AUDIO

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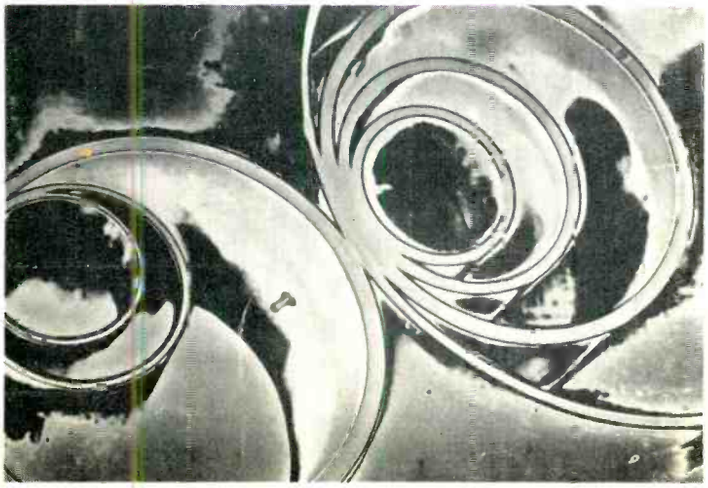
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APRIL, 1964
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Sound Images p. 74





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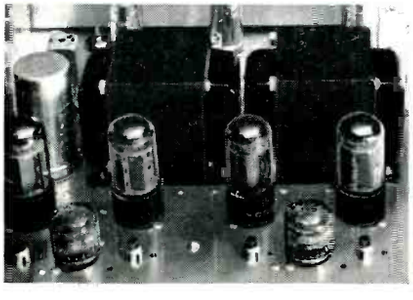
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C. G. MCPROUD • *Publisher*

DAVID SASLAW • *Editor*

JANET M. DURGIN
Production Manager

HENRY A. SCHOBER
Business Manager

SANFORD L. CAHN
Advertising Director

EDGAR E. NEWMAN
Circulation Director

Representatives

Bill Pattis & Associates,
4761 West Touhy Ave., Lincolnwood 46, Ill.

James C. Galloway,
6535 Wilshire Blvd., Los Angeles 48, Calif.

Warren Birkenhead, Inc.,
No. 25, 2-chome, Shiba Hamamatsu-cho, Minato-ku, Tokyo, Japan

Contributing Editors

EDWARD TATNALL CANBY
JOSEPH GIOVANELLI
HAROLD LAWRENCE
CHESTER SANTON
HERMAN BURSTEIN
BERTRAM STANLEIGH

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Number 8 in a series of discussions by Electro-Voice engineers



WHY A 30-INCH WOOFER?

VICTOR J. KAMINSKY
Loudspeaker Project Engineer

The quest for extended bass response with high efficiency, low distortion, and flat, uniform frequency response down to the 15–20 cps range has taken many forms. Perhaps the most unusual (and surely one of the largest) speakers designed for this purpose is the Electro-Voice Model 30W 30-inch speaker.

Because cone velocity is quite low in the very low frequency range, a typical 12-inch speaker cone must move a great distance to produce even moderate sound intensity. By increasing the cone diameter to 30 inches, cone motion for the same acoustic output is reduced from 1¾-inches to only ¼-inch (for example).

This sharp reduction in cone travel makes possible more linear operation for reduced distortion. This linearity is enhanced in the 30W by a large phenolic-impregnated cloth spider and viscous damped suspension capable of truly linear cone excursion in excess of ⅜-inch.

The successful development of a 30-inch woofer had to await the availability of cone materials that would provide the necessary rigidity without adding undue mass. Typical paper and high-density plastic cones did not offer the desired stiffness without the penalty of excessive weight.

Experimentation with molded expanded bead foam polystyrene offered the answer in a material light in weight yet with unusual rigidity. By carefully controlling thickness and density of the foam plastic, the desired characteristics of a true piston woofer could be achieved. Below 250 cps no cone breakup or flexing can be noted despite the cone's 30-inch size.

For efficiency, 10 pounds of Indox V® ceramic magnet is used in a low-loss magnetic structure that provides 15,000 gauss flux density despite the unusually wide (.082-inch) gap needed to accommodate the heavy edgewise-wound ribbon voice coil employed.

This heavy, flattened copper coil permits extremely low DC resistance for minimum power loss while maintaining desired impedance. Mounted on a polyester glass laminated cloth form, the coil assembly is easily capable of withstanding the high forces encountered at the sound pressures developed by this unique woofer.

Proof of the design strength of the 30W lies in its use by a prominent pipe organ manufacturer to replace the bulky bass pipes in installations where organ loft space is limited. In every respect, the E-V Model 30W woofer represents the logical extension of proven techniques plus the creative use of the most modern materials.

For technical data on any E-V product, write:
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Coming Next Month

Phono Pickup

● The Elliptical Stylus. J. Kogen and R. Samson. A thorough explanation of this important method for reducing tracing distortion. Includes actual photographs of elliptical tips.

Construction

● Build Your Own Electrostatic Speaker System. R. J. Matthys. Characteristics, theory and design of electrostatic speakers are fully discussed in this article. Finally, complete information on constructing a specific electrostatic speaker is given.

Sound Reinforcement

● A Basic Course in Commercial Sound. Norman Crowhurst. Chapter II.

Equipment Profiles

● Shure V-15 Stereo Pickup

● Bell "Imperial 1000" Solid-State Receiver

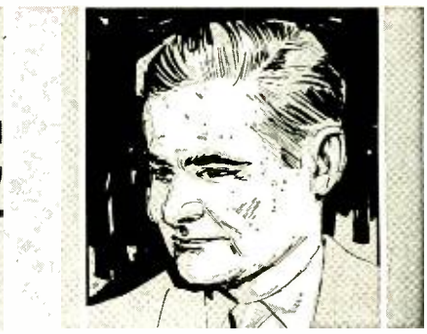
● Thorens TD-224 Automatic Turntable

In the May Issue

On the newsstands, at your favorite audio dealer's, or in your own mailbox.

AUDIO CLINIC

Joseph Giovanelli



Send questions to:
Joseph Giovanelli
2819 Newkirk Ave.
Brooklyn 26, N. Y.
Include stamped, self-addressed envelope.

Ceramic Magnets

Q. What is a ceramic magnet and what is its advantage over Alnico? Name Withheld.

A. Ceramic magnets are made of barium ferrite pressed into the desired shape and then baked in an oven. The temperature is carefully controlled so that it is just below the melting point of the material. Failure to exercise this control would result in a deformation of the material.

The material is then magnetized.

Ceramic magnets have a very high coercive force, that is, it takes a considerable amount of energy to magnetize and demagnetize them. Once magnetized however, it will hold its magnetism. About the only way it can be demagnetized readily is by heating it.

For a magnetic material with a given coercive force there is a relationship between length and radius which determines the ability of the material to retain its magnetism. The higher the coercive force, the smaller this ratio can become.

Ceramic magnets have a higher coercive force than Alnico V, therefore they can be made more compact than Alnico V.

The flux produced by a ceramic magnet of a given size is not as high as that produced by a magnet made of Alnico V of the same size. This is not necessarily a disadvantage because ceramic magnets can be produced somewhat more cheaply than Alnico V magnets in many instances. Therefore a larger ceramic magnet can be used where required.

Ceramic magnets cannot be used where stability is important over elevated temperatures. Above 70-deg. F the magnetic energy decreases by 0.1 per cent per degree of temperature rise. Obviously, such materials could not be used in space experiments as a general rule.

The latest Alnico material is Alnico VIII. This material has a high coercive force but is very expensive. It is likely that when the price of this material becomes more competitive it will be used in many of the applications now reserved for ceramic magnets because of their special properties.

One of the common uses for ceramic magnets is for holding devices, such as latches, which can be produced much more inexpensively than if they were constructed of Alnico V. In addition, ceramic material can be made very flat, which further enhances their usefulness in this application.

Visual "Doorbell"

Q. My problem is that I cannot hear the doorbell while listening to stereo. Do you know of a circuit which will result in a light flashing when the doorbell button is depressed? To be sure that the light will catch my attention, could the system be so arranged that the light remains on for a full minute after the button has been released? Werner Semmler, Sioux City, Iowa.

A. Here is a schematic, *Fig.* 1, which should allow a light to remain on for a full minute after your doorbell has been rung. The bell transformer must supply

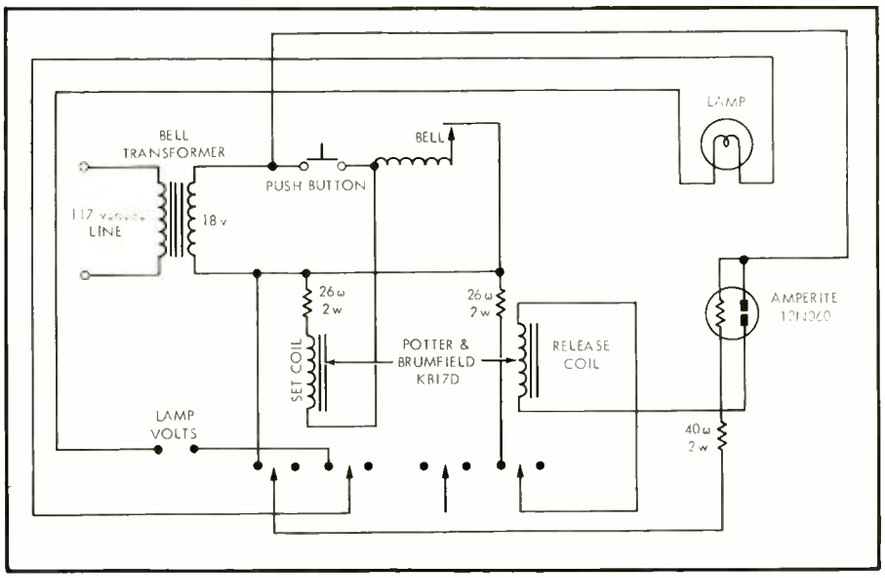


Fig. 1. Visual "doorbell" schematic.

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consider this...

Whatever the other components—most music systems today start with a Garrard Automatic Turntable!



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Is it creative engineering, quality control, Garrard's 50 years of experience?

Is it features?

Admittedly—the counterweight-adjusted tone arm; the heavy balanced turntable; the Laboratory Series® motor; the ability to track your choice of cartridge at the lightest specified pressure; the convenience of single and automatic play, either at your service when you want it—all play their parts.

But a Garrard is more than the sum of such parts.

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This is why more dealers recommend Garrard, and more people are buying Garrard, than any other component!

There is a Garrard Automatic Turntable for every high fidelity system. Type A, $84.50; AT6, $59.50; Autoslim, $44.50. For literature, write department GD-14, Garrard, Port Washington, N. Y.



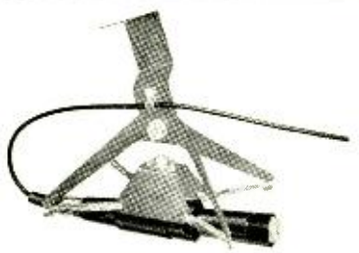
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DYNAMIC NEWS FROM ALTEC

2 New Microphones Expressly for Professional Use

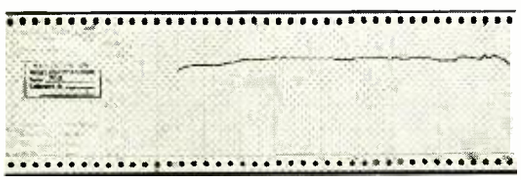
Two new studio dynamics—Altec 688A Omnidirectional; Altec 689A Cardioid—have been developed by Altec specifically for broadcast, recording, and TV use. Part of the famed Altec Series 680, these microphones offer maximal characteristics to meet and exceed the strictest professional recording and broadcast standards. Each is equipped with the exclusive Altec "Golden Diaphragm" which is not only extremely rugged in use but which also contributes inherent low resonance qualities and peak-free response. These two new microphones plus Altec's famed M20 Omnidirectional Condenser Microphone System and M30 Cardioid Condenser Microphone System now offer the industry superb qualities and characteristics to meet any and all requirements that can be imagined.



ALTEC 688A OMNIDIRECTIONAL DYNAMIC MICROPHONE—$90 net. Extremely uniform response from below 35 to over 20,000 cycles. Highly efficient. Low hum pickup. Shown in an Altec 181A Boom Mount. Output Impedance: 30/50, 150/250 and 20,000 ohms (selection by connections in microphone cable plug). Output Level: —55 dbm/10 dynes/cm². Hum: —120 db (Ref.: 10^{-3} Gauss). Dimensions: 1⅛" diameter at top (1½" largest diameter), 7½" long not including plug. Weight: 8 ozs. (not including cable and plug).



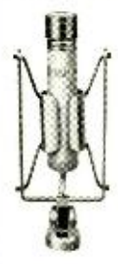
ALTEC 689A CARDIOID DYNAMIC MICROPHONE—$108 net. High front-to-back discrimination for an average of over 20 db from 40 to over 16,000 cycles. Virtually flat response throughout this frequency range. Output Impedance: 30/50, 150/250 and 20,000 ohms (selection by connections in microphone cable plug). Output Level: —54 dbm/10 dynes/cm². Hum: —120 db (Ref.: 10^{-3} Gauss). Dimensions: 1⅛" diameter at top, 7 13/16" long not including plug. Weight: 11 ozs. (not including cable and plug).



Each 688A and 689A microphone comes with its own individual response curve made by a Bruel & Kjaer servo-driven recorder in conjunction with an Altec anechoic chamber. The curve serves as a permanent record of the unit's response characteristics for immediate reference at any time required.



ALTEC M20 OMNIDIRECTIONAL CONDENSER MICROPHONE SYSTEM—$233 complete with base, stand attachment, and power supply. This is the famous "Lipstik"—so named for its miniature size—the only American-made condenser on the market. The M20 provides the wide, uniform frequency response of a laboratory standard — an exceptional microphone for broadcast and recording of highest quality.



ALTEC M30 CARDIOID CONDENSER MICROPHONE SYSTEM—$280 complete. This directional microphone offers the superb response characteristics of the condenser with the ruggedness and small size available only from Altec. 20 to 20,000 cycle range with better than 10 db front-to-back discrimination at the extremes, better than 20 db in the mid-range.

ANNOUNCING AN IMPORTANT NEW DIVISION AT ALTEC

The Audio Controls Division was recently organized at Altec Lansing Corp. The new division specializes in design and manufacture of precision attenuators, equalizers, filters, networks and switches, as well as custom consoles and associated products specifically for the recording and broadcast industries. It is headed by Arthur C. Davis, a Fellow of the AES and well-known in this field as a leading design engineer and manufacturer.

For specific engineering details and free demonstration, call your nearest Altec Distributor (see Yellow Pages) or write Dept. AM-4.

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ANAHEIM, CALIFORNIA

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about 6 watts of power in addition to that required by the bell itself. Voltages for all circuits are supplied from the bell transformer. I have assumed that the bell transformer supplies 8 volts to the bell. This is the usual arrangement. If a different voltage is used, then the values of the resistors must be adjusted so that 6 volts appears across the circuit elements.

It is possible to operate the light from this transformer. If this is done, account must be taken of the power drawn by the bulb. If you prefer, you can use this circuit to operate a bulb which requires 117 volts. Remember that it is not a good idea to have long, 117-volt cables unless they are enclosed in tubing. Therefore, it would be a good idea to locate your circuit in the room where the light is to be located. Possibly you can mount the light in the same box as that containing the rest of the circuitry. This will eliminate the need for BX cable or conduit.

Tuning Indicator for an FM Receiver

Q. I would like to add a tuning indicator to the discriminator section of my FM receiver. How do I go about it? Neil Sandow, Brooklyn, New York.

A. Here are two schematics, *Fig.* 2 and 3. Either one of these can be used to add a tuning indicator to your equipment.

You will have to balance the tube section in the meter amplifier of *Fig.* 2 so that, in the absence of voltage at the grid of the tube, the meter will register zero. The meter associated with this circuit must have a zero-center scale.

(Continued on page 69)

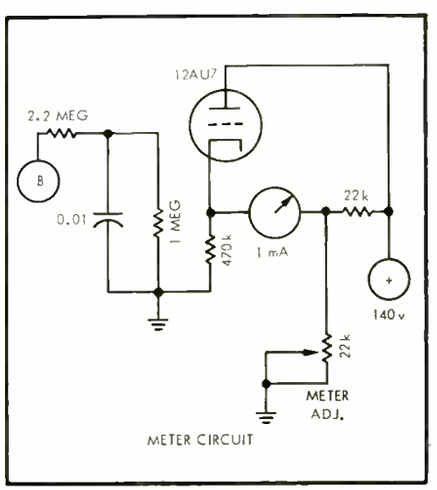


Fig. 2. FM tuning indicator.

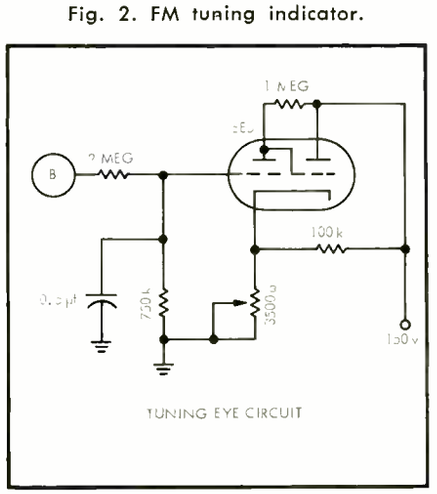
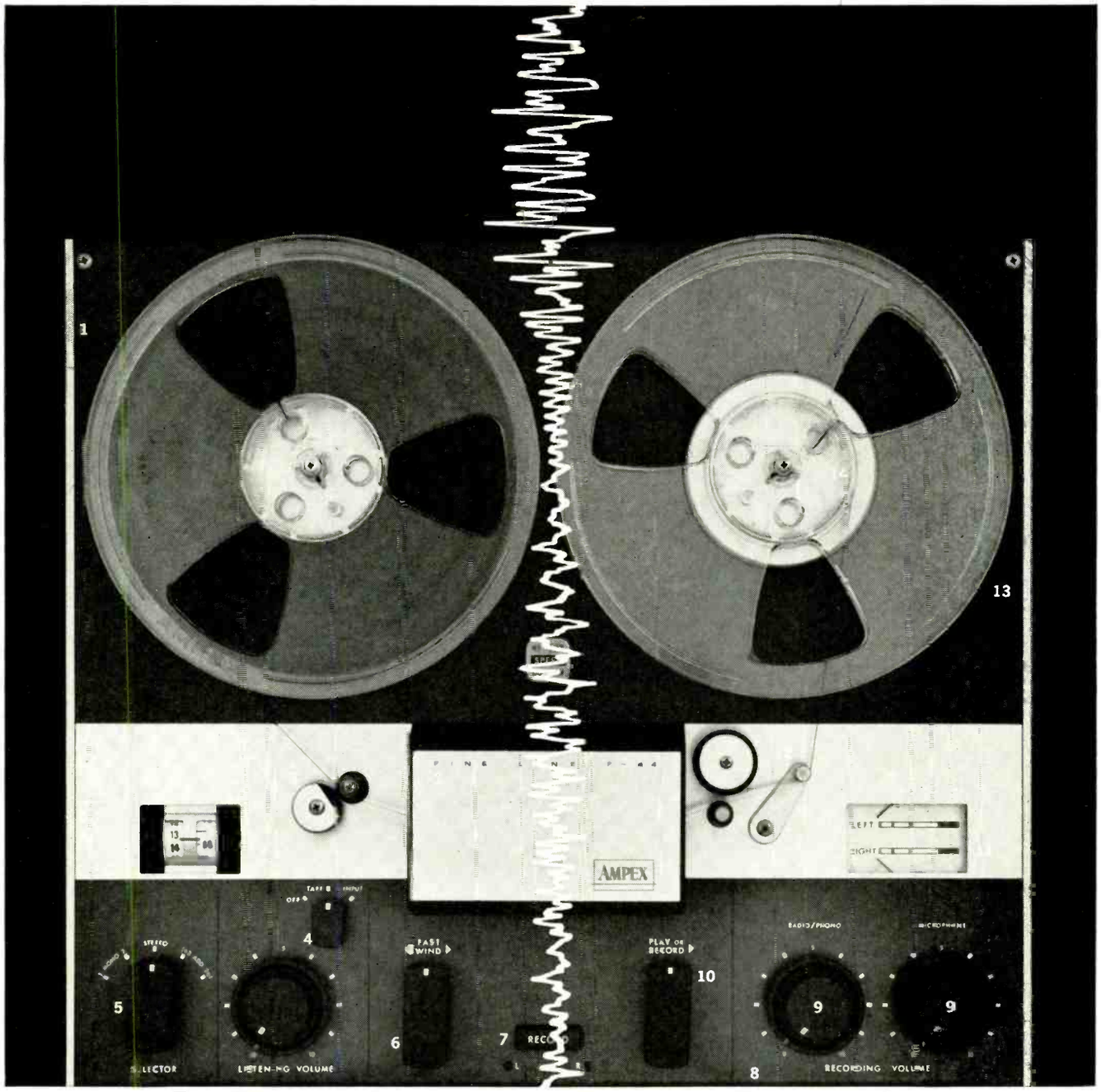


Fig. 3. Another FM tuning indicator.

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Fourteen ways to save money on your next tape recorder

Before you buy, compare the features of the Ampex F-44 with those of any other recorder in its price range. Note the features the F-44 has that the others don't. Then compare price, and you'll see what a bargain the F-44 actually is. In fact, if you can find a better bargain, buy it. **1)** *Professional Electronics.* Each F-44 recorder is individually tuned and adjusted by Ampex technicians to meet or exceed the following standards: Overall frequency response 50-15,000 cps ± 2db at 7½ ips; 50-10,000 cps + 2-4 db at 3¾ ips. Signal-to-noise ratio: better than 53 db. Flutter and wow: 0.12% rms at 7½ ips: 0.18% rms at 3¾ ips. **2)** *Three separate heads.* Each head in the F-44 is built to perform its own individual task (recording, playing or erasing), with no compromise of purpose in attempting to make one head serve several functions. Precision engineered head shielding virtually eliminates crosstalk. **3)** *Advanced tape-tension system* eliminates the use of pressure pads, by feeding tape or transporting it past the heads under constant tension adjusted at the factory. **4)** *New, separate power and monitor switch* makes it possible to monitor both source and playback while you're recording. **5)** *Master selector switch* permits simple changes from stereo to mono, choice of individual track, multiple generation sound-on-sound-on-sound. **6)** and **10)** *New compartmentalized mode-to-mode controls.* Two knobs control all transport actions, permit going from one mode to another quickly and safely. **7)** *Record indicator lights.* One for each channel. **8)** *Die-cast frame.* Micro-milled for meticulous alignment. **9)** *Built-in mixer,* with separate volume controls for recording of 4 inputs. **11)** *Separate record level meters.* **12)** *Exclusive unattended shut-off.* **13)** *New hysteresis synchronous motor.* **14)** *Automatic tape take-up.* Makes threading easy. For brochure, write Ampex Corporation, Consumer and Educational Products Division, 2201-C Landmeier Road, Elk Grove Village, Illinois. In Canada, Ampex of Canada Ltd., Rexdale, Ontario.



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LIGHT LISTENING

Chester Santon

Hello, Dolly! (Original Broadway Cast)
RCA Victor LSO 1087

The Girl Who Came to Supper (Original Broadway Cast)
Columbia KOS 2420

The ladies dominate these albums issued at the height of the current Broadway season. The Vehicle with a capitol "V" is the production of "Hello, Dolly" David Merrick has fashioned for Carol Channing from the famous play, "The Matchmaker." Florence Henderson is the other mid-season Belle of Broadway in Noel Coward's "The Girl Who Came to Supper." Miss Channing's show, if nothing else, had the distinction of becoming the season's "hot ticket" as soon as it opened to the wild plaudits of the critics. Unfortunately, some of these plaudits have a way of taking on a hollow ring when the original cast album is sampled in the home. I don't know what the cast did with Jerry Herman's "Dolly" score on Broadway's opening night but the conductor's tempos in the recorded version cannot be described as lively. The lethargy in most of Carol Channing's songs will puzzle anyone who expected the zing she once put into *Diamonds Are a Girl's Best Friend* and *I'm Just a Little Girl from Little Rock*. Perhaps the role of a meddlesome widow is a difficult one to imbue with the famous Channing impishness. At any rate, most of the songs begin to sound threadbare after the first hearing. The roster of seasoned supporting players (Eileen Brennan, Charles Nelson Reilly and David Burns) does all it can to ignite the turn-of-the-century songs, but their material is no better than Miss Channing's.

In "The Girl Who Came to Supper" Noel Coward tries his hand in a period piece starring Florence Henderson and Jose Ferrer. The plot, based on a play by Terrence Rattigan, will recall memories of the film made some years ago by Sir Lawrence Olivier and Marilyn Monroe. Coward's music and lyrics play up the local color of the 1911 London setting for the complicated romance of an American showgirl and a Carpathian prince. No one can accuse this show of taking itself too seriously. To preclude that remote possibility, Noel Coward has imported an authentic star of the London Music Halls. Tessie O'Shea, for twenty years a headliner in British vaudeville, turns out to be the brightest attraction in the show.

Rugantino (Original Cast Album)
Warner Bros. HS 1528

"Rugantino" is a novelty on Broadway: a foreign language musical using subtitles on a screen above the stage to translate the action of a show imported direct from Rome. A very successful production for many months on the stage of the Teatro Sistina, this handsome and elaborate show deals with the adventures of a rogue named Rugantino in the Rome of 1830. The booklet accompanying this Warner release, far more lavish than most brochures for a Broadway album, contains translations of only a portion of the songs. Fortunately, the music, as sung by stars Nino Manfredi, Ornella Vanoni and Aldo Fabrizi, has considerably more melodic appeal than you'll find in the typical homegrown show of recent seasons. The amount of reverberation introduced into the recording is far greater than we normally use in this country. A departure from RIAA equalization in playback gets rid of a good percentage of it.

The Sound of Sight
London Tape LPL 74040

This wild and wooly number in the London "Phase 4" process is billed as an experiment in imagination. It is calculated to recall just about every type of major motion picture you've ever seen. Every musical cliche in the book is exhausted by the time the album completes its ribbing of eight varieties of movie score, dissected with considerable good humor by composer Ray Martin. So many are the musical descriptions satirized by Martin in his make-believe Western, sea epic, whodunit, Egyptian spectacular, etc., London Records has provided copious notes to make sure you get all the details being made fun of. Liberal use of sound effects underlines the debunking nature of the album. Those who take formula movie music seriously will enjoy this spoof far less than the rest of us will.

America America (Original Sound Track)
Warner Bros. WS 1527

Only once in a blue moon does a sound track album come along with the variety of attractions of this one. Inasmuch as exceptionally clean sound is the first of these attractions in Elia Kazan's moving story of a Greek immigrant boy, the album already has enough to recommend it to readers of this magazine. Perhaps the overriding value of this recording lies in the chance to hear what is being done in audio these days by Greek technicians in Athens. The score, the work of the composer responsible for the extremely popular "Never on Sunday," was recorded at the Alfa Studios in Athens and serves as another reminder that good sound can be found wherever engineers are willing to work for it. As anyone familiar with former productions of Elia Kazan will suspect, this is not a typical movie score, bland and innocuous. This music bristles with local color (street cries of Constantinople dubbed over music) and modern percussion effects delivered with relish by the Athens Experimental Orchestra. When Kazan engaged Manos Hadjidakis to write the music for "America America" his first request was that the composer forget the bouzoukis or Greek guitars featured so prominently in "Never on Sunday." The result? By the time you've finished this album, you'll know a good deal more about the native instrument called the sanduri.

Great Scenes from Porgy and Bess
RCA Victor LSC 2679

This album is a "must" for any reasonably comprehensive collection of theatre music. It presents some of the members of the original cast of the famous 1952 revival of Gershwin's "Porgy and Bess" hat toured the United States, Canada, South America and Europe. The highly successful production was a historic one on two counts: it demonstrated in other lands the continuing vigor of the American theatre and brought the now-famous Leontyne Price into wide public notice for the first time. In view of the fact that Miss Price appeared in the Porgy and Bess company for a period of almost two years, it should surprise no one to find her involved in a truly exceptional recording of the Gershwin score. Her voice, now richer than ever, underlines her understanding of the role to give us the best portrayal of Bess available in recorded form. As a bonus, Miss Price offers a few songs normally delivered by other female members of the cast. William Warfield, also a member of the 1952 revival, matches Leontyne Price in his projection of the role of Porgy. In the main supporting roles, McHenry Boatwright appears as Crown and John W. Bubbles is Sportin' Life. It is particularly illuminating to hear the Bubbles portrayal of Sportin' Life because it was Gershwin's unorthodox idea to recruit Bubbles from vaudeville when he was assembling the first cast for Porgy and Bess way back in 1935. The Leonard de Paur Chorus lends strong support in well-detailed stereo. With a singing cast as strong as this one, the success of the album was a foregone conclusion. For many listeners, including this one, the biggest surprise in the project is the tremendous job Skitch Henderson turns in as conductor of the session. He easily surpasses the podium work of Andre Previn in the Original Sound Track recording on Columbia and offers a few pointers to Lehman Engel who conducted the complete version of Porgy and Bess on three mono-only Columbia records (OSL 162).

Freddy Martin in a Sentimental Mood
Capitol ST 1889

Throughout the past decade or so, the recording staffs of at least three prominent labels have had occasion to agree that few outfits are easier to record than the Freddy Martin Orchestra. With the possible exception of the famous Guy Lombardo crew there isn't a dance band in the business capable of producing the carefully modulated style of the Martin men. Gain watchers in Capitol's control rooms during sessions involving the label's other artists may experience an occasional uneasy moment when a Ray Anthony or a Billy May lets out the stops unexpectedly in a heavy passage for brasses but the Martin arrangements, little changed since the band's formation, hold no such perils. Anyone who has fooled around with stereo discs since their inception is certainly familiar with the obvious strides made in the recordings of the loud and strident bands. Does the same hold true in the case of the soft-spoken bands? While listening to the smooth sound of the sentimental favorities on this Martin disc, I found myself trying to recall the sound of the early Freddy Martin stereo discs issued by Capitol. Before getting up from my favorite easy chair to check more directly on the quality of eariler Martin records, there was some temptation to decide that the recorded sound of this orchestra could not have changed much during the years of the stereo disc. Not until I took down from the shelves an already discontinued Capitol stereo album, "Concerto" SW 1066, did I realize that even the smoothest dance bands have undergone a genuine transformation on stereo discs in only a few year's time. The Concerto album, judging by its number, was probably released late in 1958 when most stereophiles were still trying to decide whether to blame the stereo pickups or the stereo discs for the sound they were getting through what they once considered familiar amplifiers and loudspeakers. Disc no. 1066 displays more than passable sound with a present-day stereo pickup but instrumental presence is vastly improved on Capitol ST 1889. The improvement is all the more impressive because the brand new Martin disc incorporates multiple recording that enables Freddy Martin to play saxophone and clarinet parts simultaneously.

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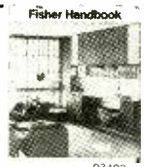
The Fisher FM-50-B features the exclusive STEREO BEAM†, a Fisher invention that automatically indicates whether or not an FM station is broadcasting in stereo. The five costlier Fisher tuners incorporate the famous STEREO BEACON†, an exclusive Fisher development that automatically indicates the presence of FM Stereo broadcasts by means of a signal light and at the same time automatically switches the tuner between the mono and stereo modes of operation. The unique Fisher warranty — one year, *including* tubes and diodes—applies equally to all six models.

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LETTERS

A Third Party to a Controversy

SIR:

In Mr. Stephen F. Temmer's letter, which is in answer to a report about the Sennheiser MK 104 in the October issue of AUDIO, there is apparently an error. This error might gave the impression that the Neumann M269 condenser microphone has a signal-to-noise ratio that is not as good as the Sennheiser MKH104. The Neumann M269 uses classical a.f. circuitry with an AC701K tube, while the MKH104 uses an r.f. circuit. In Mr. Thomas A. Schillinger's answer to Mr. Temmer's letter, the error is picked up and is used in favor of the Sennheiser microphone.

It is known that there are a large quantity of psophometric curves for the subjective weighting of noise signals, based on new measurements and new progress in the field of subjective acoustics. Some of these curves are DIN 5.045, curve 3, IEC curve A, CCIR 1946, CCIF 1954, corresponding to DIN 45.405, as well as the so-called N-curves of the IEC. Every single one of these weighted curves gives a different noise level, and, therefore, a different signal-to-noise ratio. The signal-to-noise ratio depends further on the rectifying and integrating properties of the meter. If quality is to be compared, it would be necessary to indicate the exact measuring methods. A better comparison can be obtained by stating the spectral distribution of the noise, for instance throughout one octave, and in absolute level or sound pressure values. This is the case with the N-curves of the IEC.

Mr. Stephen F. Temmer writes that the noise level of the MKH104 is 10 μv, while the noise level of the Neumann M269 is approximately 8 μv. According to the Sennheiser data sheet, these 10 μv are the weighted noise level, according to DIN 45.405, which is identical to CCIF 1954. Compared to this value, the 8 μv of the Neumann M269 is an unweighted noise level. In one place Mr. Temmer says that the weighted noise level of the Neumann microphone is 1.5 μv only. This means, however, that the 10 μv of the MKH104 should be compared with the 1.5 μv of the Neumann M269. The unweighted noise level of the MKH104 is not stated at all, therefore, Mr. Schillinger cannot correctly state that the Sennheiser microphone is, unweighted, 10-db better than the Neumann M269. Taking into consideration the various sensitivities (2 mv/μbar for the MKH104 and 0.9 mv/μbar for the M269), the signal-to-noise ratio for the MHK104 is 46 db, while the signal-to-noise ratio for the Neumann 269 is 55.5 db. Our measurements here have proved these values.

The advantage of the MKH104, as stated by Mr. Schillinger in paragraph 2, namely the fact that the r.f. circuit also picks up changes of pressure is rather a disadvantage, because of the danger of over-modulation by those low frequency impulses, so that we have built into the AKG microphone devices for an artificial cut-off of the lowest frequencies. Another disadvantage of this r.f. condenser microphone is the tendency to produce non-linear distortion. It has taken quite a bit of research work to avoid this difficulty and to keep the total harmonic distortion at a value which is just as good as with normal a.f. condenser microphones (better than 0.5 per cent at 100 μbar). The AKG r.f. condenser microphone also avoids the unwanted pick-up of broadcast and television transmitters through the r.f. microphone circuit.

BERNHARD WEINGARTNER, Dipl Ing.
Head of Research of Development
AKG
Vienna, Austria

Party One Answers

SIR:

The prologue of Mr. Weingartner's letter deals with the unfortunately diverse weighting procedures used to measure noise voltages, and the differing sound levels and signal-to-noise ratios which result therefrom.

Because it is so thoughtfully written, it is indeed odd to find that in his following statements, Mr. Weingartner commits an error on precisely this point.

He refers, quite rightly, to the fact that Mr. Temmer has compared our weighted noise voltage of 10 μv, measured according to DIN 45.405, to that of the unweighted noise voltage (8 μv) of the M269. The Neumann specification sheet states "Noise voltage less than, or equal to, 1.5 μv, weighted according to DIN 5.045." The norm DIN 5.045 refers to the DIN sound volume measurement procedure, carried out by using RMS rectification and a noise weighting which differs from the curve used to determine the weighted noise voltage according to the procedure of DIN 45.405.

In comparing the Neumann microphone's noise voltage of 1.5 μv with the 10-μv value of the Sennheiser microphone, Mr. Weingartner makes the same mistake as Mr. Temmer, since each of these values is determined by using an entirely different measuring method.

In its publications, the Neumann Company states that the noise voltages for the same microphone, if measured according to DIN 45.405, and then with DIN 5.045, will differ by about 10 db. If this fact, as well as the differing sensitivities of the microphones, is taken into consideration, it follows that both microphones are about equal, when weighted according to DIN 45.405.

In light of these facts, it is our belief that the text of our previous reply is correct in its entirety, and the error is thus Mr. Weingartner's.

With regard to the slow variations in pressure that Mr. Weingartner mentions, it should be said that the extension of the frequency range down to very low frequencies can create difficulties, but, on the other hand, steep roll-off below 40 cycles leads to self-resonances, which can also be undesirable.

In their audio-frequency condenser microphones, Neumann and AKG sometimes use special circuitry with a rather steep roll-off at low frequencies.

If AKG has problems in keeping the distortion at 100 microbars below 0.5 per cent, we can fully understand these difficulties. Our approach to this problem was to develop a special cartridge with very small temperature coefficients, and to provide the microphone with additional inverse feedback, incorporated in the r.f. circuitry.

We trust that as soon as Mr. Weingartner becomes aware of his error through the above facts, the need for further open letters on this topic will be obviated.

THOMAS A. SCHILLINGER
Sennheiser Electronics Corp.

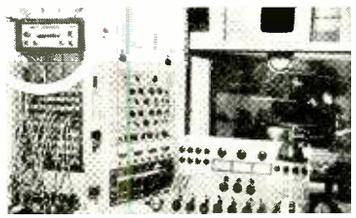
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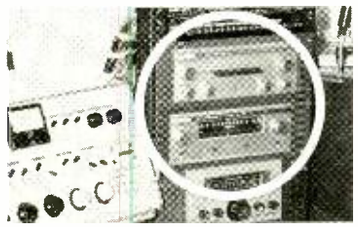


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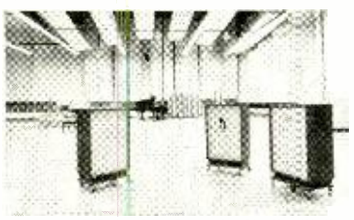
Perfect partners! Rack-mounted Altec 360A works with Altec 314A Emperor Royale FM Multiplex Tuner at Sim-O-Rama Sound Recording Studio, N. J.



The film production service at Virginia State Department of Education relies on the 360A for power in conjunction with other Altec PLAYBACK amplifiers and controls.



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The difference in quality between the all-transistor Altec 360A and even the finest vacuum tube amplifier becomes most readily apparent through comparative A/B listening tests. Bass frequencies assume life-like solidity seldom heard outside a concert hall. Transient distortion, background hiss, and microphonics just aren't there. Even at loudest volumes, hum is so completely inaudible our engineers have concluded that it is totally absent. (In fact, we urge you to compare this feature with that of any other amplifier on the market!) Highs are so crisp, clean and transparent that listening to them approaches a new and revealing musical experience. You hear the highest frequencies in complete purity for the first time, since this amplifier neither contains nor needs the built-in bass boost found in ordinary units—one which affects the *entire* frequency spectrum.

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AUDIO ETC.

Edward Tatnall Canby



Philharmonic Hall

A short time ago, I found myself at last in a properly Canbyesque position to judge a Thing—a very big Thing—about which I had been reading reams and reams of controversy listening to minutes and hours of discussion these many months. I had it, at last, all to myself. In effect, anyhow. The Thing was Philharmonic Hall. All of it, not just one seat during one concert.

For an hour or so, the whole darned shebang was mine, complete with its thousands of seats, all empty (but neatly padded to absorb like human carcasses), its hanging terraces, down the sides and up around the back, its outside hall with that sword-of-Damocles metal sculpture suspended in space, ready to slice a few hundred customers into ribbons when it falls, the glassed-in runways around each of the many levels and the endless sunken stairs from level to level, the seats 'way high up in the far corners of the top and the seats 'way low down below stage-level on the floor—all this was for me alone, to explore as I wished.

And inside the hall (otherwise why bother) there was music going on, from the stage. Also talking, from the same stage. Also, some casual noise-making up on one side, where audio men were installing a brace of horn-type speakers, removing several seats in the process. Don't ask me why—but they proved to be important before I was finished. The installers, that is, not the speakers, which remained mute. The installers provided some useful audio signals, live, for my test procedures.

