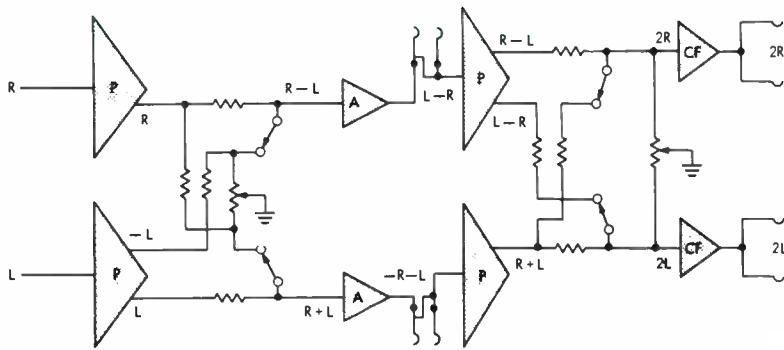


# AUDIO

JANUARY/1965

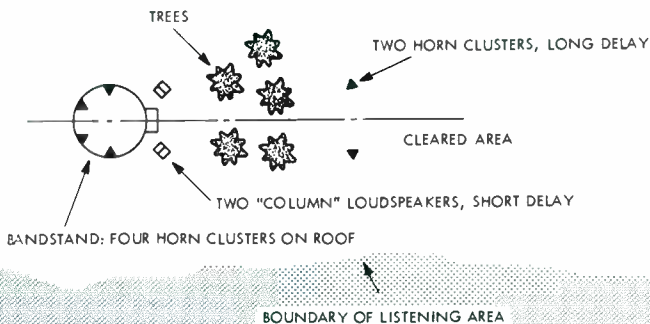
60¢

*...the original magazine about high fidelity!*



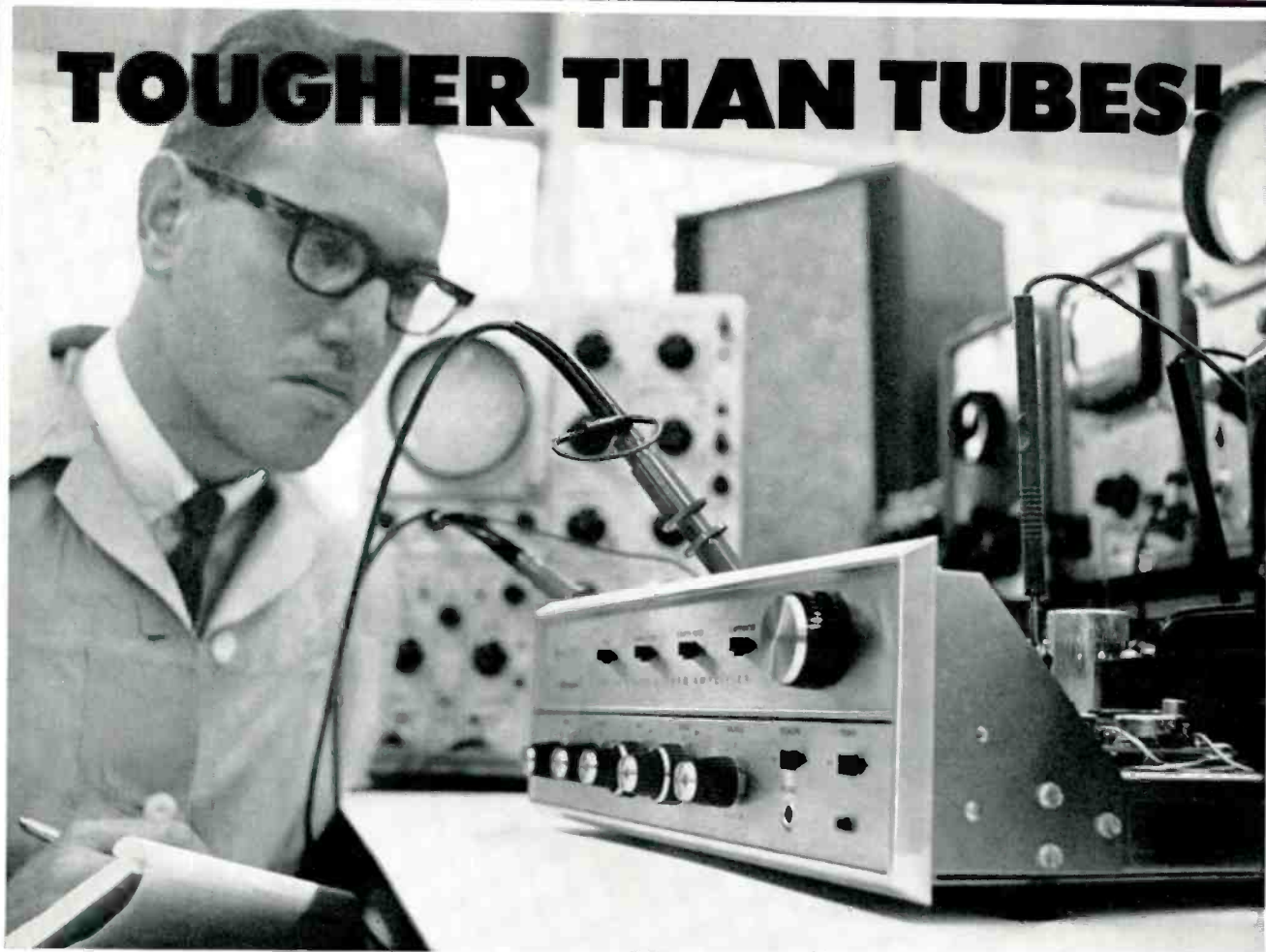
## WALL RACK INSTALLATION

## MATRIXING AMPLIFIER FOR 2-CHANNEL STEREO



## TEMPORARY SOUND SYSTEM

# TOUGHER THAN TUBES!



## New Scott Solid-State Amplifier Passes Rugged Torture Tests

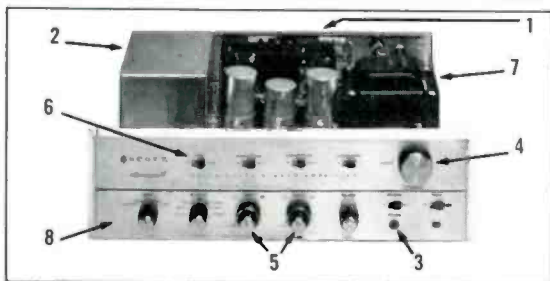
Now you can own a powerful 80 watt solid state amplifier constructed to standards unique in the high fidelity industry. The new Scott 260 uses rugged pre-tested heavy-duty components, including massive heat sinks, heavy printed circuit boards and new silicon output transistors. Critical electrolytics are hand selected and have operating capabilities far exceeding circuit requirements.

To insure the thoroughness of its quality control procedures, H. H. Scott called in transistor specialists with many years experience in the design of critical military components. Rugged tests were devised to subject the amplifier to conditions far more severe than encountered in normal use. These "torture tests" include: Applying a "step-stress-test" to a selected sample of all components used, simulating hundreds of hours of normal operating

life and showing up any components that might fail; applying a unique "surge and cycle" test, normally performed only on rugged military equipment, to simulate stresses the amplifier may be subjected to under the most severe home conditions; elaborate pre-test and checkout of all components, including transistors, to insure that components will not fail in service.

As a result of these extensive procedures, the 260 now combines the amazing virtues of transistors . . . their compactness, cool operating temperatures and fine sound . . . with the ruggedness and reliability that the audio fan has come to expect of finest Scott vacuum tube components. Backed by Scott's unique 2-year guarantee, the 260 will give you countless hours of trouble-free fine listening. Less than \$260.

**SPECIFICATIONS:** Sine-wave power, 30 watts/channel; music power, 40 watts/channel (8ohms); all-transistor design with direct-coupled silicon output stage. Harmonic distortion less than 0.8%. Frequency response 20 to 20,000 cps. Damping factor greater than 20; Load impedances: 4, 8 or 16 ohms; full tape facilities including tape monitor and direct tape head input. Operating features: Derived center channel output; rumble filter; scratch filter; impedance selector switch. Matches all Scott tuners.



(1) Rugged silicon direct-coupled transistor output stage (2) Pre-amps on separate modular-type printed circuit boards (3) Stereo headset output (4) Master volume control (5) Separate bass and treble controls (6) Complete tape recorder input and output facilities (7) Massive power supply provides high power surges when music demands it (8) Hand-some styling matches Scott Transistor Tuner model 312

### FREE! NEW 1965 CATALOG AND GUIDE TO STEREO

H. H. Scott, Inc. 111 Powdermill Road  
Department 35-01, Maynard, Mass.

Please send me your new 20-page full-color 1965 Stereo Guide and complete catalog.

Send me complete information on new consoles by Scott . . . component quality in beautiful, hand-finished cabinets.

Name .....

Address .....

City ..... Zone ..... State .....



Export: Scott International, 111 Powdermill Road, Maynard, Mass. Canada: Atlas Radio Corp., 50 Wingold Ave., Toronto. Cable HIFI. Price slightly higher west of Rockies. Subject to change without notice.

Circle 100 on Reader Service Card



# AUDIO

JAN., 1965 VOL. 49, No. 1

Number 17 in a series of discussions  
by Electro-Voice engineers

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Model PE34

Model SG520

Model AJ-43

Model LPL-FM10

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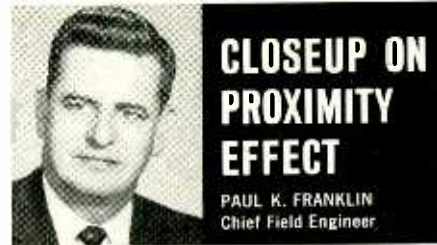
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Matrixing Amplifier for 2 Channel Stereo Signals	19
Temporary Sound Amplification Systems —In Two Parts—Part One	23
Shaping Electronic Organ Tone Envelopes	24
A Basic Course in Commercial Sound— Chapter 10	28
Light Listening	8
Record Revue	46
Jazz and All That	49
Perpetuum Ebner Turntable	34
JBL Preamplifier	34
Heath AM/FM Tuner	35
JFD FM Antenna	50
Audioclinic	2
Letters	6
Audio ETC	10
About Music	14
Editor's Review	16
New Products	38
InZide Audio	42
Tape Guide	48
A Wall Rack Audio System	51
Advertising Index	56



Most system designing for radio, television and sound reinforcement installations is based on stable response. Much effort is made to maintain operation at peak efficiency at all times so that results will be predictable.

Despite these precautions, disconcerting changes in response are sometimes noted without apparent cause. Careful examination of operating techniques by the performers may reveal the cause, one that is often difficult to control. This is the effect known as "proximity effect."

Proximity effect is the increase in bass response for close sounds compared to distant sounds. It is most noticeable at 2' or closer to most pressure gradient (directional) microphones, and does not occur with omnidirectional microphones.

This effect can have subtle, yet serious, consequences for many systems. When a performer works "too close" bass energy sharply increases, sometimes as much as 10 db. This can serve to reduce intelligibility in radio systems since modulation levels are restricted by high energy lows having little useful information compared to high frequencies. It may also lead to excessive limiting in some systems, with the consequent destruction of natural aural perspective.

The unstable nature of microphone proximity effect problems can also destroy the carefully achieved effect of sound reinforcement systems, calling immediate attention to the existence of a sound system as performers move in and out of range near the microphone.

The severity of the proximity problem is directly related to the design characteristics of the microphone. Directional (pressure gradient) microphones having a single access port to the rear of the moving element generally suffer most from proximity effect, due to the close adjacency of the openings to the front and rear of the element. One of the beneficial by-products of the Electro-Voice Variable-D and Continuously Variable-D microphones has been the sharp reduction in proximity effect.

This is due to the relatively long distance from the front of the microphone to the rear access port for low frequencies. This greater distance equalizes driving force on the diaphragm for near and distant sounds (of equal intensity at the microphone) thus providing uniform response over a wider variation of performer-to-microphone distances. System performance is thus predictable over a wider range of circumstances.

For technical data on any E-V product, write:  
ELECTRO-VOICE, INC., Dept. 153A  
Buchanan, Michigan 49107



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# Coming

## General Topics

- Characteristics of Shunted Potentiometers. R. R. Ives. For experimental and development work there is often a need for potentiometers with a nonlinear taper. This article explains how to achieve special tapers using a simplified notation to avoid errors.

- Effects of Power Supply Variation on Low-Frequency Operation. George Lehsten. Does power line variation affect performance of an amplifier with an unregulated supply? This author performed a large number of tests on amplifiers, exposing them to the type of variations one would experience in the average home, and found a significant reduction in power handling capability at low frequencies.

## Sound Reinforcement

- Temporary Sound Systems. David L. Klepper. The second part of an article started last month. This part describes a temporary system for an indoor arena.

## Profiles

- Dual 1010 Record Changer
- Acoustech III Amplifier
- McIntosh MR71 & C24 Tuner and Preamp
- Benjamin 200 Record Playing System

## In the February 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.

### Audio Interference

*Q. Can you advise me as to how to eliminate a loud whistle in an AM tuner. It happens across the dial, except at that frequency allocated to a nearby radio station, located about 300 yards from my home.*

*This whistle does not occur in the morning hours all the time, but it is always present at night.*

*I do understand antenna orientation is important, but I would like to know if anything else can be done. This tuner does not pick up distant stations as readily as my \$20.00 table radio does.*

*I suspect that it does need some work done on it but it does pick up all local stations without static and is clean sounding. Name withheld.*

A. If an AM tuner is to give reasonably good fidelity, its bandwidth must be wide. If the bandwidth is not wide, sidebands will be lost. The high frequencies are contained in the sidebands. If a tuner is to yield a flat frequency response to 10 kc, the bandwidth must be 20 kc in order that each sideband can be passed to the detector.

