Division of Annapolis, Electro-acoustic Corp., 241 West St., Annapolis, Md. User net price, \$99.95.

PA-2000 60-w ster pwr ampl \$99.95
PA-3000 130-w ster pwr ampl 199.95

REALISTIC

● **50-Watt Transistorized Stereo Amplifier.** Employing neither vacuum tubes or output transformers, the new Realistic Model TA-208 provides 25 watts per channel plus a full complement of controls. Frequency response of the TA-208 is plus or minus 1 db from 20 cps to 15,000 cps at rated output. Hum and noise are 55 db below rated output for low-level inputs and 70 db below for high-level inputs. Sensitivity at 1000 cps and full



power output is 4 mv at the magnetic phono input, 3 mv at the tape head input, and 300 mv at the high-level input. The TA-208 employs 6 power transistors, 12 medium gain transistors, 2 driver transformers, and 1 rectifier transformer. Radio Shack Corp., 730 Commonwealth Ave., Boston 17, Mass. User net price, \$189.95; in kit form \$139.95.

SP-212 ster preamp \$99.95
TA-18 36-w trans ster ampl 99.50
SAF-24 24-w ster ampl 59.95
BA-210 140-w ster/pwr ampl 179.95

H. H. SCOTT

● **72-Watt Amplifier Kit.** Taking its place beside the unusually well-designed H. H. Scott FM tuner kit is this 72-watt amplifier kit, the Scott LK-72. On the surface this kit seems to have all the virtues of the tuner kit—that is extreme simplicity for the kit builder combined with factory performance standards. From the way these kits go together it seems that the designer was ordered to remove the drudgery and leave only the cost-saving fun. In appearance this amplifier is a perfect match for the tuner kit so that the builder may have a system which is



matched in appearance as well as performance by the time he is finished. Specifications for the LK-72 read like those for any factory-assembled unit: full power 72 watts (36 watts per channel); 111FM power band extends down to 20 cps; total harmonic distortion is less than 0.4 per cent at full power; hum level is better than 70 db below full power output. Among the many additional features of the LK-72 are a "center channel" level control, scratch filter, tape recorder monitor, and separate bass and treble control for each channel. The H. H. Scott Model LK-72 retails for \$159.95. H. H. Scott, Inc., Dept. P, 111 Powdermill Road, Maynard, Mass.

LC-21 ster preamp kit \$99.95
LK-150 ster pwr ampl kit 169.95
122 ster preamp 285.00
222C 44-w ster ampl 149.95

SHELL

● **40-Watt Stereo Control Amplifier.** A complete monophonic-stereophonic control center, the Shell 2020 "Monhasset" features visual

announcing



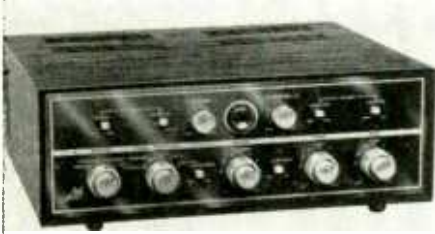
the new **MIRACORD**
STUDIO SERIES AUTOMATIC TURNTABLE AND RECORD CHANGER

... the first and only automatic turntable and record changer designed to meet the uncompromising requirements of stereophonic record reproduction. The heart of the finest record reproduction equipment is the constant speed hysteresis synchronous motor. This is the heart of the new MIRACORD STUDIO H. Equally outstanding is the one-piece, dynamically-balanced, seven-pound, cast and machined 12" turntable... another assurance of uniform speed. The scientifically designed, professional type tone arm with plug-in head is non-resonant and free in all planes. It tracks faultlessly at recommended tracking weights. The arm is mass balanced and no springs are used. The 4-speed MIRACORD plays all size records as a conventional turntable, an automatic turntable or as an automatic record changer. **STUDIO H** with hysteresis synchronous motor **\$99.50.*** Where line voltage variation is not a problem the **STUDIO** with heavy-duty, shaded, 4-pole motor will provide uncompromising stereo performance..... **\$79.95.***

*Complete with arm, less cartridge and base.

BENJAMIN ELECTRONIC SOUND CORP., 97-03 43rd Ave., CORONA 68, N.Y.

balance of the stereo channels by an electronic "eye" tube. Located on the front panel, with individual channel-balance controls nearby, the "eye" permits precise dynamic balancing of the input signals. In addition a built-in signal generator provides a reference voltage for balancing. The "eye" is also useful as monitor for recording. Controls are also provided for selecting mode, loudness contour, mono channel 1, channel 2, or combined, and rumble filter. Bass and treble controls are separate within each channel. Power output

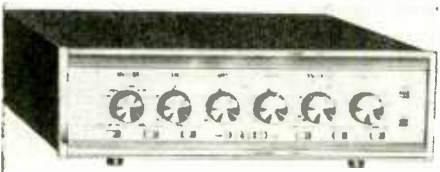


is 40 watts, or 20 watts for each channel with intermodulation distortion less than 2%; harmonic distortion less than 1% between 30 and 10,000 cps. Frequency response is 30 to 20,000 cps ± 1 db at rated output. 18 db of feedback is used with a stability margin of 15 db. Hum and noise are down 80 db at the tuner and auxiliary inputs, 65 db at the tape input, and 70 db at the phono magnetic input. Shell Electronics Mfg. Corp., 112 State St., Westbury, N. Y. User net price, \$129.95.

Northport 20-w ster ampl \$79.95
Meadowbrook 60-w ster ampl 159.95

SHERWOOD

● **60-Watt Stereo Amplifier.** Featuring fifteen front-panel controls and switches and twelve inputs, the new Sherwood Model S-5500 amplifier provides 25 watts (music power) per channel. Included in the front-panel controls are 12 db/octave rumble and scratch filters (effective at all inputs), friction-locked bass and treble controls (each channel separately or both channels simultaneously), function switch, selector, stereo balance and individual gain, loudness, tape monitor switch, loudness in-out switch, phase-reverse switch



and stereo-reverse switch. To facilitate home or professional type stereo tape recording, two cathode follower outputs and front panel tape monitoring switch combine to give complete recording flexibility. Hum and noise is 80 db below 24 watts (radio input) and 60 db below 24 watts (phono input). Frequency response is plus or minus one db, 20-40,000 cps; IM distortion is 1.5 per cent, and harmonic distortion is 0.5 per cent at 24 watts continuous. Damping factor of five assures optimum performance with today's low-efficiency speaker systems. Dimensions are 4 x 14 1/4 x 14 inches; price is \$159.50 (less case). Sherwood Electronic Laboratories, Inc., 4300 N. California Ave., Chicago 18, Ill. S-5000II 80-w ster ampl \$199.50
S-1000II 36-w ster ampl 109.50

TEECO

● **30-Watt Stereo Amplifier.** An integrated amplifier containing provisions for controlling all audio playback functions, the Teeco Model 1230 provides 15 watts in each channel or 30 watts in monophonic operation. It incorporates provision for a center channel speaker which may be used in the same room as the stereo speakers, or it may be used in a remote location for monophonic reproduction of the program. The Model 1230 is designed for use with a magnetic cartridge, tape head, ceramic or crystal cartridge, AM/FM

tuners, or auxiliary equipment. Treble, bass, and balance-loudness controls are ganged or, by turning each friction-locked knob separately, can be operated to adjust the channels individually. The S-15 includes low and high filters, and output jacks for tape recording.



Frequency range is 30 to 30,000 cps. Tru-tone Electronics, Inc., 6912 Santa Monica Blvd., Hollywood 38, Calif. User net price \$119.75.

1220 20-w ster ampl \$91.50
957 14-w ster ampl 67.50

TRANSIS-TRONICS

● **All-Transistor 40-Watt Stereo Amplifier.** Providing all the required facilities for a home music system, the TEC S-15 all-transistor 40-watt stereo amplifier provides several advantages which are unique to transistor circuitry. For example, the amplifier may be operated from either batteries (12 to 28 volts), or from a standard 110-volt a.c. line. The current drain at full output is below 2 amperes and is less than 1 ampere at listening levels. This means that the TEC S-15 can be used in automobiles or boats without appreciable drain on the standard electrical system. The absence of heat that is associated with transistor operation, makes cabinet



mounting and placement less critical since ventilation is not a factor. The TEC S-15 does not use an output transformer, and is thus free of the distortion developed in this type of unit. Separate bass and treble controls are provided for each channel. There are also five pairs of inputs and two switched a.c. outlets. Power output is 40 watts (20 watts per channel) measured according to IIEFM music power standards with 4-ohm load. Frequency response is 20-20,000 cps within 0.5 db, response down 3 db at 6 cps and 45,000 cps. Intermodulation distortion is less than 0.9 per cent at rated output, and harmonic distortion is less than 0.5 per cent at rated output. The circuit includes fourteen low-level transistors, four power transistors, two germanium rectifiers, two germanium diodes, and three silicon diodes. Transis-Tronics, 1601 Olympic Blvd., Santa Monica, Calif. User net price \$129.50.

TUNERS

ALTEC

● **Home Music Center.** Advanced design and performance with an accent on style is featured in the new Altec Lansing 707 stereo AM-FM tuner-amplifier. Operating as a complete home music center the 707 can accommodate either mono or stereo systems with equal facility. Featured also is a connection for a center speaker which makes the unit suitable for extended stereo applications. Power output of the amplifier section is 48 watts (24 watts per channel) by IIEFM ratings. The 707 is part of line of matched monophonic and stereophonic components



Altec Lansing Corporation, 1515 S. Manchester Ave., Anaheim, Calif. User net price, \$387.00.

309A AM-FM ster tuner \$216.00
312A FM tuner 111.00

BELL

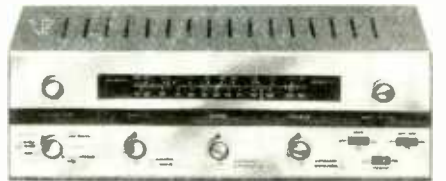
● **AM-FM Receiver.** An AM-FM tuner with a 44-watt stereo amplifier on the same chassis, the Bell Model 2445 will receive simulcast broadcasts and contains provisions for the installation of an FM-stereo adapter. The FM tuner sensitivity is 1.8 μ v for 30 db of quieting and frequency response is ± 0.5 db from 20 cps to 20,000 cps. The AM section sensitivity is 4 μ v for a signal-to-noise ratio



of 20 db, and its frequency range is 20 cps to 5000 cps (includes 10,000 cps whistle filter). Individual tuning meters are provided for AM and FM. The amplifier section provides 22 watts per channel (IIEFM) and its frequency response is ± 1 db from 20 cps to 20,000 cps. Total harmonic distortion is less than 1 per cent at 1000 cps at 40 watts rms. A full complement of controls is provided. Bell Sound Division, Thompson Ramo Wooldridge, Inc., Columbus 7, Ohio. User net price, \$329.95.

BOGEN

● **"Fun Couple" AM-FM-Stereo Receiver.** Inspired by a book of the same name, the new Bogen "Fun Couple" Series includes an FM-stereo tuner and the AM-FM-stereo receiver shown (Model RP-200). The RP-200 features a 20-watt per channel stereo amplifier and built-in FM-stereo circuitry. Except for speakers, this unit contains everything necessary for a complete stereo system. FM sensitivity is 3 μ v by IIEFM standards. The RP-200 incorporates sufficient controls to make the most ardent knob twirler happy. The



TP-200 is the FM-stereo tuner in the series and is the same unit incorporated in the RP-200. Bogen, Division of the Siegler Corp., P. O. Box 500, Paramus, N. J. User net prices: RP-200, \$299.95; TP-200, \$199.95.

RP40A AM-FM rec \$399.95
TP-60 AM-FM tuner 269.95
RP-100 mono FM rec 169.95
PX60 FM-stereo adapter 69.95

the year's most wanted components...

BOGEN

featuring

BUILT-IN MULTIPLEX

in all

RECEIVERS and TUNERS



RP200 Fun Couple FM/AM, 40 watt, Stereo Receiver \$299.95*

Top quality, handsome styling . . . and the Industry's first complete line of receivers and tuners with built-in Multiplex...all from BOGEN, the only major high fidelity manufacturer with five years experience in the production of commercial Multiplex receivers.

For example, take just one unit from the all-new Stereo Line . . . the superb RP200 Fun Couple receiver. Inspired by the novel "the fun couple," and dedicated to fun couples everywhere . . . the RP200 offers compact, contemporary design, unexcelled performance, sensitivity, balance, and many features found only in receivers costing far more.

The all-new Bogen Stereo Line is the result of 30 years leadership in the precise art of sound engineering. Write for the BOGEN Stereo Hi-Fi Catalog.

*Prices slightly higher in the West

BOGEN-PRESTO

Desk A-8 - Paramus, N. J. • A DIVISION OF THE SIEGLER CORPORATION



TP200 Fun Couple FM/AM Stereo Tuner . . . Noise Free reception in weakest areas. Pair it with the AP200 for a matchless system. \$199.95*



AP200 44-watt Fun Couple Stereo Amplifier . . . offers amazing flexibility and control at a modest price. \$154.95*

PX60 Multiplex Adapter . . . designed especially for all pre-multiplex Bogen equipment currently in use . . . but excellent for any good quality receiver or tuner. Self-powered with external connections. Complete with Seville textured cage. \$69.50*



CROSBY

● **FM-Stereo Receiver.** An all FM-stereo receiver, the Crosby Model 650MX is an FM-stereo tuner and a 28-watt amplifier all on the same chassis. The FM section boasts a sensitivity of 2 μ v by HIFM standards and a frequency response of plus or minus 0.5 db from 30 cps to 20,000 cps. The frequency response of the amplifier section is plus or minus 0.5 db from 20 cps to 35,000 cps. Distortion is 1 per cent at full output and 1M



distortion is less than 0.4 per cent at "normal" listening levels. The 650MX contains a full complement of controls and mode is selected by means of 5 pushbuttons. The unit is handsome in appearance and has a solid, deep-etched, brass-finished front panel. Crosby Electronics, Inc., 135 Eileen Way, Syosset, N. Y. User net price, \$249.95. Wood cabinets (Walnut, mahogany, ebony), \$20.00.

690 FM tuner \$99.95
880 AM-FM stereo rec 375.00

DYNACO

● **FM Tuner Kit.** Etched circuit design claimed to be so inherently non-critical that it can be completely aligned without test equipment is a feature of the new Dynatuner just introduced by Dynaco, Inc. With a sensitivity of 4 microvolts by HIFM standards (comparable with about 1 microvolt for 20 db of quieting) this tuner should be sensitive enough for all areas. Distortion levels



are below 0.1 per cent with 100-per-cent modulation; a result of the broadband, bridge-balanced discriminator. A novel construction feature is the planetary drive system for the tuning capacitor which eliminates the need to string dial cords. It is claimed that precise alignment can be accomplished by the user at any time, so the performance can be maintained at optimum. Dynaco, Inc., 3912 Powelton Ave., Philadelphia 4, Pa. User net price, \$79.95.

EICO

● **AM-FM Stereo Tuner Kit.** Prewired, pre-aligned r.f. and i.f. stages of both the FM and AM sections make the new Eico ST96 an easy kit to construct and reduces the

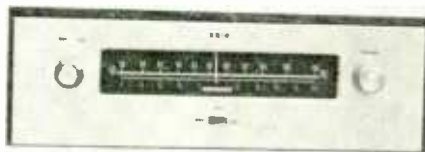


problem of alignment. The new tuner features Eico's traveling tuning indicators which contract into an exclamation point at the exact center of each broadcast channel. Two completely independent sets of controls allow the ST96 to be used for separate and simultaneous FM and AM reception, or for FM-AM stereo. It will also receive FM-Stereo upon

addition of an adapter. The FM section has a.f.c., a.f.c.-defeat, a.g.c., and a broadband ratio detector for improved capture ratio and easier tuning. FM frequency range is 20-15,000 cps. The AM section features switched "wide" (to 14,000 cps) and "narrow" (to 7000 cps) bandpass. AM frequency range is 20 9000 cps (wide), 20 4500 cps (narrow). Panel controls include: separate AM, FM tuning; separate AM, FM level controls; selector switch for choosing AM only, FM only, AM-FM stereo, or FM-Stereo. The ST96 sells for \$89.95 in kit form; wired, the price is \$129.95. Both prices include a metal cover. Electronic Instrument Co., Inc., 33-00 Northern Blvd., L. I. C. 1, N. Y.

ERIC

● **FM Tuner.** Eric Model 3457 is the top FM tuner in the Eric line. It features a sensitivity of 1.5 μ v for 20 db of quieting. The discriminator is of the Foster-Seeley type and the frequency range is 20 cps to 20,000 cps. Space is provided on the chassis for installation of multiplex. It has a.f.c. plus a defeat



switch on the front panel. Antenna input is 300-ohms balanced. The front panel is satin-gold finished. Eric Electronics Corp., 1823 Colorado Ave., Santa Monica, Calif. User net price, \$84.95. (Slightly higher in East.)

3357 FM tuner \$56.75
3157 stereo tuner 99.95

FISHER

● **FM-Stereo Tuner.** An unusually fine FM tuner with many advanced features, the Fisher FM-200B is an example of excellent engineering. Incorporation of such features as interchannel muting by cutting off the last i.f. stage and automatic a.f.c. defeat whenever the tuning knob is touched makes this

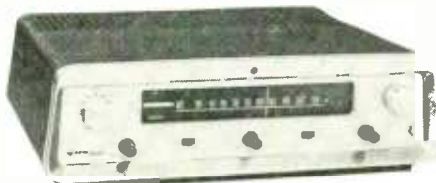


unit high in convenience. Coupled with this is sensitivity of 1.6 μ v by HIFM standards, 6 i.f. stages, and 5 limiters. With built-in automatic FM-stereo, Fisher Radio Corp., 21-21 44th Drive, L. I. C. 1, N. Y. User net price, \$289.50.

FM-100B FM-stereo tuner \$229.50
FM-50B FM-stereo tuner 189.50

GROMMES

● **FM Receiver.** Designed to provide background music for office and home, the new Grommes Model 510 FM tuner-amplifier should be of particular interest to doctors



and dentists, as well as other business offices where background music is desired. The Model 510 is a complete FM tuner, pre-amplifier, and amplifier in one compact attractive unit. The amplifier has phono, tape, and microphone inputs. The microphone in-

put enables the unit to function as a public address system at the same time it is providing background music. Controls include loudness, bass, and treble, and the tuner section has a three-gang tuning unit with an electronic tuning eye. The circuit consists of two broad-band i.f. stages, dual limiters, and a ratio detector. The price of the Model 510 is \$149.95. An enclosure is available for \$10.00. Grommes, Division of Precision Electronics, Inc., 9101 King Avenue, Franklin Park, Illinois.

101GTA sens FM tuner \$89.95

HARMAN-KARDON

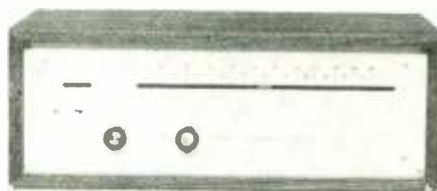
● **Integrated AM/FM-Stereo Tuner.** The Harman-Kardon Model T300X is a new AM/FM tuner with a multiplex adapter built in. The circuit consists of a tuned grounded-grid r.f. amplifier followed by a triode mixer. 3 high-gain, wideband, pentode i.f. stages and a



gated-beam limiter. The circuit employs a wideband solid state Foster-Seeley detector, a Colpitts oscillator, and reactance type a.f.c. circuit. Sensitivity of the T300X is 3.2 μ v by HIFM standards. Harman-Kardon Inc., Plainview, L. I., N. Y. User net price, \$149.95. Cit III prof FM tuner kit \$149.95
F500 "Award" FM tuner 129.95

KARG

● **FM Tuner.** Intended to round out the Karg line of FM tuners, the "Primata" CT-3 is a sensitive, stable tuner with a handsome exterior. Featuring printed r.f. coils, flywheel-action with in-line tuning, "magic eye" tuning indicator, dual function gated-beam limiter, wideband Foster-Seeley discriminator,

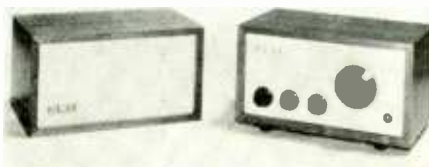


and two audio outputs plus multiplex jack. Sensitivity is stated as 0.8 μ v for 20 db of quieting with 1M distortion less than 0.7 per cent at 100 per cent modulation. Frequency response is plus or minus 1 db from 20 to 20,000 cps. Price of the CT-3 is \$99.50 without a case. A brown metal case and various wood cabinets are available as accessories. Karg Laboratories, South Norwalk, Conn.

XT-3A prof. FM tuner \$290.00
XT-1A crystal-cont. FM tuner 199.50
CT-2 ster FM tuner 139.50

KLH

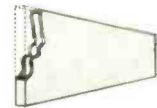
● **Complete FM Receiving System.** The KLH Model 8 is a complete FM receiving system in two walnut cabinets, each of which meas-



Wharfedale

COMMANDING NEW SYSTEMS

We are proud to present the new W40 Achromatic—Wharfedale's remarkable ultra-compact two-speaker system built around a newly developed 8½ inch low frequency drive with an extremely high flux density magnet; and Wharfedale's outstanding 5 inch tweeter. In size (24"x12"x10"), the W40, with its unobtrusive, clean modern lines, is an instrument of remarkable range. It is ideally adaptable for the greatest enjoyment of music in today's modern apartments, the den of a country home or in larger rooms. **True Wood \$79.50, Unfinished \$69.50.**



The Sand Filled Panel

The sand filled panel, exclusive in all Wharfedale systems, "damps" all vibration. Creates a full rich bass without false resonances and develops excellent transient response in the treble. Achieves a perfectly pure "Achromatic" musical image without acoustical coloration.

Achromatic speaker systems are available in enclosures skillfully executed in true wood veneers: Oiled Walnut, Polished Walnut, Mahogany. (Provincial Style in Fruitwood, only.) Unfinished utility models in Sanded Birch Hardwood do not have curved molding or dividers.

NEW W40



NEW W60PR



Wharfedale has combined the excellence of W60 and W70 reproduction with handsomely crafted pieces of period furniture. We are sure you will welcome the addition of these authentic Provincial designs in genuine Fruitwood to the Achromatic Series.

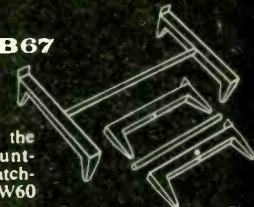
134.50

\$189.50

NEW W70PR



NEW B67



The new B67, the Universal Mounting Base—in matching woods—for W60 and W70 systems. Simple to install. An effective addition to the beauty of these enclosures.

Utility Model \$8.95

True Wood \$9.95



The W60 and the W70 continue to provide the distinguished performance which has won phenomenal acclaim for all the speakers in the Wharfedale Achromatic Series. The decorator designed cabinets will complement modern decor... look "at home," anywhere. **True Wood \$116.50, Unfinished \$101.50.**



W60



W70

**Mail Coupon Dept. WK11
British Industries Corp.,
Port Washington, N. Y.**

*Please send me literature regarding
the Wharfedale Achromatic Series.*

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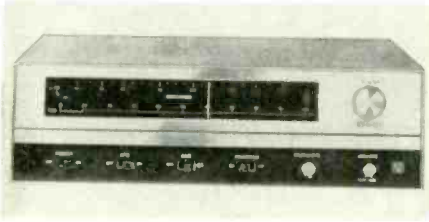


Wharfedale, a division of British Industries Corp., Port Washington, N. Y.

ures 10% × 6%. One cabinet consists of a tuner-amplifier, the other cabinet contains a wide-range speaker system. Jacks are provided to permit the use of the tuner section with other equipment and for the addition of a multiplex adapter. KLIH Research and Development Corp., 30 Cross St., Cambridge 39, Mass. User net price, \$159.00.

KNIGHT

● **FM-Stereo Tuner with DSR.** Featuring dynamic sideband regulation (DSR), the Knight KN-150M FM-stereo tuner is claimed to provide optimum reception of all FM stations. The advantage of DSR is that it virtually eliminates the distortion of a weak signal as well as the distortion caused by overmodulation of the signal at the station. The multiplex adapter and a control for regulating stereo balance is included. A panel light will



glow automatically when an FM-stereo signal is received. IM distortion of the KN-150M is below 0.25 per cent at signal levels over 10 microvolts. The audio output stage utilizes a cathode follower to permit cables up to 100 feet in length. AFC and inter-station muting are also provided. An output level control is mounted on the front panel to facilitate tape recording FM broadcasts. The KN-150 is provided with a beige-finish metal case and the control panel is gold and charcoal brown. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois. User net price, \$149.50.

KN-310M FM-stereo tuner-ampl \$229.95
 KF-90 AM-FM-stereo tuner kit 99.95
 KF-75 AM-FM-stereo tuner kit 84.95

LAFAYETTE

● **"Criterion" FM Tuner Kit.** The Lafayette Model KT-650 FM tuner kit is a member of the Lafayette "Criterion" series—apparently the top of their kit line. The KT-650 incorporates many features: multiplex jack; anode follower output allows tuner to be located up to 50 feet away from amplifier; flywheel weighted tuning; variable a.f.c.; electronic eye tuning indicator; tuner level control on front panel. Sensitivity is 6 μ v by IHFM



standards; frequency response is ± 0.5 db from 15 cps to 35,000 cps. Distortion and noise are better than 57 db below 1.5 volts at 100 per cent modulation. Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y. User net price, \$54.50. Factory wired and tested, \$79.95.

KT-500A AM-FM stereo tuner kit \$74.50
 LT-77 AM-FM stereo tuner 74.50
 LA-225 40-w AM-FM stereo rec 174.95

McINTOSH

● **Stereo AM-FM Tuner.** A deluxe tuner with many unusual features, the McIntosh Model MR-66 AM-FM tuner is clearly intended for the perfectionist. Some of the features are: variable a.f.c. which automatically disengages with the slightest tuning action, and automatically re-engages after tuning is completed; ultrasonic muting injected in the i.f. stage

so that it is operative during FM-stereo broadcasts; Balun coil in the 300-ohm antenna input circuit for a balanced line. Sensitivity of the FM section is 3 μ v by IHFM standards. Frequency response is ± 3 db from



20 cps to 20,000 cps. AM sensitivity is 1.5 μ v and distortion is less than 2 per cent at 100 per cent modulation. Provision is included to feed a multiplex adapter. McIntosh Laboratory, Inc., 4 Chambers St., Binghamton, N. Y. User net price, \$325.00.

MONARCH

● **Stereo AM-FM Receiver.** Monarch Model STA-2100 is a complete stereo unit mounted on a single chassis. Featuring dual amplifiers, separate AM and FM tuners, the STA-2100 is ideal for simulcast reception or, with an adapter, for FM-stereo. With its full complement of controls and its built-in 100-watt



amplifier, the STA-2100 truly qualifies as a home music center. Amplifier circuit features are an oversized power transformer; fully potted, grain-oriented output transformers; d.c. on the amplifier heaters; separate tuning indicators for AM and FM; balance-adjust meter on back panel; fixed bias on the output tubes. Sensitivity of the FM tuner is 1 μ v for 20 db of quieting. Monarch Electronics International, Inc., North Hollywood, Calif. User net price, \$324.95.

PACO

● **Stereo FM/AM Tuner Kit.** The Paco model ST-45PA stereo FM/AM tuner kit features separate prewired and prealigned AM and FM tuner circuitry on two printed circuit boards. Having separate FM and AM circuits, the Paco model ST-45PA can play simulcast stereo as well as separate AM or FM. A multiplex socket is provided with space beside it for a multiplex adapter. The FM tuner has a sensitivity of 2 microvolts for 30 db quieting. Bandwidth is over 200 kc, with harmonic distortion less than 1% from 20 to 20,000 cps. The circuit includes dual limiters and a

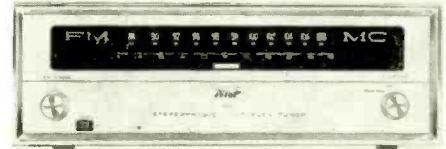


Foster-Seeley discriminator. The AM tuner has a tuned r.f. stage with a three-gang tuning capacitor. The built-in ferrite antenna is rotatable as well as removable. The circuit includes a 10-kc whistle filter. Both AM and FM sections have separate flywheel tuning, cathode-follower outputs and individual output level controls. PACO Electronics Co., Inc., 70-31 84th St., Glendale 27, L. I., N. Y. User net price, \$99.95 for the kit; factory wired, \$134.95.

ST-35 FM tuner kit \$59.95

PILOT

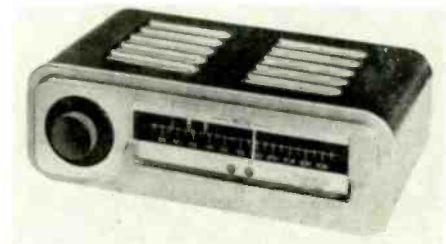
● **FM-Stereo Tuner.** Featuring an indicator light which automatically glows when a stereo program is tuned in, the Pilot Model 380 tuner also automatically switches to stereophonic FM reception. Some of the other features of the Model 380 are a precision tuning indicator; built-in power-line cord FM



antenna; low-impedance cathode follower outputs; FM level control on rear panel. FM sensitivity is 3 μ v by IHFM standards. The circuit includes a low-noise triode r.f. amplifier, low-noise triode converter, 3 i.f. stages, and a wideband detector. Pilot Radio Corp., 37-06 36th Street, Long Island City 1, N. Y. 200 FM-stereo adapter \$79.50
 480 stereo AM-FM tuner 159.50
 602 30-w AM-FM rec 249.50

QUAD

● **Compact FM Tuner.** The Quad FM tuner is a compact unit designed to be used with Quad amplifiers. It is an attractive companion to the Quad 22 or 11 control units. Special features are a positive tuning indicator; drift-free temperature-compensated a.f.c.



circuitry; low distortion; and high noise rejection. Sensitivity is 3 μ v for 20 db of quieting. Distributed in United States by Lectronics of City Line Center, 7644 City Line Ave., Philadelphia 31, Pa. User net price, \$125.00.

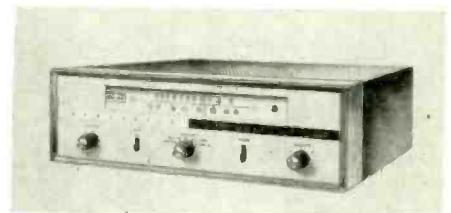
RAVENSWOOD

● **AM-FM Tuner.** Completely ready to be adapted for FM-stereo, the Ravenswood Model T-1000 provides FM sensitivity of 1.8 μ v for 20 db of quieting and an AM sensitivity of 20 μ v using the built-in ferrite loop-stick antenna. Frequency response is plus or minus 1 db from 20 cps to 20,000 cps. Distortion is less than 0.5 per cent at 100 per cent modulation. A.f.c. and a.f.c. defeat provided. Ravenswood Division of Annapolis Electroacoustics Corp., 241 West St., Annapolis, Md. User net price, \$99.95.

TCC2000 AM-FM tuner & ster preamp \$249.95

REALISTIC

● **AM-FM-Stereo Tuner.** Built-in FM-stereo provisions and separate AM and FM tuners make the Realistic Model TM-8 an up-to-the-minute tuner. In addition, color-scale tuning



makes this unit unusually easy to tune for minimum distortion. Separate tuning meters

ALTEC LOW FREQUENCY SPEAKERS

402B SPEAKER. 8" \$19.50

414A SPEAKER. 12" \$54.00

803B SPEAKER. 15" \$69.50

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804A DRIVER \$63.00

811B SECTORAL HORN . . . \$30.00

511B SECTORAL HORN . . . \$39.00

ALTEC HIGH FREQUENCY SPEAKERS

2000B SPEAKER . . \$15.00 INCLUDING NETWORK

3000B SPEAKER \$42.00

ALTEC SELF-CONTAINED TWO-WAY SPEAKER

605A "DUPLEX" 15" . . . \$177.00 INCLUDING NETWORK

OTHER ALTEC "DUPLEX" SPEAKERS:

601C "DUPLEX", 12" . . . \$120.00 INCLUDING NETWORK

602C "DUPLEX", 15" . . . \$143.00 INCLUDING NETWORK

ALTEC
LANSING CORPORATION

SATISFY YOURSELF! SATISFY YOUR BUDGET!

CUSTOM ALTEC TWO-WAY SPEAKER COMPONENT SYSTEMS NOW FROM \$34.50 TO \$301.00 COMPLETE . . .

Make up your own distinctive two-way speaker system with world-famous ALTEC Speaker Components. It's a personally satisfying project that adds up to uncompromised quality at remarkable savings!

Wide range ALTEC Speaker Components smoothly cover the entire audible spectrum—from lowest low to highest high—in a professional two-way manner. Result? Virtually distortion-free realism that is impossible to achieve with limited range speakers used in phase-distorting multi-crossover systems.

HOW TO GET STARTED? THREE EASY STEPS:

- 1) On chart at right, 12 ALTEC two-way Speaker Systems are shown. With ALTEC, you have a wide choice from good small systems to the finest full-size systems available today.
- 2) Clip out chart as a reminder and visit your nearest ALTEC Distributor where you may order the ALTEC System of your choice. Ask for your FREE copy of the informative 16-page ALTEC brochure, "Loudspeaker Enclosures—Their Design and Use."
- 3) Use the design plans and ideas in this brochure to build your own

enclosure. Or, if you prefer, your ALTEC Distributor can have one built for you. For additional savings, consider a "built-in" installation in wall, closet, etc.

So why compromise sound to pamper a budget? You needn't, ever again! Instead, do-it-better-yourself . . . with ALTEC.

YOUR GUIDE TO 12 CUSTOM ALTEC TWO-WAY SPEAKER COMPONENT SYSTEMS				
ALTEC LOW FREQUENCY SPEAKERS	ALTEC HIGH FREQUENCY SPEAKERS	DIVIDING NETWORK	SYSTEM CROSSOVER FREQUENCY	TOTAL SYSTEM PRICE*
402B	2000B	Built-in	2,000 cycles	\$ 34.50
2-402B	3000B	N-3000E (\$22.50)	3,000 cycles	\$103.50
414A	3000B	N-3000E (\$22.50)	3,000 cycles	\$118.50
601C	DUPLEX	Included	3,000 cycles	\$120.00
602C	DUPLEX	Included	3,000 cycles	\$143.00
605A	DUPLEX	Included	1,600 cycles	\$177.00
414A	804A w/811B	N-800E (\$46.50)	800 cycles	\$193.50
803B	804A w/811B	N-800E (\$46.50)	800 cycles	\$209.00
803B	804A w/511B	N-500D (\$60.00)	500 cycles	\$231.50
2-414A	804A w/811B	N-800E (\$46.50)	800 cycles	\$247.50
2-803B	804A w/811B	N-800E (\$46.50)	800 cycles	\$278.50
2-803B	804A w/511B	N-500D (\$60.00)	500 cycles	\$301.00

*Exclusive of Enclosure

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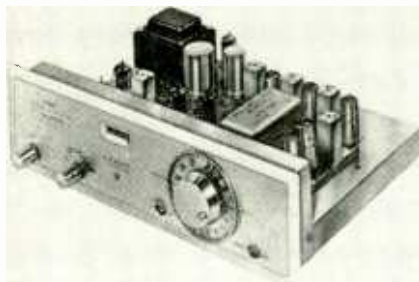
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New York • Los Angeles
A Subsidiary of Ling-Temco Electronics, Inc.

are provided for AM and FM. Sensitivity of the FM section is 1.5 μ v for 30 db of quieting \pm 75,000 cps deviation and 100 per cent modulation. AM sensitivity is 2 μ v for 20 db signal-to-noise ratio at 30 per cent modulation. Frequency range of the FM section is 20 cps to 20,000 cps; frequency range of the AM section is 20 cps to 9500 cps. Radio Shack Corp., 730 Commonwealth Ave., Boston 17, Mass. User net price, \$89.95.

STA-7 FM-stereo rec \$124.95
 TM-220 transis FM-stereo tuner 149.95
 MPX-215 FM-stereo adapter 39.95

H. H. SCOTT

• *FM-Stereo Tuner.* The new H. H. Scott FM-stereo tuner, Model 350, is essentially a stereo version of the well-known Model 314 tuner. Incorporating the wideband circuitry which characterize all the H. H. Scott tuners, the Model 350 will provide optimum stereo-phonie reception. Usable sensitivity, by HIFM

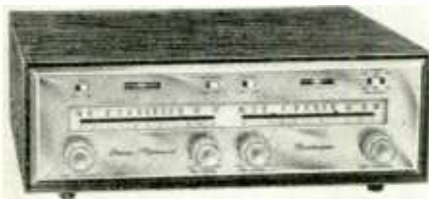


standards, is 2.5 μ v. The Model 350 uses 10 tubes and 11 diodes and incorporates the H. H. Scott silver-plated front end. It can receive either monophonic FM or FM-stereo. Special circuitry for stereo tape recording is included. H. H. Scott, Inc., 111 Powder Mill Road, Maynard, Mass. User net price, \$199.95.

LT-10 FM tuner kit \$99.95
 310D prof FM tuner 194.95
 314 FM tuner 119.95
 335 FM-stereo adapter 99.95

SHELL

• *AM-FM Receiver.* Named after a pleasant town on Long Island (N. Y.), the Shell "Huntington" is an AM-FM tuner which can receive simulcast stereo as well as separate AM and FM programs. FM sensitivity is 2.1 μ v for 30 db of quieting. AM sensitivity is

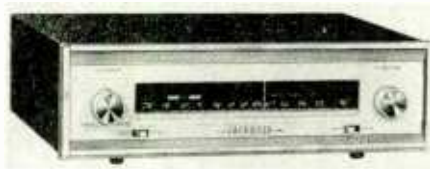


3 μ v for a signal-to-noise ratio of 20 db. A.f.c., and a.f.c. defeat, are controlled by means of a slide switch on the front panel. Distortion is less than 1 per cent for both AM and FM. Provision is included to accommodate an FM-stereo adapter. Shell Electronics, 112 State St., Westbury, N. Y. User net price, \$159.95.

SHERWOOD

• *FM-Stereo Tuner.* The new Sherwood Model S-3000 IV combines the sensitive Sherwood S-3000 III tuner with their new wideband multiplex circuitry to receive either FM-stereo or monophonic FM. The multiplex circuit includes a phase-locked synchronous oscillator, an extremely sharp filter circuit to remove the 19,000 cps pilot and the 67,000 cps commercial channel transmission. This tuner has controlled frequency and phase response of the i.f. amplifier, limiters, and discriminator for minimum distortion and

maximum stereo separation. FM sensitivity is 1.8 μ v by HIFM standards. Sherwood Electronic Laboratories, Inc., 4300 N. California



Ave., Chicago 18, Illinois. User net price, \$160.00.

S-3000 III FM tuner \$110.00
 S-8000 FM-stereo 64-w rec 299.50
 53MX self-pwrd FM-stereo adapter .. 69.50

TEECO

• *AM-FM Receiver.* A complete unit consisting of an AM-FM tuner plus a 30-watt stereo amplifier, the Teeco Model 1030 provides pushbutton selection of either simulcast or separate AM and FM operation. Separate tuning controls and tuning indicators are



provided for AM and FM. The amplifier may be used as a 30-watt monophonic amplifier or as a 15-watt per channel stereophonic unit. Sensitivity of the FM section is 2 μ v for 30 db of quieting; AM sensitivity is 10 μ v. Frequency range of the FM section is 20 cps to 20,000 cps and of the AM section is 20 cps to 5000 cps. The Model 1030 has a full complement of controls plus pushbutton mode selection. Trutone Electronics, Inc., 6912 Santa Monica Blvd., Hollywood 38, Calif. User net price, \$232.50.

TRANSIS-TRONICS

• *Transistorized FM-Stereo Tuner.* Occupying a space of only 3" x 10 1/4" x 8 1/2", the TEC FM-15M1X provides FM-stereo (or mono FM) with a power consumption of only 4 watts. Utilizing 27 transistors and 9 diodes, the



TEC-15M1X features a tuning meter, illuminated slide-rule dial, local-distance switch, a.f.c., interstation muting, and completely automatic stereo operation. Sensitivity is 3.5 μ v by HIFM standards. Frequency response is \pm 1 db from 20 cps to 20,000 cps. Transis-Tronics, Inc., 1601 Olympic Blvd., Santa Monica, Calif. User net price, \$179.50.

FM-15 transistorized tuner \$119.50

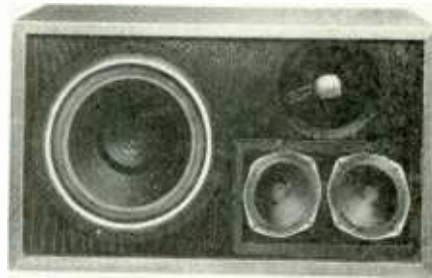
LOUDSPEAKERS AND SYSTEMS

ACOUSTIC RESEARCH

• *Low-Cost "Acoustic-Suspension" Speaker System with Super Tweeter.* Selling for little

over a hundred dollars, the AR-2a consists of an AR-2 speaker system in combination with a 1 3/8 inch dome-type super-tweeter.