One of them, for instance, dropped a hammer with a loud bang. It didn't go just plain BANG, plus decay. It went *BANG*-bang, plus decay. (Now didn't I hear something about a recent great effort to remove a certain echo, in the latest Philharmonic Hall tuning procedures? Maybe so, but it still went *BANG*-bang.)

Ah—but don't think I'm going to lambaste Philharmonic Hall! Everybody and his relations have long since done that. Rather, I'm interested in evaluation.

Lonely as a Cloud

The occasion for my private look-hear was simply a long dress rehearsal of the Dessoff Choirs for their concert in Philharmonic Hall. There was a semi-chorus in which I did not sing. I did sing in the main chorus. I sang in the concert. So, altogether, I was able to "evaluate" with some concentration during a good many hours of varied acoustic experience, not a single moment from a conventional one-spot concert seat. (I'd done that on other occasions, of course.)

I sang my head off, to an empty hall and then to a (reasonably) full one, onstage and in an ensemble. I wandered lonely as a cloud all over, up among those mechanical bits of reflective geometry they call "clouds," down the side-rows of seats, forward on each side, back again to the rear, up the endless stairs and into each of the many levels, one by one, all the way to the top. My only companion, other than a few supine auditors downstairs, was a small child who appeared at the topmost place in the hall. She was trapped. "Mister," she said, "how do you get down from up here?" She couldn't reach up to the door handles on the glass-enclosed corridor outside.

Not a soul anywhere around, other than these few. Nothing but a mere stageful of performers, performing music, intermittently. And a conductor (Paul Boepple), haranguing the performers with his back to the "audience"—me and the little girl, up near the ceiling. Odd effect! It grew upon me. Imagine, Philharmonic Hall, private, yours, just sitting there like, well, like a sitting duck. As though time had stopped and the great public meeting place was suspended of its normal brilliant concert life. Like Times Square in a war-time black-out.

(Public places are always ghostly in this fashion when their business is suspended—whatever the business may happen to be. The parkways around New York at 4 a.m., lighted up for miles and not a car in sight as far as you can see. Grand Central Station at the same hour. Wall Street on a Sunday morning. Coney Island beach on a Monday—in December. It's an illusion; for these suspensions are merely normal. We are the ghosts who aren't there.)

The Music, Not the Hall

My impressions add up rather conclusively. I like Philharmonic Hall, in an absolute sense. I suspect that it is an excellent hall for its size and its time, perhaps even an outstanding one. I found it quite thrilling to *be within it* in this wandering fashion, while sound was actually being produced inside this famous acoustical environment.

I suspect that the trouble with Philharmonic Hall is the music, not the Hall. We're putting the wrong stuff in it. For how in Heaven do you expect to package Nineteenth century music in a Twentieth century wrapping? That, as sure as sure, is what Philharmonic Hall is. By no possible stretch of the imagination, nor via any conceivable juggling of formulae, nor by any manner of computer calculation, could this place have turned out other than an entirely modern auditorium, created today and very much of today. (Whether for better or worse, architecturally, is perhaps beside our point, though I like the thing both inside and out in spite of its high-toned impressiveness.) Modern as the day.

And what do we do? We stuff a huge, old-fashioned orchestra into this modern package and cause it to play Tchaikowsky. Or Beethoven. Or even Richard Strauss, or Mahler, from the turn of the century! Preposterous! What is music of 1905 doing in an auditorium of 1960-odd? How can Brahms in the 1880's, the gingerbread period of architecture, survive in a geometrical fabrication of curves and smooth surfaces such as he could never have dreamed of?

Axioms

Is it surprising, perhaps, that Symphony Hall, in Boston, is famed for superior musical acoustics? It surely is a superb hall in an absolute sense; but that superiority *must* be qualified by a period-sense. It was perhaps built superbly because it was at ease with the music which lived within it; they were compatible. They came from a similar impulse, from a similar way of life; their axioms were consonant—mutual principles that were taken-for-granted.

There are axioms for Philharmonic Hall. Taken-for-granted basic principles that, for all the calculating and figuring, are unthinkably fixed and absolutely unquestioned.

Did anybody, for instance, propose a nice pseudo-Gothic gingerbread ceiling decoration for the Hall? How about some plaster rosettes, cupids, intertwined grapevines? A few semi-Greek friezes, here and there? Woodwork, suitably carved into spirals and scrolls and serpents' heads? How about filling up all the blank wall spaces with ornamental bas-relief, maybe the Muses with flowing robes, or Saint Cecelia? And the busts of famous composers, in long rows—can't we have them somewhere in the

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Industrial Design Magazine used these words to describe the functional beauty of the AR turntable:

"noteworthy for elegant simplicity".

The AR turntable's simplicity of basic design, in engineering as well as in looks, makes possible a combination of professional quality, reliability, and low price. Percy Wilson writes, in the British publication **The Gramophone:**

"I have, in fact, only one criticism of the AR turntable and arm: it is greatly under-priced. For its high standard it could well be double the price."

We believe that the AR turntable at double the price would keep its position of leadership in the field. Its wow and flutter were reported by **HiFi/Stereo Review** as being the lowest ever measured on any turntable, irrespective of price; its speed accuracy was the best of any fixed speed turntable tested by **High Fidelity;** its design was described in **Modern Hi-Fi** as being the best answer to the interrelated problems of rumble and acoustic feedback; and **Gentlemen's Quarterly** included the AR turntable in its selection of a ne plus ultra stereo system costing $3824.



The AR turntable at New York's Industrial Design Show. Products in the show were selected by **Industrial Design** as representing the best designs of American industry.

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chamber-like. It was that kind of music.

And when the full chorus sang, all 200-odd singers, I among them, I found to my astonishment that for the first time, we were singing in a hall that took us, so to speak, exactly as we were. Everybody in that hall, distant or near, could get our music from us, and we did not need to strain. Our sound did not blend into a grand blur; we were not isolated from one another acoustically, the sopranos helplessly out of touch with the basses across the stage—we heard one another well. And we heard *us;* we heard our combined sound, much as the audience itself did. The music was alive, all around us; it was ours and it was the audience's as well. There was close communication.

Alive—but not live. Definitely, Philharmonic Hall is "dead," whatever they say the reverb decay time is supposed to be. Not really dead, though. Not stifling, not depressing, not sound-swallowing. Not any more. (The bass end did get swallowed—that was a major technical miscalculation that seems to have been taken care of.) Just not reverberant in the accepted Nineteenth-century-and-earlier fashion. Like Carnegie. Like Symphony Hall. Like a hundred European halls. It can't be. It never will be. It isn't in the cards for it to be.

And so Philharmonic is never going to sound like Tchaikowsky or Brahms or Beethoven at home. Not ever. It will always bring a modern touch to the old music, as it must. It will bring the symphony up close, make it intimate willy-nilly, make personalities out of minor solo orchestral players and put major soloists right in your lap, like television. A lot of people won't ever like it—the music won't like it, either. But that is strictly the music's fault, for being so very un-modern.

Recurring Elements

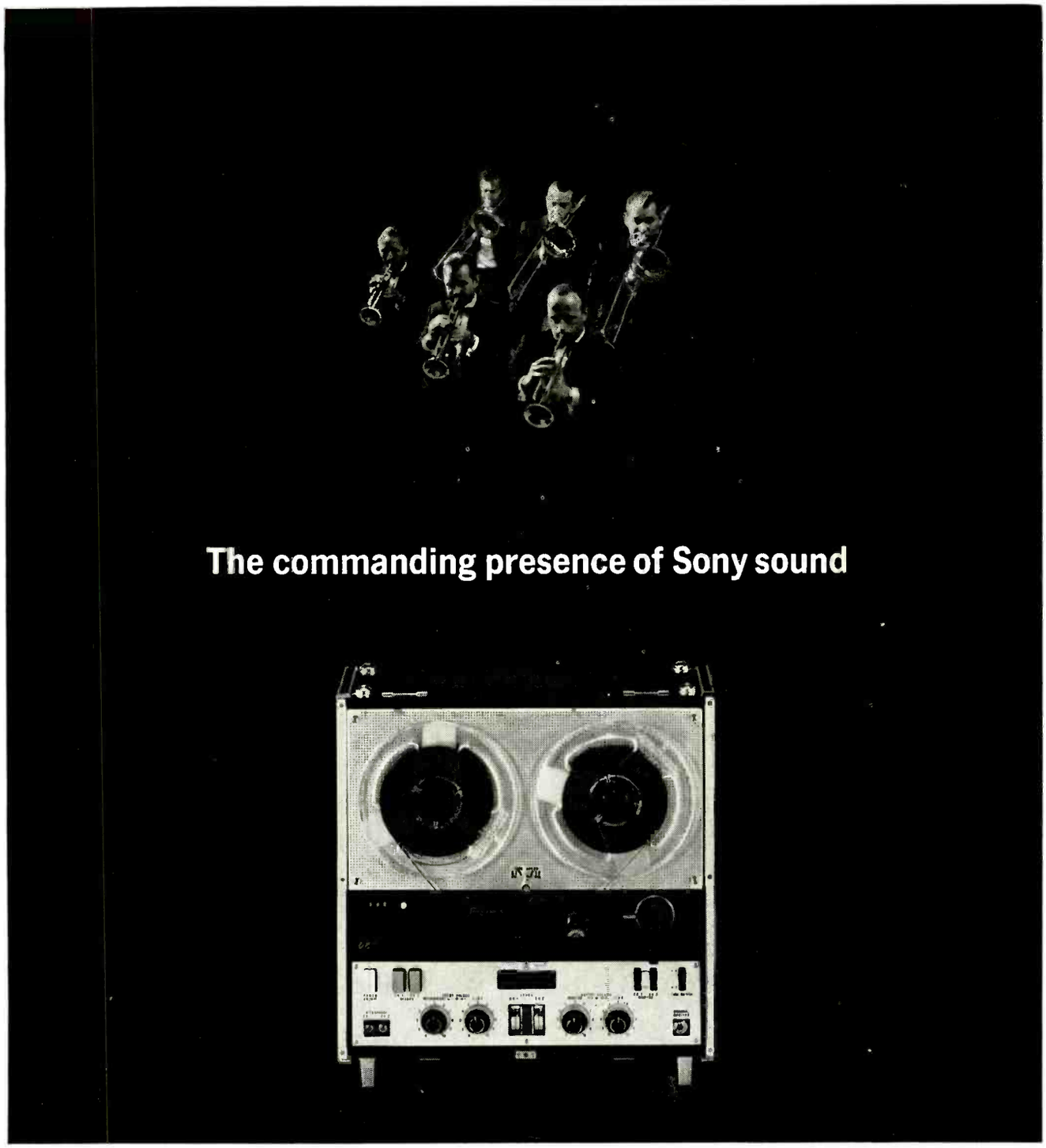
I need add only a further observation. I may seem to oversimplify the relation between music and its architectural environment—I don't think so. Not in the large.

Does all music require its proper acoustical environment, historically? Should Brahms live in late Nineteenth century architecture and Bach in a Baroque church, Palestrina in a Gothic-Renaissance cathedral? Definitely, in the ideal. Of course! And remember that large quantities of the music we hear in our concerts was never intended for concert listening, let alone concert acoustics.

Fortunately, though, we are flexible and so is music. Imagination can make up for a lot that is ideally missing. Moreover, the styles and the manners of men have changed greatly—but men are still men. There are recurring elements.

(*Continued on page 62*)

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EDITOR'S REVIEW

AN FM SATELLITE

THE NEWSPAPERS have carried a super-abundance of stories about satellites and their communications potential in recent months. Certainly a substantial portion of the television-owning world has had occasion to witness those insecure pictures showing French, English, and American entertainers. In all this hubbub and excitement a possibility of far greater importance to the audio world has been ignored—the possible use of satellites for FM broadcasting.

This possibility was brought to our attention in the midst of a 38-page report by the National Aeronautics and Space Administration (the familiar NASA) to the Space Committee of the House of Representatives in Washington. Most of this report is a rather straightforward (and fascinating) compilation of possible practical benefits related to the amassing of technology required to pursue the space program. One paragraph (on page 32), however, caught our eye and interest. We reproduce it in its entirety:

> 5. A particularly intriguing application of communication satellites is direct broadcasting to the individual listener. By broadcasting, we mean radio as well as television transmission, especially because radio broadcasting might be achieved within the limits of current spacecraft power supplies, whereas visual broadcasting with its wide bandwidth requires power which can only be realized from nuclear power sources. The use of satellites for broadcasting would permit coverage of countries, sub-continents, and even continents for purposes of entertainment, classroom and home education, and information purposes. The unique aspect of satellites is that continental coverage can be achieved without a network of local coverage stations interconnected by an extensive surface communication system.

Reading this paragraph we can conclude that FM broadcasting is possible *now* with available satellite equipment and that networks on the order of AM radio and television can be accomplished. In a previous editorial we mentioned the possible emergence of FM networks, but the technical and financial difficulties inherent under present circumstances has limited the possibilities.

Now, with the possible use of satellite relays, all of the problems can be solved in one fell swoop. Then the potential of FM, with its stereo transmission, wide frequency range, and history of good music, may evolve into the universally-available good-program source many people desire.

So, the next time a satellite passes overhead, just think . . . !

GREEN IS LEFT, RED IS RIGHT, OR IS IT?

Have you noticed the variety of color codes used for identifying the leads in tonearms?

Of course we had noticed it in a negative way over the years when we would try to identify the left or right hot lead in a tonearm without having the instruction sheet. Out would come the trusty ohmmeter, and some minutes later the job was done. Time consuming.

Then, recently, a manufacturer intent upon making his leads match everyone elses, reported the results of his research to us. According to his findings, very few manufacturers agree, each apparently content to go his own way.

But the strangest thing about this whole business is that there is a standard published by the Electronic Industries Association (EIA) which is supposed to be followed by all.

Now look here manufacturers, we know that a color code for tonearm leads is not very important, but after all there *is* a standard!

A THREEAXIAL LOUDSPEAKER

In the March issue of AUDIO a "triaxial" loudspeaker was referred to in the cover story on page 14. Little did we realize that we were stepping on the legal toes of Jensen, the well-known and long-time purveyor of loudspeakers. In short order, and with exceeding gentleness, they informed us that "Triaxial" and "Triax" are registered Jensen trademarks.

Our hats are off to you, Jensen, for having captured such simple and descriptive terms for a three-way loudspeaker with common axis. But you do leave us with a problem, through no fault of yours, may we add.

How do we describe this three-headed beast? Threeaxial?

Cumbersome and, we suspicion, uncomfortably close to the forbidden title.

Triaxiom?

Now we're stepping on somebody else's toes.

Probably we are missing the obvious, but we fail to see a simple way out. How about you?

THE LOS ANGELES HIGH FIDELITY SHOW

At the time of this writing, the Los Angeles Show had not yet begun, and yet by the time you read this it will have been over for some weeks. Obviously we can't report in the usual fashion. Instead we will "predict" what you have seen, those of you who attended.

First and foremost there were many more solid-state amplifiers and tuners shown. In addition, solid state circuits have invaded the tape recorder field, to a large extent "capturing" the market.

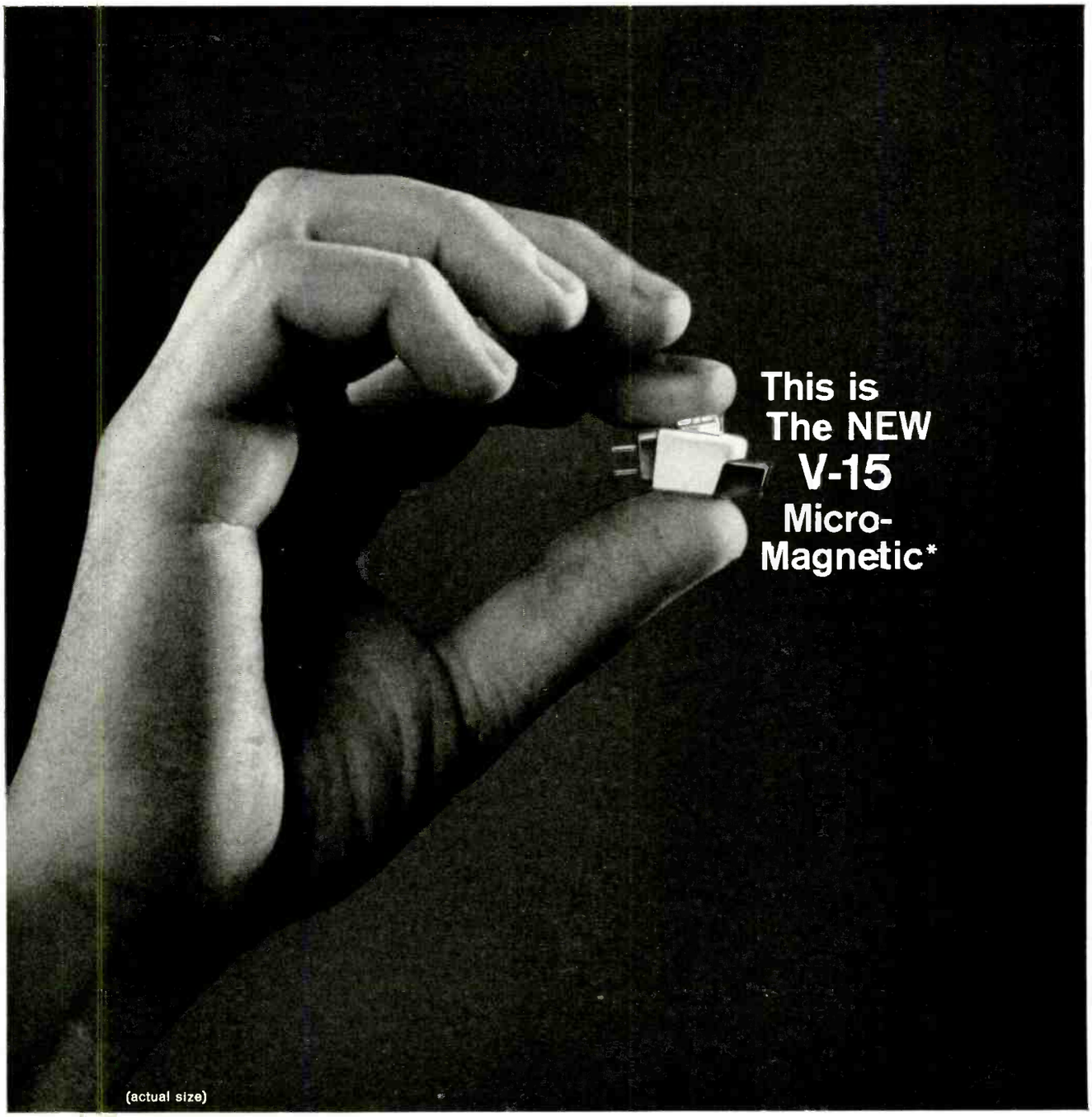
Although not as strong an item as solid-state amplifiers and such, the advent of portable record-playing packages encompassing a record changer, a solid-state amplifier, and a pair of speakers, has really made some waves. Several "on the market" varieties were shown, while some companies showed prototypes.

At the same time, at the other end of the portability spectrum, several consoles were shown. Of course we must point out that these were "component" consoles, incorporating components tailored to fit a console.

As usual there was *mucho* music to listen to, *mucho* of it too loud, some just delightful. At the end of the Show the products still performed well, but the exhibitors seemed to have lost efficiency. Most likely we need solid-state exhibitors.

And the viewers again vowed to cease and desist from attending high fidelity shows. To which we add—'till next year.

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PICKERING'S NEW SUPER-LIGHTWEIGHT PICKUP

Here's a magnetic cartridge that's radically different. You can hear the difference. You can see the difference. Pick up the V-15. Note its lightness—only 5 grams. Perfect for low mass tone arm systems. The V-15, because of its high compliance, high output and rugged construction can be used in either manual turntables or record changers. Hear how it outperforms pickups two and three times its size. A revolutionary new magnetic structure provides an exceptionally flat response (20 cy to 20 KC), 7.5 mv per channel output at standard recording levels, low IM and harmonic distortion with 15° vertical tracking angle.

Now, take a close look. See how Pickering's exclusive "Floating Stylus" and patented replaceable V-Guard assembly protects your record and diamond as it plays.

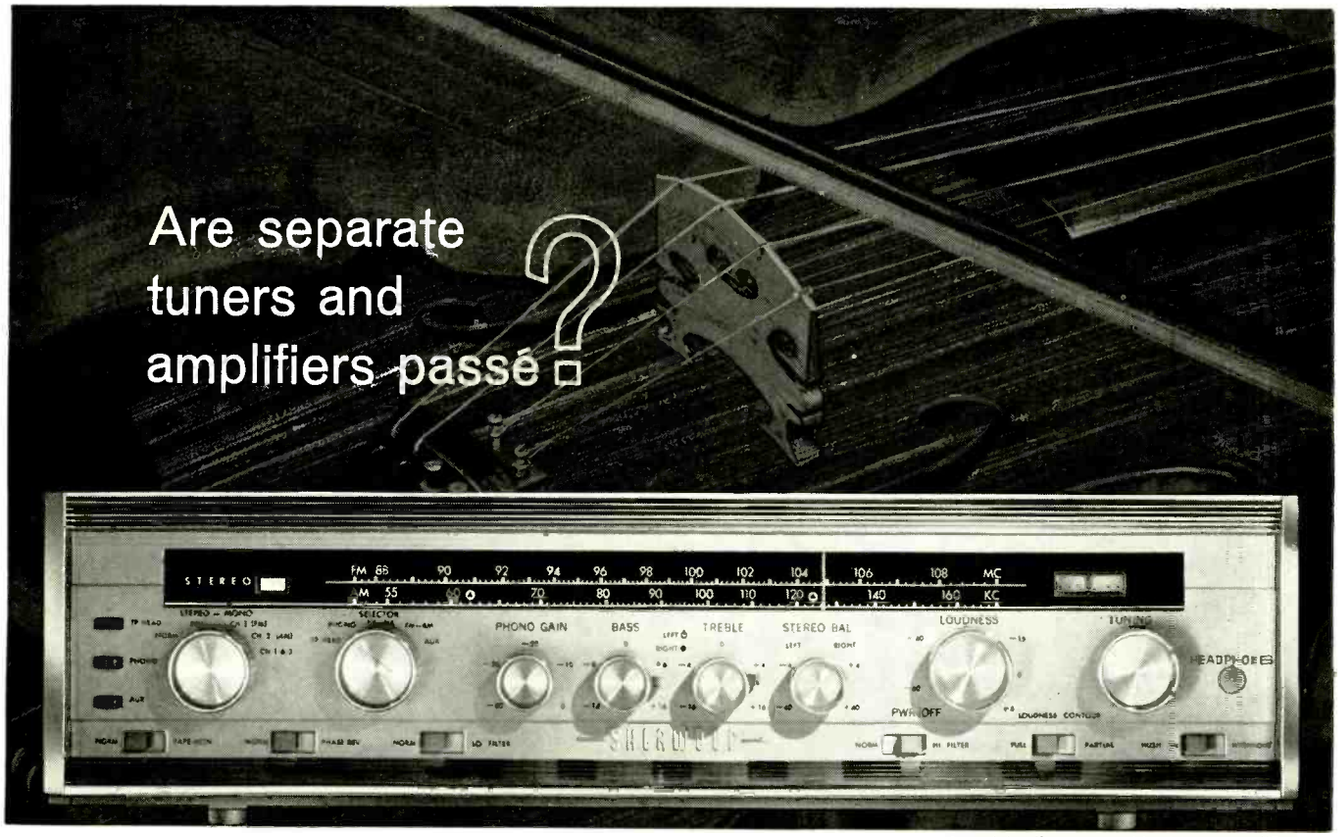
See the V-15. Hear the V-15. Your local Pickering dealer has it.

FOR THOSE WHO CAN HEAR THE DIFFERENCE **Pickering**

Pickering and Company, Inc., Plainview, New York.

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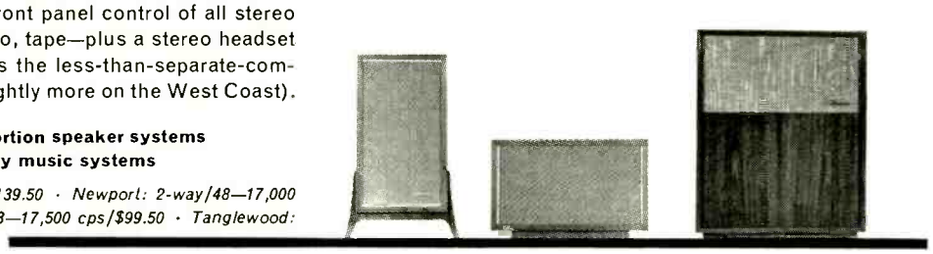
An outstanding new combined tuner/amplifier component . . . the S-7700II AM/FM/FM Stereo 80-watt Receiver.

Nothing duplicates the installation flexibility of separate components. This is one of many reasons why Sherwood sells so many of them. But for those who do not need this flexibility, Sherwood engineers have created an outstanding single component, which without compromise of fidelity, combines both functions.

The new S-7700II AM/FM/FM Stereo Receiver combines the 1.8 microvolt sensitivity and 2.4db capture effect of Sherwood's finest tuner with the 80-watt dual channel music power of Sherwood's highest-rated high fidelity amplifier. The size is a space-saving 16¼" x 4" x 14". You enjoy all the tuning surety of Sherwood's D'Arsonval zero-center tuning meter and 8" long professionally calibrated dial scale. And, you have front panel control of all stereo amplifier functions for phono, tape—plus a stereo headset jack. As trim as the size, is the less-than-separate-components price of $374.50 (slightly more on the West Coast).

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A "Purist" Tackles Room Acoustics

J. W. LINSLEY*

Many audiofans make the error of thinking that a fine audio system will automatically insure fine sound. This "purist" found that an understanding of acoustics is just as necessary as excellent components.

THIS ARTICLE describes a so-called "Purist" stereo system. It wouldn't have been written if I hadn't accidentally discovered how room acoustics had upset my best efforts to achieve the "ultimate" realism in sound.

Since the term "ultimate realism" is almost impossible to define and most people would hear it differently anyway, you are welcome to laugh as loudly as you care to. However, I would suggest that you give the logic some careful thought because you might someday be pursuing the same goal.

* *5637 Hillcrest Road, Downers Grove, Ill.*

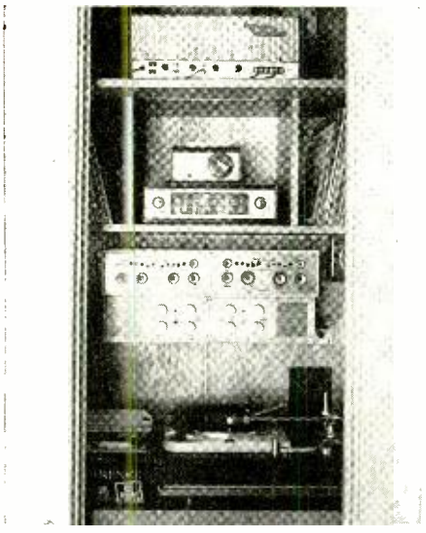


Fig. 1. The authors' system consists of: ADC-1 cartridge; Rek-O-Kut tone arm (with special alterations and moving horizontal pivot); Thorens TD-124 turntable; McIntosh C-8 preamp with C-8S stereo add-on preamp; Marantz electronic crossovers (at 100 cycles); Marantz 40-watt basic amplifiers (above 100 cycles); Scott 80-watt basic amplifier (combined signal under 100 cycles); Electro-Voice K Horn (below 100 cycles); James B. Lansing theater woofers (from 100 to 500 cycles through curved horn enclosures); Stephans P-35 theater drivers (used from 500 cycles on up through straight cement horns and James B. Lansing lenses); Ionovac tweeters (filtered in above 500 cycles).

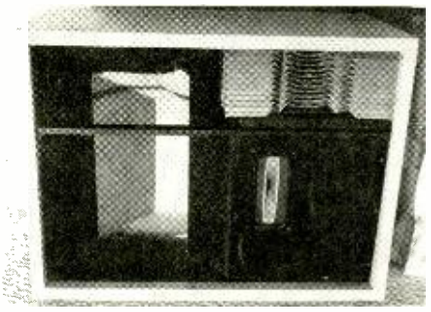


Fig. 2. Front view of speaker system with grille cloth removed.

In my case, the pursuit of realism is a fascinating hobby that not only gives me countless hours of listening enjoyment but in addition serves as an outlet for a natural curiosity. The combination is almost unbeatable as a hobby because each new discovery adds new interest to the listening and the listening leads to new discoveries.

To me, it is a sign of great progress that I can even get close to realism because just one year ago I was almost convinced that it was beyond the reach of present-day equipment. Until that time, I had always assumed that the effect of poor acoustics was, at its worst, only a small difference in brilliance or clarity. One can easily get this impression because music critics often disagree in such subtle terms that it seems as though there is little difference between the acoustics of different concert halls. What I failed to see was the fact that these critics might have agreed, without exception, that the poorest hall was twice as good as my living room.

I have attended concerts at Orchestra Hall in Chicago and marvelled at the non-irritating power and delicate clarity of live music. However, like most dedicated Hi-Fi fans, I assumed that my equipment was incapable of handling all that power without distortion. As a result, I kept on increasing the quality and power-handling ability of my system until I ended up with the equivalent of two theatre sound systems operating under horrible acoustical conditions.

In a way, it was fortunate that I ended up with this big system before I corrected my room acoustics because this made the effects of acoustics extremely obvious. In fact, I could almost see the acoustical principles in operation as the system began to produce the solid feel of live music.

I wasn't seeing anything that couldn't be found as isolated statements in a book on acoustics, it's just that the experts seldom try to explain why acoustics can make the music sound better. Instead, they tend to measure the reverberation times of halls that have received good notice and figure out how to achieve the same sound in the new halls that are built. As a result, I have tried to describe the statements and interpetations that I used to modify my acoustics in the hope that you might be encouraged to try a few experiments in this very important area.

Experiments and Reading

I started out by trying almost every conceivable kind of playback curve but just couldn't get close. On the assumption that some loudness effect was upsetting the playback curve, I tried to play the system louder with no success (and apparent distortions).

A little reading led me to the subject of flutter echoes which can be a problem in rooms with hard walls. It was explained that a flutter echo was simply a sound wave that started bouncing back and forth between two parallel walls until your ear heard the same sound several times in quick succession. Some acoustical experts tie in this effect with the so-called standing wave which is also caused by the repetitive bouncing of sound waves but the waves arrive at your ear so close together that your ear hears them only as a single sound which seems much louder in volume. In any case, it was stated that the echoes could be eliminated by making the walls non-parallel or making one of them sound absorbent to reduce the volume of a given sound before it gets back to your ear a second time.

This was a clue for me. I decided to test the theory by stringing up some old draperies on the wall behind my listening

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Controlling Sound-Reinforcement Systems Automatically

DAVID L. KLEPPER*

Developments in sound-system automatic controls have allowed an increasing number of more complex sound-reinforcement systems to be operated automatically. In other cases, automatic devices further extend the usefulness of sound systems that may or may not require an operator. The following discussion describes some of the available devices.

Limiter and Compressor Amplifiers

Limiter and compressor amplifiers decrease gain when signal strength increases. They have been used to solve the problems of overmodulation and maintenance of signal-to-noise ratio in broadcast transmissions for the past 40 years. Compressors and limiters are somewhat different in operation, although often the same device can be one or the other depending on control settings and the level of the input signal.

* *Bolt, Beranek, and Newman, Inc., 50 Moulton St., Cambridge, Mass.*

An ideal compressor would effect a reduction in gain (as expressed in decibels) proportional, but not equal, to increase in signal strength throughout its operational range. Typically, the gain of the compressor might be 60 db for a –50-dbm signal, 50 db for a –30-dbm signal, and 40 db for a –10-dbm signal. Assuming the dynamic range of the input program was 40 db, we can see that the compressors would "compress" this dynamic range to 20 db. (See *Fig.* 1.)

Instead of compressing the dynamic range, the limiter amplifier attempts to limit the output signal below a predetermined point. An ideal limiter amplifier would provide fixed gain for a range of input signals up to the "threshold" signal. The decrease in gain for input signals above the threshold would be equal to the level of the input signal minus the threshold signal level. Limiter amplifiers generally are not ideal, and their action above the threshold point is similar to that of compressor amplifiers

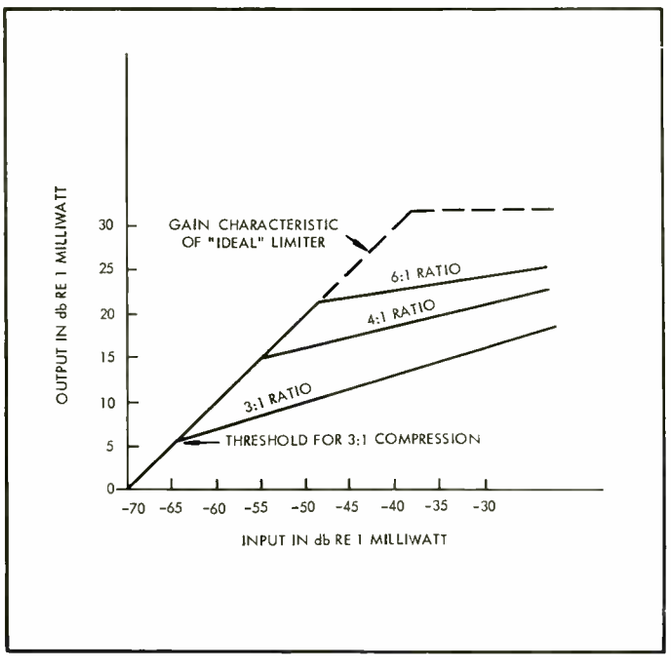


Fig. 1. Input versus output characteristic of RCA BA-25 automatic gain control (Compressor) amplifier with adjustable threshold. At higher threshold settings it approaches limiter action.

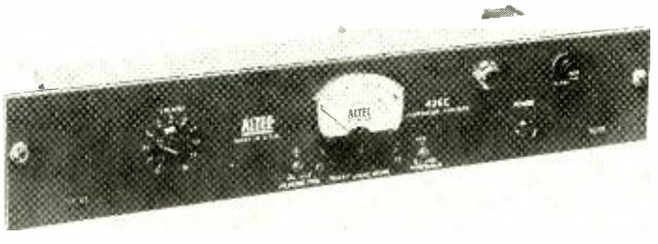


Fig. 2. Typical compressor amplifier, Altec Model 436C.

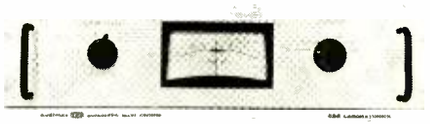
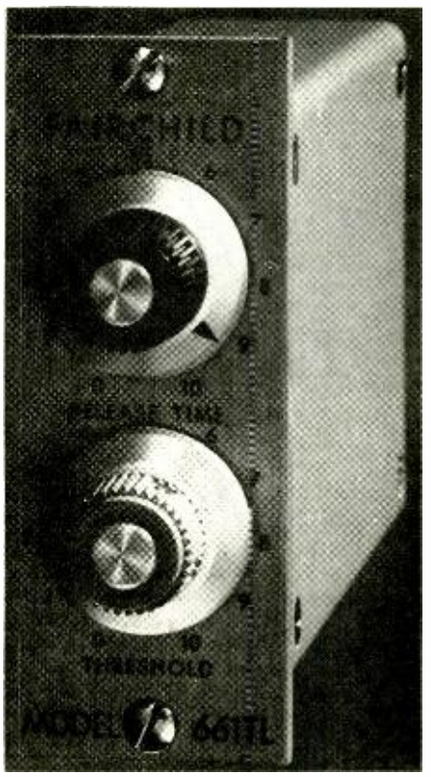


Fig. 3. CBS Laboratories Audimax II.

Fig. 4. Fairchild Model 661TL "Auto Ten."



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A MAJOR BREAK-THROUGH IN SOUND PURITY

. . . BY SHURE

THE SOUND FROM THE NEW SHURE V-15 STEREO DYNETIC® CARTRIDGE WITH ITS REVOLUTIONARY BI-RADIAL ELLIPTICAL STYLUS HAS NEVER BEFORE BEEN HEARD OUTSIDE AUDIO LABORATORIES

by S. N. SHURE, President, Shure Brothers, Inc.

The sound from the new Shure V-15 Stereo Dynetic Cartridge is unique. The unit incorporates highly disciplined refinements in design and manufacture that were considered "beyond the state of the art" as recently as the late summer of 1963. The V-15 performance specifications and design considerations are heady stuff—even among engineers. They probably cannot be assimilated by anyone who is not a knowledgeable audiophile, yet the sound is such that the critical listener, with or without technical knowledge, can appreciate the significant nature of the V-15 music re-creation superiority. It is to be made in limited quantities, and because of the incredibly close tolerances and singularly rigid inspection techniques involved, it is not inexpensive. Perfection never is.

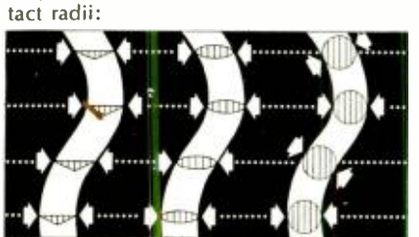
THE BI-RADIAL ELLIPTICAL STYLUS

The outstanding characteristic is that the V-15 Stylus has two different radii . . . hence the designation Bi-Radial. One is a broad frontal plane radius of 22.5 microns (.0009 inch); while the actual *contact* radii on each *side* of the stylus are an incredibly fine 5 microns (.0002 inch). It would be impossible to reduce the contact radius of a conventional spherical/conical stylus to this micro-miniature dimension without subjecting the entire stylus to "bottoming" in the record grooves.

The Shure Bi-Radial elliptical stylus, because of its larger frontal radius of 22.5 microns (.0009 inch), cannot bottom . . . and as you know, bottoming reproduces the crackling noise of the grit and static dust that in practice cannot be eliminated from the canyons of record grooves.

TRACING DISTORTION MINIMIZED

The prime objective in faithful sound re-creation is to have the playback stylus move in exactly the same way as the wedge-shaped cutting stylus moved when it produced the master record. This can't be accomplished with a spherical/conical stylus because the points of tangency (or points of contact between the record grooves and the stylus) are constantly changing. This effect manifests itself as tracing distortion (sometimes called "inner groove distortion"). Note in the illustration below how the points of tangency (arrows) of the Bi-Radial elliptical stylus remain relatively constant because of the very small 5 micron (.0002 inch) side contact radii:



Cutter Elliptical Conical

The Shure Bi-Radial Stylus vastly reduces another problem in playback known as the "pinch effect." As experienced audiophiles know, the record grooves are wider wherever and whenever the flat, chisel-faced cutting stylus changes directions (which is 440 cycles per second at a pure middle "A" tone—up to 20,000 cycles per second in some of the high overtones). An ordinary spherical/conical stylus riding the upper portion of the groove walls tends to drop where the groove gets wider, and to rise as the groove narrows. Since stereo styli and cartridges have both vertical and horizontal functions, this unfortunate and unwanted up-and-down motion creates a second harmonic distortion. The new Shure Bi-Radial elliptical stylus, on the other hand, looks like this riding a record groove:



You'll note that even though it has a broad front face with a frontal plane radius of 22.5 microns (.0009 inch), and it measures 30 microns (.0012 inch) *across* at the point of contact with the groove, the small side or contact radii are only 5 microns (.0002 inch). This conforms to the configuration of the cutting stylus and hence is not as subject to the up-and-down vagaries of the so-called "pinch-effect".