All is well so far, but here is the real problem. In any given area, the broadcast stations are scattered over the band in such a way as to keep interference among them to a minimum. The stations are 30 to 40 kc from one another. Stations in other areas occupy the spaces between stations in your area. There is at least one station at 10 kc intervals between 540 and 1,600 kc.

During the daylight hours most of these stations will only be heard in the regions they have been licensed to served. When the sun sets, however, radio propagation conditions improve. Hence, the signals cover more territory. This explains why you can hear stations coming from distant points at night.

It may also explain the whistles you are hearing. Remember that stations occur on the broadcast band in 10 kc steps. Let us say that you are listening to a

station located at 630 kc on the dial. At night a station may be heard which has a frequency of 620 kc. Because of the response of many tuners designed for high fidelity sound reproduction, this signal will be received to some extent, along with that of the desired station at 630 kc. The difference in frequency between the two stations, of course, is 10 kc which is an audible note when detected. (To say this another way, the two signals combine to form a resultant, or beat tone which in this instance equals 10 kc.) This 10 kc tone is your "whistle" and it will be repeated all over the dial at night.

If your tuner is not a wideband unit, there are other factors which will come into play and we shall come to them.

It is very possible that your tuner is working well if it is a high fidelity unit and antenna orientation will probably do little to eliminate the troublesome interference in most instances. About all you can do is use a filter designed to remove all frequencies above 8 or 9 kc. If the tuner already employs such a filter, and it is not working properly, try readjusting the slug associated with the inductance of this circuit. If the filter is there and is working but you still hear some of these tones, their origin is likely to be other than the cause cited here. If no filter is present, one can easily be installed. The Miller EL58 is one excellent unit which can be used for this purpose.

Some of the whistles may not be removed by a filter because there is another source of whistles whose frequencies are more random. Television receivers use a horizontal oscillator running at a frequency of 15,750 kc. The wave shape of this oscillator makes it rich in harmonics. On many sets this oscillator is not properly shielded. Hence, quite a bit of the energy from these harmonics is radiated into space. The harmonics continue through the broadcast band and lower shortwave bands and appear across the dial at each 15.75 point. These harmonics of the TV horizontal oscillator combine with broadcast stations to form beats, just as two broadcast stations combine to form beats as has been discussed. Again, this condition is more prevalent at night than in the day not because of propagation conditions but because this is the time when most television receivers are

*(Continued on page 40)*



Finely adjustable counterweight cushioned in rubber

Dynamically balanced tone arm of Afrormosia wood

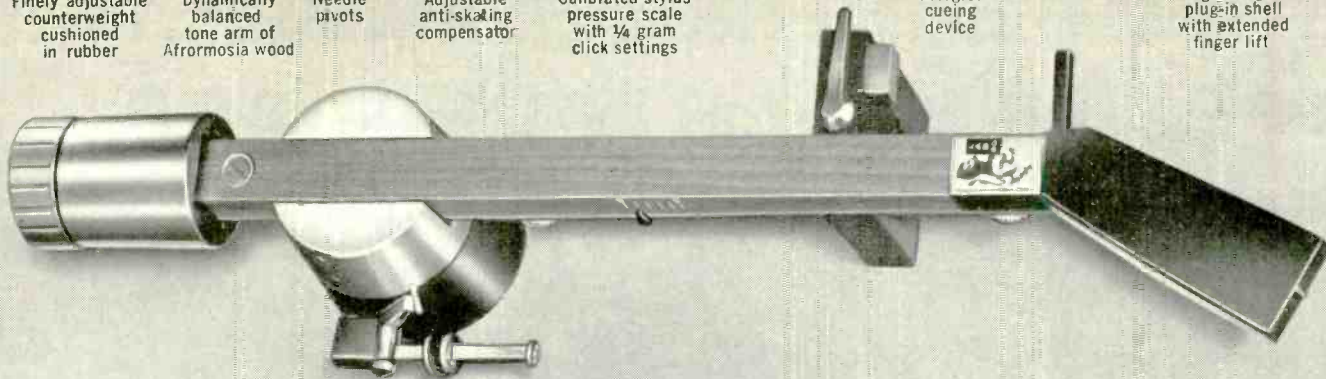
Needle pivots

Adjustable anti-skating compensator

Calibrated stylus pressure scale with 1/4 gram click settings

Integral cueing device

Lightweight plug-in shell with extended finger lift



The tone arm system of Garrard's new Lab 80 Automatic Transcription Turntable is a masterful combination of developments...all of them needed to achieve full benefit from the most advanced ultra-sensitive cartridges



"Which cartridge do you recommend?"  
"Can I use the— model?"

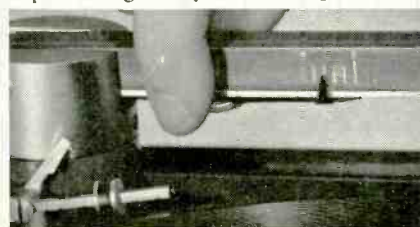
"How lightly and precisely will it track?"

"Will it get the best performance from the pick up I select?"



These are certainly the most commonly asked (and misunderstood) questions concerning record playing equipment. Now they have been resolved with the development of the Lab 80 tone arm system. Distinguished in appearance...as well as performance...this unique tone arm is the ideal transport for cartridges of professional calibre, including those originally designed for use with separate arms. It is built of Afrormosia, the least resonant of all woods, held in precision alignment by an aluminum stabilizer along its entire length. The knurled counterweight can be finely adjusted to put the arm in perfect dynamic balance.

The built-in calibrated stylus pressure gauge has click adjustments, each click representing one-quarter of a gram.

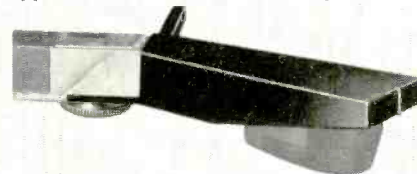


It provides a precise method of setting the tracking force specified by the cartridge manufacturer, no matter how light



...to the correct fraction of a gram. Because of today's featherweight tracking, the slightest interference with free arm movement may affect the cartridge's performance. To avoid this, the Lab 80 arm moves on needle pivots, set into tiny ballbearings. Flat arm geometry cancels warp/wow; low center of gravity eliminates sensitivity to external jarring.

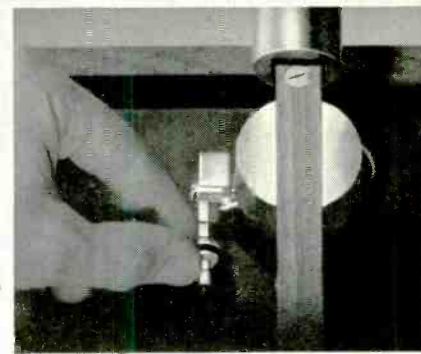
The lightweight removable shell is compatible with all cartridges...most particularly the low mass professional types. The shell slides into the arm on



channels...locks into position...cannot resonate or become misaligned.

Because of the offset angle used to minimize tracking error...all tone arms

have an inherent tendency to move inward (skate) toward the center of the record. This tiny side pressure must be cancelled out accurately, to permit the arm to track sensitive cartridges without distortion. The Lab 80 accomplishes this with a patented adjustable anti-skating compensator, making it possible to use cartridges with the highest compliance and most delicate stylus assemblies.



This total performance tone arm system, plus an ingenious cueing control (built into an automatic unit for the first time) and the other advanced features which distinguish the Lab 80, are detailed, illustrated and explained in the Garrard 32-page Comparator Guide covering the entire line. For your complimentary copy, write: Garrard, Dept. GA-15 Port Washington, N.Y.

**Garrard**<sup>®</sup>  
WORLD'S FINEST



# THE SMALLEST, TRUE HIGH FIDELITY SPEAKER SYSTEM IN THE WORLD

*Goodmans of England*

# MAXIMUS 1

"Amazing! Incredible! Fantastic! Magnificent!" These are among the comments of praise most often made by those who hear a MAXIMUS LOUDSPEAKER SYSTEM for the first time. Hearing is believing. And, all the words in the world are not as convincing as a single demonstration. You must hear it yourself. Next time you visit your hi-fi showroom, ask for a demonstration of the GOODMAN'S MAXIMUS. This is what you will experience:

- Sufficient handling capability . . . with ease!
- Crisp voice articulation . . . natural presence!
- Superb music clarity . . . true timbre and tone!
- Real treble, solid bass . . . for "him!"
- Smart, sophisticated styling . . . for "her!"
- Unusual compactness . . . fits anywhere!

## CROSS SECTION OF SUPERIORITY

To make possible such solid performance in a compact enclosure . . . new, basic research into diaphragm behaviour and electro-magnetic control characteristics were essential. GOODMAN'S OF ENGLAND is uniquely equipped — with experience, facilities and technical staff — to undertake such an assignment. After five years of solid research, GOODMAN'S MAXIMUS LOUDSPEAKER SYSTEMS finally represent an extraordinary successful marriage of loudspeaker components and enclosures. They deliver to the listener, with complete naturalness, the range, depth and brilliance of music, voice and all sounds known to man's ears. Heretofore, this has only been possible with systems many times the size and price of a MAXIMUS.

Inside each mastercrafted oiled walnut enclosure, custom-finished on all sides, are precision direct radiator drive units with specially designed crossover networks. The woofer has a massive magnet structure of 3½ lbs., a total energy of 2½ million ergs and a fluxdensity of 14,000 gauss.

## CAPS® CUSHIONED AIR PNEUMATIC SUSPENSION

EACH MAXIMUS 1 incorporates the CAPS® CUSHIONED AIR PNEUMATIC SUSPENSION SYSTEM. The new revolutionary speaker system providing exceptionally uniform linear response — lowest distortion ever attained . . . in an enclosure one half to one quarter the size of other fine speaker systems.

## UNUSUALLY FLAT RESPONSE LOWEST DISTORTION POSSIBLE

Unlike any other system in performance! Few speaker systems have approached the listening quality of GOODMAN'S MAXIMUS. Quite apart from their ability to handle power, MAXIMUS systems cover the frequency range with less deviation from level response than any remotely comparable system. This frequency response vs. power curve, shows the complete absence of severe peaks or sharp valleys, and the ultra-smooth roll-off! These are among the very important reasons why the sound you hear from a MAXIMUS is so excitingly real, unlike any other loudspeaker system in its class!

CAPS® — CUSHIONED AIR PNEUMATIC SUSPENSION MAXIMUS Speaker Systems are a design product of UTC SOUND DIVISION

Available at Leading Hi-Fi Dealers Everywhere! For additional information, write to:

UTC SOUND DIVISION, 809 Stewart Ave., Garden City, New York

## What other people and experts are saying about the MAXIMUS

★ *Excerpts from featured article in the Audio, November, 1964.*

The Goodmans MAXIMUS 1 is the smallest loudspeaker system we have ever encountered which is appropriate for use with hi-fi components in this 10½" x 5½" x 7¼" box. The Goodmans people have managed to pack 2 speakers, a crossover network, damping material and a surprising amount of music reproducing ability.

In the past we have encountered miniscule speaker systems which perfectly matched their size. We could rightly say that it takes a large system to achieve large sound. Of course, we did not mean that all large systems are better than smaller systems. There are some bookshelf-sized speaker systems which will stand up to all but the most elaborate systems — but we had not imagined that a box that small could reproduce so much musical sound unaided by special electronic circuits.

Undoubtedly, the musical quality of the MAXIMUS 1 derives from the smoothness of its response curve. In its effective frequency range there are few speaker systems smoother.

In essence, the MAXIMUS 1 is an excellent choice for medium powered component systems, and because of its size, ideal for audio fans with space problems. It should also be a big hit with the decorator-minded because it is so unobtrusive visually.

★ "I still don't believe it. It's utterly fantastic. Nevertheless, my eyes tell me that the astounding sound is coming from the MAXIMUS 1."

★ "This, David, outclasses all the Goliaths."

★ *Excerpts from Electronic News October, 1964. Claim New Loudspeakers Start Trend Toward Miniaturization by Roger Merahon.*

"This loudspeaker is designed to combine compactness, wide frequency response, low distortion and power handling. Goodmans Maximus 1 is 10½" wide, 5½" high, and 7¼" deep. It contains two speakers, a tweeter and a woofer. The woofer contains an extremely large magnet to insure high acoustic efficiency. The Maximus is enclosed in oil-walnut cabinet finished on all four sides."

★ *Excerpts from Berkley Gazette November, 1964. The World of Sound by J. D. Royce.*

"One of the most outstanding wonders exhibited at the 1964 High Fidelity Show in San Francisco was the Goodmans loudspeaker. The display room on the fourth floor was filled with concert volume and quality music. There were no visible speakers. I then had to be shown the two little boxes—the Maximus 1. I said you are kidding. He assured me he wasn't and proved it by having the volume turned up. They performed better than larger speaker systems. From the specifications on the unit I find that it not only sounds good, it is good. It's attractive, and styled to contribute to any decor. This 'Mouse that Roars' sells at an unbelievable low price and could be pointed to with pride."