The AR-2 speaker system uses the AR patented acoustic-suspension principle in which a small enclosure provides improved rather than compromised reproduction quality. In this principle the woofer cone is mounted on very free suspensions, so compliant that they are unable to provide the elastic restoring force normally required of them. The missing elasticity is then reintroduced by the pneumatic spring formed by the air within the cabinet. The cone literally rides on air instead of on mechanical springs.



The small enclosure size is necessary for optimum performance. The 1 3/8-inch super-tweeter uses a very small, stiff, hemispherically shaped diaphragm as a direct radiator which provides a nearly ideal performance in the high-treble range.

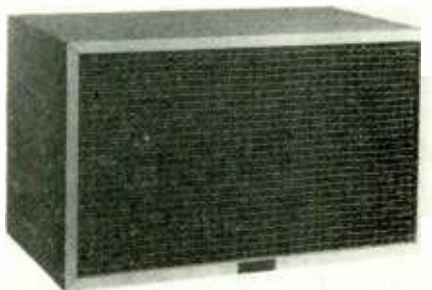
The AR-2a is a 4-speaker system consisting of a single 10-inch woofer, two 5-inch tweeters, and the 1 3/8-inch super tweeter. Frequency response is more than adequate to cover the entire range of musical instruments. Cross-over frequencies are 2000 cps and 7500 cps. Dimensions of the AR-2a are 13 1/2" h x 11 1/2" d x 24" l.

Recommended for use with amplifiers having power output of 20 to 40 watts. Acoustic Research, Inc., 24 Thorndike St., Cambridge 41, Mass. User net price mahogany or birch \$122.00; unfinished pine \$109.00; oiled walnut \$128.00.

AR-1 full-range speaker system, mah .. \$185.00
 AR-2 full-range speaker system, mah .. 96.00
 AR-3 full-range speaker system, mah .. 216.00
 AR-3st super-tweeter for AR-1 or
 AR-2, mah 35.00
 AR-3t mid-range & super-tweeter for
 AR-1, mah 92.00

A. E. S.

• *Bookshelf Speaker System.* The A.E.S. Gigliolo II is a wide-range speaker system enclosed in a natural birch cabinet, which is only 24" x 30 1/2" x 12". All of the wood used for the enclosure is at least 3/4-in. thick, and the enclosure comes completely assembled



and ready for finishing. Frequency response of the Gigliolo II is 29 cps to 16,000 cps plus or minus 8 db. Harmonic distortion is less than two per cent from 50 cps to 15,000 cps. A.E.S. Inc., 3338 Payne, Ave., Cleveland, Ohio. User net price \$49.50.

Gigliolo 1 bkshlf spkr sys \$15.00
 800A 8-in spkr 19.95
 1200A 12-in spkr 49.50
 1500A 15-in spkr 59.50

PERFECT FOR MULTIPLEX STEREO BROADCASTING

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GRAY**



**A STEREO
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ARM
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The most versatile ever developed—
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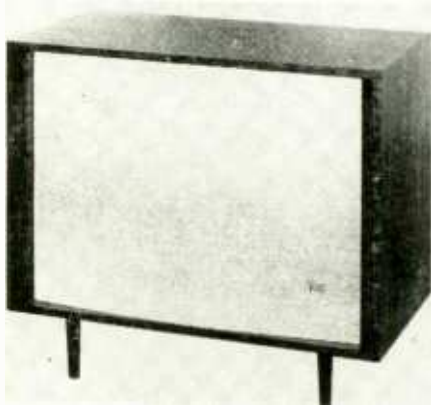
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ALTEC

● **Two-way Speaker System.** The Altec 838-A "Carmel" speaker system provides unusually fine sound in a handsome cabinet of modern design. Available in walnut or mahogany finish, this Altec system is compact enough to be practical for stereo in most living rooms yet large enough to provide "large" loudspeaker sound. The Carmel is a professional-type, two-way reflex system with a "guaranteed" frequency range from 30 cps to 22,000 cps. Two new high-compliance 414-A



bass speakers provide low-frequency reproduction. An Altec 802-B driver mounted on an 811-B horn covers the highs to 22,000 cps. An 800-E crossover network provides crossover at 800 cycles. Altec Lansing Corp. 1515 S. Manchester Ave., Anaheim, Calif. User net price \$297.00.

837-A "Avalon" spkr sys	\$246.00
831-A "Capistrano" spkr sys	399.00
A-7 "Voice of the Theatre" spkr sys ..	299.30
605-A 15-in Duplex spkr	177.00
414-A 12-in. bass spkr	54.00
802-D High freq. driver	53.00
811-B Sectoral horn	30.00

ARGOS

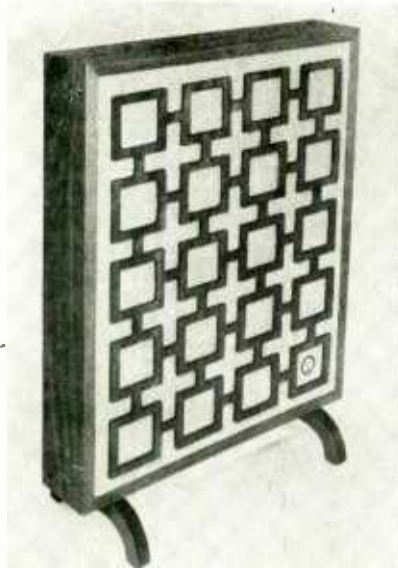
● **Speaker Enclosure.** Compact enough for a table-top yet large enough to accommodate a 12-in. woofer and a tweeter, the Argos "Eldorado" is only 27½" x 14¼" x 10". Especially important for smoothness of the bass



is the tuning tube which is easily installed to match the Eldorado to any speaker you may use. The top, bottom, and two sides are covered with a "wood-grained" Pyroxylin, a new covering which looks exactly like wood from four feet away. Available in either blond or walnut. Argos Products Company, 301 Main St., Genoa, Ill. User net price \$22.50.

AUDAX

● **Thin Loudspeaker System.** The new "Sonoteer" speaker system introduced recently by Audax, employs five speakers but measures only four inches thick. Featuring a return to the open baffle principle, the "Sonoteer" produces the figure-eight sound pattern usually associated with this type of speaker mounting. Thus greater coverage can be achieved if this speaker is appropriately placed. Housed in an oil rubbed walnut frame with a fligreed pattern of matching wood over the speaker cloth, the "Sonoteer" weighs only 18-lb. and costs \$79.95. The "Sonoteer Contemporary" Model CA-70 is the first in the Sonoteer's series which will include cabi-



nets of traditional, classic, and provincial designs. Rek-O-Kut Company, Inc., Corona, N. Y.

CA-60 spkr sys	\$59.95
CA-1008 spkr sys	124.95

BOZAK

● **Three-way Speaker System.** Although small in size, the Bozak B-302A possesses the same musical sensitivity featured by all Bozak speaker systems. It is ideal for small listening rooms or in pairs for stereo. The B-302A contains one Bozak 207A two-way speaker, one B-209A midrange speaker and one 10102 crossover network to provide crossover at 875 cps. Frequency range is 40 cps to 16,000 cps. Impedance of the system is 8 ohms, and



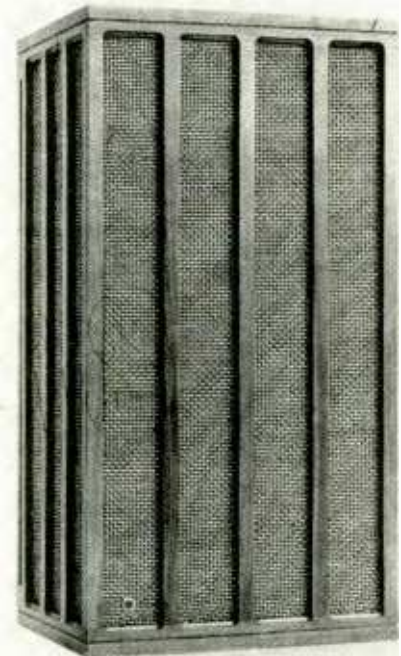
the power handling capabilities are at least 20 watts. The B-302A is available in contemporary styling or provincial styling. The contemporary model, "Urban," is available in either oiled walnut, mahogany, or ebony finishes while the "Provincial" is available in cherry. R. T. Bozak Sales Co., Box 1166, Darien, Conn. User net price for the "Urban" is \$254.50; for the "Provincial" \$290.00.

B-305 wide-range spkr sys "Urban" ..	\$397.50
B310A wide-range spkr sys	770.00
B-1000 spkr sys	79.50
B207A 2-way coaxial spkr	89.50
B-209A midrange spkr	51.00
10102 crossover network	27.50

CROSBY

● **Servo-Amplifier Speaker System.** Representing a new concept in sound reproduction, the Crosby/Intergrand servo-amplifier speaker

system utilizes the servo-amplifier principle to provide improved fidelity. Servos, through a special coil wound on speaker elements, constantly monitor the action of the cone. The slightest unwanted variation from input signal is corrected within the fully transistorized, transformerless amplifiers. These are the same techniques employed in military missile guidance. The three channels of the system consist of one 12-in. woofer, three midrange elements, and three horn-loaded tweeters, respectively. Speaker elements feed



their information back to their own transistorized amplifier sections. Each amplifier is conservatively rated at 12 watts per channel, at one per cent maximum harmonic distortion within its pass-band. Thus a total of 36 watts is available. Crossover networks are provided at the input of each amplifier: woofer up to 800 cps; midrange 800 to 3000 cps; tweeter 3000 to 20,000 cps. All crossover networks have 12 db per octave attenuation outside of their respective transmission bands. Frequency response is plus or minus 3 db from 35 cps to 15,000 cps. Input requirements are 0.75 volts and input resistance is 250,000 ohms. It is available in walnut fruitwood finishes, and also in a utility model less outer wood housing. Crosby Electronics, Inc., 135 Eileen Way, Syosset, L. I., N. Y. User net price, contemporary walnut \$500.00, provincial fruitwood \$525.00, utility model \$480.00.

Troubadour compact spkr sys

DUKANE

● **"Ionovac" Speaker System.** Utilizing ionized air instead of the conventional speaker diaphragm for converting electrical pulsations





— not only the best, but the most complete line of long-excursion, infinite baffle, precision speaker systems...

LINEAR-EFFICIENCY SYSTEMS



THE OLYMPUS

infinite baffle system without peer

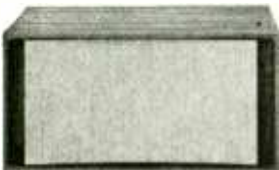
Sensational sight, sensational sound, remarkable bass, undetectable crossover, incredible transient response, transparent highs, smoothest wide-angle projection... Every superlative ever used to describe a precision transduction system has been applied to the new JBL Olympus. The system includes a new 15" Linear-Efficiency low frequency unit, the LE15; new high frequency driver, the LE85; new slant plate acoustical lens, exponentially-tapered horn, and new dividing network. All unite to reproduce sound so clean, so smooth, so intact that the Olympus is destined to establish a new standard for this type of system. The free-standing, trim, beautifully-proportioned enclosure is available in all JBL wood finishes and with choice of carved wood or fabric grille.

FINEST QUALITY COMPACT LINEAR-EFFICIENCY SYSTEMS



THE JBL MINIGON

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



THE MADISON



THE DALE

THE JBL MADISON

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

THE JBL DALE

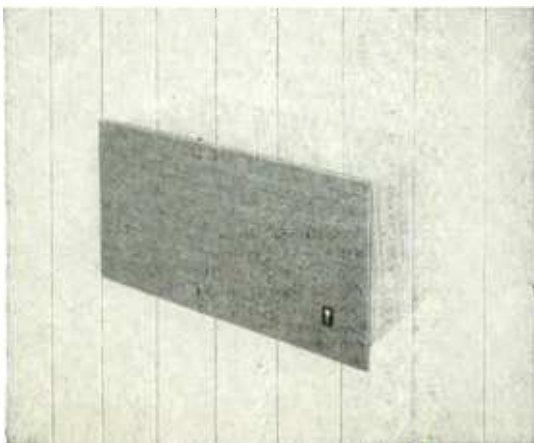
A timeless, elegant, modern design with removable legs and hangers on back (also on Madison) for wall mounting. Finished four sides and front. All finishes and grille cloths available.

HIGH QUALITY, LOW COST COMPACT LINEAR-EFFICIENCY SYSTEMS



THE LANCER 33

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



THE LANCER 66

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

and for building in...

THE JBL WILTON

Unfinished, the Wilton is furnished with either the LE8 or S5 system factory installed. Offered with either a flush grille or overlapping grille for use when built into a wall or partition.

Whatever your choice... exponentially-tapered horn, bass reflex or infinite baffle system... you'll find your ideal speaker in the extensive JBL line. Write for complete catalogue.

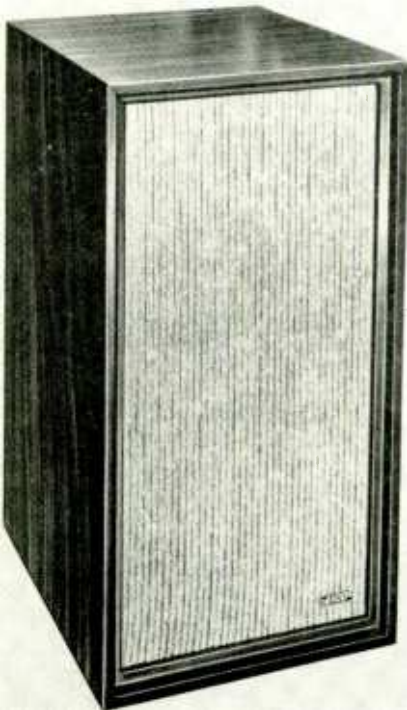
JBL products are manufactured by James B. Lansing Sound, Inc. and marketed by
JBL INTERNATIONAL Los Angeles 39, Calif

into sound, the "Ionovac" high-frequency speakers are available either separately or as part of a complete speaker system such as the DuK-20 full-range system shown. Based on the work of French physicist Sigfried Klein some years ago, the DuKane Corporation developed the principle to a practical reality. Heart of the speaker is a small open-end quartz cell, no larger than the eraser on a pencil, in which air is confined in a chamber which narrows down to a tiny aperture. Within this small space air molecules are bombarded with a high-frequency, high-voltage current which knocks sufficient electrons free to ionize the air. The ionic cloud is modulated by signals from the amplifier and is then fed into a small horn which delivers them efficiently to the room as sound waves. The "Ionovac" has a frequency range from 3500 to 20,000 cps. The DuK-20 includes two midrange speakers and a 12-in. high-compliance woofer in addition to the "Ionovac." DuKane Corporation, St. Charles, Ill. User net price \$87.50.

DuK 10 tweeter \$79.50
 DuK 30 wide-range sys 199.50
 DuK 40 wide-range sys 149.50
 DuK 50 bookshelf sys 139.50

EICO

• **3-Way Speaker System Semi-kits.** The Eico HFS-3 and HFS-4 provide extraordinarily pure reproduction of bass frequencies with good efficiency in an enclosure of only 2 1/4 cubic feet. Both are 3-way systems consisting of a 12" bellows-suspensions woofer and an 8" closed back mid-range speaker with a high-internal-damping cone. A 3 1/2" cone tweeter

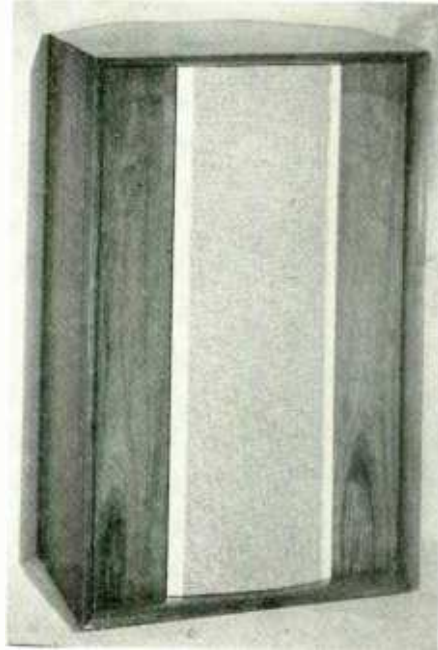


is supplied in the HFS-3 for those who prefer softer highs; a compression-driver horn tweeter is supplied in the HFS-4 for those who prefer more brilliance and projection in the highs. (In all other respects, the HFS-3 and HFS-4 are identical.) The impregnated cloth-bellows woofer surround underlies the excellence of the bass reproduction. Built-in cross-over networks (600 and 4000 cps) with a level control provided for the tweeter. The enclosure is tuned to 25 cps by a tubular ducted port. The tuned enclosure loads the woofer and reduces cone excursion and distortion in the 28 to 60 cps region. Phase-coded terminals. Frequency range 28 to 14,000 cps. Power handling capacity 30 watts; rated impedance 16 ohms. The cabinet is completely factory constructed ready to receive speakers and networks. Available in walnut, mahogany, or unfinished birch. Electronic Instrument

Co., 33-00 Northern Blvd., Long Island City 1, N. Y. Kit price HFS-3, mah \$87.50; HFS-4, mah \$98.50. HFS-5, 2-way spkr sys, mah, kit \$59.50 HFS-1, 2-way spkr sys kit 39.95

ELECTRO-VOICE

• **Large Speaker Systems.** The Electro-Voice Patrician 700, the latest in a series of 4-way speaker systems, although designed for utmost operating efficiency in a corner, can be placed in almost any room location without hampering its performance. The Patrician 700 includes the Model 30W, 30-in. woofer,

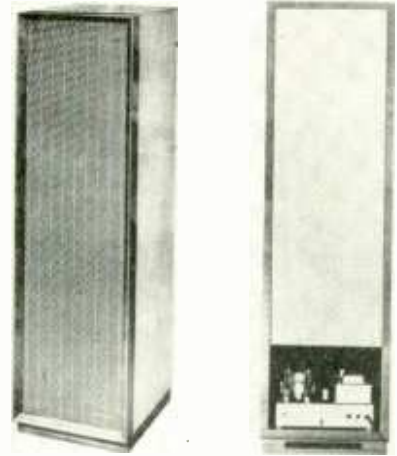


which achieves its highest efficiency in the 40 cps region, and continues to respond down to 20 cps and lower. Midrange is handled by an SP12 full-range speaker in a separate compartment. The sensitive T250 treble driver using an SHD defraction horn, provides reproduction of frequencies above 700 cps. A T350 tweeter extends the response to an upper limit of 35,000 cps. The enclosure is styled in a handsome contemporary design, and is made of selected one-inch-thick woods which are finished in hand-rubbed mahogany, blond, limed oak, or walnut. It occupies only 5.3 square feet of floor space. Size 54 1/2" x 33" x 28 1/2". Electro-Voice, Inc., Buchanan, Mich. User net price \$795.00.

Stereon 200 3-way spkr sys \$375.00
 Royal 400 3-way spkr sys 249.50
 Regal 300 3-way spkr sys 179.00
 Leyton 100 Bkshlf spkr sys 84.50
 Coaxial spkr (8-15-in.) 29.50-89.00
 3-way spkrs (12-15 in.) 66.00-125.00
 30W 30-in. woofer 185.00

EMI

• **Professional Studio Monitor Speaker System with Built-in Amplifier.** Hand made and identical with the systems used in the recording studios of EMI in England, DLS1 is a superb speaker system which will appeal to the connoisseur with unlimited budget and limited space. Built high rather than wide, the DLS1 stands 50-inches high but is only 13 1/4 inches wide and 17-inches deep. Although these dimensions were chosen for the system's design function as a studio monitor, it works out very well in a home. Three speakers are used in the column; a large elliptical cone woofer and two smaller units to cover mid- and high-frequencies. The axes of all speakers are vertical so that maximum horizontal dispersion is achieved over a wide frequency range. Frequency range of the system is 30 to 15,000 cps. An EMI 25-watt, extremely low distortion amplifier is built into the base of the column. The amplifier uses four adjustable, factory-set, frequency correcting networks to



attain linear response over the required frequency range. The column is mounted on four large, concealed casters. Exclusive United States distributor, Scope Electronics Corp., 10 Columbus Circle, New York 19, N. Y. User net price, \$594.00.

DLS 529 bookshelf spkr sys \$159.00

ERCONA

• **Compact Speaker System.** A precision product of Swedish design incorporating a new, patented, multi-layer free-speaker cone, the Nordie 1 is an exceptionally efficient speaker which performs well with amplifiers of moderate power. The compact enclosure contains a 2-way speaker system which consists of an 8-in woofer, and a 5-in cone-type tweeter. The woofer has a multi-layer, free cone, each layer of which is made of a different fibre and material. The combination of hard and



soft materials, plus special edge treatment, reduces distortion to one per cent in the range from 100 cps to 10,000 cps. Distortion from 10,000 cps and 18,000 cps does not exceed 1.5 per cent. Crossover for the tweeter is 7500 cps, although it actually cuts in at about 5,000 cps. System frequency range is 45 cps to 18,000 cps. Impedance is 8 or 16 ohms. Power handling capability is 20 watts music power. Dimensions of the handsomely finished enclosure are 7 1/16" x 10 1/2" x 22 3/4". It is finished on four sides in walnut or teak. Ercona Corp., 16 W. 46 St., New York, N. Y. User net price \$59.50.

FISHER

• **3-Way Speaker System.** The Fisher X1-4 represents a new approach in loudspeaker design. The conventional metal frame (basket)





Is this man an audiophile or an audio engineer?

In view of the many 'good music' FM stations now using Empire turntables, arms and cartridges, he *may* very well be an engineer. On the other hand, he *may* be an audiophile. We're not sure. The appreciation of fine equipment is not limited to professionals. Neither are we sure whether he is using a stereo or monophonic system. The Empire Troubador is known to be fully compatible with both.

However, we *are* sure of the quality of his other components. They are undoubtedly the finest obtainable. For, it is hard to imagine this man having exercised such meticulous care in the selection of his playback equipment being any less discriminating in the choice of his amplifier and speaker components for his music system.

Audio engineers *know* the importance of component quality to playback performance. People in other walks of life are beginning to recognize this too. They are discovering a quality of performance in the Empire Troubador, they believed to be unattainable in high fidelity music systems for the home.

The Empire Troubador comprises the finest components ever designed for the playback function: the Empire 208, 3-speed, hysteresis belt-driven turntable; the Empire 98, dynamically balanced arm; and the Empire 108, truly compatible mono/stereo cartridge.

See and hear the Empire Troubador at your high fidelity dealer. Price of \$180 includes cartridge, arm, turntable and walnut base. Price, less cartridge, \$145.50. For full details, write to:

empire
DYNA EMPIRE INC. 1075 STEWART AVE.
GARDEN CITY, N. Y.

supporting the outer edge of the bass speaker cone has been completely eliminated. This structure is often the source of undesirable acoustic feedback, causing uneven frequency response. In place of the metal speaker frame, the Fisher XP-4 utilizes the heavy walls of the cabinet itself. Reflections are eliminated by packing the space behind the bass speaker cone with AcoustiGlass. The XP-4 contains a total of four speakers, a 12-in. woofer with 2-in. voice coil, two 5-in. midrange units (packed with AcoustiGlass to eliminate cone breakup), one 2-in. hemispherical, high-frequency unit which covers an angle of 120 deg. for non-directional treble. Infinitely variable balance controls are provided for mid and high frequencies. Professional type, three-way crossover network uses heavy air coils, and oil-filled capacitors for elimination of distortion of crossover frequencies. Impedance is 8 ohms. Dimensions are 12½" x 24½" x 14¼". It is available in oiled walnut, cherry, mahogany, and unstained birch. Fisher Radio Corp., 2121 44th Drive, Long Island City 1, N. Y. User net price, mahogany, walnut and cherry, \$199.50; unstained birch \$189.50.

XP-1 3-way spkr sys mah \$129.50
 XP-2 2-way spkr sys mah 84.50

FRAZIER

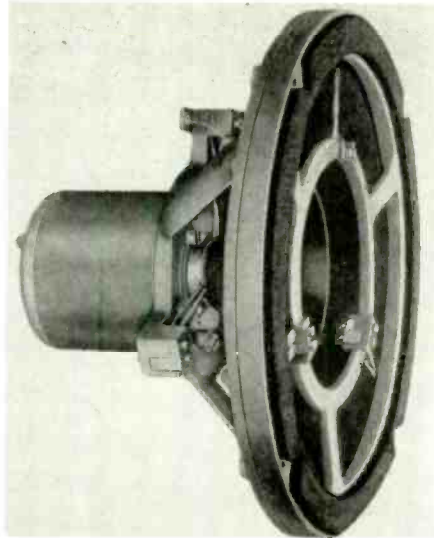
● **F8-3 Speaker System Series.** The Frazier F8-3 series of loudspeakers consists of models having approximately 3-cu. ft. enclosures. The Delmar (F8-31), the Lexington



I (F8-3E), the Coronado I (F8-3G), and the Black Box I utility model (F8-3X) are all equipped with identical loudspeakers. These consist of a special 8-in. full-range speaker; a 3½-in. cone-type tweeter; and a high-pass filter. Since these assemblies have identical tuning tubes and components, their sound is identical except for the slight loss of high frequencies due to the grille cloth on the finished models. The price differential on these units is dependent entirely on the cabinet cost. Frazier Loudspeakers, 2649 Brenner Drive, Dallas, Texas. User net price, Del Mar, \$89.50; Lexington I, \$99.50; Coronado I, \$89.50 and Black Box I, \$57.00.

GOODMANS

● **Super-quality 8-in. Speaker.** The Axiom 80 (shown) is capable of the highest accuracy of sound reproduction at medium power levels. It has an audio range of 20 to 20,000 cps and a power handling capacity of 12 watts. Flux density is 17,000 gauss. The low-frequency diaphragm of the Axiom 80 is a true "free-edge" suspension, being suspended by three pairs of double-acting cantilevers to produce an extremely low and linear axial stiffness and a powerful radial centering action. Resonance is 20 cps. Ideal for monitoring applications. New Triaxiom series consists of dual-cone low-frequency units with aluminum-diaphragm high-frequency pressure drivers. Three 12" models range from 25 to 45 watts; three 15" models from 30 to 50 watts. Axlette II is economically priced 8" unit covering range from 40 to 15,000 cps and capable of

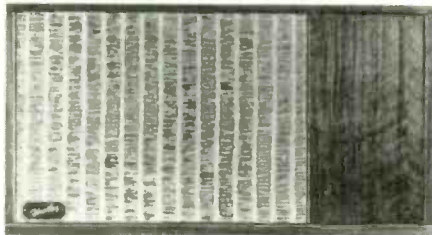


handling 12 watts. Rockbar Corporation, 650 Halstead Ave., Mamaroneck, N. Y. User net price, \$68.50.

Triaxiom series 3-way spkrs ... \$69.50-147.50
 Alpha 2-way spkr sys 49.95

HARTLEY

● **Compact Full-Range Speaker System.** The Hartley "Capri" comprises a full-range 10" speaker mounted in a handsome natural wood cabinet which measures 24" w x 13½" h x 12" d. The grill is made of bamboo, adding a note of distinction to the appearance. The driver is the new model 320 which is a paper polymerized adaptation of the model 220



chemical cone speaker. It has a 15,000-line magnet, 8-ohm voice coil, one-piece molded flannel surround, large dome high-frequency propagator attached to the aluminum shorted-turn portion of the voice coil, which is in turn damped and separated from the wound portion of the coil by a polysiloxane coating. Hartley Products Company, Inc., 521 E. 162nd St., New York 51, N. Y. User net price, \$120.00.

Holton Sr., wide-range spkr sys \$245.00
 Holton Jr., wide-range spkr sys 195.00
 Duo, complete stereo spkr sys 280.00

JANSZEN

● **Speaker System Kit.** Solving the perplexing problems of enclosing electrostatics or of finding a woofer whose efficiency and sound "character" match the electrostatic units, the new JanKit manufactured by Neshaminy Electronic Corp. contains an electrostatic mid- and high-range speaker, its power supply, and a matching woofer—all pre-mounted on a rigid 19½ by 16 inch panel designed for custom installation in a location of your own choosing. Mid- and high-frequency reproduction in the JanKit 41 comes from a Janszen electrostatic speaker whose two push-pull radiators are stated to produce uniform frequency response from 700 to beyond 30,000 cps. Bass is provided by a Neshaminy Model 350 11-inch woofer. This highly compliant speaker is specifically designed to match the Janszen electrostatic and to retain full efficiency down to 30 cps in enclosures as small as 2 cubic feet. Priced at \$99.95 the JanKit 41 comes with complete instructions for building an inexpensive, shelf-type enclosure or for mounting in exist-

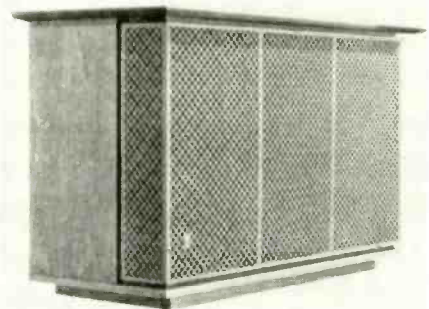


ing cabinets. Neshaminy Electronic Corp., Neshaminy, Penna.

Z400 shelf spkr \$149.50
 130M electrostatic spkr mah 1842.00
 65M electrostatic spkr mah 89.50

J. B. L.

● **Elegant Speaker Enclosure.** The James B. Lansing C-50 "The Olympus" loudspeaker enclosure exemplifies fine furniture craftsmanship and advanced acoustical engineering. The Olympus is designed to bring out the capabilities of the JBL S7 linear efficiency system. The C-50 will also accept the JBL S6 and S8 systems. The C-50 is available in mahogany, tawny walnut, oiled walnut, Danish teak, and ebony. The S7 system consists of an LE-15A 15-in. woofer, and an LE-85 high-frequency driver which is used



with an HL-91 exponentially tapered, cast-aluminum horn coupled to an acoustic lens. The crossover network, LX-5, crosses over at 500 cps. James B. Lansing Sound Co., Inc. 3249 Casitas Ave., Los Angeles 39, Calif. Price of the Olympus with hand-carved wooden fretwork grille, is \$258.00; with fabric grille, \$198.00.

LE-15A 15-in. woofer \$124.50
 LE-85 high-frequency driver 138.00
 HL-91 horn-lens assembly 33.00
 LX-5 crossover network 72.00

JENSEN

● **Slim Loudspeaker System.** The Jensen 3P/2 is a super-slim panel speaker which is only 3¾-in. deep, and can stand on a floor or hang on a wall, and in general fits in with most decors unobtrusively. Dimensions are 28½" x 21¼" x 3¾". The case is selected walnut veneer in an oil finish with rattan grille and oak trim strips. The 3P/2 contains five speakers, a 10-in. woofer with a solid foamed plastic cone; an 8-in. M-80 midrange plastic-cone speaker; two TW-40 tweeters; and an E-10 "Sono-Dome" super tweeter. All

Quoted from

"ASSEMBLING A GOOD STEREO SET"

by Ken Winters,
music and recordings editor
of the

Winnipeg Free Press:

“ I chose the AR-2a speakers over other extremely good systems because of their self-effacing dispositions. They seemed to intrude less in the music than did other speakers with more markedly individualistic sound-producing natures. ”

A number of articles have appeared recently in which the author (or magazine staff, or consumer organization) selects components for a complete high fidelity system. Most of these systems have included Acoustic Research speakers for the same reason given by Mr. Winters: the ability of AR's to reproduce music naturally, with minimum coloration.

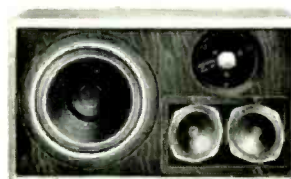
We will be glad to send you a reprint of Ken Winters' article, discussing his choice of components for a stereo system in the medium-price range. Other lists of preferred high fidelity equipment are also available on request: a reprint of *down beat* magazine's "Picks of the Year" in stereo components,* and a description of four stereo systems,** each selected for *Gentlemen's Quarterly* by a different audio expert as the ultimate in quality.

AR speakers are priced from \$89 to \$225.

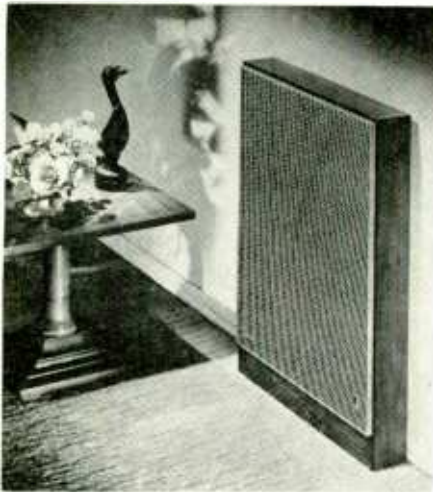
*AR-2a's chosen for medium-price system, AR-3's for luxury system

**AR-3's included in three of the four lists

AR-2a



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

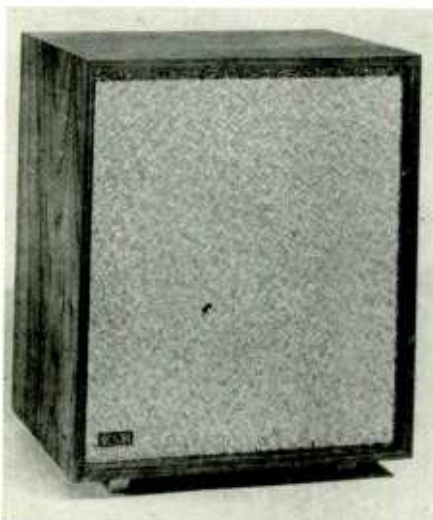


of the speakers have "Polytec" radiators. Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 28, Ill. User net price \$139.50.

3P/1 4-way spkr sys	\$119.50
TF3 3-way spkr sys oil walnut	99.50
TR-10 3-way spkr sys mah	119.50
Galaxy III spkr sys mah	229.50

KLH

• **Full-Range Two-Way Speaker System.** Housed in a cabinet measuring 24 $\frac{3}{4}$ "h x 21 $\frac{1}{2}$ "w x 11 $\frac{1}{2}$ "d and supported 1 $\frac{1}{2}$ " above the floor by runners, the volume of the Model 7 is 2.6 cu. ft. The speaker complement is a 12" acoustic suspension woofer and two small cone-type direct radiators operating as rigid pistons over the range from 1500 to 20,000 cps. The use of two such loudspeakers gives a surprisingly large apparent sound source. Low- and high-frequency sections are coupled



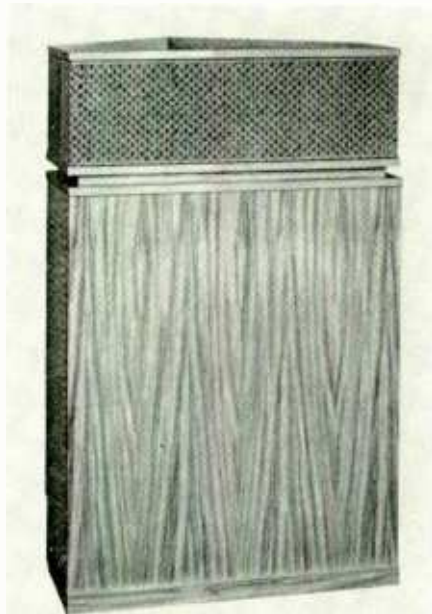
by an LC crossover network at a frequency of 1500 cps. The relative levels of low- and high-frequency sections may be varied $\pm 2\frac{1}{2}$ db to provide some degree of control over different room acoustics. Cabinet shape chosen to fit decors where the longer rectangle shape of the Model Six might not fit. Efficiency is identical with that of Model Six. KLH Research and Development Corp., 30 Cross St., Cambridge, Mass. User net prices: mah, korina, \$196.00; wal, oiled wal, \$203.00; unf wal, \$198.00; unf birch, \$189.00.

4 2-way spkr sys mah	\$224.00
6 2-way spkr sys mah	129.00
9 wide-range electrostatic mah (pr)	1,030.00
10 2-way spkr sys mah	98.00

KLIPSCH

• **3-Way All-Horn Speaker System.** The Klipsch horn employs a folded corner horn

bass unit with straight-axis midrange and tweeter horns. The bass system delivers one acoustic watt output at 32.7 cps, with a maximum diaphragm motion of 1/16-in. assuring very little frequency- and amplitude-modulation distortion. The straight-axis midrange unit affords less than 5 db peak-to-trough ratio over the range of greatest auditory sensitivity. Natural "toe-in" for stereo provides a minimum shift of the virtual sound source for different listening positions over a

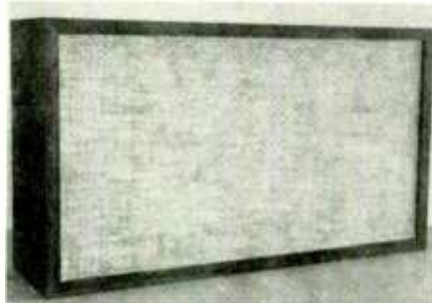


wide listening area. Amplifier power requirement is of the order of less than five watts for 120 db intensity (referred to 0.0002 dyne per centimeter), but the speaker is capable of 25 acoustic watts output at 120 electrical watts input of normal program material. Klipsch and Associates, Inc., Hope, Arkansas. Prices range from \$514.00 for the decorator model to \$822.00 for the most expensively finished, exotic hardwoods.

Cornwall wide-range spkr sys ..	\$311.00-408.00
Model H 3-way spkr sys	188.00-221.00

KNIGHT

• **Two-way Speaker System.** The new Knight KN-281 is a beautifully styled, very shallow enclosure that fits anywhere, offering almost unlimited placement possibilities in your home. The good reproduction of sound is made possible by the use of specially designed components: a 10-in. high-compliance woofer



with $\frac{3}{4}$ -in. cone excursion; two $\frac{3}{8}$ -in. direct-radiator tweeters for midrange and a treble; a precision duct. The enclosure with its components and duct are critically tuned for lowest distortion and uniform response. The matching natural beige grill cloth is acoustically transparent to permit free passage of high frequencies. Frequency range of the KN-281 is 40 cps to 16,000 cps. Built-in crossover network with level control for adjusting high-frequency response. The crossover point is 2000 cps. Power handling capability up to 30 watts of program material. Impedance is 8 ohms, and the over-all

size is 13 $\frac{1}{2}$ " x 23 $\frac{3}{4}$ " x 6 $\frac{1}{2}$ ". The enclosure is finished in an attractive, oiled walnut veneer. Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. User net price \$49.95. Also available in an unfinished, smooth-sanded Korina veneer at only \$44.95.

LAFAYETTE

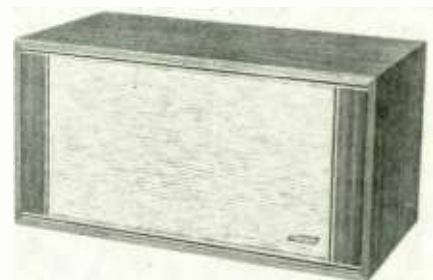
• **10-in. 3-way Speaker.** Designed expressly for use with bookshelf enclosures the Lafayette "Trihelix" Model SK-180, incorporates three completely independent speakers with three separate voice coils in a single compact unit. Although they are individual units, the 2-in. tweeter and 5-in. midrange speakers have been especially designed to complement the 10-in. woofer. In addition, the midrange



and tweeter are completely enclosed by a specially designed baffle. A built-in electrical crossover network with crossover points at 1500 cps and 5000 cps allows each speaker to reproduce its portion of the audio range smoothly and efficiently. Frequency response is 30 cps to 18,000 cps, plus or minus 3 db. Free-air resonance is 35 to 55 cps; impedance is 8 ohms. Power handling capability is 20 watts average program material. Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y. User net price \$32.50. Lafayette also has available a complete line of speakers and enclosures at all price levels.

MERCURY

• **Compact Speaker System.** Featuring an acoustically sealed enclosure plus an additional airtight compartment with flexible walls which permits the speaker cone to undergo greater excursions, the Mercury Model CR-1 contains a 3-way speaker system specifically designed for its small size. The



special compartment (called "Doublet") accepts the back pressure from the speakers and radiates it in two directions which are 180 deg. out of phase. Speakers are a 10-in. bi-axial woofer-midrange and a 4-in. tweeter. Enclosure is executed in genuine walnut veneer. Mercury Electronics Corp., 111 Roosevelt Ave., Mineola, N. Y. User net price, \$79.95.

MA-1 "Maestro" 2-way sys	\$59.50
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PIONEER

PAT-30X

20-CYCLE SOUND IS PERFECTLY AUDIBLE

12-inch Triaxial Speaker With Horn Speakers Arranged For The Medium And Treble Ranges

The PIONEER is proud to offer its latest 12-inch speaker, which it claims to be the world's highest in performance.

PAT-30X is a full 3-way speaker with a 12-inch woofer arranged with speakers for medium and treble ranges. For each speakers, a powerful magnetic circuit is provided.