SYMMETRY, TOLERANCES AND POSITIONING ARE ULTRA-CRITICAL

Frankly, a Bi-Radial elliptical stylus, however desirable, is almost impossibly difficult to make CORRECTLY. Diamond, as you know, is the hardest material . . . with a rating of 10 on the Mohs hardness scale. It's one thing to make a simple diamond cone, altogether another to make a *perfectly* symmetrical Bi-Radial stylus with sufficiently close tolerances, actually within one ten thousandth of an inch! Shure has developed unprecedented controls, inspections and manufacturing techniques to assure precise positioning, configuration, dimensions and tolerances of the diamond tip. It is a singular and exacting procedure... unique in the high fidelity cartridge industry. And, unless these inspection techniques and safeguards are used, an imperfectly formed elliptic configuration can result and literally do more harm than good to both record and sound.

THE V-15 IS A 15° CARTRIDGE

The 15° effective tracking angle has recently been the subject of several Shure communications to the audiophile. It conforms to the effective record cutting angle of 15° proposed by the RIAA and EIA and now used by the major record producing companies and thereby minimizes tracking distortion.

The major features, then, of the V-15 are the Shure Bi-Radial Elliptical Stylus, the singular quality control techniques and standards devised to produce perfection of stylus symmetry, and the 15° tracking angle. They combine to reduce IM and harmonic distortion to a dramatic new low. In fact, the distortion (at normal record playing velocities) is lower than the inherent noise level of the finest test records and laboratory measurement instruments! In extensive listening tests, the V-15 proved most impressive in its "trackability." It consistently proved capable of tracking the most difficult, heavily modulated passages at a minimum force of $^3/_4$ grams (in the Shure-SME tone arm). The entire V-15 is hand-crafted and subject to quality control and inspection measures that result in space-age reliability. Precision machined aluminum and a special ultra-stable plastic stylus grip. Exact alignment is assured in every internal detail—and in mounting. Mu-metal hum shield surrounds the sensitive coils. Gold plated terminals. Individually packaged in walnut box. The V-15 is a patented moving-magnet device—a connoisseur's cartridge in every detail.

SPECIFICATIONS

The basic specifications are what you'd expect the premier Shure cartridge to reflect: 20 to 20,000 cps., 6 mv output. Over 25 db separation. 25 x 10^{-6} cm. per dyne compliance. $^3/_4$ gram tracking. 47,000 ohms impedance, 680 millihenries inductance per channel. 650 ohms resistance. Bi-Radial stylus: 22.5 microns (.0009 inch) frontal radius, 5 microns (.0002 inch) side contact radii, 30 microns (.0012 inch) wide between record contact points.

But most important, it re-creates music with a transcendent purity that results in a deeply rewarding experience for the critical ear.

Manufactured under U.S. Patents 3,055,-988; 3,077,521 and 3,077,522. Other Patents Pending.

$62.50 net

SHURE BROTHERS, INC.
222 Hartrey Avenue, Evanston, Illinois

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Fig. 5. Altec noise operated automatic level adjustment (NOALA), Model 7464.

but with a sharper reduction in gain with increases in input signal.

Obviously, in many sound amplification system applications, the compressor or limiter amplifier can replace a human operator. For any particular application, however, we must select the time-constant of operation of the limiter or compressor rather carefully. The time-constant is merely the length of time required for the limiter to change from one gain setting to another. The attack time-constant determines the time of compression, the release time-constant, and time of restoration of gain during a drop in signal level.

In general, compressor amplifiers have been found more useful than limiters in replacing human operators in simple systems, by minimizing changes in level. Limiters are most useful as protective devices, preventing amplifiers or loudspeakers from overloading. A single set of time-constants cannot handle all public address system applications, or even handle different changes within the same application ideally. Imagine a minister standing in front of the pulpit moving slowly back and forth away from the fixed pulpit microphone. To compensate for such movement the compressor amplifier should have a relatively long time-constant, so that the dynamic range and the minister's delivery (which are short-time-variations in signal level) are not affected adversely. The system should merely compensate for his unconscious movement. Then, to emphasize a particular phrase, the minister may suddenly lean forward and shout into the microphone. Now the compressor or limiter should have a relatively short time-constant to prevent the signal from overloading the amplifier and distorting. The well-trained sound-system operator has the variable time-constant "built-in."

Conventional compressors can introduce the following faults into even the simplest sound-amplification system unless care is taken in choosing time-constants, input levels, threshold, and so on:

1. Unwanted pre-emphasis of sibilants (soft-voice consonants), as compared with vowel sounds. (Occasionally this may be highly desirable.)
2. Feedback resulting from increase in system gain during periods of no signal input.
3. Increase in system background noise level during periods of signal input, due to a rise in system gain to the maximum level.

The CBS Laboratories "Audimax II" goes far in eliminating such difficulties. It has a variable time constant which permits no changes in gain during normal variations in speech input level between two established thresholds. A sudden increase in level above the previous long-term peak levels will decrease system gain; similarly a drop in level below the lowest preceding long-term signal level will cause an increase in gain. Speech routed through the Audimax does not "sound" compressed; yet, the compressor is able to restrict unusual level variations. Finally, during periods of no-signal input the device can restore system gain to a predetermined level, avoiding feedback and high-noise levels. The usefulness of this device in replacing a manual sound-system operator in typical church and auditorium sound-amplification systems is just beginning to be explored, possibly because of this unit's greater expense as compared with conventional limiter and compressor amplifiers.

Gated-Gain Amplifiers

Several years ago, the author was requested to design a sound system for the boardroom of an industrial firm. One requirement was that no sound-system operator could be employed. For such applications, a "gated-gain amplifier," one for each microphone input, seemed a satisfactory solution to the problem. A gated-gain amplifier requires input signal to "switch on" the amplifier. With signal input below a predetermined threshold, the amplifier is "off." We have heard of similar applications designed and installed by several sound-system contractors.

Previously, the best approach to constructing a gated-gain amplifier was to modify a conventional compressor amplifier. Today, the Fairchild "Auto-Ten" is available.[1] The Auto-Ten has a variable-release time control. The attack time-constant appears sufficiently short to insure no loss of intelligibility by clipping at the start of a phrase.

(*Continued on page 67*)

[1] This unit can be used as an expander, as a "ducker" (suppressing one channel in favor of another), or even as a compressor by suitably modifying or adding to the circuitry.

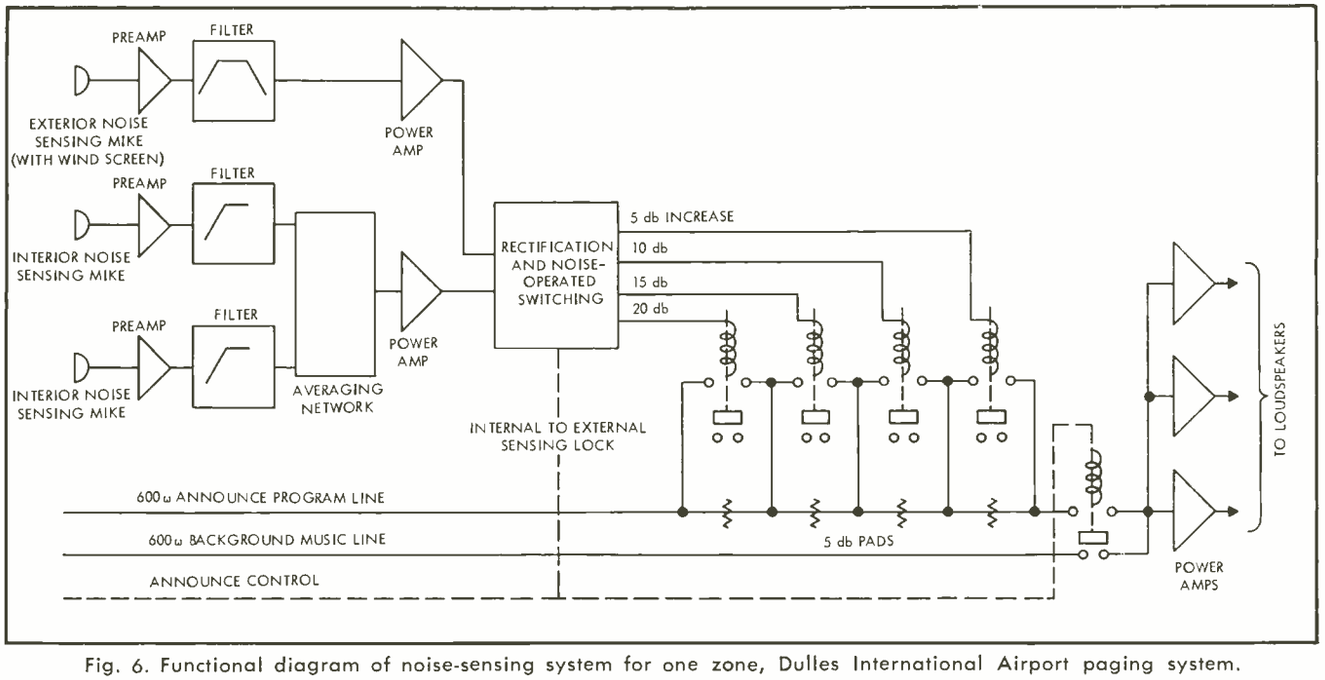


Fig. 6. Functional diagram of noise-sensing system for one zone, Dulles International Airport paging system.

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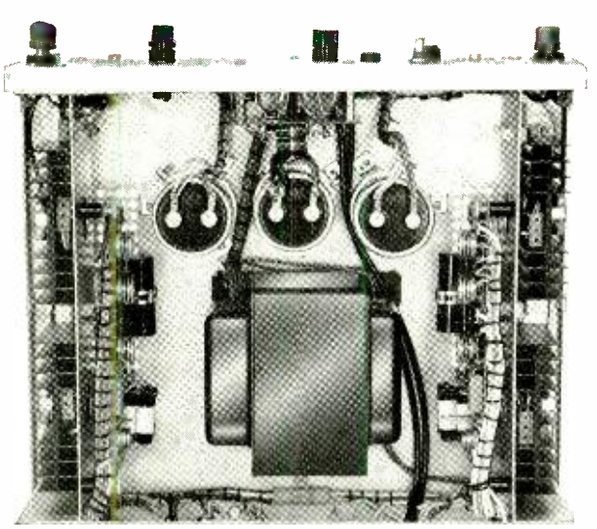
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Electrolytic capacitors: engineered to computer-grade specifications for unlimited shelf life and consistent, long-term performance.



"Heat sink": heavy-duty finned aluminum device which rapidly draws heat away from output transistors—insuring long life, fail-safe performance.

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A Ribbon Microphone for Stereo

E. R. MADSEN*

The author presents the argument that ribbon microphones are better suited for M-S stereo than other types of microphone due to their phase characteristics.

This article is not intended as an investigation of the general pros and cons of ribbon versus other types of microphones, nor a justification of the ribbon microphone. Instead, I want to discuss a specific problem of stereophonic transmission of information and how the ribbon microphone has a unique advantage for stereophonic use.

There are two approaches in the recording or transmission of stereophonic information: one system, which I will call the A-B system, in which the A channel carries information from one side of the sound source and the B channel carries information from the other side; there is another type which is referred to as the M-S system, in which the M channel contains A + B information and the S channel contains A – B information. The use of the M-S system is predicated on the idea that the A and B channels can be recovered from the M and S information by the usual matrixing techniques. This system imposes certain limitations on recording in that spaced multiple microphones cannot be used.

Until recently, the choice of the A-B or the M-S system was an arbitrary one which could be made to fit the available equipment. Now, however, it is essential that all stereophonic recording and transmission use either the M-S technique or an A-B technique which is convertible to M-S. The necessity for this lies in the FCC choice of a stereo multiplex system which uses an A + B signal on the normal monophonic transmission and an A – B signal on the subcarrier. One of the FCC stipulations was that the sound quality for the monophonic listener must not be degraded. Both direct broadcasts and playback of stereophonic tapes and discs can furnish a combined A + B signal to the listener. The quality of this combined signal must be satisfactory for the system to be acceptable to the vast majority of listeners who have monophonic equipment. Unfortunately, the A + B signal is not always a satisfactory one. It requires suitable microphone type and placement to be able to combine the A and B signals.

There are several ways to get a suitable M (A + B) signal: Different types of microphones lead to an M signal with different replacements. For example, the figure-S patterns of two

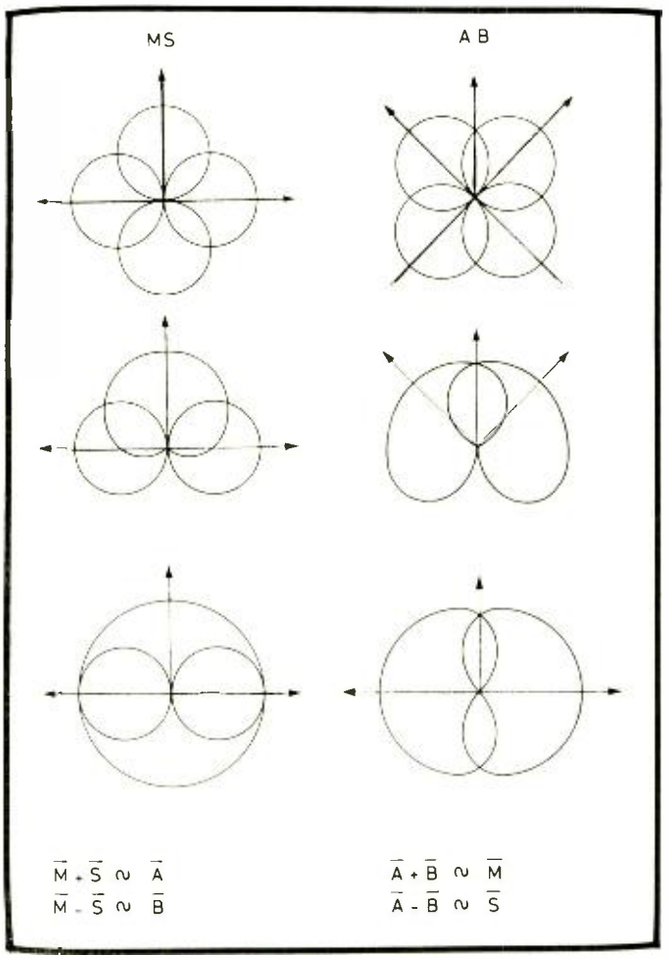


Fig. 1. Various combinations of microphone patterns which can add up to the M-S or A-B signals.

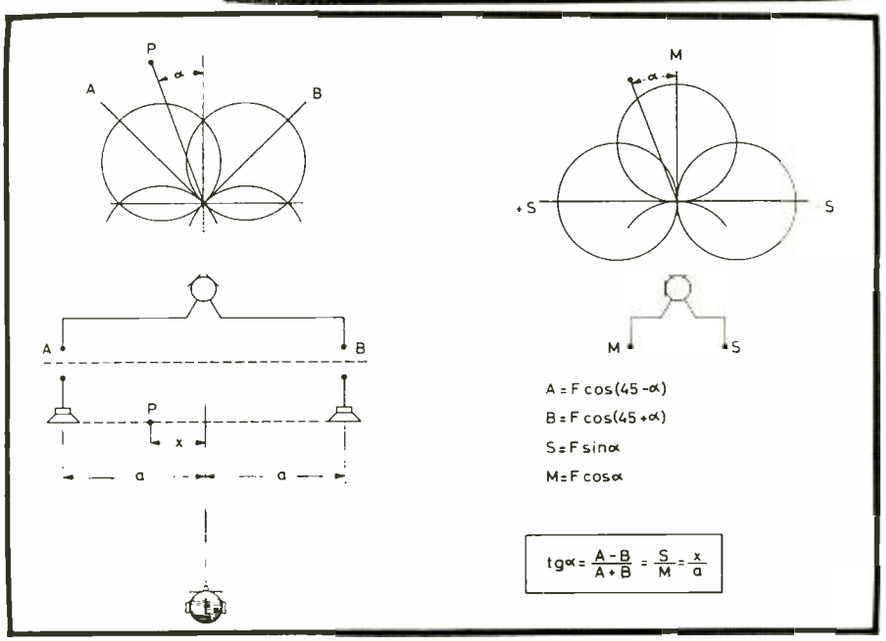


Fig. 2. Basic analysis of stereophonic transmission.

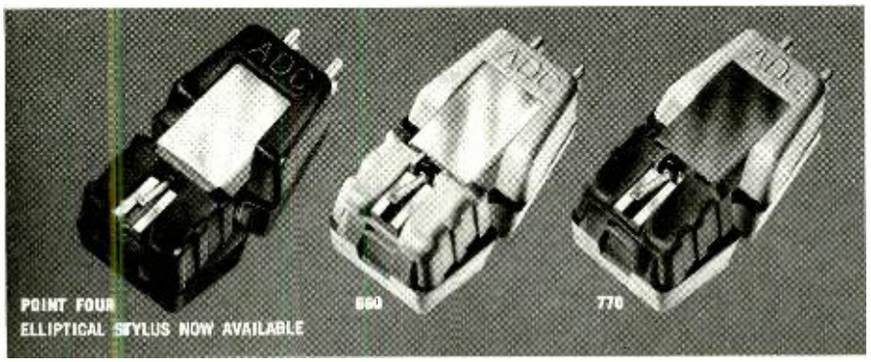
* *Bang & Olufsen, Struer, Denmark.*

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What are the characteristics of the ideal stereo phonograph cartridge? Recording engineers and equipment manufacturers are in agreement here. Distortion will be eliminated only when the cartridge can trace the exact shape of the record groove and reproduce its exact electrical analogy. What changes must be made to free the stylus for precise tracing are now also known. As to the manner in which these changes are to be achieved, experts are less optimistic. They say, **"Not today, but years hence."**



Stylus mass they hold, will have to come down. Not another shade or two, but drastically. **Compliance** will be concomitantly increased. Not refined slightly, but brought to a new order of magnitude. And there is more reason than ever to insist on adherence to a standard **vertical tracking angle.**

The low-mass, high-compliance cartridges will permit exceptionally low tracking forces. Only then will we have truly flat response beyond the limits of the audio spectrum, free of resonant peaks and dips. Record wear and distortion will at last be brought to the point where they are truly negligible.

WHAT ADC HAS DONE

These conclusions were the starting point some time ago for ADC, not the end. We knew that marginal upgrading of existing designs would not bring us within reach of the ideal goals. We faced the need for boldness in seeking completely new solutions. From this decision came the concept of the INDUCED MAGNET TRANSDUCER. In short order we had prototypes of this new class of magnetic cartridge which shattered old technical limitations. What followed were three startlingly new cartridges that incorporated this principle: the ADC Point Four, recommended for manual turntables; the ADC 660 and 770, recommended for automatic turntables and record changers — **NOT YEARS HENCE, BUT TODAY.**

YEARS AHEAD PRINCIPLE, TODAY

How do ADC cartridges using the new principle measure up to the "years ahead" goals? **"Significantly reduced mass"** was the key advantage, we said — months before the spotlight was turned on this factor. The use of a fixed magnet, separate from the moving system, inducing its field into an armature of extremely light weight, slashed mass to "half or less than that of systems previously regarded as low-mass designs." The tubular, aluminum stylus arm or cantilever connected to the stylus to move this negligible mass was made even lighter. We were then able to match this low mass with a suspension of **exceptionally high compliance.**

As to stylus tracking force, we have suggested a minimum of 3/4 gram. But we have tracked the Point Four perfectly at 1/2 gram. The chief problem here is the ability of available tone arms, not of the cartridge. The physical arrangement of elements, using the new INDUCED MAGNET principle, brought other gains. "The remote position of the magnet with respect to the main structure," we said, "ensures freedom from saturation and hysteresis distortion—serious effects that are beyond control by conventional shielding."

As to the **vertical tracking angle,** we noted that "obtaining the now established tracking angle of 15° is no problem" with the pivot point of the arm brought close to the record surface by the new physical configuration.

OTHER ADVANTAGES OF THESE NEW CARTRIDGES

These are not the only virtues of the new Point Four, the 660 and the 770 which employ the INDUCED MAGNET principle. There is the exceptional ease of stylus replacement by the user. There is the self-retracting stylus that protects itself and your records. There is the difference in sound that you MUST hear for yourself. There are others. We stress a few of the many virtues only because they involve factors designated for an idealized cartridge of the future. And we ask you to compare the ADC cartridges AVAILABLE TODAY with these eventual goals. We believe you'll agree that these are the most advanced cartridges available anywhere. We can only hope that you try them with equipment that will do them justice.

SPECIFICATIONS	ADC POINT FOUR*
Type	Induced magnet
Sensitivity	5 mv at 5.5 cms/sec recorded velocity
Channel Separation	30 db, 50 to 8,000 cps
Frequency Response	10 to 20,000 cps ± 2 db
Stylus tip radius*	.0004" (accurately maintained)
Vertical tracking angle	15°
Tracking force range	3/4 to 1½ grams
I.M. distortion	less than 1%—400 & 4,000 cps. at 14.3 cms/sec velocity
Compliance	30 x 10^{-6} cms/dyne
PRICE	$50.00

SPECIFICATIONS	ADC 660
Type	Induced magnet
Sensitivity	7 mv at 5.5 cms/sec recorded velocity
Channel Separation	30 db, 50 to 8,000 cps
Frequency Response	10 to 20,000 cps ± 3 db
Stylus tip radius	.0007" (accurately maintained)
Vertical tracking angle	15°
Tracking force range	1½ to 4 grams
I.M. distortion	less than 1%—400 & 4,000 cps. at 14.3 cms/sec velocity
Compliance	20 x 10^{-6} cms/dyne
PRICE	$46.50

SPECIFICATIONS	ADC 770
Type	Induced magnet
Sensitivity	7 mv at 5.5 cms/sec recorded velocity
Channel Separation	25 db, 50 to 8,000 cps
Frequency Response	10 to 18,000 cps ± 3 db
Stylus tip radius	.0007" (accurately maintained)
Vertical tracking angle	15°
Tracking force range	2 to 5 grams
I.M. distortion	less than 1%—400 & 4,000 cps. at 14.3 cms/sec velocity
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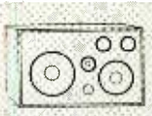
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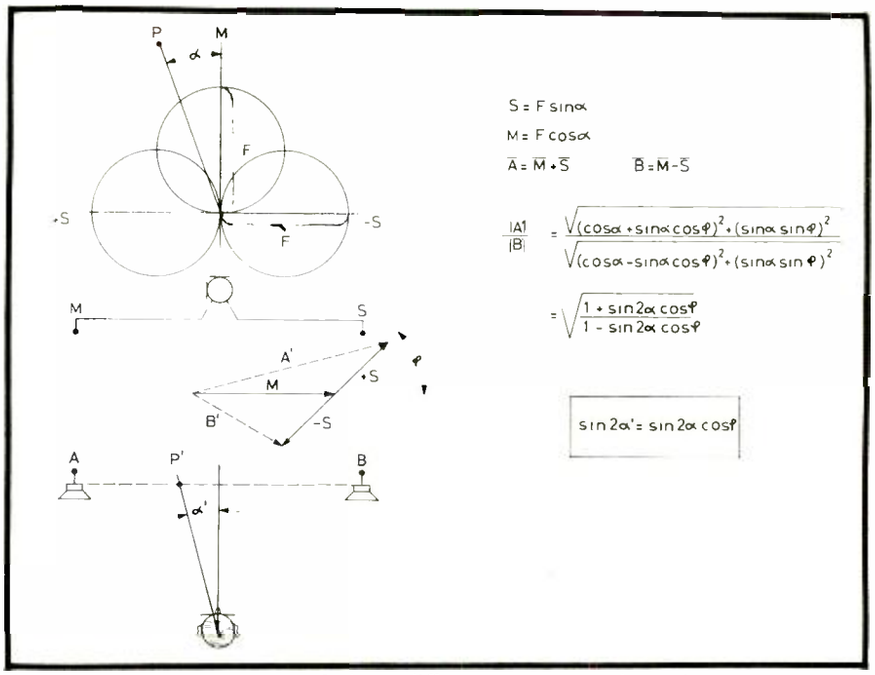


Fig. 3. Effect of phase difference between channels.

velocity microphones can be crossed. Also two cardioid patterns can be used. The first of these methods gives either M-S or A and B signals, the second an A and B signal which can be combined by addition and subtraction to get M and S signals, where the M is fully compatible for monophonic use, and the S contains the directional information for stereo.

It is also feasible to combine a pressure-gradient microphone or a cardioid microphone with a velocity microphone. The former gives the M information, and the latter the S information. The A and B channels are obtainable by dematrixing. (See *Fig.* 1.)

Which Is Best?

Which of these methods will give the best results in terms of compatibility for mono and stereo?

It is evident that the phase characteristics of the microphones must be important when the signals are combined electronically. For example, a 180-deg. phase reversal of one channel in an A-B system is noticeable to some listeners, but is not always distressing and not always detected. However, a 180-deg. phase shift in one channel with an M-S system leads to cancellation of all monophonic information. Thus, it is obvious that phase makes a big difference in electronic combination of signals while it is of lesser importance in auditory combination of signals.

It is necessary, therefore, to use M and S microphones with identical phase characteristics. Similarly, if the recording is made in A-B fashion to be matrixed later, the same requirement for identical phasing exists. Further, the microphones must have phase characteristics independent of the angle of incidence of the sound source if proper localization of the source is required at the point of playback. In addition, the two microphones should occupy the same point in space. This cannot be done in practice, of course, but a good compromise is obtained by placing them axially, one over the other, and as close as possible.

A phase displacement of 90 deg. between the M and S channels will cause a shift from one side to the center between the loudspeakers when the A and B signals are reconstructed. Since the relationship between the M and S and A and B is reflexive (either is obtained by the same arithmetic applied to the other), the same effect is obtained whether M and S are derived by matrixing the A and B signals or by recording direct M and S information through ap-

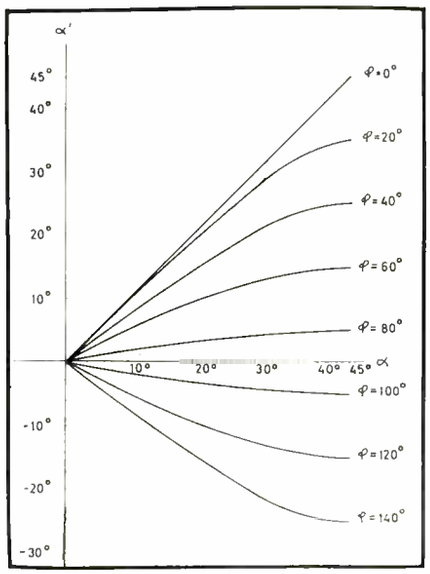


Fig. 4. Relationship between α and α' with different angles.

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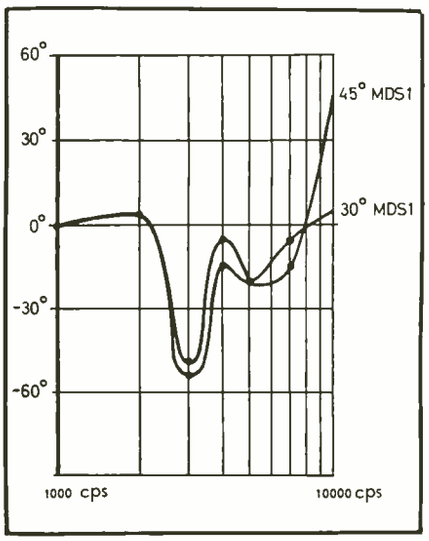


Fig. 5. Phase characteristic of a commercial stereo microphone with two dynamic elements.

propriate microphones. Thus a phase difference in the microphones will cause a mislocation of the playback sound relative to the original.

Figure 2 shows the basic principle of stereophonic transmission. The relationship of observer, loudspeakers, and apparent location of sound source is described by the equation

$$\tan a = \frac{S}{M} = \frac{A-B}{A+B} = \frac{x}{a}$$

a is the angle between the sound source and the symmetry axis of the microphones; x is the distance from the apparent sound source to the symmetry line between the loudspeakers: a is half the distance between the loudspeakers. The relationship is simplified by assuming that the loudspeakers subtend a 90-deg. angle from the observer.

If there is a phase difference, ϕ, between channels (see *Fig.* 3), there will be a change from a to a^1 when we change from the A-B system to the M-S system or vice versa. This change is described by the relationship:

$$\sin 2a^1 = \sin 2a \cos \phi$$

Figure 4 shows the relationship between a and a^1 with ϕ as parameter. At higher values of phase difference, the displacement of the apparent sound source is very great. It is necessary to limit the phase difference between microphones to 20 deg. if correct illusion is to be preserved.

This immediately eliminates certain types of microphones for suitability for stereo use, either for M recording directly or for matrixed A + B recording. Microphones which exhibit a phase change for different angles of incidence and/or for frequencies will introduce problems of position displacement in stereo usage when the signals are combined electronically. All cardioid microphones which are *acoustically* adjusted to obtain their pick-up pattern including dynamic, ribbon, and condenser types must be considered unfit for stereo use by this standard. All of these have unsuitable phase characteristics.

Figure 5 shows the phase characteristic of a commercial stereo microphone which is made up of two dynamic microphones.

Figure 6 shows the phase characteristic of an acoustically adjusted condenser microphone with cardioid pattern.

Again, I must repeat that if only an A-B system is used, the ear is not sensitive to these phase variations and does not hear misplaced position of sound sources due to phase differences in the microphones. However, if there is an A + B combination of the signals such as is encountered in multiplex stereo broadcasting, these phase differences will alter the stereo effect. Some strange effects may be encountered when the phase characteristic changes with the angle of incidence of the sound on the microphone; in such cases, a solo instrument may seem to move to and fro as if the soloist dances about while he plays.

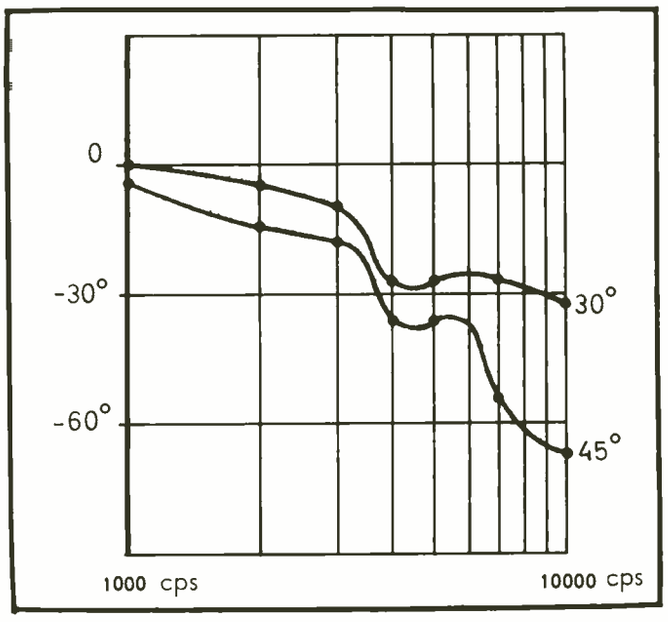


Fig. 6. Phase characteristics of an acoustically-adjusted condenser microphone with cardioid pattern.

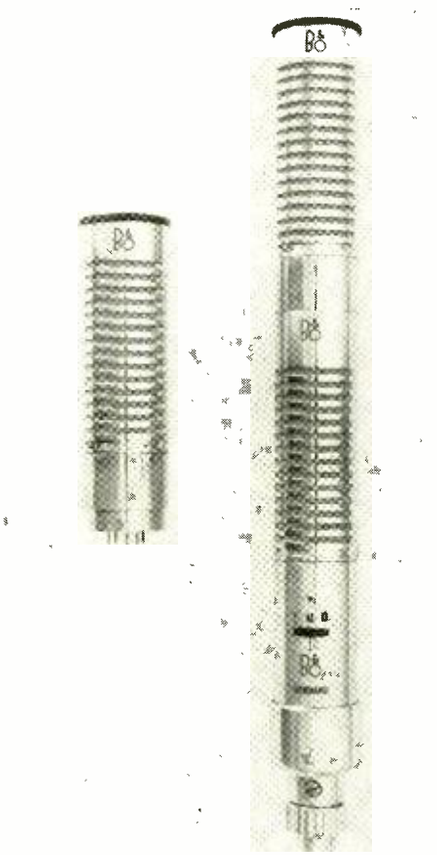


Fig. 7. The B & O Model 200 dual ribbon microphone.

It is possible to obtain a cardioid pattern suitable for A + B recording, but it is expensive. The double membrane type of a condenser microphone which is electrically adjusted has a suitable phase characteristic. However, an ideal phase characteristic is obtainable in a ribbon microphone at far lower cost. The ribbon microphone does not change phase with change in angle of incidence of the sound. The directional characteristic of the ribbon microphone is almost exactly the theoretical requirement as described in a paper which I gave five years ago.[1]

A Dual Ribbon Microphone

Two identical ribbon units at a 90-deg. angle can be used for either A-B use or M-S use with only a 45-deg. rotation to change from one mode to the other. I want to describe a new microphone which uses this arrangement and includes some convenient features for the recording or broadcasting engineer, particularly the user who does work with both monophonic and stereo sound.

(*Continued on page 66*)

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Freedom of Speech, Sound Trucks and the Constitution

ALBERT WOODRUFF GRAY*

Sound trucks are required to take a "middle-of-the-road" course by recent Supreme Court decision.

WHEN A CALIFORNIA labor union sought to publicize the payment of substandard wages by some employers in the Palm Springs area of that state and of substandard working conditions they attempted to supplement the distribution of printed pamphlets with sound trucks.

That city has an ordinance that provides, "Sound amplifying equipment shall not be operated unless the sound truck upon which such equipment is mounted is operated at a speed of at least ten miles per hour, except when said truck is stopped or impeded by traffic. When stopped by traffic the sound amplifying equipment shall not be operated for longer than one minute at each such stop."

There it is also further provided that the volume of sound shall be controlled so that it will not be audible for a distance in excess of 200 feet from the sound truck and the volume of sound shall be so controlled that it will not be unreasonably loud, jarring, disturbing or a nuisance to persons within the area of audibility.

At the outset of its decision that this ordinance was unconstitutional and unenforceable the Supreme Court of that state in this decision said,

"To resolve the stated problem we must answer two questions. First, does the freedom of speech guaranteed by the First Amendment, which admittedly applies to the content of the communication, extend as well to the means of communication? More particularly does it include sound trucks?

"Second, if so, does the section in question exceed the permissible range of regulations so as to impinge on constitutionally guaranteed rights? For reasons hereinafter set out we believe that both of these answers should be in the affirmative."[1]

Its conclusion that the ordinance here in question was unconstitutional and void the court rested on two recent decisions of the U. S. Supreme Court that have served to resolve controversies of this character, one in New York and the other in New Jersey.

In the New York case a minister of Jehovah's Witnesses challenged the validity of an ordinance of Lockport in that state that, "It shall be unlawful for any person to maintain and operate in any building or on any premises or on any automobile, motor truck or other motor vehicle any radio device, mechanical device or loudspeaker or any device of any kind whereby the sound therefrom is cast directly upon the streets and public places and where such device is maintained for advertising purposes or for the purpose of attracting attention of the passing public or which is so placed or operated that the sounds coming therefrom can be heard to the annoyance or inconvenience of travelers upon any street or public places or of persons in neighboring premises.

"Exception. Public dissemination through radio loudspeakers of items of news and matters of public concern and athletic activities shall not be deemed a violation of this section provided that the same be continued upon permission from the Chief of Police."

Charges were made against the minister that he had violated this ordinance by operating an automobile equipped with a radio device and loudspeaker for the purpose of attracting the attention of the public. Also that he had failed to obtain a permit so to do. When this man's conviction was sustained by the highest court in that state he carried the controversy to the U. S. Supreme Court.

That court vacated the conviction. It said of loudspeakers and efforts of this sort to restrict such activities, "Loudspeakers are today indispensable instruments of effective public speech. The sound truck has become an accepted method of political campaigning. It is the way people are reached. Must a candidate for Governor or Congress depend on the whim or caprice of the Chief of Police in order to use his sound truck for campaigning?

"Must he prove to the satisfaction of that individual that his noise will not be annoying to the people? The present ordinance would be a dangerous weapon if it were allowed to get a hold on our public life. Noise can be regulated by regulating decibels. The hours and places of public discussion can be controlled. But to allow the appeals to bar the use of loudspeakers because there can be an abuse in their use is like barring radio receivers because they do make a noise.

"The police need not be given the power to deny a man the use of his radio in order to protect a neighbor against sleepless nights. The same is true here. Any abuses which loudspeakers create can be controlled by narrowly-drawn statutes.

"When a city allows an official to ban them in his uncontrolled discretion it sanctions a device for suppression of free communication of ideas. In this case a permit is denied because some persons were said to have found the sound annoying. In the next one a permit may be denied because some people found the ideas annoying. Annoyance at ideas can be cloaked in annoyance at sound. The power of censorship inherent in this type of ordinance reveals its vice.

"Courts must balance the various community interests in passing on the constitutionality of local regulations of the character involved here. But in that process they should be mindful to keep the freedoms of the First Amendment in a preferred position."[2]

Only a few months after this decision was made another controversy involving the same features came before the court. There however, the validity of the ordinance that had been adopted in Trenton, New Jersey was sustained by the same court.

By this ordinance it was provided, "It shall be unlawful for any person, firm or corporation, either as principle, agent or employee, to apply, use or operate for advertising purposes or for any other purpose whatsoever, on or upon the public streets, alleys or thoroughfares in the City of Trenton, any device known as a sound truck, loudspeaker or sound amplifier or radio or phonograph with a loudspeaker or amplifier, or any other instrument known as a calliope or any instrument of any kind or character which emits therefrom loud or raucous noises and is attached to and upon any vehicle operated or standing upon said streets or public places aforementioned."

When the controversy over this ordinance reached the United States Supreme Court it was held valid and enforceable. In sustaining this ordinance that court held that the avowed and obvious purpose of the ordinance was to prohibit or minimize such sounds on or near streets since some citizens found the noise objectionable and to some degree an interference with the business or social activities in which they are engaged or the quiet that they would like to enjoy.

Then of the adjustment of these opposing features the court said that the solution was difficult. Those who desired to broadcast can hardly acquiesce in a requirement to modulate their sounds to a pitch that would not rise above other street noises nor would they deem a restriction to

(*Continued on page 73*)

* *40 Washington Street, East Orange, New Jersey.*

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A Basic Course in Commercial Sound

NORMAN H. CROWHURST

CHAPTER I

When you are called in to install, or to estimate on installing, a commercial sound system, one aspect of the problem is simple: you start at the end and work back. By that, I mean that the first thing to decide upon is how many of what speakers to use and where to put them. In audio, this is the output end of the system. Beyond this "simple" fact, the decision is considerably less simple; you need to carry along a number of 'hats.'

The basic problem is always the same: you have to serve an audience, or the area an audience will occupy, with sound; but the way in which this can best be done can vary all the way from using one speaker for the entire audience, maybe of thousands, to using one speaker for each individual member of the audience. The desired compromise, of course is usually somewhere between these extremes.

The main differences in basis for choice rest on: (1) the shape and furnishing of the audience area; (2) the kind of program they need to hear; (3) some "decorator" limitations about where speakers *can* be put.

The Sound Man Is an Expert

This is why you, as an expert, must be able to carry these requisite 'hats': (1) architectural acoustician; (2) audiometry expert; (3) diplomat! It's gratifying to know that no single individual is likely to be proficient in all these areas at the outset, so you have as good a chance as the next man of learning to wear all the hats effectively. Most of it amounts to plain common sense and the first thing is to be sure of the essential facts involved.

There is no substitute for experience. So, while you're learning, try to find someone else's experience to lean on. If there is no experienced acoustical expert to rely on, the books "*Acoustics*" by Beranek and "*Acoustical Engineering*" by Olson are the industry standards. But you need some experience at least before you can interpret them intelligently in terms of a practical installation.