★ Coupling purity of sound with minimum of size, the MAXIMUS units are an irresistible amalgam to discerning sound specialists, decorators, and architects. Count us among the first to use them.

★ *Reported from the Houston Hi-Fi Show in The Houston Post November, 1964. Your Leisure, Stereo High Fidelity Tiny Speakers by Lynn Jackson.*

"Goodmans Maximus 1 gets the mostest with the smallest. The Maximus 1 had to be seen and heard to be believed. It can be played loud, louder and loudest and still offer fine sound. For those with extreme space problems, it's the smallest, yet for quality sound, the Maximus 1 was a highlight of the trend toward miniaturization — in speakers as well as electronic components."

★ *Reprinted by kind permission of D.P. and D.W.A. Audio and Record Review May 1964 Great Britain.*

A pair or, indeed, a single unit give a performance that can only be described as astonishing for their size.

If Believe It Or Not Ripley was still alive, we are sure he would feature the Goodmans MAXIMUS 1 in one of his articles, as its remarkable performance has to be heard to be believed. Never again need a potential customer for Stereo be dissuaded from adding a second loudspeaker. (usually by the distaff side of the household) — "We're not having two of those huge things in my lounge." The MAXIMUS 1 makes stereophony possible in the smallest room. Goodmans have a certain winner here — ESPECIALLY WITH THE LADIES!

★ "Unless I'd seen and heard the MAXIMUS 1, I would never have thought it possible."



**This is Actual Size: 10½" x 5½" x 7¼"**

There's a **GOODMANS MAXIMUS** for every need... every budget.

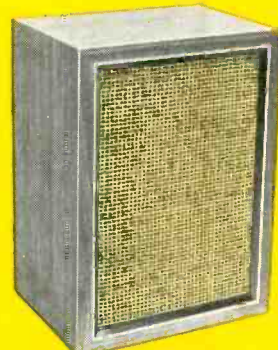
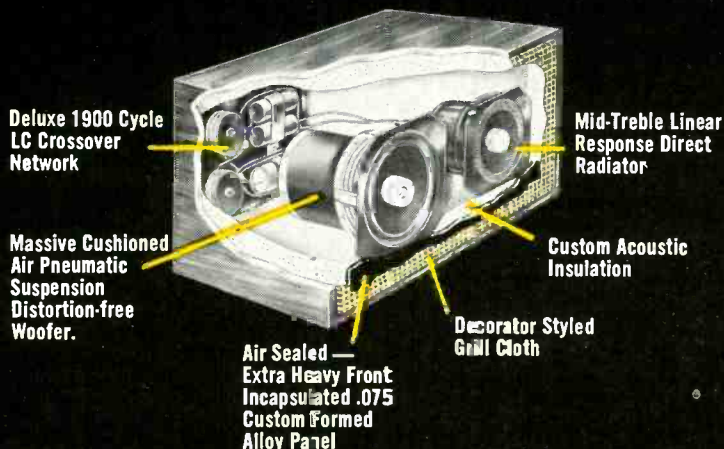


**the MAXIMUS 1**

**45-20,000 CPS** **15 WATTS**

Only 10½" x 5½" x 7¼" ... fits everywhere ... book shelf ... end table ... wall! Takes no more space than a few books, a small lamp, or a modest picture frame. True bass from the specially designed MAXIMUS woofer. Exceptionally large magnet provides high acoustic efficiency and power capability. Uniquely designed L-C crossover network transfers power at 1900 CPS to a newly developed backloaded mid-range/high frequency unit. Ideal for wide range mono ... two for stereo. Designed for 8 to 16 ohms.

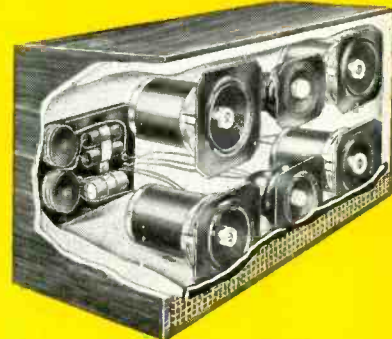
Net price: **\$59.50**



**the MAXIMUS 2**

**35-20,000 CPS** **30 WATTS**

This middle-size brother to the compact MAXIMUS I handles twice the power, extends the bass range down to 35 CPS. It measures only 14½" x 11" x 8" ... Still bookshelf size ... amazingly small for such big, powerful performance. MAXIMUS II uses two of the new MAXIMUS woofers, and the unique mid-range/high-frequency driver to provide an uncanny audio mirror of life-like projection of mono or stereo sound. 8 to 16 ohms. Net price: **\$109.00**



**the MAXIMUS 3**

**30-20,000 CPS** **60 WATTS**

Big brother ... but still only 18" x 12¾" x 10" ... The MAXIMUS III employs 4 MAXIMUS I woofers to give extraordinary precise critical damping for perfect transient response. Ideally suited for use with the newest high-powered Transistorized High Fidelity amplifiers. At 1900 cycles a Deluxe LC crossover network transfers the electrical drive from the 4 woofers to 2 MAXIMUS mid-range and high-frequency units to produce uniform linear performance from the lowest bass note to beyond the upper limits of human hearing. 8 to 16 ohms impedance.

Vital Statistics: Each of the 4 bass woofers has a total energy of 2½ million ergs, and a fluxdensity of 14,000 gauss. Each woofer has a massive magnet structure of 3½ lbs. The total distortion of the MAXIMUS III system is less than ½% between 150 cycles and 20,000 cycles, and less than 5% at 30 cycles.

Net price: **\$169.00**

★ "Quite unbelievable! You can almost see the performers. The MAXIMUS I is just out of this world! Unquestionably, the sensation of the show. Will revolutionize Stereo in the home."

★ In a combined living and dining area of 12 x 32 x 8½ feet, I recently installed two of your MAXIMUS II units with a Solid State 75 watt stereo tuner amplifier combination. My wife thinks the sound astonishing, and dares our friends to find the MAXIMUS II units. Actually, they are "hidden" amongst books and the stereo effect is really lifelike, and our guests have fun finding the speakers.

★ Reprinted by kind permission of Hi-Fi News June 1964 R. L. West.

"I just don't believe it. In fact, I still switch it on periodically to see whether I'm dreaming. We have talked about quarts into pint pots; well, here is a pint and three-quarters into a tot.

Bass is fantastic, showing the design really does meet the necessary requirements. Tested with a tone generator, it is possible to hear 30 C/S in a favorable seat in the room, audibly free of harmonics — comparable with many current speakers of accepted goodness. Above 35 C/S it will accept full power without any buzz or rattle, showing the very careful detail consideration this has been given.

The really miniature loudspeaker may well completely revolutionize our thinking. It brings nearer the day when really decent loudspeakers could be built into a house by a competent architect. It will displace 2½ bricks! With a little more development, it could possibly outstrip all other approaches. Meanwhile, it certainly takes its place amongst real high fidelity loudspeakers. Congratulations to the Goodmans team.



# How Fairchild puts psycho-acoustics to work for your station!

Now you can fully utilize the listening capabilities of your audience! Scientists for years have investigated and tabulated the various phenomena that make people want to listen. These findings come under the broad category of psycho-acoustics. Now Fairchild has harnessed many of these findings and incorporated them into a line of unique world-renown audio control devices which produce a sound easier to listen to and easier to perceive... in short a bright, crisp, lively sound which keeps your audience listening. This is the sound you need to help you sell your station to your audience and to your sponsors.



## THE DYNALIZER

the Psycho-acoustic way to achieve a bright, full bodied easy-to-listen-to, easy-to-perceive station sound. The Dynalizer contours your station's frequency response to fully utilize the listening capabilities of your audience. Makes your station sound really big, big, big even on the smallest pocket receivers.



## THE CONAX

the world-accepted way to control high frequency spillovers in FM due to preemphasis. Lets your station maintain real high levels even with brass and crashing cymbals and still avoid FCC citations.

## THE REVERBERTRON



the new compact reverberation system which gives your station that real big voice. With the Reverbertron you can have that Carnegie Hall effect as close as the gain control on the Reverbertron. And there's the added plus of an increase in apparent loudness of your station sound due to reverberation, as originally described by Dr. Maxfield.

For complete details on psycho-acoustic sound that sells write to Fairchild — the pacemaker in professional audio products.

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# LETTERS

## Psycho-acoustics and Live-vs-Recorded Comparisons

SIR:

Mr. Villechur's article "Techniques of Making Live-versus-Recorded Comparisons" (AUDIO, Oct. 1964) was very interesting. However, I wonder if Mr. Villechur would be so kind as to resolve one apparent anomaly for me.

The third paragraph of the article seems to deprecate those who suggest that psychological factors color "viewer preferences" in live-versus-recorded comparisons. Yet in the fifth paragraph Mr. Villechur notes that live-versus-recorded comparisons were conducted as long ago as the first decade of this century and that "copywriters soberly claimed that the reproduced sound was indistinguishable from the original, although the difference was gross."

How does Mr. Villechur account for this discrepancy, unless on the basis of psychological factors? For that matter, does Mr. Villechur intend to discount the work of Helmholtz in psycho-acoustics?

In conclusion, let me say that I found Mr. Villechur's discussion of technique technically stimulating and his conclusion that "the reference standard in high fidelity reproduction should be—the sound of live music" to be irrefutably valid.

B. R. RUBENSTEIN  
144 George St.  
Medford, Mass.

## Disappearing Audio Engineers

SIR:

I am enclosing a check for the renewal of my subscription for three years, and I consider it money very well spent. I have come to the conclusion, after reading many past issues, that your publication stands alone in the attempt to raise the general level of audio knowledge above the notorious "Hi-Fi for the Lay-

man" type of pamphlets that are so prevalent. As an electrical engineer, I am greatly disturbed when other engineers of my acquaintance state that audio is a dead field and good only for a hobby. I know differently, but new developments and the reasons behind them are seldom publicized as widely as similar developments in "space-age" oriented fields. I think this is a deplorable state of affairs, but perhaps with hereulean and unstinting efforts on the part of AUDIO and other magazines that follow your example, this generation of audio addicts may produce another generation of respected and recognized audio engineers.

ROBERT O. WILKINSON  
36 Rosemary Street  
New London, Conn.

## Matching Transformers

SIR:

In "Tape Guide" in the Nov. issue, Mr. Burstein suggests the use of matching transformers to increase the gain of a low-impedance (200-ohm) microphone, for feeding a high-impedance input. While these no doubt will do the job effectively, a prime deterrent is the rather high cost of a good wideband transformer.

An excellent alternative which I have used for a number of years is a small transistor preamp, such as the one described by H. West in AUDIO, Nov. 1959. This unit performs quite well with a medium quality ribbon microphone. It is a very high gain preamp, having a fairly sophisticated circuit.

For lower gain, I recently designed a simpler circuit, as shown in Fig. 1, using a single transistor. The gain is sufficient for my ribbon mike to comfortably feed a high-impedance input. As the output impedance is less than 200 ohms, very long lengths of shielded cable can be run without hum pickup. Due to extreme low-level operation, the unit can be operated from a small (1.5v) battery, and no a.c. feedback is necessary for distortion reduction. The whole preamp is housed in a Minibox, with switching of the battery following West's effective method, via the output connector.

JOHN L. GRAUER  
8 Garden St.  
Great Neck, N. Y. 11021

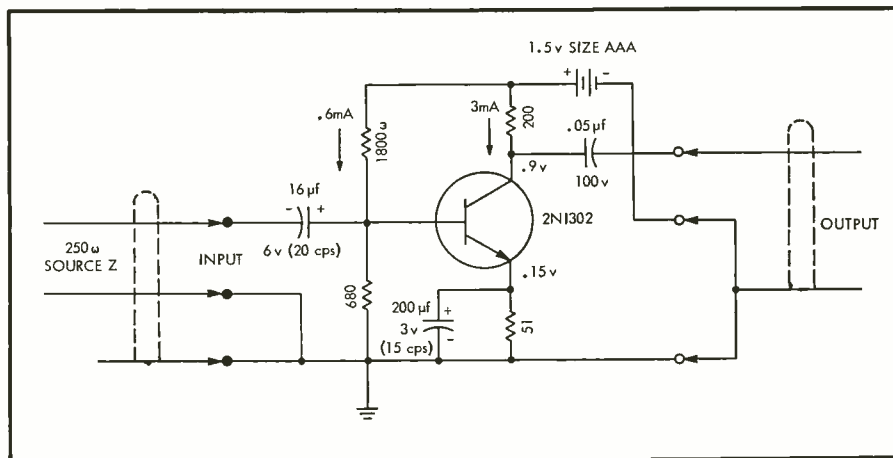
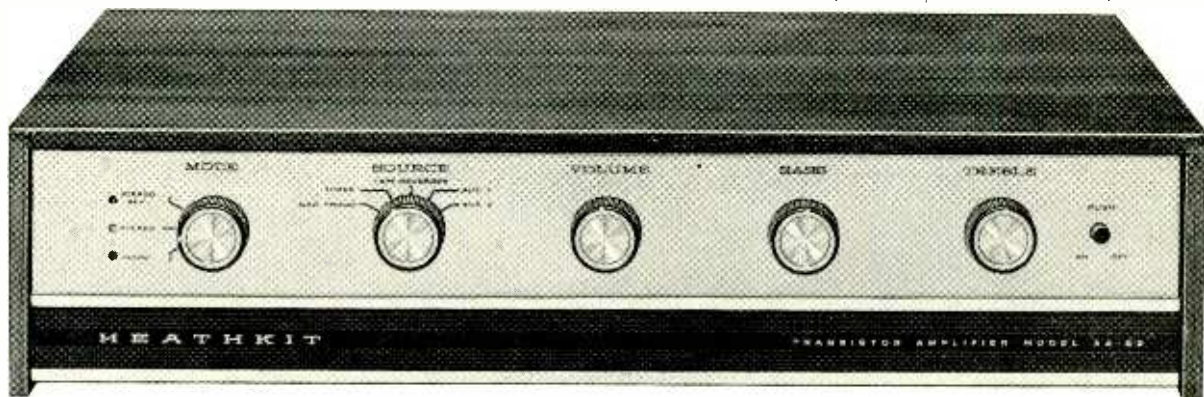


Fig. 1. Preamp for matching low-Z mike to high-Z input.