The woofer is provided with a minimum resonance frequency entirely out of comparison with existing 12-inch speakers through the adoption of a special design for the edge. Distortion in the bass range, moreover, has been so reduced as to be entirely negligible.

One of the outstanding features of this 12-inch speaker is its capacity to reproduce sound as low as that reproduced by a 15-inch speaker. The second feature is the adoption of horn

type speakers for reproducing medium and treble ranges. The medium range, in particular, is far more excellent in quality than any of the existing cone speakers, reproducing natural and beautiful sound. The tweeter is capable of reproducing up to 20,000 cps, which is the highest achieved by a horn type speaker. The quality of sound is very clear and sonorous. PAT-30X is provided with a crossover network capable of sharp attenuation, and an attenuator for the medium and treble ranges. These have completely eliminated disturbances near the crossover frequency, and the reproduction over the wide frequency range between 20 cps and 20,000 cps is entirely flat.

Sound reproduced with PAT-30X is guaranteed to satisfy you completely.

SPECIFICATIONS

Voice Coil Impedance	16 ohms
Resonance Frequency	23—32 cps
Frequency Range	20—20,000 cps
Power Input	30 watts
Sensitivity	102 db/watt
Total Flux	255,000 maxwell
Woofer:	70,000 maxwell
Mid-Range Sp.:	20,000 maxwell
Tweeter:	10,450 gauss
Flux Density	13,200 gauss
Woofer:	12,800 gauss
Mid-Range Sp.:	24.25 lbs
Tweeter:	
Weight	
Crossover Network	Parallel Type 3-way
Type	12 db/oct., 18 db/oct.
Attenuation	800 cps, 6,000 cps
Crossover Frequency	16 ohms
Impedance	

Well-known for its Pioneer Brand, the Fukuin Electric, Ltd. has now changed its name to the Pioneer Electronic Corporation.

PIONEER ELECTRONIC CORPORATION

5 Otowa cho 6-chome, Bunkyo ku, Tokyo, Japan

MONARCH

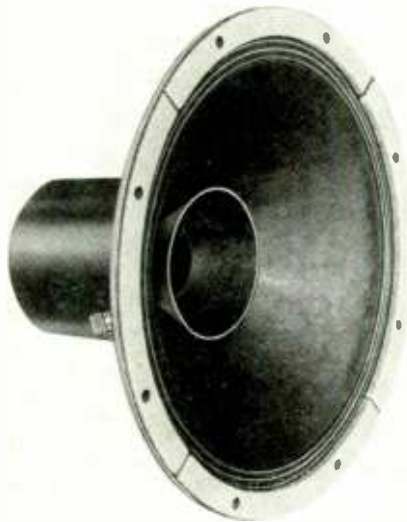
● **Bookshelf Speaker System.** The Monarch Model STS-10S Bookshelf Speaker System employs a foam suspended woofer which permits exceptionally large voice-coil excursions while maintaining linear response. Frequency range is 25 cps to 18,000 cps. A pair of



specially designed cone-type tweeters are also incorporated in a tuned cabinet ducted with plastic tubing, thus reducing unwanted resonance. A level control is provided for the tweeters. Power handling capacity is 30 watts. Unit is finished on the four sides with Swedish walnut. The cabinet is 23½" x 14" x 11¾". Monarch Electronics International, Inc., 7035 Laurel Canyon Blvd., North Hollywood, Calif. User net price is \$69.95.

NORELCO

● **Speaker Series.** Illustrated is Model AD-5277M, the most powerful in the new T-7 series of twin-cone speakers manufactured by Philips of The Netherlands, and featuring Ticonal 7, a high-coercivity alloy which provides the highest possible concentration of flux densities in the voice-coil air gap. Weight for weight, Ticonal 7 is said to be about 30 per cent more powerful than any of the conventional magnet materials used in speaker



construction. Voice-coil impedance of the new T-7 speakers is held constant throughout the entire frequency range by means of a copper ring fitted into the air gap. The ring acts as a shorted turn which induces a current opposite in polarity to that flowing through the voice coil, which reduces that current, thereby lowering the impedance to its proper level. The resonant frequency of the T-7 speakers is very low, resulting in an extremely straight response curve in the bass region. In addition to the cone for low and middle notes, the speakers are equipped with a high-note cone which extends the upper frequency range. Model AD-5277M is a 12-in. speaker with a frequency range of 35 to 18,000 cps and 20-watt continuous power handling capacity when properly housed. Cone resonance is 45 cps. High Fidelity Products Division, North American Philips

Company, Inc., Hicksville, N. Y. User net price, \$59.50.

AD-4277M 12" spkr	.....	\$39.00
AD-4877M 8" spkr	.....	26.00
AD-3877M 8" spkr	.....	9.90
AD-3690M 6 x 9" spkr	.....	6.20
AD-3500M 5" spkr	.....	4.95

PACO

● **2-Way Semi-Kit Speaker System.** A compact 2-way speaker system, the Model L-2 kit features a factory-built and finished cabinet crafted of furniture-grade plywood. The integrated system incorporates a special design



10-inch Jensen long-excursion woofer and a horn-loaded compression tweeter. Low-frequency response is extended by a pre-tuned, tube-loaded port. Frequency range is stated at 45 to 14,000 cps. Impedance is 8 ohms. The compact cabinet, 23" x 13" x 12", is available, unfinished or walnut finish. Paco Electronics Company, 70-31 84 St., Glendale 27, Long Island, N. Y. User net price, \$59.95 unfinished, \$69.95 walnut finish.

L1 bookshelf spkr sys \$24.95

PERMOFLUX

● **"Royal" Speaker Line.** The Permoflux "Royal" speaker line includes 8 and 12-in. speakers in deluxe and standard configurations. The speaker cone in this series is flexible, slotted, and thin at the edge, and coated with a permanently soft and resilient formula which, together with an extra large, low-resonance suspension at the cone apex gives very high compliance. The stiffened cone apex and special voice coil provides a smooth distribution of high frequencies. The Royal Deluxe 12 (shown) has a frequency range from 30 cps to 12,000 cps, and has a power handling capability of 20 watts. The Royal Standard 12 has a frequency range

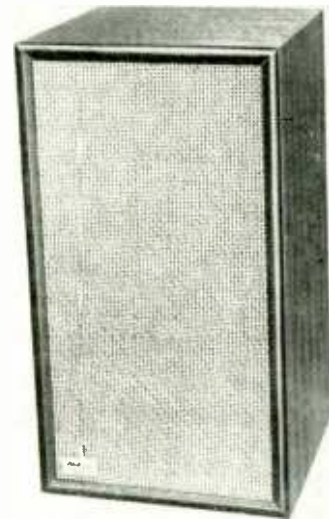


from 40 cps to 12,000 cps, and has a power rating of 15 watts. The Royal Deluxe 8 has a frequency range from 45 cps to 14,000 cps

and a power rating of 20 watts, whereas the Royal Standard 8 has a frequency range from 50 cps to 12,000 cps with a power handling capability of 15 watts. The Royal Standard 6 has a frequency range from 60 cps to 10,000 cps, with a power handling capability of 6 watts. All the Royal speakers have an impedance of 8 ohms. Price for the speaker line varies from \$10.00 for the Royal Standard 6 up to \$32.50 for the Royal Deluxe 12. Permoflux Products Company, 1101 San Fernando Rd., Glendale, Calif.

PILOT

● **3-Way Bookshelf Speaker System.** Completely finished on all four sides the Pilot PSV-4 3-way bookshelf speaker system is a handsome addition to any room. The bass is produced by a 12-in. "Air Flex" heavy-duty woofer which is front mounted in an orlon filled enclosure. Two 3½-in. cone-type speakers produce the midrange frequencies. The high frequencies are produced by a specially designed super tweeter. This

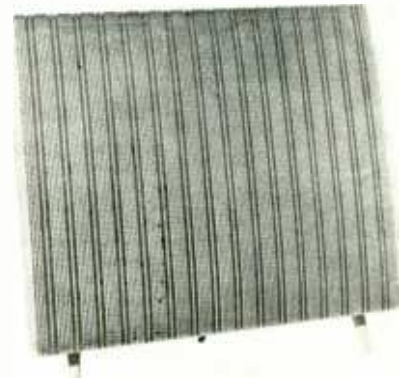


four-speaker combination, plus a crossover network, provides a frequency range from 30 cps to 16,000 cps. Impedance of the system is 8 ohms. Power handling capabilities are 30 watts of program material. Dimensions of the enclosure are 25¾" x 14½" x 12" and it is available in lacquered walnut, oiled walnut, or mahogany. Pilot Radio Corp., 37-06, 36th Street, Long Island City 1, N. Y. User net price \$119.50.

PSV-3 3-way spkr sys	.....	\$64.50
PSV-2 3-way spkr sys	.....	69.50

QUAD

● **Full-Range Electrostatic Speaker.** Perhaps the first full-range electrostatic speaker in



the world, this speaker may herald the future for the industry. Completely free standing and non-critical as to placement, it radiates

new
new new
new new
new

LESS THAN 3 GRAMS TRACKING PRESSURE



the
Electro-Acoustic
7000 series
automatic
record player
...made
to protect
the original
fidelity of your
recordings

The selected Diamond Stylus pickup of the 4-speed Electro-Acoustic 7000 Series stereophonic record player, with its high compliance and extremely low stylus pressure combine to extend record life and maintain the original fidelity of your fine recordings.

The dynamically-balanced 4-pole, 4-coil motor and turntable, micro-honed motor spindle, precisely machined bearings, and the custom-fitted turntable drive . . . limit rumble to -40db, wow to less than 0.15% RMS and flutter to 0.06% RMS (better than NARTB standards). Turntable speed is certified to be within $\pm 1\%$ of absolute.

The Electro-Acoustic 7000 series handles your records more carefully than human hands. It is designed to capture the full beauty of every recording for hundreds of playings.
\$69.50 Audiophile Net.

CERTIFIED QUALITY

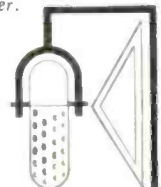
Each record player is laboratory tested and is sold with a written test report coded to the serial number of that particular record player, certifying that performance is within specification limits.



Write today for free illustrated literature and the name of your nearest dealer.

ELECTRO-ACOUSTIC PRODUCTS COMPANY

2135 South Bueter Road, Fort Wayne, Indiana



from both sides in a figure-eight pattern which minimizes reflections from the walls and ceiling. Frequency range of the speaker is 45 to 18,000 cps and its impedance is 16 ohms. Dimensions are 31" high, 34½" wide, 10½" deep at bottom. Manufactured in England, exclusive United States distributor is Leetronics of City Line Center, 7641 City Line Ave., Philadelphia 31, Pa. User net price, \$345.00.

RAVENSWOOD

● *"Reflection Coupler" Stereo Speaker System.* Utilizing a patented "Reflection Coupler" system for achieving stereo spread, the Ravenswood Model M-50 is a complete stereo speaker system in an enclosure measuring only 38" wide x 16½" high x 6" deep. Power handling capacity of the system is 35 watts of program material and dispersion is 180 deg. The system contains 4 speakers and the impedance is 16 ohms. Ravenswood Division of Annapolis Electroacoustic Corp., 241 West St., Annapolis, Md. User net prices: in oiled walnut enclosure, \$99.95; utility model, \$79.95.

M-500 6-spkr ster sys walnut \$169.95
M-5000 walnut 259.95

R & A

● *Couaxial Speaker Series.* Manufactured by a well-known British speaker manufacturer, the 700 series Mark IV models are a group of high quality woofer/midrange speakers. Although they vary in fundamental resonance they all provide smooth frequency response up to 18,000 cps. All feature Alcomax III Anisotropic magnet systems with a flux density of 12,000 gauss (10,000 gauss in 5-in. unit). The magnet assembly is easily removable without demagnetization and has zero external field. Power handling capacity is 10,

frequency is 7500 cps and level attenuator is included to permit sensitive balance of the highs. An ON/OFF switch is provided to control the electrostatic element. Frequency range is stated as 30 to 25,000 cps for the system. Power handling capacity is 20 watts,



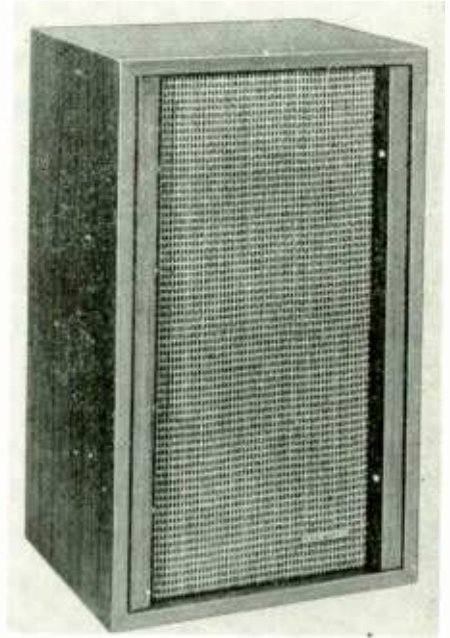
impedance is 8 ohms. In addition the Electrostat-2 is available in a choice of two decorator cabinets: genuine mahogany or imported teak. Radio Shack Corp., 730 Commonwealth Ave., Boston 17, Mass. User net price \$54.95.

Solo I 2-way spkr sys \$15.95
Solo II 2-way spkr sys 29.50
Solo III 2-way spkr sys 39.95
360-5 thin spkr system 69.95
Electrostat 4 3-way spkr sys 79.95
Electrostat 3 tweeter 19.95

RICH

● *Three-way Speaker System.* A completely new type of unit which embodies three different and unique transducers, the new Rich

new H. H. Scott loudspeaker systems, the S-2 and S-3 are the culmination of years of experience. The S-3 consists of a low-resonance woofer, a midrange unit, and a super tweeter. The slightly larger S-2 contains a high-compliance woofer of low resonance, two dual-cone midrange speakers, and a special spherical tweeter. Continuous midrange and tweeter controls permit fine adjustment of



each speaker system to the particular acoustic environment and room setting. The speakers have been designed to be used with amplifiers of modest power. H. H. Scott, Inc., Dept. P, III Powder Mill Road, Maynard, Mass. User net price in traditional finishes (east of the Rockies) Model S-2 \$199.95, Model S-3 \$129.95.

STENTORIAN

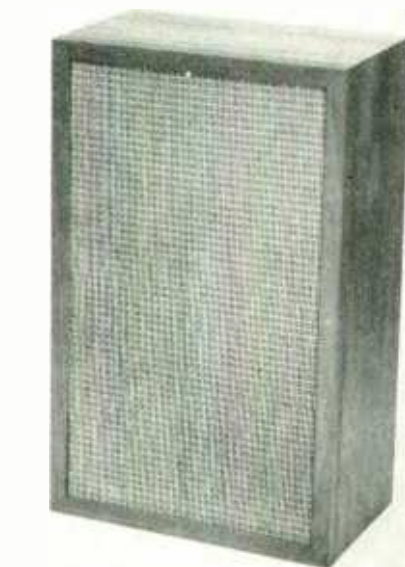
● *12-inch Extended-Range Speaker.* Excellent performance is the key feature in this high-fidelity speaker manufactured by Whiteley Electrical Radio Company in England. The model HF1214 has a frequency range of 25 to 14,000 cps with a cone resonance of 39 cps. The 1½-inch diameter voice coil is driven by a 5½ pound Alcomax magnet structure with a flux density of 14,000 gauss. Power handling capacity is 15 watts and voice-coil impedance is 16 ohms. The patented Stentorian conical cone is used, and the speaker is mounted on an unusually sturdy die-cast, non-resonant



20, 25, and 30 watts respectively for Model 750 (5"), Model 780 (8"), Model 7100 (10"), and Model 7120 (12") speakers. Voice-coil impedance is 8 ohms for all models. Distributed in the United States by Ercann Corporation, 16 W. 46th St., New York 36, N. Y. User net price, Model 750 \$9.95, Model 780 \$14.95, Model 7100 \$16.95, Model 7120 \$18.95.

REALISTIC

● *Electrostat-2 Full-Range Speaker System.* Featuring a 4-element electrostatic tweeter, the new Electrostat-2 introduced by Radio Shack of Boston is intended to provide good sound quality at a reasonable price. The highs in this full-range system, as previously indicated, are handled by a 4-element electrostatic tweeter which is placed so that a 120-degree dispersion is achieved. The lows are handled by an 8-inch woofer. Crossover

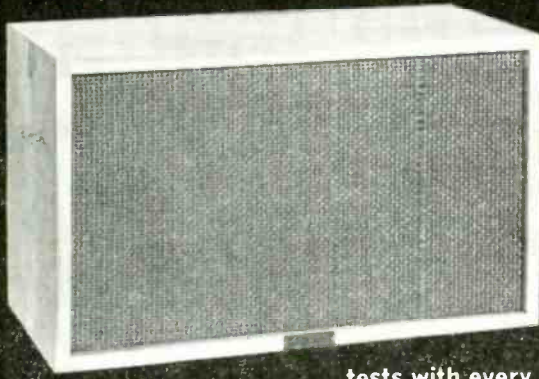


20/20 reproducing system is about 6 db more efficient than other low-efficiency systems. Also the low-frequency load does not require a critical enclosure size and shape as do conventional low-efficiency woofers. Over-all size of the system is 25½" x 16" x 9½". Power handling capacity is 50 watts. Frequency response is plus or minus 8 db from 20 cps to 20,000 cps (including crossover network). Input impedance is 8 ohms. The enclosure is finished in oiled walnut. Bogen and Rich Co., 28 School Street, Yonkers, N. Y. User net price \$200.00.

H. H. SCOTT

● *New Loudspeaker Systems.* Utilizing a fresh approach to crossover network design, the





A. E. S. *Gigolo II*

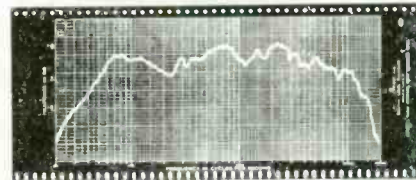
**WE CHALLENGE COMPARISON
REGARDLESS OF PRICE OR SIZE**

Here, at A. E. S. we have made comparison tests with every bookshelf speaker system available to us, and found the Gigolo II to be by far the most outstanding performer. In the words of our Engineering Department, quote: "This system cannot be improved upon."

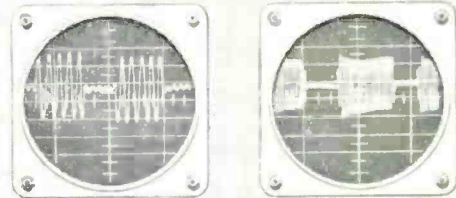
These are the facts:

To explain these technical specifications to the average layman, in language that can be easily understood, all these figures and curves show that the Gigolo II is more properly suited for use in some type of professional application, where large surges of power and extreme frequency reproduction would be needed, rather than for use in the home.

But, for those people who feel they must impress their audiophile friends by having the most outstanding performing system in his group, or the type of person who wants to have that certain feeling of psychological satisfaction which comes with owning that special piece of audio equipment, we offer the Gigolo II, so you may compare and prove this to yourself, or it may be returned on our purchase price money back guarantee.



RESPONSE CURVE



700 CPS TONE BURSTS 3500 CPS

SPECIFICATIONS:

Frequency response	29-16000 cps \pm 8 db
Harmonic distortion	less than 2% 50-15000 cps
Impedance curve	within -0% +100% of 8 OHMS
Intermodulation distortion	Negligible
Free air resonance	35 cps
Recommended power	15-60 watts

Following test equipment was used to determine the above specifications:

- Hewlett Packard distortion analyser
- General Radio response curve recorder
- Tektronix Oscilloscope

Response curve run at continuous 25 Watt input.

DESCRIPTION:

THE A. E. S. GIGOLO II incorporates a newly developed 10" free edge woofer, a 3" hard cone tweeter, and an electronic cross-over. The enclosure is made of the finest 3/4" select natural birch. The baffle is of the pneumatic loaded design. The outside dimensions are: 24" long, 13 1/2" high, 12" deep. Our grille cloth is supplied by one of the country's largest manufacturers of acoustic grille material. Your Gigolo II, comes to you completely assembled, sanded, ready for finishing in either blond, walnut, mahogany, cherry or ebony. All units sold on 100% MONEY BACK GUARANTEE.

Price \$49.50 Unfinished, F.O.B. Factory

A. E. S. Inc.
3338 Payne Ave., Cleveland 14, Ohio

Gentlemen please ship Gigolo II \$49.50 Each
I understand these units are guaranteed and if I am not
satisfied I may return for a full purchase price refund.

Name

Address

City and State

Enclosed find check money order

frame. Distributed in the United States by Barker Sales Co., 339 Broad Ave., Ridgefield, N. J. User net price, \$52.50.

HF1012U, 10" spkr	.....	\$18.95
HF812U, 8" spkr	.....	14.95
T-359, 3 1/2" tweeter	.....	14.95
T-10, tweeter	.....	20.95

STEPHENS

● *Free-Cone Full-Range Speaker.* Although only 8-in. in diameter, the Stephens 80FR achieves big speaker response. An exclusive internal air damping system provides control cushioning to eliminate breakup at extremely high levels. Impedance is 16 ohms (8 ohms optional). Frequency range is 40 cps to 15,000 cps. Free air resonance is 50



cps. Power handling capabilities are 25 watts of program material, and the voice coil is 2-in. edge-wound aluminum ribbon. Stephens Trusonic, Inc., 8438 Warner Drive, Culver City, Calif. User net price is \$33.50.

120FR 12-in. wide range spkr	.....	\$60.00
150FR 15-in. wide range spkr	.....	87.00
150 CX 15-in. coaxial	.....	129.50
ST102 "Stereo Dot" w tweeters	.....	249.50
RT-1 tweeter	.....	26.50

TANNOY

● *Compact Speaker System.* In keeping with the modern trend towards decreased size, the new Tannoy "Cadet" is a mere 11 x 13 1/2 x 2 1/4 inches in size. Of course the scant size is not an indication of performance; within its 1 1/2-cubic-foot volume is contained a 10-in. Tannoy dual-concentric loudspeaker



which was designed specifically for an enclosure of this volume. In common with the other Tannoy dual concentrics, this speaker incorporates two completely separate loudspeakers: a horn-loaded high-frequency unit and direct-radiator low-frequency unit. The low-frequency unit has a curvilinear cone, plastic-terminated surround, and the whole unit is dustproofed by means of an acoustically transparent center dome and rear suspension. Although not claimed to have all

the "brawn" of its 12- and 15-in. big brothers, this speaker will provide the extended range coupled with low harmonic distortion for which its elders are already well known. Power handling capability is 20 watts and impedance is 16 ohms. The Cadet is available in oiled walnut at \$145.00. Tannoy (America) Limited, P. O. Box 177, East Norwich, L. I., N. Y.

Dalton w. 12-in. dual conc	.....	\$213.00
Belvedere w. 12-in. dual conc	.....	203.00
"GRF" w. 15-in. dual conc	.....	725.00
15-in. dual conc. w. x-over	.....	179.00
12-in. dual conc. w. x-over	.....	138.00
10-in. dual conc. w. x-over	.....	112.75

UNIVERSITY

● *3-Way Speaker System.* Intended as a bridge between the large speaker systems of the past and the compact of the present, the University Classic II is a 3-way speaker system capable of "big" sound. The system includes a high-compliance 15-in. woofer featuring rigid diaphragm and extremely compliant, soft surround and a massive die-cast frame. Midrange is handled by an 8-in. direct radiator which features a completely enclosed

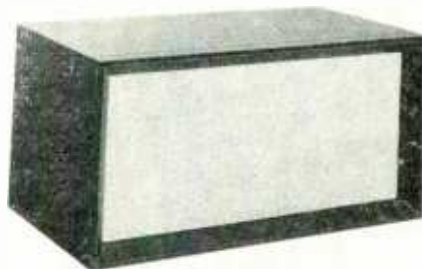


basket, thus protecting it from the effects of woofer-generated pressures inside the cabinet. The tweeter is the well-known University "Sphericon" super tweeter. Frequency range is from 20 cps to 40,000 cps. The Classic II may be used with any high-quality amplifier rated from 10 watts to 60 watts. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. User net price \$295.00.

Medallion XII 3-way spkr sys mah	..	\$139.95
RRL-12 12-in. 3-spkr sys mah	....	119.95
TMS-2 stereo spkr sys mah	.....	258.00
Series 200 high-compl spkrs		
(8-15 in.)	.....	28.00-156.00
Series 100 wide-range spkrs		
(8-15 in.)	.....	16.95-83.00

UTAH

● *Bookshelf Speaker System.* The Utah bookshelf speaker system, S11-1, is only 10" x 10" x 20" and 3/4-in. plywood is used throughout. The system is Fiberglas lined as necessary. Bass is reinforced by tuned, ducted reflex ports which have been adjusted to



complement the response curve of the 8-in. woofer. The 8-in. woofer-midrange speaker handles frequencies from 38 cps to 4,000 cps. The 2" x 6" tweeter handles frequencies up to 17,500 cps. The power handling capa-

ilities are 18 watts. Impedance of the system is 8 ohms. Available in walnut, mahogany or blond finishes. Utah Electronics Corp., Huntington, Ind. User net price \$99.95.

VITAVOX

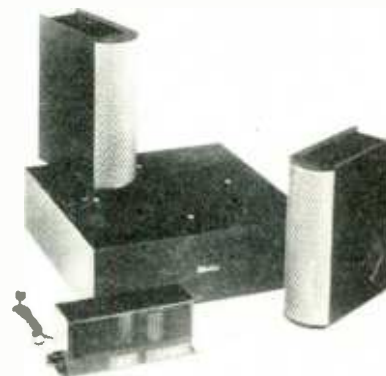
● *Coaxial Speaker.* The Vitavox DU120 coaxial loudspeaker provides full-range reproduction, and incorporates mechanically and electrically independent low- and high-frequency units. Both units are of the direct-radiator, moving-coil type, permitting a broad crossover, and are chosen because of their reliability. The magnets used in the DU120 utilize high-efficiency magnet materials, and are designed to give optimum per-



formance with price as a secondary consideration. The magnet in the low-frequency unit is of the ring type, and provides a constant field throughout the maximum excursion of the voice coil, thus eliminating nonlinear distortion. The high-frequency unit uses a center pole magnet because the cone movement is extremely small. Frequency range is 30 cps to 15,000 cps. Crossover frequency is 2000 cps. Voice resonance is 40/45 cps. Ercona Corp., cps. Power handling capability is 15 watts. Ercona Corp., 16 W. 46 St., New York 36, N. Y. User net price \$89.50.

WEATHERS

● *Triphonic Stereo System.* An unusual approach to stereo speaker design, the Weathers stereo speaker system consists of the non-directional Hideaway Bass and a pair of Harmony stereo speakers. No bigger than an un-



abridged dictionary (11 x 9 1/4 x 3 1/2 inches) the Harmony stereo speakers have a stated frequency range from 70 to 15,000 cps and have a power-handling capacity of 3 watts. The speaker is a full-range moving-coil type with an impedance of 4 ohms. The Hideaway

(Continued on page 82)

Which cable has the **Beldfoil***?

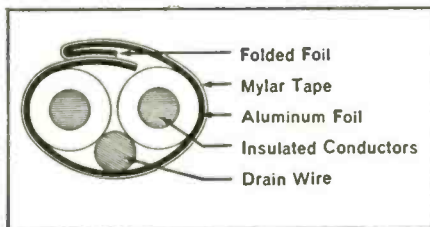


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For complete specifications, ask your Belden electronics jobber.

*Belden Trademark
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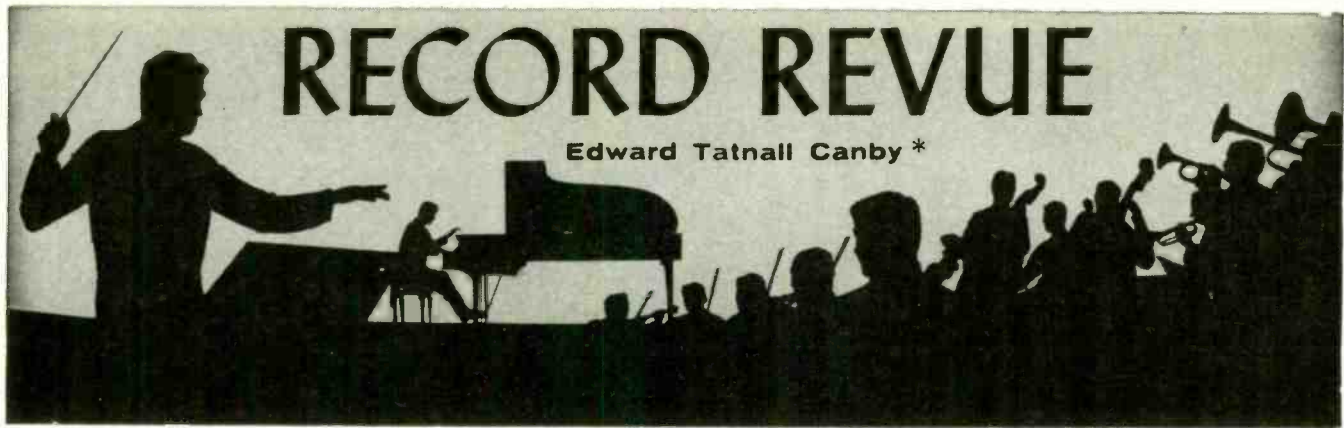
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8-5-0

AUDIO • AUGUST, 1961

65



RECORD REVUE

Edward Tatnall Canby *

Folk

Carolyn Hester.

Tradition TLP 1043

We have a Texas gal, here, who has entered the folk-song world in the now-usual manner, out of the city via records and night club dates. It's all far removed from what folk song once was in the good old times, but these gals (and boys) carry a big wallop and much appeal to the hearts of young admirers today.

I'd say Carolyn is lucky to have a fine musical ear and an interesting voice, strangely thin and bright in its upper register, ranging down into an unexpected Odetta-like throatiness at the bottom. She's a good showgirl. With such a voice and ear her singing can't go far wrong. But she still hasn't made up her mind where to settle down in folk-song styling. She hasn't heard enough.

The voice is always musical but the guitar accompaniments tends towards the amateurish, with awkwardly placed chords and a poor choice of them. She doesn't know what to do with the modal tunes—tunes which have found superb harmonizations plenty often enough. Hers are uncomfortably gauche. She needs to hear what others have done and to learn from them, if she can.

Remember that these new folk singers are "third generation"; they learn their music mostly from people who in turn learned theirs from the actual "original" folksingers—people who picked up their music just naturally, from their daddies, and uncles, and cousins in some smallish community. Work songs were sung to work to, coal-mine ballads grew in coal mines and railroad songs were heard on the railroad.

Pete Seeger, Alan Lomax, Frank Warner, even Jean Ritchie, are "second generation," folk-song collectors who have got their stuff direct from these. The new young people mostly learn indirectly, from them in turn, via records and an occasional "live" session; or they dig out tunes from printed collections like the Cecil Sharpe material published in the early part of this Century.

Yes, each generation, each of the individuals, adds his own touch and feeling. But today's young people must decide arbitrarily where to choose, at a complete distance, out of the huge wealth and variety of folk material now audible. Will it be the prison yards of the U.S. South, or an Irish peat bog? Not easy to know, especially when your livelihood is going to come from the very un-folksy night club circuit. This is Carolyn Hester's problem and she's doin' fine, so far, with a long way to go.

The Clancy Bros. & Tommy Makem.

Tradition TLP 1042

I Am the Wee Falorie Man. David Hammond.

Tradition TLP 1028

Songs of Tommy Makem.

Tradition TLP 1044

The folksy label of Tradition Records was inspired by an American gal, Diane Hamilton,

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

Duophonic—Spread-out Mono

Haydn: The Salomon Symphonies, Vol. I (Nos. 93-98). Royal Philharmonic, Beecham.

Capitol Duophonic DGCR 7127 (3)

Following upon RCA's painstakingly careful reconstruction of a group of Toscanini recordings into simulated stereo, Capitol launches here a similar but evidently simpler operation, applied to a wide range of material from Benny Goodman to these Haydn Symphonies. The "Duophonic" discs play only on stereo machines, are derived from mono masters.

Again—it works. Indeed, I have nothing but praise for the wise limitations in the "treatment" of both classical and pops selections. No studied effects, no freak sounds, indeed nothing that is consciously strange at all. Just a real stereo-like hall liveness, a wide spread and only a moderate amount of directionality, helpful by its very unobtrusiveness.

The big point here is that instead of looking for stereo superficialities—sensational "on-the-right" and "on-the-left" trickery—Capitol has gone straight to the heart of the mono inadequacy as heard via stereo reproducing systems, the forced bunching-up of the mono sound into a blob in the middle, between the speakers. (Actually, the sound is heard from a single sharp point, as with a speaking voice; but the imagination can't take this and is able to widen it into a "blob"—though not nearly wide enough.)

The fact is that mono records sound better on single-channel systems, where a natural mono spread is achieved by reflection and general dispersion of the sound. The stereo speakers force the mono sound into the middle, pinch it together, and the better the stereo set-up, the worse is the mono pinch.

Therefore Capitol has concentrated simply on spread—on enough unphased, differentiated sound-pairings to provide a difference signal of sufficient impact, especially in the reverberation, to pull the music out sidewise into the equivalent of the stereo spread. I don't know the method (though I suspect a good deal of tricked-up added reverb) but I do know that the thing works like a charm. Sir Thomas Beecham did the first set of these Symphonies in mono only, then the second in stereo; he died before he could do over the first set. You need have no hesitation in acquiring this Duophonic Vol. 1 to match the stereo of Vol. 2.

And try the other Duophonics too—I really enjoyed the vintage Benny Goodman, spread out and modernized to whistle-cleanliness of sound.

and is managed by the Clancy family of actors and singers; the company has naturally specialized in popular Irish fare sung by the Clancy clan and their friends imported from

the old country, mostly of a youthful sort. The material is largely forthright and popular, not the fancy folk music the collectors dig up in obscure rural retreats but simply the songs that are popular here and there, done up with zest and a proper brogue, accompanied by the now-inevitable guitars (not so special here), occasionally by fifes and drums and sech (much more lively).

The Clancy tribe plus friend Makem have lately broken into big stuff but (natch) remain on their own "home" label too. Bolsterous and good humored, they have the punch and fineness to hit TV and nitery spots without essentially compromising their own way of doing things. Good, loud, lusty pub stuff for the most part, but unflinchingly musical (and in tune).

On his own, Tommy Makem shows himself as a young promoter of masculine strength in singing. He's solid and matter of fact in rhythm, tough in diction—you should hear his "doodling" of nonsense Irish syllables—and his baritone voice has the edge of a sharp-cutting axe. He belts it out, to mild guitar background, and no hi-falutin' nonsense about voice production and vocal culture; his is OK just as it is. You wouldn't believe he was primarily an actor, as are the Clancy brothers too. Acting needs strong muscles and a mind for realism if you're Irish.

An almost unnoticed oddity may strike you in passing; in some of his songs, Tommy Makem accompanies himself on a penny-whistle. Just try that some morning when you're singing in the shower, being careful not to choke to death. Quite a trick and I hate to think it's merely done by re-recording.

A newer addition to the tribe, here in the U.S., is David Hammond. He sings by himself in a higher, more nasal voice, ingratiating and sincere; he goes in for frequent hesitations and likes the slower, more romantic items. He's a Belfast lad, out of Northern Ireland, and a few of his items have a Scots touch to them. Compared to Makem, Hammond is a bit weak-tea-ish, for my taste.

Wayfaring Stranger. Richard Levitt, countertenor, Charles Byrd, guitar, Carl Tucker, flute.

Period SPL 751

So the countertenor hits the folk music trail! Not that he hasn't before, what with Alfred Deller singing assorted folk songs for Vanguard. But the name itself, for a very high alto-range male voice, properly goes with "classical" music of the Anglican church and in much secular music of the British Seventeenth century—Henry Purcell was himself a countertenor.

The countertenor is now a fad of considerable proportions in "Baroque" music circles. Good idea, for the voice will survive all faddisms. That it should go over to other areas of production is inevitable. But, as I say, if this man were really a folk singer, he probably wouldn't have ever heard the term. He isn't of course. He sings classical, in Bach, Purcell, Carl Orff and even much modern music for high tenor. This is a side-line.

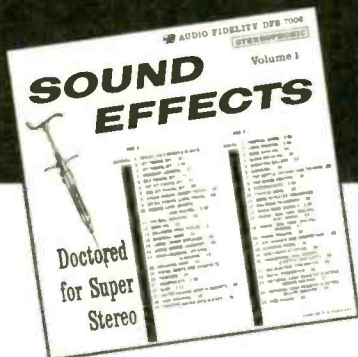
These are thus "classical" arrangements of many old familiar ballads—*Waly, Waly, The Coventry Carol, Greensleeves, Barbara Allen, Poor Wayfaring Stranger*. The guitar is more

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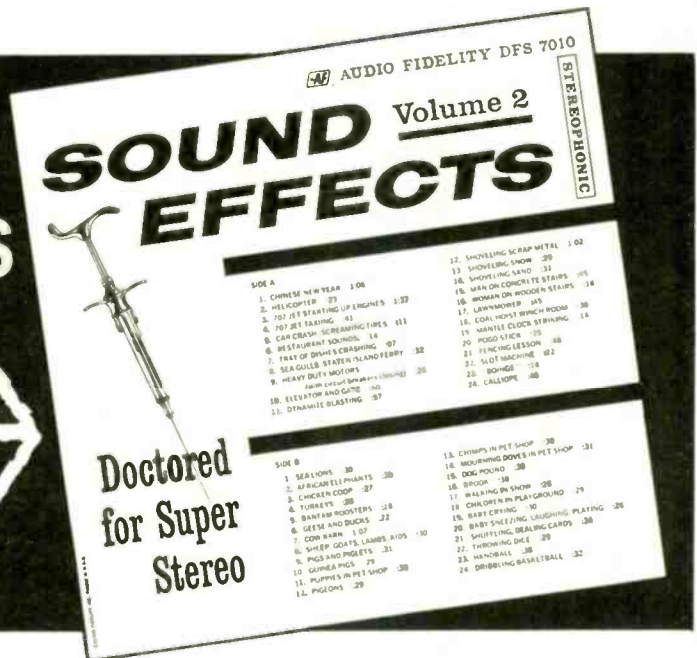
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SOUND EFFECTS, Vol. 2

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DFM 3010/DFS 7010



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ROMAN HOLIDAY, Jo Basile, his Accordion & Orchestra Typically Italian in lyrical, romantic appeal, tunes like Ciao, Ciao Bambino, La Strada Theme, Domani, Mambo Italiano, Parlami d'Amore have been recreated in their native essence by the splendid interpretive artistry of Jo Basile on his accordion with a mellifluous orchestral background.

AFLP 1915/AFSD 5915

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Dept. A8, AUDIO FIDELITY INC., 770 Eleventh Avenue, New York 19, N. Y.

a lute in style, the flute plays pretty counter-melodies against the tune. Aside from the odd neighing quality inherent in most counter-tenor singing, you'll find it all pleasingly straightforward and pleasantly old-fashioned, in a classical sort of way. **ZE**

Exotic and Circular

Classical Indian Music. Introduced by Yehudi Menuhin.

London CS 6213 stereo

No use giving the names of the three distinguished Indian musicians who play the Veenas (2) and the Mridangam through most of this two-sided look at an exotic music. You wouldn't know them. The well-known Western name artist doesn't play a note; he talks, and at length, on a full inch of side 1, not to mention shorter introductions to three different works on side 2. Yehudi Menuhin has talked before about Indian music in a recording of this same type, but not if I remember rightly at such length as this.

Frankly, though I am for the noble sentiments he expresses concerning the musics of other peoples, I found his speech rather full of flowery generalities and, paradoxically, technical matters not adequately explained. There is, for instance, much talk of the improvisatory nature of this ancient musical tradition, of how the musical "variations" are made up within a very rigidly stylized framework—then without an eye batted, the first piece is introduced as by a well-known Nineteenth century composer and not a word as to whether he "improvised" it, say on January 23, 1867, or it is being improvised now, according to the composer's never-written-down ideas. Menuhin doesn't tell us.

Indian scales or modes are played and described (which is good) but the relationship of the scales to the music might as well be made clear while the moment is propitious; and such obviously notable aspects of the music as the sliding-pitch notes, starting one place and zooming up or down to another, or the assorted trills and other ornamentation, could at least be mentioned in passing.

I emphasize this because Menuhin is here acting quite sincerely the role of a musician. Like many performers, his imagination does not go out well into words, he is at a loss to offer rational explanations for listening people, he takes things for granted which with a more imaginative outlook he would surely attempt to explain, as well as he could. Like many big musicians, he takes refuge in a sort of doctrinaire, academic sort of discussion—and of all places, the doctrinaire approach is most at a loss in getting at the meaning of this exotic and exacting oriental music!

It seems to me that more music and a lot less Menuhin would be preferable on the record itself. He does not in any case speak "to" the home listener, but reads his manuscript as though making a formal platform speech, which is merely one more miscalculation in recorded effectiveness.