Many installations, made by professional, or semiprofessional people, are so poor they give the impression that almost anyone could have done better. This most often happens because acoustic checks and measurements leave so much to subjective judgment, which can easily become a matter of wishful thinking. The man who did the job thought it ought to work, so to his ears it does!

Never disregard a comment by someone you regard as a layman. If he says sound is bad in a certain spot, believe he has some trouble. He may be unduly hard of hearing (which is usually obvious in talking to him), or he may experience difficulty for reasons you don't notice immediately. The sound may be loud enough to hear, but not intelligible enough to understand. It is your job to make it intelligible. You are the expert. If you don't know what to do, you'd better find out. We will help you as you follow this course. Meanwhile, don't tackle the more difficult jobs until you've gone through most of this course at least. The simpler ones you may tackle quite soon.

Let's suppose you walk into the place to be installed, to look it over. It may be an outdoor arena or baseball park, an indoor arena or auditorium, a theater, a restaurant of one kind or another, or a church.

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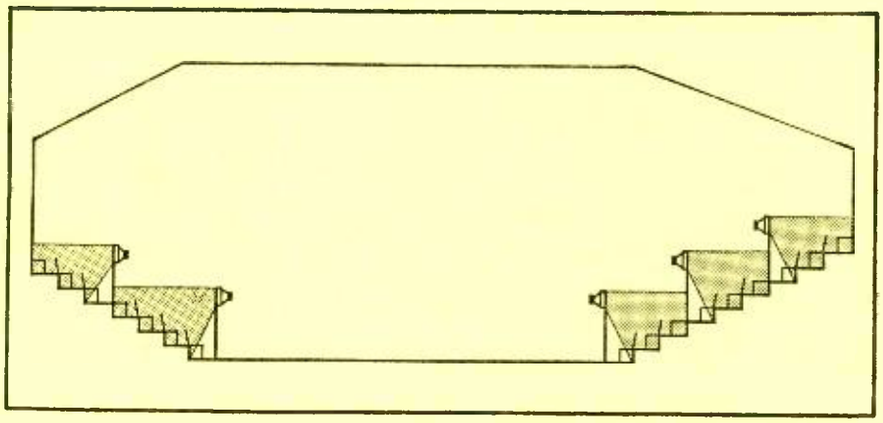


Fig. 1-1. Treatment in a highly reflective place, with relatively small audience space, such as a swimming pool, requires speakers to serve very small segments of the audience.

Those are relatively big, single-audience areas. Then it may also be a collection of offices and/or workshops—and you'd be surprised how many variations can exist in each of these possibilities. Even the single category of "hotel room" can vary quite widely. There are no "rules of thumb" which can substitute for going to the location and getting the "feel" of the place.

Regardless of the kind of installation, the first thing is to decide how it *should* be done, then to consider how it *can* be done. You are indeed lucky if these are the same! Previously we mentioned two extremes: using one speaker for everyone, and giving everyone an individual speaker. The first represents volume coverage—the whole volume of the auditorium or audience space is filled with sound; while the second represents area coverage—sound is only at audible level in the area occupied by the audience, not the whole space surrounding them.

Indoor Swimming Pools

Suppose you have a large indoor swimming pool, or sports arena, where all the surfaces are hard—tile, glass, bare wood paneling (painted, but not otherwise covered), and so on, and the audience occupies a relatively small part of the total space. A single loudspeaker with not too much power fed into it will fill the space with sound quite effectively, because the sound bounces around and has no way out; but it will not be intelligible. In this kind of situation, you have to avoid filling the volume with sound, to avoid the confusion of countless echoes and re-echoes.

While individual speakers for every member of the audience may not be practical—too expensive—this is the direction we have to think along: sound must be fed to the audience *area*, taking care not to fill the entire *volume* (*Fig.* 1–1). In indoor swimming pools, practically all surfaces are hard (to sound), which means avoidance of echo is very difficult, because wherever sound hits, it will bounce. The use of many speakers, close to individual groups of listeners and operated with very little individual power, is the only answer.

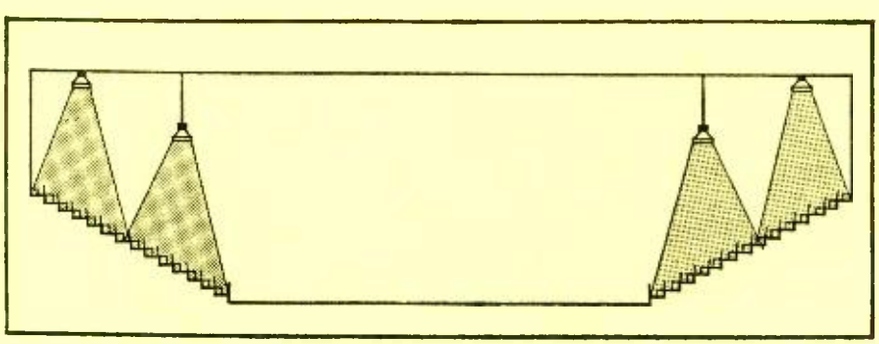


Fig. 1-2. The sports arena, a type of building with larger proportion of audience space, but still highly reflective, can use this approach, regarded as 'illuminating the audience with sound.'

Sport Arenas

More generally in this type of building, a considerably larger part of the floor area will be occupied with audience, so the solution changes. Audiences are about the best acoustic absorption there is. The thing to avoid here is directing sound at reflecting surfaces. It is a good idea to think of the speakers as lights (*Fig.* 1–2), where you have to "light" the audience, without "lighting" any of the hard surfaces. This comes close to area distribution, without needing quite so many speakers for a given number of audience as the type shown in *Fig.* 1–1.

Theaters

At another extreme is the theater auditorium (*Fig.* 1–3). Here one usually wants to fill the place with sound—volume distribution, with one or two speakers mounted over, under, or beside the stage. The acoustic design of most theaters will absorb excess sound that would cause echo, and sound is just "pumped in" until everyone can hear. Some modern theaters have controlled reflections and require area treatment rather than volume.

Sometimes this kind of installation will need extra speakers for a different reason from that just discussed—because there is too much absorption (rather than not enough) in certain parts. For example, under a balcony (*Fig.* 1–4). Here sound

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goes out and fills the main body fairly uniformly, but the piece under the balcony (and perhaps over it, too, in some theaters) is fed through a rather narrow "slot," behind which the space opens out again. This is a natural sound attenuator and will often require augmenting speakers to keep the sound level adequate in the extension areas.

Whether or not such augmentation is necessary, or even advisable, depends on the degree of absorption surrounding the area. Unless it is fairly serious, the extra speakers may even spoil a good installation. To be successful, the extra absorption must be sufficient for the additional speakers not to be heard from rows immediately in front of them (*Fig.* 1–5), while the sound from the main speakers is too low to be heard above the level at which the auxiliary speakers are operated, behind them. The building construction and furnishings must be such as to produce considerable attenuation of sound from one space to the other, for this arrangement to work without producing an artificial "echo" effect.

In cases like this, use of directional speakers may help—as it also will in the highly-reflective buildings we discussed earlier. But remember that no speaker is 100 per cent directional. It does not put all its sound in one direction and none in the unwanted directions; it just puts more of the sound where it's wanted and less where it isn't.

Churches

Traditional churches, with high, vertical walls and a vaulted ceiling, are difficult problems for the sound man, while the modern ones, with shapes according to the whim of the architect, can produce as wide a variety of cases as any other type of auditorium. In all religious buildings, one must be more diligent with all one's hats. Sound reinforcement must be unobtrusive both visually and audibly. As far as possible, it must not be seen nor heard. It may sound odd to say that a sound system must not be heard, but it's true.

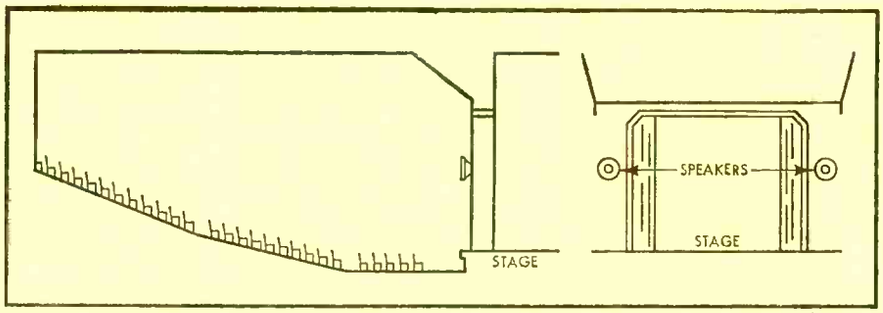


Fig. 1-3. A theater with plenty of acoustic absorption can be treated on the 'volume' concept—by filling the space with sound.

Of course the sound must reach the audience, so they can hear the program, music or sermon, but they must not be conscious that they are hearing it through a sound system. The illusion should be that they are hearing the sound directly. We'll come back to this, after we've covered some of the simpler kinds of problem.

Reinforcement or Relay

So much for the single auditorium in its various ramifications. While we have not so specified, all these require sound reinforcement. By this we mean that the original sound source is in the same "room": it has to be picked up by a microphone, amplified, and conveyed to an audience by means of speakers, *still in the same room.* Occasionally, the system will be called upon to carry recorded or radio program material but these uses are incidental as a rule, and certainly much easier than the reinforcement job.

In the multi-room jobs, the function of the sound system is relay. It has to pick up sound in one room and relay it to another. In the reinforcement job, there is an acoustic feedback problem: the speakers may feed back sound to their own microphone, so the amplifiers reamplify it, until a howl sets up. In the multi-room job, this problem is absent.

Here the need is to obtain coverage in each room to be served, at the correct level—neither too loud nor too quiet. In a noisy

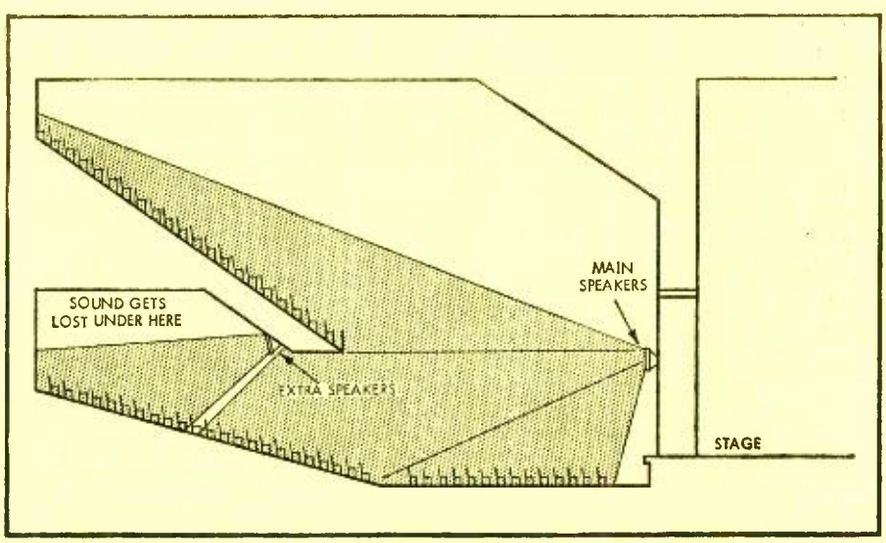


Fig. 1-4. A need for auxiliary speakers that sometimes occurs in theater installations.

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shop, the problem may be to get sound loud enough—or close enough—to be audible above a shattering background. In a quiet office, it must be audible, which presents little difficulty in this location, without being loud enough to startle or shatter.

That's a very quick introduction to the over-all picture of commercial sound installation and many of the kinds of problem you will meet. In later installments of this series, we shall get into the discussion of how to tackle the various detail aspects of them all. Before we leave the matter here, however, we should recapitulate the main problems for which we have to be on the look out. They are:

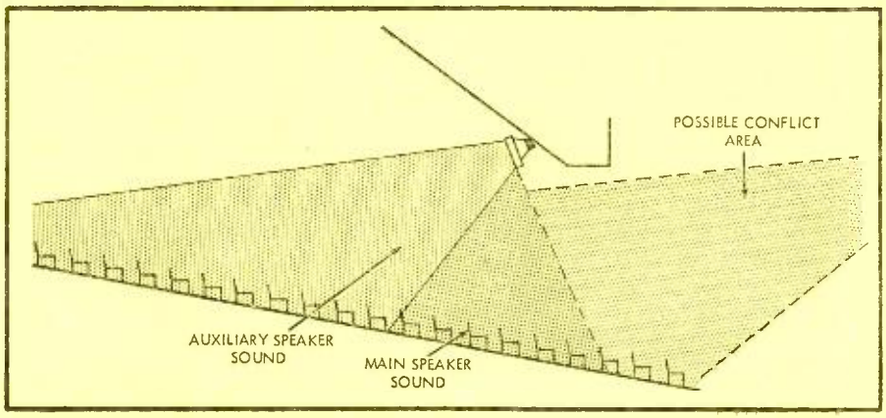


Fig. 1-5.A possible difficult area when auxiliary speakers are used as in Fig. 1-4.

(1) reverberation — sound bouncing around a building;

(2) acoustic feedback—the howl set up when speakers feed back to their own microphone;

(3) background noise—extraneous noise that the system has to "shout down" to make itself heard; and

(4) acoustic absorption—loss of sound, because the furnishings are too absorbent in places.

Questions—Chapter I

Now, some of these problems can occur together and others cannot. Mark the following pairs with yes or no, according to whether it is possible you may have both troubles in the same installation:

(a) reverberation and acoustic feedback

(b) reverberation and background noise

(c) reverberation and acoustic absorption

(d) acoustic feedback and background noise

(e) acoustic feedback and acoustic absorption

(f) background noise and acoustic absorption.

Now look to the right for the correct conclusions on these points.

Answers—Chapter I

(a) Yes, they certainly can occur together, although often one problem may be more severe than the other.

(b) Yes, these can occur together, although it is not so usual. Reverberation is more commonly a problem in sound reinforcement, while background noise affects relay more often. However, sound reinforcement can also be rendered difficult due to unwanted background noise, such as from a nearby airport or railroad sidings.

(c) No, these two are opposite extremes. They may occur in different *parts* of an installation, but never together.

(d) Yes, these can quite commonly occur together. Often the background noise may be sufficient to prevent the acoustic feedback being heard until it's a really loud howl, which can aggravate the combined effect of the problems.

(e) Yes, although this is much less likely. High degrees of absorption are usually a good protection against acoustic feedback, but a howl can still occur, if proper care is not exercised.

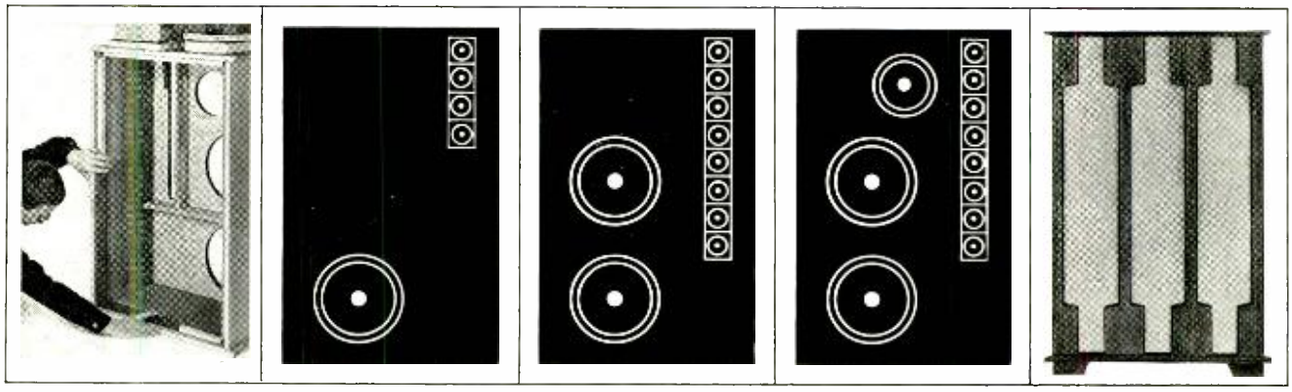
(f) Yes, although again, this is an unlikely combination, in most instances. The treatment that provides acoustic absorption will usually also absorb background noise to a satisfactory level, where it ceases to be a serious problem.

If you answered 'no' to questions (b), (e) or (f), this is not a serious error. The other questions should have been answered correctly. Now, before the next installment, give some thought to what equipment you will need to check out some of these properties. Can you judge background noise by just listening to it? Is a noise meter an absolute necessity, or can you find a way of using something you may already have as an alternative? And how do you judge the best way to get reasonably uniform distribution of sound to an audience? We'll take up these questions in our next installment.

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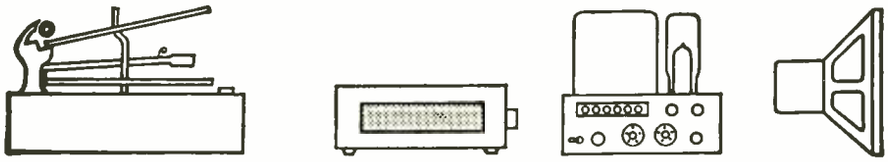
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EQUIPMENT PROFILE



UHER 4000 REPORT-S PORTABLE RECORDER

"Magic in a matchbox" might well be the slogan of this little instrument, even though "matchbox" may be some exaggeration. We do, however, have a cigar humidor which is larger.

Picture, if you will, a neat case 3⅛-in. high, 10½-in. long, and 8½-in. deep, which will record at your choice of four speeds with its self-contained battery for eight hours, will play back through its own speaker, or will furnish one watt of power to an external speaker, will accommodate inputs from phono, radio, or microphone, and has such refinements as an illuminated recording-level meter which will also check battery voltage, facility of operating from flashlight batteries, from an a.c. line, or from the lighter outlet in an automobile with the added facility of being able to recharge its storage battery from the a.c. line or from a car battery. Furthermore, it can be operated remotely with a "power" microphone, and—with a couple of accessories—can control a slide projector, or start itself in the presence of sound and stop when the sound stops.

Description

Arranged along the top right of the unit are six organ-type keys which control the mechanical functions—rewind, start, pause, stop, recording, and fast forward. Just below the keys at the right is the speed control—a chromed knob operating a lever which moves from its rest position into one of four slots to select speed—7½, 3¾, 1⅞, or 15/16 ips. This knob also turns on the amplifier when away from its rest position, and it must be depressed in order to move it, since it locks in all positions. From left to right across the bottom are four knobs and the microphone socket. First is the speaker volume control, coupled with a switch which cuts off the internal speaker when the knob is pulled out, thus eliminating interference from the monitoring when recording from microphone. Next is the tone control, which does not, of course, affect the recorded signal. Coupled with this control is a switch which turns on the meter light when pulled out. Next is the recording level control, coupled with a momentary-action switch which gives a battery-voltage indication on the meter. Last is the input selector switch with three positions—phono, radio, and microphone.

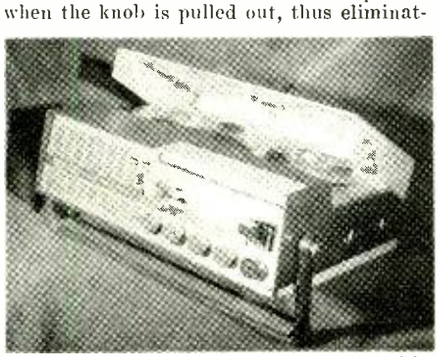


Fig. 1. Uher 4000 Report-S Portable Recorder

The machine accommodates 5-in. reels under its hinged cover, giving a playing time of 32 minutes continuous on one track of the tape at 7½ ips, or a total of 64 minutes on the two tracks, when using double-play tape. At the lowest speed, total playing time is 8 hours, using both tracks. The reels can be held in place by simple rotatable locks on the tops of the spindles. On the right side of the case are three sockets—one to accommodate radio and phono inputs, as well as the playback output, one for external speaker or monitoring earphone, and one for accessories.

Among the accessories are the Dia-Pilot, which will record a sub-audible signal on the tape at the proper intervals so as to change slides in an automatic projector during playback, and the Akustomat, which starts and stops the machine in the presence or absence of sound signals applied to the microphone. The a.c. power supply, the adapter for use with a car battery for operation, or the charging device used with the car battery all plug into the accessory socket. When the a.c. power supply, which has a transistorized voltage regulator built in, is plugged in, the machine may be operated direct from the supply, since the internal battery is disconnected, or the battery may be charged from the same unit. Furthermore, the a.c. supply is the same size as the "Dryfit" storage battery, 1⅜ x 2⅜ x 5⅛ in., and may, if desired, be installed in the battery compartment in the unit itself if the recorder is to be operated from the line for an extended period of time. This flexibility of power sources makes the recorder extremely versatile. The battery may be charged at full rate—inaugurated by depressing a small blue button on the side of the a.c. supply. When charging is complete, the button pops out, and a trickle charge can be continued for as long as ten days. A plastic covered metal carrying handle also serves to tilt the recorder slightly, as shown in *Fig.* 1. The bottom of the case is fitted with rubber strips to protect any surface on which the recorder is placed. Also available as an accessory is a tan cowhide carrying case provided with a shoulder strap which is fitted with a socket to hold the microphone. Several types of microphones are available —one is cardioid, with a music-speech switch and a stop button which interrupts tape movement without the need to operate any of the key-type controls.

Circuitry

The circuit is fully transistorized, and consists of a four-stage amplifier, used for recording and for playback into an external amplifier, followed by a two-stage audio amplifier to provide adequate power output —one watt—with a push-pull output stage. In addition, one transistor provides the bias and erase voltages at a nominal frequency of 63 kc, another provides the drive for the level-indicating meter, and three more are used for the electronic speed control. In this section is a 90-kc oscillator which feeds one winding of a transformer. A second winding is intermittently shorted out by a governor-operated switch in the motor, and the third winding feeds a two-transistor circuit which regulates motor speed so that a constant speed is maintained over an input voltage range from 6 to 8 volts. A zener diode holds the maximum voltage down to 7.5 at the input of the filter system.

The usual custom in European equipment is that the radio input shall be fed from a relatively low signal level, since that is how their receivers are set up, so this input is second in sensitivity to the microphone jack. The phono input is normally—in European equipment—at a much higher level. In the 4000 Report-S, the input impedances and levels are as follows: microphone, 0.1 mv at 2000 ohms; radio, 1 mv at 47,000 ohms; phono, 25 mv at 1 megohm. Thus a high-impedance dynamic microphone can be used in the radio input quite satisfactorily, while the phono input is suitable for feeding from a typical U. S. tuner or from another tape recorder. The high-impedance output is approximately 1 volt at 15,000 ohms at normal tape operating level, while the speaker output is 2 volts at an impedance of 4 ohms.

Performance

Regardless of the appearance and apparent qualifications of any piece of sound reproduction equipment, the important part is the actual performance. As is usual, our first test is to play standard frequency tapes to determine the playback response, and the following data were obtained:

Playback Response

Ampex Standard Tape No. 31321-01—7½ ips

Frequency—cps	Relative output—db
700	0.0
15000	− 0.1
12000	− 1.3
10000	− 2.0
7500	− 1.7
5000	− 1.0
2500	− 0.6
1000	− 0.7
500	− 0.5
250	+ 1.6
100	+ 0.8
50	− 2.6

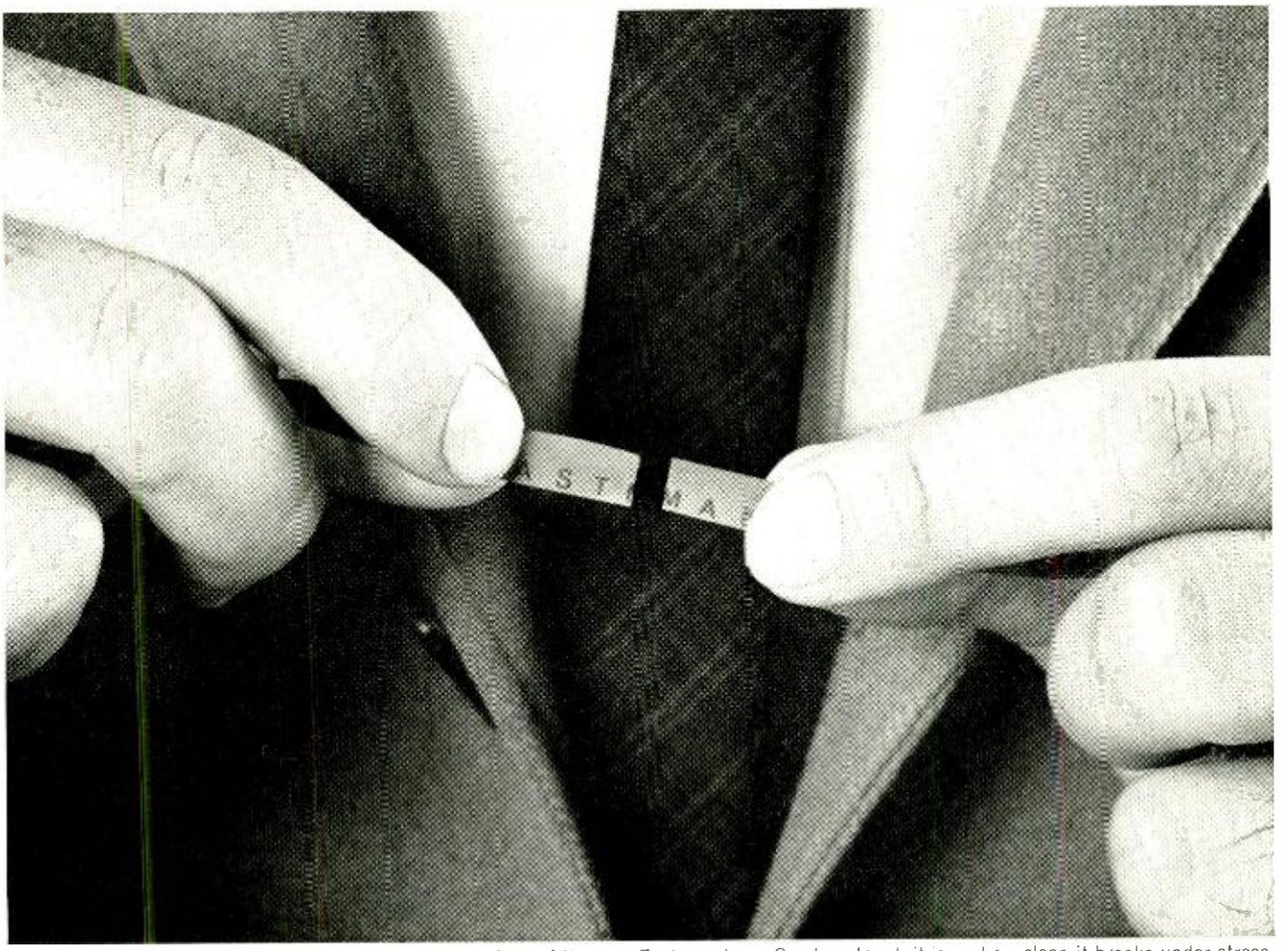
Ampex Standard Tape 31331-01—3¾ ips

Frequency—cps	Relative output—db
500	0.0
7500	+ 0.5
5000	− 1.0
2500	− 1.5
1000	− 0.5
500	− 0.1
250	− 0.2
100	+ 1.3
50	− 2.0

No standard tapes are currently available for 1⅞ or 15/16 ips.

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Now...a new EASTMAN Sound Recording Tape!



Take a piece of the new Eastman tape. See how tough it is . . . how clean it breaks under stress.

Look! No stretch...when it breaks—it breaks clean!

NEW! Support material for EASTMAN Sound Recording Tapes is DUROL Base. A specially prepared form of cellulose triacetate—smooth, tough, durable, highly flexible—provides high strength with low elongation. When equipment accidents happen, it breaks clean. Splices are made easily, quickly—with minimum program loss.

Another important feature: "Lifetime Coding," your assurance of highest quality. Printed on the back of all EASTMAN Sound Recording Tapes is a continuously repeated, permanent legend. This identifies Eastman Kodak Company as the manufacturer and provides a convenient means of indexing these tapes.

New "R-type" binder. This gives a smoother, tougher surface, thereby reducing tape noise and distortion. In addition, it provides extreme abrasion resistance, preventing oxide build-up at the head. Even more important, however, are the amazing magnetic properties of coatings of "R-type" binder which make possible two superlative tapes—both available now . . .

At leading electronic supply houses: Ask for Type A303 for all general recording work. It has vastly superior low-print through characteristics. Need a special purpose high-output tape with remarkably low noise performance? Try Type A304!

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Unique ultra-handy Thread-Easy Reel with indexing scale and built-in splicing jig.

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Record/Play Response

Input signal held constant at 20 mv, phono input (15-db below normal operating level)

Freq. cps	7½ ips Rel. out, db	3¾ ips Rel. out, db
1000	0.0	0.0
20000	− 0.8	
15000	− 2.0	− 11.0
12000	− 2.5	− 1.0
10000	− 2.3	− 2.8
7500	− 1.5	− 2.8
5000	− 1.3	− 2.8
2500	− 0.7	− 1.7
1000	0.0	0.0
500	− 0.1	+ 0.2
250	+ 2.0	+ 0.2
100	0.0	+ 2.3
50	− 2.5	− 0.7

	1⅞ ips	15/16 ips
10000	− 3.4	
7500	− 2.3	
5000	− 1.8	− 6.0
4000	− 1.7	− 2.0
2500	− 1.3	+ 0.3
1000	0.0	0.0
500	+ 1.1	− 0.7
250	− 1.6	+ 2.1
100	− 1.5	+ 3.6
50	− 1.3	− 0.5

Signal-to-noise ratio measured 62 db using the self-contained storage battery supply; operating with the a.c. power supply unit, S/N measured 59 db.

At 15-db below normal operating level, the in/out distortion at 1000 cps measured 1.3 per cent, and wow and flutter measured just under 0.2 per cent at 7½ ips. Absolute speed constancy measured 4 seconds off in timing in 30 minutes. **D-1**



Fig. 2. Altec Lansing "Royale II" Solid-State Stereo Amplifier, Model 360A.

ALTEC LANSING "ROYAL II" SOLID-STATE STEREO AMPLIFIER, MODEL 360A

Professionals in the recording and broadcasting industries know that Altec has been making solid-state amplifiers for some time now—for professional use only. The "Royale II" reflects the experience Altec has achieved in making those amplifiers.

Surprisingly enough, Altec has been making solid-state equipment with relatively little fanfare—certainly it is surprising in view of all the fuss that is being made in this area. Of course, when one realizes that Altec is related to Ling-Temco Vought, Inc., one can understand their advanced knowledge of solid-state devices plus their relative reticence.

Now to the 360A.

The Altec 360A is a 70-watt (IHF) stereo amplifier with a full complement of stereo controls, and facilities for functioning as a complete stereo control center for phono, tuner, tape, microphone, or whatever. In addition it provides switching facilities for recording from all those sources, and monitoring during recording through a stereo headset.

The controls on the front panel include: Input selector; ganged gain control with power switch; independent, concentric (friction coupled) bass and treble; blend; balance; rumble filter; stereo-mono; tape monitor; channel reverse; high-low gain; loudness compensation; scratch filter; phase reverse; and headphones. On the rear panel there are speaker impedance-selector switches and a magnetic-ceramic phono input selector.

All the inputs and outputs (except for headphone output) are located on the back panel and chassis. The inputs include: magnetic or ceramic phono; tape head; microphone; tape machine; tuner; and auxiliary. The outputs include: left, right, and center speaker; center-channel voltage output; left and right recorder; and the stereo headphone output.

The appearance of the "Royale II" is a rather handsome blend of gold and brown, the panel and knob-edges being brushed gold, and the knob-faces, switches and markings being brown. Obviously, a designed appearance, rather than the "evolved" kind we sometimes get in highly-technical products such as this.

Circuit Description (See Fig. 3)

The low-level inputs of the 360A—phono,

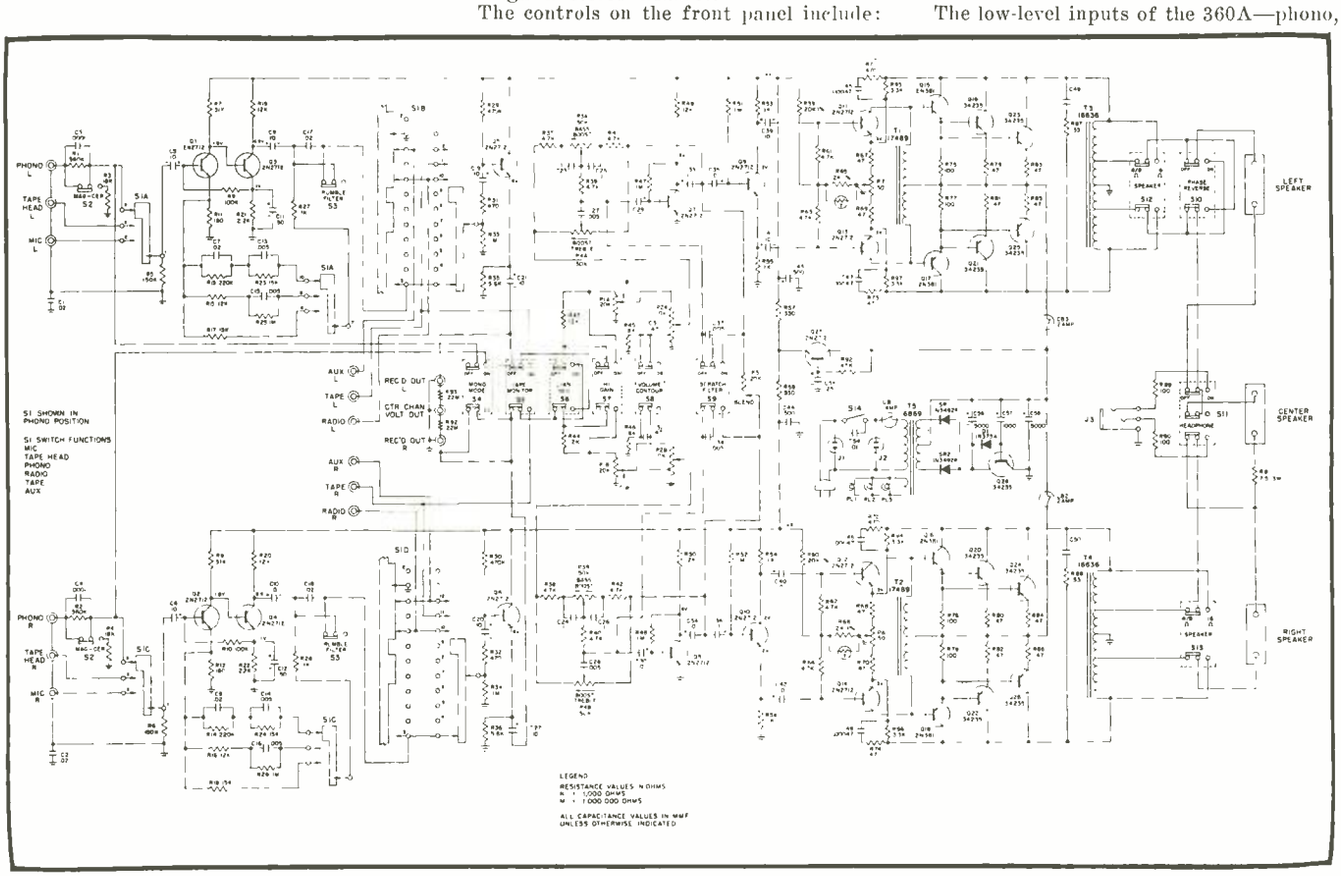
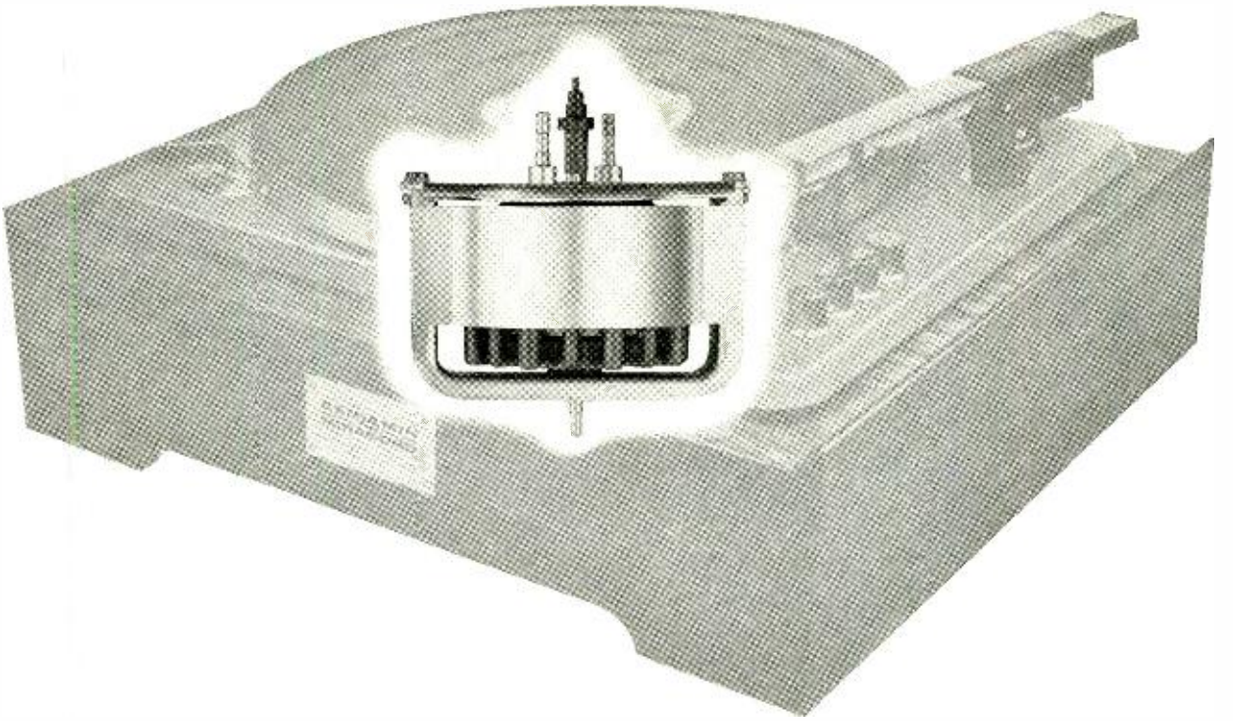


Fig. 3. Schematic of the Altec 360A.

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world's only automatic with hysteresis–synchronous motor

The motor is the heart of turntable system. Unless it assures smooth, steady, constant motion, the quality of the remaining mechanism is to no avail.

There is probably no finer motor than the famous Papst hysteresis-synchronous, used in the finest studio turntables and tape transports. The speed of this motor is synchronized to the frequency of the power line. And it rotates at a constant, accurate rpm, even with extreme variations in voltage and load conditions.

The Miracord 10H is the only automatic that offers the speed reliability of a hysteresis motor, and the only one equipped with a Papst. The smooth, steady motion this imparts to the turntable is one of the major reasons for the distinctively natural quality of sound associated with the Miracord 10H.

There are other reasons, too: a mass-counterbalanced, freely responsive tone arm using no springs—and a heavy, one-piece die cast turntable, 12 inches in diameter, precisely machined and weighted for dynamic balance.

The Miracord is incredibly gentle to your records, as a manual turntable, an automatic turntable, automatic record repeater or automatic record changer. Four FEATHER-TOUCH push buttons reduce automatic operation to utter simplicity.