“Until just recently, I have been somewhat skeptical about low priced transistor amplifiers. However, after testing and listening to the Heath AA-22, I feel it is time to revise my opinion. This remarkable amplifier can easily hold its own against any amplifier—tube or transistor—anywhere near its price range.”

JULIAN D. HIRSCH, Hi Fi/Stereo Review, Nov. '64



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gloves. I operated it at full power for long periods, and frequently overdrove it mercilessly, without damage to the transistors, and with no change in its performance measurements” . . . “One of the best things about the Heath AA-22 is its price, \$99.95 in kit form, complete with cabinet.”

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# LIGHT LISTENING

Chester Stanton

## My Fair Lady (Original Soundtrack Recording)

Columbia OQ 664

After nearly a decade spent enlivening the musical stages of the world, Lerner and Loewe's "My Fair Lady" has finally received the Hollywood treatment—and escaped relatively unscathed. Unscathed, that is, if you can bring yourself to accept the songs of heroine Eliza Doolittle without the irreplaceable voice of Julie Andrews. There is a certain irony in the casting of Audrey Hepburn to portray the visible Eliza and Marni Nixon to sing the songs off-camera. When plans for the movie version of this record-breaking musical were announced no one dreamed that Julie Andrews, by the time Fair Lady was ready for theatre screens, would have ceased to be solely a stage attraction and already have three highly successful films to her credit. Had the Warner Bros. studio shown a bit more patience until Miss Andrews had a chance to prove to Hollywood that she was a safe boxoffice bet, stereo fans everywhere would now have a definitive up-to-the-moment recording of a theatre classic. While it is true that Columbia Records re-recorded "My Fair Lady" in stereo with the principal players while they were appearing in the London production that followed the New York run, the performance guided by British conductor Cyril Ornadel simply didn't have the verve and snap that Franz Allers got in the original, mono-only version. In this Columbia reel of the movie version, Andre Previn leads singers and orchestra in a performance that falls somewhere between Ornadel's and Allers'. Of the old gang still going strong in their original roles, Stanley Holloway's Alfred Doolittle has aged less than the Henry Higgins of Rex Harrison, Audrey Hepburn's undeniable charm being nowhere available in this recording, we are left with the voice and interpretive talents of Marni Nixon to carry the full load of some of the best songs in the score. An American in native dialect, Miss Nixon only approximates a Cockney accent in the earlier scenes. Only now can we fully appreciate the amazing stunt Julie Andrews carried off in making Cockney phrases intelligible in a song.

This Columbia reel, like any normal stereo tape, preserves with ease the wide separation on the master recording. The sound is surprisingly clean in the transfer from the soundtrack and a special word of commendation is due the Columbia staff for the absence of tape hiss even at high-level playback.

## Stan Kenton: Artistry in Voices and Brass

Capitol ST 2132

The finest sound equipment modern technology is able to assemble today can not deliver sonic entertainment greater than that of the instrumental or vocal ensemble it happens to be reproducing. No matter what the nature of your present system, the entertainment value of this latest Stan Kenton release cannot be questioned. As a bonus, Kenton is very fortunate in having at his disposal a recording philosophy that reflects the mature thinking of Capitol Records' engineering staff instead of the wild dictates of a sales crew bent on bolstering its sales to the teen-age phono market. "Artistry in Voices and Brass" will do credit to the capability of components chosen without compromise in an audio budget. It's difficult to know where to

begin enumeration of the solid attractions in this album. The idea for the recording began with the decision to convert some of the great Kenton instrumental favorites into vehicles for a mixed chorus of eighteen carefully chosen voices backed by a choir of five trombones. Pete Rugolo, who has been writing for the band for the past eighteen years (could that have been the reason for the choice of eighteen voices?) was assigned the arranging duties in the conversion of his own compositions as well as those of Kenton and Bill Russo. The lyrics were the work of Milt Raskin who tackled the far from easy job of devising words for instrumental specialties such as "Artistry in Bolero," "Eager Beaver" and "Concerto to End All Concertos." It is a tribute to the boundless imagination of the Kenton organization that this idea was ever tried in the first place. Its exciting fruition can be traced to hard work and insistence on the very best vocal talents the Hollywood area has to offer. The four sopranos, four altos, four tenors, four baritones and two basses are a joy to the ear as Capitol has miked them. Their rhythmic grace and true tonal colors are very easy to spot because the sound they produce is uncanny in its transparency. Admittedly, it is easy to write a rave review about a record of genuine sound fidelity in the midst of souped-up discs but this one is a standout in the select company of today's natural stuff.

## Reprise Repertory Theatre

Reprise 4FS 2019

Since its establishment by Frank Sinatra some four years ago, the Reprise label has concentrated its efforts on cornering most of the singers who happen to make Hollywood their home. It would seem that it takes a working singer as head of a recording firm to attract and keep happy a collection of vocal colleagues. Just how large a segment of Hollywood's singing luminaries Sinatra has signed up by now is revealed in this four-record album. In the most ambitious project Reprise has undertaken to date, 23 name recording artists appear in a special recreation of four famous Broadway shows—"Guys and Dolls," "Finian's Rainbow," "South Pacific" and "Kiss Me Kate." Uppermost in fame (and polish of performance) are such easily-recognized voices as Bing Crosby, Rosemary Clooney, Dinah Shore, Debbie Reynolds, Sammy Davis, Dean Martin, Jo Stafford. The McGuire Sisters and Maestro Sinatra working at both sides of the control room glass. Also featured in this four-show marathon: Clark Dennis, Alan Sherman, Keely Smith, Lou Monte, The Hi-Lo's and the Mary Kay Trio. With a roster of such diversity and versatility, the fifty-eight selections, spread over sixteen recording sessions, were cast for optimum effect upon the ear and the ear alone. If you approach these four great shows without deeply-rooted prejudice in favor of the original casts that brought the songs to Broadway, you're bound to admit there is much that is valid in the Reprise approach. I was struck by one thing throughout the series: Hollywood no longer has to take a back seat in the recreation of musicals for records. As a whole, this series preserves the mood of the shows in question with greater fidelity than do some of the recent New York recordings that have been going in for far-fetched arrangements of the songs in order to "refurbish" or "brighten" a long-established show. Particu-

larly welcome in this Reprise series is a chance to hear Harburg and Lane's "Finian's Rainbow" and Frank Loesser's "Guys and Dolls" in up to date sound.

## Morton Gould: More Jungle Drums

RCA Victor LSC 2768

## Xavier Cugat Plays Ernesto Lecuona

Mercury SR 60936

Lecuona's music figures prominently in both of these releases, proving once more the versatility of the Latin master's compositions. The Gould album explores new ways of presenting the sweep and color of some of the more pretentious Lecuona works. While not neglecting an old standby such as *Siboney*, Gould concentrates his efforts on the composer's *Danzas Cubanas* and *Afro-Cubanas* along with the better-known *Andalucia Suite*. Before taking up the larger Lecuona items with that familiar style that combines scholarship and showmanship in equal measure, Gould first turns this record into a resounding sequel to his bestselling album called *Jungle Drums*. The first five selections on the disc offer fresh, attention-grabbing versions of *Espana Cani*, *Peanut Vendor*, *Brazil* and *Ay Ay Ay*. Because Gould has so much to say in his arrangements, the listener with a decent sound system may find himself wishing that RCA had kept the Dynagroove process in the background, allowing Gould to work in the widest possible frequency range. The treble boost, introduced to cover the absence of natural highs, is typical of many Dynagroove releases of popular music. I was able to "maximize" my listening comfort in the following way. Abandoning the RIAA playback position used for virtually all recordings, including RCA non-Dynagroove, I rolled off the high end with a steep-slope 10 kc filter. A final adjustment slightly downward on the fine-treble knob brought the response of the record to the point where the trumpets sounded as comfortable as they do on RIAA records.

In his tenth release for Mercury Records, Xavier Cugat puts the emphasis on the dance beat in the Lecuona selections comprising the entire contents of his recording. A miking setup closer than Gould's appears closer still because a fuller frequency range bathes the ear with the true color of each instrument. Decades of music making haven't dimmed Cugat's enthusiasm in setting up a truly pulsating rhythm for Lecuona favorites many of us heard for the first time played by his band. *Always in My Heart*, *Jungle Drums* and *La Comparsa* are but a few of the top Lecuona items brought to fresh life here.

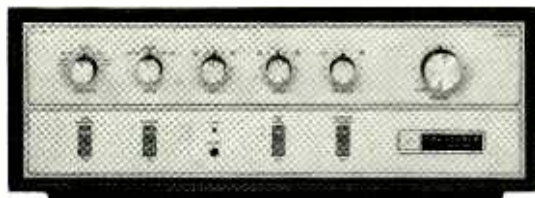
## Jan Peerce: World's Greatest Love Songs

United Artists 6374

In his earlier records, most of them on the RCA Victor label, tenor Jan Peerce has had scant grounds for concern about the treatment accorded his voice by recording engineers. On the basis of the sound he gets on this United Artists release devoted to famous love songs, I would say his fortunes in the recording studio have taken a sizable turn for the worse. In all probability, Mr. Peerce formed his opinion of the playback quality of these songs on the basis of the master tape played for him by the control crew after each take. Like all master tapes heard before they have been subjected to processing techniques that can vary widely these days according to the effect sought on the disc, this master undoubtedly gave the artist little or no clue to the ultimate disposition United Artists was going to make of the voice on the finished record. Jan Peerce here sounds for all the world as though he were singing into a long metal tube separating him from the microphone. It could be that Peerce actually prefers the sound of his voice in UA's processing to that of a conventional recording. Chances are, he himself wasn't aware of the weird effect on this record until it was too late. At the rate things are going now, the day may not be far off when name recording artists in a position to do so will ask to check the finished disc instead of the master tape before approving a recording for public release. Æ

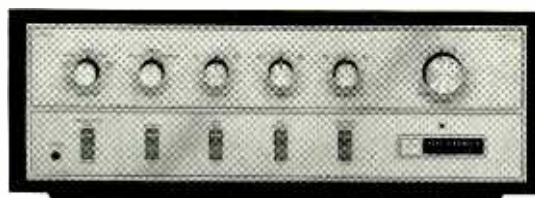


# The powers that be: 50 watts



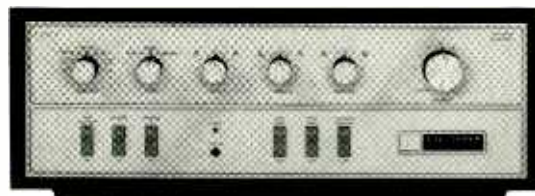
**THE FISHER X-100-C**  
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 DEEP. WEIGHT: 23 LBS. PRICE: \$169.50\*

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 \*WALNUT CABINET, \$24.95

The powers that inspire awe in high fidelity circles these days are the output ratings of the new Fisher stereo control-amplifiers. They indicate a level of performance that until recently would have been unthinkable in moderately priced equipment. You merely have to match the watts against the dollars and remember that a Fisher watt is inevitably a clean watt.

Heavy-duty beam-power output tubes of the latest types are one of the most important factors in the Fisher power elite. Superior circuit design is another. Large output transformers with low leakage and high primary inductance make sure that

the power does not suddenly fall off at the frequency extremes, as is the case in so many lesser control-amplifiers.

Of course, clean power throughout the audio spectrum is not the whole story. These Fisher amplifiers also have the most complete and most advanced preamplifier and control facilities. Plenty of gain. Superbly convenient rocker switches. Front-panel headphone jacks. The exclusive Fisher DIRECT TAPE MONITOR.† Sharp-cutoff filters. And each amplifier provides a power-derived center channel output.

Is this the kind of amplifier you appreciate? More power to you. †PATENT PENDING.

**FREE! \$2.00 VALUE!** Send for your free copy of *The New Fisher Handbook*. This entirely new, revised and enlarged edition of the famous Fisher high fidelity reference guide is a magnificent 76-page book. Detailed information on all Fisher stereo components is included.



Fisher Radio Corporation  
 21-40 44th Drive  
 Long Island City, N. Y. 11101

Name \_\_\_\_\_

Address \_\_\_\_\_

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## The Fisher

Circle 109 on Reader Service Card

# AUDIO ETC.

Edward Tatnall Canby



## THE PEBBLE GRAYS

One of the most startling trends in recent stereo phonographs, as far as I am concerned, has been the violently rapid appearance of umpteen million stereo portables à la KLH Eleven, every last one of them clad in the same shiny, pebble gray, looking so much alike in their suitcases that we can scarcely tell them apart at ten feet! I'm amazed, because I guessed wrong. It was mostly a private guess, luckily for me. I was for stereo portables of a practical sort long before KLH ever got around to thinking about the idea (now don't make me go look for those back numbers of AUDIO again . . .) and I was all for the KLH development when it came out; it was definitely on the right track with the right principle.