Th music? Well, don't expect me to have much to say about it either. I enjoy it, I begin to have a vague sense of its shape and progress, but I do not "understand" it any more than you will, until you have heard many hours more than is here presented.

It is enough to say that this Eastern music has no real beginning or ending but does definitely build up in both complexity and intensity, very gradually over minutes and even hours. It is a "psychological buildup," not only in the increasing speeds and greater complexity but in the persistent monotony-with-variety of the key tones that keep recurring with a head-drilling force.

Twangy stringed instruments and assorted percussion are featured here by the three performers. They sound like a dozen.

Musical Merry-Go-Round. An Adventure in Circular Sound. Sinfonia of London, Irving, Gamley.

Capitol SG 7244 stereo*

I'm supposed to act seasick after hearing this new stereo sensation. I'm not. I didn't feel a thing, though I enjoyed the music.*

The brilliant idea of someone with a very limited imagination was to reproduce in stereo the circular whirl of a merry-go-round.

So—the music sort of gets louder in one speaker, then in the other. The violins play on this side, then on that. (They're meant to get further away, then nearer, but I missed that subtlety.) That's all.

I can do the same by gently rocking my balance control; I wouldn't say the effect was overwhelming. The volume just goes up and down. That's about what I heard on this disc, and it wasn't the slightest bit circular either. (By this time we ought to know that stereo motion is highly unreliable and the best policy is to stick to the old right-and-left, immovable.)

Besides, Capitol has it all mixed up. The music doesn't go 'round, the people (and the painted horses) do that. The music just stays put, right in the middle.

So the idea here must be that you—and your stereo rig—are doing the revolving. You, the speakers, the living room, the neighborhood, the universe. Everything but that music.

A pretty dizzy idea, I'd say.

* P.S. Switch to mono and the music is

quite pleasant, ranging from "Carousel" to the gallumphing and seldom-heard "Circus Polka" by Stravinsky, written for the Barnum and Bailey elephants.)

More Moderns

Bartok: Piano Concerti Nos. 2 and 3. Geza Anda; Berlin Radio Symphony, Fricsay.

Deutsche Grammophon 138 111 stereo

Bartok grows and grows. The second and third of his piano concerti, once noisily incomprehensible to most listeners, now have the power to move almost any music listener who is moderately versed in recent music, who likes "Le Sacre" (as music or as hi fi) and "Ionisation" (the same). The perfect preparation for these Bartok works is the late and now wonderfully familiar "Concerto for Orchestra." A taste for that superb piece will lead you right to its immediate successor, the



AM-131 Disk recording Lathe

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*Electronic 16 2/3 rpm speed converter available as an accessory.

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IN CANADA: Gotham Audio Div. A. T. R. Armstrong Ltd., 700 Weston Rd., Toronto, Ontario



"Third Concerto," Bartok's last work. And from that you can travel with zest into the extraordinary sounds of the "Second," which dates from the early 1930's and rates with such incredibly potent pieces as the "Music for Two Pianos and Percussion" (1937) or "Music for Strings, Percussion and Celesta" (1935).

It just isn't possible to convey an impression in so many words of the "Second Concerto," but it is an overwhelming experience if you are ready for it. That peculiarly great quality of humanity in Bartok, shining through the wildest dissonance, the "sound of genius" in every hit of the marvelous construction, the ineffable spirit of Bach and Beethoven that shapes the modernity of the sound, these things hit you more and more as you delve into this man's mature middle-period and late-period work.

This Hungarian team (with a German orchestra) does a most interesting job with

the music. Interpretation of works like these is still fluid; no binding traditions have as yet been solidly established. New ways of expression appear at each recording—Anda does particularly successful things in the difficult and atmospheric slow movement of the "Second Concerto," with its strange, subterranean trills, its half-suppressed glints of high voltage thought. He is excellent, too, in the gentler and less dissonant "Third Concerto," and his orchestral backing is superb throughout.

Berg: Three Pieces for Orchestra, Op. 6.
Schoenberg: Begleitungsmusik, Op. 34.
Webern: Six Pieces for Orchestra, Op. 6.
Columbia Symphony, Robert Craft.

Columbia MS 6216 stereo
(mono: ML 5616)

When he conducts other types of music

Robert Craft is a pretty chilly intellectual, but in the music of the original Viennese "twelve-tone" school and in many another more recent product in related fields decidedly he has a way with the material. 'Course, it could just be that these musicians play well and convincingly by themselves, but one must infer the dynamic leadership of a very learned conductor here. He's good.

In a considerable sense this series (there are others previous) is a historical survey of significant music within the serial (twelve-tone) movement, as well as a recording of the masterpieces in that area. It's astonishing how "modern" these men already sound in works dating back to 1906; the rest of the musical world has had to catch up to them in that respect, not to mention us listeners. It won't do your ear any harm at all to give this disc a once-over and a twice-over, and the sounds, however meaningless you may at first think them, will be bound to interest you as sheer instrumental color and texture. Don't worry about those Twelve Tones; just listen.

Hindemith: Oboe Sonata (1938).
Loeffler: Two Rhapsodies for Oboe, Viola and Piano (1905). Harold Gomberg, oboe, Milton Katims, Viola, Dmitri Mitropoulos, piano.

Columbia ML 5603 mono

When a big musician dies, these days, they rush to dig out all the old tapes he left lying around and publish them on discs before his memory begins to fade.

Mitropoulos was a fine pianist and an ever-eager searcher into odd but important corners of recent musical history. I once saw him positively gloating with pleasure as he conducted Stravinsky's "Histoire du Soldat" in a tiny chamber-style performance, chatting casually with the players between scenes as is the nice tradition in that work. His name turns up in surprising places, on small labels, in obscure situations, all for the sheer love of music.

He's the piano here, in a middle-period oboe piece of typical Hindemith expertise and in two remarkable and unheard works of a dated period by one of our earliest real composers, Charles Martin Loeffler. Loeffler was born in Alsace but became a long-time Bostonian, for 54 years indeed. By today's taste, his music is thick and old-fashioned, a style that is now at bottom reputed (pretty soon it'll come back, like Edwardian clothes). Nevertheless, there's a lush, fresh sound about it that wears well. He was a good musician and composer, as Mitropoulos knew.

Poulenc: Sextuor. Francaix: Divertissement. Milhaud: La Cheminée du Roi René. Phila. Woodwind Ensemble.

Columbia MS 6213 stereo
(mono: ML 5613)

Columbia has put out some stunning photographic cover art recently. The jacket photo on this one tells as much about the performance as the playing inside—a pleasantly social get-together of five smiling wind players with Poulenc himself seated in the near foreground. Excellent, and it should sell the record.

Actually, I found that the Poulenc piece, with Poulenc playing the piano, was the least interesting item on the disc, which shines largely because of the skillful and entertaining Milhaud suite. These three composers, of varying ages, all belong within the once-modern anti-German Post-War I school of French snazzy satire (or did, in the 1930's), music that is deliberately small-scaled, unheroic, low-brow but, as French art, carefully tailored and expertly written. The Poulenc is just plain too low-brow, self-consciously, at the expense of stylistic consistency, whereas the Milhaud is a far less self-conscious and much better integrated work, absolutely charming in its expertly French woodwind expression. The later Francaix is a kind of after-thought (1954) by a younger man in the same style, now pretty much passé and very nearly a French dead end. But it hums along pleasantly, even so. Gorgeously transparent playing throughout, and even better recorded sound..

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Beethoven: Violin Sonata No. 9 ("Kreutzer"); No. 1. Francescatti, Casadesus.

Columbia MS 6125 stereo

Beethoven: Violin Sonata No. 9 ("Kreutzer"); No. 5 ("Spring"). Szeryng, Rubenstein.

RCA Victor LSC 2377 stereo

These two rival discs came out a while back and I have just got around to a detailed comparison of the common element, the "Kreutzer" Sonata, Opus 47.

For my ear, Rubinstein and Szeryng win hands down, though Columbia's French team is far from second rate nor yet again incompetent.

There is, admittedly, a French approach to Beethoven that predicates a certain anti-Teutonic love for the composer, altering those Beethovenian aspects that are most Germanic in favor of a more French aesthetic. The breadth and grandness of German architecture are converted—as far as is possible—into a more precise and delicate tracery. And when Beethoven obstinately gets out of hand, into powerful contrasts or complex development, the French become frantic, hard, as if to beat the music into submission to the French ideal. Still, the best French Beethoven is generally lovely, picking up as much as it loses, for an over-all excellence.

Francescatti and Casadesus are an eager team by all accounts but in this demanding sonata Francescatti is tired and out of tune, lacking breadth and emotional control, while Casadesus pounds the daylight out of the loud parts without achieving either grandness of line or convincing musical shape. Columbia concurs with a dry, rather dead pickup and a low recorded level.

Rubinstein and Szeryng, both Polish born, are top Central European pianists and close to the German tradition. Rubinstein is a master of the very architecture that Casadesus misses cold, Szeryng is a somewhat old-fashioned and Romantic fiddler whose style compliments Rubinstein's most eloquently. And RCA has given this pair a bigger, more resonant recording, at a higher level, to fit the musical drama.

Debussy and Fauré Sonatas. (Debussy: Sonata No. 3 in G Minor; Fauré: Sonata No. 1 in A.) Berl Senofsky, violin, Gary Graffman, piano.

RCA Victor LSC 2488 stereo

This is just plain a lovely record, if not exactly a sensational one. Listening to it, I somehow kept imagining the whole enormous, haughty RCA Victor colossus here brought to a benign halt, waiting quietly for these two unassumingly excellent young musicians to finish their music making—like some fabled emperor who stops to chat with the citizens while his minions stand by! Silly idea, perhaps, but in a way that is what RCA does here. Even the program notes by Joseph Wechsberg are casually informal.

"I asked the artists why they were recording there.

"Because we like the sound of this hall," said Senofsky.

He stood beside the piano in his stocking feet, having taken off his creaking shoes.

"Yes, alive sound," added Graffman. "Perfect for Debussy."

So maybe Debussy would have liked Webster Hall after all.

"Let's do it once more," said Graffman."

And so they did, unto the sixth and the seventh take, while RCA stood around paying for tape and technical assistance by the hour with not even a murmur of official protest. This is the way recording should always be done. It's a shame that smaller companies aren't more often subsidized in order to offer exactly this sort of leisure to all recording artists worth hearing.

The big Fauré sonata is high French Romanticism, at length and out of César Franck, a type of music that too quickly becomes dated and dull under today's usual high-pressure treatment. Not here. Graffman is a wonderfully energetic sort of relaxed pianist, an old fashioned poet of the instrument; Senof-

sky plays a sweet, gentle fiddle, never florid, modestly unassuming when the piano is in the forefront (ah! for more of that among big fiddlers.), rather nervously tense in expression at just the right moments of climax. I don't think I've ever enjoyed Fauré as easily on records.

The short Debussy sonata is almost an after-thought, a part of side 2. A quietly excellent performance, relatively less outstanding than the Fauré—but, after all, the Debussy sonata gets some pretty fancy performances elsewhere.

Give credit to RCA, also, for a perfectly balanced recording, exactly right for the musical sense, with an optimum piano sound and an ideal fiddle pickup, light and wholly natural.

Chamber Music from Marlboro. (Brahms: *Liebeslieder Walzer, Op. 52.* Schubert: *The Shepherd on the Rock, Op. 129.*) R. Serkin, Leon Fleisher, pianists; Harold Wright, clar.; B. Valente, sopr.; M. Kleinman alto; W. Connor, tenor; Martial Singher, bass.

Columbia MS 6236 stereo
(mono: ML 5636)

These Marlboro Music Festival records, taken down at the Vermont summer "school" directed by Rudolph Serkin, offer a strange and interesting sort of music-making. As Serkin says, "we are a republic of equals"; and in these recordings you will hear top professional artists mingling with top student performers, most democratically. A wonderful experience for the students.

But, I'd suggest, not always so wonderful for us. True, the student performers are inspired and the general "tone" is impeccably good; these are not bungling beginners. But for all the republic of equals, the plain fact is that Serkin is one thing (and Fleisher, Singher, Harold Wright), the rest are something not quite the same.

They try earnestly and do well, but they are still in that formative, imitative stage that shows up with relentless persistence in the repetitions of a recorded performance—though perhaps not in the generally inspired enthusiasm of a festival.

Thus in the Brahms "Liebeslieder" the two pianists Serkin and Fleisher (one piano four hands) are so astonishingly wonderful that it is a pity the mixed quartet of singers is in comparison merely more than adequate. In spite of Martial Singher (of the French tradition and not exactly a Brahms man), the leadership and the urgency is all in the piano. The piano part has never been played with such easy, authoritative, unbuttoned precision!

The soprano, Benita Valente, has a lovely young voice of unusual accuracy. Her sense of style isn't really well enough developed yet to cope with the Brahms (in company with three other voices, at that) but in the long solo Schubert work, an extended song with clarinet obbligato, she does quite an extraordinary job, rolling off the high-speed yodel-style trills and runs as few singers can now do. She is again outclassed, however, by that veteran of piano music-making, Rudolph Serkin, and by one of the most lovely clarinet performances I hope ever to hear, from Harold Wright.

Altogether, a pretty fine record, students or no.

Albeniz: Iberia (complete). Arr. Arbos, Surinach. **Ravel: Rapsodie Espagnole.** Paris Conservatoire Orch., Morel.

RCA Victor LSC 6094 (2) stereo

The usual orchestral suite "Iberia" is an arrangement of five out of 12 pieces originally for piano, done by Albeniz' friend Arbós many years ago. 5:12 is a good average proportion for dozens and dozens of such "suites" that have been made up for concert use out of longer works during the last seventy five years or so; now the trend is strongly in reverse and back we go, again and again, to the full-length works. Now it's the whole of "Fire Bird", the complete "Daphnis", all twenty four movements of the Handel "Water Music".

And so it is that the contemporary Spaniard Carlos Surinach was commissioned to fill



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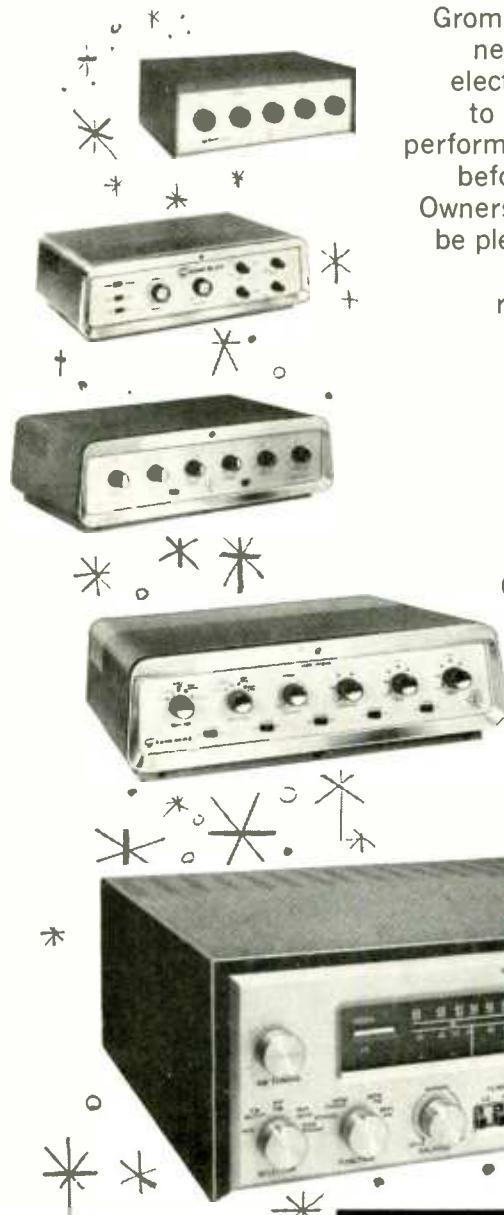
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out of the whole of "Iberia", seven more movements. This is the resulting complete version—and it is pretty darned long if you ask me. The stuff is too thick, too lush, too ripe for such heavy-orchestra treatment. It palls after three or four movements in a row, and twelve of them—more than three LP sides—is really too much at a time.

In spite of a worthy desire to emulate the earlier Arbós orchestrations, Surinach has turned out a quite different sound in the movements that are his. Much more modern in tone (even though based on the same Albeniz), oddly Latin-American in sound—more precisely, Mexican; I kept thinking of Chavez.

Surinach puts a contemporary emphasis on brass and winds, where Arbós stuck to the lush string-based sound of Albeniz' own day, 1909. In the Surinach movements you hear the chatty trumpets, the grunty horns, the staccato rhythms, of middle Stravinsky. And some of the harmonies sound mighty like Surinach's own, though it could be merely a modern emphasis on inner dissonance technically already present in the 1909 originals. All of which is highly anachronistic, but generally good to listen to even so. After all, it's 1961 and Surinach isn't living in 1909.

The French Conservatory Orchestra is most uneven in its playing, some of which is well below RCA standards. French orchestras are notoriously temperamental; either this one is insufficiently rehearsed in the Albeniz (they play the Ravel practically by heart) or else it is just plain acting sloppy, especially in the strings. Messy timing, blurred outlines, slithery pitch. RCA had better tighten up its remote-control discipline.

Bach

Bach Harpsichord Recital. (Chrom. Fantasia and Fugue, Italian Concerto, Toccata in D, French Suite in G.) George Malcolm.

London CS 6197 stereo

This man is so fantastically good that I devoted three successive radio programs to his recording. And this even though in some respects his earlier 10-inch mono record for London (around 1955) was even better musically.

For the initiate, let's say that in a very masculine way he carries on the Landowska tradition. He is a romantic-minded "big" harpsichordist, a master of dramatic registration and phrasing. He makes the instrument "talk" as though it were a piano, or better an orchestra. We'd best not yet say he is Landowska's successor; but he surely is one of the great harpsichordists of our time and unique in his skillful romantic-dramatic approach.

The uninitiated will find this harpsichord music fully as exciting as anything by a Bach orchestra; for the kind of legerdemain that Malcolm plays with his pedals, his registrations, his tone colors, his rhythms and phrasings, is the sort that hits you direct in the musical emotions.

Remember only that the harpsichord gets its big sound by tone color and doublings of octaves, not through sheer volume; keep your volume control turned well down from maximum and let the instrument's proper lightness speak for itself.

David Oistrakh Plays Bach Sonatas (Violin and Keyboard Sonatas in F Minor, G Major). with Hans Pischner, harpsichord. Deutsche Gramm. 138677 stereo

Even the great Russian, the "Oyster", has come around to the harpsichord for these big Bach sonatas (instead of the piano), thereby joining the "authentic" camp straight out of a career of typically Russian old-fashioned Romanticism. He still sounds old-fashionedly Romantic himself, but this is a big musician and a careful one; the purest of purists will have to admit he does a pretty fine job; and his German colleague at the keyboard is an excellent instrumentalist. Moreover, though this was presumably a special-occasion recording, taken while the Russian was on concert tour, there is every evidence that the two players worked over the music together to achieve a reasonable balance of forces and a common interpretation.

Oistrakh even takes the trouble to play the

Bach ornaments rightly (with only a few minor absent-minded lapses)—a thing few big violinists of world repute bother to do.

Only two points can remain at issue, then. First is the Olstrakh tone, which remains rich and sultry, with a florid vibrato well suited to Lalo and Tchaikowsky. It is too much of a soloistic sound for this "teamwork" sort of music. Second, partly the recording engineers' fault (prompted no doubt by persuasion from the local powers) is too much emphasis on the fiddle. The neutral balance that is so hard to achieve at the close range necessary in normal microphoning is definitely not achieved here. You'll get a bit tired of the constant sawing away ("sawing wood") of the violin; it is because much of this violin passage work should blend unobtrusively into the sound of the harpsichord, which is an equal soloist. Less showy tone color and less vibrato in the fiddle sound might make the difference even without change in the mike set-up.

Bach: The Three Sonatas for Harpsichord and Viola da Gamba. Sylvia Marlowe, harpsichord, Bernard Greenhouse, cello. Decca DL 710036 stereo

This pleasant recording by an earnest and well-rehearsed team offers one of those commonly-made "compromise" ensembles that pop up today, between musical friends and within record-company contract-areas: part authentic, part old-fashioned non-authentic. Authentically, I might point out, has very little to do with musicianship and so it often happens that two excellent musicians team up for an interesting performance and, as the phrase goes, die—the stylistic torpedoes.

Well, these two pros give a *very* interesting performance, if not one of top inspiration. Mr. Greenhouse is no great gamba player—he doesn't even bother to try, but plays the sonatas on the similar instrument, the cello. (Similar but not at all the same, and Bach was exactly specific when he called for one or the other, as with the cross-blown flute versus the end-blown recorder, the oboe d'amore versus the lighter-toned oboe or the heavier-toned English horn.)

This is gamba music played on a cello and by analogy we might expect the harpsichord part to be played on a piano, also a "similar" instrument—but Sylvia Marlowe just happens to be a harpsichordist, so that is that. No great matter, I guess. Maybe there wasn't a good gamba player available, or maybe Miss Marlowe just likes to play with Mr. Greenhouse. Good enough reason.

(But it would be nice to hear the music on its original instrument—well played.)

Bach: Cantatas No. 198, Trauer Ode; No. 131, Aus der Tiefe. Soloists, American Concert Choir, Columbia Symphony, Robert Craft. Columbia MS 6177 stereo

The ubiquitous Robert Craft moves into big Bach in these two splendid cantatas. Much in the performances is lovely. But there is also that dogmatic rigidity which Mr. Craft brings to contemporary music a great deal more successfully than to that of earlier periods. There is also the hallmark of up-to-date old-music playing, an increasing emphasis on authenticity—lutes, gambas, violone, double-dotted rhythms ("French dotted"), exactly correct ornaments.

The "Trauer Ode" is a major work, much more than a cantata, but it has been seldom heard. Even in this frequently rigid and unpliant performance the gorgeous expressiveness, the glowing vocal and instrumental colors, come through—crazy to have neglected such tremendous music. "Aus der Tiefe" (Out of the Depths I Cry to Thee) is a very early work—which means merely that it is free in form, youthful in intensity, broken up into

(Continued on page 96)

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JAZZ and all that

CHARLES A. ROBERTSON*

Popular disk jockeys often protest against being restricted to playing hits in the top forty, but few do anything more about it than blame program directors or station managers. One of the exceptions is Alan Grant, a former jazz musician who insists on making his own rules, and he believes the methods used to establish his jazz show on WLIR-FM will work in other parts of the country. Stereo already plays an important part in attracting new listeners to his programs, and plans are underway to begin FM-Stereo broadcasts.

Rather than just sit playing records in the station's Garden City studios, Grant goes out to nearby clubs on Long Island for weekly remotes. He journeys to "Copa City" in Jamaica on Tuesday nights, visits the San Su San in Mineola the next evening, and presents the musicians on the stand or interviews personalities for his listeners.

During intermissions at both places, Grant introduces the live audiences to the latest jazz releases, in stereo, which he plays on component systems loaned on a long-term basis by a generous sponsor. Queries about the equipment from any interested parties are answered, and Grant issues frequent invitations over the air, in a rich baritone voice, urging homebodies to come down and hear a demonstration.

"If more disk jockeys did this sort of thing," claims Grant, "they would put more live music on the air and find their work more enjoyable. Their shows would attract a more mature audience, including those young adults who are as tired of the top forty tunes as the disk jockeys. Better programs lead to a better class of sponsor, but first they must be convinced that the right audience will be reached. Some of my clients never used radio before."

Grant is quick to credit Eloise Smith of "Copa City," along with John Avinzino of "San Su San," for having the foresight to see the show's possibilities. "The musician's union is also happy about the response," he adds, "and it would like to see similar activity in other clubs. It has no objection to the playing of stereo recordings during intermissions, and both clubs use the equipment when I'm not there. Perhaps the union prefers stereo because it sounds more like actual musicians than a coin machine. And customers who hear something they want to buy can always inquire as to the album title, which is not the case with anonymous piped in sound. The people who play records in my absence are all informed enough about stereo to answer most questions."

The advantages of Grant's program as a showcase for stereo components was noted by Newark and Lewis. Sy Teitler, manager of their Hempstead store, received the cooperation of manufacturers in assembling the equipment to be installed in the clubs. Rek-O-Kut takes credit for the turntable and matching tone arm as well as the Audax speaker system. Harman-Kardon contributed the Citations I and II used at "San Su San," while the amplifier at "Copa City" is a Sherwood 5000 II. Grant hopes to complete ar-

rangements to broadcast Friday nights from the "Cork 'n' Bib" in Westbury in the near future. In any event, manager Charlie Graziano will install stereo components for intermissions.

"Women comment on the pleasing room-divider appearance of the Audax speakers," Grant states, "but the men are happy to see the components out in the open, as they should be. Some musicians who travel a lot never had a chance to hear stereo before playing the clubs. The Slide Hampton group wanted to keep on playing with the records, while Philly Joe Jones called it a "wild" sound. Among others who were impressed are Charlie Mingus, Toshiko, and Charlie Mariano. Quite a few musicians now consider an understanding of stereo to be essential in their work and have purchased equipment. Jack Lesberg, the bass player, lives in the neighborhood and drops in just to listen because he likes stereo in a big room."

Grant started out in jazz in the early 1940's, playing tenor sax with Tony Pastor, Georgie Auld, and other swing-era leaders. By the time work on the road became irregular, Grant was tired of traveling anyway, and an executive position in an ice cream company looked inviting. When corporation life palled about a year ago, he took a salary cut and joined WLIR-FM. As the station had been operating at 92.7 mc for only six months, Grant built his jazz show up from scratch, going after sponsors who had never considered radio, let alone advertising on a jazz show. Since a majority of jazz broadcasts around metropolitan New York are relegated to late evening or early morning hours, a ten o'clock starting time puts Grant in a favored position.

"I try to reach teenagers during the first hour," Grant explains, "and not all are rock 'n' roll followers, as is commonly supposed in broadcasting circles. Many like the same things as adults, but with the added enthusiasm of discovering jazz, folk music, ballet, or the classics for the first time. Some are confused about jazz because of what they have heard or read. I give them music with a beat and artists with a style easy to identify. Men like Cannonball Adderley, Ray Bryant, Dave Brubeck, or Jimmy Rushing are hard to mistake. And they can understand Otis



Fig. 1. Alan Grant broadcasting his jazz program from the San Su San in Mineola, N. Y.

Spann without a lecture on jazz roots. I wait until the hour after midnight to schedule avant-garde works. Every so often I play a mystery record, and the first listener to identify the artist wins a jazz LP of his choice at a sponsoring record store. I always put one on when a sponsor is in the studio and let him watch the switchboard light up."

Grant ran a successful concert for teenagers at Syosset High School, featuring the Slide Hampton Octet, and would like to schedule Sunday afternoon concerts at "Copa City." Another of his projects is planning a jazz benefit for Cerebral Palsy at Roosevelt Raceway next fall. "Other stations made me offers after the show began drawing attention," claims Grant, "but refused to guarantee that I could continue to play jazz. I intend to stay in jazz and schedule my own programs. John Reiger, station manager at WLIR, gives me cooperation and complete freedom. He plans to broadcast FM stereo as soon as possible, and I have a large stereo library ready."

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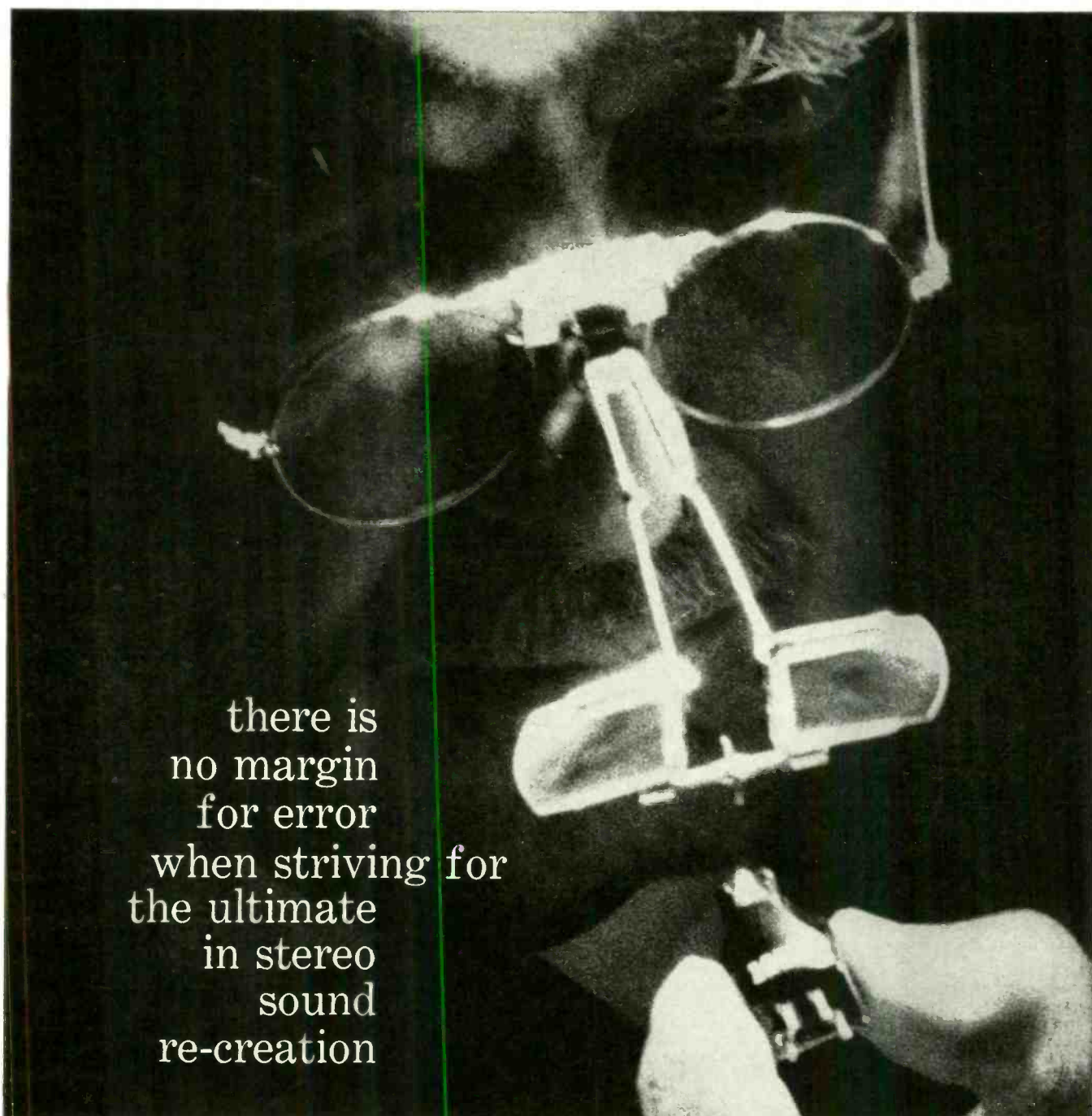
The supply of adjectives enticing enough to accompany the word percussion in album titles must be nearly exhausted by now, but trust Dick Bock to find one that is both alliterative and alluring. The World-Pacific head also engineered this project himself, and the quest for perfection brings into play a total of forty-four separate and distinct percussive instruments and special effects. Rest assured that not all are sounded at once, nor is the entire battery heard on a single selection. Roy Harte and Milt Holland, the experts in sole command of the imposing collection, are only human and can activate no more than four items apiece at one time. Since their joint efforts are over-dubbed anyway, they could fire a complete barrage at will, but the technique is invariably used to ensure an aim of unqualified accuracy.

Selected works of the Mastersounds, a youthful quartet first introduced on this label three years ago, serve as a base of operations for the percussive team's forays. Before deciding to go separate ways earlier this season the Mastersounds put together seven LP's, including several successful treatments of full scores from Broadway musicals. Richie Crabbtree, Benny Barth, Buddy and Monk Montgomery, who made up the foursome, became equally adept at handling modern jazz standards and originals of their own. They took special delight in trying adventurous sonic combinations and indulged in occasional exotic voicings which still fall pleasantly on the auditory senses. Of even more appeal to jazz listeners are the clean, loose-limbed improvised passages.

Besides setting the Mastersounds apart from groups of similar instrumentation, all these factors together add up to just the sort of framework that would excite the imagination of practicing percussionists. Through the courtesy of Hollywood's Drum City, Harte and Holland increase the already exotic tonal coloration of the original recordings with such unusual implements as Indian cistrums, Chinese cymbals, Japanese wind chimes of both bamboo and glass, Samoan tuils, and South American scratchers. This type of ornamentation goes exceedingly well on *Dance of The Siamese Children*, an extract from the group's first show album. Also adorned in the same luxuriant manner is *Not Since Nineveh*, on which guitarist Wes Montgomery joins his brothers for one of his first recorded solos.

Such leisurely piecework must be put aside when vibist Buddy Montgomery unwinds long, free-wheeling solos on Horace Silver's *Enchantment*, and *Moonrays*. Just because the percussionists never met the Mastersounds in a studio is no reason to prevent them from swinging after the fact. At least, this stereo spectacular achieves its mission without channel-switching, complex arrangements, or so many drummers in the studio that even the bass player loses his composure. The Mastersounds never dreamed they were engaged in a percussion display, while Harte

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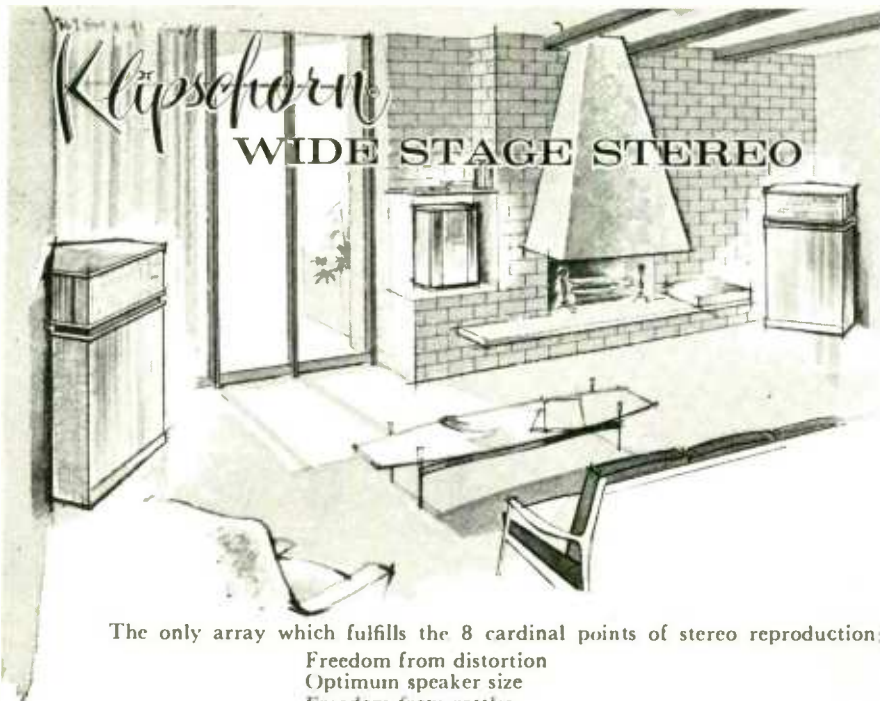


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rived systems and equipment specifications. Complete procedures are given for: Planning, assembling, and testing sound control installations—Articulating sound control with other elements of production—Rehearsals and performances—Operation and maintenance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

THE AUTHORS

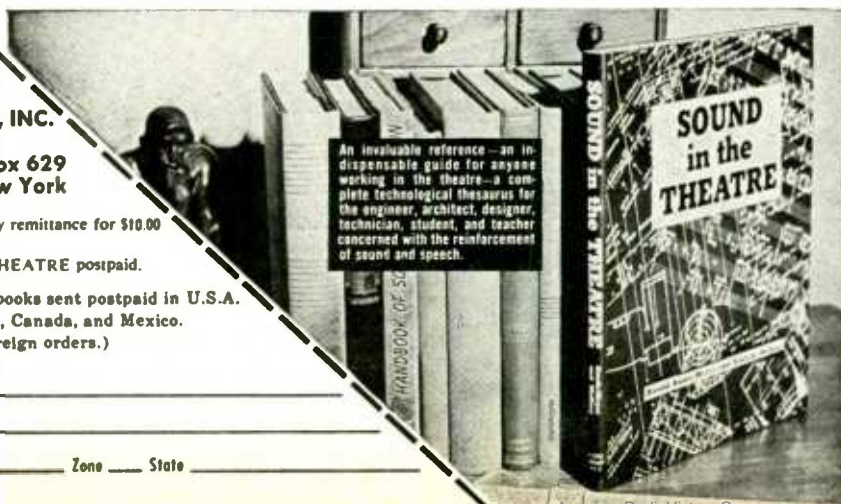
During the past thirty years, the authors have developed the techniques of sound control in opera, open-air amphitheatres, theatres on Broadway, theatres on-the-road and off-Broadway, in concert halls and night clubs, in Hollywood and in the laboratory. Some of their techniques are used in broadcast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

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and Holland are unimpeded in their most fanciful flights.

Before dismissing over-dubbing along with channel-switching and other tricks of the trade, stereo purists might investigate some of the virtues and practical advantages of the method. As purists want an exact reproduction of what takes place in a studio or auditorium, they entertain little sympathy for practical considerations that dictate anything different. However, they could have doubts about the advisability of the characteristic size and acoustics of the recording hall remaining constant throughout, no matter how much the music changes during the course of an entire album. The original Mastersound recordings were given the intimate qualities suitable to a jazz quartet. With a bit of Bock's legerdemain adding at the controls, the percussionists cause the stereo dimensions to expand or contract at will, fully justifying a liner claim that "the final effect is startling and unlike anything previously presented on record."

A wind machine and a few surflike sounds are employed to invent a fog-bound seascape on Erroll Garner's *Misty*, but the effect must be heard to be believed. Yet the individual quartet voicings remain unaltered on such jazz originals as Illinois Crabtree's *The Kick*, and the spatial gain here is mostly in the nature of increased depth, plus repeated excursions into both extremes of the frequency range. In this last respect, Harte and Holland demand nothing less than perfection from reproducing systems in either the stereo or monophonic versions.

Don Ewell: Man Here Plays Fine Piano! Good Time Jazz \$10043

As anyone who has heard Jack Teagarden in the last four years knows, the man playing fine piano in the group is Don Ewell. This session, which features Ewell in a solo role and as part of a quartet, was recorded just before he accepted the post and went with Teagarden on a State Department tour of eighteen countries in Asia. Perhaps one reason it took so long to see the light of day is because a record warehouse in San Francisco served as a studio. Evidently working on the assumption that excellent acoustics might result from the conjunction of a large storage space and stacked rows of corrugated boxes, Roy DuNann cleared space for the musicians and set up microphones. On the basis of the evidence just issued, both theory and situation prove correct, and the late arrival dates neither the sound nor the spacious studio. Now that this recording has escaped from the warehouse, traditionalists should never let it go back.

The bass playing of Pops Foster, who celebrates his seventieth birthday next year, is another aspect of the date not superannuated. The New Orleans stalwart has yet to lose his ability to propel a small group or get a big solid sound. No wonder Max Roach says he would like to find a bassist with similar qualities and the strength to stay on the job sixty years. Veterans of only slightly less experience are Minor Hall, drums, and Darnell Howard, whose melodic and impassioned clarinet is the nearest thing to Sidney Bechet's now extant. Howard assumes a fluent lead on his own *Green Swamp, My Home Is In A Southern Town*, and *Am I Blue?*

Ewell is one youngster who always learned from elder statesmen, and his first job after Army service was with Bunk Johnson. Far from being adverse to later developments, the pianist works in a style best described as timeless and solos assuredly on *Save It Pretty Mama, I Want A Little Girl*, and his own *Frisco Rider*. S. I. Hayakawa contributes discerning liner notes.

Jimmy Rushing: The Smith Girls Columbia CS8405

In paying tribute to girls named Smith, the indomitable Jimmy Rushing is outbalanced physically for once. Bessie, Mamie, Trixie and Clara are all hefty wenches, with lungs fully developed from quieting tentshow audiences, and they knew the blues from the inside out. Even Rushing's five-by-five dimensions are no match on the scales for all four, but he is

equally versed in the blues and can shout with the best of them. On the feminine side of the dossier, only Bessie can be said to have possessed greater vocal stature. Rather than try to displace her recorded versions, Rushing wisely offers his own distinctive styling of such tunes as *Down Hearted Blues*, *Squeeze Me*, and *Gulf Coast Blues*. By the time he reaches *Muddy Waters*, a full head of steam is pressing against the escape valve, causing the boat to rock in a true Kansas City fashion. Clara is remembered only once, but Rushing makes a real masterpiece of *Shipwrecked Blues*.

Rushing handpicked the supporting cast, and both Coleman Hawkins' tenor sax and Buster Bailey's clarinet are on records as having been in the studio with more than one of the Smith girls. Buck Clayton's glorious trumpet obligatos remind once again that the late Joe Smith, who Bessie called her favorite accompanist, was one of his earliest influences. Dickie Wells, Claude Hopkins and Everett Barksdale are also present, and stereo brings out the full majesty of Rushing's vocal powers.