Model 10H with Papst hysteresis motor, $99.50; Model 10 with induction motor, $89.50 (less base and cartridge). Hear the Miracord with the new Elac cartridge: the Stereo 322 or Mono/Stereo 222. For details, write:

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tape head, and microphone—all have an input impedance of 47,000 ohms. These inputs feed a pair of 2N2712's in cascade, feedback around the pair providing the necessary RIAA or NAB equalization. The signal is now high enough in level to join the high-level inputs (impedance 250,000 ohms): radio, tape, auxiliary. All signals are now fed through two more stages of gain (both 2N2712's), with the tone and other special circuits between them. Then comes a phase splitter, another 2N2712, which feeds the pre-driver, a pair of 2N2712's. The bias for this stage is regulated by means of a thermistor. A driver transformer follows this stage, which is in turn succeeded by another pair of drivers, 2N381's for a change. The output stage consists of four RCA 34235's which are loaded by a choke with a grounded center tap. Thus the output is balanced to ground. The outside taps of the choke provide a 16-ohm impedance for 16-ohm speakers, another set of taps provide matching for 4/8-ohm speakers. With this arrangement the output transistors are safe unless the speaker terminals are shorted. Even then, because of the fast-acting automatic circuit breaker the supply circuit is instantaneously opened when the output stage draws too much current.

The power supply is extremely stiff and well regulated, utilizing two transistors as regulators. A third circuit breaker is located in the primary circuit of the power transformer. This one is also automatic.

Performance

The power output of the 360A averaged 40-watts (IHF) per channel up to 10,000 cps, and then averaged 35 watts per channel up to 20,000 cps. Frequency response from 20–20,000 cps was within 1 db, actually being within 0.5 db throughout most of the range. The noise level at the auxiliary input for 25-watts rms output was down 82 db; at the magnetic phono input, for the same output, it was 65-db down; at the tape head input it was down 55 db. The input sensitivity for an output of 25-watts rms at 1000 cps and with the gain switch in "hi" was 380 mv at the radio, tape, and auxiliary inputs; 5 mv at the magnetic phono input; 2.1 mv at the tape head input; and 6 mv at the microphone input.

Distortion was less than 1.5 per cent for an output of 25 watts rms (both channels driven) from 20–14,000 cps. From 14,000–20,000 cps total harmonic distortion increased gradually up to 3.7 per cent at 20,000 cps.

In listening tests the 360A revealed the sound that professionals have been hearing for some time, at least those who use the 351 amplifier. There is a smoothness and musical quality which is certainly desirable in an amplifier, and provides nonfatiguing listening. The Altec "Royale II" is not inexpensive, about $360 list, and it certainly deserves a hearing **D-2**

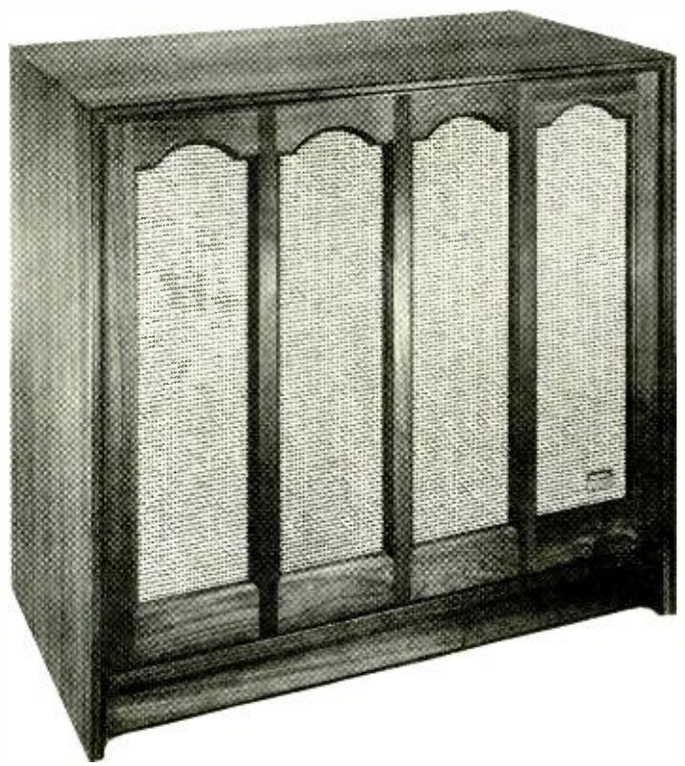


Fig. 4. Electro-Voice Model Six Speaker System.

ELECTRO-VOICE SPEAKER SYSTEM, MODEL SIX

Over the years Electro-Voice has been famous as the manufacturers of the giant-voiced (and sized) Patrician speaker systems. This system, the Model Six, is obviously intended to bridge the gap between the Patricians and the less herculean systems available today. Indeed the Model Six stands about half the height of the Patrician, but certainly is more than half the sound; in fact it comes surprisingly close.

Housed in a cabinet measuring 30-in. high, 32-in. wide, and 17½-in. deep, which is styled in the traditional mode, the Model Six features a four-way system with separate speakers in the bass (30–250 cps), mid-bass (250–800 cps), mid-range (800–3500 cps), and high frequencies (3500–20,000 cps). The enclosure is unusually handsome and solid, the pair we reviewed being of oiled walnut with a cane grille cloth. Would go well in both the modern and traditional home in spite of its traditional styling. Seems to be "au courant" to mix styles.

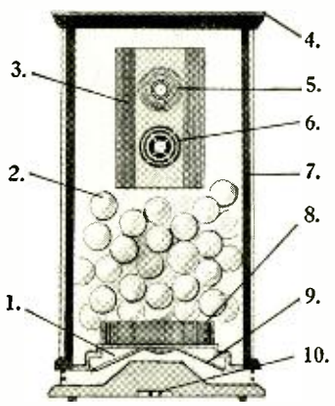
(*Continued on page 62*)

The New Empire

Grenadier

Divergent Lens Speaker System

Exclusive Sonic Column — Totally Rigid Without Resonance. Two years in the making . . . the Grenadier's shape is a function of its performance . . . its performance, an achievement of design. Virtually, no matter where or how you listen, the new Empire Grenadier gives you acoustically flat frequency response.



1. Mass loaded woofer with floating suspension and four inch voice coil.
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3. Die-Cast Mid Frequency-High Frequency Full Dispersion Acoustic Lens.
4. Polyester Laminate surface.
5. Ultra-Sonic Domed Tweeter.
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8. World's largest speaker ceramic magnet structure (18 lbs.).
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Freedom From Distortion. A unique combination of electrical and acoustical crossovers and cutoffs avoid woofer cone breakup and mid range response dips. The woofer, mid range and tweeter combine at mathematically correct crossover frequencies.

Aesthetically Designed to fit any decor . . . from warm elegance to stark modern. Fits in corners or against walls. Truly a beautiful and functional achievement of sight and sound.

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Technical Specifications Model 8000 — Frequency Response: 30-20,000 cps • **Nominal Impedance:** 8 ohms • **Power Handling Capacity — Music Power:** Maximum undistorted 100 watts • **Sine Wave Power:** 30-450 cps 60 watts • 450-5000 cps 40 watts • 5000-20,000 cps 20 watts • **Components — Woofer:** 12 in. High Compliance with 4 inch voice coil • **Mid Range:** Direct Radiator • **Hi-Frequency** Ultra Sonic Domed Tweeter • Mid & Hi coupled to Die-Cast Acoustic Lenses • **Overall Dimensions** — Dia. 15¼" x Ht. 29" • **Weight** 65 lbs. • Rich Satin Walnut Finish with Mar Proof and Stain Proof Surface.

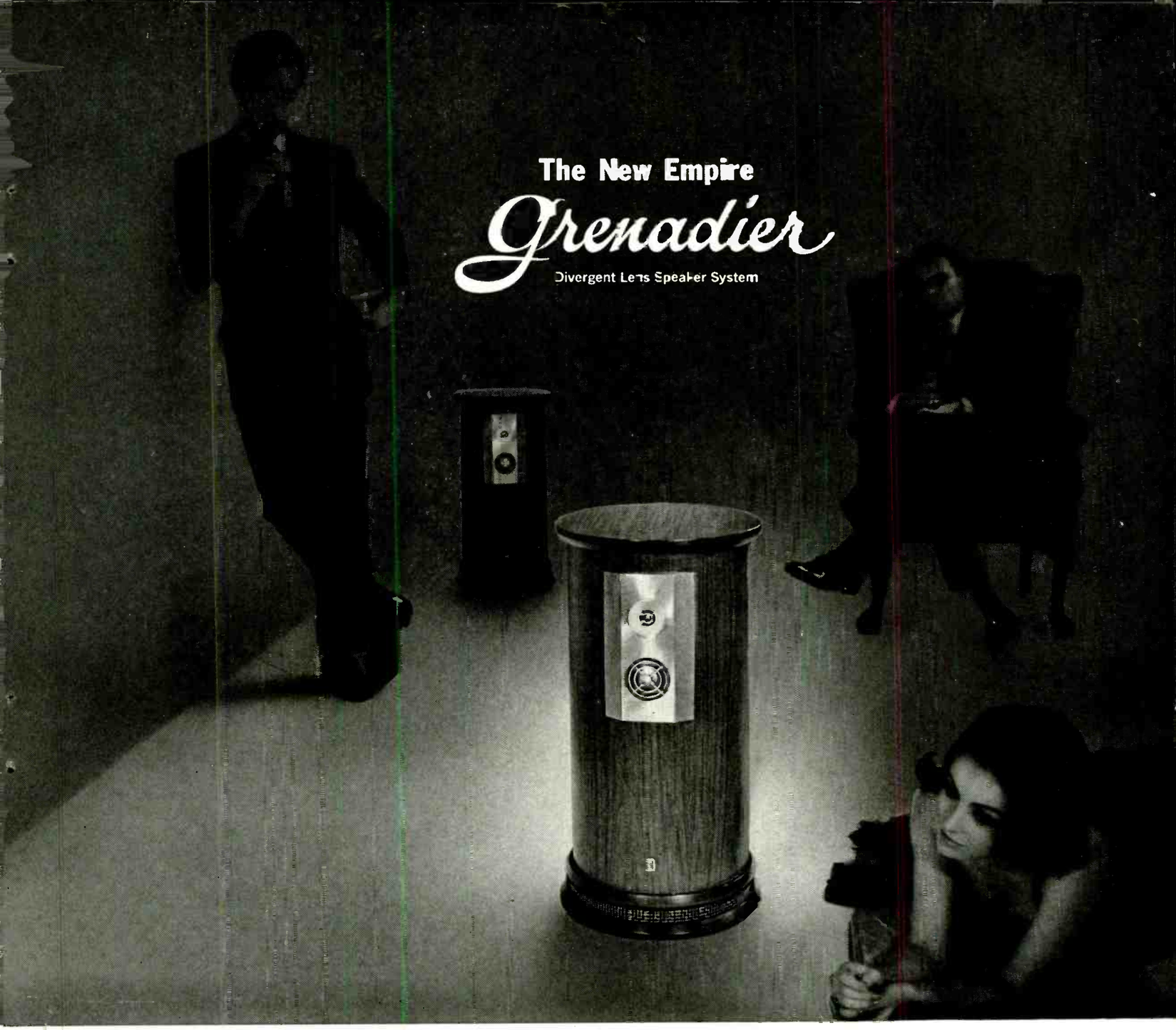
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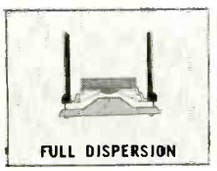
Lets you sit anywhere– Hear everything

The first speaker system designed and engineered for stereophonic sound. Three acoustic lenses allow you to enjoy phenomenal stereo separation and the highest fidelity of music anywhere in the room. Speaker placement non-critical.



RIGIDLY STIFF AND TOTALLY DAMPED

The Empire Grenadier cabinet gives you discipline of sound while virtually eliminating cabinet vibration. Formed from acoustic material and completely wrapped with walnut to delight the eye.



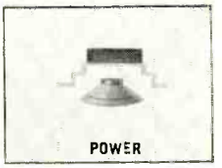
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A downward woofer, close to the reflecting floor surface, feeds through a front loaded horn with full circle aperture throat. This provides 360° sound dispersion and prevents standing waves.



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The full presence midrange direct radiator and the low-mass ultrasonic domed tweeter in combination with the die-cast divergent acoustic lens, achieve broad sound propagation.



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Massive three driver magnetic structure totaling one million lines of force produces the needed high efficiency, yet handles up to 100 watts of music without overload or burnout.

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A Direct Approach to Q-Point Stabilization

FRANK W. BRANDS*

In small-signal transistor circuit design all you have to know is Ohm's Law to stabilize the Q-point

A SUBSTANTIAL SEGMENT of the circuit-designer population determines the value of the biasing resistors for transistor circuits by twiddling knobs on decade resistance boxes. The net result is equivalent to "selecting" components, which in turn contributes to low reliability. Often this approach is used because of the apparent complexity of the standard stability-factor determinations and the difficulty of obtaining the parameters required for such an approach.

In reality, a physical understanding of stabilizing technique is not difficult; and if performed one step at a time, need not be obscured by equations which contain parameters—some of which must be generated by the designer and others which are not readily available. Many times the only information that is available for a particular transistor is that which is listed in a commercial catalog or a transistor manual.

Fortunately, however, a good design can be obtained with surprisingly skimpy data, and the quiescent operating point stabilized regardless of reasonable variations in the transistor parameters whether due to temperature variation, aging, the state of the art of Quality Control, or any other reason.

The first parameter to establish is the position of the desired Q-point (collector d.c. current, I_C, and collector d.c. voltage, V_C). The maximum values of V_C and I_C must be found from the catalog or the manual and of course these values must not be exceeded. On the other hand, V_C and I_C must be large enough to permit sufficient peak-to-peak variations for the required output power. It is generally satisfactory to select V_C and I_C to each be at least 25 per cent larger than the single peak value of the desired signal output.

For distortionless operation, V_C must be selected at least as large as the peak value of the desired signal output, plus the small voltage required to saturate the collector. I_C must be at least as large as the peak value of the desired signal current, plus the current which exists in the collector with zero current in the base. Such a design, while perhaps considered by some to be optimum, is not conducive to high reliability. Any drift whatsoever in the Q-point or change in the transistor characteristics in an unfavorable direction would cause faulty operation. It is therefore generally satisfactory to select V_C and I_C to be about 25 percent or more larger than these minimum values.

To summarize then, the Q-point should be selected such that V_C and I_C are at least 25 per cent greater than the peak values of output signal expected, but at least 25 per cent less than the maximum values specified by manufacturer. Furthermore, the product of V_C and I_C should not exceed the allowable collector dissipation, again allowing a 25 per cent margin.

When the desired value of I_C is known, we wish to ensure that it remains at nearly that value regardless of changes in the transistor parameters. This will be accomplished by making use of the emitter-follower action produced by the presence of the resistor R_E as shown in *Fig.* 1.

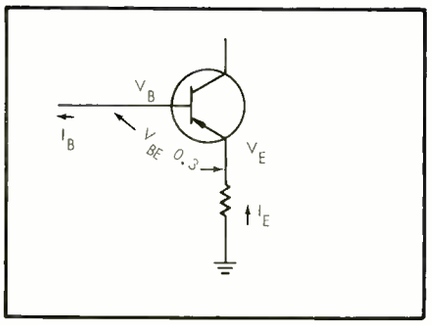


Fig. 1. Emitter-follower action produced by R_E.

For purposes of bias stabilization, the d.c. voltage between the emitter and the base in normal class-A operation may be taken as a constant 0.3 volt for nearly all low-power transistors. This is true because of the nature of the PN junctions, which do not obey Ohm's Law. If the collector current is to be very much less than the maximum rated collector current of the transistor, the base-to-emitter voltage may drop to as low as 0.20 volts. For relatively higher values of collector current the base-to-emitter voltage will increase somewhat, but seldom will it exceed 0.35 volts for a small-signal transistor.

V_E will therefore follow V_B with a very-nearly constant 0.3 volts difference. If V_B is made to be a fixed value, then V_E will likewise be fixed. Note that V_E is also equal to the IR drop across R_E so that:

$$V_E = I_E R_E$$

and since I_E is very nearly equal to I_C

$$V_E \cong I_C R_E$$

and within about 2 per cent of precision it can be stated that:

$$V_E = I_C R_E$$

I_C is therefore fixed if V_E and R_E are fixed. The requirement for stabilization arises, however, because V_E is not exactly fixed but will vary a small fraction of a volt if the transistor is replaced or the parameters vary for any reason. The variation of V_E cannot, however, exceed a small fraction of a volt.

If V_E is small, a variation of a fraction of a volt may be a relatively large per cent variation. If V_E is made larger, the percentage variation is accordingly decreased. The per cent variation of V_C will be the same as the percentage variation of I_C. For a given Q-point and V_B fixed, variations in V_E will generally not exceed 0.1 volt. Therefore, if I_C is to be fixed within 5 per cent of a certain value, 0.1 volt must be made to be no more than 5 per cent of V_E, which requires a V_E of at least 2 volts magnitude. Since I_C is a known parameter, R_E is simply found by Ohm's law:

$$R_E = \frac{2 \text{ volts}}{I_C}$$

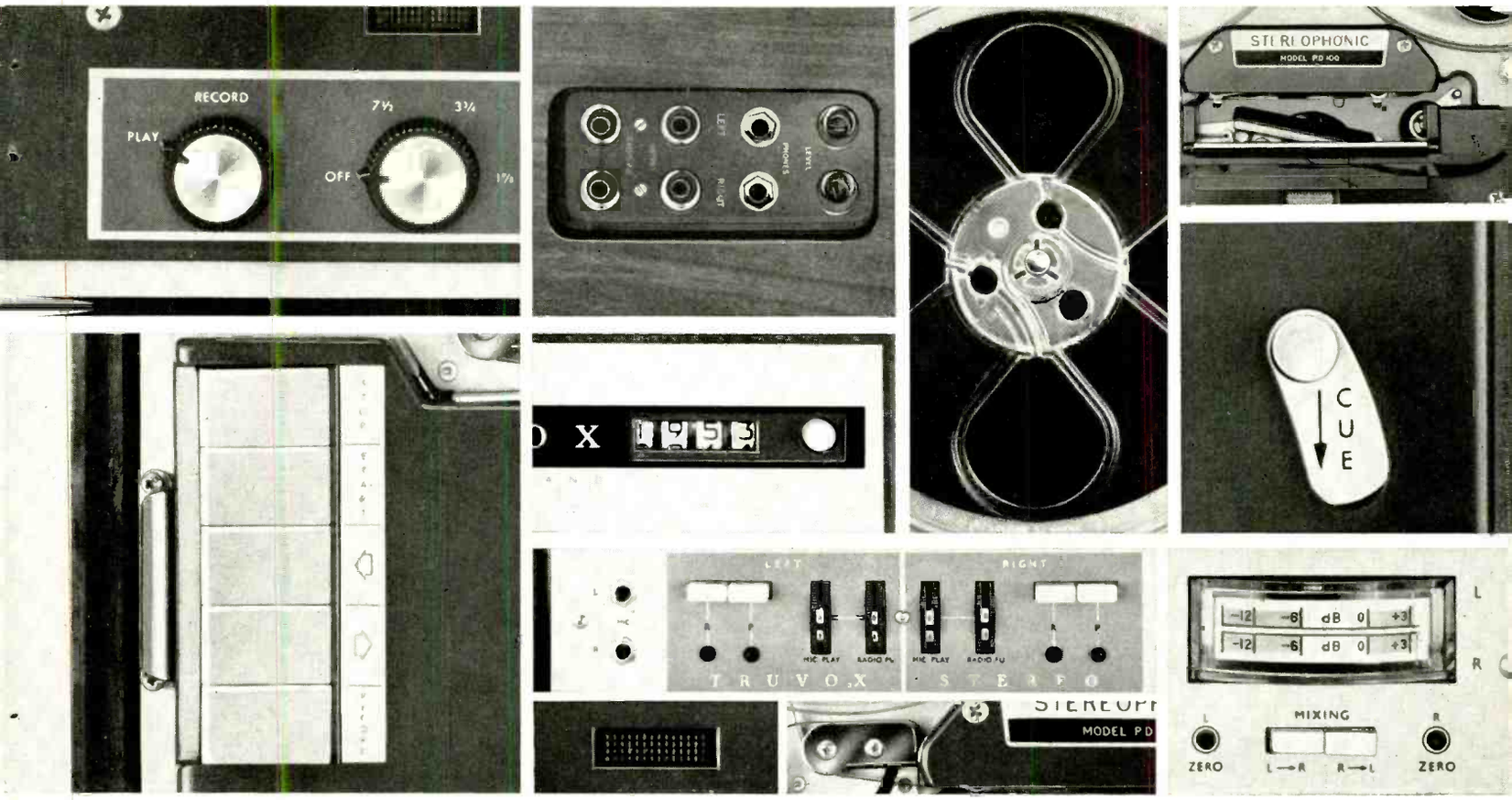
We must now proceed to fix V_B to a value 0.3 volts greater in magnitude than V_E. The parameter which would cause a change in V_B is a change in I_B, and for a given Q-point I_B will change from one transistor to another; and also temperature will cause a change in I_B.

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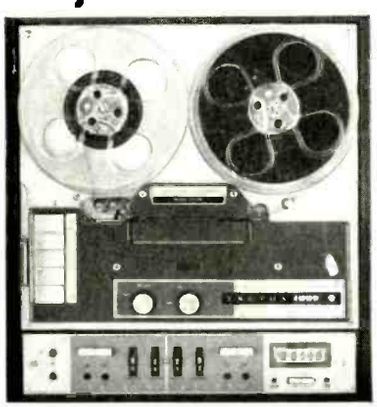
* *Associate Professor, Dept. of E.E., Washington State Univ., Pullman, Wash.*

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the one outstanding feature is that it has them all



New Benjamin-Truvox PD-100



The Truvox PD-100 is a new 4-track, stereo tape deck with built-in 'record', 'playback' and 'monitor' preamplifiers. It is so complete in every detail, no one feature or facility can be said to dominate. It has them *all*. A remarkable example of British thoroughness in audio equipment design!

Whether you judge this unit by these features or by the quality of its performance, there is only one conclusion you will reach: *the PD-100 stands squarely with the finest professional tape units available today.*

features: □ operates vertically or horizontally □ 3 speeds: 7½, 3¾ and 1⅞ ips □ 3 heads: 'erase', 'record', and 'playback' □ 3 motors: including Papst 'squirrel-cage' motor for capstan drive □ 6½-inch capstan flywheel □ 'record-playback' preamps with cathode-follower outputs □ transistor preamps for monitoring 'record' quality with low-impedance headphones directly from tape. □ 2 VU db-calibrated meters □ 4-digit counter with automatic zero-reset button □ stop-start' cueing button □ self-adjusting instantaneous 'stop' brakes □ hinged-cover giving access to tape heads with convenient splicing guide-plate built in □ automatic end-of-play and tape-break 'shut-off' □ patented 'hubloc' spindles hold reels securely when operated vertically □ function signal lights.

recording versatility: □ off-the-air tapes of FM-multiplex, mono radio or TV programs □ stereo and mono tapes from your favorite records for unlimited playback without wear to your records and stylus □ sound-on-sound □ echo, fade and mixed input effects.

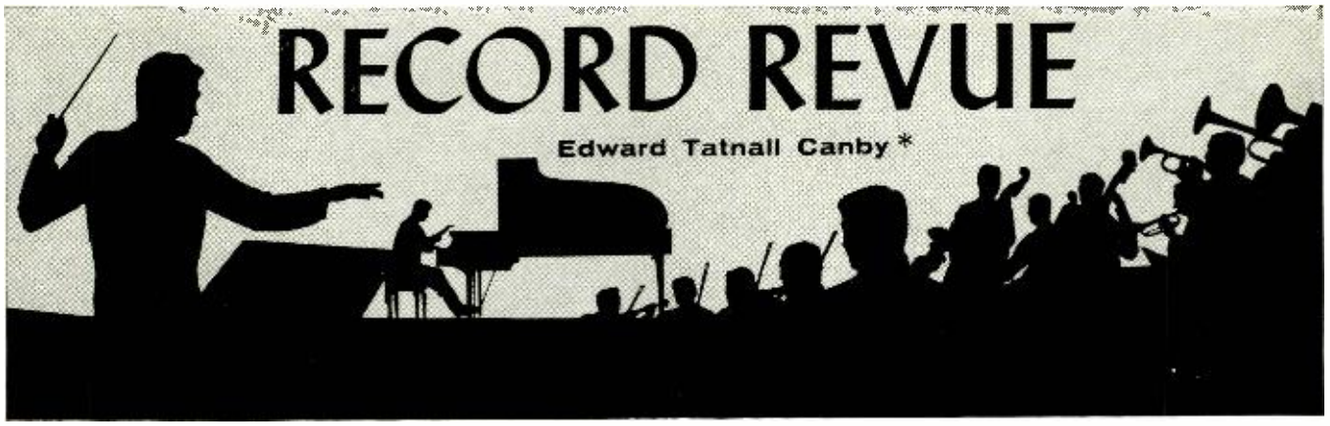
and here are some hints of the quality you can expect: □ frequency response: 30 to 20,000 cycles at 7½ ips; 30 to 12,000 at 3¾; and 50 to 8,000 at 1⅞; ±3 db □ wow and flutter: less than 0.1% at 7½ ips; 0.15% at 3¾; and 0.25% at 1⅞. □ signal/noise ratio: better than 50 db □ channel separation: better than 55 db

Dimensions of the PD-100: 14¼" wide x 15⅞" deep x 7" high. Price is $399.50 (less base). At your high fidelity dealer, or write:

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RECORD REVUE

Edward Tatnall Canby*

SERIES

Great Recordings of the Century — The Complete Beethoven Piano Concertos. Artur Schnabel. (Recorded 1932–47).
Angel GRE 4006 (5) mono
Also separately: COLH 1/5

A quick mention of this great reissue series from 78 days, featuring various orchestras but the same famous Beethoven pianist—and a quick note that except for one, if I remember rightly, these are *not* the same Schnabel recordings of the music as those released some years back on LP by RCA Victor. Schnabel did most of the concertos several times over the years; RCA's choice isn't Angel's.

Many factors go into such decisions, including the weighing-in of technical considerations vs. musical ones, the balancing of the solo part against the values of his orchestral accompaniment. It isn't easy to say which version is the best, nor much use trying. They're all Schnabel, which is plenty.

Great Music By French Composers. (Six vols.) Detroit Symphony Orch., Paray.
Mercury SR 90372/77 (6) stereo

Six perfectly enormous LP records and well over six continuous hours of symphonic music! Mercury's "Great Music" series is a new advance on an old front, the *long* long-play disc, each group of six LPs (the others, so far, are Romantic and Russian collections) centering about one school of music. Technically speaking, are quite an astonishment. Musically, they express, varyingly, the always forceful personality of Paul Paray, the bouncing Frenchman from Detroit.

Phew—I couldn't play all of this series. I did try two with care and sampled significant parts of the others. It was enough to show me that Mercury's combination of techniques has, indeed, pushed back the length-barrier for useable stereo disc recording. The complete César Franck Symphony, for instance, is on a single LP side running more than *thirty four* minutes. The inside grooves betray scarcely a trace of inner-diameter distortion, even with a loud ending. The necessary compromises are slight, what with ingenious electronic groove depth and spacing controls; mainly they would seem to involve an inevitable lowering of the over-all level. Thanks to quiet surfaces, this won't cause serious trouble—hum and rumble in your own system is the likely limiting factor.

The six discs cover a wealth of standard Nineteenth century French repertory, filling out the familiar with items less well known to us over here, Lalo's "Namouna" ballet suite, for instance. There isn't a record in the series with less than a lively impact, for Paul Paray is the most energetic of conductors. Almost everything goes quite a bit faster than you'd expect; he likes things that way. Nor is Paray one for the long musical line; he falls too often into march-like, jumpy patterns. Very good for such music as "Bolero" and the "Valses nobles et sentimentales" of Ravel, not so convincing when it comes to the "Afternoon of a Faun," which should loll and laze more than Paray lets it. Nor is the Detroit string ensemble as unctuously perfect as, say, the sound from Boston or Philadelphia. Even so—here's a splendid way to introduce yourself to a lot of repertory, hi-fi and stereo. A good idea, and be sure to check into the several other series too.

J. S. Bach: The Great Organ Chorales. Carl Weinrich; Organ of Vårfrukyrka, Skänninge, Sweden.
Westminster WST 17048/50 (3) stereo

Here is a masterful set of organ recordings, coupling a splendid organ with a well known Westminster organist and some fancy stereo hi-fi out of Sweden. I shall never tire of hearing these great organ chorales, and I thoroughly enjoyed these performances though there are some reservations to be made.

Not in the organ—which though "late" by Baroque standards (1800) is a fine example of the proper highly colored tracker-action instrument appropriate to Bach's music. But I personally would prefer a more distant, over-all mike pickup, giving more of the church sound, if perhaps less tonal detail. These Swedish engineers seem to be following the lead of Westminster's former man on the scene, Kurt Liszt, in taking down a clinical close-up of the organ pipes. Not bad at all—just a bit myopic.

As for Weinrich, I find once again that he shares with such as E. Power Biggs a habit of playing that seems to have carried over from their training days with the big, mushy organs used before the Baroque revival began. Everything is played short and staccato; phrasing of the melodic ideas is haphazard or downright inconsistent. With close-up miking, plus the brilliance and clarity of an organ like this one, the staccato jumpiness of touch shows up with painful sharpness. It is both unnecessary and ugly, however useful it may have been for performance on the big-blur organs.

Probably Weinrich is beyond altering his technique at this point; in which case Westminster should tactfully take him down at a greater distance, to restore some of the blur and cover up the jumpiness.

But the Weinrich registration on this lovely and varied organ is authoritative and always interesting, as it must be in the organ chorale preludes (ornamental settings of German hymn tunes). The series is highly worthwhile in spite of my carping.

Dvorak: The Wood Dove; The Golden Spinning Wheel; The Water Sprite; The Midday Witch; Hussite Overture. Czech Philharmonic, Chalabala.
Artia ALS 7200, 7201 stereo

Here is the evidence of a Dvorak not well known to those who swoon over the familiar "New World" Symphony—this large-scale set of program pieces was composed after Dvorak's return to Czechoslovakia (Bohemia) from the United States. No more espousal of the American Negro, no more Americanisms at all, nor any trace of Spillville, Iowa. Perhaps it was inevitable that these late works have remained less than well known hereabouts.

A better reason than nationalism is simply their format and style, which is so utterly out of date now as to leave most listeners in a state of confusion—that is, if they attempt to follow the "plots" of these pieces. For they are gory stories, out of local folk legend, and the music is of the sort that roars and rants, sighs and pants, until the cows come home. Not much to our taste in these days of hard-boiled frenzy.

Yet—this *is* Dvorak, the superb melodist, the master of ingenious harmony and mellow orchestration! Given a good parceling-out of time, you can find here the man who composed the "New World" Symphony; it is he, no less. And nowhere are the big tone poems better played than in the home town itself, as here. Fine recording in stereo, too.

(The Hussite Overture is an earlier work, from 1883, a patriotic piece that first established his international reputation. The rest are from 1896.)

Dvorak: String Quartets, Vol. II. Kohon Quartet.
Vox SVBX 550 (3) stereo

A continuation of a series that is likely to run to quite a number of albums—and much of the material has seldom been heard; the early A major Quartet, Op. 2, from Dvorak's 21st year, is here recorded for the first time, as were three quartets in the first volume. This album contains two of the big last quartets, one of them the familiar "American," composed in 1893 in Spillville Iowa, the other (G major) of still later vintage.

This isn't easy quartet music to play. Though wonderfully lyric in the Dvorak manner, it often strains the bounds of the medium, as did so many chamber works of that period, leading to inevitable squeaks and scratches and notes slightly out of tune. No great deterrent to your appreciation, if you know the style! But this isn't Mozart or Haydn, nor yet even Beethoven. The Kohons are indefatigably ardent but things do get a wee bit out of control now and then. Perhaps they always will in this music. Which doesn't mean the interpretation is less than highly knowledgeable and musical.

Curious stereo recording. Two instruments, are "in" each loudspeaker. If yours are more than three or four feet apart, you'll have string players strewn oddly all over your room, out of normal formation! Rather intriguing effect.

Handel: The Organ Concertos (4 volumes). Marie-Claire Alain; Orch. de Chambre Jean-Francois Paillard.
Decca DL 710085/8 (4) stereo

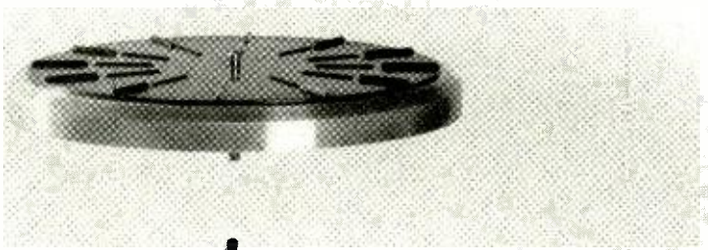
This French-played set of Handel organ concertos is a new and healthy venture—utterly unlike the benign and near-sentimental versions played by the ever-reverent British! Here, all is crisp French clarity, lean masculinity; the organ has a serviceably bright Baroque sound and the string orchestra (with harpsichord) plays with that impetuous, brilliant tone color that is found in the best of French playing. The whole is recorded close-up, but with enough of a large-space sound to weld the organ, the orchestra and the space into an effective ensemble.

And there is authoritative modern interpretation, too. Correct ornamentation in both organ and strings, well and easily played.

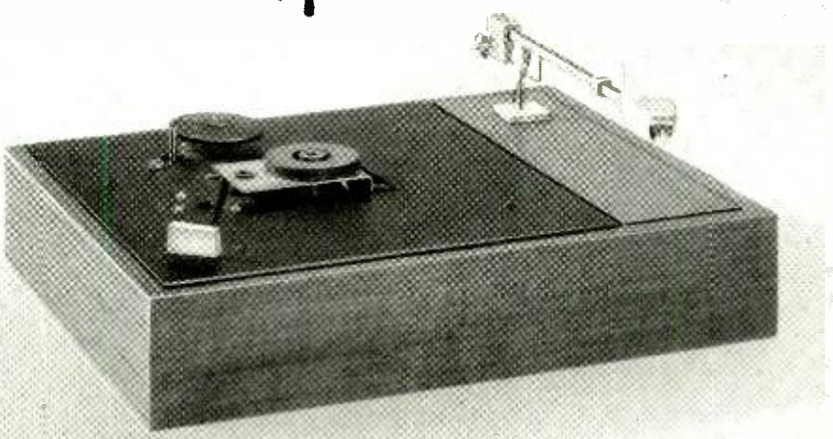
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STANTON



*



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Brisk, accurate tempi, nicely lean rhythms in good Baroque style, especially the excellent dotted figures. Marie-Claire Alain plays with a decidedly staccato touch; but unlike many an organist, shapes and phrases the ideas, using the staccato touch for musical purposes rather than merely as an anachronistic way to "punch" through a big blur of echo. No blur here at all and not a trace of sentiment but a good deal of good music-making just the same.

PARALLEL

Schubert: Die Winterreise; Eight Songs from Schwanengesang. Gerard Souzay; Dalton Baldwin, piano.

Philips PHS 2-910 (2) stereo

Schubert: Die Winterreise. Hermann Prey; Karl Engel, piano.

Vox SLDL 5502 (2) stereo

Here are two really significant recordings of the eternally famous Schubert song cycle by two teams of new-generation performers. Together, they sum up what has happened to Schubert in a quarter century since the great days of such as Lotte Lehmann—and they sum up, too, the basic differences of approach that still persist, legitimately, between French and German art. Old Schubert fans will be fascinated.

First, this quarter century has oddly favored the baritone voice in Schubert (the original) while the Schubertian piano accompaniment seems to have fallen behind. (So those of us in an older generation will claim, anyhow.)

Recording techniques do beautiful things with the baritone voice today but the singing style itself seems to have moved favorably towards good Schubert. Twenty five years back, the great Schubert singers were mostly women and the exceptional recorded males were few and far between. Now, you may find how convincing the present-day baritone can be in this music via these two lovely performances, easily absorbed by any ear without the slightest strain. But the pianos—no. Those who have marvelled at the subtle pianism of such older greats as Paul Ulanowsky or Gerald Smith, will find these young pianists appallingly outside of the old traditions, bright, earnest, musical enough but simply not "hep." How much more the pianist can do for Schubert than these young men know!

Gerard Souzay's French baritone on Philips triumphs musically over all differences of national temperament and singing technique—his remains esentially a French performance, expressive through high art and tasteful restraint and through the beauty of sheer song itself. He is superb, if unlike his German opposite on Vox. Souzay's young pianist, however, plays a bright, nicely turned piano part that will make old listeners' hair stand on end—it is not unmusical; it merely sounds like a cheerful Baroque concerto, slightly on the harpsichord side. What extraordinary Schubert!)But can we be sure what is right? Yes—via feeling alone. No proof.)

Vox's Hermann Prey is all-German, even in the somewhat bulky look of him. He, too, is suberb but in a wholly Germanic fashion. His singing is deeply moodful, sulky, passionate by turns; his half-voice is almost deadpan, without vibrato; it bursts into a passionate full voice that reminds us of a Fischer-Dieskau in a somewhat higher range. Wonderful! The very essence of the German Romantic approach. And so un-French. Herr Prey's pianist, Karl Engel, plays one of those subdued, wooden-sounding German pianos, so characteristic, and he knows of the older traditions of moodiness and tone-painting. He is knowledgeable, but not arresting in his pianism. Perhaps the older piano-magic is no longer attainable, even by Germans? (But listen to Erich Werba, who plays for Irmgard Seefried.)

Appropriately, the Souzay album has a light, French sound with a brilliant piano tone and a generally pleasing ambience; the Vox album is more solid and bassy in a useful way, placing more emphasis on the blend of harmony and voice. Sonzay adds eight songs from the posthumous "Schwanengesang" collection to those of the "Winterreise" set; he moves right along fast.

Mélodies de France (Ravel, Duparc, Debussy). De Los Angeles; Paris Conservatoire Orch., Pretre.

Angel 36105 stereo

By golly, this Victoria de los Angeles can't sing a note that isn't superbly beautiful—whether it is Spanish, Italian, or French. Here she siugs with orchestra, the early and gloriously impressionistic "Schéhérezade" songs of Ravel (no relation to Rimsky's), the familiar "L'Invitation au voyage" of Duparc and his "Phydilé," in Duparc's own orchestrations, and a lovely "Air de Lia" from the early Debussy work "L'Enfant Prodigue." To cap it all there are seven most unusual Ravel songs, five Greek and two Hebrew. Sheer music-making, by one and all, and a heartenjugly beautiful disc.

Prokofieff: Classical Symphony; Love for Three Oranges Suite; Lieutenant Kijé Suite. Phila. Orch., Ormandy.

Columbia MS 6545 stereo

Prokofieff: Symphony No. 5, Boston Symph., Leinsdorf.

RCA Victor LSC 2707 stereo

The now-familiar concert suites from the 1919 opera "Love for Three Oranges" and the 1933 movie ("The Czar Sleeps"), out of which came the legendary Lt. Kijé, join very happily here with the even more familiar "Classical" of 1917. The three works are now easily heard as one, from the same mind that produced "Peter and the Wolf." Suave, juicy playing by the Philly Orchestra is good for these works, bringing out their benign qualities, smoothing out the once-"modern" spiciness into a wholly tasteful sound for today's ears.

The Symphony No. 5 is the same, on a bigger, grander scale; the BSO performance is a most happy one, Prokofieff being an old friend of that orchestra back from the early days.

The contrast between Columbia and RCA sound is something else again. If RCA is working for the common man's common box of a phonograph, OK—but on my slightly superior equipment the Dynagrooved Symphony No. 5 is unavoidably unpleasant, and that is that.

With the most complete inattention (I get lost in the music itself) I still was forcibly reminded by that curiously coarse, wooden sound, by the seeming lack of an "imaginative space," by the pops-style semi-uniformity of level, that this was no ordinary recording but a Dynagroove. I've long since given up any attempt to analyse this sound by ear in terms of the published engineering info; I don't really know how much of it is actually a part of the Dyna process. I just know that I tend to be relieved when I see an RCA label without the Dynagroove letters on it. But, remember, Dynagroove wasn't designed for the likes of me.