Frankly, I thought to myself, this Model Eleven was a worthy experiment just too good to be true. It would never succeed in our hard-boiled stereo world. To be sure, it was an ingenious machine; yet, thought I to myself, strictly for the commercial birds.

It was a biggish bird, for one thing, barely able to fly (if you had the strength to heft it through the air), and it carried its two speakers with it, detachably. *Detachable* speakers, imagine it! And wires. Miles of wire, so you could hook the speakers up at a distance, say, of a quarter mile on each side. (Well, a slight exaggeration but I'll bet you could put them 20 feet apart.) Separation—at last! And not via a big speaker and some tiny satellite; there were two equal and identical speakers and you could have Optimum Stereo in anybody's living room up to 100 by 150 feet. Phew! Couldn't be believed. BUT (I wondered) who's going to fuss with all this? Who'll want to cope with all that mass of wire and plugs and what-not? Who wants to carry a big thing like that?

For hadn't we taught Mr. John Q. Public, all these years, that the miracle of stereo was his absolutely EFFORTLESSLY? Hadn't we shown how you could pack six or eight stereo speakers in a lovely little box with a foot-and-a-half spread between channels, and if you put your nose right down on the table a couple of inches away you could hear the world's finest stereo to left and

right (of the nose, that is)? And if you moved back three or four feet, you could still hear superb high fidelity? (That, of course, is our euphemism for mono.)

If you'd asked me point-blank, I'd have had to say that if this particular bird didn't turn into a turkey, I'd eat crow. If not a turkey, then a very dead duck.

So now I have to eat crow. Wherever you look, there's pebble gray. Here comes the portable parade! Where there was one, now there are legion, and like Henry Ford's Model T they come in every color of the rainbow so long as it's pebble gray. All sorts of aluminum trim around the edges, too, though the variety is so extremely subtle that I can't tell one trim from the next.

And when you get their speakers unclamped and unhooked, the wires unwound, untangled, laid out on the floor, then, at last, plugged into the right RCA receptacles, you are left with a characteristic look-alike curved-bottom "deck"—let's call it a tray—oblong with curved-in bottom and corners, a sort of deep-dish hi-fi pie with a pebble-gray bottom crust and an aluminum edging all around; at the left end you'll find the built-in record changer, to the right (who's left-handed except me?) a neat control panel of five or six knobs one above the other, and underneath somewhere there'll be the transistorized power department, probably housed in a pill box or two in the middle of the changer's gears.

They all look remarkably alike and they are all truly portable, if you mean by portable that they are pebble gray, streamlined, and have handles that won't break when you lift them a few inches off the floor. Alike as so many modern Fords and Chevies though, of course, a Fisher pebble gray speaker won't fit onto a Zenith pebble-gray tray. But, then, neither will a Chevy fender fit onto a Ford chassis. How much conformity do you expect? There's plenty and I haven't seen any signs of a revolt so far, such as, maybe, a shocking-pink portable.

Now of course there *are* differences. Plenty, in spite of the pebble-gray monotony of the outside. Don't expect me to go into them. I don't want to try out ninety-nine portables (I refused to do an

article on a mere seven of them awhile back)—and fortunately, I don't have to. It isn't my business. I leave that worry to the editor (who won't do it either if he has any sense). (*Haven't the room, sense or not!* Ed.). Instead, in order to pin down generalities with illustrations of some practicality (for you and me) I've been trying just two of the pebble grays. And one of them isn't basically intended as a portable at that, though it does wear the prevailing pebble-gray uniform.

I'm not saying these two are typical—I use a milder word: representative. And the two are really *very* different, under the pebble-gray skin. That's my idea. One of them, a moderately priced model, is the svelte, suave Fisher 50. The other is the big, bluff, massive and *very* de luxe Shure M100L, adapted from the basic Shure M100 system. This one comes in two pebble gray suitcases. Phew! Pretty soon they'll be selling pebble-gray Volkswagens (if this goes any further) with handles on top so when you run out of gas you just grab the handles and carry the Volks to the next gas station. Real portable. But M100L is a special case.

### Fisher 50

First, the Fisher. I am all respect for the kind of thinking that has gone into this recent model in a relatively modest price range and I am happy that it is typical of much in the numerous other similar models from other big companies. The pebble gray concept has been working up rather nicely this year, granted its original outline—a transistor "phono deck" in a suitcase body with a pair of detachable speakers molded in.

Fisher 50 is, *first of all* not too heavy! If you're going to design portable stereo, minus wheels and a three-speed propulsion unit to get it from place to place, then first, please, think in terms of weight. Some people don't. They must hire weight-lifters to do their testing. My first self-imposed assignment for Fisher's pebble gray was to carry it up four flights of city walk-up stairs to a rehearsal of the Canby Singers, where we used it to play back stereo test discs of our new record, then unreleased. I'm glad to report that I survived. The Fisher really is not heavy at all, as suitcases go. It is portable in a purely practical way, an excellent compromise between the demands of reasonable sound quality (I'm coming to that eventually) and the inexorable law of gravity. Moreover the machine is smoothly shaped and fitted so it doesn't bang your knees or sag sidewise and the handle is big and comfortable. What a pleasure! Remember—we are talking about *portable* stereo. That means stereo you can carry, not merely lift and set down again in a hurry. (Ah—that wonderful word *porta-*



# GOTHAM ANNOUNCES A NEW NEUMANN PARTNERSHIP

## The industry respected U-67 now complemented by the new U-64 LINEAR ADMITTANCE CONDENSER MICROPHONE



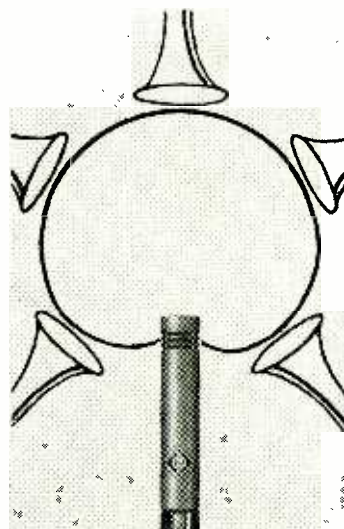
*You may ask "Why does that flexible studio 'work horse,' the U-67, even need a partner?" Let us explain in detail.*

**THE INDUSTRY RESPECTED U-67:** This microphone, first introduced in 1961, is NEUMANN's answer to a number of demands growing out of today's operating methods and recording vogues. The need here is for a microphone capable of linear response for a sound source even inches away from the microphone element, leading to: A sharp 40 cps cut-off to suppress

"popping" at this distance; a further low end switchable attenuation; overload protection to extend its 100 dB dynamic range; all three patterns to cover many unpredictable eventualities in the studio; and a standard tube type (the EF-86) for simple local replacement. The unprecedented sales record of the U-67 testifies to NEUMANN's accurate interpretation of what our Industry had desperately needed. The ridiculously low repair rate attests to its reliability and ruggedness in 'round-the-clock use.

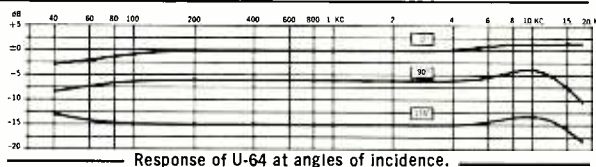
**MEET THE NEW PARTNER—THE LINEAR ADMITTANCE U-64!** Again demonstrating its foresight, the NEUMANN Engineering Department has applied itself since 1960 to the solution of another long standing studio problem—designing a condenser microphone element that would come closer to the ideal cardioid pattern at all frequencies in the spectrum—not just in the midrange. Such a microphone would permit a greater working distance from instrumentalists resulting in a better sound perspective. Bear in mind that there are two ways of evaluating a directional microphone. 1) How dead is it to sounds other than from its front? and 2) How flat is its response to sounds emanating from directions other than directly in front? At very close range (Say less than 2 feet) point 1 is more important, for you are then concerned

entirely with a pick up directly at the microphone's axis of maximum sensitivity where it has flat response. What happens, though, when you get farther away from your sound source and try to cover an entire string section, saxophone group, or get a better perspective on a piano pick up? The answer is that you must consider what the frequency response (i.e., sound quality) will be for a performer at 45, 90 or even 135 degrees from dead ahead of the microphone. NEUMANN has solved this problem with the U-64 linear admittance cardioid condenser microphone! Now the off axis sax player will be heard with the same linear response as the one directly in front, and string players in the back row sound the same as those with the direct shot at the mike. With the new U-64 you can henceforth enjoy the benefits which come only from a diversity of distances between performers and microphones.



### TECHNICAL DATA

	U-64	U-67
Frequency Response:	40-18,000 cps	40-16,000 cps
Capsule Construction:	Vacuum gold steamed Mylar® diaphragm with acoustical delay network	Same but two diaphragms
Directional Characteristic:	Cardioid	Cardioid-Omni-Figure 8
Overload Protection:	Built-in 14dB, switchable	Same
Distortion, Harmonic:	<0.5% to 120 dB SPL (to 134 dB with overload protection)	Same
Effective Output Level:	-43 dBm re 10 dyne/cm <sup>2</sup>	-48 dBm re 10 dyne/cm <sup>2</sup> (with built in pad)
Self Noise Level (DIN 45405):	<29 phon	<16 phon
Amplifier Complement:	RCA Nuovistor type 7586	EF-86 / GCF8
Connectors:	Cannon XLR series throughout	XLR output connector
Power Supply:	a) N6u single unit supply (portable) b) N62u dual unit supply (portable) c) N66 19" rack mounted to power six U-64 units in permanently wired installations	NU-67 single unit supply (portable) NUK single unit plug-in type for rack frame
Finish:	Standard matte satin chrome or non-reflecting dark gray	Standard matte satin chrome
Microphone Size:	7/8" diam. x 4"	2 1/4" diam. x 7 7/8"
Power Supply Size:	a) 8 3/4" x 4" x 4" b) 8 3/4" x 4" x 4" c) Standard 19" rack x 3 1/2" high	8 3/4" x 4" x 4"

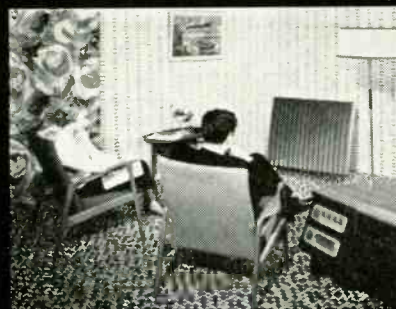
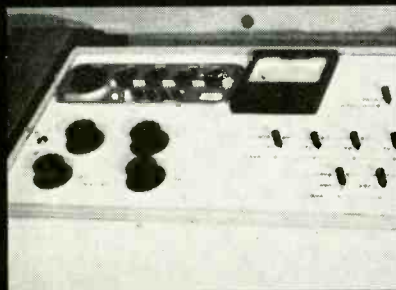
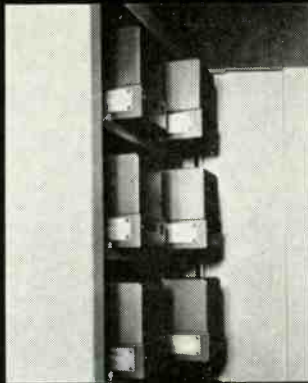
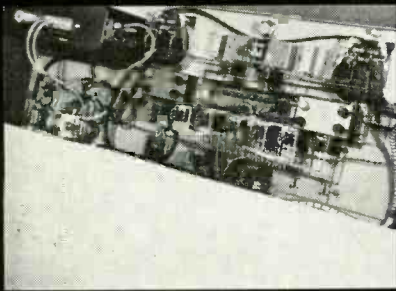


	U-64	U-67
Accessories Available:	Z-118 Wind Screen Z-38 Elastic Suspension Z-68 Auditorium Hanger UC-11 Extension Cables in 25, 50, and 100 ft. lengths UC type bulk cable for permanent installation wiring.	Z-67 Wind Screen Z-48 Elastic Suspension UC-5 Extension Cables in 25, 50 and 100 ft. lengths

If your microphone problems are outside the studio or if you need information on the applicability of NEUMANN's other condenser microphone types, our Engineering Department is always available for consultation. No obligation, of course.

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\*  
 100 volt signal to line?  
 . . . . . 25 ohm output?  
 . . . . bridging monitor  
 for 600 ohm line? . . . .  
 230 volt signal output?  
 . . . . variable correc-  
 tion unit? . . . . 1 ohm  
 output? . . . . 30/64 ohm  
 output? . . . . special  
 input sockets? . . . .  
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 mounting? . . . .  
 50 volt line? . . . . or  
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tive! Anything with handles that can't be carried is portable.)