Tommy Gwaltney: Goin' To Kansas City
Riverside RLP9353

Not everyone talking about Kansas City is ready to go there, but this lvevy outfit has all the qualifications and then some. Tom Gwaltney spent a decade in the bands of Bobby Hackett and Billy Butterfield before settling in Norfolk, Virginia, where he is the guiding force behind the Virginia Beach Jazz Festival. He produced and arranged this album, with the help of fellow-Virginian Tommy Newson, and together they take care of the sax section. The band's seven other members include veterans Buck Clayton, Dickie Wells and Buddy Schutz, along with such relative newcomers as Charlie Byrd, Bobby Zottola, John Bunch and Whitey Mitchell.

Where most trips to Kansas City usually stop short after a rehash of familiar Basie tunes, this excursion covers a lot more territory. Besides side trips to the bandstands of Benny Moten, Andy Kirk and Jay McShann, the itinerary lists representative new material. Newson provides Clayton with a productive trumpet showcase on *Kansas City Ballad*, and Gwaltney switches to xylophone on his own touching tribute to *Walter Page*. Bunch strides through the piano choruses on Moten's *New Tulsa Blues*, and Wells reclaims his trombone part on *Hello, Babe*. The arrangements swing mightily, with solo space for all, and the relaxed riffs in the background are an incentive for dancing. Phil Ramone, of A & R Studios is responsible for the effective stereo.

Cannonball Adderley And The Poll-Winners

Riverside RLP9355

Nearly every label has its poll-winners by now, and albums featuring beaming victors of one sort or another are apt to sprout at any time of the year. As anything unexpected happens so rarely on these parade-of-stars releases, the surprise of an unbilled artist walking away with top honors is something of an event. Cannonball Adderley, Ray Brown and Wes Montgomery, the featured dignitaries at this gathering, all go politely through the required paces. Being British-born and unformed about the rules of behavior, Victor Feldman charges in where the awardless fear to tread. Aided and abetted by drummer Louis Hayes, he stirs up so much excitement on piano and vibes that the rest of the quintet forgets propriety for awhile, especially on two Feldman originals. Montgomery unleashes his guitar for a headlong solo on *Azule Serape*, and everyone answers the tribal call on *The Chant*. Boss alto-saxist Adderley toys in friendly fashion with *Yours Is My Heart Alone*, and *Never Will I Marry*. The meeting took place on the west coast, and Wally Heider is credited with the engineering.

Peggy Lee: Basin Street East
Capitol ST1520

A four-week return engagement brought Peggy Lee to Basin Street East last January, and the management threw away the key. Patrons braved three of the worst snow storms

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H. H. Scott FM-Stereo Adapter Schematic

Here is the schematic diagram of the H. H. Scott FM-stereo adapter, Model 335, which was omitted from Mr. von Recklinghausen's article in the June issue. Note that all of the circuit constants are given except for a few of the filter coils. In reality these omissions are not significant and would not stop an experienced experimenter. On the other hand only the most experienced builder should even think about building this complex circuit—and if he is really experienced he would hurry to his local audio store and buy one.

JAZZ

(from page 77)

in fourteen years to keep every seat filled at all performances. Record purchasers are a more cautious breed, however, and may well ponder the reasons for acquiring this in-person album, especially since the singer has recorded most of the songs before in a studio. There is a difference, almost like the one between night and day, and all devoted admirers will want to hear how Miss Lee reacts to a live audience. Any doubt about the reactions from the paying customers would never enter their minds, but cheers are to be heard in plenty for such choice items as *Fever*, *But Beautiful*, and *Moments Like This*. Miss Lee responds with an electrifying performance and builds to a smashing climax in paying her respects to Ray Charles on *Just For A Thrill*, and *Yes, Indeed!* Capitol engineers do a marvelous job of retaining the singer's intimate qualities, spotlighting drummers Chino Pozo and Stan Levey, and allowing a full stereo spread for Joe Harnell's lively band.

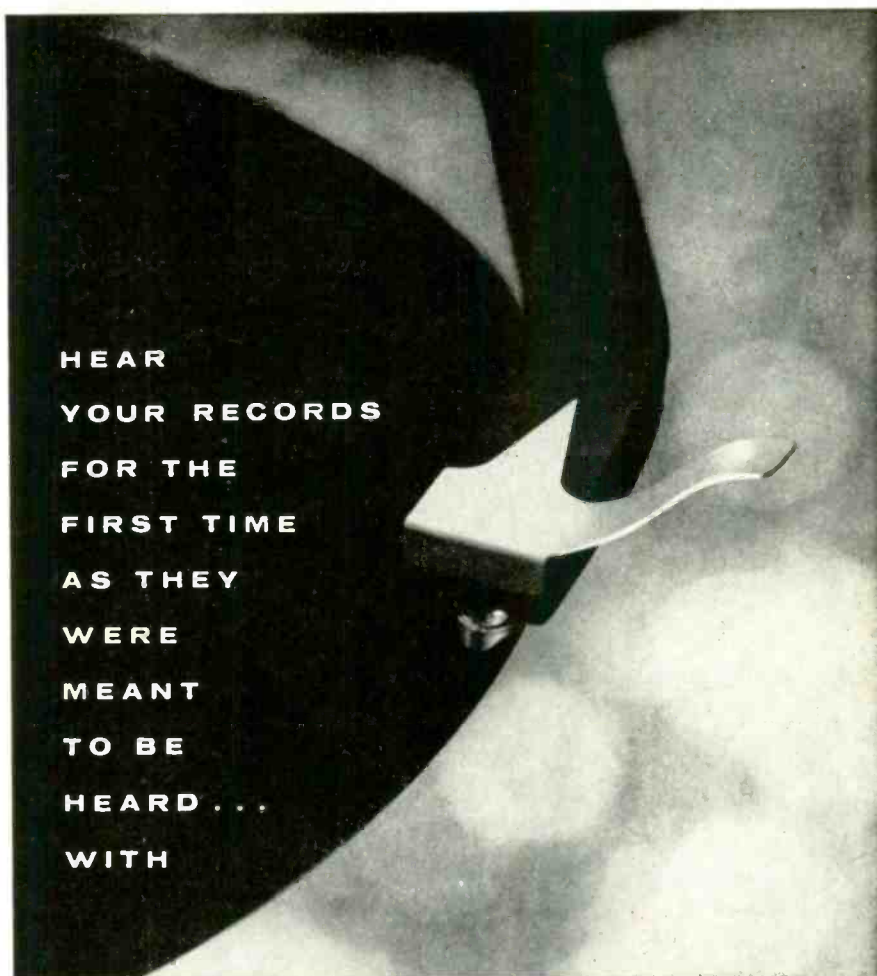
MONO

Red Mitchell: Rejoice!

Pacific Jazz PJ22

Esteemed bassist Red Mitchell turns to the cello at this session, which was recorded live at The Renaissance in Hollywood, and the instrument is made to sound for the first time as illegitimate as the lowly washboard. Jazz bassists have flirted with pizzicato cello before, but they seem slightly awed by the lady-like qualities and always treated it with too much respect. Mitchell gives it the same sort of workout Armstrong or Gillespie would use to test a new trumpet, extending it to the utmost and discovering hitherto undisclosed resources. He frequently gets a tone as gutty and unprincipled as any Jim Hall, the other invited guest, can manage on guitar. Hosts are members of the Frank Butler trio, which holds the fort all week and withstands the onslaughts of featured weekend visitors.

Butler receives ample opportunity to demonstrate why he is the jazz drummer to hear right now. Taking off from an ordinary rhythmic figuration on *You'd Be So Nice To Come Home To*, he develops a solo filled with logic and imagination. Definitely not to be overlooked is a stunning display of finger drumming on *Night In Tunisia*. Mitchell contributes the title tune, while Hall is responsible for *Jim's Blues*, and together they whip up fierce and gusty interplay between guitar and cello. Jimmy Bond, bass, and pianist Frank Strazzeri complete the quintet. This is one of the best informal sessions ever, and is highly recommended. The recording quality is fully adequate and conveys vocal participation of both audience and players.



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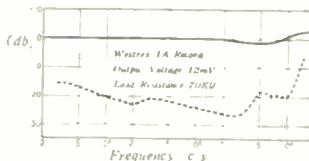
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ABOUT MUSIC

HAROLD LAWRENCE*

Anyone For Quodlibet?

A 103-YEAR-OLD ENGLISHWOMAN was interviewed recently by a B.B.C. announcer who asked for her opinion of the world today. "Wonderful, isn't it?" she replied, in a light, musical, slightly quavering voice. She went on to speak enthusiastically of man's great strides in the fields of science and technology, of the jet aircraft, atomic power, and flights into outer space. Probably the "wireless" and the "tele" had more to do with bringing the world closer to her than any other factor. Paradoxically, mass entertainment in the home may help us to better understand the universe, but it also makes us feel less at home than ever before. Fewer people now create their own home entertainment, and, instead, rely increasingly on passive forms of recreation.

Olin Downes devoted one of his last Sunday columns in *The New York Times* to a musical victim of our scientific age: the "grand old practice of duet playing." During the 19th century and the early decades of the present century, when four-hand piano-playing was one of the most popular musical diversions, arrangements were made of everything from operas to symphonies, and there was hardly any work in the standard repertoire that had not been transcribed for piano duet. In the days before the phonograph, this was the only way one could hear one's favorite symphonic compositions short of attending a concert. But, even today, the phonograph or radio, wrote Olin Downes, "can never replace the joy and the profit of four hands and a new score on the music rack, and the creative participation of all concerned on the piano." There is a special insight and pleasure to be derived from producing the actual notes of an orchestral work with your own fingers. Fortunately, tandem piano-playing has not vanished altogether; four-hand music is still available, and even performed in public from time to time.

Musical home entertainment was probably at its height during the 17th and 18th centuries, when the public and private lives of entire households were often given over to music. The Bach family is a case in point. The numerous members of this celebrated clan practiced their trade as cantors, organists, and court composers all over Germany and taught their offspring the rudiments of the clavichord and string instruments along with their ABC's. So as not to lose track of each other, it was decided that the Bachs should meet annually on a pre-arranged "family day" in Erfurt, Eisenach, or Arnstadt, depending on the geographical deployment of the family at the time. Naturally, music-making took

precedence over all other functions, with the possible exception of eating. The Bachs particularly enjoyed playing musical games during these "journées," and the *quodlibet* was a favorite pastime.

Taken from the Latin, "what you please," the quodlibet is an old musical joke, dating back to the 13th century. The game is based on the juxtaposition of pre-composed melodies, usually of entirely incongruous moods or textual inspiration. There are two kinds of quodlibets: successive and simultaneous. The first, a simple quodlibet, consists of stringing together unrelated tunes or snatches of melodies, for which only the skills of modulation and rhythmic flexibility are required. The simple quodlibet is cousin to the medley, pot-pourri, fantasia, and "musical switch." In its more humorous aspect, it appeared in the Hoffnung Music Festival Concert at the Royal Festival Hall in London (November, 1956). The work was Franz Reizenstein's *Concerto Popolare*, a self-styled "piano concerto to end all piano concertos." Themes from a parade of concerto war-horses were announced in an outrageously ingenious manner, coming upon one almost without warning. In Strauss's music for "Le Bourgeois Gentilhomme," a large part of *The Dinner* constitutes a witty quodlibet. To illustrate the menu, the composer helped himself to generous portions of Wagner, Verdi, and his own compositions. For the serving of the Rhine wine, what could be more appropriate than *Das Rheingold*? For the mutton course, Strauss's own sheep music from "Don Quixote" was in order. And some sort of Italian dish is suggested by *La donna è mobile*.

The more sophisticated simultaneous (or polyphonic) quodlibet is encountered less frequently than its simpler counterpart. Here, two or more melodies are made to run in multiple harness. The composer is permitted to alter time-values so as to dovetail each part. He may also introduce parts of different points of entry, since it is obviously impossible to begin and end all contrasting and pre-composed melodies at the same time. Finally, he may fragmentize his tunes, using a phrase here and there, in jigsaw-puzzle fashion. A classic example of a meticulously devised polyphonic quodlibet was written (assembled?) by Johann Gödel, a 16th century composer, on no less than five chorale tunes.

It is not surprising that the Bachs, who were all proficient contrapuntists, should practice the simultaneous quodlibet at their family gatherings. They particularly delighted in combining sacred and profane melodies. In the last variation from the *Goldberg Variations*, Johann Sebastian composed a quodlibet based on two popular songs, one of which is still extant, accord-

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

ing to some reports. Here are the texts of the original tunes:

1.

I long have been away from thee,
I'm here, I'm here, I'm here
With such a dull and dowdy prude
Out there, out there, out there.

2.

Cabbage and turnips
Don't suit my digestion;
If my mother cooked some meat
I'd stay here without question.

Over the years, the polyphonic quodlibet of the 17th and 18th centuries has lost most of its intended humor. Only when one knows the texts behind the quoted melodies can one appreciate Bach's musical joke. On their own stems, the notes don't indicate the point. As a device, however, the quodlibet continued to attract composers. Mozart made effective use of a three-part quodlibet in the Act I *Finale* of "Don Giovanni," when three orchestras play three different dances simultaneously: a minuet, a country dance, and a waltz. In the concluding measures of the "Meistersinger" *Prelude*, Wagner combines three motifs in grand fashion: the theme and fanfare of the Mastersingers, and the *Prize Song*. Although the latter is regarded as a true quodlibet, it lacks the thrown-together feeling characteristic of the finest examples of the species. This charge can never be leveled against Charles Ives, master of the modern quodlibet, both successive and simultaneous. His "Second Symphony" is a vivid illustration of his use of this device; through the fabric of this score are woven such tunes as *Bringing in the Sheaves*, *America the Beautiful*, *Old Black Joe*, *Columbia the Gem of the Ocean*, and fragments of Brahms's "First Symphony" and the Beethoven's "Fifth." The second movement, *Putnam's Camp*, from Ives's "Three Places in New England" is a riotous example of simultaneous quodlibet, in which is depicted the sonic collision of two passing bands during a Fourth of July celebration.

With all due respect to Ives, it should be pointed out that his quodlibets were freer in execution and therefore easier to assemble than the purer variety. He may have created an unforgettable music image in *Putnam's Camp*, but could he have thought of mating Bizet and Wagner in the following quodlibet masterpiece?



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(Continued on page 103)

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PRODUCT PREVIEW

(from page 64)

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TURNTABLES AND RECORD CHANGERS

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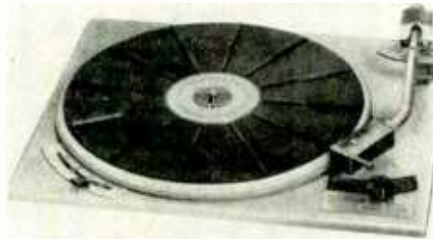
● **Single-Speed Turntable.** This turntable is Acoustic Research's first product outside of the loudspeaker field. A single speed (33½-rpm) turntable, it comes complete with arm, oiled walnut base, transparent dust cover, cables, and even an overhang adjustment device and stylus-force gauge. Belt drive, syn-



chronous motor, 3.5-lb. machined, individually balanced aluminum platter. Manufacturer states that a condition of sale is that these turntables meet NARTB specifications for broadcast equipment on wow, flutter, rumble, and speed accuracy. Acoustic Research, Inc., 24 Thorndike St., Cambridge 41, Mass. User net price, \$58.00.

BOGEN

● **Series B Turntables.** Equipped with tone arms and featuring continuously variable speed and automatic cueing, the Bogen Series B turntables, B60 and B61, are similar in



design and differ only in the type of turntable platter used. Thus the Model B60 turntable uses a 3¾-lb. formed steel platter whereas the B61 has a platter made of a 7¾-lb. machined zinc alloy casting. Both models use the modified PA1 transcription tone arm. A convenient lever on the turntable deck automatically lowers or raises the tone arm at any point on the record, thus assuring gentle contact between the stylus tip and the record. Speed may be varied from 29 to 86 rpm continuously by sliding a lever on the deck. There are click-stop positions for the four standard speeds. Bogen, A Division of the Siegler Corp., P. O. Box 500, Paramus, N. J. User net prices: B60, \$49.95; B61, \$59.95.

COLLARO

● **Four-Speed Transcription Turntable.** Manufactured in England, the new Collaro 4-speed turntable, Model 4TR-200, features a dynamically balanced, 8½-lb. non-magnetic turntable platter. The weight is distributed carefully to take advantage of flywheel effect to achieve smooth rotation. The motor is a heavy duty shaded 4-pole induction type



and it is isolated and resiliently mounted by means of three tension springs parallel to the plate. This mounting method tends to eliminate rumble. Flutter is less than 0.04 per cent, wow is less than 0.15 per cent, and rumble is -50 db. Rockhar Corp., 650 Halstead Ave., Mamaroneck, N. Y. User net price, \$49.50.

● **Stereo Record Changer.** The Collaro Model TSC-740 "Coronation II" is a deluxe stereo changer and player equipped with the "Sensimagic" two-piece tone arm and a detachable 5-terminal plug-in head shell. The "Sensimagic" feeler mechanism, synchronized with the tone arm, automatically changes and "finds" the record to be played. The spring-damped and counterbalanced tone arm is designed for minimum record wear. Wow and



Collaro Coronation Model TSC-740

flutter are less than 0.25 per cent rms at 33½ rpm. The heavy rim-weighted balanced turntable has an extra-thick rubber mat and is driven by a 4-pole induction motor which is dynamically balanced. Rockhar Corp., 650 Halstead Ave., Mamaroneck, N. Y. User net price, \$42.50.

TSC-640 "Conquest II" \$38.50

DUAL

● **Four-Speed Changer-Turntable.** The new Dual-1006 "Custom" is a combination record changer and turntable offering four-speed operation. The "roller-feeler" record indexing action permits intermixing of any size records for completely automatic operation. A shaded four-pole induction motor is used which goes from rest to correct speed in one-quarter of

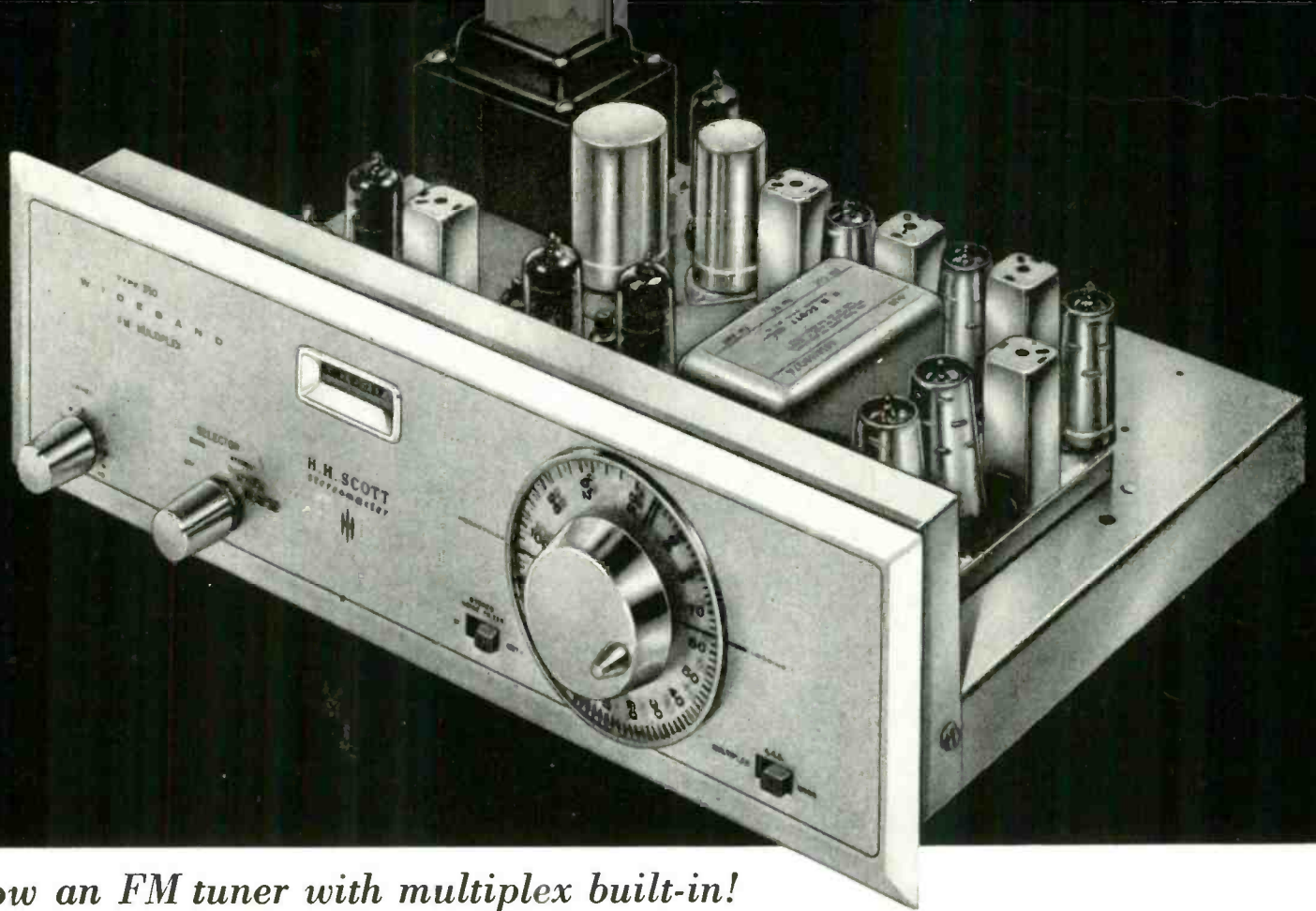


a revolution. The platter is laminated and concentrically girded for increased rigidity. The one-piece tone arm tracks and trips at 1.5 grams and is adjustable for a wide range of tracking forces. The arm has a built-in tracking-force gauge. A lock-in cartridge holder is provided for use with all standard cartridges. With built-in stereo-mono switch. United Audio Products, 202 E. 19th St., New York 3, N. Y. User net price, \$79.95. Wood base, walnut or mahogany, \$6.95.

ELECTRO-ACOUSTIC

● **Four-Speed Turntable-Changer.** Featuring low stylus force (2.5-3 grams) for a record changer, the new Electro-Acoustic 7000 Series provides performance exceeding NARTB





Now an FM tuner with multiplex built-in!

New H. H. Scott FM Stereo Multiplex Tuner uses Wide-Band design for top performance

Here it is! No adaptor needed! The world's *first* Wide-Band tuner designed specifically for multiplex! H. H. Scott's new Model 350 FM Multiplex Stereo Tuner heralds a new era in FM reception.

The FCC, in its recent acceptance of FM stereo multiplex, said that the approved system "... like any multiplex transmission system, will increase energy transmission at the edges of the channel involved. Accordingly, for optimum stereophonic reception, the (tuner's) bandwidth ... must be considerably greater than that of monophonic (tuners) ..."

From our very first design ... the revolutionary 310A ... H. H. Scott incorporated substantially wider IF bandwidth than conventional tuners. This gave better selectivity and usable sensitivity. The new 350 FM Multiplex Stereo Tuner incorporates this same exceptional circuitry allowing reception of even weak multiplex stations with amazing clarity. You get other benefits, too — the 2 MC Wide-Band detector provides superior rejection of interference and complete freedom from drift. The Wide-Band design of the

IF's and detector give the new 350 a remarkable *usable* sensitivity of 2.5 μ v measured by stringent IHFM standards ... one of the best measurements of a tuner's ability to effectively receive weak multiplex signals.

If you are considering a new tuner, or addition of an adaptor to a conventional narrow-band tuner, you owe it to yourself to first listen to the new H. H. Scott Model 350 Wide-Band FM Multiplex Stereo Tuner. Its superiority in sound quality ... its ability to receive weak multiplex signals ... its complete freedom from drift ... are so dramatically different that you will not want to settle for less.

Important Technical Information

Usable (IHFM) Sensitivity: 2.5 μ v. 10 tubes, 11 diodes. Famous H. H. Scott silver plated front end. Tuning meter. Performance matches FCC transmission specifications. Can receive either monophonic or stereo multiplex programs. Special circuitry for perfect stereo tape recording. Dimensions in handsome accessory case 15½"W x 5¼"H x 13¼"D. Matches styling of all H. H. Scott amplifiers. \$199.95, East of the Rockies.

*see paragraph 36, FCC Report and Order, Docket no. 13506, 4/19/61. Emphasis ours.

Wide-Band Multiplex Adaptor



Important News for H. H. Scott Tuner Owners

H. H. Scott has once again protected your investment against obsolescence. Your tuner, regardless of age or model, can be quickly converted to multiplex with the new Model 335 Wide-Band Multiplex Adaptor. Because of H. H. Scott's unique no-compromise Wide-Band design, we can guarantee superior multiplex reception only when the 335 and an H. H. Scott tuner are used together. 5 tubes, 8 diodes. \$99.95, case extra.

H. H. SCOTT

H. H. Scott, Inc. Dept. 035-08
111 Powdermill Rd., Maynard, Mass.

Please rush me full details on your Wide-Band Multiplex Tuner and Adaptor. Include new 1961 catalog.

Name _____

Address _____

City _____ Zone _____ State _____

Export: Morhan Exporting Corp., 458 Broadway, N.Y.C.

standards: wow is less than 0.15 per cent, flutter 0.06 per cent, and rumble -40 db. The change cycle at all turntable speeds is 7 seconds and turntable speed is held constant within 1 per cent. The four-pole induction motor is dynamically balanced. Stylus-pressure adjustment is accessible from the top of the tone arm and the indexing and tone arm height adjustments are accessible from the top of the changer. The tone arm is also dynamically balanced and special provision is made to prevent skating. A convenience feature of the 7000 Series is that all controls are located at one point—concentric knobs which permit one-hand operation. An adapter well containing a 45-rpm adapter is included. Electro-Acoustic Products Co., Fort Wayne, Ind.

EMPIRE

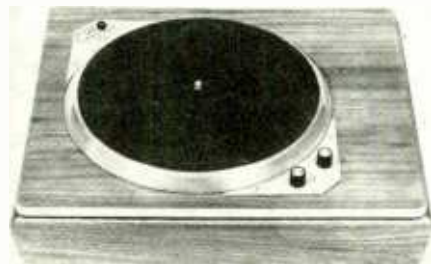
● **Stereo/Balance Turntable.** Deriving its name from the dynamically-balanced hysteresis synchronous drive motor, the Empire Model 208 Turntable is a three-speed (33 $\frac{1}{3}$, 45, 78 rpm) belt-driven turntable. The precision-machined, heavy aluminum baseplate and



turntable are virtually vibration free because of the belt drive and the "acoustic isolation" type of suspension for both motor and baseplate. Incorporates pop-up 45-rpm adapter spindle. Available in satin chrome or satin gold finish. Dyna-Emire, Inc., 1075 Stewart Ave., Garden City, L. I., N. Y. User net price, \$100. Walnut base, \$15.00.

FAIRCHILD

● **Belt-Driven, Two-Speed Turntable.** The new Fairchild Model 440 features 2-speed operation (33 $\frac{1}{3}$ and 45 rpm) from a single belt drive plus a "Speed Sentinel" control that varies turntable speed by $\pm 1\frac{1}{2}\%$. Speed change is effected by a "finger" system which controls the placement of the belt. The "Speed Sentinel" applies d.c. to the motor windings to control the rotational speed. The entire as-



sembly is mounted on a channel for easy installation. Each turntable is packed with its final inspection record in the form of graph. Fairchild Recording Equipment Corp., 10-40 45th Ave., Long Island City 1, N. Y. User net price, less base and mounting board, \$69.95. 412-1A single-speed turntable \$87.50 440-2K 440 kit 55.00

FISHER

● **Automatic Turnover Record Player.** The Fisher-Lincoln Automatic Turntable automatically plays both sides of each record, or one side only. It handles 7", 10", and 12" records intermixed. 33- and 45-rpm speeds are automatically matched to the record on the table. It can repeat one or both sides of each

record, if desired. It handles up to ten records (twenty sides) or plays one or both sides of single records. Records are transported as gently as one could by hand—or possibly gentler than some hands. Only one record is on the turntable at a time so that the stylus



and tone arm can be set to the optimum position. A precision heavy-duty motor drives the studio-quality turntable. Tracking force is 3 grams. The tone arm will accept all standard mount cartridges. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y. User net price, \$249.50.

GARRARD

● **Automatic Turntable.** Combining a dynamically balanced (counterweight adjusted) tone arm with a fully professional turntable, the new Garrard Type A Automatic Turntable provides all the convenience of a changer plus the quality of a fine turntable and arm. The Type A turntable platter is cast, weighted, and polished—over-all weight being 6 pounds. The table is cast of non-ferrous



metal to avoid introducing hum pick-up into sensitive magnetic pickups. The tone arm is dynamically balanced, and is adjustable by means of a sliding counter weight. At this point the arm is in gyroscopic balance. Tracking force is adjusted by means of a calibrated gauge on the side of the arm. Utilizing the pusher-platform changing mechanism exclusive with Garrard, the Type A operates as a fully automatic changer when desired. Garrard Division, British Industries Corp., Port Washington, N. Y. User net price, \$79.95.

GLASER-STEERS

● **Stereo Record Changer.** The GS Seventy-Seven is precision-engineered, completely automatic in operation, and offers new features and refinements which enhance the enjoyment of stereo records, at the same time allowing enjoyment of monophonic records to the utmost. Stylus force is variable over a wide range with easily accessible vernier adjustment. Variation of stylus force between first and last record on a stack is less than 0.9 gram. The damped, acoustically isolated tone arm is not resonant within the audio range, and moves both laterally and vertically on pinpoint bearings. Rumble, wow, and flutter have been reduced by improved motor design. As in earlier Seventy-Seven models, the turntable pauses during a change cycle, and resumes motion only after the stylus has been lowered to the next record, to reduce stylus and record-surface wear. The idler disengages automatically on "off" position to prevent wow caused by flat spots. A dual-channel muting



switch and R-C network maintain silence for both stereo channels during record change and at shut-off. Glaser-Steers Corporation, 155 Oraton St., Newark, N. J. User net price, less cartridge, \$59.50.

GSC cover for GS-77 \$9.75

GRAY

● **Gray ST-33 Turntable.** Equipped with a precision hysteresis-synchronous motor, the Gray ST-33 turntable provides a high level of performance for playing 33 $\frac{1}{3}$ rpm stereo and monophonic records. Rumble is minimized by four live-rubber shock absorbers and a polyurethane belt drive which isolates the motor both vertically and horizontally.



The mounting plate is fabricated from $\frac{1}{8}$ -inch steel to add rigidity to the entire unit. A mounting hole is drilled in the plate to accommodate most 12-inch tone arms. Hand-somely finished in "Sunset Gray" baked enamel with contrasting black and polished aluminum trim. Available as a kit with a smaller mounting plate (PK-33). The Gray Manufacturing Company, Special Products Division, 16 Arbor Street, Hartford 1, Conn.

LAFAYETTE

● **4-Speed Transcription Turntable and Tone Arm.** Each unit engineered to complement the other, Lafayette's new 4-speed turntable and tone arm are supplied on a single mounting plate and are designated as Model PK-449.

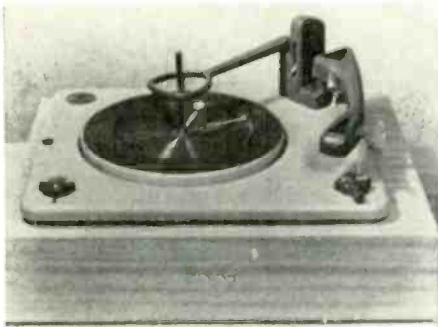


The turntable features a heavy duty 4-pole induction motor, free floating and shock mounted to eliminate vibration. The 3-pound, rim-weighted, 12-inch aluminum table is constructed with a permanently lubricated oilite bronze bearing while the spindle turns on a single ball bearing. Speeds are selected by means of a click-in shift lever and the idler

is disengaged in the off position. A fine-speed control permits adjusting the speed up to plus or minus 7 per cent. Noise and rumble are 50 db below average recorded level with wow and flutter less than 0.2 per cent. The 12-inch tone arm is easily adjusted for different stylus forces by means of a knob at the rear of the arm. Additional features include a plug-in head and an ON/OFF switch located in the arm rest; simply lift the tone arm to start the motor and replace in the arm rest to stop it. Supplied with a strobe disc, 45-rpm adapter, shielded hook-up cables. Lafayette Radio Corp., 165-08 Liberty Ave., Jamaica 33, N. Y. User net price, \$49.50.

LESA

• *Four-Speed Record Changer.* Fully automatic, the new Lesa Model CD2/21 record changer has only two controls for all operating cycles, speed selection, start, stop, reject. Up to eight records of any size may be played with automatic intermix. For manual operation, the record balance is simply moved to its side position. When operated manually, the tonearm is returned to rest automatically, after each record. A built-in click suppressor eliminates switching noises by means of an R-C network. A 4-pole, carefully balanced, heavy-duty motor drives the CD2/21's turntable which has an exceptionally high moment



of inertia. The tonearm mechanism is jam-proof, the arm capable of being moved or handled at any time without damage to the mechanism. The record-changing-cycle time of 6 seconds is the same for all record sizes and speeds. Pre-wired for both monophonic and stereo operation, the Lesa changer is equipped with a universal plug-in shell which accommodates all standard cartridges. Electrophono & Parts Corporation, 530 Canal St., New York 13, N. Y. User net price, \$44.50.

SM5/11 4-sp. man. rec. player \$29.95
4-V3/11 man. rec. player 23.95
66SAL port. stereo phono. 229.95

MIRACORD

• *Hysteresis Motor Turntable-Changer.* Featuring a hysteresis motor for accurate speed control, the new Miracord "Studio-II" is intended to combine the convenience of a record changer with the accuracy of a turntable. In addition, the tone arm is of the quality normally found on turntables. The one-piece turntable platter weighs 7 lb., is dynamically balanced, is made of a non-ferrous metal, and is 11 7/8-in. in diameter. Automatic changing is accomplished by means of the "Magic Wand" spindle which was a well-known fea-



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OF NUCLEAR AGE MATERIALS AND PROCESSES



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ALPHA RAY NUCLEAR SOURCE

If you are a real, uncompromising, hard-nosed perfectionist, this is now the ONLY phono cartridge for your system. Astatic engineers have significantly extended the application of today's new processes and wonder materials to bring you a new standard of excellence. Example is the inclusion of a patented* miniature alpha ray nuclear source which keeps grooves free from foreign particles by dissipating static charge from the record surface. Record and needle abuse are reduced, extra clarity and cleanliness of reproduction are achieved. By any measurement, actual or theoretical, the Cantata is superior. The specifications are excellent, and an actual listening test provides final proof of superiority. So much so that you must try it. Then, we'll wager, you must own it!

TECHNICAL DATA

Frequency response: 20-20,000 cycles; Output voltage: ten millivolts at magnetic input, 1000 cps at 5 cm/sec; Separation between channels: 30-35 db; Channel balance: within 2 db; Tracking force: one gram in professional tone arm; Hum rejection (to external fields): better than 60 db below 5 cm/sec. recorded level after RIAA equalization; Mounting: standard mounting and dimensions to fit all audiophile tone arms and record changers; Needle: single super-polished replaceable diamond; Entire finish: polished gold.

WRITE FOR MORE COMPLETE DETAILS

THE **Astatic** CORPORATION, CONNEAUT, OHIO

IN CANADA: Canadian Astatic Limited, Toronto, Ontario
EXPORT SALES: Roburn Agencies, Inc. 431 Greenwich St., N. Y. 13, N. Y., U.S.A.

*U.S. Patent
No. 2,991,331

ture of previous Miracord changers. The Studio-II also comes with a manual spindle. Record-size selection and actuation of automatic operation is accomplished by means of pushbuttons. For manual operation, the arm need only be placed in the first groove of the record; a switching device built into the arm activates the motor. The Studio-II is also extremely handsome in appearance. Benjamin Electronic Sound Corp., 97-03 43 Ave., Corona 68, N. Y. User net prices: Studio-II, \$99.50; Studio (same as Studio-II but with shaded 4-pole, induction motor), \$79.95.

NEAT

• **Four-Speed Turntable.** The Neat Model P-68H is an attractive turntable with high-priced performance characteristics which belie its price tag. Driven by a hysteresis-synchronous motor which is designed to reduce vibration and noise, the P-68H has wow



and flutter of less than 0.25%. The heavy, die-cast turntable is 12 inches in diameter and is composed of a special aluminum alloy. Neat Onkyo Denki Co., Ltd., No. 4 1-chome Kanda Hatagocho, Chiyoda-ku, Tokyo, Japan.

NEUMANN

• **Automatic Two-Speed Turntable.** Small in size (14½" x 12" deck) but large in performance, the Neumann PA2A automatic turntable turns itself off at the end of each record. The turntable is built on a solid cast plate. The hysteresis drive motor on the one hand, and the turntable and the arm on the other, are separately shock mounted on this plate. Rotation of the motor is transmitted by means of a rubber belt to two idlers, either of which—depending on the setting of the speed selector switch—is brought to bear against the inner rim of the turntable and thus driving it. When the speed selector switch is in its neutral position, both wheels are free. Next to the speed selector switch is the tone-arm lever. Bringing this lever forward causes the pickup to lower slowly to the disc until it gently sinks into the groove. Moving the same lever gently



to the right raises the arm just as slowly while leaving the motor rotating. The tone arm is also raised at the end of a record, or when the speed selector switch is manually depressed. For easy location of the disc's starting grooves, a detent in the tone arm rest automatically locates the stylus directly over the lead-in groove of the standard 7-, 10-, and 12-in. diameter records. Wow and flutter is 0.1 per cent rms. Rumble is virtually unmeasurable. Norted Audio Corp., 72 West 45th St., New York 36, N. Y. User net price, \$495.00.

PICKERING

• **"Gyropoise" Turntable.** Engineered specifically for microgroove records—both mono-phonie and stereo-phonie—the Gyropoise 800

Stereotable is a single-speed machine operating at 33½ rpm. It embodies a unique method of magnetic suspension, on which patents are pending, which eliminates vertical rumble to the point that it becomes inconsequential in the playing of stereo records. Vertical period of spring suspension is below 5 cps; compound



vertical rumble attenuation is 12 db/octave below resonance; noise is 65 db below reference level; speed accuracy is ±0.2 per cent total variation. Pickering & Company, Inc., Plainview, N. Y. User net price, chassis only, \$66.00. Model 800CB, complete base, in mahogany, walnut, or blond, \$15.00.

REK-O-KUT

• **Three-Speed Hysteresis-Motor Turntable.** Featuring a hermetically oil-sealed hysteresis-synchronous motor and a self-lubricating turntable shaft, the Rek-O-Kut Model B-12H is ideal for the most exacting turntable requirements. Noise level is 57 db below average recording level and wow and flutter are 0.12 per cent. Speed selection is by means of single selector knob. An "Off" position is adjacent to each speed selection to permit the



turntable to be shut off without passing through other speeds. The idler is disengaged in "Off" position. A built-in pilot light indicates when the motor is operating. A 45-rpm hub is built in. Rek-O-Kut Co., Inc., 38-19 108 St., Corona 68, N. Y. User net price, \$139.95. B-12GH (standard instead of custom-built hysteresis motor), \$99.95.

N-33H single-speed belt dr \$79.95
N-34H 2-speed belt dr 89.95

THORENS

• **Transcription Turntable.** Engineered for the finest music systems, the Thorens Model TD-124 is a four-speed machine featuring a full 12-inch, 11½-lb. table for lowest wow and flutter. The main table is made of cast iron to provide shielding against hum pickup.



A cover table made of aluminum, plus an attractive rubber mat, mitigates the attraction of magnetic pickups. Precision-machined, the Thorens Roto-Drive is adjustable ±3.0 per cent for exact musical pitch. A built-in illuminated strobe allows setting to exact speed while record is playing. Easy levelling is accomplished by means of a built-in level-bubble and easily accessible levelling screws. The precision 4-pole motor is equipped with a compliant belt-plus-idler arrangement which provides excellent motor-vibration isolation. The TD-124 operates on 50- or 60-cycle a.c. at any voltage from 100 to 250 volts. Thorens, New Hyde Park, N. Y. User net price, \$99.75.

TD-121 33½-rpm turntable \$80.00
TD-111 33½-rpm turntable 60.00

WEATHERS

• **Two-Speed Lightweight Turntable.** Approaching the two-speed problem with the same ingenuity that resulted in the well-known Weathers single-speed model, the Model ML-234 uses two separate synchronous motors; one for the 33½-rpm speed and one for 45 rpm. Each motor couples directly to the turntable by means of a small soft-rubber wheel, and a simple speed-shift lever selects



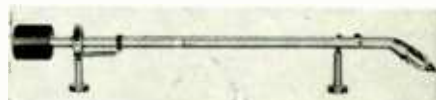
one motor and disengages the other. The Weathers method of reducing rumble and other rotational errors by reducing the mass of motors and turntable is utilized in the ML-234 and is reflected in a rumble of -70 db. Wow and flutter are, respectively, 0.15% and 0.1%. The turntable mat is of special design which eliminates transfer of dust from mat to record. Weathers Industries, 66 E. Gloucester Pike, Barrington, N. J. User net price \$74.50.