Anyhow, RCA's Boston Dynagroove made me think obscurely that something was wrong with my equipment, Columbia's sound reassured me that all was right. Just a normal modern stereo effect for a good LP disc—open, wide-spaced, easy, the strings shimmering brightly, the volume levels rising and falling naturally, the orchestra well placed within the realistic illusion of big-hall space, right there in front of you and unvarying.

Prokofieff: Peter and The Wolf. Britten: The Young Person's Guide to the Orchestra. Orch. Nat. Français, Lorin Maazel.

Deutsche Gramm. SLPM 138 746 stereo

Two ingenious renditions of these often-paired works-with-narrator, for children of all ages, played with grand precision by a good French orchestra and a precise and dramatic young conductor—who does the talking, too, on one side. In English and French. And it's packaged on disc by the Germans.

The first U. S. "Peter" was narrated by the unforgettable Richard Hale in grandfatherly quaverings from a point in the middle of the Boston Symphony and far—very far—from the nearest mike. No dubbings. Nowadays, "Peter" is generally recorded with "open-end" narration—i.e., the speaker does his bit separately and afterwards, in as many languages as needed for various commercial packagings in different countries. Here, one Alec Clunes narrates "Peter" in somewhat dead-pan British, very effective, combining the English and American market, we assume. (Somebody else probably did a version in Deutsche for D-G's home trade. And maybe another en français.) Split-second playing, very exciting.

As for the "Young Person's Guide," each new version of that hardy piece seems to introduce a new approach; here, Mr. Maazel talks away on his own, eavesdropping (in English) on his own rehearsing (in French), evidently speaking his own text, made to order, before launching into the familiar sequence of musical variations common to all performances of the work. Very good stuff and the recording is expertly balanced against the voice so that—for once—the full orchestra really sounds louder than the speaker. Glorious stereo effect, the music again sparklingly precise.

Prokofieff: Alexander Nevsky. Czech Singers Choir, Vera Soukupova, contralto; Czech Philharmonic, Ancerl.

Artia ALS 7202 stereo

Not so long ago, a disc out of Czechoslovakia was likely to sound like mud and sandpaper even if the contents, dimmed by dreadful recording, might interest the true collector. No more! Here's as fine a stereo disc as you'll ever hear and a technical triumph, considering the enormous musical forces recorded in this huge movie-derived cantata. Loud, loud—but always clean and clear.

Moreover, it is miles ahead of the last version of the stirring music that I listen to, from our own overfed and under-imaginative performers at Philadelphia. They just sang it, played it. These people sing, play and ACT it too. Gorgeous big chorus, splendidly alive orchestra, a big-voiced contralto.

Don't ask me if it's Russian or Czech they sing. Either would do for me. (Likely it is Russian-with-a-Czech-accent.) And don't ask me how such a superb stereo recording gets to us in an envelope marked "Made in England." A Supraphon/Abbey Production, via Connoisseur Records, on the Artia label. Internationalism rampant!

Prokofieff: Romeo and Juliet, Suites Nos. 1 and 2. Minneapolis Symphony Orch., Skrowaczewski.

Mercury SR 90315 stereo

The unpronounceable young Skrowaczewski is unexpectedly lively here, for a first-rate reading of the two Prokofieff ballet suites. Unexpectedly, because in much earlier Romantic music this conductor lays on a heavy, neo-Romantic hand, as do many of the younger musicians today. Not here! Indeed—the opposite; for whereas many an older conductor tries to re-convert this big, popular Prokofieff score into old-fashioned Romanticism, Mr. S. plays it straight, as contemporary music in the best sense. It crackles with excitement this way. Its "old fashioned" melodies and what-not no longer sound tame: they sparkle. Unusually nice. And good to have both Suites on the one disc.

DOCUMENTARY

In White America. Martin B. Duberman. Orig. cast. recording.

Columbia KOL 6030 mono

The idea behind this show was both timely and arresting—a compilation of actual documents throughout Negro history in America, to be presented as a stage show in the now-familiar style of documentary readings. The material gathered by Mr. Duberman is extensive and awesome. Some of it shocks, some must be understood in the context of its time, as with Thomas Jefferson's speculations about the inferiority of the blacks. Some is familiar or in a familiar vein—but much will jolt the listener with its immediacy. Altogether, the texts spoken here are a potent document of Negro history.

The production on records is something else.

(*Continued on page 64*)

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"Only the Music is Present...When the Classics Speak"

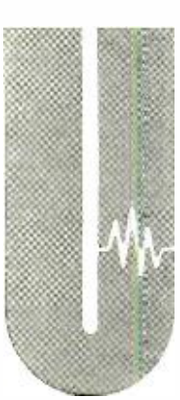


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(they look like this when the music stops)



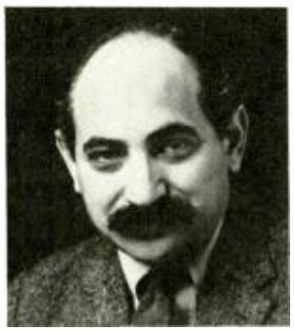
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JAZZ and all that

Bertram Stanleigh



Bossa Nova at Carnegie Hall
Audio Fidelity Stereo AFSD 6101

In spite of all the defects that can crop up to mar a recording of a live performance, one comes along from time to time that has such outstanding musical merit that for all its flaws it must be acknowledged as superior to a studio made waxing. Rare as such discs are, another type of live recording is even rarer—one that documents an event and refutes derogatory reports in the press. The present disc of a 1962 concert at Carnegie Hall is just such a document, and at least a portion of its interest is in the noises made by the audience.

The concert, presented by Audio Fidelity, introduced a number of important Brazilian musicians to North America, among them Joao Gilberto, the famous interpreter of *Desafinado*, Luiz Bonfa, composer of the music from "Black Orpheus," and Agostinho Dos Santos, the voice of Black Orpheus in the film. About thirty of Brazil's best performers were flown to New York by their Government and participated in the event. For Brazil and its musicians this Carnegie Hall concert was an important gesture of cultural interchange, and that country was shocked when the critic of a leading New York daily labelled the concert "a fiasco." For the musicians who had hoped for heavy American bookings, such dreams were shattered. And since the concert, word of mouth reports have circulated that bossa nova is dead, killed by a bad concert at Carnegie Hall. Now we have a chance to judge for ourselves just how bad that concert really was.

Fifteen songs and fifteen solo performers, backed up by the Oscar Castro Neves Quartet, are represented on this record. Among the selections that stand out particularly are a guitar solo of the *Black Orpheus Theme* by its composer, a hoarsely whispered, poignant *Outra Vez*, sung by Joao Gilberto. *A Felicidade*, sung by Agostinho Dos Santos with Luiz Bonfa and the Oscar Castro Neves Quartet, and Sergio Ricardo singing his own melancholy *Zelao*. In my opinion, these and most of the remaining selections on this disc are superb but that's just my view. Another critic has a perfect right to think differently.

Branding a concert "a fiasco" is another matter again. Just what constitutes a fiasco? Webster's defines it as "a complete or ridiculous failure." Was it? The concert was a sellout. That's a matter of record but if you're in doubt, just listen to the audience. That the audience was fascinated and pleased can also be established. Listen to *Outra Vez*. During the instrumental introduction, the usual audience sounds can be heard, but when Gilberto begins his very soft solo, a marked hush falls over the audience, made all the more real by a random cough or two. Then listen to the thunder clap of applause at the end. The only ridiculous failure appears to have been that critic.

The long delay between the concert and this disc's release was due to sensitivity engendered by the review. Actually there was enough music recorded for at least one or two more records. Let's hope they finally see the light of day to demonstrate that there's still life in the bossa nova.

Kenny Dorham: Una Mas
Blue Note Mono 4127

Evidence of just how alive *bossa nova* is can be found on this bossa influenced platter from Kenny Dorham, ably abetted by Joe Henderson on tenor, Herbie Hancock on piano, Butch Warren, bass, and Anthony Williams, drums. Three performances of unusual length and interest comprise the entire contents. *Una Mas*, whose fifteen minutes extend all across side A, is one of those rare examples on records of an occasion when soloists find a thematic and rhythmic basis for elaboration so rich that they can continue to improvise for an extended period without resorting to repetition or familiar cliches. *Sao Paolo* is a seven minute bossa oriented number that combines Brazilian melancholy with American drive. As to the final selection *Straight Ahead*, as its title might suggest, is all American drive, nearly eight minutes of it. Ideas, performances and recording on this disc are all first rate. Although there is nothing about the level of the recording or the quality of the sound to justify such short sides, I, for one, am happy that Blue Note had the good taste not to water down the impact of these moving statements by padding out the playing time with additional material.

Roland Kirk: Kirk in Copenhagen
Mercury Stereo SR 60894

Recorded live at the Monmartre Jazzhus in Copenhagen, this performance by Kirk offers all of the high jinks and instrumental tomfoolery associated with this virtuoso of the manzello, stritch, nose flute and siren. In addition to increasing the recorded literature on these neglected instruments, this disc introduces a Spanish pianist, Tete Montoliu, whose crisp technique is matched by an abundance of ideas and rhythmic vitality. It would be interesting to encounter him again in an ambiance of serious music making, since he seems out of place in an atmosphere which smacks more of vaudville than jazz. All of the usual live audience sounds are present on this waxing, and in this instance they serve an important function in making it clear to the listener that these performances obviously have more to offer to the eye than to the ear.

Woody Herman: 1964
Philips Stereo PHS 600-118

While this most recent herd doesn't include any of the grand old men from the famous aggregations of the late forties and early fifties, it does bear the indelible stamp of the master—the vigorous drive and the same emphasis on crisp, accurate ensemble technique. Some of the former wildness has disappeared, and on records at least, that means cleaner sound. And this is indeed clean sound, some of the sharpest and most transparent brass waxing ever encountered. Tuttis never overload, and all of the inner voices can be heard clearly in such loud numbers as *Hallelujah Time* and *Jazz Hoot*. Whether the remarkably low distortion is the result of exceptional taping, superior cutting, or a combination of both, the final product is a knockout. Recording of this calibre might even bring back big bands.

Freda Payne: After the Lights Go Down Low and Much More!!!
Impulse Stereo A-53

This is a first waxing for a highly musical young woman with an agreeable voice and a bright, clear manner of belting out a song. While her performances are chiefly interesting for a strong degree of personal involvement, they are nevertheless not lacking in a highly individual style. The backing that Impulse has afforded Miss Payne does a great deal to insure the success of her debut. For side A she has a band led by Manny Albam which includes among its personnel such brilliant sidemen as Ernie Royal, Quentin Jackson, Bob Brookmeyer, Phil Woods, Zoot Sims, Seldon Powell and Hank Jones. Good as this group is, the quintet on side B is better. Phil Woods, alto, Hank Jones, piano, and Art Davis, bass, are joined by Jim Hall on guitar and Walter Perkins on drums to provide one of the most effective jazz accompaniments a singer has ever received. Stereo sound is bright and forward with Miss Payne smack in the center. The entire production has an air of superior planning about it, and the results justify the effort.

Georgie Auld Sextet: Here's to the Losers
Philips Stereo PHS 600-116

A sequal to Philips recent "Georgia Auld Quintet Plays the Winners," the present disc includes three of the sidemen from that earlier release—Lou Levy, piano, Leroy Vinegar, bass, and Mel Lewis, drums. Larry Bunker, vibes, and Johnny Gray, guitar, make up the balance of this gently swinging group. Everything fits neatly into place behind Auld's tenor lead in a collection of wistful ballads that includes such items as *In the Wee Small Hours, That Old Feeling, Learnin' the Blues* and *One for My Baby*. Throughout, the approach of the performers is conservative and restrained, but it is not in any sense inhibited. This is simple, direct music making that extracts a large portion of meaning from a number without attempting to alter its values or enlarge its dimensions. The clean sound is also on the conservative side with everything kept down to a level for late evening listening.

Phineas Newborn, Jr.: The Great Jazz Piano of Phineas Newborn Jr.
Contemporary Stereo S7611

Bright, fluent and highly inventive playing by one of the most original of modern jazzmen, from start to finish this album is a remarkable tour de force. No other pianist, today, has such solid technique, and we are all fortunate that along with that technique Newborn has developed into a musician with ideas interesting enough to put his technique to the service of making real music, rather than devote himself to the sort of superficial display that exploits dexterity for its own sake. This collection of nine compositions includes four by other pianists—*Celia* by Bud Powell, *This Here* by Bobby Timmons, *Prelude to a Kiss* by Duke Ellington and Billy Strayhorn and *Well, You Needn't* by Thelonius Monk. The remaining works include two Newhorn originals and tunes by Miles Davis, Sonny Rollins and Benny Golson. Everything is done to perfection.

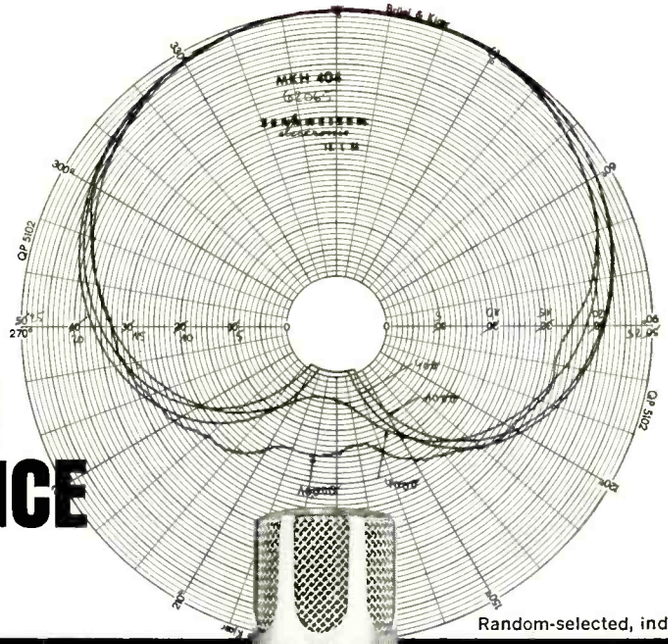
Herbie Mann: Live at Newport
Atlantic ALC 1927 (4-track stereo tape)

Herbie Mann's stint at the 1963 Newport bash has been taped with more success than other performances from the festival noted in previous months. Close miking with cardioid mikes has eliminated audience sounds, and Atlantic has also had the good taste to reduce applause to about four seconds at the end of each selection (RCA Victor prolonged such noise for as long as twenty-four seconds and even dubbed applause on to the end of Martial Solal's numbers recorded at rehearsal). In addition there are verbal introductions by musicians or announcers. Bossa nova figures prominently on this program with Jobim's *Desafinado* and *Garota de Ipanema* and Bonfa's *Samba de Orfeu*, but it's a long way from Rio to Newport, and the requirements of an open air concert demand the hopped up, houncier approach with which Mann invests these numbers. They have lots of excitement, but they are a far cry from the supple, sensitive bossa nova of Audio Fidelity's "Bossa Nova at Carnegie Hall." The remaining two numbers on this concert recording are *Soft Winds* and *Don't You Know*. Together with *Samba de Orfeu*, they share some added accompaniment on percussion by Willie Bobo and Carlos Valdez. Dave Pike contributes fine work on vibes, but his singing does nothing to arouse this listener's enthusiasm.

(*Continued on page 67*)

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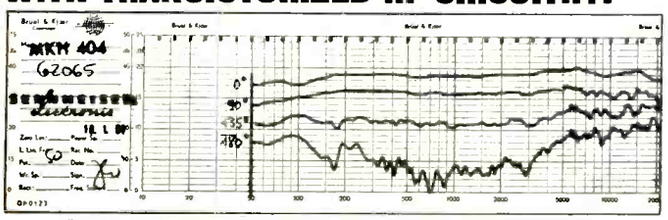
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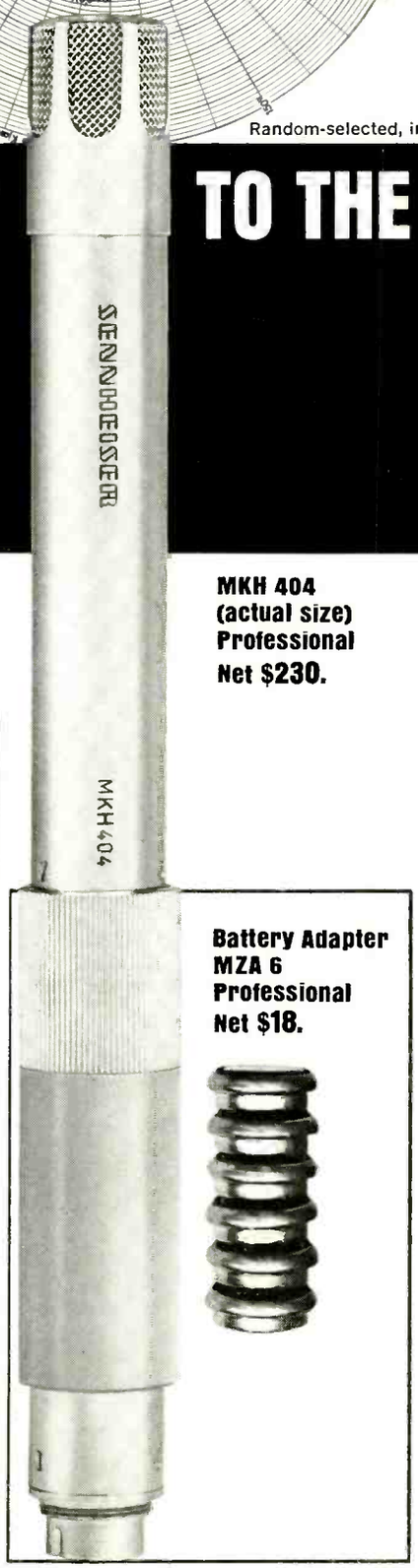


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Between the introduction of the MKH 104 Condenser Microphone into this country and its establishment as a standard of comparison, very little time has passed. Where the requirement for the most exacting professional performance can be met with an omnidirectional microphone, it is an unhesitating choice. Now with the development of the MKH 404, a comparable instrument is available when conditions dictate directional pickup. Thus, a significant milestone has been reached.

Cardioid condenser microphones are not new. But the MKH 404 is the **first transistorized cardioid condenser microphone to employ integral RF circuitry successfully.** This type of circuitry offers unique advantages in performance and convenience. It enables the exceptionally flat, peak-free response above and below the audio range; the minimal distortion; and the unusually low noise level. It also renders the microphone impervious to temperature changes, humidity, shock, and stray magnetic and electric fields. It eliminates the power-supply problem. The slender, lightweight assembly shown here in full size includes the plug-on power pack, which holds the 6 mercury cells that energize the circuit. The performance of the MKH 404 attests the success of the engineering effort.

The cardioid patterns and frequency response curves shown here, taken in the laboratory from a random-selected MKH 404, show the excellent front-to-back rejection ratio at all frequencies and the outstanding uniformity of response at any angle, as well as on axis. In fact, the directional characteristics are exact and independent of frequency. The individually graphed frequency response curve you receive with any MKH 404 will adhere very closely to the one shown here. Response below 40 cps has been tailored to meet practical requirements in most applications.



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Weighted noise voltage (German Engineering Standard DIN 45 405)	10 microvolts
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Power-supply voltage	8 volts ±1 volt
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Weight	3 oz.

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HERMAN BURSTEIN*

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

The Difference Between Mylar and Acetate

Q. I recently inherited a large number of used tapes several years old which I feel can be reused to advantage. They are of various brands, thicknesses, and types of base (acetate or Mylar). However, the boxes and reels are all mixed, so that I can't tell one type from the other. Can you please tell me if there is some easy way of telling the thickness and the base material?

A. To distinguish between Mylar and acetate, hold the tape up to the light. The Mylar is opaque and the acetate is translucent. Another method is to tear off a small piece from the end of the tape. The Mylar stretches a good deal before tearing and is harder to tear; the acetate breaks rather sharply.

To distinguish between 1 and 0.5-mil Mylar, rapidly wind the tape from one reel to the other on a machine having a footage counter. You will get a much higher reading with 0.5-mil tape than with 1-mil tape.

Planned Tube Replacement —Another View

"You might be interested in a comment from one with over 25 years of professional experience with commercial tube systems, employing from 300 to many thousands of tubes per system, where reliability is of the utmost importance. I am referring to the statements in your column concerning "Planned Tube Replacement." Here I disagree quite violently. If a tube works and works well, for goodness sakes leave it alone! Experience has shown that the great majority of tube failures occur in the first 500 hours. Statistically, tubes that have lasted that long have a much greater chance of lasting the next 500 hours. In fact, there seems to be no upper bound: this would apply equally well to tubes having 2000 hours of service or 10,000. This assumes, of course, that the tube is operated within ratings in properly designed circuits.

"I might cite a personal case. My own old high fidelity system, designed and built 20 years ago to achieve maximum performance in a very poor receiving area still gets quite hard usage. It has not required a tube replacement of any sort in the last 16 years and is still going strong." B. E. Phelps. Poughkeepsie, N. Y.

Several remarks may be appropriate with respect to Mr. Phelps' letter:

1. A tube that has not failed but is "weak" may give less than the best performance. If it is an output tube in a power amplifier, it may produce more distortion than a new tube. If it is a rectifier tube, there may be a significant drop in d.c. voltage, resulting in increased distortion. If it is an i.f. tube in a tuner, it may result in a reduction in gain, sensitivity, and signal-to-noise ratio.

2. Mr. Phelps refers to tubes that are operated "within ratings in properly designed circuits." However, some tubes, particularly in the output stage of a power amplifier, are worked very close to their ratings and hence may be more than usually susceptible to a deterioration in performance or to failure after a given period of use.

(EDITORS comment: We must agree with Mr. Phelps, tubes which have survived 500 hours, about 10 ten hours of use a week for a year, are less likely to "defect" than new tubes. Also tubes do not "weaken" as much as circuit components vary.)

Quarter-Track Tape

Q. I have assumed that the format of quarter-track tape is four equally-spaced channels, each channel centered in each quarter width of tape; i. e. each channel is alloted 1/16th inch. If this is correct, the two sets of pole pieces of a stereo tape head should be spaced 1/8th inch apart. The spacing in my tape head seems to be different than this. Will you please tell me where I can obtain specifications for recording and playback heads that indicate the pole-piece spacing and the relationship of the tape to the pole pieces during recording?

A. When a tape is recorded quarter-track, each track has a width of 43 mils (thousandths of an inch), and the three islands separating the four tracks are each about 25-mils wide, all adding up to the approximately 250-mil tape width. The distance between the bottom of the upper gap and the top of the lower gap of a stereo tape head (recording or playback) should be 93 mils, which is slightly less than 1/10th inch. The distance between the gaps of a stereo erase head will be slightly smaller, because the gaps are longer in order to insure complete erasure of the track width.

Blips and Pops

*Q. I have recently purchased a * * * recorder, which seems to operate perfectly with the following exceptions. First, when the record circuit is engaged, a "blip" is recorded on the tape. A tape recording will have a number of these blips and pops if it has been necessary to stop and start the machine several times. Second, the machine does not have an instant start despite the solenoid-actuated transport and the claims of the manufacturer. Third, the VU meters seem to be inaccurate; 100 per cent modulation is reached only after the indicator is far into the red. Also, the meters are very small and not illuminated.*

A. I have checked and am told that the blips and pops appear to be a rather frequent phenomenon, although more so in some units than in others. Also, these noises depend on the line voltage, tending to be greater when the voltage is low. One suggestion is that you fully reduce the recording gain control before stopping and starting. Another is that you can erase the blips and pops by manually backing up the tape a few inches before you recommence recording.

I have no suggestions concerning the lack of instant start. I recommend that you consult the manufacturer.

100 per cent tape modulation (presumably the recording level that results in 3 per cent harmonic distortion on the tape at 400 cps) should be reached at a recording level that drives the meter about 6 to 8 db above O VU; that is, well into the red. Correspondingly, when the meter reads O VU, this means that the recording level is 6 to 8 db below 100 per cent modulation. This provides a desirable safety factor to allow for the inability of the meter to keep up with brief, sharp signal peaks. In sum, the VU meters in your unit appear to be properly calibrated.

I don't see that you have much to gain by installing different VU meters.

Takeup Reel Slows Down

Q. I've been having what I assume to be mechanical problems with my Viking Series 85 tape deck. Often, after playing ½ to ¾ of a reel, the takeup motor will start to slow down. First the tape becomes loose on the reel and eventually starts spilling off as the takeup slows below capstan speed. At first it appeared that the motor might be defective, and I replaced the takeup motor, but the problem continued. An audio repair shop and I have independently adjusted the brake system, but to no avail. However, the shop has never been able to induce the problem to assert itself in the shop. The problem occurs only when I have the deck in its cabinet, where it is mounted horizontally about eight inches above an AM-FM tuner. Nothing appears to be binding, and the fault is not dependent upon the tuner being off or on.

A. Your problem is indeed puzzling, and I am far from sure that the following comments will be helpful. For what they are worth, here are two things you might do:

1. I believe there is a capacitor across the takeup motor. This may be leaky or otherwise defective. Try replacing it, using a capacitor of identical value.

2. The fact that your difficulty occurs only when the tape deck is in a cabinet suggests that heat may be responsible. The motor produces heat. If it is struggling to perform its task, it heats up all the more. And in a confined space such as a cabinet it heats up still more. I suggest that you take the deck out of the cabinet, train a heat lamp on it to simulate the heat generated inside the cabinet, run the deck for a while, and look for anything that may be binding.

Shorting-Type Switches

Q. I employ shorting type, rotary switches for head switching, record/play, and so on. Every time one of these switches is turned while the recording amplifier is on, a loud pop is heard from my loudspeaker. Is there any way to eliminate this difficulty?

A. Try connecting a 10-megohm resistor from each of the switch terminals to ground.

(Continued on page 56)

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

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collector's item



The Concord 884 transistorized stereo tape recorder is designed for the connoisseur of sound, the collector with tastes and demands above the ordinary. No other recorder, regardless of cost, has all the Concord 884 professional quality features.

Three separate heads—one record, one playback and one erase—assure professional quality reproduction from FM multiplexing, stereo records and live performances. Four completely separate preamps—two record and two playback—and full transistorization assure maximum reliability. A flip of the AB monitor switch lets you compare source vs. tape while recording.

A few of the other features are: built-in sound-on-sound switch for effects such as electronic echo chamber; stereo headphones output; automatic reel-end shutoff; 3 speeds; 2 lighted VU meters. All push-button operation; 15 watt stereo power amplifier and separate 7" full range speakers complete your 884 stereo system. Model 884 under $450.* Other models from $100.*

*Prices slightly higher in Canada

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CONCORD 884

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ABOUT MUSIC

Harold Lawrence

Sound and Light—A New Entertainment

IN THE WORLD of the French teen-ager, the ages of man are neatly arranged in four categories:

1) *"les copains"* (under 20)—pals.
2) *"les croulants"* (20–30)—beginning to crumble with age.
3) *"ça ne passera pas le weekend"* (30–40)—won't last the weekend.
4) *"Son et Lumière* (40 and over)—as ancient as the palaces, cathedrals and historic monuments which provide the settings for Sound and Light spectacles.

The copains' description of the fourth age group leaves no doubt as to how they feel about Sound and Light spectacles as well. But the old stones, like more than a few 40-plus citizens, are not crumbling with age; nor do they expire on weekends. On the contrary, *Son et Lumière* is very much alive and has grown into a multi-million dollar tourist industry over the past dozen years.

A French De Mille

The idea of bringing history to life in sound and light was conceived by Paul Robert-Houdin, grandson of a celebrated magician, while on a visit to the castle of Chambord in 1951. A thunderstorm had burst over the Boulogne Forest and the nocturnal rain beat down. As Robert-Houdin watched the flashes of lightning illuminate the chimneys, gables, pinnacles, and dormer windows of the Renaissance château, the years seemed to drop away like leaves in the storm-lashed forest. He found himself transported to the time of François I, the sixteenth-century king who built the impressive castle. A showman at heart, Robert-Houdin thought big. Why not try to duplicate nature's spectacular lighting and, combining it with the latest techniques of sound reproduction, assemble a historical pageant featuring narration, drama, poetry, music, sound effects and lights?

Stones Lit Up

Viewed separately, the components of Robert-Houdin's idea were not original. French buildings began to be illuminated as early as 1918, when the Strasbourg Cathedral was lit up "like a fixed meteor on the horizon" in celebration of the end of World War I. From 1925 to 1937 lights were focused on the Eiffel Tower, Arc de Triomphe, Notre Dame, the Louvre, and scores of other historical places throughout France. And the French had been flocking for years to night performances of opera and drama staged in ancient Roman amphitheatres in Province and in the courtyards of royal palaces.

What gave Robert-Houdin's scheme its unique significance was the application of all these elements to specific buildings and periods in French history. Enlisting the support of the government, he began work in the studios of Mazda and Pathé-Marconi in Paris, where he planned the lighting, directed the recording of the tracks that were to be used in the "Rich Hours of Chambord," and supervised the final mix. The first *Son et Lumière* spectacle was produced at Chambord in 1952.

It was an immediate success. The number of visitors to the famous Loire château doubled that year. In 1953 the Philips company was given equal rights with Mazda to equip and present *Son et Lumière* epics. Now there are almost a hundred of these presentations in being or in the process of production.

Outdoor "Spectacular"

The two most successful Sound and Light spectacles in France were produced by Mazda and Philips. Mazda's Versailles show, with sound by Pathé-Marconi, is a lavish affair: the scenario is by Jean Cocteau and André Maurois; the music by Jacques Ibert; the spoken words by members of the Comédie Française and Charles Boyer; and the music performed by members of the Paris Opera and chorus, and the French Radio orchestra. Philips' first Sound and Light show remains one of its best. The setting could not be more dramatic: Chenonceaux Castle, built over a bridge of the Cher river near Tours, with its turrets and arches reflected in the mirror-like surface of the water.

The French Government Tourist Office took *Son et Lumière* to its bosom. Visitors thronged to the nocturnal pageants—more than 300,000 paid to see Versailles lit up last year, for example—and the money they spent went toward the maintenance and restoration of historic monuments throughout the country. It was inevitable that other countries would follow France's example. The lights soon went on all over the world: in the Acropolis, the Pyramids at Giza and the Cairo Citadel, the Royal Palace in Madrid, the Inner Court of Parliament at The Hague, Independence Hall in Philadelphia, and elsewhere.

Costs and Technical Details

The production of a major Sound and Light spectacle is a costly and intricate affair. Chenonceaux cost $100,000, the Acropolis $250,000, and the Pyramids and Citadel spectacles $600,000. But with crowds pouring into these shows at ever increasing rates, amortization poses no problem; Chenonceaux, for instance, takes in about $33,000 a year. Philips' engineers say they have developed the technique to the point that, with the latest electronic equipment, the switching of lights and sound and the remote control of other effects have become almost automatic from a central control desk. These effects are produced by a combination of multi-track tape recorders and a system of automatic switching of loudspeaker groups.

For the Acropolis show, nearly a hundred tons of Philips equipment were shipped from France, including cables and junction boxes, floodlights and projectors, dimmer controls and sound equipment. In addition, it was necessary to build a 600 kva transformer station. The floodlights used were diffusors of enameled sheet metal and aluminum mirror reflectors either with polished mirror for narrow beams or faceted mirror for wider beams. Batteries of speakers located around the ensemble of the Sacred Rock and its monuments were set into operation by means of a highly sophisticated cueing system.

Son et Lumière in the U.S.

Encouraged by the success of its sound-light productions in Europe, Philips is moving ahead with its American plans. Having produced spectacles at the Castle San Marco in Saint Augustine, Florida, and at Independence Hall in Philadelphia, the North American Philips Company in close collaboration with the *Son et Lumière* Department of French Philips, is preparing new projects here, including several for the forthcoming New York World's Fair.

Putting on shows in the United States is proving no easy matter, even with a dozen years of experience to draw on.

A lengthy script by Archibald Mac-

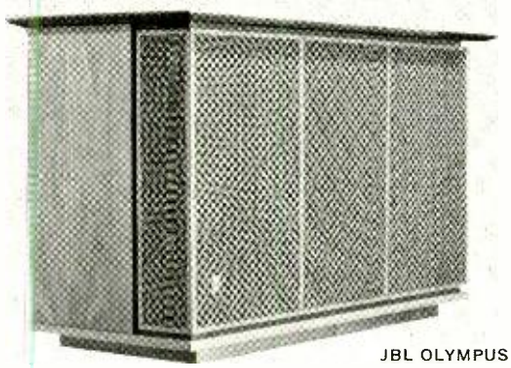
(*Continued on page 65*)

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WILL YOUR ULTIMATE PRECISION LOUDSPEAKER BE

A JBL LINEAR-EFFICIENCY SYSTEM ?

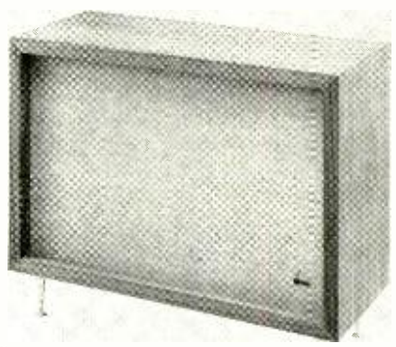
To the concept of long linear cone excursion James B. Lansing Sound, Inc., adds JBL precision workmanship, extremely close tolerances, and the largest voice coils made anywhere. When Linear-Efficiency transducers are mounted in a *compact* enclosure, the full-range coverage they provide is miraculous indeed. And when the same principles are applied to a full size system, "ultimate" is a most apt description.



JBL OLYMPUS

...OR A JBL HIGH EFFICIENCY SYSTEM ?

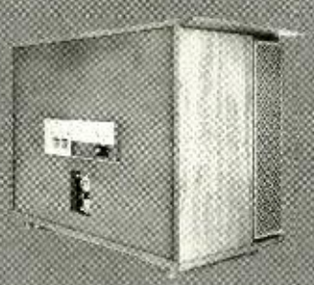
JBL makes the most efficient loudspeakers in the world, the only transducers with four-inch voice coils. JBL efficiency is the result of advanced magnetic circuitry, tight tolerances, and the large amount of conductor in the gap provided by large voice coils made of wire ribbon wound on its narrow edge. This gives them a dynamic range, transient response, presence, and an evenness of coverage without equal.



JBL C37

ALL JBL SPEAKER SYSTEMS ARE AVAILABLE SELF-POWERED

In a JBL Energizer/Transducer, loudspeakers and power source are engineered as a unit, perfectly matched to reproduce a preamplified signal with a purity that has no precedent. All-solid-state construction is used in the energizer. Generating negligible heat, non-microphonic, it can be mounted in and become a part of the acoustical enclosure.



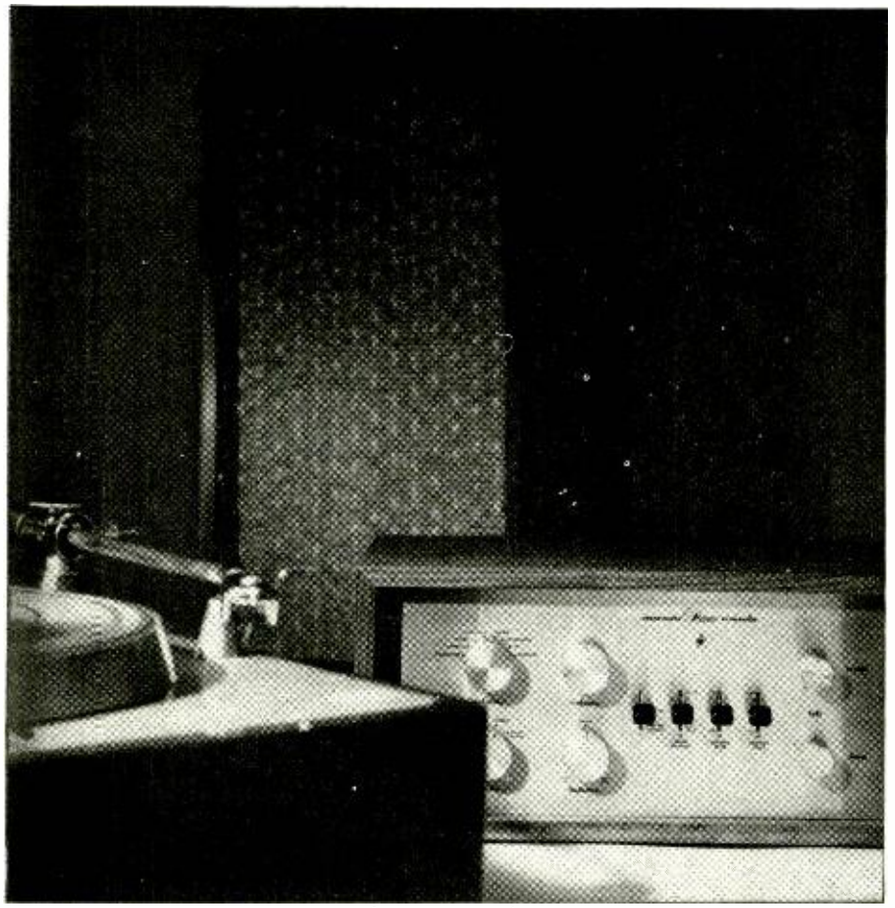
It is without hum, and distortion in any form approaches the vanishing point. It is not subject to the creeping degeneration common in vacuum tube devices. With custom matching of energizer and transducers, exactly the right damping is provided at all frequences. Transient response of an Energizer/Transducer has never been equalled.

JBL OFFERS YOU MORE WAYS TO MAKE YOUR SYSTEM YOUR VERY OWN

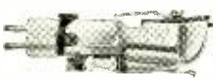
JBL recognizes the fact that the serious participant in the art-science of high fidelity is an enthusiastic individual. He wants his very own system, one not quite like any other he has known. To serve the need of each individual, JBL offers two basic types of loudspeakers in many models. They can be used in large systems or small systems, built-in or free-standing. JBL provides enclosures for every taste—infinite baffle, bass reflex, folded horn ... acoustically excellent, at the same time beautiful furniture. You will find that JBL makes equipment you will find nowhere else—acoustical lenses, a passive radiator, integrated stereo... All have one thing in common: JBL products are precision built for the talented listener who is implacably determined to own the finest. Write for a free copy of the JBL complete catalog.

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A ceramic cartridge in a system like this?



Absolutely!

We're talking about the new Sonotone Velocitone Mark IV. Use the high compliance Mark IV in the **finest** tonearm, on the **finest** turntable, playing through the **finest** amplifiers and speakers. It has everything the **finest** magnetic cartridges have, including a compliance of 15 x 10^{-6} cm/dynes in all directions. Capable of tracking at the low forces required by modern, professional turntables, it is equally well suited for use in record changers.

What's more, it offers a number of innerent advantages not possible with magnetic cartridges. There's a stylus that's virtually indestructible—the exclusive SONO-FLEX®. There's complete—but **complete**—freedom from magnetically-induced hum.

That's why we say: There's **one** ceramic cartridge that's worthy of the finest equipment—the Velocitone Mark IV. You don't have to make any change in your equipment to install it, either. The Mark IV comes complete with factory-matched equalizers that you can plug right into any magnetic input.

Mark IV with dual diamond styli, $24.25*; with diamond/sapphire, $20.25*. Hear the new Velocitone Mark IV at your hi-fi dealer. *SUGGESTED LIST

Sonotone Sonotone Corporation, Electronic Applications Division, Elmsford, New York
Cartridges • Speakers • Microphones • Headphones • Hearing Aids • Batteries

TAPE GUIDE

(from page 52)

Recording from Deck to Deck

Q. I am planning on buying an Ampex 936 tape player and rerecording tapes with my Ampex 1250. I wonder if I could record directly from the 936 to the 1250? Would the preamps from the 936 be enough to drive the 1250, or would a better method be to record from the tape output jack of my audio system's preamp? Also, what would be the best relative settings of the playback gain control on the 936 and the record-level control on the 1250?