Since I've found that pebble grays come apart rather more easily than they go together again, I looked at Fisher's array of clamps and whot-not with some apprehension. My early KLH Model Eleven had crossed me up—I couldn't figure which way the speakers looked back on. Well, Fisher's system is as good as they come. Four easy clamps, two on top and two on the bottom as you carry the suitcase, and they work very easily. The speakers join together to form the second half of the machine and they do so easily and with security. Only one mild faux-pas here from Fisher: you can hook the speakers on upside down, whereupon the assembled suitcase immediately topples over on its side, because two of its four rubber feet are, so to speak, on its head. All four must be on the ground, or bottom side, natch, if it's to stand up.

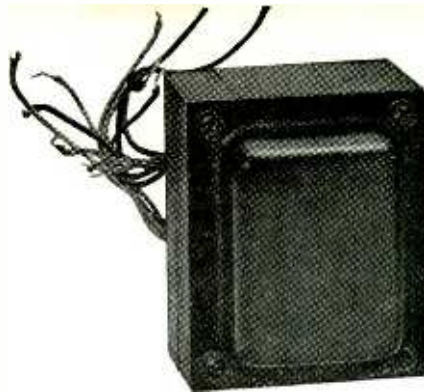
Fisher's miles and miles of hook-up wire (that's the way I always think of the long speaker cords included in these pebble-gray machines) are neutral gray and of a thinner-than-usual gauge, which makes it easier to untangle them and renders the wiring aspect a bit less violently conspicuous, though no less trippable for the wandering foot. Better, a neat little zipper pouch holds all the rolled-up wire easily and has a place on one of the speaker halves, under an elastic cord—none of that exasperating business of trying to close the portable with stray loops of wire escaping out of the edges in spite of your cramming it all together in a big wad. Oh how we customers hate that sort of thing!

The two speaker halves are pretty tiny but they do stand up by themselves after a fashion and they aren't too undecorative, even with the clamps and the half-a-suitcase look. If they topple over, blame it on the streamlined decorator shape of the pebble-gray exterior. After all, a box-square portable wouldn't do for a moment, now, would it?

The Fisher tray differs from others mainly in that its commercial brand turntable is perhaps a different one from the next portable. The pebble-grays are still at this point (and will probably remain) tied to standard commercial tables as a matter of practicality. No specially built compact models, Fisher uses Garrard's AT-60, probably as good a machine for its weight as any available. Also for bulk, except maybe in the upward direction thanks to the overhead arm. There is nice portable thinking around the edges here—quick-type fasteners for carrying, clips for the spindles and, on the changer itself, a quick fastener for the wandering tone arm. These things are important in any practical portable that is to last more than a week

(Continued on page 53)





## CULPRIT

## VILLAIN

**Tubed components are doomed.** It is now common knowledge among hi-fi engineers that tubes and output transformers play a major role in creating distortion.

**Why transistor components are better.** Transistor units produce better frequency response (cleaner, more "transparent" sound) because they don't use output transformers. Transistors are the best switching devices known to man, give better response to sounds of very short duration. Speakers are coupled directly to the output transistors, giving you crisp, solid bass. Tubed receivers require realignment at least every other year. Transistors simply do not age . . . and they run cool.

**Why invest in obsolescence?** As you approach the extremely important purchase of your next stereo system, bear in mind that the very finest tubed equipment will soon be hopelessly obsolete. Harman-Kardon, possessing the industry's longest, most extensive experience in solid-state audio design, is and will remain many years ahead of the field.

**The industry's only all-transistor line.** While an occasional solid-state component has appeared in other lines, only Harman-Kardon now offers the fabulous wide-open sound quality of complete transistorization throughout its entire line . . . only Harman-Kardon has advanced

to the point of going completely out of the tubed-equipment business. Not even a nuvistor tube remains to mar the 100% solid-state sound of every Harman-Kardon instrument.

**Now, transistor economy.** The new Stratophonic all-transistor FM stereo receivers (shown below), priced down with the most popular tubed units, give you Sound Unbound without the old price penalty of transistor equipment. Now, with the Stratophonics, there is literally an all-transistor receiver for every home and every budget. When you hear these magnificent instruments, you will never again settle for the distortion of tubed equipment.

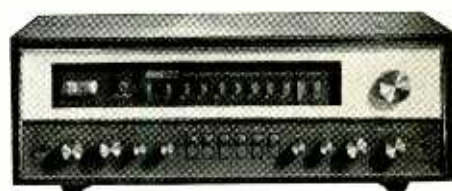
# Harman-Kardon Stratophonic FM Stereo Receivers . . . a complete all-transistor line, priced from \$279 to \$469



**MODEL SR300**, 36 watts IHFM music power. The best news yet for music lovers on a strict budget. A delightful sound at any price, an unbeatable value at just \$279.\*



**MODEL SR600**, 50 watts IHFM music power. All the front-panel convenience controls of the SR900, and most of its fantastic performance at every power level with minimum distortion. Price \$389.\*



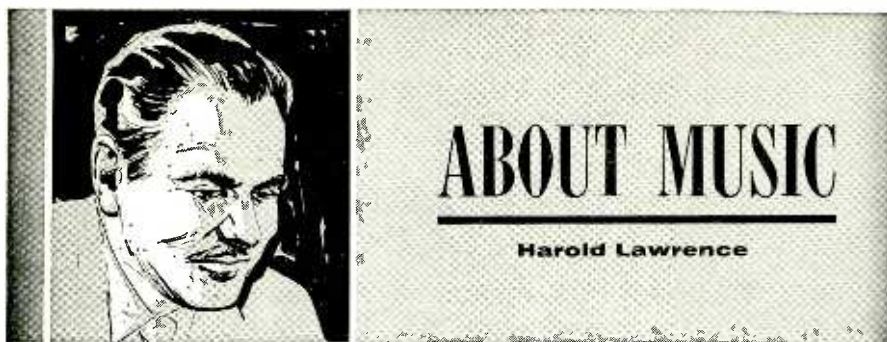
**MODEL SR900**, 75 watts IHFM music power. Hailed by Audio (October 1964, before the SR600 and SR300 came out) as "the only component-quality all-transistor receiver we know of." Price \$469.\*

\*Prices slightly higher in the West. Enclosures optional.

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## Len Lye's Un-Frozen Music

A Variac auto transformer, a relay amplifier, a 4-track tape recorder, a 4-rpm motor—of what possible use can these components be to a sculptor? To Len Lye, they represent a breakthrough on several fronts. With the help of his friend and electronics consultant, Bert Stanleigh, Lye will now be able to “program” his motorized sculpture on tape, transfer the information to tape cartridge and, for the first time in his career, sit back and watch his creations whirl, twist and shimmy to his own pre-recorded signals.

New Zealand-born Lye is in the mainstream of the kinetic art movement. “The mobiles of Calder, the revolving sculptures of De Rivera, and the kinetic constructions of Tinguely are examples of (the fact that) motion sculpture is a distinct form of modern art,” Lye says. His metal sculptures vibrate at different speeds; fascinating shapes appear and dissolve rapidly in air, to the accompaniment of a whole new vocabulary of sounds produced by the natural resonances of high-tempered steel rods and bands.

Most motion sculpture is powered by simple motor-vibrators. The clattering, jangling and thrumming sounds we hear when metals or plastics are being vibrated are concomitant features of kinetic sculpture. But these sounds are usually absorbed in a matter of seconds by the spectator, whose main interest is focused on shape and movement. A few motion sculptures use externally produced sounds in their work. Jean Tinguely, best known for the “self-creating and self-destroying” machine that committed suicide in the garden of the Museum of Modern Art four years ago, introduced radio sculpture to New York in 1962. These works were exhibited behind clear plastic sheets. Actual radio parts (tuners, speakers, tubes, wires) were attached to the sheet. A switch protruded from each sheet, and the spectator was invited to turn it on. With the juice flowing through the sculpture, its parts began to move at varying speeds, and sound emanated from the small speakers. Because the tuner was in constant motion, the sound was a jumble of music and talk.

Lye also uses external sounds in his work. From his collection of ethnic recordings, he chooses dances and drum patterns to underscore the pulsating rhythms of his sculptures. But the electronic system he and Stanleigh have designed has nothing to do with sound directly. It is a device to enable Lye to “compose” his movements in advance and to synchronize these movements with pre-recorded musical and other sonic effects.

To see the system in action, I paid a visit to Len Lye, a tall, goateed, slender man who lives in a private house on Pethune Street in Greenwich Village. His workroom on the second floor would resemble a repair shop were it not for the gleaming metal objects thrusting up out of black pedestals or hanging from the ceiling. “All these are studio models,” Lye explains, offering us glasses of Swedish ale. “This rod here, in its ‘practical’ model, is 8-feet high, a springy, powerful piece of stainless steel.”

In repose, Lye’s sculpture suggests a steel foundry rather than an artist’s *atelier*. “My emphasis,” he says, “is on motion, rather than on the object describing it.” With this, Lye went to a cluttered table, reached under it, located a pair of wires, made a connection, and turned to his Variac.

A free-standing blade of polished steel about 40 inches high began to vibrate, gently at first, then with increasing speed. At its most agitated point, the blade struck a metal ball suspended on a wire alongside it. Called *Plinth*, the sculpture described a constantly changing pattern of forms while the air sang with its vibrations, all of which was punctured by loud gongs as the clapper hit the blade.

Lye set into motion some of the other studio models. A sculpture called *Ring* unwound from a gibbet in the ceiling. When power was fed into its oscillator, the ring of stainless steel began to do a “twist” in slow motion. Its upper part, like a woman’s bare shoulders, hunched forward gradually as the motor hummed; tension built up, and it seemed as if the ring wanted to turn itself inside out. Suddenly the metal woman did just

that. With a plangent shudder, it “dematerialized” in a burst of sound and shattered lights.

One of the most evocative of Lye’s works, “Grass,” is a sculpture consisting of 23 stainless-steel rods each 1/32 of an inch in diameter, lined up on a platform. At the flip of a switch, the platform began to sway, and the rods moved like wheat in the breeze.

On a black pedestal bearing the sign, “Resist Touching,” a circle of bells suspended on wires surrounded a tall rod wearing a sort of thin-metal headgear. When Lye set the oscillator in motion, the wires jiggled, leaped and spun in all directions, while the central wire tossed its headgear violently from side to side. Lye accompanied the dance with a recording of African drums, which gave the sculpture a Watusi flavor.

Lighting plays a vital role in Lye’s sculpture. Yellow, blue, purple, green and white beams (red is outlawed in Lye’s spectrum because of its honky-tonk associations) play on the polished surfaces of his works, giving them a disembodied quality. You are unaware of the pedestal with its motor inside, so completely does the glittering metal hold your attention.

In the past, Lye has had to operate the Variac at his own exhibitions, like a composer creating a new work before an audience. Now he will be able to experiment at home with his electronic system, recording as he goes along; keeping the good, discarding the misses. The gadget developed by Stanleigh will permit him to increase, decrease, or cut off the power that drives the motor. Instead of turning the Variac knob himself, Lye will flip a switch, putting a 1000-cps tone on alternate tracks on the tape. The tape, via relay amplifier, will activate the

(Continued on page 50)

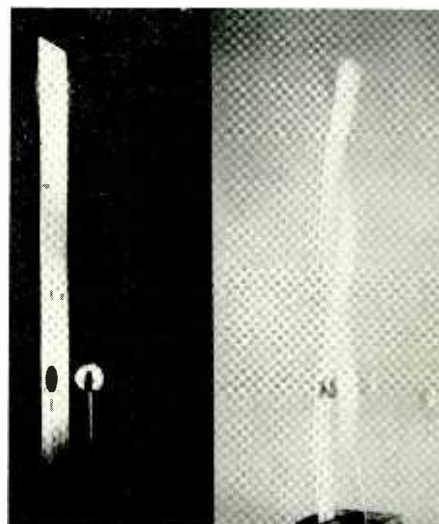


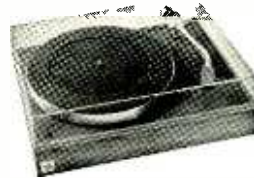
Fig. 1. “The Blade” by Len Lye, a motor operated, movable sculpture shown in two of its positions. Movement is remotely controlled by a magnet tape programming device.



*HiFi/Stereo Review has published test reports on 9 turntables.<sup>†</sup>*

*The AR had the lowest rumble, wow, and flutter.*

† as of July, 1964



TURNTABLE	RUMBLE*	WOW	FLUTTER
<b>AR</b> (Mar. '63)	-38 db	.05%	.02%
<b>2</b> (Nov. '62)	-36 db	.05%	.11%
<b>3</b> (May '64)	-32 db	.07% (33⅓)	.03% (33⅓)
<b>4</b> (Dec. '62)	-30 db	.15%	.1%
<u>Changers</u>			
<b>5</b> (Dec. '61)	-35 db	.2%	.1%
<b>6</b> (Sep. '62)	-34 db	.1%	.1%
<b>7</b> (Jan. '64)	-32.5 db	.1%	.035%
<b>8</b> (Oct. '62)	-23 db	.13%	.13%
<b>9</b> (July '63)	-16.8 db	.08%	.04%

\*Combined vertical and lateral rumble below the NAB reference of 1.4 cm/sec at 100 cps. When the measurements were given in different form they were converted so that they could be compared directly. The NAB standard for broadcast turntables is -35db.

The HF/SR report on the AR turntable included this comment:

*... records played on the AR turntable had an unusually clean, clear quality. The complete freedom from acoustic feedback (which can muddy the sound long before audible oscillations occur) was responsible for this."*

Literature on AR speakers and the AR turntable, including a reprint of the complete HF/SR AR turntable report, will be sent on request.