ML-1 one-speed turntable \$59.95

PHONO ARMS

DYNACO

• **16-in. Professional Integrated Tone Arm.** A new 16-in. tone arm and cartridge combination manufactured by Bang and Olufsen of Denmark is now being distributed by Dynaco, Inc. This arm, the TA-16, features the "Isodyne" principle of inertial balance to attain dynamic equilibrium. This concept, on which patents are pending, maintains equal pressures on each side of the record groove regardless of the frictional forces which tend to make conventional arms slide inward. Application of this principle yields



lower record wear, lower distortion, and other related benefits. The TA-16 can track at stylus forces as low as one gram with a tracking error of less than one degree. Tracking force is determined by a linear spring set by a simple, easily read slide which permits accurate settings to fractions of a gram. The TA-16 gives flat response within 2 db from 30 to 15,000 cps, with 30 db of channel separation up to 10,000 cps. Output is 7 millivolts. Dynaco, Inc., 3912 Powelton Ave., Philadelphia 4, Pa. User net price, \$59.95. The 12-in. version, TA-12, sells for \$49.95.

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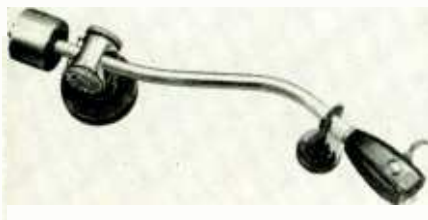
• **Stereo Tonearm.** The Empire 980 is a significantly improved version of the Empire Model 98. Maximum tracking error has been reduced to 0.65 deg and arm resonance has been lowered to 8 cps. Dynamic balance is achieved by locating the pivot points at the precise center of mass. Once in balance in one plane, the arm is balanced in all planes. Even the application of stylus force does not upset this balance because a linear torque spring is used which acts directly on the pivot shaft at the center of mass. The 980 is



provided with a 5-wire circuit, the 5th wire being an independent ground lead to bring the arm and turntable to the same ground potential as the rest of the system and thus eliminate hum induced by ground loops. The 5-wire circuit is terminated at the base of the arm by a 5-prong connector, and a 4-foot cable with mating connector is provided. The other end of the shielded cable terminates in phono-plugs for left and right inputs and a spade lug for the ground wire. Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y. User net price, \$45.00

ESL

• **Gyro/Balance Tone Arm.** Designed on the principle that an arm should be balanced in every plane and the stylus force provided by a spring, the ESL super Gyro/Balance arm has many advantages. Because of this design, turntable leveling is unnecessary, and on demonstration the ESL 2000 arm is often shown playing records with the turntable in an absolutely vertical plane—in fact, if it were possible to keep the record and platter in place and provide proper bearings for the turntable itself, the arm would play records upside down. Ball bearings are used throughout for all vertical and horizontal motions, assuring



smoother operation, increased record life, and longer trouble-free performance. In operation, the spring force is reduced to zero by turning the two knurled knobs backward; the sliding weight at the back is then adjusted for perfect balance of the arm and cartridge. The knobs are then turned forward to obtain the desired stylus force. The head is of molded plastic and is fitted with four terminals. A wire ground lead is carried through the assembly for connection to a terminal strip under the turntable base. Stylus force adjustable from zero up to 7 grams. Electro-Sonic Laboratories, Inc., 35-54 36th St., Long Island City 6, N. Y. User net price, \$34.95; arm rest, \$4.50.

FAIRCHILD

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

an equal but opposite force. One benefit resulting from the anti-skating characteristic is the ability to employ a very-high-compliance cartridge such as the SM-2. The arm also utilizes a system of dynamic balancing, with-

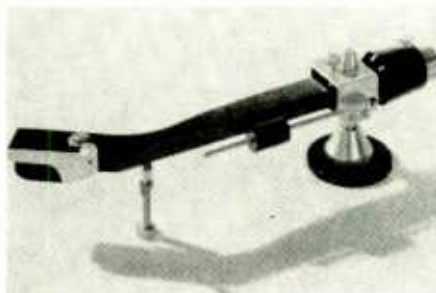


out springs, which ensures uninterrupted tracking in the event of sudden shock. Fairchild Recording Equipment Corp., 10 40 45th Ave., Long Island City 1, N. Y. User net price: arm and cartridge, \$55.00; arm only, \$29.95.

501 16-in. arm \$37.50

GRADO

• **Laboratory Series Tone Arms.** Engineered to accept all cartridges, but available with matched Grado cartridges, this arm is the first in a series designated the "Laboratory Series." Intended to retain all the advantages of the integrated tone arm/cartridge combination with none of the disadvantages, this arm can be adjusted for overhang and weight within the shell. Because of this, the arm



need not be rebalanced when changing cartridges. Constructed of fine gunstock walnut with precisely machined aluminum fittings the arm looks and performs magnificently. Electrical connections are by screw terminal so that a soldering iron is not required for installation. To simplify installation in small cabinets the arm has been designed with a very small rear overhang. Adjustments are provided for vertical and lateral balance as well as linear tracking force. A vertical stop is provided to prevent stylus damage. Tracking error is ± 0.8 deg. Grado Laboratories, Inc., 4615 Seventh Ave., Brooklyn 20, N. Y. User net price, \$39.50.

GRAY

• **Fluid-Damped Stereo Arm.** Linear fluid damping in both vertical and lateral planes is featured in the Gray Model 212-TG stereo tone arm. Precision balanced for maximum tracking stability, the unit incorporates such features as adjustable static balance and a quick-change holder which will accommodate



all standard cartridges. Four leads are included for stereo operation. Tracking error is reduced to an absolute minimum. Available fully assembled or in kit form, this arm will meet every demand of the most discerning music lover. Gray High Fidelity Division, 16 Arbor St., Hartford 1, Conn. User net price, \$34.00.

LAFAYETTE

• **Integrated Stereo Tone Arm and Cartridge.** Intended to provide optimum stereo performance by integrating the cartridge into the tone arm, the Lafayette Model PK-449 is supplied complete with a 0.7-mil diamond stylus. The *raison d'être* of integrating the cartridge into the tone arm is to provide exact positioning of the stylus in the record groove and produce a relationship between tone arm and cartridge which is not usually achieved in non-integrated units. Arm structure, balance, and compliance can be precisely engineered to complement the cartridge. The cartridge utilizes the "moving-magnet" principle, with cartridge, coils, and other components housed in a Mumetal case to reduce



hum and noise. In addition, Mumetal shielding is employed throughout the entire length of the arm, providing a signal-to-noise ratio well over 100 db. Frequency range is from 20 to 16,000 cps and is flat ± 2 db from 20 to 15,000 cps. Replacement of the stylus may be accomplished without special tools within a few seconds. Each arm is individually factory balanced to track at 3 grams. Lafayette Radio Electronics Corp., 165-08 Liberty Avenue, Jamaica 33, New York. User net price, \$32.50.

NEAT

• **Professional 12-in. Tonearm.** Constructed of the finest quality materials, the Neat GA-12 is designed to provide long life under the most exacting conditions. Both horizontal and vertical motion is smoothed by the use of precision ball bearings. The 4-terminal



plug-in head of the GA-12 is designed to accommodate cartridges with various terminal configurations. Special attention was given to reducing arm resonance to the minimum possible. Neat Onkyo Denki Co. Ltd., No. 4 1-chome Kanda Hatagocho, Chiyoda ku, Tokyo, Japan.

PICKERING

• **"Unipoise" Tone Arms.** An integrated arm and cartridge, the new Pickering "Unipoise" Models 198 and 199 combine the "Unipoise" arm with the 380A or 381A cartridges respectively. The arm employs a single pivot

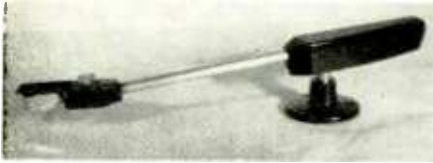


bearing to achieve unusually low friction. The complete assembly is much lighter than conventional tonearms. Simple single-mount installation employing only one thumbscrew and a bolt. The arm rest has a soft sable brush on it to keep the stylus tip free of dust. Tracking force for both models is 2-5 grams.

Pickering and Company, Inc., Sunnyside Blvd., Plainview, L. I., N. Y. User net prices: Model 198, \$54.00; Model 199, \$67.50.

PRIMO

● *12-in. Stereo Tonearm.* Designed specifically for stereo operation, the Primo A-18 is dynamically balanced and utilizes a jeweled vertical pivot. Stylus force is adjusted



by means of a coil spring, adjustment being possible within a gram. Tracking error is less than 2.5 deg. The plug-in head is provided with 4 terminals and will accommodate any style of cartridge. Primo Co., Ltd., 2043 Mure, Mitaka-shi, Tokyo, Japan. User net price, ¥3,400 (in Japan).

REK-O-KUT

● *"Omni-Balance" Tonearm.* The new Rek-O-Kut Model 320 tonearm can be balanced with any cartridge by means of "Omni-Balance". By means of this new feature (patent pending) the arm can be adjusted for optimum bearing loads and lateral balance. A convenience is the anchored single-jacket cable which terminates in two color-coded plug-in leads, two shields, and a ground wire. The arm is designed to be balanced statically with the



cartridge installed and then the spring-tensioned balance control is set at the desired stylus force, from 0 to 6 grams. The gimbal mounting assembly includes twin sets of five-ball, one-millimeter bearings to provide what the company describes as "the freest vertical and lateral motion found in any tonearm today." The arm is mounted to the base through a single hole, with a single nut being tightened to secure it. Rek-O-Kut Company, Inc., 38-19 108th St., Corona 68, N. Y. User net price \$32.95.

Auto-Poise \$49.95

H. H. SCOTT

● *Integrated Arm and Cartridge.* The London-Scott Model 1000 was the result of the combined efforts of London Recording Laboratories and the H. H. Scott engineering staff. Frequency response of 20 to 18,000 cps \pm 2 db, and compliance is 3.5×10^{-9} cm/dyne. Output is 7 mv in the stereo connection. Stylus radius is 0.5 mil, and output impedance is 4000 ohms per channel at 400 cps. Recommended load is 47,000 ohms, and channel separation is better than 20 db. Tracking force, 3.5 grams. The over-all length of the arm is 12 1/2



in., and the height adjustment range is 1% to 2 1/2 in. above the mounting board. The assembly is complete with arm rest and all mounting hardware and templates, as well as all connecting cables. H. H. Scott, Inc., 111 Powder Mill Road, Maynard, Mass. User net price, \$89.05.

SHURE

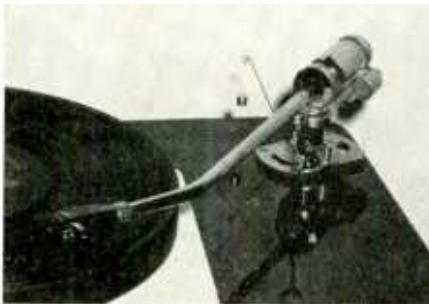
● *Stereo Tone Arm.* Modern, high-compliance light-tracking cartridges require arm balance of a high order in all planes to deliver undistorted sound. The new Shure arm pivots on drag-free precision bearings and easily made adjustments for balance, stylus force, arm height, and—for the first time—overhang for any type of cartridge mounting are provided. Available as model M232 (12") or as Model M236 (16") the arm comes with detailed instructions for mounting most of the



available cartridges on the market. Removable head is designed to hold cartridge on its mounting plate by single screw through a slot in top of head for overhang adjustment. Direct-reading stylus-force gauge has instant disconnect, and "micrometer" counterweight assembly permits visual static balance check. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. User net price: M232, \$29.95; M236, \$31.95.

SME

● *Precision Pickup Arm.* Featuring an arm mount that permits overhang adjustment without the need for changing original mounting holes. The British-made SME arm employs a mounting plate fitted with a long slot in which the base of the arm may be moved backward and forward as required. The arm rests on knife-edge bearings, and two counterweights are used, one to adjust static balance with the smaller one at the zero position, and



then the second weight is moved to the desired stylus force. Lever-operated arm lifter is provided, with hydraulic "dash-pot" arrangement to allow gradual set-down of arm even though lever is moved rapidly. Accommodates all standard mono and stereo cartridges, and head is interchangeable with Ortofon type G, Lectronics of City Line Center, Inc., 7644 City Line Ave., Philadelphia 31, Penna. User net prices: Model 3009 (12") \$87.00; Model 3012 (16") \$99.00.

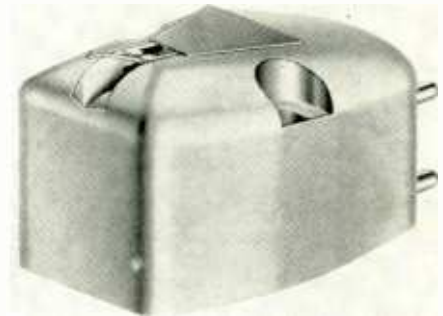
Anti-skating adjuster \$4.05

PHONO PICKUPS

ADC

● *Pickup Can Track at Less Than 1 Gram.* A new stereo cartridge, model ADC-1, that can track at less than 1 gram has been introduced by Audio Dynamics. Featuring extremely high lateral and vertical compliance, 20×10^{-9} cm/dyne, it is said to reduce record

wear to a minimum. The low tracking force is attributed to the fact that the dynamic mass of the moving system is smaller than any other cartridge now available. As a result the resonance of the moving system is of small magnitude and has a frequency well above that to which human ear is sensitive.



The stylus of the ADC-1 is easily replaced without special tools; the basic design assures correct positioning. With provision for mounting on either 1/2-inch or 7/16-inch centers it can be used in virtually all tone arms. Sensitivity of the cartridge is 7 millivolts per channel plus or minus 2 db at 1000 cps and a velocity of 5.5 cm/sec. Frequency response is within \pm 2 db from 10 to 20,000 cps. Channel separation is 30 db from 50 to 7000 cps. Stylus-tip radius is 0.6 mils. Audio Dynamics, 1677 Cody Ave., Ridgewood 27, New York. User net price, \$49.50.

ADC-2 \$37.50

ASTATIC

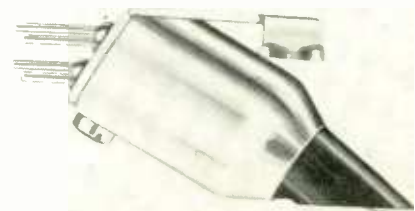
● *Ceramic Stereo Cartridge.* Combining the advantages of the ceramic cartridge with those of the magnetic cartridge is the goal of the Astatic Model 45D cartridge. Being a ceramic cartridge it has a much greater output than does a magnetic cartridge and, of course, is impervious to magnetic hum induction. Some of the drawbacks of the ceramic cartridge have been the relatively high tracking force and the need for separate inputs. The Model 45D can track at forces



as low as 1 gram and, with the matched networks supplied with the cartridge, it can be plugged into magnetic inputs without change in the amplifier. Frequency range is 20 cps to 20,000 cps. Output voltage is 0.2 volt direct at 1000 cps at 5 cm/sec and 10 mv at magnetic input under the same conditions. Channel separation is nominally 30 db with each channel balanced within 2 db at 1000 cps. Stylus comes with 0.7 mil diamond tip. The Astatic Corp., Conneant, Ohio. User net price, \$27.00.

DYNACO

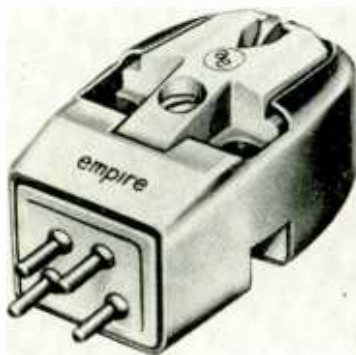
● *Stereodyne II Cartridge.* Utilizing the variable reluctance principle, this cartridge made



by Bang and Olufsen of Denmark is designed for superior reproduction from either mono or stereo microgroove records. It has a frequency response from 30 to 15,000 cps ± 2 db, compliance of 5×10^{-6} cm/dyne, and an output of 7 mv per channel for a stylus velocity of 5 cm/sec. Channel separation is better than 22 db, and tracking force is from 2 to 4 grams. Recommended load is 47,000 ohms for rated frequency response. The unit employs an unusual construction, with the entire moving element being enclosed in a plastic cone permanently attached to a metal shell surrounding the body of the cartridge. It is mounted at an angle, as shown. The mechanism consists of a light mumetal cross which is attached to a slender aluminum tube with the stylus affixed to the end. Four terminals. User net price, \$29.95. Dynaco, Inc., 3912 Powelton Ave., Phila. 4, Pa.

EMPIRE

• *Stereo/Balance Cartridge.* Featuring wide frequency response and low tracking force, the Empire model 108 is a high-quality stereo cartridge at moderate cost. Frequency response is 15 to 20,000 cps ± 2 db with usable output at 30,000 cps. Output voltage is 8.0 millivolts per channel balanced within



1 db. Channel separation is more than 25 db. Inductance is 500 mH and d.c. resistance 1250 ohms; recommended load impedance is 47,000 ohms. Vertical and lateral compliance is 6×10^{-6} cm/dyne and the recommended tracking force is from 1.5 to 5 grams. Supplied with a 0.7-mil diamond stylus. Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y. User net price, \$37.50.

ESL

• *Stereo Cartridge.* The new C99 cartridge is of the electrodynamic type, and utilizes



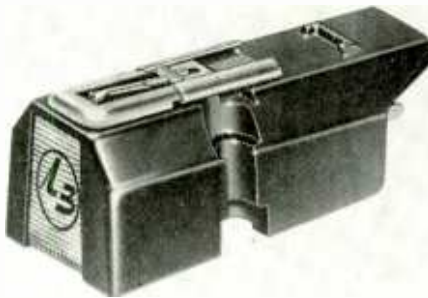
two patented, inherently linear D'Arsonval movements coupled to a unique "Micro/Flex" frictionless stereo separating system. Technical data include: vertical compliance, 5×10^{-6} cm/dyne; lateral compliance, 5×10^{-6} cm/dyne; dynamic mass, 0.0025 grams; output per channel, 1.0 mv at 10 cm/sec.; channel separation, 20 to 25 db; frequency response, 18 to 20,000 cps ± 2.0 db (Elektra 35 test record). The C99 fits any standard changer

or arm. Electro-Sonic Laboratories, Inc., Long Island City, N. Y. User net price, \$49.50.

C-60 dynamic cartridge \$39.50
Redhead ceramic cartridge 14.95

ELECTRO-VOICE

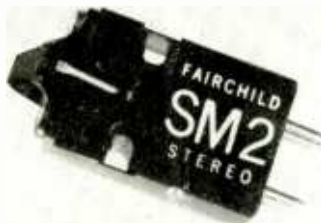
• *Magneramic 31MD-5 Stereo Cartridge.* Employing ceramic elements in connection with a special printed circuit which is an integral part of the cartridge, the Magneramic 31MD-5 is designed to be fed into the usual magnetic pickup inputs of stereo preamps. Frequency response is given as 20 to 20,000 cps ± 2 db,



with a channel separation of 28 db at 1000 cps and an output of 8 mv. Compliance is 3.5×10^{-6} cm/dyne and the cartridge is available with 0.5-mil styli for use with transcription arms with a stylus force of 2-4 grams. The cartridge is also available for ceramic inputs. Electro-Voice, Inc., Buchanan, Michigan. User net price, Magneramic 31MD-5, \$24.00.

FAIRCHILD

• *Low Mass Moving Magnet Cartridge.* Designed to fulfill professional studio playback requirements, the Fairchild SM-2 can be used in high fidelity arms and changers. Although compliance is high (5×10^{-6} cm/dyne) the stylus assembly is still rigid enough to track high-level stereo records without fatigue. The stylus utilizes a 0.7-mil polished



diamond tip and the dynamic mass is 2 milligrams. Tracking force is 2.5 grams and the output is 5 mv at 3.8 cm/sec. Inductance is 500 mH per channel. Frequency range is 20 cps to 15,000 cps. Fairchild Recording Equipment Corp., 10-40 45th Ave., Long Island City, N. Y. User net price, \$37.50.

SM-1 high output \$34.95
225A mono cartridge 37.50
230 mono cartridge 42.50

GRADO

• *Moving-Coil Stereo Cartridge.* Similar in design to the "Laboratory Series" cartridge, the Grado "Classic" employs a moving element consisting of a hollow plastic cube on which are wound two coils and from which extends the stylus bar. This cube is supported in a rubber "grommet" which serves to hold the coils in the magnetic field as well



as provide the necessary damping. Frequency response is 10-30,000 cps. Interchannel output balance, 0.5 db; frequency balance, 0.5 db. Output, 6 mv at a stylus velocity of 10 cm/sec. Impedance, 950 ohms; tracking force, 3 grams. Input load, any value over 5000 ohms. Channel separation, in excess of 30 db. Grado Laboratories, Inc., 4614 Seventh Ave., Brooklyn 20, N. Y. User net price, \$37.50.

"Senator" cartridge \$24.95
"Lab Series" cartridge 49.50

NEAT

• *Stereo Cartridge.* Manufactured in Japan by one of their better-known high-fidelity manufacturers, the Neat VS-500 stereo cartridge employs the moving-magnet principle for maximum channel balance and separation. Featuring simple stylus replacement and complete freedom from induced hum, the VS-500



delivers an output of 5 mv at 1000 cps at 5 cm/sec. Optimum stylus force is 3 to 5 grams with a 0.7 mil stylus. Frequency range is 20-20,000 cps. Channel balance is within 1 db at 1000 cps and channel separation at 1000 cps is 30 db and 25 db at 10,000 cps. EIA standard mounting is used. Neat Onkyo Denki Co., Ltd., No. 4-1 chome, Kanda Hattago-cho, Chiyoda-ku, Tokyo, Japan.

NEUMANN

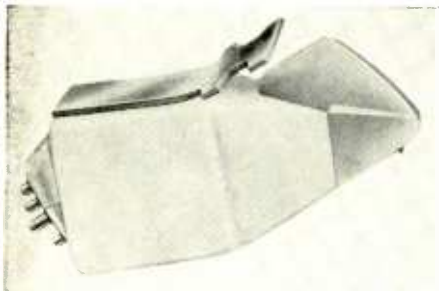
• *Dynamic Stereo Cartridge.* Said to be the first stereo cartridge, the Neumann Model DST features a low impedance (18 ohms) and is designed to work into a load of at



least 50 ohms. Channel separation is over 30 db in the midrange. Output is 1.05 mv for 7-cm/sec velocity, and the unit is intended to track at 4 grams stylus force. Frequency range is from 30 to 15,000 cps. ± 2 db. The DST cannot be mounted in most arms, but will fit directly into SME arms. Norted Audio Corporation, 72 West 45th St., New York 36, N. Y. User net price, \$75.00.

PICKERING

• *"Calibration Standard" Cartridge.* Produced specifically for the professional level of the recording and broadcast industry, the Pickering model 381 Stanton Calibration Standard is now available for general use. The model 381 is an ultra-linear pickup designed to make precise record measurements and is available in the standard high-impedance model (47,000-100,000 ohms) as well as low

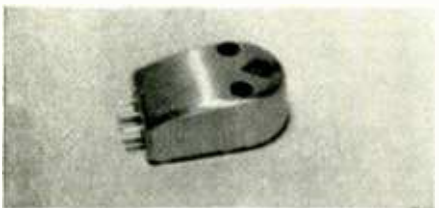


impedance models (250 or 500-600 ohms). Response is within 1 db from 20 to 10,000 cps and within 2 db from 10,000 to 17,000 cps. Output is 5 mv per channel; channel separation is 35 db. Recommended tracking force in professional arms is 2 to 3 grams. Weight of the unit is 12 grams. Model 381A complete with an individual calibration test report and 0.7-mil diamond stylus is priced at \$48.00. Pickering and Company, Plainview, N. Y.

380A collectors series \$34.50
 MK11A stereo cartridge 26.40
 Stereo "90" 16.50

PRIMO

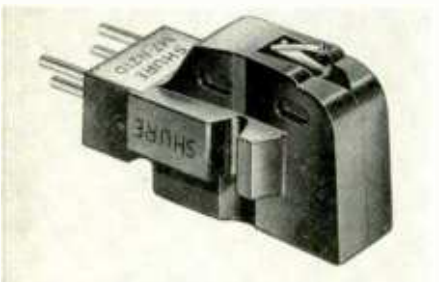
• *Moving Magnet Stereo Cartridge.* The Primo Model C-57 is a moving magnet cartridge with unusually high output (9 mv at 1000 cps at 5 cm/sec) and low tracking force (2-3 grams). Made in Japan by a well-known



manufacturer, the C-57 compares well with cartridges of the highest calibre. Frequency range is 20 cps to 18,000 cps; channel separation is 24 db at 1000 cps and 20 db at 10,000 cps; channel balance is within 1 db; compliance is 1.4×10^{-8} cm/dyne. It will mount in any standard tone arm with EIA hole spacing. Primo Co. Ltd., 2043 Mure, Mitaka-shi, Tokyo, Japan. User net price, ¥5,800 (in Japan).

SHURE

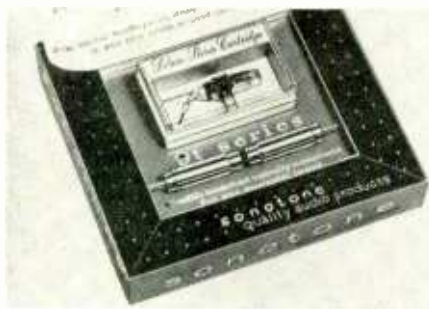
• *Professional and Custom Dynetics.* These two cartridges, M3-N21D and M7-N21D, are designed for mounting in transcription arms and in record changers (which do not exceed



2.5 grams tracking force). Both have frequency responses of 20 to 20,000 cps, ± 2.5 db, outputs of 5 mv per channel, and channel separations of more than 20 db at 1000 cps. Recommended load impedance is 47,000 ohms. The Professional model, M3D, has an inductance of 365 mH, a d.c. resistance of 330 ohms, and a compliance of 9×10^{-8} cm/dyne when used with N21D stylus. The Custom model, also when used with N21D stylus, has an inductance of 400 mH, a d.c. resistance of 400 ohms, and a compliance of 9×10^{-8} cm/dyne. Both have four terminals and fit standard mounting dimensions. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. User net price: M3-N21D, \$47.25; M7-N21D, \$36.75.

SONOTONE

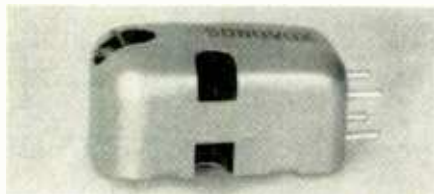
• *Ceramic Stereo Cartridge.* A turnover stereo cartridge for all record speeds, the new Sonotone model 9T also plays monophonic records. Frequency response of the 9T is plus or minus



1 db from 20 to 17,000 cps. A compliance of 3.5×10^{-8} cm/dyne permits stylus force of 2 grams for professional pickup arms and 3 grams for changers. Output is 0.4 volts. One feature of the cartridge is the gold-plated metal cover which shields the cartridge both mechanically and electrically. Stylus replacement is simplified because of the virtually unbreakable nylon needle assembly and pre-wired terminal plug. Protection for the stylus is provided by turning the stylus positioning lever halfway between either position, thus eliminating the need for a needle guard. Sonotone Corporation, Elmsford, New York. Available with sapphire stylus at \$20.50, or diamond-sapphire stylus at \$23.50, both with equalizers for magnetic inputs included.

SONOVOX

• *Moving Magnet Stereo Cartridge.* The Sonovox SX-1 represents a refinement in moving magnet cartridges. The magnet is spherical in shape thus achieving a uniform field. Ex-



tremely low mass and high compliance of the vibrating system produce minimum record wear. Frequency range is 20 cps to 20,000 cps. Output is 4 mv at 5 cm/sec at 1000 cps. Tracking force is 2-3 grams with a 0.7-mil diamond stylus. Channel separation is better than 20 db at 1000 cps. Sonovox Co., Ltd., 101 Tokiwamatsu-cho, Shibuyaku, Tokyo, Japan. User net price, \$20.00.

WEATHERS

• *Capacitance Stereo Pickup System.* Pulling another rabbit out of his bag of tricks, Weathers has again come up with something new in pickup systems. Utilizing a system wherein a change in capacitance is produced by the movement of the stylus, and then



amplifying it in an "amplifier bridge circuit", this system is as careful with records as any pickup system can be. The system consists of the cartridge (integrated with arm), the viscous damped arm, and the power supply-amplifier bridge. The system cannot be separated—the cartridge requires the polarizing supply and the special mount on the arm. Frequency response of the system is plus or minus 1 db from 20 cps to 20,000 cps. Compliance is 20×10^{-8} cm/dyne; moving mass is 0.6 milligram; separation is 35 db from 20 cps to 15,000 cps. Output is 1 volt with RIAA equalization, 7 mv at constant velocity—7 cm/sec at 1000 cps. Weathers Industries, 66 E. Gloucester Pike, Barrington, N. J. User net price, \$129.50.

TAPE RECORDERS

AMPEX

• *Portable Stereo Tape Recorder.* The Ampex model 970 is a portable stereo tape recorder featuring a self-contained matched pair of amplifier/speakers for stereo playback monitoring. The new unit utilizes the same tape transport as the Ampex model 960 portable deck, installed in a longer portable case with a two-channel stereo amplifier and two 7" oval speakers which face outward from each end of the unit. Sound-directing panels are in front of each speaker thus permitting some directional control of the sound. Monitoring "off-the-tape" while recording can be done either through earphones or the unit's own speakers because the 970 has separate record and playback preamps as well as separate heads for record, playback, and erase. Capable of recording and playing two-track stereo and $\frac{1}{2}$ -track monophonically, it can also play four-track tape. It can also be used as a public address system—in stereo or mono. Capable of essentially distortionless frequency response from 30 to 20,000 cps at $7\frac{1}{2}$ ips, and 30 to 15,000 cps at $3\frac{3}{4}$ ips. Its precision engineered timing accuracy is such that it offers perfection of pitch held to tolerances of $\frac{1}{4}$ of a half-tone. Flutter and wow less



than 0.2% rms at $7\frac{1}{2}$ ips; under 0.25% at $3\frac{3}{4}$ ips. High-impedance inputs are provided for microphone and high-level program sources. Azimuth alignment of stereo head gaps is within 20 seconds of an arc, equivalent to less than 10 millionths of an inch. The appearance of the 970 in a distinctive gray carrying case is in keeping with its impressive performance. Ampex Audio, Inc., 1020 Kifer Road, Sunnyvale, Calif. User net price, \$595.00.

960 ster rec/pbk \$495.00
 936 ster player w preamps 249.50
 934 ster player 199.50
 601-2 ster rec/pbk in case 795.00

AMPLIFIER CORP.

• *Transistorized Portable Tape Recorder.* The Amplifier Corp. of America Model 612 Series "TransMagnemite" is a transistorized portable tape recorder with a spring-wound motor, a multi-purpose VU meter and a battery-operated amplifier. The machine is available single or dual track. It uses a balanced fly-ball governor and achieves a flutter of only 0.1 per cent at $7\frac{1}{2}$ or 15 ips. Six models are available with speeds ranging from 15/16 ips up to 15 ips. Four of the models are



dual track, the remaining two are single track. The six models range in price from \$445.00 to \$505.00. Amplifier Corp. of America, 396 Broadway, New York 13, N. Y. 610 Series portable 6 models .. \$315.00-425.00

BELL

• *4-Track Stereo Playback-Recorder.* The Bell Model 337 records and plays back 4-track stereo and plays back 2-track stereo. The "piano key" mechanical controls permit simple control of the mechanism. Also, pressing the speed keys automatically switches the preamp record equalization to coincide with the speed. Frequency response is 18 cps to 16,500 cps plus or minus 3 db at 7½ ips and 18 cps to 15,000 cps plus or minus 3 db at 3¾ ips. Signal-to-noise ratio is better than 50 db. Flutter is less than 0.2 per cent at



7½ ips and 0.25 per cent at 3¾ ips. The T-337 has a Bell Model RP-320 stereo preamplifier built in. The frequency response of the RP-320 during playback is 18 cps to 20,000 cps. The recording sensitivity is 2.5 mv at the microphone input, 100 mv at the high level input. Total harmonic distortion of the preamplifier is less than 1 per cent at 12-volt playback and maximum recording level. Bell Sound Division, Thompson Ramo Wooldridge, Inc., Columbus, Ohio. User net price, \$334.95.

CONCERTONE

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



track recorder and playback machines the 505-4R features two separate 4-track playback heads, one for each direction of tape movement, thus ensuring optimum fidelity in both directions. Another feature of the 505-4R is its use of three hysteresis motors for maximum smoothness of tape motion. Concertone is also making available a kit, No. 510, for converting 4-track versions of the model 505 for automatic reversal operation. American Concertone, Inc., 9449 W. Jefferson Blvd., Culver City, Calif. User net price, \$579.50.

CONCORD

• *Stereo Tape Recorder.* The Concord 401 tape recorder records and plays 4-track and 2-track stereo and mono tapes. It combines the 400-D tape deck and the Model 400-RP



stereo record and playback preamplifier. Tape speeds are 7½ and 3¾ ips and maximum reel size is 7-in. Wow and flutter are 0.18 per cent and 0.25 per cent at 7½ and 3¾ ips respectively. Frequency response is 30 cps to 16,000 cps plus or minus 2 db at 7½ ips and 40 cps to 12,500 cps plus or minus 3 db at 3¾ ips. Frequency response of the preamplifier is 20 cps to 20,000 cps plus or minus 1 db, and signal-to-noise ratio is more than 55 db. Concord Electronics Corp., 809 Cahuenga Blvd., Los Angeles 38, Calif.

CROWN

• *Professional Stereo Tape Recorder.* A machine of advanced design, the Crown 714C (Stereo X) records and plays back four-track stereo, plays two-track stereo, and records and plays 4-track monophonic tapes. Featured in the 714C are three-speed operation (15, 7½ and 3¾ ips), forced air cooling, patented differential magnetic braking to assure smooth operation without tape stretch, automatic stop to prevent tape runaway, and non-magnetic capstan. The all-aluminum panels are satin anodized and markings are deep engraved for performance. Four high-impedance microphone inputs are provided;

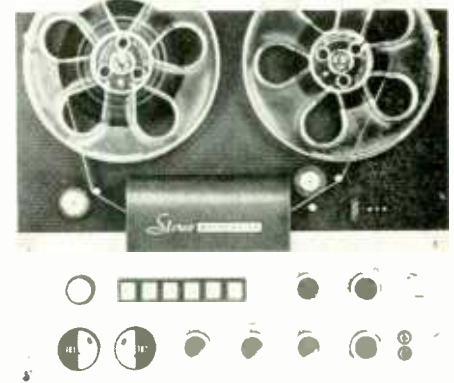


four level controls permit mixing of all inputs. Cathode follower outputs plus standard rack mount permit adaptability to a large variety of equipment. At 15 ips frequency response is 50 to 28,000 cps plus or minus 2 db, flutter and wow is 0.06%; at 7½ ips frequency response is 30 to 17,000 cps within 2 db, flutter and wow is 0.09%; at 3¾ ips frequency response is 30 to 9000 cps within 2 db, flutter and wow is 0.18%. Timing accuracy is 99.5%. Crown International, South 17th St. and Mishawaba Road, Elkhart, Indiana. User net price, \$730.00.

712, 2-track stereo rec \$710.00

EICO

• *Stereo/Mono 4-Track Tape Deck.* Designed for professional and home use, the Eico Model RP-100 tape deck has many features found in the most expensive models. The RP-100 includes a 14 transistor playback and record amplifier, electronic push-pull bias-erase oscillator, and full-wave rectifier; a hysteresis-synchronous capstan drive motor, and two heavy-duty, four-pole induction motors to drive the reels. The entire transport mechanism is extremely simple. There are only three mechanical linkages in the deck. Each head is provided with a four point professional mount, and the record and play heads have laminated mumetal pole pieces, interchannel mumetal shielding, and mumetal outer shielding. Use of separate record and



playback heads and amplifiers permit off-tape monitoring, and selected sound-on-sound operation without changing connections. In playing or recording, a d.c. solenoid actuates the pinch-roller. Tape lifters are actuated by an a.c. solenoid during fast winding. Controls are all electric, all push-button, and the "record" button is interlocked with the "run" button to prevent inadvertent erasure. The frequency response at 7½ ips is 30-15,000 cps plus or minus 2 db; noise is 55 db below maximum recording level, and wow and flutter are 0.2 per cent. At 3¾ ips the frequency response is 30-10,000 cps plus or minus 2 db, wow and flutter are 0.25 per cent. The RP-100 is available fully wired and tested, for \$395.00, or as a semi-kit with the entire tape transport fully assembled and tested, and with the electronics in kit form for \$289.95. Eico, 3300 Northern Boulevard, Long Island City 1, New York.

FERROGRAPH

• *Professional Stereo Tape Recorder.* The Ferrograph 808 offers complete stereo recording and playback facilities as well as monophonic recording and playback. Available with 3¾ and 7½ ips tape speeds. Portable units, the 808 series have matched outputs at low-level to feed a high fidelity system. Accommodate reels up to 8¼" and have a flat frequency response (±3 db) of 60 to 14,000 cps at 7½ ips and 60 to 8000 cps at 3¾ ips. Signal-to-noise ratio is better than 50 db. 200 to 12,000 cps; 45 db unweighted including hum. Three motors are used including one hysteresis-synchronous drive motor for the capstan. Other features include re-



now hear this!

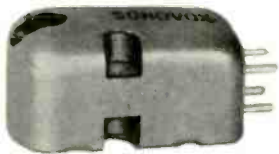
You are looking at the new ADC-1 stereo cartridge. It is the most effortless cartridge available today. You'll hear subtleties of timbre and tone you never suspected were in your discs. Hear it at your favorite dealer.

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Circle 92A

SONOVOX



MAGNETIC STEREO CARTRIDGE model SX-1

SPECIFICATIONS

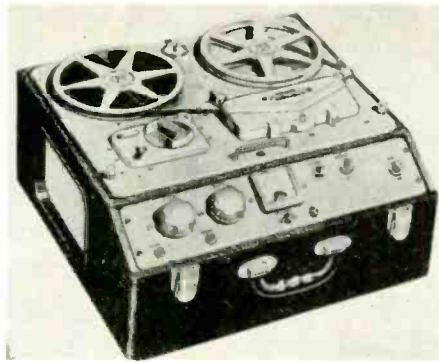
Response 20 ~ 20,000 cps
 Output 4mv / 5cm / 1,000 c/s
 Channel Isolation 20dB 40 ~ 12,000 c/s
 Channel Balance ± 0.5dB at 1,000 c/s
 Compliance 3 × 10⁻⁶ cm/dyne
 Load Resistance 50 ~ 70 k ohms
 Tracking Force 3 grams
 Stylus 0.7 mil Diamond
 Weight 12.5 grams



SONOVOX CO., LTD.

101, Takawamatsu-cho, Shibuya-ku, Tokyo, Japan.

Circle 92B

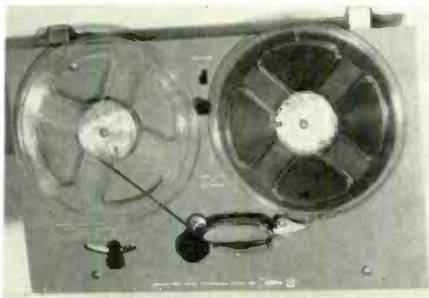


ording VU meter, auto-switch cutoff, "Ferro-dexer" gear-driven turn counter, and azimuth adjustment for heads. Distributed in United States by Ercona Corporation, 16 West 46th St., N. Y. User net price, \$595.00.

4A/NH mono 7½-15 ips \$425.00

KNIGHT

• *4-Track, 2-Speed Tape Transport.* An economy priced transport, the Knight KN-4200 provides performance that far surpasses the price tag. The KN-4200 has a record/play head plus an erase head and provision for adding a third monitor head when desired. The heavy-duty motor drives the dynamically balanced capstan flywheel by means of a fabric covered rubber belt.



The controls are extremely simple to use; speed is changed by pressing a button and a single lever selects rewind, stop, forward, and fast forward in that order. It plays through the tape head inputs of the amplifier but for recording it requires a recording preamp (such as the Knight KN-4001). Response is 30 cps to 14,000 cps at 7½ ips. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois. User net price, \$79.95.