A. I see no reason why you cannot record directly from the 936 into the 1250. The fewer stages through which the signal has to go before being recorded, the less distortion and the better frequency response you are apt to have.

The signal into the high-level input of 1250 goes directly to the record volume control. Therefore no danger exists of overloading the 1250 by excessive signal. Accordingly, it appears desirable to operate the playback gain control of the 936 at maximum to avoid any possibility of high-frequency loss, which sometimes occurs when a gain control is set at mid-position; the loss is greatest when the control is electrically at mid-position, which is 6-db below maximum volume. Of course, there may be some possibility of treble loss due to mid-setting of the 1250's volume control. To find out, play around with various combinations of the two controls to discover whether there is any noticeable change in treble.

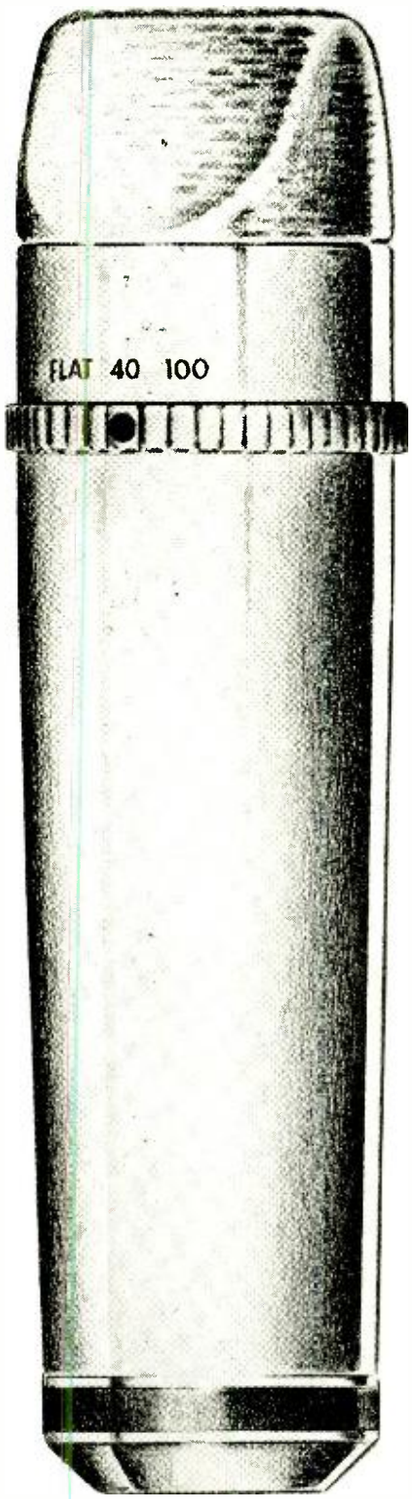
Selecting Microphones

Q. I recently purchased a tape recorder and have yet to acquire two matching low-impedance microphones. Since I am a professional organist and choirmaster, I plan to record pipe organ and choir music, normally within large or medium size churches. What type of microphone should be used ideally for such applications? Stereo separation should not be too pronounced. Most churches possess considerable reverberation which should be recorded within its proper perspective. As of late, there have appeared on the market a number of fairly high quality omni-directional dynamic microphones of reasonable price. Would these microphones be suitable for such use, perhaps with some mechanical modification?

A. It is very difficult to advise about microphones because so much depends upon personal listening preferences, recording site, and the material being recorded. If a fair amount of reverberation is desired, an omnidirectional microphone may be suitable; the closer you place such a microphone to the sound source, the less reverberation will be picked up. On the other hand, If reverberation is excessive no matter where you place the microphone, it would appear desirable to use a cardioid pattern. To avoid excessive separation on stereo recording, it is ordinarily necessary only to bring the two microphones closer together. I would avoid attempting a mechanical modification of any microphone: The design factors are quite intricate, and in the absence of elaborate test equipment any attempt at modification is apt to make things worse. **Æ**

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The only completely self-contained condenser microphones are made by... TEACHOUT WEST!



Condenser microphone disadvantages and problems have been eliminated. Teachout West transistorized condenser microphones include power supply, transformer, impedance matching amplifier, and permanently polarized condenser capsule in one compact, trouble-free package.

- ☐ Exclusive permanently D.C. biased condenser capsule.*
- ☐ Self-contained rechargeable nickel-cadmium battery.
- ☐ A minimum of 1000 hours of operation between battery recharges.
- ☐ Self-contained matching transformer – 50Ω, 200Ω, 600Ω balanced output impedances.
- ☐ Optional single-ended output – 100Ω output impedance into 15,000Ω load or greater.
- ☐ Low-noise, highly reliable 400 meg ohm field-effect transistorized circuitry* – does not employ critical RF oscillator or balanced-bridge circuitry.
- ☐ Absolutely no possible over-loading of the impedance matching amplifier by low frequency or high output of the condenser capsule.
- ☐ Cannon XLR 3-pin output connector.
- ☐ Regulated constant current battery charger permits recharging through two-wire audio cable while microphone is in use.
- ☐ 4 position ring switch, employing glass sealed, magnetic actuated reed switches to insure low-noise, long-life operation. OFF, FLAT, 40 CYCLE CUT, 100 CYCLE CUT
- ☐ Two models: AS360, axially sensitive
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- ☐ Sensitivity: –51dbm re 10 dyne/cm² balanced
  –35dbm re 10 dyne/cm² single ended

LIFETIME WARRANTY! Because of the simplicity of our unique two-transistor design, Teachout West makes no charge for service under normal use.

AS360 . . . . . $395.00
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NEW PRODUCTS

● **Three-Speed Tape Recorder.** The Concord Model 440 is claimed to be unequaled in quality and price. Among its outstanding value features are transistor preamps,



pushbutton operation, exclusive Trans-A-Track, three speeds, two dynamic microphones, separate mike and auxiliary inputs, cue button, plus many other features. The 440 is a complete system which can play back stereo through its own amplifiers and speakers. Concord Electronics Corp., Los Angeles, California. **D-5**

● **Stereo Positioner.** A low-cost high-quality version of the "pan post" used for years by most major motion picture and disc recording studios has been introduced by UltraAudio Products. Known as the Hollywood Phantom Positioner, model H-122, the 4 × 6 × 2-inch self-contained and fully transistorized circuitry allows the user to electronically position any sound source from left to right and back again



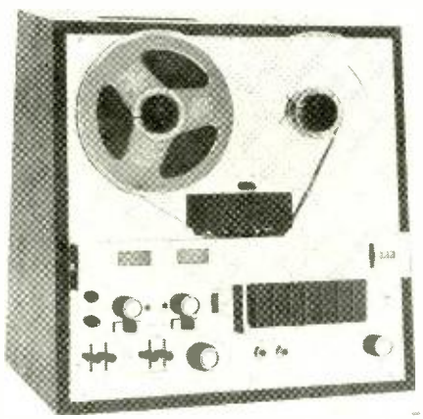
. . . and anywhere in between, in a two-channel stereo sound or recording system, just by sliding a knob. The Positioner also provides about 60-db of gain, more than sufficient to bring even the weakest sound sources up to high level for feeding any stereo input . . . even amplifiers that do not have gain controls. UltraAudio Products, Division of Oberline, Inc., Box 921D, Beverly Hills, California. **D-6**

● **Magnetic Pickup.** Pickering announces a new development in pickups with their V-15 Micro-Magnetic (TM) Stereo Cartridge. Its miniature size and super light weight (5 grams) make it ideal for the low-mass tone arm systems of today. The V-15 can be used in either manual turn-



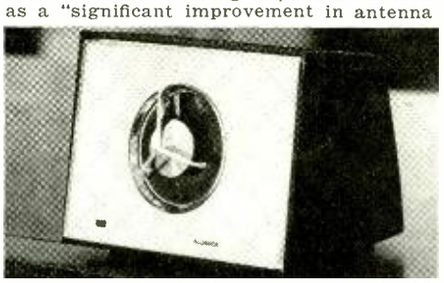
tables or record changers. A new magnetic structure provides flat response from 20-20,000 cps, 7.5-mv per channel output at standard recording levels, low IM and harmonic distortion with 15-deg. vertical tracking angle. The V-15 features the exclusive "Floating Stylus." Pickering and Company, Inc., Plainview, L. I., New York. **D-7**

● **New Tape Deck.** A new addition to the Bell line is the T-367 Stereo Tape Deck/Duplicator which provides facilities for four-track stereo tape recording, playback, and tape duplicating. Self-contained preamplifiers in the T-367 permit recording, playback, and tape duplicating without need for external amplifiers, yet provide preamplifier-level output adequate to feed into a separate stereo system power amplifier. A special feature of the new Tape Deck/Duplicator is its ability to make copies of tapes without need for a second tape transport, simply by the addition of DK-1 accessory motors which mount to the deck assembly housing. These motors also permit use of the larger 10 ½-in. tape reels to achieve increased recording and playback time on a single reel of tape. The tape deck may be operated either with or without the DK-1 accessory motors. The Bell T-367 incorporates three-motor drive, electro-



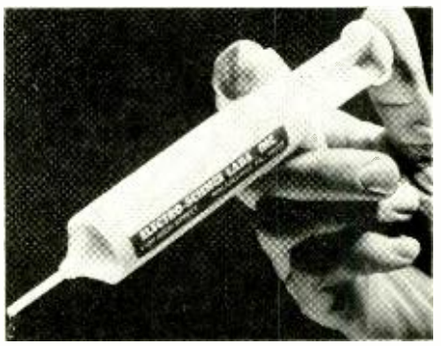
dynamic braking, dual lighted recording-level meters, tape lifters, automatic stop switch, index counter, piano key control, and three separate heads to provide off-the-tape monitoring, echo, and sound-on-sound capability. In addition dual-channel input selection and output selection have been included as well as front-panel microphone input jacks and motor selector controls. The T-367 is priced at $369.95, the DK-1 at $49.95. TRW Columbus Division, Columbus, Ohio. **D-8**

● **'Solid-State' Antenna Control Unit.** Clearer color TV and stereo FM reception is promised by a new "solid-state" automatic antenna rotator developed by The Alliance Manufacturing Co., Inc. Described as a "significant improvement in antenna



rotating devices," the new Model C-225 "Tenna-Rotor" offers all transistor circuit; constant synchronization between room control and outside antenna; silent operation. Resembling a small desk clock, it is styled in brown and white of high-impact plastic. List price is $59.95. The Alliance Manufacturing Co., Inc., Ohio. **D-9**

● **One-Part Potting Material.** A clear one-part potting material, based on a modified epoxy resin, and used for potting small electronic components and assemblies, has been developed by Electro-Science Laboratories, Inc. Known as Microcast 100, it requires no mixing prior to application, and goes direct from the tube to the desired area. The non-toxic material features the desirable physical, electrical and chemical characteristics of a high-grade epoxy casting material. It comes packaged in no-drip reusable syringes equipped with



60mm sealed spouts. The potting agent is released in consistent drops, each weighing approximately 0.03g. This eliminates the former necessity of measuring the amount of agent used in many applications, and keeps air entrapment to a minimum. Cure for the ESL material is 2 hours at 120 deg. C to 125 deg. C, followed by post-bake of 1 hour at 160 deg. C. Microcast 100 is available in 35ccm Polypropylene syringes. A sample syringe is $2.45, with quantity prices below $2.00. It is also available in bulk containers at $3.75 per pound. Electro-Science Laboratories, Inc., Phila., Pa. **D-10**

● **Portable Generator.** Highly exacting audio, ultra-sonic, sub-audio and servo-mechanism measurements are attained with the new Waveforms 473B Sine and Square Wave Generator. Dial accuracy, both sine and square is ± 1 per cent—designated as "precision plus" under the company's system of instrument classification. A companion "precision" instrument with ± 3 per cent dial accuracy is also available. Frequency range is 1 cycle to 100 kc. Sine wave distortion 1/10 per cent at 1000 cps. Square wave rise time



below 1 microsecond. Amplitude constant with frequency within ± ½ db. Sine and square wave output 600 ohms. Power capability 10 v rms (sine wave) or 10 v p-p (square wave) into a 600-ohm load. Both waveforms are controlled to a fraction of a millivolt by a 5-position decade attenuator and a fine output control. Size 8″ × 6″ × 10½″. Weight 12 lbs. Price $410.00. Also available with standard rack and panel mountings. Waveforms, Inc., New York, N. Y. **D-11**

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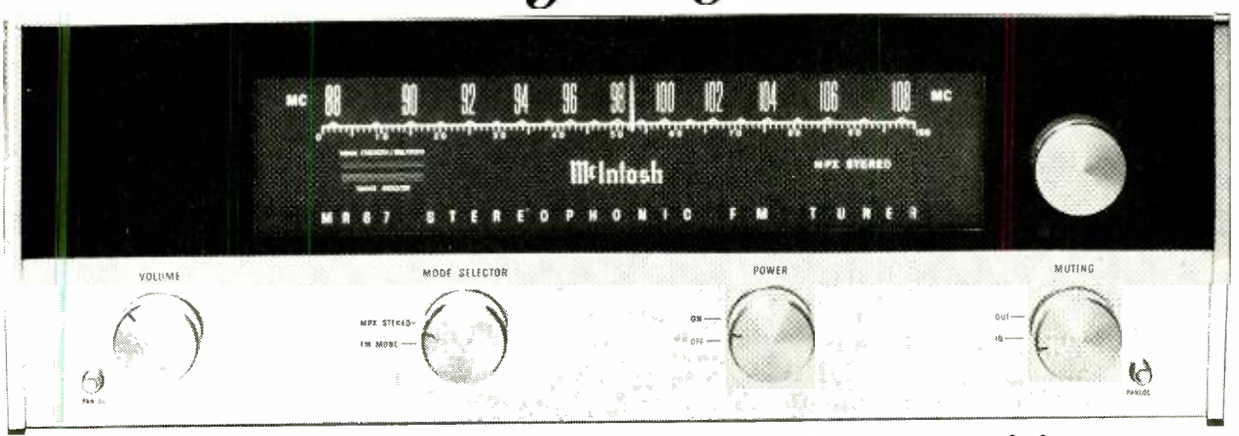
Who builds the best FM stereo tuners?

McIntosh

Who says so?

Audio Magazine February 1964 in their equipment profile said the McIntosh MR 67 is

"...unexcelled by any other tuner..."



The MR 67 is priced less than several competitive tuners. It outperforms any tuner Audio has tested. Need we say more? Would you like a complete copy of the Audio test report? Would you like a copy of specifications for all McIntosh FM stereo tuners?

All you need to do is send in the coupon with your name and address and we will rush you copies of the report and specifications sheets on all McIntosh tuners. FREE OF CHARGE.

McIntosh Laboratory Inc.
4 Chambers St.
Binghamton, N. Y.

Please send me copies of report and specifications sheets on McIntosh Tuners.

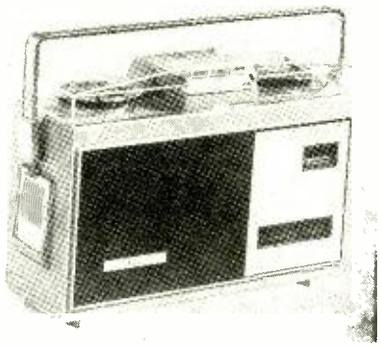
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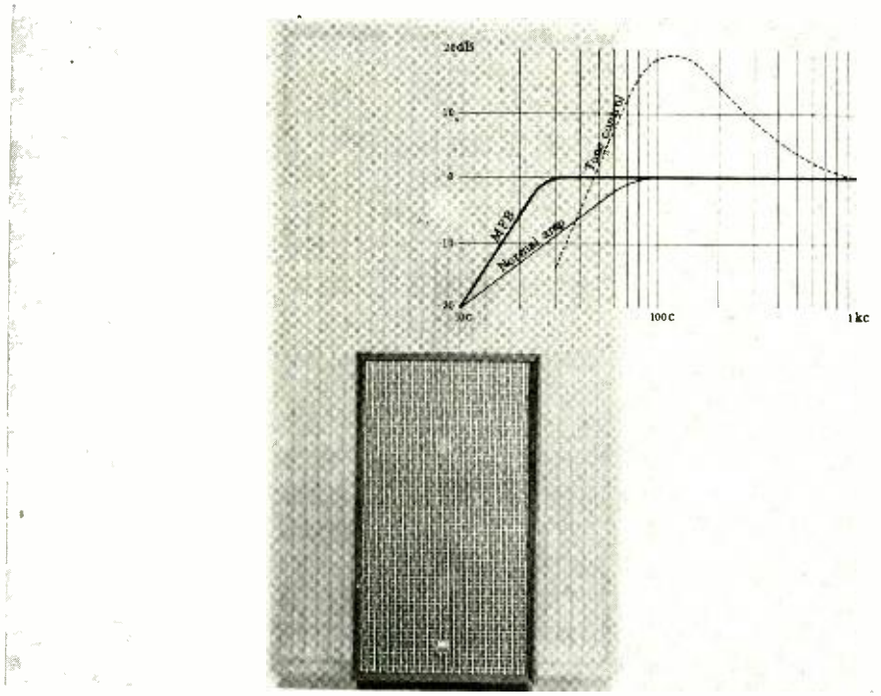
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• **Portable Tape Recorder.** The new Norelco Continental '101' (Model EL 3586) self contained, portable, battery operated, transistor tape recorder, has a broad range of optional accessories to permit recording under a wide range of conditions. The Continental '101' is simple to operate; push two buttons to record, one to play back. It weighs only 7 lbs. and uses D-cell flashlight batteries. 40 hours of recording per set of batteries is possible. The Continental '101' can record from a radio, phonograph or TV as well as the microphone by means of a special input jack. A second jack is designed to accommodate headphones or a remote microphone-switch. North American Philips Company, Inc., High Fidelity Products Division, New York, N. Y. **D-12**





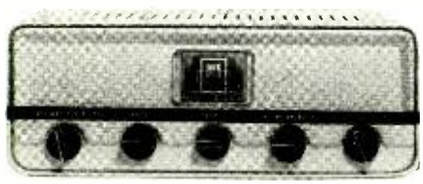
FIRST STEREO AMP WITH MFB DOUBLES ANY SPEAKERS' LOW FREQUENCY RANGE

Now Hi-Fi can be low-cost. Because this new stereo amp makes inexpensive, smaller speakers work just like the big, expensive ones. Here's how:

The LUX SQ63 Stereo Amp is equipped with MFB—or Motional Feedback. It's the world's first stereo amp which incorporates variable cross-over MFB. If a speaker's normal bass response is to 80 cycles per second, MFB will extend it to 40 CPS or less.

For true Hi-Fi, you need bass frequencies in the 20-30 CPS range. But such speakers are big and costly. With MFB in your amplifier, you can choose inexpensive speakers whose normal range is only to 60 CPS. MFB brings it down to the 30 CPS you want.

With the new LUX SQ63 and MFB, you'll save money and get true Hi-Fi from a far more compact system.



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HEAD OFFICE: C.P.O. Box 117, Osaka, Japan Cable: "CITOH OSAKA"
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38 South Dearborn St., Chicago 3, Ill. Phone: STate 2-7195/6
LUX CORPORATION Osaka, Japan

LETTERS

(from page 8)

Party of the Second Part

SIR:

In order to be able to compare the noise levels between microphones, they must of course be measured according to the same method. If one bases all measurements of noise level on the method according to the German standard DIN 45.405 then the following values are obtained for the Neumann M-269 model microphone for the omni-directional pattern: weighted noise voltage 4.5 μv; unweighted noise voltage 8 μv. The comparable data for the Sennheiser Model MKH-104 are: weighted noise voltage, approx. 10 μv; unweighted noise voltage, 25 μv.

The absolute values of noise voltages in themselves are not a measure of the quality of a microphone. A meaningful comparison between microphones can only be made using the signal-to-noise ratios. To obtain these values it is necessary to take the sensitivity of the microphone in question into consideration. The Sennheiser MKH-104 has a sensitivity of 2 mv/dyne/cm². Calculating the signal-to-noise ratio for both microphones at a mean sound pressure of 10 dyne/cm² produces the following comparable values: Sennheiser MKH-104—weighted 66 db, unweighted 58 db; for the Neumann M-269—weighted 66 db, unweighted 61 db.

On the basis of this comparison we are of the opinion that as far as this property of the microphones is concerned, there are no significant differences between them for the user.

In addition we wish to point out that both the sensitivity and noise voltages of the Neumann microphone were obtained using the load resistance encountered in its operation, while it was assumed that both of these measurements made for the Sennheiser microphone were made without such termination but converted for this purpose.

GERHART BORÉ Dr. Ing.,
Chief Physicist,
Georg Neumann Electro-acoustic Laboratories

Record Companies at Fault?

SIR:

There was a time when I earnestly thought that the record industry was at a peak; that they had reached a good height for the most part and that manufacturers had sufficiently removed annoyances called rumble, hiss, distortion, wow, and flutter. I must say that I have been wrong. This thought was initiated with the hearing of two live stereo broadcasts programmed over Chicago's fine station WFMT, 98.7 mc FM. The two musical events were the Boston Symphony Orchestra and Guiseppe de Stefano, both broadcast from Orchestra Hall. When I sat at home listening to a performance with the tape and disc element missing it was absolutely unbelievable; tape hiss and surface noise were absent, only two microphones were used (I believe they were U-47's) and compression was virtually absent. I know now that this is the level of quality which record companies must seek. Here was a smoothness and balance together with a lack of distortion that produced a great impact upon me. The recording industry, fortunately not all labels are guilty, incorporates such exaggeration that they no longer approach what the original pioneers of reproducing equipment had in mind. I am sure of this.

JAMES F. KREGG
4063 North Milwaukee
Chicago 41, Ill.

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New Literature

• **New "FM/Q" Book and FM Station Directory.** The newly-revised 40-page booklet, "Theme and Variations" has just been issued. This very informative handbook tells about FM antennas, type to use, their installation, noise suppression, rotators, and answers many other questions you wish to know in order to obtain the best FM reception. Written by an authority on the subject, the booklet has been widely recommended by tuner manufacturers, FM stations, and editors for the wealth of factual information that it contains. Also included is a complete directory of FM stations for the U. S. and Canada with identity of all MPX broadcasters. You may obtain a copy by sending 35¢ to FM/Q, Box 153, Wethersfield, Conn. 06109.

• **1964 Edition of Radio-TV Station Guide.** A brand-new edition of the most comprehensive, up-to-date, radio-TV station guide over published has just been introduced by Howard W. Sams & Co., Inc. Prepared by Vane A. Jones, widely known for his four previous editions, this new volume contains over 7500 broadcast station listings, including 5000 AM and 1500 FM radio stations by city, state and frequency; and nearly 1000 TV stations (both UHF and VHF). The 12 Sections include: Symbols and Notes; Last-Minute Changes; How to Use This Book; FM Stations by Geographic Location; FM Stations by Frequency; TV Stations by Geographic Location; UHF-TV Stations by Channel; TV Station Maps; AM Stations by Geographic Location; AM Stations by Frequency; and AM, FM, and TV Stations by Call Letters. "North American Radio-TV Station Guide," 1964 Edition, is available from electronic parts distributors and bookstores throughout the country, or from Howard W. Sams & Co., Inc. Price is $1.95.

• **Basic Record Library Pamphlet.** The editors of the Schwann Long Playing Record Catalog have prepared a 16-page pamphlet entitled "A Basic Record Library" with the hope that it will encourage exploration of the great wealth of music now available on long playing records. No attempt is made to suggest specific recordings in the pamphlet. Readers can obtain "A Basic Record Library" free upon receipt of a stamped, self-addressed, long envelope. The Schwann Catalog, 137 Newbury St., Boston, Mass. 02116.

• **Theory, Mounting and Circuit Uses of Pressure-Fit Rectifiers.** A 90-page application manual for pressure-fit rectifiers has been published by Tung-Sol Electric Inc., Newark, New Jersey. The book covers applications of two families of high-performance silicon diodes: an 18-amp family in five voltage categories from 50 to 400 volts, and a 25-amp family in seven voltage categories from 50 to 600 volts. Basic rectifying theory and standard rectifier circuits are shown and explained. In addition, the book describes 27 special circuit applications. A section is devoted to the numerous ways that the pressure-fit rectifier may be mounted. Another section presents tables and curves for the ratings and characteristics of pressure-fit rectifiers. In all these sections, the book provides a wealth of design information not usually included in commercial rectifier literature. The device treated in this book is called the Pressure-Fit Rectifier because it is mounted by pressing the rectifier case directly into a heatsink surface. The pressure fitting feature opens up many applications by making readily available both positive and negative polarity rectifiers. Copies of Pressure-Fit Rectifiers Application Manual may be obtained for $0.75 each. Tung-Sol Electric Inc., Technical Publications Department, One Summer Avenue, Newark 4, New Jersey.

Who says a professional-grade, ribbon-type mike has to cost a small fortune?

Most audio engineers agree that microphones with ribbon-type generating elements give the best acoustic performance obtainable... the smoothest, most distortion-free response over the broadest frequency range.

Most ribbon-type mikes are therefore quite expensive... up in the hundreds of dollars.

But not the RCA SK-46. It gives you a frequency-response of 40 to 15,000 cps

...and it costs only $49.50*

•

What's so special about ribbon-type mikes?

There are 7 basic types of microphone generating elements: ribbon, condenser, magnetic, dynamic, ceramic, crystal and carbon. RCA sells all 7, so we can be relatively impartial about the advantages of the ribbon type.

A typical ribbon element (special aluminum alloy foil 0.0001" thick) weighs only about 0.25 milligram—hundreds of times lighter than generating elements in, say, dynamic and condenser mikes. The ribbon, in fact, is as light as the air mass that moves it, which accounts for its exceptional sensitivity.

In fact, of all 7 types of generating elements, the ribbon-type element is superior in:

★ Smoothness of response
★ Breadth of frequency range
★ Immunity to shock and vibration
★ Adaptability to various impedances



★ Low hum pickup
★ Immunity to temperature and humidity variations

That's why most of them cost so much.

But now you can get the remarkable RCA SK-46 bi-directional ribbon-type mike at Your Local Authorized RCA Microphone Distributor — For Only $49.50*.

For full technical information—or the name and address of your nearest distributor—write: RCA Electronic Components and Devices, Dept. 451, 415 So. 5th St., Harrison, New Jersey.

*Optional Distributor Resale Price

RCA Electronic Components and Devices, Harrison, N. J.

The Most Trusted Name in Electronics

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AUDIO ETC.

(*from page 14*)

Music of one period resembles that of another, maybe leapfrogging a few centuries. Tastes, styles oscillate. Now, we like Baroque music, Eighteenth century; a hundred years back they didn't think much of it, nor hear much.

And so there are types of music that fit beautifully into an acoustical environment of today, way out of their own time, just as the music itself fits people's needs, today. If we turn almost instinctively to much early music, because it has something for us, then our brand-new concert halls, wonderfully enough, take to the very same types of music. Like a duck to water.

You can see, then, that my feeling about Philharmonic Hall is absolute, as I said in the beginning, but only in a very special sense. It is a fine concert hall *of its type and period.* It will treat the right music well. It will make things rather difficult for the wrong music.

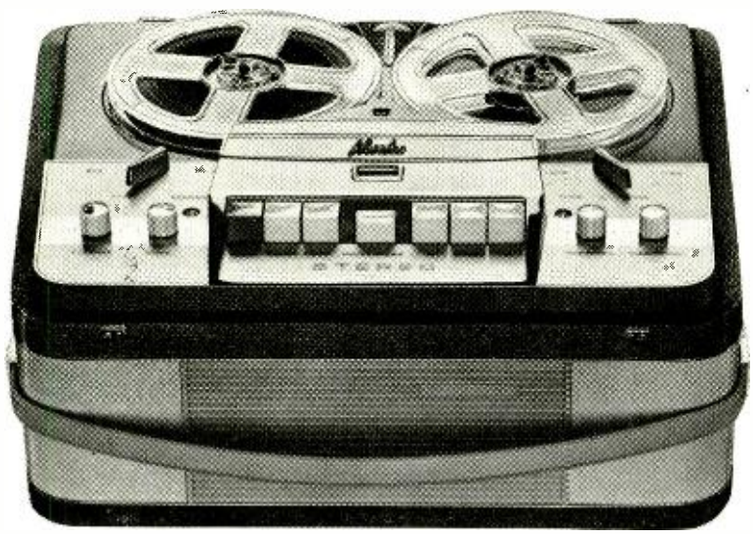
And alas the wrong music gets played in it every day, month after month! It survives, it comes off rather well, indeed, as most listeners admit, once they've got used to the sound. Music *is* flexible and so are we. But if you think Philharmonic Hall is the ideal Hall for the Philharmonic-Symphony of New York, you are wishful-thinking. Not with present repertory, nor with present audience—though some of the repertory (and some of the audience) fits perfectly. Not with present-day mixtures of repertoire—violent mixtures, too, the modern always followed by the nice, old-fashioned warhorse music that keeps the sweet ladies in their seats to the end. Nope. All-modern is what's *really* needed.

Now why didn't the promotors of Philharmonic Hall think of that in the first place? Didn't it even occur to them that contemporary architecture requires its own parallel in sound—*contemporary music?* Too much to ask, I guess.

Now isn't it a funny coincidence that the program which was sung by the Dessoff Choirs on the above occasion, when Philharmonic Hall was all mine to play around with in the listening, was the following: One work by Buxtehude, an early-Baroque and rather intimate sacred piece. One work by Perotinus, from the year 1200 more or less. And all the rest Twentieth century.

No wonder the place sounded good to me. Æ

all signal no noise



The most noise-free recordings you have ever heard are to be made on the new all-transistorized Norelco Continental '401' Stereo Tape Recorder, the only recorder using the newly developed AC 107 transistors in its two preamplifiers. The only transistor specifically designed for magnetic tape head preamplifiers, the AC 107 utilizes specially purified germanium to achieve the extraordinary low noise figure of 3 db, measured over the entire audio band (rather than the usual single frequency). This noise figure remains stable over large collector-emitter voltage swings and despite large variations in source resistance.

Norelco®

Hear the new transistorized Norelco Continental '401' • 4-track stereo/mono record and playback • 4 speeds: 7½, 3¾, 1⅞ and the new 4th speed of 15/16 ips which provides 32 hours of recording on a single 7" reel • fully self-contained with dynomic stereo microphone, two speakers (one in the removable cover for stereo separation), dual preamps and dual recording and playback amplifiers • self-contained PA system • mixing facilities • can also play through external hi-fi system • multiplay facilities.

SPECIFICATIONS: Frequency response: 60-16,000 cps at 7½ ips. Head gap: 0.00012". Signal-to-noise ratio: better than −48 db. Wow and flutter: less than 0.14% at 7½ ips. Recording level indicator: one-meter type. Program indicator: built-in, 4-digit adjustable. Inputs: for stereo microphone (1 two-channel); for phono, radio or tuner (2). Foot pedal facilities (1). Outputs: for external speakers (2), for external amplifiers (1 two-channel); headphone (1). Recording standby. Transistor complement: AC 107 (4), OC 75 (6), OC 74 (2), OC 44 (2), 2N1314 (2), OC 79 (1). Line voltage: 117 volts AC at 60 cycles. Power consumption: 65 watts. Dimensions: 18½"x15"x10". Weight: 38 lbs. Accessories: Monitoring headset and dual microphone adapter.

For a demonstration, visit your favorite hi-fi or camera dealer. Write for Brochure A-4. North American Philips Co., Inc., High Fidelity Products Division, 100 East 42nd St., New York, N.Y. 10017.

EQUIP. PROFILE

(*from page 42*)

The Speakers

The woofer is an 18-in. cone speaker with a ½-in. thick foam-plastic cone, a 4-lb. 10-oz. ceramic magnet, an edgewise-wound voice coil, and a rugged die-cast frame. This bass driver is the largest used by Electro-Voice in any system except for the Patrician.

The mid-bass driver is an 8-in. cone speaker which also features a die-cast chassis, ceramic magnet, and an edgewise-wound voice coil.

The mid-range and high-frequency speakers both use diffraction horns. The mid-range unit features a ring diaphragm rather than a dome and the tweeter features a silvered-aluminum voice coil.

A four-way crossover network (see *Fig.* 5) is used with the crossover points set at 250, 800, and 3500 cps. A five-position balance control is provided on the back of the cabinet which changes the response of the system above 1500 cps to accommo-

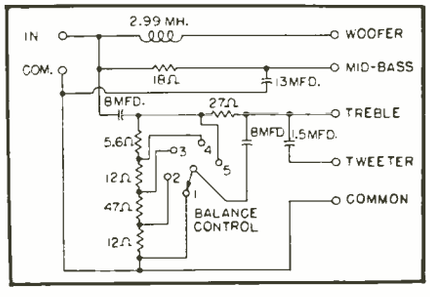


Fig. 5. Crossover network of the Model Six showing 5-position balance control.

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date different room acoustics. Position 3 (as shown in *Fig.* 5) is the "average" setting, with Position 1 dropping response some 8 db at 20,000 cps and Position 5 boosting response 5 db at the same frequency. This step arrangement, which gives a choice of five response curves, has some advantage in that it provides easily identifiable settings. On the other hand, a potentiometer would permit greater precision.

Perfomance

The Electro-Voice Six has a nominal impedance of 8 ohms and a power handling capacity of 35 watts of program material. Frequency range of the Model Six is 30–20,000 cps, plus or minus 5 db with the balance control at position 3. The response is generally smooth, although there is a depression between 70 and 1000 cps which extends down to 5 db in spots. (Of course another way to interpret this curve is that there is a bump at 70 and 1000 cps of about 5 db.) Above 1500 cps the response is generally smooth, dropping off some 5 db from 10,000–20,000 cps. (All of the high-frequency curves are similar except for the change in level.)

Listening tests confirmed the response curves in most respects, revealing a generally smooth response with a slightly-boomy bass. Listening tests further confirmed the rather directional top end we would expect with the type of speakers used. This means that they must be properly placed for stereo, as described in the sheet accompanying the speakers.

As far as music reproduction is concerned, we are convinced that the Electro-Voice Model Six is as close in sound character to a Patrician as one can come without being a Patrician. You listen. **D-3**

EMPIRE STEREO PICKUP, MODEL 880p

The Empire 880p is the professional (that's what the "p" represents) version of the Model 880. The 880p is intended for top-quality turntables and tonearms; the 880 is designed for use in changers and automatic turntables.

The 880p operates on the moving-magnet principle which involves moving a magnet attached to the end of the stylus bar away from the diamond tip. The magnet moves in the vicinity of four symmetrically-placed coils which pick up the slightest movement of the magnet and translates it into an electrical signal. This signal is proportional to the amplitude of movement—a large excursion of the magnet will induce more current into the coils. The direction of movement is indicated by means of the amount of signal each coil receives. Thus a movement up and to the left, for example, will induce signal mainly into the lower and right coils.

The 880p consists of three main assemblies: The stylus assembly containing the stylus, its pivot, a protective tube, and a plastic cap; the front assembly which holds the stylus assembly in proper tracking position; and the back assembly which contains the coils, the mount assembly for the tonearm shell, and the four electrical connections. The front and back assemblies are sheathed in mumetal to prevent hum pickup. The stylus-tip radius is 0.6 mil.

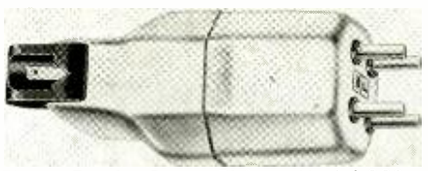


Fig. 6. Empire Stereo Pickup, Model 880p.

Replacing a stylus is a simple procedure which does not require professional competence; one merely unscrews the screw whose head protrudes at the front of the cartridge, separates the front and back assemblies, pulls out the stylus assembly by grasping the plastic cap, and inserts the new assembly in its place.

Performance

The 880p conforms to the standard 15-deg. vertical tracking angle, although it was designed before the significance of this angle was fully realized. In conversations with some of the Empire people we discovered that their selection of the 15-deg angle was based on their projection (and "guesstimate") of the angle which would produce least distortion for the greatest amount of available records. An inspired guess.

At 1000 cps, and at 5.5 cm per second, the output was 7.2 mv per channel. Frequency response from 20–20,000 cps was within 4.5 db, and up to 15,000 cps it was within 1 db. Stereo separation was 25 db at 1000 cps. With a 400 and 4000 cps test signal, amplitude 4:1, tracking force 1–3 grams, IM distortion remained within 5 per cent. The optimum force for minimum distortion was 2 grams.

In listening tests the 880p turned in an exceptionally fine performance, its handling of music confirmed the flatness of its frequency response measurement and the low distortion. In addition its handling of transients was truly excellent. Without question, the Empire 880p is one of the finest cartridges tested to date. And it's price of just under $20 makes it a great value. **D-4**

FOR THE ULTIMATE IN PROFESSIONAL STANDARDS...

SPECIFY AKG MICROPHONES



This professional dynamic microphone contains a hand centered capsule, individually adjusted to certified performance standards and characteristics. It is recommended for television and radio installations requiring wide range response. Also excellent for location and field work.



Second to none. Two independent capsules in this stereophonic microphone can be manually preset. Depending upon program content or changes in group arrangements during performance, **nine** separate or overlapping directional patterns may be selected through a remote control.

CONDENSER • DYNAMIC MICROPHONES

AKG of America
Division of North American Philips Company, Inc.
125 Park Avenue, New York, N.Y. 10017

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Q-POINT

(*from page 44*)

The effect of the change in V_B caused by a change in I_B must be minimized. This is accomplished by supplying V_B from a source of as low impedance as one can afford.

This is equivalent to saying that I_1 and I_2 of *Fig.* 2 must be large compared to I_B. Relatively large variations of I_B will then not substantially change I_1 or I_2.

If Q-point stability were the only end product desired, I_1 and I_2 could be made large without limit. However, as I_1 and I_2 are made larger, R_1 and R_2 are consequently smaller, thereby lowering the input impedance of the circuit and wasting certainly valuable signal power and

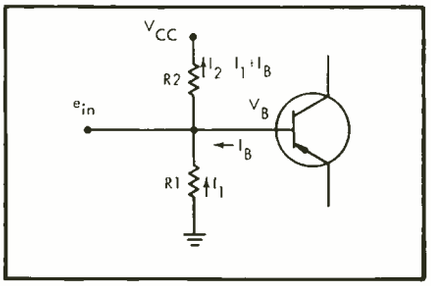


Fig. 2. I_1 and I_2 must be large compared to I_B.

possibly valuable battery power in R_1 and R_2.

I_B need not be known accurately. If it were known accurately and did not vary from one transistor to another, there would again be no need for stabilization. I_B is an inverse function of h_{FE}, a parameter which varies widely but for which nominal values are generally published. Using the published value of h_{FE} for a particular JEDEC type as a starting point, but realizing that great variance exists, we can determine a nominal value of I_B from the relation

$$I_B = \frac{I_C}{h_{FE}}$$

where I_C is already known from the established Q-point. The value so obtained will vary by a factor as high as two. We must then make I_1 and I_2 large enough that a change in I_B will not seriously alter V_B.

For a pnp, I_2 is the sum of I_1 and I_B. In practice it has been found that if I_1 is made nine times the nominal value of I_B (I_2 then equals $10I_B$), bias stability is ensured for most conditions ordinarily encountered. If I_2 is made as small as twice the value of I_B, a certain amount of selection of transistors will be required. The ratio to be used in any particular case must be determined by considering other factors.