**\$78<sup>00</sup>** complete with arm, oiled walnut base, and dust cover, but less cartridge, 33⅓ and 45 rpm

*5% higher in the West and Deep South*

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# EDITOR'S REVIEW

## THAT SHRINKING FEELING

**D**id you experience a shrinking feeling upon first viewing this issue of *AUDIO*, as if there was something different but you couldn't quite pinpoint it? Did it seem as if things were smaller, and yet not smaller?

Well, if you had that feeling, chalk one up for yourself. You were right! Last month *AUDIO* was *soooooo* big. Now it is *sooooo* big. Hard to see the difference, isn't it?

The overall page size of *AUDIO* is now the so-called "standard" magazine size. Last month, and for years and years before that, it was an in-between size; in between the "standard" and the large-size magazines (*Life*, *Look*, *McCall's*, and so on).

Now that we have changed to a "standard" size, we will be able to take advantage of printing equipment and techniques which were heretofore unavailable to us. We will be able to use color and other techniques much more freely throughout the magazine. We will be able to improve visual presentation for increased clarity. (In case anyone is wondering we do not use decoration, color, or what have you for their own sake; rather we use them to increase understanding of text. Of course if we end up with a more attractive presentation, so much the better.)

The amount of text or editorial material is not affected!

Surprisingly, in spite of the reduction in overall page size, there is no reduction of text page size. For those who haven't figured it out yet we'll let you in on the secret—we reduced the borders. Now you can begin to understand why this issue of *AUDIO* seemed smaller, and yet not smaller, at the same time.

Frankly we feel rather pleased; we have gained several worthwhile advantages without sacrificing editorial content, or spending extra money. Sort of like having your cake and eating it too. The only question that comes to mind is, "Why didn't we do it before?"

Returning to our opening question, be reassured, that shrinking feeling is temporary. On the other hand, the improvements in *AUDIO* will be permanent.



Now, just how many watts would you like!

## A PAPER TIGER

**T**he cartoon presented on this page pokes fun at one of the strange practices in the component high fidelity field; a home grown version of the horsepower race indigenous to the automotive industry.

As the cartoon suggests, it is quite true that amplifiers can be, and are, rated in several different ways insofar as power capability is concerned. It is also true that the power number arrived at can vary rather drastically depending upon the power rating technique. Thus it is possible to arrive at a 20-watt rating using one system and an 80-watt rating using another system. We are talking about the same amplifier, mind you.

The crux of the problem is that there is no definite standard for manufacturers to adhere to; that is, there is no standard which is definite enough to gain the respect of manufacturers, or to prevent misuse.

Taking advantage of this undisciplined area, some amplifier manufacturers produce "high-powered" amplifiers which prove to be "paper tigers" in practice. Not that they are necessarily poor amplifiers, but they are less powerful than their ratings would lead one to believe.

We don't wish to repeat previous discussions as to the need for amplifier power, but it is fair to say that there are times when relatively high powers are desirable. Even more important, whether or not high-powered amplifiers are necessary, the consumer who purchases what he believes to be a high-wattage amplifier is entitled to get it. Deliberately inflated "paper" ratings discredit both the manufacturer and the dealer who uses it as a sales feature.

We would be willing to wager that were one to survey dealers and manufacturers a very precise knowledge of how to rate amplifiers, meaningfully, would be revealed. Further, we would bet that a heartfelt collective sigh of relief would be heard if a definitive rating standard were adopted.

Strangely enough, we can understand the reason for inaugurating a power struggle with paper tigers. Consider how difficult a task it would be to convince an uninformed consumer that one amplifier is better than another. One would have to be an engineer or advanced amateur to comprehend the many significant but rather subtle parameters which define a good amplifier. Obviously it is easier, and perhaps more sensible, to concentrate on a few characteristics and imply that they are an index of quality.

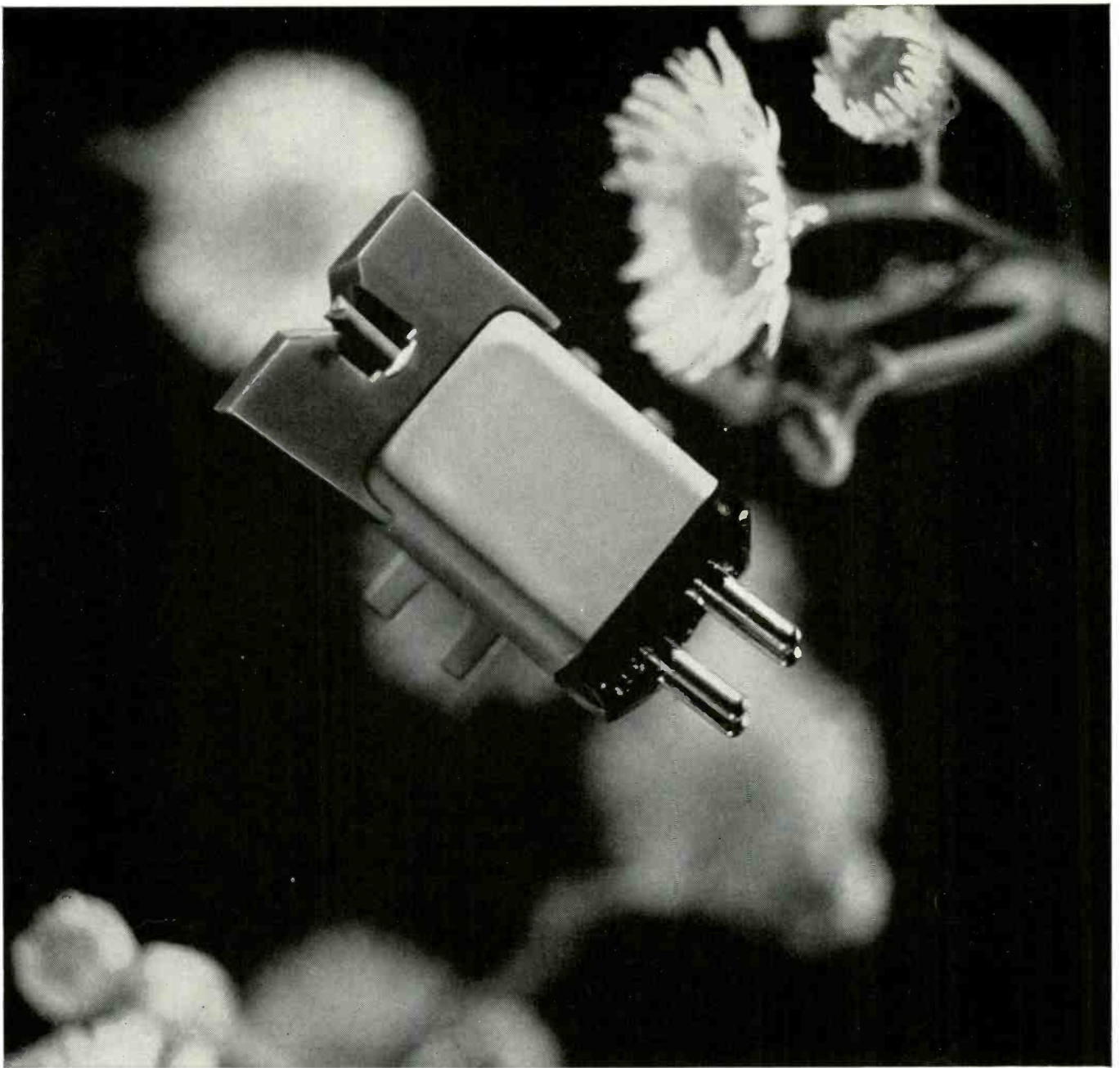
But wouldn't it be easier for everyone, and less confusing, if a single, valid method of reporting these characteristics were adopted? A method which would be used by all manufacturers? A method which would provide a common denominator?

We think so.

The proper way to resolve these questions is to have appropriate industry representatives meet and agree on the parameters. We will present our thoughts to them, and so will others.

We will do our part to cage this paper tiger. How can you help?





(V-15 AME-1 ELLIPTICAL STYLUS)

## NATURAL SOUND BEGINS WITH PICKERING

Whether you own a record changer, automatic turntable, or a professional type manual turntable Pickering has engineered the RIGHT V-15 pickup for you. Each of these applications requires a cartridge with specific characteristics and specifications to produce the maximum in NATURAL SOUND that is possible from the record playing equipment and other components in your system. If it's RECORD CHANGER application, where high output and heavier tracking forces are required try the **V-15 AC-1**. Most of you, no doubt are tracking lighter on the late model AUTOMATIC TURNTABLES and will use the **V-15 AT-1**. Or if a professional type MANUAL TURNTABLE is your choice you'll need the even more compliant **V-15 AM-1**. And if it's unexcelled tracking ability you're seeking, you will demand the ELLIPTICAL STYLUS PICKUP **V-15 AME-1**. All of these pickups are radically different from any other cartridge. You can see the difference. You can hear the difference. Pick up a V-15. Note its light weight—only 5 grams. Perfect for low mass tone arm systems. Now, see how Pickering's exclusive "Floating Stylus" and patented replaceable V-Guard assembly protects your record and diamond as it plays.

FOR THOSE WHO CAN **HEAR** THE DIFFERENCE

PICKERING & CO., INC. PLAINVIEW, N.Y.

# Pickering

THE WORLD'S LARGEST AND MOST EXPERIENCED MANUFACTURER OF MAGNETIC PICKUPS  
AUDIO • JANUARY, 1965

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# Should Sherwood's new solid-state amplifier be rated at 150 watts?...300 watts?...or 100 watts?

Audio power *should* be one of your major criteria of amplifier performance. The important thing is to use the same yardstick of comparison.

Among responsible component manufacturers, the commonly-accepted expression of audio power today is "MUSIC POWER"—the amplifier's output capability across the full spectrum of orchestral sound.

If you simply like to play with bigger numbers, multiply MUSIC POWER by two (the way some manufacturers do) and you get "PEAK POWER". It's exactly the same rating but it *looks* twice as powerful.

But the really important measurement is "CONTINUOUS SINE-WAVE POWER" with both channels operating simultaneously. This is the *meaningful* measurement, used in laboratory work. It separates the wheat from the chaff.

*Sherwood's new S-9000 delivers 150 watts of MUSIC POWER... 300 watts of PEAK POWER... and 100 watts of CONTINUOUS SINE-WAVE POWER at less than 1/2% harmonic distortion. (At normal levels, distortion never exceeds 0.15%).*

Unequalled power—by *any* standard—is just one of the important engineering advances built into the new Sherwood solid-state amplifiers. Here are some more:

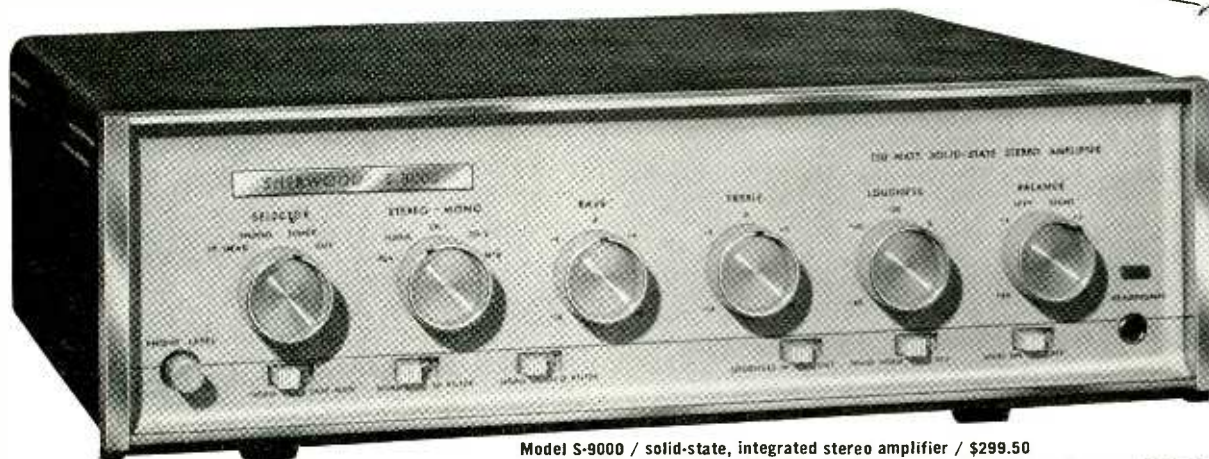
*Military-type Silicon Transistors.* Used exclusively throughout Sherwood circuitry. Twice the heat-reliability of ordinary germanium transistors. Safe for even the most confined custom installations.

*Exclusive transistor short-circuit protection.* (Pat. Pend.) New system virtually eliminates transistor failure or fuse replacement due to shorted speaker terminals or other improper operation.

*Additional features:* Phono input noise less than -65db., with no microphonics or hum / Professional Baxandall tone controls / Tape monitoring and tape-head playback facilities / Stereo headphone jack with speaker disabling switch / Glass epoxy circuit boards / Compact size—14" x 4" x 12 1/2" deep.