KORTING

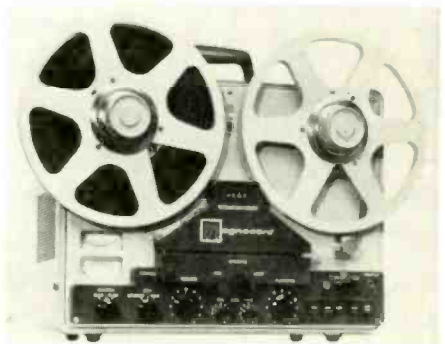
• *Stereo Tape Recorder.* Manufactured in Western Germany, the new Korting Model MT-158S is a four-track stereo recorder-playback machine with features unusual in its category. A three-head machine, the Korting



permits synchronized dubbing. You can actually hear the first recording while the second recording is being added. In addition the recording is modified rather than the input signal. Because of the head construction and other circuit features, a recording can take place on one track while the other is playing back independently. Tape speeds are 3¾ and 7½ ips and wow and flutter are less than plus or minus 0.2 per cent at 7½ ips. Other features of the machine are recording-level indicator, automatic shut-off, and a low-noise transistor input stage. The Korting MT-158S comes in an attractive carrying case and weighs twenty-nine pounds. Kimberly International Ltd., 346 W. 44th St., New York 36, N. Y. User net price, \$369.50.

MAGNECORD

• *Three-Head Stereo Recorder.* Designed for professional use, the Magnecord Model 748 is a 3-head machine available in several options to suit individual requirements. The basic machine records and plays two-channel stereo and it is available with or without a portable case. The 748 is also available with a fourth head for 4-track playback, again with or without the portable case. Although the standard machine offers 7½-3¾ ips tape speeds, the 748 is available with 15-7½ ips speeds. Timing accuracy is plus or minus 3 seconds in 30 minutes. Frequency response

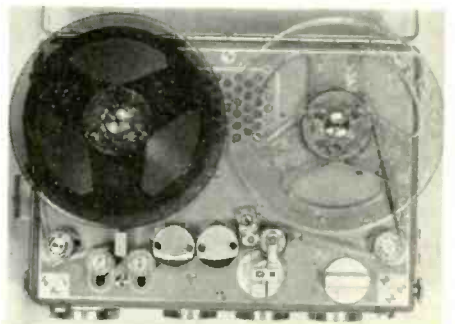


is plus or minus 2 db from 40 cps to 15,000 cps at 7½ ips and from 50 cps to 8000 cps at 3¾ ips. Signal-to-noise ratio is better than 5 db per channel. Flutter and wow is 0.15 per cent at 7½ ips and 0.25 per cent at 3¾ ips. Reels up to 10½-in. can be handled. The erase head is split so that either or both channels may be selected. Magnecord Dept., Midwestern Instruments, P. O. Box 7509, Tulsa, Oklahoma. User net price, Model 748-4 (basic machine) \$924.00 with case.

PT6-6A mono full-track rec w case .. \$425.00

NAGRA

• *Portable, Professional, Tape Recorder.* The Nagra IIIB is a completely transistorized professional, 3-speed (3¾, 7½, 15 ips) tape recorder. Incorporating three heads and a servo-controlled motor, the Nagra IIIB has a speed constancy of 0.2%. Wow and flutter is 0.15% at 15 ips and 0.2% at 7½ ips. Signal-to-noise ratio is 58 db or better. The recorder operates from any 12-volt source or

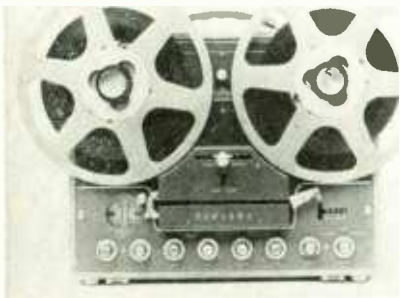


from the self-contained flashlight batteries; battery condition and level being indicated by the built-in meter. Output is +6 VU at 600 ohms balanced. A monitor-speaker is built

in and an AGC circuit controls speech level during recording. All normal microphone inputs are incorporated in addition to two line mixers. Electronic Applications, Inc., 194 Richmond Hill Ave., Stamford, Conn. User net price, \$1,045.00.

NEWCOMB

• **Stereo Tape Recorders.** Now available in the 1/4-track version as Model SM-310-4 as well as the earlier 1/2-track Model SM-310, the Newcomb stereo tape recorder is "cybernetically engineered for intuitive operation." Control of the tape transport is centered in a "joy stick" which is sensibly moved to the left to rewind, to the right for fast forward, and toward the operator for record and play modes. Both models will operate either vertically or horizontally and take from 3" to



10 1/2" reels, as well as NAB hubs. Two speeds, 7 1/2 and 3 3/4 ips, are provided, and flutter is less than 0.2% at the higher speed, less than 0.25% at the lower. Response is from 30 to 15,000 cps \pm 2 db at 7 1/2 ips, and 40 to 10,000 cps at 3 3/4 ips. Equalization is in accordance with NAB standards, and output is approximately 1.3 volts from cathode followers. Two input jacks are provided for each channel, one for microphone and one for high-level sources. Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif. User net prices: SM-310-4, \$499.50; SM-310, \$499.50.

NORELCO

• **Lightweight 4-Track Stereo Tape Recorder.** A lightweight version of the Norelco "Continental" tape recorder, the new "Continental" 200 (Model EL3541) operates at 7 1/2 ips and incorporates a narrow-gap, 4-track record-playback head. The "Continental" 200 will play standard 4-track stereo tapes (head output) through an external system, and will record and play back monophonically on 4-tracks. The 200 is provided with input jacks

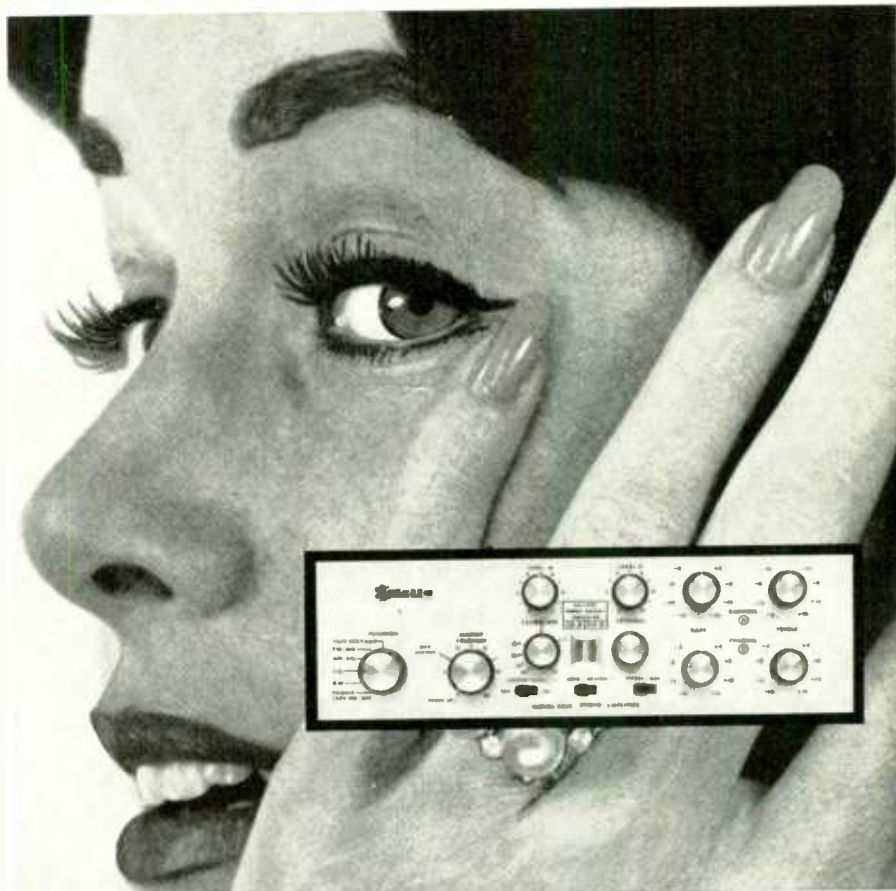


for recording from microphone, tuner, or phonograph, with facilities for mixing (two sources), and for "sound-on-sound" recording. The machine also includes an output jack for monitoring with headphones. The 200 may also be used as a self-contained public address amplifier and speaker system. A foot switch is available as optional equipment. North American Phillips Co., High Fidelity Products Division, 230 Duffy Ave.,

Hicksville, L. I., N. Y. User net price, \$179.50.
300 ster pbk/mon rec. 4-track \$259.50
400 ster rec/pbk 4-track 399.50

ROBERTS

• **Automatic Repeat Tape Recorders.** Featuring a "Magic Memory" automatic repeat, the new Roberts Models 440 and 144 DPA repeat all or any part of the tape by simply pushing the "repeat" button and setting the "repeat" knob back to the desired position. Complete 1800-foot tape rewind takes just sixty seconds; thus with the "Magic Memory" these Roberts recorders can play for a full nine hour period with just six 60-second silent intervals during that time. The Model 440 comes complete with power amplifiers and forward facing stereo speaker system, and is priced at \$699.50. The 144 DPA is identical to the 440 except that it comes without the built-in power amplifiers and speakers. It is priced at \$649.50. Roberts



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IT'S THE EXCITING NEW ERIC 3560T, 3 CHANNEL STEREO 50 WATT "MUSIC POWER" AMPLIFIER. Ladies admire the satin-gold decor finishes... men can't resist the realism of sound reproduction. Here is tomorrow's amplifier... today! Exclusive visual balanced power output indicator lets you pre-set and determine actual output to speakers. Clean response - 20 to 20,000 cps; total harmonic distortion less than 1% and individual controls for the ultimate in sound reproduction.

A touch of the finger and sound comes alive in a way you've never experienced before! Pure sound... excitingly crisp... brilliant! Only Eric, the West's leading AM-FM tuner manufacturer, could develop this advanced amplifier so perfect in engineering and so low in price. \$149.95... slightly higher in the East. Write today for complete specifications. Ask for Eric... highest quality at the lowest price.

ERIC MULTIPLEX ADAPTOR, MX 6000. Another example of Eric fine engineering and low price! Only the MX6000 has the exclusive "Stereo Announcer" which automatically lights up when stereo is being broadcast. The unit is compatible with all Eric tuners and most other makes using wide bandwidth. Additional amplifier stage assures strong "fringe area" reception. Separate balance control for optimum separation. Audiophile net... \$59.95. MX600 semi-automatic... \$39.95.



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MODEL 440-2K only **\$55⁰⁰**

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Circle 94A

notice

to owners

of

AR speak-

ers

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

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

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

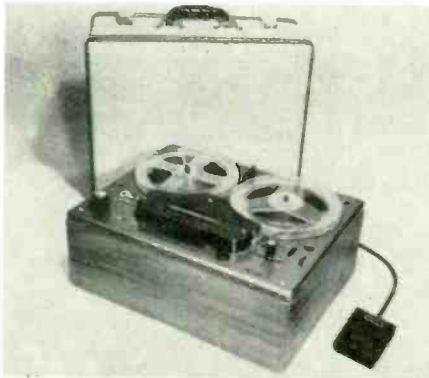
Circle 94B

Electronics, Inc., 829 N. Highland Avenue, Los Angeles, California.

90D ster rec/pbk \$349.50
990 ster rec/pbk 4-track 399.50

TANDBERG

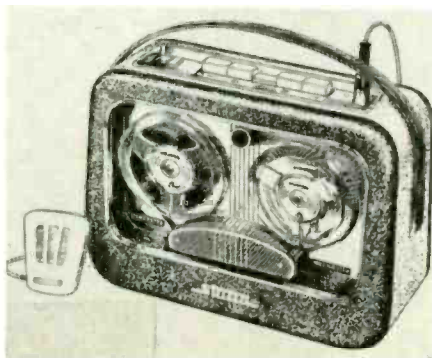
• *Stereo Tape Deck.* Feature for feature the Tandberg Series 6 Tape Deck represents magnificent performance in a compact, handsomely styled package. A three-speed machine (7½, 3¾, 1½ ips) it records 4-track both monophonically and stereophonically, and plays back 4-track. The unique 4-track stacked precision laminar record head has double mu-metal shielding to give crosstalk rejection of 60 db. Built-in are four separate preamplifiers, two for recording and two for playback. The pause control achieves precise pick up in stop-and-go recording or playback. Frequency response is 30 to 20,000 cps at 7½



ips; 30 to 15,000 cps at 3¾ ips; and 50 to 7000 cps at 1½ ips. Flutter and wow are 0.1, 0.2, and 0.25% at the three respective speeds. The Series 6 incorporates a hysteresis synchronous drive motor, military-type printed circuitry, and special toroid-type windings on the power transformer to cancel stray hum. The 4-track stacked erase head selectively erases 1 or 2 tracks. 6 inputs are provided; 2 each for microphone, high level, and low level. Tandberg of America, Inc., 8 Third Ave., Pelham, N. Y. User net price, \$498.00.
65 ster tape deck \$199.50
4 mono rec/ster pbk 349.50
3 mono rec pbk 299.50

STUZZI

• *Portable Transistorized Tape Recorder.* The Stuzzi Magnette is a fully transistorized, battery operated, completely portable tape recorder. Manufactured in Austria, the Magnette weighs only 8 pounds and achieves performance equal to more expensive, heavier units. The self-contained speaker system provides fine tone quality for music, dictation, or conference recording. Vibration proof, the Magnette incorporates a 7-transistor, 2-diode amplifier which provides ample volume and reliable performance. Other features include a battery life indicator. 3¾ and 1½ ips tape speeds, usable as a portable PA system, separate motors for fast wind and capstan drive,



and can be played through an external amplifier. Easy to load and operate, the Magnette provides push-button controls, a 3-digit

counter, VU level and Magic-eye modulation indicators. Frequency range is 50 to 9000 cps at 3¾ ips; 60 to 4000 cps at 1½ ips. Distributed in United States by Ercona Corp., 16 West 46th St., N. Y. User net price, \$269.50.

SUPERSCOPE

• *Professional Stereo Recorder.* This new recorder by Sony, the Model 777, provides 2- and 4-track record and playback by means of a new patented head configuration. Individual half-track and quarter-track stereo laminations are combined into one head and are completely isolated and shielded from each other. The three heads—erase, record, and play—are similarly constructed providing the equivalent of six separate stereo heads. The electronics of the 777 is completely transistorized and consists of four printed circuit boards mounting 29 transistors, including 2 silicon power transistors.



Modular plug-in construction of the boards permits instantaneous substitution of each circuit. All three motors are hysteresis-synchronous. A remote control unit is included which permits complete remote control of all functions. Choice of 15 and 7½ or 7½ and 3¾ ips combinations. All specifications are completely professional. Superscope Inc., Sun Valley, Calif. User net price, \$725.00.

CS-300 2-, 4-track ster rec/pbk \$399.50
262-SL mono rec/ster pbk 199.50
262-D tape transport 89.50

VIKING

• *Economy Stereo Playback/Recorder.* Small in size and price, the Viking 76 Compact packs a lot of tape recorder in a minimum package. For example, the recording and



playback frequency response at 7½ ips is 25 cps to 16,000 cps plus or minus 3 db. Signal-to-noise ratio is 5 db or better and the recording amplifier has less than 0.25 per cent total harmonic distortion at "0" VU. The 76 Compact records and plays only ¼-track

tapes both monophonically and stereophonically. The bias frequency is 80,000 cps. Dual independent VU meters indicate level during recording and playback. Viking of Minneapolis, Inc. 9600 Aldrich Ave. South, Minneapolis 20, Minnesota. User net price, \$199.50.

MICROPHONES

AKG

• *Stereo Microphone.* Intended for stereo recording and broadcasting, the AKG D88 microphone consists of two dynamic elements in the same case. Each element has a cardioid pattern and their axes are 90 deg. apart so that unusually wide stereo coverage may be achieved. The elements may also be paralleled for wide-angle monophonic use. Ideal



for FM-stereo control room and announcing use.

CHARACTERISTICS

Frequency range: 80 cps to 15,000 cps.
 Pattern: Cardioid.
 Output impedance: 200-ohm, also available high Z.
 User net price, \$46.50 for 200-ohm; high-Z, \$54.00.

C14 condenser mic	.....	\$22.95
D19B cardioid dyn mic	.....	52.00
200K dyn studio mic	.....	110.00
C60 condenser mic	.....	259.50

ALTEC

• *Polyester Film Microphone.* One of a new line of modestly priced professional-quality microphones, the Altec model 683A features a polyester film diaphragm and a sintered bronze filter. The use of polyester film as the diaphragm material, instead of aluminum, greatly increases the ruggedness of the diaphragm thus taking it out of the delicate, easily damaged category. The sintered bronze filter placed in front of the diaphragm protects it



from foreign particles such as ferrous filings, dust, and water.

CHARACTERISTICS

Type: Cardioid dynamic.
 Frequency range: 45 to 15,000 cps.
 Output impedance: 30/50, 150/250, and 20,000 ohms (selected by connections in microphone cable plug).
 Output level: -54 dbm/10 dynes/cm².
 Hum: -120 db (ref. 10⁻² gauss).
 Weight: 11 ounces (not including cable and plug).

(Continued on page 99)

STEREO DEMANDED IT!



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THE NEW "MONITOR" DUAL CONCENTRIC

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INCORPORATING



"MONITOR"
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MODELS

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- ★ Unique treatment of low frequency diaphragm surround providing improved response and stability.
- ★ New acoustic balance cavity improving high frequency response, reducing distortion.

Tannoy engineers have produced a speaker of unsurpassed quality, already being used as a 'Monitor' by world wide recording, radio, and television companies. The extended range and increased efficiency of the low frequency unit make it ideal for use in relatively small enclosures, whilst still maintaining the "presence" of unrestricted sound. This, combined with the fully integrated sound source of the 'Monitor' Dual Concentric makes it especially suitable for stereophonic reproduction.

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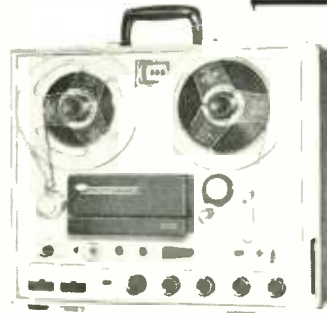
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TANNOY (AMERICA) LTD.
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Circle 95A



Exclusive REVERSE-O-MATIC® on world famous 505



Only Concertone brings you the revolutionary new Reverse-O-Matic... a unique, unprecedented playback feature that plays 4-track stereo tape from end to end and back again! No changing reels! Doubles unattended playing time! Doubles your listening pleasure! Two permanently stationary heads assure perfect tape alignment... optimum fidelity! The Concertone 505 with exclusive Reverse-O-Matic is truly the most versatile instrument available in the professional stereo tape recorder field. Standard 505-2- or 4-track stereo recorder from \$495. Model 505-4R Reverse-O-Matic from \$579.50.

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 505 Stereo Recorder Reverse-O-Matic

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City _____ Zone _____ State _____

Circle 95B

FM-STEREO

(from page 22)

A sufficient amplitude of pilot subcarrier is injected into the oscillator tank circuit to lock the oscillator not only on frequency but within a few degrees of phase relative to the incoming pilot subcarrier appearing in the composite stereophonic modulation.

For monophonic reception it is desirable to remove the contribution of the stereophonic subcarrier channel from the output of the left and right channels by killing the oscillator so that the beam deflection demodulator tube electron beam rests between the two

anodes, thus equally dividing the beam current between the two anodes.

Adjustment

The circuitry as shown in Fig. 6 is quite simple to adjust for optimum demodulation. The sequence of tuning is as follows:

The 67,000-cps trap shown in the filter portion of the schematic is tuned until a null at 67,000 cps appears at the output of the filter. The anode resonant circuit of the triode portion of the 6AU6 is tuned for maximum pilot subcarrier amplification. The oscillator tank circuit is then adjusted so that the oscillator is locked to the incoming pilot subcarrier frequency (an aural test is adequate

here). The doubling tanks, both primary and secondary, in the anode circuit of the electron-coupled oscillator are tuned for maximum output at 38,000 cps, as observed at the deflection plates of the beam deflection demodulator tube. The signal generator is modulated with a composite stereophonic signal having the modulating condition $L = -R$. Each of the carrier tank circuits, namely: anode circuit of the cathode follower, oscillator tank circuit, electron coupled frequency doubling tank circuit, and the driving tank circuit for the beam deflection tube is then retouched for maximum recovered audio at both left and right outputs.

The modulating condition of the signal generator is then changed to left channel modulation only. The 500-ohm matrix control in the cathode circuit of the beam deflection demodulator tube is adjusted for a null at the right channel output. If the matrix resistors are well matched and the gain characteristic of each anode circuit of the beam deflection demodulator tube are well matched, then a null condition will also exist at the left output when a right only signal is applied to the signal generator. AE

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"Fantastic sound, equal to the finest tape I have ever heard"

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"The greatest improvement to my system for the least money. Difficult to believe I am listening to records"

"The quietest surface I have ever heard. The sound is a dream come true"

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4614 Seventh Ave., Brooklyn 20, N. Y. • Export — Simontrice, 25 Warren St., N. Y. C.

RECORD REVUE

(from page 73)

many unexpectedly contrasted sub-sections woven into a continuous whole. It is top Bach, a style one could wish he had not put aside later as "antique".

I do wish I could recommend this major pair of works heartily. But the effect of the excellent young solo singers being dragged rigidly along by the Craft human metronome, the casually rushed big moments, the lack of a sense of recitative "speaking" as a contrast to the arias, add up to a necessary condemnation. The sprightly professional chorus trained by Margaret Hillis (who can be pretty rigid herself) is about the best element here—if one doesn't count some extremely fine detail work among the instrumental players. AE

AUDIO ETC

(from page 16)

Horrible racket. The birds positively shrieked at me, like those utterly fake bird calls you get in the movies when somebody wants to indicate that spring has come at last.

PISTON I: EXPRESSING THE SOUL

I've been saving a publicity release that came to me earlier this year from the Philadelphia Orchestra, concerning a new modern symphony that was to be performed in one of the Philly's weekly concert programs, a work by the American composer Walter Piston. Prof. Piston just happens to have been my own teacher in my salad days. He taught advanced harmony and beginner's orchestration, and

I took both of these courses under his benign and gently satirical direction; so, of course, my eye caught his name quickly enough. It was his Seventh Symphony that was to have its world premiere with the Philly in a forthcoming concert.

I should say that Prof. Piston, in the far-off college days of my education, got my slightly grudging respect by his obviously keen observation of human foibles, carefully hidden by him under a mask of comfortable indifference. Piston never orated nor emoted. He put on an elaborate act of shiftlessness, as though teaching were no more than a pleasant bore. He affected to be lazy; he'd rather give a high mark to anybody (he didn't to me, alas), than bother with a lot of fancy arguments. He underplayed everything he did, being ultra-careful never to suggest that it might be exciting or interesting—heaven forbid.

Even the dumbest of us students caught onto the act; the more deadpan was Prof. Piston, the more important was the stuff he gave us in that slow, monotone drawl of New England casualness.

My particular purgatory came one day during our weekly set-to with a performing member of the BSO—the Boston Symphony—who came to class in order to play the exercises we had composed for his instrument. This was obviously Piston's favorite moment; the opportunities abounded for that quietly devastating satire that was his specialty. Three or four words out of the side of Piston's mouth and your musical pretensions were demolished in a heap.

I was a very young super-idealist then. Most of the students tossed off elaborately professional and vastly complex tid-bits for the week's solo instrumental player to try—perhaps it was an oboe, or a bassoon, or a trombone. Nothing looks as professional on paper as a beginner's technical exercise, aping his elders! The only trouble, of course, was that half of them were completely unplayable. These kids really didn't know from nothing, but they had to put on the big bluff. So Piston would sit there, trying to hide a quiet smile, as his friend the bassoonist would huff and puff through one preposterously elaborate exercise after another, as prepared by us novices. A marvellous way to show up false schoolboy pretensions and gain real, down-to-earth knowledge, thus to have your own attempts actually performed, read at sight before your eyes and those of your rivals and fellow-students by a top professional in the field.

Well, as I say, I was a young idealist. No flossy scale passages and roudades and technical tours-de-force for me. I wanted to Compose Music. Of course I really didn't know *how* very well, but my soul was unshakeable; I wasn't going to allow mere technical virtuosity to impede my expressiveness, nor to sully the simplicity of my Mozart-like melody.

One day I composed a particularly lovely little tune for some instrument or other, let's say the bassoon. I slaved over it for hours, shaping the thing down to utter simplicity; I was enraptured with my own highmindedness. That day, after seven or eight of the typical flossy virtuoso exercises had been negotiated with reasonable success by the solo player, each one more elaborate than the last, it came my turn. And out floated my lovely, simple, undecorated little tune, straight from Heaven—or so I felt.

A dry half-voice came from the rear of the room. Was it merely a clearing of the throat, Mr. Piston professing to hate

early-morning classes; or was it a chuckle? I couldn't say. But my world was demolished with four drawled words. "Grumph," said the voice, to no one in particular, "Canby expressing his soul."

I blushed pink and sank practically through the bottom of my chair; I was cut down in the flower of my youth as a composer! Nobody dared titter; but the titters absolutely roared in my imagination. I nearly wept on the spot, I assure you. And from that time onward I took care to avoid any soul-expression within a half-mile of the devastating Prof. Piston.

It did not occur to me until at least twenty years later that just possibly Prof. Piston had been on my side; that in his

own gruff way he might have—*maybe*—been passing a backhanded compliment to me, for a reasonably musical exercise, if a somewhat naive and simple-minded one. Perhaps if I'd had a little more gumption I might have been a composer after all. Bit late to start now.

What was I saying? Oh yes, about Professor Piston's latest Symphony and his very decidedly keen sense of observation, behind that mask of dry indifference. Mr. Piston is quoted by the Philadelphia Orchestra people in the following terms, concerning his Symphony, and I think you will see the point. This composer listens and observes, not only to music but to the impact of music in the actual sound. That is our business, in audio.



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CONTINENTAL '400'
4-Track Stereo Tape Recorder



A recording studio in a suitcase—that's how Norelco '400' owners describe this most advanced (and most popular) self-contained stereo tape recorder. **VERSATILITY:** 4-track stereo recording and playback, as well as 4-track monophonic recording and playback, at any of its 3 speeds. **FREQUENCY RESPONSE:** at 7½ ips, 50-18,000 cps; at 3¾ ips, 50-14,000 cps; at 1¾ ips, 60-7000 cps (yes, its response at 3¾ ips is actually equal to or *wider* than the response of most other machines at 7½ ips)! **PROFESSIONAL EXTRAS** (at no extra cost): mixing, monitoring, sound-on-sound facilities and the Norelco stereo dynamic microphone. **SIGNAL-TO-NOISE RATIO:** 48 db or better. **WOW AND FLUTTER:** less than .15% at 7½ ips. **CROSSTALK:** 55 db. **HEAD GAP:** .00012". **AUDIO FACILITIES:** completely self-contained, including dual recording and playback pre-amplifiers, dual power amplifiers and two Norelco wide-range, stereo-matched speakers (one in the detachable lid). For complete specifications, write to Norelco. In the meantime, see and hear the '400'. The recording studio you can carry is now available for immediate delivery.

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I quote the Philadelphia news release. "Mr. Piston has said that in composing this work he was conscious of being influenced by the sound of the specific orchestra (the Philadelphia) for which he was writing 'a circumstance I had already experienced in my Sixth Symphony, written for the Boston Symphony. Although I am somewhat less familiar with the Philadelphia Orchestra than that of Boston (Note: that's Piston for you—he has been intimately associated with the Boston for thirty-odd years. E.T.C.), I could not help hearing it mentally as I worked on the composition. Another intriguing factor was that I knew that their sound is not quite the same there (i.e. in Boston's Symphony Hall, on visiting tour) as it is in the Academy of Music (the home Philadelphia concert hall). These acoustic problems constitute one of the many absorbing and fascinating problems to be faced by the composer."

You see how this sharp musical mind works: he composes not only to express his own soul but to express specifically the sound of the Philadelphia orchestra as differing from the Boston, and even further, to express the sound of that orchestra in a particular hall. Well, if not that, then at least he is aware that his music is going to be different in each performance and in each acoustic situation where it is played. Recording engineers take note, especially if you are about to tape a piece by one Walter Piston, senior American composer.

And just in case Prof. Piston is on hand in person—well, beware, beware! Beware of that friendly drawl with the keen cutting edge to it. You, too, may be caught expressing your soul, via the stereo mikes.

PISTON II: THIN PISTON

Speaking of Pistons—this seems like an opportune moment to note in advance a speaker development that has me intrigued on theoretical grounds, the introduction of a new Jensen line of speakers (both within cabinets and separately as driver units) which are "actual" pistons.

My interest at this point is theoretical. You see, for years and years it has been dunned into all of us that the theory of loudspeaker operation supposes a moving piston that pumps air, straight ahead, with a forward-and-backward motion. In actuality, these "pistons" have been something slightly less than pistons as matched up against the theoretical ideal. Most cones, over the years, have been variably flexible, pushing out energetically from their centers, pushing from their outer edges with less excursion because of the necessary mounting and centering of the piston element itself. In their complex motions, cone-pistons have managed to produce some notably piston-like sound over these decades, i.e. sound of reasonably push-pull high fidelity. Cones break up into weird and involved subpatterns, modes of vibration that go 'round and across and back; but together with the coupled enclosure, many a complicated cone action has produced remarkably simple and straightforward sound, ingeniously cancelling out faults by playing them one against another, hauling in as a third force the amplifier coupling and the whole electrical and magnetic circuitry as part of the intricate adjustment.

So we've had pistons of paper that, though not really pistons at all, produce piston-like sound-resultants. Not to perfection, for the loudspeaker still is the biggest distorter in our business by a wide

margin. But to an ingeniously high degree of semi-perfection.

Moreover, thanks to the newly-high compliance built into recent speakers (thanks to the many new materials, new papers, and new plastics now being put to work), some of our new cone pistons act mightily like a true piston. The middle pumps in and out. The edge pumps in and out in very nearly the same path. The cone itself remains reasonably rigid, even if it is pushing air at angles, diagonally to the forward direction.

So—along comes, for the first time that I know of, a real piston. (Well, the electrostatics are pretty close to it, a sort of infinite piston limited by the finite edges of the electrostatic panels). A loudspeaker in woofer sizes that actually has a flat, rigid piston element as its front end, instead of the traditional curved or pyramidal cone shape. This Jensen speaker for the first time really looks the way the theory looks on paper. It pushes flat, straight ahead then it pulls flat, straight back again. It has a compliant edge mounting like standard speakers and a center mounting also of relatively normal sort, but the pushing area is a round plane—literally. A disc. Really looks funny, to see it on paper, diagrammed or in photos.

Now the interesting question is, how are these piston-speakers going to sound? Does the literal application of the piston theory to a practical rounded woofer result in a dramatic improvement, as per theory?

Ah—this is where I stop. At least for now. I don't know. I haven't heard. But I can give a smart guess that I think will offend no one, nor step on anybody's toes—because there is no need to do so.

I'll be willing to bet that Jensen's new speakers are excellent in sound. But I'll bet, too, that many another speaker with a cone shape can come up in actual practice with very good sound too, piston or no piston.

It is an old story, I think, that in many a technology the efforts towards ingenious compromise around a theory that is in itself simple but unattainable usually end up with results almost as good—and in a de facto practical sense even better. As the blind man sharpens his ears and his touch in the endless search for the unattainable sight, so we perfect our multifarious compromises of technology year after year with persistence, seeking the unattainable ideal until the ideal model itself becomes almost superfluous.

Almost, but not quite. We can never put our simple, idealized models entirely aside, even when somebody comes along and seems to duplicate the very model itself.

The chances are, I'd guess, the Jensen's pistons are much too good to be impractical and merely ideal. In the end, we'll find that this development is more significant as another practical step towards happily unattainable perfection, a step made possible by the burgeoning developments in precisely controlled plastics and papers. Nevertheless, to turn out a commercial speaker that really does have a flat piston-like element up front is quite a feat. We'd better keep our eyes on it and, more important, we'd better listen and compare.

Oversquare

Of course the really practical aspect of Jensen's piston speakers is not their piston-ness but a much more down-to-earth aspect, their thinness front to back. Never

saw such odd shapes! The impact that will hit first of all when these speakers get around is obviously going to be the new shallow-depth enclosures they make possible. As the auto engineers put it, this piston driver is "oversquare"—decidedly.

Jensen is well aware of this. The company has designed a series of enclosures to test out in practical form a set of alternatives in the enclosed air space, as between back-to-front thickness and side-wise dimensions. The thinner the enclosure, the bigger its front area. Jensen's thinnest is pretty close to the "picture frame" concept pioneered by the electrostatics and carried on recently in such piston-like rectangles as the Bi-Phonic Coupler speaker.

I suggest that we take a long and close look at this thin-line feature; it is clearly the coming decor bonanza, and with reason.

If bookshelf boxes were a bonanza a few years back because of living room convenience, then thin-line speaker boxes, that stand free as a panel or can fit against a wall like a picture, are going to

be an equally big hit, given even reasonably good sound.

Compromise—yes. Though a good audio engineer hates compromise when it means compromise in ideal sound quality, every good practical engineer knows that compromises are the stuff of his life—and the better the ingenuity he can summon up to compromise with, the better the ratio, say, of bass to space, the happier will be his engineering life. I would suggest that there is clear promise of continued useful compromise with ingenuity in this coming area of the ultra-thin speaker box. There is promise, because clearly we are just now getting well into the numerous constructive advances that will allow thin speaker systems that are not at all thin in tone. (It's easy enough to make a thin speaker that sounds terrible. There'll be plenty of them, too.)

So, if you want my real estimate of the significance of Jensen's piston units, it is simple enough. These are *thin pistons*. That's what matters. Where else will you find a big woofer with a total depth of something like three inches? Boy, that's a *really* practical piston. **Æ**

LIGHT LISTENING

(from page 10)

at his disposal in the band's heyday. Luckily, we still have this music on discs in the memorable Carnegie Hall performance. In *Waiting For the Robert E. Lee* and *Bill Bailey*, Maria Marshall demonstrates a better sense of rhythm than do many band vocalists of the present. Although the audience heard in the background shows full signs of content during the up-tempo selections, I would have preferred a few more slow tunes in the famous Goodman manner. At only one point in this program—during a quiet perusal of *Where or When*—do we get a sample of the gentle, easy-swinging style he patented so many years ago.

Irma La Douce/Bells Are Ringing Richmond RPE 45024

In the entire catalog of United Stereo Tapes, Richmond is the only widely-distributed label being offered at a \$4.95 price tag. In addition to the popular orchestras of Frank Chacksfield and Cyril Stapleton, who first gained fame on the parent label of London Records, Richmond also features a unique series of show tapes made in England by the London Theatre Company. These tapes give us a chance to hear the lyrics of leading Broadway shows without incurring the expense of the original cast performances.

No one contends that a series such as this, of which these versions of "Irma" and "Bells Are Ringing" are a vital part, competes directly with the casts that first presented the shows on Broadway. Yet, while listening to the selections from "Irma La Douce," I was tempted to concede that this English group has almost as much on the ball as the crew heard in Columbia's original cast recording. Joyce Blair is a fine Irma, winsome in personality and believable in her sauciness. Other members of the cast have the zest and crisp enunciation called for by a continental locale. *That's a Crime* is tossed off with just the right flair. Most English productions of shows that originate in this country are usually burdened by a difference in accent. In this version of *Bells Are Ringing* the greatest surprise is in the distinctly American approach of the leading players. The leading lady's imitation of our own Judy Holliday is downright startling. The dance steps that are part of the duet *Just in Time* are retained here for exploitation of stereo side-to-side motion. These performances may not give you as complete a cross-section of the the shows as you're apt to find in a typical original-cast recording but they do represent an excellent buy for the money. **Æ**

PRODUCT PREVIEW

(from page 95)

Finish: Two-tone baked enamel, black and dark green, dark brown and platinum pink, or brushed chrome plating.
Altec Lansing Corp., Anaheim, Calif. User net price, \$66.00.

681A omni-directional \$36.00
682A omni-directional 49.50
26A desk stand 12.00

DYNACO

• *Ribbon Microphones*. Suitable for the highest quality recording and broadcasting applications, the Dynaco-B & O Model 53 microphone uses a replaceable duralumin ribbon only .001 in. thick and weighing 1.3 milligrams. The extremely small mass eliminates resonances within the audible range. The unit is bidirectional, which allows controlled discrimination of the pick-up area and facilitates a natural balance of the primary pick-up with



TAKE THE GUESS WORK OUT OF STEREO

To achieve the utmost in realism through stereophonic sound reproduction it is mandatory that the audio signals of all recording and playback channels be maintained in phase. Out-of-phase stereo reproduction results in confused directionality, diffuse sound, loss of bass response and reduction in center instrument presence.

The **STEREOSONICS PHASE COORDINATOR** provides a simple and effective way to determine the phase of any audio signals or stereo high fidelity components. It may be used to measure the phase and stereo effectiveness of discs, tapes, multiplex broadcasts and microphone setups, and to distinguish honest two channel stereophonic material from pseudo or doctored stereo.



FEATURES: High impedance transformer inputs to permit use with all studio 600, 300, 150, or 75 ohm grounded or ungrounded line systems, as well as with any high fidelity component.

Individual input level controls, adjust meter sensitivity for a wide range of input signal levels.

Function switch converts the **PHASE COORDINATOR** to a dual channel balance meter.

May be removed from oil finished wood cabinet for easy rack or panel mounting.

Cabinet Dimensions: 9½" wide, 4¼" high, 3" deep.

Price: \$29.50 Audiophile net at your high fidelity dealer.

For further information write to DEPT. P

STEREOSONICS INC.
BOX 4205
Long Island City 4, New York

room acoustics. When used with the Stereo Spacer—an acoustically absorbent "partition" between the microphones—these units provide the effect of 10-ft. separation while avoiding unnatural ping-pong effects typical of poor stereo. A 3-position switch provides music, speech, and off positions, and a built-in transformer enables operation at 50, 250, or high impedances. Model 50 is identical in all particulars except output impedance, which is fixed at 50 ohms.

CHARACTERISTICS

Frequency range: 30 to 13,000 cps. ± 2.5 db.
 Pattern: Bidirectional.
 Output impedance: Model 53—50, 250, or high; Model 50—50 ohms.
 Dimensions: $7\frac{3}{4} \times 1 \times 1\frac{3}{16}$ " dia.
 Dynaco, Inc., 617 N. 41st St., Philadelphia 4, Pa. User net price, Model 53, \$59.95; Model 50, \$49.95.
 SS-1 ster spacer \$14.95
 MT-1 matching trans (50/40K ohms) .. 10.95
 MS-1 desk stand 3.30

ELECTRO-VOICE

• *Dynamic Cardioid Microphone.* The Electro-Voice Model 666 is a cardioid microphone of the dynamic type with only one moving element. The cardioid pattern is obtained through use of three sound entrances located in the microphone case at different distances in back of the diaphragm. These three en-



trances, each utilizing the proper acoustical impedance, combine to form one effective back entrance which varies in distance from the diaphragm inversely with frequency. This variable front-to-back distance, along with dynamic construction, affords high resistance to mechanical shock and produces virtually no proximity effect. Because of its uniform polar response, the Model 666 is especially useful in locations where ambient noise and severe reverberation are problems.

CHARACTERISTICS

Pattern: Cardioid.
 Frequency response: 40 cps to 15,000 cps ± 2.5 db.
 Impedance: 50, 150, and 250 ohms (shipped wired for 150-ohms)
 Output level: -58 db
 Finish: Non-reflecting gray epoxy.
 Weight: 1 1oz.

User net price, \$149.95. Electro-Voice, Inc., Buchanan, Michigan.
 644 "Sound Spot" \$110.00
 664 card dyn 85.00
 636 omni dyn 72.50

NEUMANN

• *Professional Condenser Microphone.* Containing many advanced features, the Neumann U-67 microphone is designed to anticipate future needs as well as satisfy present requirements. Features include: electronically switched directional characteristics—cardioid, omnidirectional, figure 8; a newly developed input circuit which rolls off sharply below 40 cps—and which may be disabled for flat response down to 20 cps; separate "Voice-Music" switch which raises the rolloff point from 40 cps to 100 cps; a switch to reduce



the sensitivity of the capsule by 14 db before the amplifier; frequency response within 1 db up to 15,000 cps with respect to a direct incident sound field.

CHARACTERISTICS

Frequency range: 20 cps to 16,000 cps.
 Pattern: Cardioid, omnidirectional, figure 8.
 Impedance: Switchable 30/50-ohms, 150/250-ohms.
 Output level: Omni, figure-8, -59 db at 30/50-ohms, -52 db at 150/250-ohms; cardioid, -55 db at 30/50-ohms, -48 db at 150/250-ohms.
 Power requirements: NU-67 power supply, 9 watts.
 Cable lengths: Normal length 25 feet; 250 feet permissible.
 Finish: Matte satin chrome
 Weight: U-67, 1-lb; NU-67, 4-lb.
 User net price, \$435.00. Gotham Audio Corp., 2 West 46th St., New York 36, N. Y.