For a typical small-signal amplifier, where I_C is on the order of 1 ma, h_{FE} is on the order of 50, and I_B is on the order of 20 μs. If V_B is to be 2.3 volts, then I_1 can readily be made as high as 9×20 μa or 0.18 ma, giving an R_1 on the order of 12.8k ohms. R_2 will be substantially higher (depending on V_{CC}) and the net effect of R_1 and R_2 on the input impedance of the amplifier is very slight, since the input impedance of a small-signal transistor is on the order of only one or two thousand ohms. There is generally little reason then for making I_1 less than five times I_B and a value of nine times I_B is usually quite tolerable and ensures trouble-free operation.

The approach to bias stabilization of large-signal high-power transistors is identical, the only difference being in the values of currents, voltages, and resistances used. Due to the existence of a much wider degree of variation in voltages, current, and impedances in the higher-powered transistors, the operating value of V_{BE} and the nominal h_{FE} will most probably have to be determined from a specification or by measurement.

Æ

You have to hear it & use it to believe it... the new Uher 8000 by Martel



Audio magazine reported: ". . . practically any use that can be imagined is possible with the Uher Royal 8000."

"There are seven position-four speeds with three OFF positions between. Selecting the speed also adjusts equalization for each. A second switch together with an interlocked **RECORD** button, controls all of the electronic functions in its eleven positions, which are marked: 1–4—mono record or play on upper track; 2–3—mono record or play on lower track; **STEREO**—record or play; **MULTIPLAY I**—permits recording on the upper track from microphone and mixing with material from lower track; **MULTIPLAY II**—permits recording on lower track and mixing material already recorded on upper track; **DIA-PILOT I**—used for recording from microphone and/or from phono record or another tape machine on upper track as commentary for slides; **DIA-PILOT II**—after making recorded commentary on upper track, this position is used to record sub-sonic tone on lower track at points where a slide is to be changed and for playback with slide projector thereafter, with the slide changing at each point when the tone button was depressed in the second run-through; **ECHO 1–4**—permits adding delayed sound to an original recording on upper track, the amount of delay depending on the speed of the tape; **ECHO 2–3**—same operation for lower track; **SYN-PLAY I**—used for recording on one track for later recording another signal in synchronization with the first but on a second track when the switch is turned to the **SYN-PLAY II** position. Thus, practically any trick type of recording can be made with no external interconnecting or switching.

AKUSTOMAT makes it possible to use sound as a controlling medium for the recording operation. The machine can be used as a dictating machine, for example, without the need for a start-stop button—one simply speaks and the machine starts recording, and when the dictator pauses, the machine stops. Thus it may be used to monitor and record sounds of an intermittent nature over a long period of time without actually running except in the presence of some sound. **We know no other machine which has this feature. In short, practically any use that can be imagined is possible with the Uher 8000.**

If you're interested in the complete review of the Uher 8000, Write for nearest dealer and reprint of complete review.

MARTEL ELECTRONICS / HOLLYWOOD 645 N. Martel Avenue Phone (213) 938-2803 / CHICAGO 1141 Merchandise Mart Plaza Phone (312) 644-0430 / NEW YORK CITY 1199 Broadway Phone (212) 684-0943

RECORD REVUE

(*from page 48*)

I found it over-stated, forced, artificial, the spoken texts over-acted the Negro accents needlessly exaggerated (the cast is both Negro and white). But I think the reason is not far to find. This is a stage presentation, "live." Stage acting is by its very nature exaggerated, for projection into a large space, as with the familiar "stage-whisper." Some actors naturally adapt to the microphone, or are accustomed to its needs through radio, films or TV. Others aren't—and these are of that sort.

Place your loudspeaker on a theater stage, before a large audience, and this production will click. But listen at home in your living room to these people, so close to their mikes,

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and you will probably agree with me. Too bad—for the material, as I say, is first rate in its importance.

A Time to Keep: 1963. Voices and Events of the Year. Huntley-Brinkley, NBC News. **RCA Victor LOC 1088 mono**

A glance at the cover of this one will tell TV viewers what it sounds like. The familiar voices do the narration, with sound background from NBC news. This was surely a year of years for a news documentary! And RCA has beat Columbia ("Hear It Now") to the draw, first time I remember.

The Huntley-Brinkley commentary is excellent, no doubt about it. In comparison to CBS, though, the accompanying sounds are not as descriptive nor quite as well managed—though some sequences are no less than startling. The dismal little pop of Jack Ruby's gun as he kills Oswald, and Oswald's actual groan as he falls. The first news breaks on the assassination. Some of the marching and chanting during the tense racial days. Still, given such a year to work with, it seems as though more effective sound could have been chosen; for many passages here are either vague or downright confusing. (What church choir is singing when the Negro church is about to be bombed—or has it been bombed already? I half-expected to hear the bomb itself.)

I think the reason for these slight inadequacies is basically simple—TV. These days we think in terms of visual news reporting; the sound is vivid but always secondary, excepting only the famous speeches. Deprived of the visual aid, this RCA team had a tougher time than those who worked up documentaries for the days when the mikes came first, not second.

Nevertheless, this happened to be the first time I had heard Kennedy's voice since his death. It hit me. It really did. What a ghoulish medium is this recording of ours! What astonishing history is being preserved, with such a hair-raising facsimile of life!

The Composer And His Orchestra, Vol. 3. "For the First Time" Suite. Howard Hanson; Eastman Philharmonia, Hanson. **Mercury SR 90357 stereo**

There are certainly two fascinating things about this third volume of Dr. Hanson's "fascinating project," as Mercury call it. One is the recorded sound of an enormous piano, used by Dr. Hanson for his scale-system illustrations. The other is the fabulous sound of Mercury's big-orchestra stereo.

As for the rest, which includes Dr. Hanson's own lengthy exposition of the scale arrangements he used in composing his "For The First Time" children's-story suite, plus fragments of each movement from the orchestra and, on Side 2, the complete work—I was less than enchanted by it all. Dr. Hansen has been musical emperor of Rochester and Eastman these forty-odd years and whatever he says out there goes. He raises an arm and a mightly horde of players responds to his every wish. So do Mercury's A & R people, evidently.

No matter how fancy the scale theories, how modern his book "The Harmonic Materials of Modern Music," it all comes out the same—late post-Romantic, awfully skillful, awfully big and fat, awfully long and awfully dated. It isn't bad music. It just hasn't anything vital to say, especially with a huge orchestra. But then, Dr. Hansen *is* music at Rochester. So he gets played. And recorded. AE

ABOUT MUSIC

(*from page 54*)

Leisch, static lighting techniques, and the distraction of mid-city noises were mainly responsible for the demise of the Philadelphia Sound and Light show. Lack of sufficient accommodations was one of the drawbacks of the Saint Au-



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gustine production. To be successful, a Sound and Light show must satisfy the following requirements: a) sustained and varied eye appeal, b) attractive surroundings, c) adequate accommodations in the neighborhood, and d) an imaginative sound-light scenario. Also, if the monument is visited in the daytime, the light projectors and loudspeakers must be properly concealed.

To writers, lighting designers, audio engineers and directors, the sound-light entertainment medium can be an exciting challenge. Its challenge rests in the fact that, for the first time in show business, an entire presentation is being based on the *set,* not on the music, the play, or the dance. The new medium has yet to match its overseas success here. This writer will soon visit the site of a new Sound and Light spectacle which, its producers hope, will be the first effective U. S. production in this embryo. A full technical report will follow. Æ

RIBBON MIKE

(*from page 30*)

The B & O 200 is based on the B & O 50 and 53 models which have been used in the United States for many years. The new microphone incorporates provision for usage either monophonically or stereophonically, with either one ribbon element or with two. The ribbons are arranged to have a common axis, and the plane of one is rotatable through 90 deg. relative to the other, varying from full stereo to mono use as paralleled units (see *Fig.* 7). The lower unit can be used independently as a mono microphone and the entire top element can be unplugged.

A switch is included in the unit to provide a 180° phase change of the upper microphone. A switch is also provided to switch to mono mode.

Like the other B & O units, there is a "talk" switch which reduces the low frequency response for close talk range. A small inductance in parallel is used for this modification of the response characteristic.

We feel that the ribbon microphone will undergo a renaissance of popularity, now that its attributes are so well suited to solving the problems which are introduced by multiplex stereo broadcasts. These broadcasts will not furnish high-fidelity reproduction unless the stereo information can be combined into A+B information without degradation of quality for the monophonic listener and without loss of stereo position for the stereo listener. These requirements impose the need for special phase characteristics of the microphone which are available with ribbon microphones and not with many other types. It is worth-

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while mentioning also that other transducers, such as phono pickups, must also have phase characteristics suitable for A + B combination for broadcasting of stereo phonograph records in order to attain the quality inherent in the multiplex system. Æ

[1] "The Application of Velocity Microphones to Stereophonic Recording," E. R. Madsen, *Journal of the A.E.S.*, April 1957.

JAZZ

(*from page 50*)

Jacques Loussier Trio: Play Bach Jazz Vol. 1
London LPM 70081 (4-track stereo tape)

In March I reviewed Volumes 2 & 3 of this interesting set in their disc form. The first volume is made up of a miscellaneous collection of short works including the familiar *Toccata and Fugue in D Minor* and several of the preludes and fugues for organ. Throughout, Louissier's arrangements are founded on such real understanding of the originals, that these performances emerge as delightful entertainment instead of clumsy caricature. Sound on the tape is a substantial improvement over the discs with a more solid bottom to the bass of Pierre Michelot and crisper transients on the accomplished brushwork of drummer Christian Garros. Alas, Monsieur Garros' loud cymbal clashes are also heightened in intensity, but they are generally less of an intrusion on Volume 1 than they were on Volume 2.

The Sound of Sight, composed and conducted by Ray Martin
London Stereo Spectacular SP 44040

Since this record is neither jazz nor folk music, I can only assume that the Editor assigned this disc to the present column because it could only be classified as "all that." In any event, leaving aside such matters as classification, it must be stated at once that this is a waxing of profound delight and a rare example of wit, satire, hilarity and the ultimate in good stereophonic sound. If this platter fails to become the new demonstration standard for the high fidelity industry, the reason will be that the overwhelming humor of the music engenders so much laughter that the sound emanating from the platter is obscured by the explosive guffaws of the listener. A parody on musical cliches in feature motion pictures, "Sound of Sight" offers eight capsule soundtracks, matched closely to their storylines which are fully spelled out in the liner notes. Titles of the eight features indicate their subject matter: *Westorama, Destination: Space, A Whale of a Tale, Egyptian Epic, Hoodunnit?, Tearjerker, Cartoonik* and *Flagwaver*. The album opens with a storyless masterpiece: *Overture to End All Overtures*, in which curtain raisers to *Ruslan & Ludmilla, The Bartered Bride, Barber of Seville, Marriage of Figaro, Orpheus in Hades* and a good dozen other warhorses are kidded in best tongue-in-cheek fashion. Never has London's Phase 4 stereo provided so many odd and amusing sounds emanating from so many different locations.

CONTROLLING

(*from page 24*)

Automatic Noise Sensing Equipment

Unattended operation of paging systems in airports, hotels, railroad terminals, industrial plants, and such is the norm, rather than the exception. The quality provided by such unattended systems can be greatly improved by making the amplified level louder than the background noise under varying background-noise conditions, but no louder than necessary. We believe that Altec Lansing was the first manufacturer to produce a "Noise Operated Automatic Level Adjustment," which has wide applications in industrial and airline ground facilities. A demonstration by Altec engineers convinced the engineers and consultants (including the author) that such a device was desirable for the paging system in the new Dulles International Airport.[2] Executone, Inc., whose Washington, D. C. dealer was successful bidder for the system installation, has developed equipment competitive to Altec Lansing in providing noise-operated level adjustments. In the Dulles installation, paging levels are normally held to 70–75 db during quiet periods in the air terminal. Should the noise level exceed 65 db in any one of six "noise sensing zones," the paging level is increased in 5 or 6 db steps to be between 5 and 10 db above the background noise.

[2] Architects, Eero Saarinen and Associates; engineers for the sound amplification system, Burns and McDonnel Engineering Co. (Robert C. Coffeen); design consultation by Bolt, Beranek and Newman.

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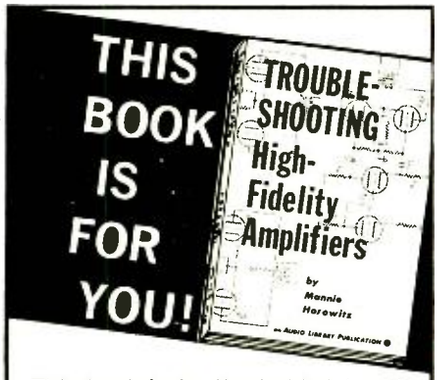
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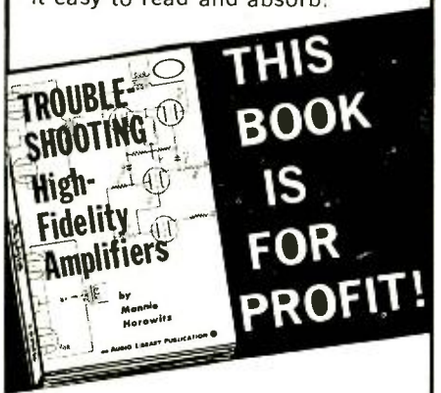
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The result is a paging system that overrides the highest indoor noise levels encountered in air terminal operation, yet does not "shock" the occasional passenger during quiet hours.

Feedback Stabilizers

Feedback stabilizers are not, strictly speaking, automatic controls, but use of a stabilizer can often allow unattended operation of a sound amplification system where otherwise a constant watch on feedback would be required. The stabilizer developed by Dr. Manfred Schroeder, of Bell Telephone Laboratories, improves gain before feedback by 9 or 10 db in a typical installation, and rejection of "ring" by 4 or 5 db. The operation of the stabilizer depends upon the statistical improbability of "peaks" in the over-all room-acoustics electroacoustics transfer function occuring every 5 cps throughout the audio range. The incoming signal modulates a carrier; the modulated signal is demodulated with a signal 5-cps "off" from the carrier signal.

The author has recommended and installed these devices in a number of speech-reinforcement systems, but there remains some controversy concerning their use in music amplification systems. Some musicians and concert-goers have mentioned their ability to hear the shift, especially with organ and piano music. This is a very subtle effect and the feedback stabilizer remains one of the most useful items of "hardware" available to the sound system designer. In the previous article (manual systems) we discussed the necessity for satisfactory electronics performance standards for the control components and planning proper signal flow through the control system. These points are equally applicable for the automatic equipment discussed in this article. Æ

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AUDIOCLINIC

(*from page 4*)

Grounding a Turntable and Arm

Q. What is the proper way to ground a turntable and arm? I know that the ground must be kept separate from the signal cable shield.

I have heard several opinions. Some say, "Ground the arm." Others say, "Ground the turntable." Still others say, "ground the motor." In addition, some say to ground both with the motor separate. Others say to ground both with the turntable separate.

Just what needs to be grounded? Leonard Drasin, Brooklyn, New York.

A. Most turntables are manufactured so that their motors are grounded to the main baseplate of the unit. Therefore, such a motor will need no further grounding. If the motor is not grounded that way, it should be grounded to the base. The base, in turn, should be grounded to the preamplifier at some convenient chassis point. If the tonearm is mounted to the metal base of the turntable, no further grounding need be made—except for the normal signal ground. However, the arm is often mounted on a wooden base. In this event the arm should be grounded to the preamplifier. One of the screws used to hold the arm in place can be used to secure this ground.

After some period of time you may find that as you hold the arm and move it in normal operation, you may hear some crackling or may hear some intermittent hum as the arm is being moved. This indicates that dirt has entered the bearings, reducing the shielding effect of the metal arm. These bearings will require cleaning in accordance with factory instructions.

Shorted FM Antenna?

Q. My antenna (a five-element yagi) was put up under the watchful eye of my neighbor, who insists that I have "stuck a big ground into the air" because the antenna is grounded at the center by the clamp attaching it to the mast. He almost talked me into insulating this connection. I decided, however, that, had the manufacturer intended it to be insulated from the grounded mast, such insulation would have been provided.

Please explain why the center of a dipole should be grounded. Why does it not short the entire antenna to ground? Wayne M. Welty, Tampa, Florida.

A. The center of your driven element (the folded dipole portion of your beam) should be grounded as provided for by its manufacturer. There will be no short-circuiting of the radio frequency energy to ground.

This is hard to believe at first but let us consider what actually appears on an antenna. You know that an antenna receives radio waves. These waves have crests and valleys like any other wave with which you are familiar. The high and low points of a wave of this type can be represented by maximum and minimum voltage or by maximum and minimum current. A maximum voltage point corresponds to a minimum current point, and vice versa. This voltage-current distribution repeats itself at various points along the antenna, with the number of repetitions depending upon the number of wavelengths of the dipole. The point from which the signal is taken can be considered as a high voltage point while the center of the dipole is a point of maximum current flow. The voltage drop at this point is zero, and, therefore, there is no difference of potential between this latter point and ground. Therefore, no short-circuiting occurs.

All of this is very useful because it allows us to ground the mast upon which the antenna is mounted. This, in turn, does two things for us. It affords some lightning protection and it reduces multipath signals coupling into the antenna from the mast. This happens because the grounding of the mast breaks up standing waves which appear on the mast. Æ

PURIST TACKLES ROOM ACOUSTICS

(*from page 21*)

the values that had been built into my big system. In a sense, I had accidentally ended up with an almost perfect experimental set up where everything else was good enough to make the change in acoustics produce obvious results which could not be attributed to any other factor. Once I heard the effects of acoustics under such conditions, I could understand how to improve the sound of much smaller systems. In fact, the principles even explain why a tiny car radio speaker puts out a far more pleasing sound quality than its size and cost would seem to justify. Of course, you can easily overload it on bass and get distortion but the relatively large amount of sound absorption in a car gives it richness and the angular placement of the windshield and rear window prevent echoes.

In a way, the system follows the horn theories with minor compromise on size except that the channels are combined below 100 cycles and routed to a 15-in. Electro-Voice K horn. At first thought, you might think that this compromise would yield a weird sounding bass but it doesn't because the peak powers of most instruments and the powerful overtones of string bass all come out of the 100- to 500-cycle horns. In a sense, the remotely-located K horn is a true woofer which serves only to pump non-directional power under the whole performance

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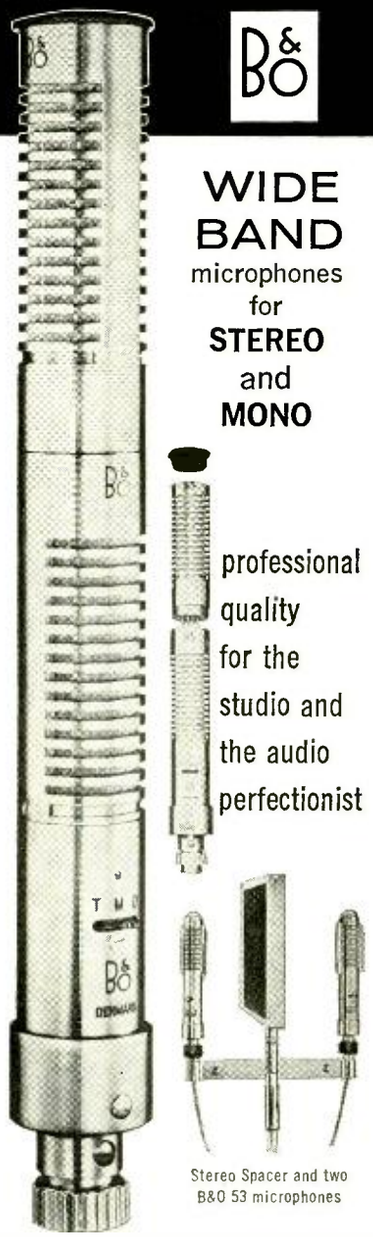
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CIRCLE 70

which seems to originate in the 100 to 500 cycle horns. The effect is so realistic on string bass, drums, and tuba that my friends often insist that the K horn isn't turned on. However, with my electronic crossovers, I can't turn off everything above 100 cycles and, sure enough, that K horn is providing the solid fundamentals of the string bass and simular instruments.

The big advantage of this split at 100 cycles is that the 100- to 500-cycle horns can be specialized to handle those frequencies best and this is especially important as they must handle most of the power peaks generated by various instruments. To give you some idea of the power that must be handled between 100 and 500 cycles, I will list the peak power frequencies of various instruments as published in an engineering handbook.[1] These are supposed to be based on acoustical measurement as each instrument was being played at different frequencies.

Instrument	Zone of Peak Power	Peak Pressures
Pipe Organ	20–62	
Bass Drum, 36" × 15"	250–500	
Bass Drum, 30" × 12"	125–250	
Snare Drum	250–500	
Bass Viol	62–125	3.1
	125–250	0.8
Piano	250–500	
Bass Saxaphone	250–500	
Tuba	250–500	
French Horn	250–500	
Clarinet	250–500	
Trumpet	250–500	2.4
	500–700	1.5
Trombone	500–700	2.9
	2000–2800	0.04
Flute	700–1000	0.6
	1400–2000	0.2
Piccolo	2000–2800	
Triangles	5600–8000	
Cymbals	8000–11,300	
15-Piece Orchestra	250–500	2.8
	2000–2800	1.3
75-Piece Orchestra	250–500	1.6
	8000–11,300	0.2

Any serious Hi-Fi fan should study and think about this chart. If you study it, even a little, you will see that most instruments including bass drum, tuba, piano, and clarinet develop their peak powers between 100 and 500 cycles. A few such as the trombone, trumpet, and flute develop peak powers in the 500- to 1000-cycle range but most live music seems to fall in the 100- to 500-cycle range.

Mr. Musician used to feel that we would never find a speaker good enough to handle all this power and he may be right in an absolute sense. However, my specialized horns with James B. Lansing theater woofers are getting darn close,

[1] Pender and McIlwain, "Electronic Engineering Handbook," Wiley.

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CIRCLE 78

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in my opinion, and one finally reaches the point where it is hard to tell if the rest of the system is as good as these horns. In any case, I can listen critically at the 500-cycle crossover point and not hear a significant change in the clarity.

The Stephens P-35 theater drivers take over at 500 cycles with straight exponential horns (cement castings) so that I could fit a Stephens driver to a James B. Lansing horn lens. The Stephens P-35 drivers may seem large but they are no larger than a good woofer magnet driving a 2½-in. diameter moving diaphragm. Of course, this diaphragm is horn loaded so that it can handle volume because the peaks and overtones over 500 cycles add up to about half the power in a full symphony orchestra. This may seem to contradict the earlier peak power chart but remember that practically all instruments have overtones above 500 cycles even though the peak power of many will occur below 500 cycles.

Ionovac tweeters are filtered in above 5000 cycles because the Stephens drivers drivers were designed for use with tweeter reinforcement in this manner. The Stephens, however, roll off so smoothly above 6000 cycles that I often use them without the tweeters for radio music. In effect, the P-35 drivers do most of the work above 500 cycles with the Ionovacs serving mainly to add a delicate but very essential ring on top of the solid cymbal and brass sounds.

The rest of the system is fairly standard except for the automatically aligned tone arm which uses a moving horizontal pivot and straight arm. It was built as a last ditch effort to eliminate those apparent distortions on percussion instruments which later turned out to be largely the result of poor acoustics. However, it does seem to improve the over-all accuracy of the signal in a subtle but very important way. By this, I mean that many people would not hear the difference but it becomes important when records are played at high volume to simulate concert hall level. To many, it would not be worth the trouble because the mechanism must be constructed to achieve a vibration-free pivot. I would not recommend that you build an arm like this unless you are a most patient and thorough craftsman.

I would like to list more details of the system such as the design details of the special horns, and so on, however, to be practical, it would be rather wasteful to print such detail thousands of times when it could be mailed directly to those few people who would be interested in a system as large as this. So, if you are interested in more details or have a specific question, just write. You won't receive a detailed set of do-it-yourself instructions but you will get the essential details. AE

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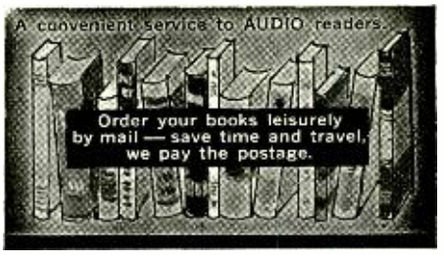
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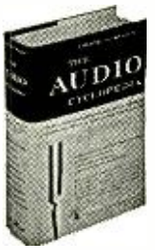
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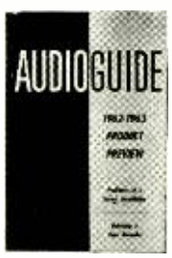
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FREEDOM ETC.

(*from page 32*)

sparsely used localities or to hours after work and before sleep sufficient for the exercise of their claimed privilege.

Unrestricted use throughout the municipality of all sound amplifying devices would be intolerable. Absolute prohibition within municipal limits of all sound amplifications even though reasonably regulated in place, time and volume, that court observed, was undesirable and probably unconstitutional as an unreasonable interference with normal activities.

Then in conclusion of the middle-of-the-road reasoning that obviously that court was seeking to follow, it was said, "The right of free speech is guaranteed every citizen that he may reach the mind of willing listeners and to do so there must be opportunity to win their attention. This is the phase of freedom of speech that is involved here. The New Jersey ordinance the court considered, did not abridge that freedom.

"It is an extravagent extension of due process to say that because of it a city cannot forbid talking on the streets through a loudspeaker in a loud and raucous tone. Surely such an ordinance does not violate our people's concept of ordered liberty so as to require federal intervention to protect a citizen from the action of his own local government.

"Opportunity to gain the public's ears by objectionable amplified sound on the streets is no more assured by the right of free speech than is the unlimited opportunity to address gatherings on the streets. The preferred position of freedom of speech in a society that cherishes liberty for all does not require legislators to be insensible to claims by citizens to comfort and convenience. To enforce freedom of speech in disregard of the rights of others would be harsh and arbitrary in itself.

"That more people may be more easily and cheaply reached by sound trucks, perhaps borrowed without cost from some zealous supporter, is not enough to call forth constitutional protection for what those charged with public welfare, reasonably think is a nuisance when easy means of publicity are open."

This section, asserted the court, bars sound trucks from broadcasting in a loud and raucous manner on the streets. There is no restriction upon communication of ideas or discussion of issues by the human voice, by newspapers, by pamphlets, by dodgers. We think that the need for reasonable protection in the homes or business houses, from the distracting noise of vehicles equipped with such sound amplifying devices, justifies the ordinance."[3]

Resting its conclusion on the authority of these two Supreme Court decisions in an effort to follow that middle of the road suggested by the harmonizing of this reasoning in these two cases, the California court said of the Palm Springs ordinance,

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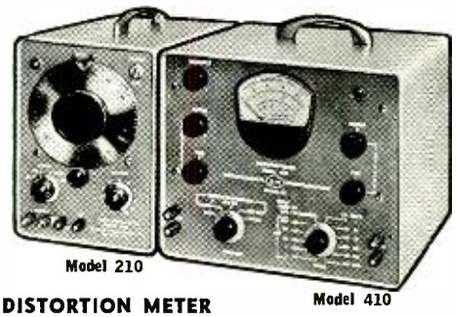
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pointed out this prohibition of the use of the stationary cound truck is not necessary to avoid traffic hazards, because the ordinance provides for means of so doing.

"Nor does the ordinance specifically direct itself to the elimination of loud and raucous noises. Instead it prohibits the dissemination of an address by means of a truck which is not loud and raucous. The regulation which narrows down to loud and raucous embraces all sounds here. The volume of sound which could properly be prohibited in a narrow channel of loud and raucous, is no narrow channel here. It is a volume of sound which, like water, may be distributed over wide lands shallow in depth and slight in impact.

"In summary, the vice of the present ordinance lies in its practical prohibition of a conveyance of a message to the public. The ordinance prevents any continuous statement, argument or sustained presentation of a point of view that cannot be transmitted during the truck's fleeting momentary passage.

"Yet the purpose of the ordinance could have been achieved without such an incursion into the field of free speech. An ordinance narrowly drawn may properly reach to the evils it seeks to avoid. Instead here, the ordinance sweeps within its broad ambit the constitutional right to tell a whole story by means of this method of communication."

REFERENCES

[1] Wollman v. City of Palm Springs, 379 Pac. 2d 481, Cal., March 12, 1963.

[2] Saia v. New York, 334 U. S. 558, New York, June, 1948.

[3] Kovacs v. Cooper, 336 U. S. 77, N. J., Jan. 31, 1949.

THIS MONTH'S COVER

The cover this month illustrates the way various amateurs interpret sound visually. During the 1963 New York High Fidelity Show a contest entitled "Images in Sound" was sponsored by the Institute of High Fidelity. Eleven winners were announced. Several hundred photographers submitted entries. Prizes awarded, valued at over $1000, included custom high fidelity components, such as amplifiers, turntables, and speaker systems, as well as photographic equipment. The photographs shown are the first and second-prize winners in the black and white and color categories (unfortunately we could not show the color photos in full color). We show the first-prize B & W upper left, first-prize color upper right, second-prize color lower left, and second-prize B & W lower right. Here are the winners and their prizes: *Black and White*—1st Prize: Robert R. McElroy—Marantz Company, Inc. preamplifier; 2nd Prize: Leonard H. Kane—Wharfedale Speaker System W-40; 3rd Prize: Martin Deutsch—Koss, Inc. Headphones; 4th Prize: Don Getsug—Zeiss-Ikon Camera (Contina Model); 5th Prize: William E. Gallagher—Ikoscop; 6th Prize: Pat D. Borrelli—Audio Dynamics Corp., record brush. *Color*—1st Prize: Edward C. Johnson—Pickering & Co., Inc. turntable, arm, and cartridge; 2nd Prize: A. Kovaleff—H. H. Scott, Inc. Tuner Kit; 3rd prize: M. Biber—Garrard AT-6 Automatic Turntable; 4th Prize: Georgia Ann Yeager—Ikoscop; 5th Prize: Cy Alexander—Ikoscop.

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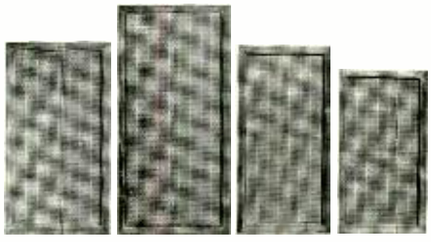
• **3M Starts West Coast Production.** The 3M Company has started production at its new magnetic products plant in Camarillo, Calif., about 45 miles northwest of Los Angeles. The 125,000 square foot plant is equipped to produce 3M's entire line of audible range, instrumentation, and video tapes. The new plant has facilities capable of increasing total production of the division by nearly 50 per cent. Location of the plant on the West Coast will enable 3M to give the best possible service to its western customers. An East Coast plant was opened in 1961 at Freehold, N. J. The company's third tape-production plant is at Hutchinson, Minn. The Camarillo installation, which will be the largest of the three domestic plants, will employ from 200 to 300 persons when production is increased to capacity. It now has a work force of 50.

• **E-V Appoints New Jobber/Distributor Head.** G. P. "Pres" **Clancey** has recently been appointed Sales and Marketing Manager for the Electro-Voice Jobber/Distributor Division according to an announcement by E-V's vice president of sales, Lawrence **LeKashman.** "The appointment of Pres to this extremely important position," LeKashman explained, "is the culmination of a long and careful search." Prior to joining Electro-Voice, Mr. Clancey was Merchandising Manager for DuKane Corporation's Communication Systems Division in St. Charles, Illinois. Before assuming this responsibility, he was District Sales Manager of DuKane's largest territory, the central district, and consistently led the DuKane sales staff in sales volume. In addition to his selling experience, he has had market planning responsibility, has conducted sales training seminars and territorial "team meetings."

• **Concertone Backs New Recorder.** The largest advertising budget in the history of Concertone, a division of Astro-Science Corporation will launch the new Concertone series 800 stereo tape recorder. The announcement was made by Paul R. **Abbey,** vice president-marketing for Concertone. Vertical trade books will be used to advertise the small model Cosmopolitan, a portable tape recorder with built-in FM radio. The 1964 budget is in excess of $200,000. "This increased investment will permit us to provide full advertising support in the industry, trade and consumer press. And, it is an indication of the tangible belief we have in the sales potential of the new Caravelle which has advanced features not found in any recorder, anywhere, at any price," Abbey said.

• **Bogen Launches Nationwide Sound Sales Seminars.** Bogen Communications Division of Lear Siegler, Inc., Paramus, N. J. has launched a sales education campaign designed for distributor sales personnel, dealers and sound specialists throughout the United States and Canada. The campaign centers around Bogen reps from coast to coast who will play a dual role of teacher and showman in special presentations. These presentations, called Sound Sales Seminars, will be conducted in major cities throughout the U. S. and Canada. The heart of the presentation is a unique and comprehensive color slide presentation which describes in detail the characteristics, features, applications and other statistics of every commercial sound product in the Bogen line. The presentation employs 66 color slides and prepared commentary to guide the rep during the sessions. It is modular so that all or part of the line may be explained at any given session.

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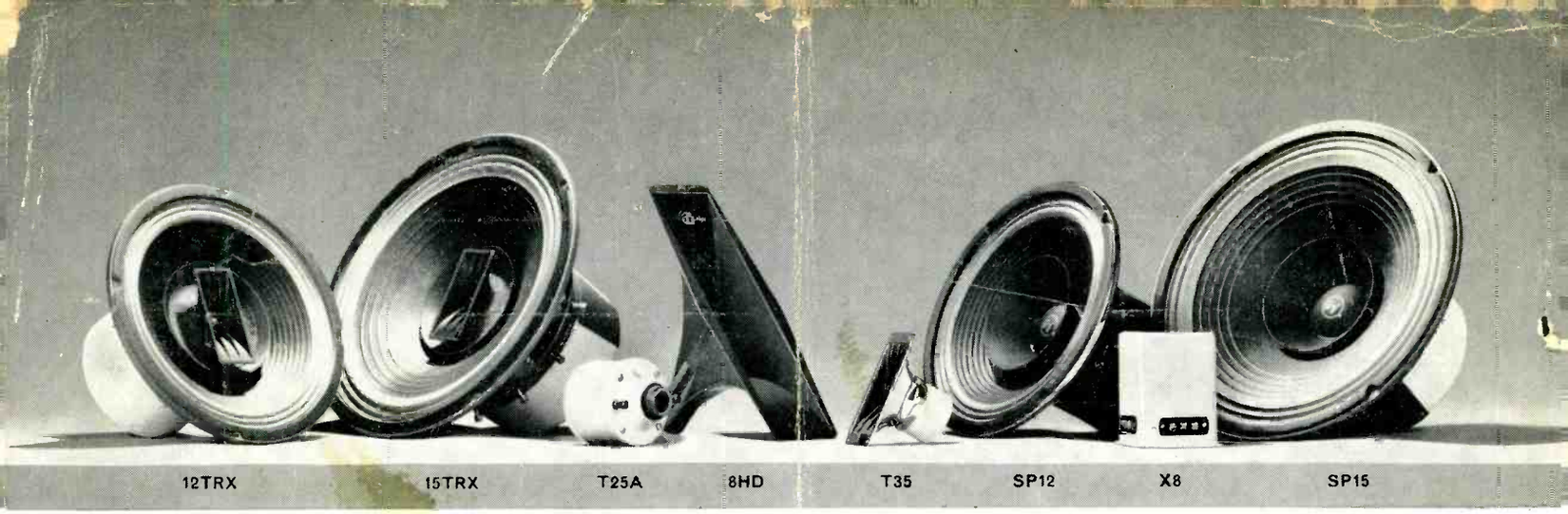
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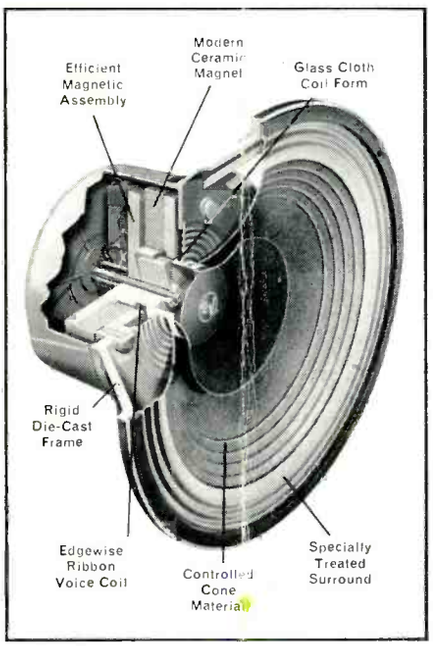
Before you make the final choice of speakers for your high fidelity system, take a moment to review your goals. What comes first—size, cost, or performance? If performance is of prime importance, then you owe it to yourself to look at—and listen to—Electro-Voice Deluxe component speakers. Granted, they are not the smallest or the least expensive speakers you can buy, but their design is predicated on the need for quality reproduction above all other considerations.

Your ear is the final arbiter of speaker system quality, but it may help you to know what's behind the unequalled popularity of E-V in the component speaker field. It begins with the finest engineering laboratory in the industry, finest not only in equipment, but also in the size of its staff and in its creative approach to electro-acoustics.

The basic design for E-V Deluxe components was laid down over a decade ago, and, despite numerous detail improvements, this approach is just as valid today. It begins on a firm foundation: the rigid die-cast frame that provides a stable basis on which this precision instrument can be assembled. It is this frame that assures that each E-V Deluxe speaker will forever maintain its high standard of performance by maintaining perfect alignment of all moving parts.

Added to this is a magnetic assembly of generous proportions that provides the "muscle" needed for effortless reproduction of every range at every sound level. In the case of the SP15, for example, four pounds, ten ounces of modern ceramic magnet (mounted in an efficient magnetic assembly weighing even more) provides the force needed for perfect damping of the 15-inch cone.

Within the gap of this magnetic system rides the unique E-V machine-wound



edgewise-ribbon voice coil. This unusual structure adds up to 18% more sensitivity than conventional designs. Production tolerances on this coil and gap are held to ±.001 inch! The voice coil is wound on a form of polyester-impregnated glass cloth, chosen because it will not fatigue like aluminum and will not dry out (or pick up excess moisture) like paper. In addition, the entire voice coil assembly can be made unusually light and rigid for extended high frequency response.

In like manner, the cone material for E-V Deluxe components is chosen carefully, and every specification rigidly maintained with a battery of quality control tests from raw material to finished speaker. A specially-treated "surround" supports the moving system accurately for predictably low resonance, year after year, without danger of eventual fatigue. There's no breaking-in or breaking down!

Now listen—not to the speaker, but to the music—as you put an E-V Deluxe component speaker through its paces. Note that bass notes are neither mushy nor missing. They are heard full strength, yet in proper perspective, because of the optimum damping inherent in the E-V heavy-magnet design.

And whether listening to 12-inch or 15-inch, full-range or three-way models, you'll hear mid-range and high frequency response exactly matched to outstanding bass characteristics. In short, the sound of every E-V Deluxe component speaker is uniquely musical in character.

The full potential of E-V Deluxe component speakers can be realized within remarkably small enclosure dimensions due to their low-resonance design. With ingenuity almost any wall or closet can become a likely spot to mount an E-V Deluxe speaker. Unused space such as a stairwell can be converted to an ideal enclosure. Or you may create custom cabinetry that makes a unique contribution to your decor while housing these remarkable instruments. The point is, the choice is up to you.

With E-V Deluxe component speakers you can fit superlative sound to available space, while still observing reasonable budget limits. For example, a full-range speaker such as the 12-inch SP12 can be the initial investment in a system that eventually includes a T25A/8HD mid-range assembly, and a T35 very-high-frequency driver. Thus the cost can range from $70.00 up to $220.00, as you prefer—and every cent goes for pure performance!

Write today for your free Electro-Voice high fidelity catalog and list of the E-V audio specialists nearest you. They will be happy to show you how E-V Deluxe component speakers fulfill the fundamental concept of high fidelity with sound of uncompromising quality!

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