NORELCO

• *Stereo Microphone.* Claimed to be the first stereo microphone for home use, the Norelco Model EL3752/01 consists of two elements set at right angles to each other in the same housing. Each element is of the moving coil type with a cardioid pattern. Ruggedly constructed, the EL3752/01 is suitable for outdoor or indoor use. The microphone elements



CHARACTERISTICS

Pattern: Cardioid.
 Output level: -50 db at 1 volt and an input pressure of 1 microbar/cm².
 Impedance: 25,000 ohms.
 Finish: Blue and gray plastic.

User net price, \$39.50. North American Phillips Co., High Fidelity Products Div., 230 Duffy Ave., Hicksville, L. I., N. Y.

RESLO

• *Cardioid Ribbon Microphone.* The "Avon" is the most outstanding microphone in the Reslo Mark III Series. This ribbon microphone is intended for live recording as well as stereo and critical PA applications. The "Avon" has a front-to-back discrimination of 15 db over the high- and mid-frequencies,



returning to normal figure-8 pattern at low frequencies. Available in three models: CRL, 30-50-ohms impedance; CRM, 250- and 600-ohms impedance; CRH, high-Z or 30-50-ohms.

CHARACTERISTICS

Pattern: Cardioid at mid- and high-frequencies, figure-8 pattern at low-frequencies.
 Frequency response: 18 cps to 20,000 cps ± 1.5 db.
 Impedance: See text above.
 Output level: -58 db.
 Ercona Corp., 16 W. 46th St., New York 36, N. Y. User net price, \$79.95 or \$84.95 depending upon impedance.
 Celeste figure-8 (various impedances) \$70-80
 Symphony figure-8 (various impedances) 60-65

SHURE

• *Unidirectional Microphone.* The new Shure Model 546 "Unidyne III" was developed primarily for the broadcast market but is also ideal for top-quality public address installations and recording. The Unidyne III features vibration isolation, improved performance, and a Cannon connector.

CHARACTERISTICS

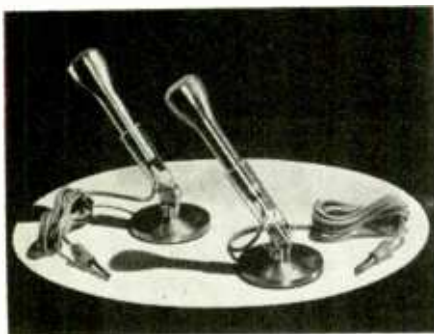
Pattern: Cardioid.
 Frequency response: 50 cps to 15,000 cps.
 Impedance: 30-50 ohms or 150-250 ohms.
 Weight: 1 $\frac{1}{4}$ lb.
 Finish: Chrome and black.
 User net price: \$135.00. Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. The Shure line of microphones is extensive and includes all price ranges.



SONOTONE

• *Matched Microphones.* Introduced for stereo recording. Sonotone paired "Ceramikes" are acoustically matched at the factory to a tolerance of 2.0 db. Plugged into any quality

stereo recorder, the CM-T10A feeds the tape a substantially flat signal. The heart of every Ceramike is a rugged, rubber-encased ceramic transducer which is immune to extremes of both temperature and humidity. Controlled



response is assured by an all-metal damping grid of a new design. The one-piece die-cast metal case is designed for easy hand use. For table and floor use there are matching stands.

CHARACTERISTICS

Frequency response: 50 to 11,000 cps.
Output level: -56 db ± 2 db
User net price, matched pair \$36.75. Sonotone corp., Elmsford, N. Y.
CM-11A matched pair \$36.75
CM-12A low-Z 29.50

SONY

• *Variable-Directional-Pattern Condenser Microphone.* The Sony C-37A is designed for professional recording and broadcast application where utmost performance, dependability, and fidelity are essential. Frequency response is



stated to be entirely free of resonant peaks and dips within the specified range of 20 to 18,000 cps. The C-37A is operated in conjunction with the Model CP-2 power supply unit. This power supply incorporates a variable switch permitting three different frequency characteristics for complete versatility in any acoustic surroundings. A small screw switch on the back of the microphone housing offers a choice of uni-directional cardioid pattern, or conventional omnidirectional pattern. Microphone and power supply may be separated by as much as 240 feet without affecting performance characteristics.

CHARACTERISTICS

Frequency response: 20 to 18,000 cps ± 2.0 db.
Pattern: Choice of cardioid or omnidirectional.
Output level: Omnidirectional, -72 db; cardioid, -70 db.

Impedance: 200 ohms.
Finish: Gray with satin chrome.
Dimensions: 1 13/16" dia., 7 11/16" long, with cradle.
Weight: Microphone, 1 lb. Power supply, 6 lbs.
User net price, C-37A system complete including power supply, \$295.00. Superscope, Inc., Audio Electronics Division, Sun Valley, Calif.
CR-4, wireless microphone system \$250.00

TURNER

• *New Microphone Series.* The Turner 400 Series are broadcast type microphones which feature adjustable impedance and response. All four microphones in the Series (401, 402, 403, and the 404 shown) are wide response moving-coil dynamics and essentially non-



directional. They can be mounted on 5/8"-27 desk or floor stand. Positive grip camlock allows instant insertion or removal of microphone without disconnecting. Adapter supplied.

CHARACTERISTICS (404)

Frequency range: 50 cps to 13,000 cps.
Pattern: Omnidirectional.
Output level: -60 db at high Z.
Output impedance: 150-ohm or high Z.
Finish: Bright chrome epoxy.
Weight: 8 oz.
User net price 404, \$85.00; 403, \$80.00; 402, \$130.00; 401, \$125.00. The Turner Co., 909 17th St., N.E., Cedar Rapids, Iowa.

UNIVERSITY

• *Cardioid Dynamic Microphone.* The Uni-



versity Model 502S is a cardioid dynamic microphone which is internally shock mounted to isolate it from extraneous noises and spurious sounds. The 502S is one of the University modular microphones wherein all

(Continued on page 105)



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FM STEREO

(from page 25)

connections are provided even in the AC-Off position for listening to FM, AM, and FM-AM programs from any tuner connected to the adaptor. An additional position of the panel selector switch designated "Noise Filter" permits listening to stereo programs with full frequency response, but reduced noise, if required on weak and distant stations. The final amplification of stereophonic and monaural signals is accomplished in a low-impedance anode-follower stage (V_6). It contains a 12-db per octave filter, which only passes audio frequencies up to 15,000 cps. This is important for recording of stereophonic programs on tape, to prevent any possibility of frequency-beating between the 38,000 cps subcarrier, its harmonics, the L-R sidebands and the bias-oscillator in the tape recorder.

One interesting final point should be noted, concerning the operation of adaptors in conjunction with tuners having muting facilities. The composite stereo signal for all adaptors is derived from the multiplex output of an FM tuner prior to the audio stages. Therefore, regular audio muting circuits do not mute this signal when tuning between stations. Muting, to be effective, must be accomplished in the IF-section prior to the ratio detector output. Æ

AUDIOCLINIC

(from page 4)

station.) It should be mentioned at this point that all components used with inductive filters or tuned circuits should be totally shielded, with the shield grounded to the amplifier chassis. The shield material (metal) should be spaced at a distance from the winding equal to a coil diameter.

One common source of pickup is the feedback loop. Loudspeakers are connected to the output transformer and this, in turn is coupled to the cathode of a previous stage via the feedback resistor and capacitor. This cathode may be bypassed to ground by a small capacitor or you may bypass the speaker leads to ground. In the case of an amplifier having a damping factor control, each side of the speaker will have to be bypassed to the chassis and ground. It is also possible that you will need to use a series choke in the "hot" speaker lead or, in the case of the amplifier having the damping control, in each speaker lead, with each side of the chokes bypassed to ground. These interference filters are mounted right at the amplifier.

Good luck!

Æ

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LOW, LOW quotes: stereo tapes, components, recorders, HIFI, Roslyn 4, Pa.

COMPONENTS, recorders. Free wholesale catalogue. Carston, 125-N East 88 St., New York 28, N. Y.

RECORDER SALE. Component quotations. Tapes. Bayla Co., Box 131-0, Wantagh, N. Y.

SELL: Telefunken KM-56 microphones. New pair, never used. Best offer. Lt. Colonel Strenner, 224 George Dye Road, Trenton 90, N. J.

SELF-HYPNOSIS TAPE or LP record. Learn quickly, easily. Free literature. McKinley-Smith Co., Dept. ATR, Box 3038, San Bernardino, California.

AMPEX A-122 stereo tape deck with pre-amplifiers, Shure 300, B&O-50 microphones. Want Magnecord 91C6910, 91C133 equalizers. Gene Blash, 1839 South 12th Avenue, Maywood, Ill.

TAPE DUPLICATION for small quantity users. Highest fidelity, stereo or monophonic. Copies guaranteed indistinguishable from original. Free particulars. Audio Industries Sound Lab, Box 4, East Aurora, N. Y.

SELL: Citation II amplifier, Scott 130 pre-amplifier. Both for \$300.00. E. Patrone, 40 West Drive, Providence, Rhode Island.

SELL: Fisher FM90X, blonde cabinet. Best offer. Harold Grovesteen, Box 230, Hyde Park, N. Y.

PRESTO 6-N disc recorder; 1-D cutter; standard and microgroove feedscrews; microscope; Pickering arm; General Electric cartridge; portable case. Cost \$1905.00. Condition good. \$485.00. R. B. Bishop, VF 6-B, College Park, Maryland. WARfield 7-5127.

SELL: Two new Daven T-pads Number T-257-C, 600 ohms to 600 ohms, 2 db/step from 0 to 40 db. \$15.00 each. P. C. Patton, 7332 Nall, Overland Park, Kansas.

SELL: Berlant Model 33 professional stereo recorder. 7½ and 15 ips., NAB reel capacity, etc. Cost new: \$1300.00. Sell: \$650 including cases. Excellent condition. Tom Groom, 324 North Spring Street, Murfreesboro, Tennessee.

WANTED TO BUY—or rent, so I can photograph—circuit diagram and instructions for an old E. H. Scott X568 custom built radio receiver. Thomas A. McIntire, 501 Wright, Wilmington, N. C.

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P. O. Box 629, Mineola, N. Y.

THIS MONTH'S COVER

The installation shown on this month's cover was recently completed in the home of Mr. and Mrs. Albert W. Gilkerson in Areadia, California, in consultation with Antoni E. Dolinski, a professional photographer who is also an audio enthusiast.

After completing all the kits himself, Mr. Gilkerson hired the competent skill of the Mitchell Cabinet Shops in South San Gabriel, a neighboring town, for the cabinet work. The equipment consists of a Harman-Kardon Citation III tuner, a Dynakit PAS-2 preamplifier, followed by a Citation V power amplifier. The turntable is a single-speed Gray, complemented by the ESL tone arm and a Shure M7-N21D cartridge combination. A Concertone 505 stereo tape recorder rounds out the system.

Flanking the equipment cabinets on each side are two 8-cu.ft. infinite baffle enclosures, each of which houses two Cletron Cathedral 12-in. woofers and an Electro-Voice BB-5 system in a wooden horn built into each cabinet. Finish of the entire ensemble is maple, which complements the decoration scheme of Mr. Gilkerson's large wood-paneled den.

ABOUT MUSIC

(from page 81)

on. Note, too, how the lines fit harmonically and move in opposing directions, in good old contrapuntal style. Finally, observe its length—most quodlibets made up of well known tunes generally don't get beyond the first phrase or two.

And who is the anonymous quodlibetist who discovered that Dvořák's *Humoresque* and Foster's *Old Folks at Home* were meant for each other?

As you can see, quodlibets can be a fascinating pastime for both the amateur and professional musician, as well as for anyone who can carry a tune. Æ



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DYNACO Super Fidelity OUTPUT TRANSFORMERS

Advanced pulse techniques and Dynaco's patented para-coupled windings and massive grain-oriented cores insure superior square wave performance and near-perfect transients. All transformers handle full rated power from 20 cps to 20 KC, and are conservatively rated and guaranteed to handle double nominal power from 30 cps to 15 KC.

SPECIFICATIONS

Response: Plus or minus 1 db 6 cps to 60 KC.
Power Curve: Within 1 db 20 cps to 20 KC.
Square Wave Response: No ringing or distortion from 20 cps. to 20 KC.
Permissible Feedback: 30 db.

MODELS

A-410	15 watts	EL-84, 6V6, 6AQ5	14.95
A-420	30 watts	5881, EL-34, KT-66	19.95
A-430	60 watts	KT-88, EL-34	29.95
A-440	120 watts	KT-88, 6550	39.95
A-450	120 watts	pp par KT-88, EL-34	39.95
A-470	35 watts	pp par EL-84, EL-34	24.95

(all with tapped primaries except A-440 which has tertiary for screen or cathode feedback)
Write for complete data on Dynaco transformers including suggested circuits and modernization of Williamson-type amplifiers to 50 watts output.

DYNACO INC.

3912 Powelton Ave., Philadelphia 4, Pa.
Circle 103B

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 - Response from 2-100,000 cps, 0, -1db at 1-Watt
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 - Multiple Feedback Loop Design
 - Easy-To-Assemble Kit Form
- Made in U.S.A.
- A new "Laboratory Standard" dual 50-watt amplifier guaranteed to outperform any basic stereo amplifier on the market. Advanced engineering techniques plus the finest components ensure flawless performance. Distortion levels so low they are unmeasurable. Hum and noise better than 90 db below 50-watts. Complete with metal enclosure. 9 1/2 x 12 1/2" D. Shpg. wt., 60 lbs.

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LA-600A Completely Wired **134.50**

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Made in U.S.A.

- Response 5-40,000 cps ± 1 db.
 - Precise "Null" Balancing System
 - Unique Stereo and Monoaural Control Features
 - Concentric Input Level Controls
 - Easy-To-Assemble Kit Form.
- Sensitivity 2.2 mv for 1 volt out. Dual low impedance "plate follower" outputs 1500 ohms. Less than .03% IM distortion; less than .1% harmonic distortion. Hum and noise 80 db below 2 volts. 14x10 1/2 x 4 1/2" D. Shpg. wt., 16 lbs.

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PRODUCT PREVIEW

(from page 101)

the accessories accept any one of the microphone modules. Thus there is a large variety of accessories available. Conversely, there is a large variety of microphone modules available to fit the standard accessories.

CHARACTERISTICS

Pattern: Cardioid.
 Frequency range: 30 cps to 16,000 cps.
 Impedance: 30/50, 150/250, 20,000 ohms.
 Output level: 30/50 and 150/250 ohms, -54 db; 20,000 ohms, 17 mv/10 dynes/cm².
 Weight: 2 1/2-lb.
 Finish: Acrylic silver-gray with non-reflecting black.
 User net price, \$145.00. University Loudspeakers, Inc., 80 S. Kenisco Ave., White Plains, N. Y.

501 cardioid	\$125.00
401 omni	72.50
403L omni lavalier	87.50
404L omni lavalier	95.00

HEADPHONES

AKG

• *Dynamic Headphones.* The AKG feather-weight K-50 headphones feature extremely light weight, and a wide frequency range. Its 3-oz. weight and frequency range from 30 to 20,000 cps make the K-50 ideal for



applications involving many hours of listening. It can be used for monophonic or stereophonic listening, and requires less than one milliwatt input. Impedance is 400 ohms. Electronic Applications, Inc., Stamford, Conn. User net price \$22.50.

BEYER

• *Dynamic Headphones.* Featuring a frequency range of 20 to 15,000 cps, and a



sensitivity of 25 mv for a sound pressure level of 100 phons, the Beyerdynamic DT-48 dynamic headphones are fully professional in performance. Their resonance-free characteristic and extreme frequency range, together with very low distortion—less than 0.1 per cent from 50 to 15,000 cps, and less than 0.3 per cent from 20 to 50 cps—makes them ideal for professional monitoring, recording, or broadcast. Impedance is 5 ohms on each side, and bridging transformers are available for broadcast monitoring across 600-ohm lines. Norted Audio Corp., 72 W. 45th St., New York 36, N. Y. User net price \$79.50.

S. G. BROWN

• *"Super K" Professional Headphones.* Actually two miniature high-quality speakers, the "Super K" headphones can be connected to any sound system, tape recorder, or similar equipment. Frequency range is 50 to over 10,000 cps. Utilizes a bakelized conical diaphragm and a moving-coil driver. Wired for stereo, they may be utilized for a monophonic system. Sensitivity at 1000 cps is 35 db above 1 dyne/cm² for 1 mw input. Will handle inputs up to 1/2 watt. Headphones come complete with rubber ear cushions and a highly flexible, 6-foot, one-piece, nylon



covered cable. British Industries Corp., Port Washington, N. Y.

KOSS

• *Stereo Headphones.* Extremely useful for the tape recording enthusiast, Koss "Stereophones" model SP-3 provide complete separation of stereo channels. Consisting of a specially de-



signed 3 1/2-inch reproducer in each earpiece, the SP-3 has a frequency range from 30 to 15,000 cps. Usable in both stereo or monophonic systems, it comes complete with a plug and jack that connects easily to any amplifier or directly across speaker leads. Soft sponge foam ear and headpieces provide comfortable

wearing and shut out 95% of outside noise. Impedance 4 ohms. Koss, Inc., 2227 North 31st Street, Milwaukee 8, Wisconsin. User net price, \$24.95.

MONARCH

• *Stereo Headphones.* Usable for either stereophonic or monophonic listening, the Monarch



Model ES-300 features foam ear pieces, which are comfortable and also provide an excellent seal. The lightweight ear pieces and padded headband are completely adjustable to give a "custom fit" for utmost comfort. Only one conveniently long plastic cord is attached to the earphone. The cord is terminated in a final plug which may be plugged directly into the source, or into a four-way switchbox connected to the speakers. This switchbox is provided. Impedance is 8 to 16 ohms. Monarch Electronics International Inc., 7035 Laurel Canyon Blvd., N. Hollywood, Calif. User net price \$19.95.

PERMOFLUX

• *Headphone Series.* Available in a variety of impedances, the Permoflux DHS series of binaural headphones achieve the full depth and presence available in binaural sound. The close coupling of the earspeakers eliminates the adverse factors of improper room



acoustics and poor speaker placement. Available with 12/12, 16/16, 300/300, 600/600, and 10K/10K ohm earpieces, and with several styles of ear-cushions, the DHS series is adaptable to a wide variety of circumstances. In addition various adapters are available which permit connecting up to four sets of headphones to one program source. Permoflux Products Co., 4101 San Fernando Road, Glendale, Calif. User net price, \$40-52.50.

TELEX

• *Dyna-Twin Headset.* This Telex headset is intended essentially for private listening to stereo program material. The twin wide-range dynamic receivers have a frequency range of 30 to 15,000 cps. They are engineered

specifically for headset application, and are equipped with two comfortable, foam-rubber ear pieces with secondary ear seals. The Dyna-Twin has a one-piece construction, a Mylar diaphragm, Tenite cups, stainless steel

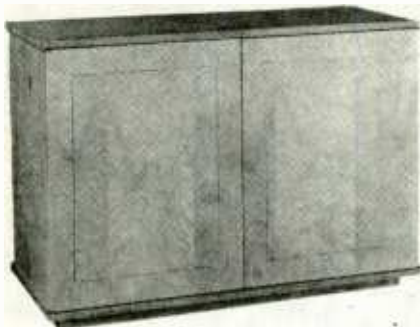


supporting members and foam cushions. Telex Inc., 1633 Eustis St., St. Paul 1, Minnesota. User net price \$23.10-\$24.00 depending upon plug configuration.

MISCELLANEOUS

AES

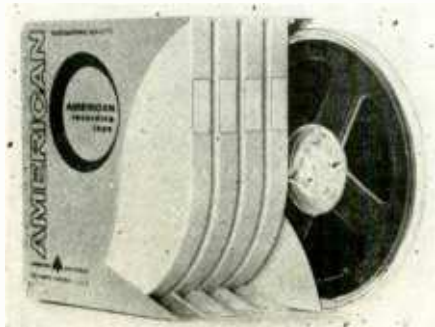
• *Equipment Cabinet.* The AES "Cavalier" equipment enclosure features construction of 3/4-in. to 1 1/2-in.-thick wood. It is made from birch stock, completely assembled,



sanded, and ready to be finished. Dimensions are 16" x 27 1/2" x 39". Blank panels are provided for mounting components without cases. Matching speaker enclosures available. AES, Inc., 3338 Payne Ave., Cleveland, Ohio. User net price \$59.50.

AMERICAN

• *"Ameripak" Magnetic Tape.* The American brand recording magnetic tape manufactured



by Greentree Electronics, is now available in the new Ameripak which is a plastic tape box designed in tan and ivory, and which makes the enclosed tape instantly available by pressing a button. The Ameripak containers interconnect to form a handsome and functional tape rack. American tape comes in either acetate or Mylar base in 1 1/2-mil, 1-mil, and 1/2-mil thicknesses. Greentree Electronics Corp., 1122 S. La Cienega Blvd., Los Angeles, Calif. User net price for 1200 ft. of 1 1/2-mil acetate base tape is \$3.50.

AMPEREX

• *Miniature Pentode for Input Stages.* Representative of the large Amperex line of audio tubes is the EF86/6267 nine-pin miniature pentode, which is designed for preamplifier and input stages having stringent require-



ments with regard to hum, noise, and microphones. It is a direct plug-in replacement for the older Z729. It is one of the Amperex "preferred" types for high-quality audio application. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y.

AMPLICORP

• *Bulk Tape Eraser.* Designed to serve a dual function, the new "Magneraser" offered by the Amplifier Corp. of America completely erases tape on the reel, without rewinding,

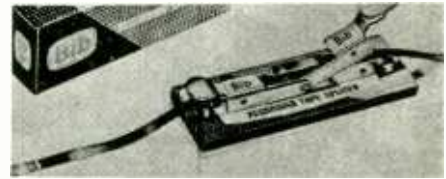


and also demagnetizes record-playback and erase heads. Wear and tear on the tape is reduced because erasure is effected on the reel. The unit operates on any alternating current (50 or 60 cps). The "Magneraser" is

available in two models: Model 200C for 100-130 volt operation; Model 220C for 200-260 volt operation. Price of either model is \$18.00. Amplifier Corporation of America, 398 Broadway, New York 13, N. Y.

BIB

• *Tape Splicer.* An indispensable accessory for any tape recordist, this new British-made splicer is extremely simple to use and can



be employed for both mending broken tapes and for editing purposes. Made of nickel-plated brass, the BIB splicer comes mounted on a flock-sprayed base, or can be mounted directly on any tape deck. The body of the splicer has two pivoted clamps which lock the tape sections in a channel. Both vertical and diagonal mitres are provided for either editing or mending. Horizontal mitres are also provided for use in trimming off surplus mending tape. Distributed in the United States by Ercona Corporation, 16 W. 46th St., New York 36, N. Y. User net price, \$3.95.

ESL

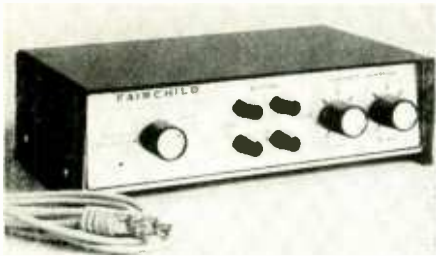
• *Automatic Record Cleaner.* Cleaning the record as it is played the ESL "Dust Bug" solves the problems of dust, lint, and static build-up on phonograph records and pickup styli. The Dust Bug cleans records thoroughly and safely, and it is easily installed on turntables or record changers. It removes the dust and lint immediately before the



moment of playing. The Dust Bug incorporates an individually pointed tuft of soft nylon fibers in front of a cylindrical plush pad. The bristles and pad are moistened with a special harmless, anti-static fluid, supplied in a replaceable dispenser. This fluid helps to loosen dust and lint, which is then collected by the pad. It also eliminates the static charge on the record, and maintains it in this neutralized condition. Electro-Sonic Laboratories, 35-54 36th St., Long Island City 6, N. Y. User net price \$5.75.

FAIRCHILD

• *Playback Compensator.* Intended to recreate full dynamics in home playback systems, the new Fairchild "Componder" was developed from operating data compiled by the professional products division of Fairchild. The "Componder" complements in playback many of the controls placed on recordings due to the geometric limitations of the disc and the magnetic limitations of tape. The device scans the output of the home playback amplifier, and dynamically increases signal levels in order to recreate the dynamics of the studio or concert hall performance which existed before any controls were placed upon the recording. The unit does not affect low-level or medium-level passages. Features of the unit include action indicators which visually show operation of the sensing device, plus providing an insight into left and right information on the disc or tape; threshold controls; and the ability of the device to be reversed and used as a level control in home tape recording, or public address. The "Componder" is complete and requires no a.c. source. It is connected to both the output and input of the amplifier. All necessary cables are provided. The "Componder" does not introduce distortion because it is not in itself an amplifier, only a sensing and control device. It is definitely not a reverberation



device. Price is \$75.00, Fairchild Recording Equipment Corp., 10-10 45th Avenue, Long Island City 1, N. Y.

FISHER

● *Reverberation Unit.* The Fisher "Space Expander" K-10 is a self-powered reverberation unit of the type which uses coil springs



to form the delay line. The delay time built into this unit is 33 milliseconds which is intended to simulate the natural reverberation of a well designed auditorium. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y. User net price \$69.95.

GENALEX

● *Beam Powered Tetrode.* Intended as a replacement for the 6L6GB, the EL34/6CA7, and the 7581, the Genalex KT77 permits 32 watts of anode dissipation maximum, and an output of 72 watts per pair. Grids are gold

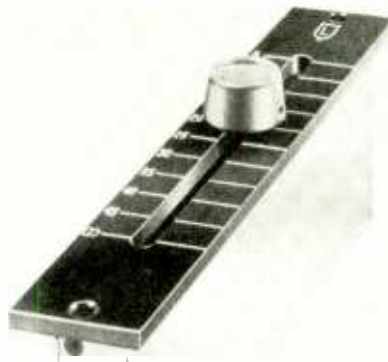


plated and optically aligned to ensure freedom from grid emission. The KT77 is built to very exact specifications, and in addition is quite rugged. This tube is only one of a long line of high-quality audio tubes which have won renown throughout the world. British Industries Corp., Port Washington, N. Y.

LANGEVIN

● *Straight-line Mixer Control.* Langevin Model MX-111 straight-line mixer control, is a highly developed slide-wire unit using resistances in a ladder configuration to afford unusual flexibility in operation of control congoles. It is used to blend signals of various origins for music scoring, re-recording, high-quality public address, radio and TV broadcasting. The MX-111 has a nylon bearing which rides longitudinally along a honed, hardened, chrome-plated shaft. Only two grams of force is required to overcome the inertia and bearing friction of the control assembly. The single-contact brush fabricated of the same material as the resistance wire, prevents generation of thermal voltages, contact oxidation, and consequent noise. An

accessible lint and dirt trap over the winding eliminates the cleaning nuisance formerly



associated with this form of control. Langevin, a Div. of Sonotec, Inc., 503 S. Grand Ave., Santa Ana, Calif. User net price \$40.00.

MULLARD

● *Matched Pairs of Output Tubes.* The Mullard EL34/6CA7 high-fidelity output tubes are now available in matched pairs. This is of especial importance to owners of high-fidelity amplifiers because matched output



tubes will keep distortion to a minimum. Undoubtedly the original manufacturer either used matched pairs, or went to the trouble of matching them himself. These tubes are a small sample of the extensive Mullard audio line of tubes. International Electronics Corp., 81 Spring St., New York 12, N. Y.

NEUMANN

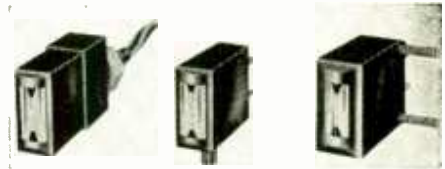
● *Disc Recording Lathe.* The Neumann AM-131 disc recording lathe has many features which ensure lacquers of unusually high quality. These include three-speed synchronous-motor drive without belts, gears, or chains, 65-lb. turntable which is oil coupled to the drive shaft, illuminated microscope which moves with cutter-head transport, and many other indispensable features. Specifications are fully professional and of the



highest order. Gotham Audio Corp., 2 W. 46th St., New York 36, N. Y. User net price \$4150.00 including "Spencer" microscope and mounting arm.

NORTRONICS

● *New Erase Heads.* The Nortronics Company has announced a new line of stereo and monophonic erase heads for use with two- and four-track magnetic tape machines. Three basic mounting styles facilitate the installation of the HQ series heads in all types of tape recorders. Double-gap construction is used for clean erasure with minimum power requirements. The tape comes into



contact with only the polished metal face, giving long life, low tape friction, and freedom from oxide loading. The heads are available in two impedances: the No. 1 high impedance head requires approximately 115 volts at 60,000 cps; the No. 4 low impedance model operates with 35 volts at 60,000 cps. The Nortronics Company, Inc., 1015 South 6 Street, Minneapolis 4, Minn. User net prices: \$8.50-14.50.

STATICMASTER

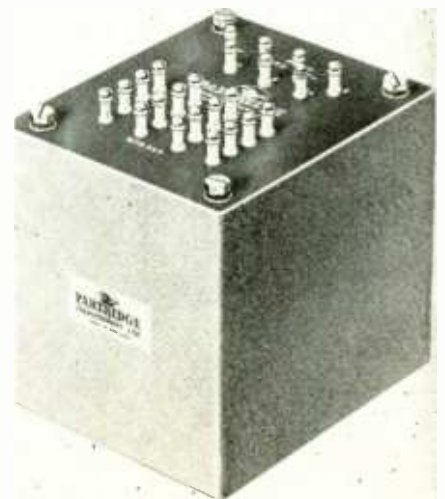
● *Record Brush.* The Staticmaster record brush Model 3R500 employs a polonium strip as a static neutralizer to make cleaning records rapid and simple. The brush of the Static-



master is made of genuine Jaguar hair which is both strong and soft. Nuclear Products Co., 10173 East Rush St., El Monte, Calif. User net price, \$14.95.

PARTRIDGE

● *Output Transformer.* The latest entry from this well-known British manufacturer is the



14160 output transformer. Regarded by them as one of their biggest steps forward for many years, the 14160 is a C-core transformer in a seamless steel case, and weighs a total of 10½ lbs. Primary impedance is 6600 ohms with Ultra-Linear taps at forty per cent of primary turns. On the secondary there are eight sections of 0.95 ohms each. This will give 60 ohms when all sections are in series. Power rating is 20 watts from 20 to 50,000 cps, and 35 watts from 25 to 30,000 cps. Primary resonant frequency is 120,000 cps. Partridge Transformers, Ltd., Roebuck Rd., Chessington, Surrey, England. User net price in U. S. \$45.00.

SOUNDCRAFT

● **Sound Track Developer.** The Reeves Soundcraft "Magna-See" is a solution that lets you see the magnetic track recorded on your tape. Making the tape visible affords a fast, simple and accurate way to check for head alignment, track uniformity, balance, and head wear. The Magna-See kit contains one-half pint Magna-See solution, plastic bath,



eyepiece magnifier for close inspection of tracks, roll of pressure-sensitive tape, and five glass slides. Reeves Soundcraft Corp., Great Pasture Road, Danbury, Conn. User net price, \$12.00. Soundcraft also markets an extensive line of virgin tape and tape accessories.

ROBINS

● **Economy Tape-Head Demagnetizer.** A new economy priced tape head demagnetizer which will remove permanent magnetization—a significant cause of high noise level and harmonic distortion—has been announced by Robins Industries. Known as Model HD-3, it features a special plastic sleeve on the tip of the probe that prevents accidental scratches to the tape. The specially shaped probe makes any head accessible and the HD-3 can be used equally well for both monophonic or



stereophonic tape heads. Claimed to be the first quality, low-cost American-made demagnetizer, the HD-3 is priced at \$5.95 which should make it very attractive to amateur tape fans. Robins Industries Corp., Flushing 54, N. Y.

"Gibson Girl" tape splicer \$8.50
ME-99 bulk tape eraser 33.00

● **Optical Instrument for Detecting Stylus Wear.** An optical instrument which shows stylus wear, the Robins "Syl-A-Scope" model SG-66 magnifies the contours of the stylus and reflects the image upon an illuminated screen. Permitting examination of the stylus while the cartridge is mounted in the tone arm, the Syl-A-Scope is well suited for use by the audiophile. The principle upon which the instrument is based is the same as that used in the "shadowgraph" which is widely used in industry for quality control and parts inspection. For this reason it can also be used for examination of small parts, tools, and instruments. It plugs into any convenient outlet and projects its image on a screen

measuring 2½ × 2¼-in. Model SG-66 retails for \$19.95. Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y.

S6-33 stylus inspector \$6.75

ROCKFORD

● **Equipment and Record Cabinet.** Designed to house your own amplifier and/or preamplifier, tuner, tape recorder, record changer and transcription table, the Rockford Model 500B is an all-in-one equipment center. It also holds over 150 LP records. The upper left compartment, with lift top, is designed for record changer, transcription table, or tape recorder. The lower left compartment has space for the records. The upper right component section is designed to house amplifier, and/or preamplifier, tuner, or tape recorder. This has a removable shelf which is adjustable in height. The lower right pull-



out drawer, with a blank mounting board, can be used for a record changer, transcription table, or tape recorder. Sliding doors across the entire front make it easy to keep cabinet open or closed. Available in natural walnut, hand rubbed mahogany, blond, and ebony. Over-all size 40" × 32" × 19½", supplied with base shown in photograph with two Model 501B matching speaker enclosures for 15-in. speaker. Rockford Special Furniture Company, 2024 23rd Ave., Rockford, Ill. User net price \$129.95. Price for matching speaker enclosures, Model 501B is \$64.95. Extensive line of contemporary and provincial lines also available.

SARKES-TARZIAN

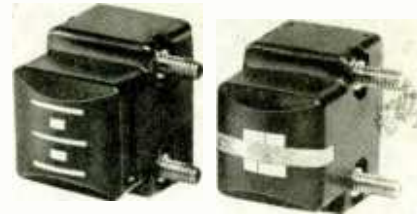
● **Magnetic Tape.** A relatively new entry



into the magnetic tape field. Sarkes-Tarzian offers a variety of packs in 1½- and 1-mil acetate. Shown is the 1½ mil acetate, 1200-ft. pack on a 7-in. reel. Also available in this thickness is 2400 ft. on hub or reel, and 3-in. and 5-in. reels with respectively 150 ft. and 600 ft. The 1-mil thickness also offers 3-, 5-, and 7-in. reels, and 3600 ft. on hub or reel. Naturally in this thickness the reels contain more footage. Also, within the next few weeks they expect to have Mylar-base tape available. Sarkes-Tarzian, Inc., Magnetic Tape Div., Bloomington, Ind. User net price of the 1½-mil acetate on 7-in. reel is \$3.50.

SONOTONE

● **Mono and Stereo Tape Heads.** The Sonotone R114 magnetic tape head is designed for operation with the new 4-track stereo tape systems. The head dimension and mounting system complies with the recent EIA stand-



ard proposal. The head is provided with universal mounting stud insertion which allows for "off- or on-center," "left or right," mounting stud protrusion. Available singly or with matching erase head, Model EH4. Sonotone Corp., Elmsford, N. Y. User net price \$28.50.
EH4 Erase head \$13.50
RH2 2-track record and play head 10.00

STEREOSONICS

● **Phase Meter.** The Stereosonic's "phase coordinator" provides a simple and effective way of determining the phase of any audio signals or stereo components. It may be used to measure phase and stereo effectiveness of discs, tapes, FM stereo broadcasts, and microphone setups, and to distinguish two-channel stereophonic material from pseudo or doctored stereo. It features high-impedance transformer inputs to permit use with all



studio 600-, 500-, 250-, or 75-ohm grounded or ungrounded line systems, as well as with any high fidelity component. Individual input level controls adjust meter sensitivity for a wide range of input signals, and permit the phasing of two signals of greatly differing strengths. The function switch converts the phase co-ordinator to a dual-channel balance meter. Stereosonics, Inc., Box 4205 Long Island City 4, N. Y. User net price \$29.50.

ULTRAUDIO

● **Unique New Mixer.** Ultra-Audio Products, a division of Oberline Inc., has introduced a mixer amplifier offering features heretofore unavailable in either professional or home units. Designated Model M-5 Custom-Mixer it is available for rack, console or carrying case use. The amplifier offers five mixing positions for microphones, phonos, tuner, tape output, and so on, and a master gain control, with high- and low-impedance inputs and output, illuminated VU meter,



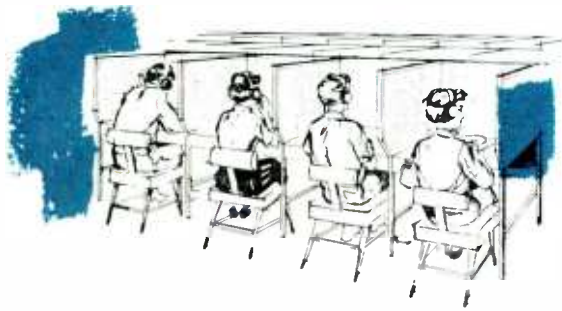
turntable cueing, and equalizing. The mixer utilizes a standard 5¼ × 19-in. panel, weighs but 20 pounds, complete with self-contained power supply. Special features are the plug-in input transformers and preamps which one buys only if needed, and the patented "Straight-Line" volume controls. Replaceable designation strips permit indication of which source is connected to each mix position. Ultra-Audio Products, Dept. P-1, 7471 Melrose Ave., Los Angeles 46. User net price, \$480.00.

For Several Years,

Viking has used this space to talk of current products for the home music system. Foregoing the usual format, we would like to use this month's space to better acquaint our readers with other, and little known, phases of our activities.

The use of magnetic tape has now become a part of our daily living. Seldom are we beyond the range of taped music or communication, or tape automated services.

Example? Here are a few Viking products which are not so likely to be found at your hi-fi dealer's showroom.



SPACE AGE TEACHING

Perhaps you, a son or daughter, or a friend study in a modern language laboratory. The chances are about seven out of ten that the equipment in that laboratory relies on dependable Viking tape transports. Although the equipment carries the respected name of one of several major companies who build language laboratories, you'll probably find that the tape decks employed strongly resemble, and actually are, the familiar Viking "75" or Viking "85" used in home music systems.



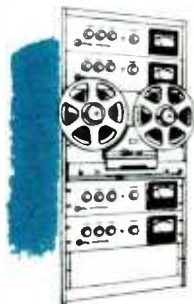
DINING OUT?

There is a good possibility the background music in the restaurants you patronize comes from a surprisingly small, continuous loop tape cartridge player, the Viking Model "35". In this unit, which must provide day-in, day-out, continuous service, you will find the same bearings, capstan assemblies and drive motors used in your *dependable* Viking home tape equipment.



TOP FORTY?

When you listen to an automated radio station, the chances are better than average the equipment used for injection of commercials uses the same dependable Viking endless loop tape cartridge players (in this case, solenoid operated mechanisms, remotely controlled). Service life? Several years under constant duty!



BLAST OFF!

In this day, it's customary to feature ascending rockets and immaculate blockhouse control rooms when you talk about tape and the space age. However, for Viking, this would not be a true picture. We do not build elaborate, specialized data recorders or "read-out" devices. But, we take pride in pointing out that you will find four-channel Viking "95" recorders, Viking "85's", and even "75's" doing a big, professional recorder's work in many military and defense installations. These, without exception, are production, high-fidelity recorders, completely comparable to those on your hi-fi dealer's shelves.

Our next ad will again deal with new things—new products for the home high-fidelity music system



VIKING OF MINNEAPOLIS, INC.

9600 Aldrich Avenue South, Minneapolis 20, Minnesota

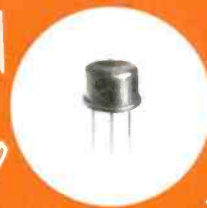
CABLE ADDRESS: VIKMIN

Tiny though the transistor might be, Transis-Tronics has used it to set a new pace for the entire high fidelity industry. TEC all-transistor amplifiers and tuners have become the "mighty oaks" of high fidelity — no hum, no heat, no microphonics. The transistor, unlike the old-fashioned tube, is a "life-time" device, therefore, both the TEC amplifier and the TEC FM tuner come to you with full two-year unconditional guarantees. Regardless of price, the S-15 and FM-15 are the most efficient amplifiers and tuners on the market today. TEC S-15 STEREO AMPLIFIER is all sound, rated at 20 watts of music power per channel with a 4 ohm load. With 8 and 16 ohm loads, the power is slightly reduced. TEC FM-15 TUNER, the perfect companion to the TEC S-15, will give you years and years of trouble-free listening. The low power consumption characteristic of transistors means that both the TEC amplifier and tuner can be operated with either 117 vac at 18 to 24 vdc as the power source. AND, NATURALLY, EQUIPPED FOR MULTIPLEX. Transistor Engineered Components • Transis-Tronics, Inc. • 1601 W. Olympic Blvd., Santa Monica, Calif.

TEC™



FROM
 little
 acorns
 !



The FM-15 (top) and the S-15 (bottom) are available as separate units or in a handsome walnut or teak combined package. How? No heat means the tuner can be stacked with the amplifier without danger of drift.