Wait till you hear Sherwood's new Tanglewood 4-way speaker system! Each six-speaker system handles 75 watts of program material. Unique design of dual, 10" uniflex woofers achieves unprecedented 34-cycle closed-box resonance. Overall response: 29-17,500 cps  $\pm$  2 1/2 db. \$219.50



Model S-9000 / solid-state, integrated stereo amplifier / \$299.50

Also available in a 50 watt Music Power version as the Model S-9500 / \$179.50

Walnut-grained leatherette cases for either model, \$8.50 Prices slightly higher in Far West

For complete specifications and new catalog, write Dept. A-1

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# Matrixing Amplifier for 2-Channel Stereo Signals

WAYNE B. DENNY\*

An amplifier for altering the stereo spread of 2-channel tapes recorded at amateur performances.

IN THESE DAYS OF superior commercial audio equipment one is less justified in spending the time and effort required to fabricate his own gear. However, situations do arise when the serious audio-fan must devise a particular unit to perform special functions for which commercial products are not immediately available. Such was the case when the writer required a device which could alter the "stereo spread" of two-track tapes made in performance by amateur musical groups. This problem is not so urgent for the recording of professionals by professionals using expensive multi-channel equipment, where retakes are possible and where no consideration need be given to how the performance "looks" to the live audience. Amateur musicians, especially students, cannot afford the time for repeated recording sessions. Moreover, they usually reach a psychological peak when the stimulus of a live audience is present. Under such circumstances the recordist will do the best he can and the results are often good but sometimes mediocre or even poor. When the results are unsatisfactory there is rarely a chance to repeat.

\* Physics Department,  
Grinnell College,  
Grinnell, Iowa.

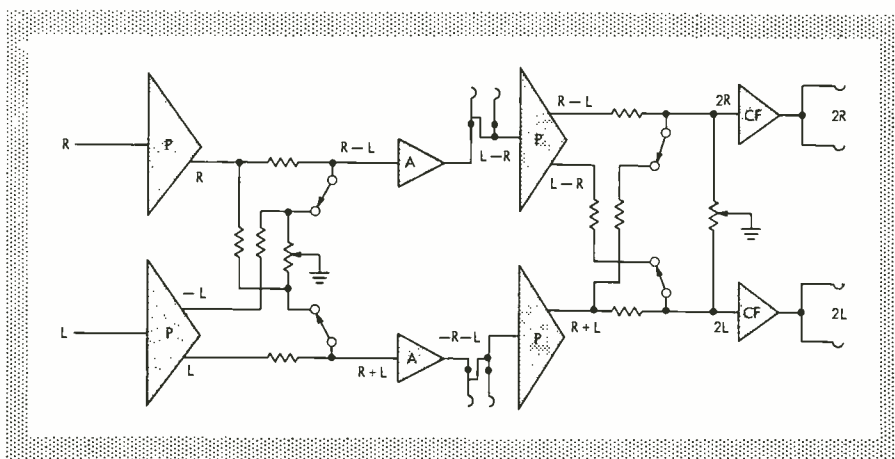


Fig. 1. Functional diagram of matrixing circuit. Circuit elements are explained in text.

The device to be described is certainly no cure-all for poor techniques. It will not substitute for experience in miking, positioning, and level control best gotten in rehearsal. Only experience will determine when peak levels during performance will exceed those in rehearsal and by how much. These must be anticipated. And why is it that in performance amateur soloists so often take a position differing from the one used in rehearsal? Such are the vagaries which the amateur recordist must confront. The device to be described can be used to improve some recordings but mistakes once made cannot be corrected by this or any gadget.

Depending somewhat on how the original recording was miked the stereo-spread of a two-channel disc or tape can often be altered *within limits*. Some commercial playback units contain "dimension controls" which permit some adjustment of the apparent *stereo-stage*. Electronic devices for accomplishing this generally function by feeding a portion of the right-hand signal into the left speaker and a portion of the left-hand signal into the right speaker. The relative magnitude of these "portions" and the manner in which the portions are combined with the original signals will affect the apparent angular spread of the stereophonic program as heard by a listener located not too far from optimum listening position.

It is not proposed to provide a rigorous proof that the stereo-spread can be altered in this way but observed results can be explained without much difficulty. A few simple hypothetical experiments will suffice. Consider first the fact (easily demonstrated) that equal signals in two identical and symmetrically positioned speakers produce sounds whose apparent source lies midway between the two speakers. But if stereophonic program material is available we can feed the right-hand signal, *R*, into the right speaker and the left-hand signal, *L*, into the left speaker. The result, of course, is normal stereophonic reproduction. Next, suppose that *L* is added to *R*

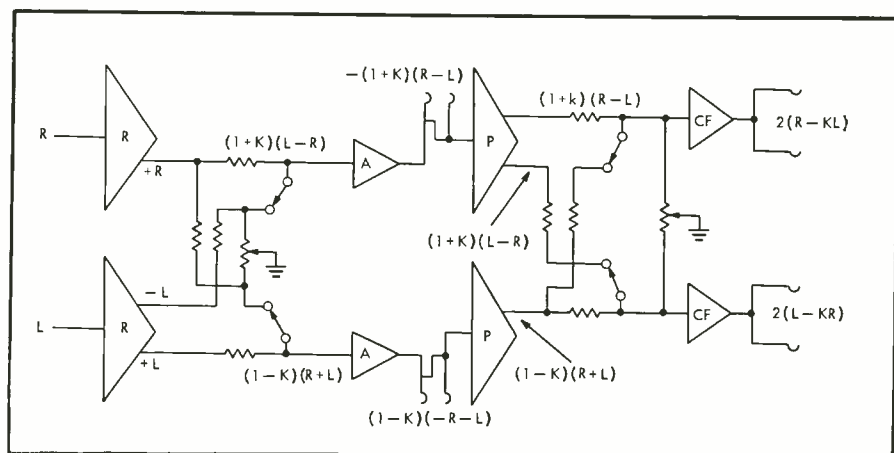


Fig. 2. Signals in matrixing circuit when:  $\frac{\text{gain of difference signal}}{\text{gain of sum signal}} = \frac{(1-k)}{(1+k)}$ .

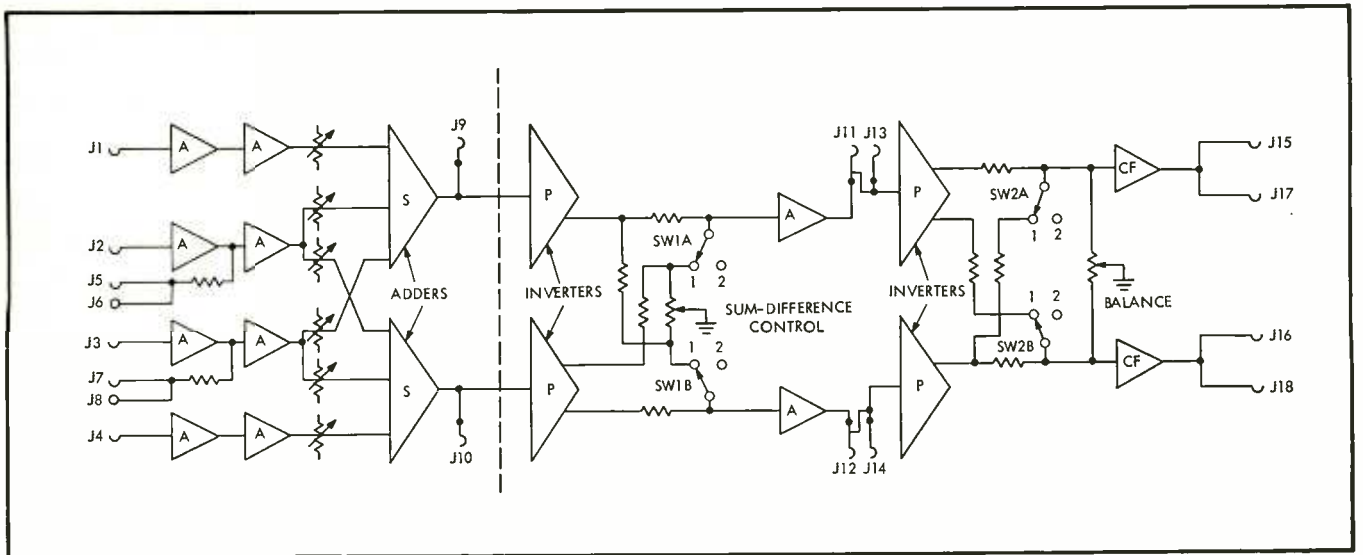


Fig. 3. Functional diagram of the entire unit.

in the right speaker and  $R$  is added to  $L$  in the left speaker. The total signals in both speakers are now identical: each speaker responds to  $(R+L)$ , the sum of  $R$  and  $L$ . The acoustic result is a rather drastic narrowing of the apparent sound stage such that the source appears to be midway between the two speakers. The apparent spread has vanished and the result is monophonic reproduction.

Of course we can change the conditions by reducing the amount of inter-channel cross-feed. For example, let the signal in the right speaker be  $R$  plus one-half

$L$  and the signal in the left speaker be  $L$  plus one-half  $R$ . We would expect to find something intermediate between the normal stereophonic and monophonic reproduction. This is generally observed to be the case.

Let us repeat our hypothetical experiment except that this time we reverse the phase of the portion of the left-hand signal fed into the right speaker and similarly reverse the phase of the portion of the right hand signal fed into the left speaker. The composite signal in the right speaker is now  $(R-kL)$  and the

composite signal in the left speaker is  $(L-kR)$ . Since this is the opposite of what was done in the previous experiment we might expect that instead of a reduction of stereo-spread we should experience an apparent increase in the size of the sound stage. Depending somewhat on the manner in which the original  $R$  and  $L$  signals were obtained this prediction is generally verified by experiment. But there are limits. Suppose that the quantity,  $k$ , is unity and positive. Then the signal in the right speaker is  $(R-L)$  and the signal in the left speaker

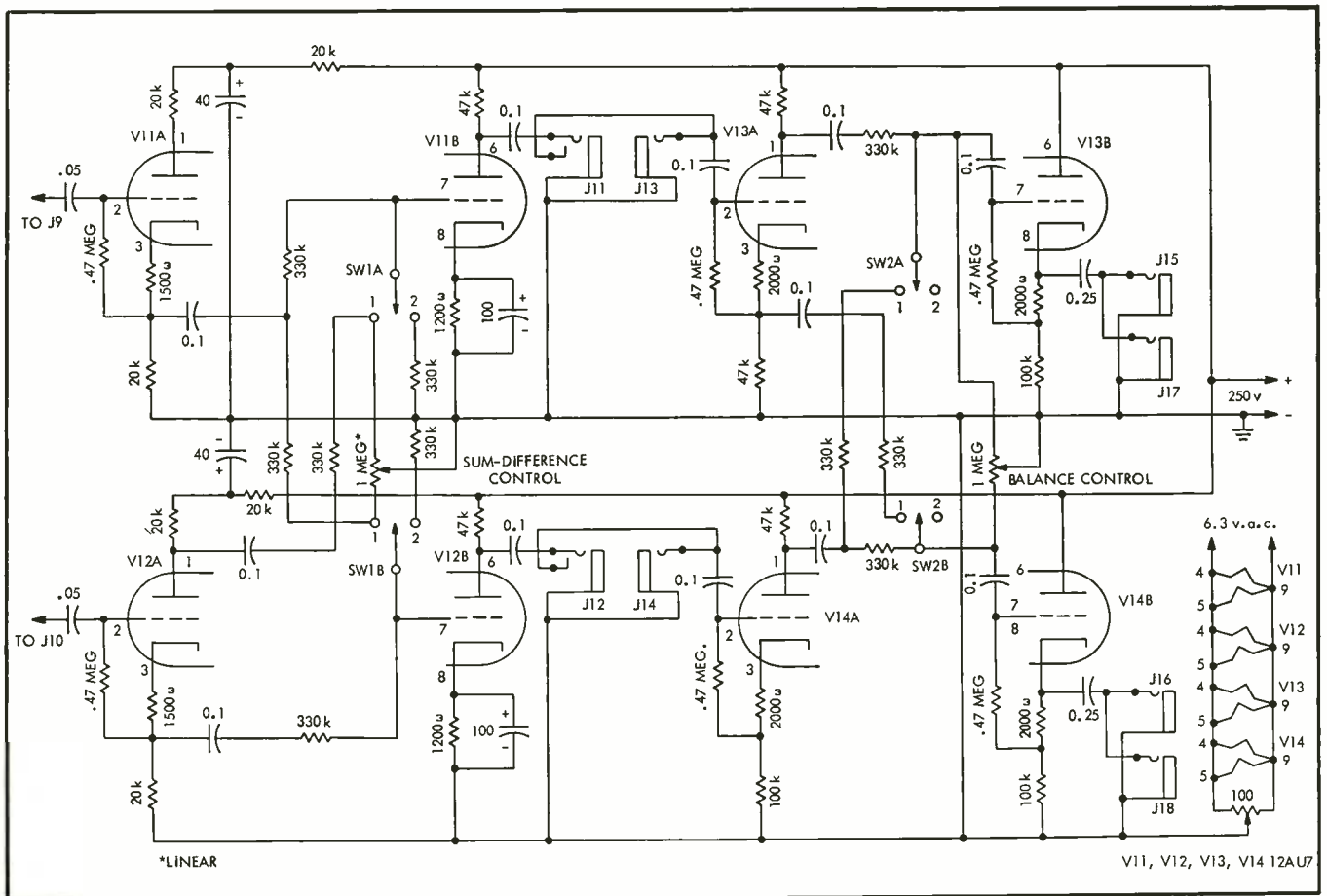


Fig. 4. Schematic of matrixing circuit.



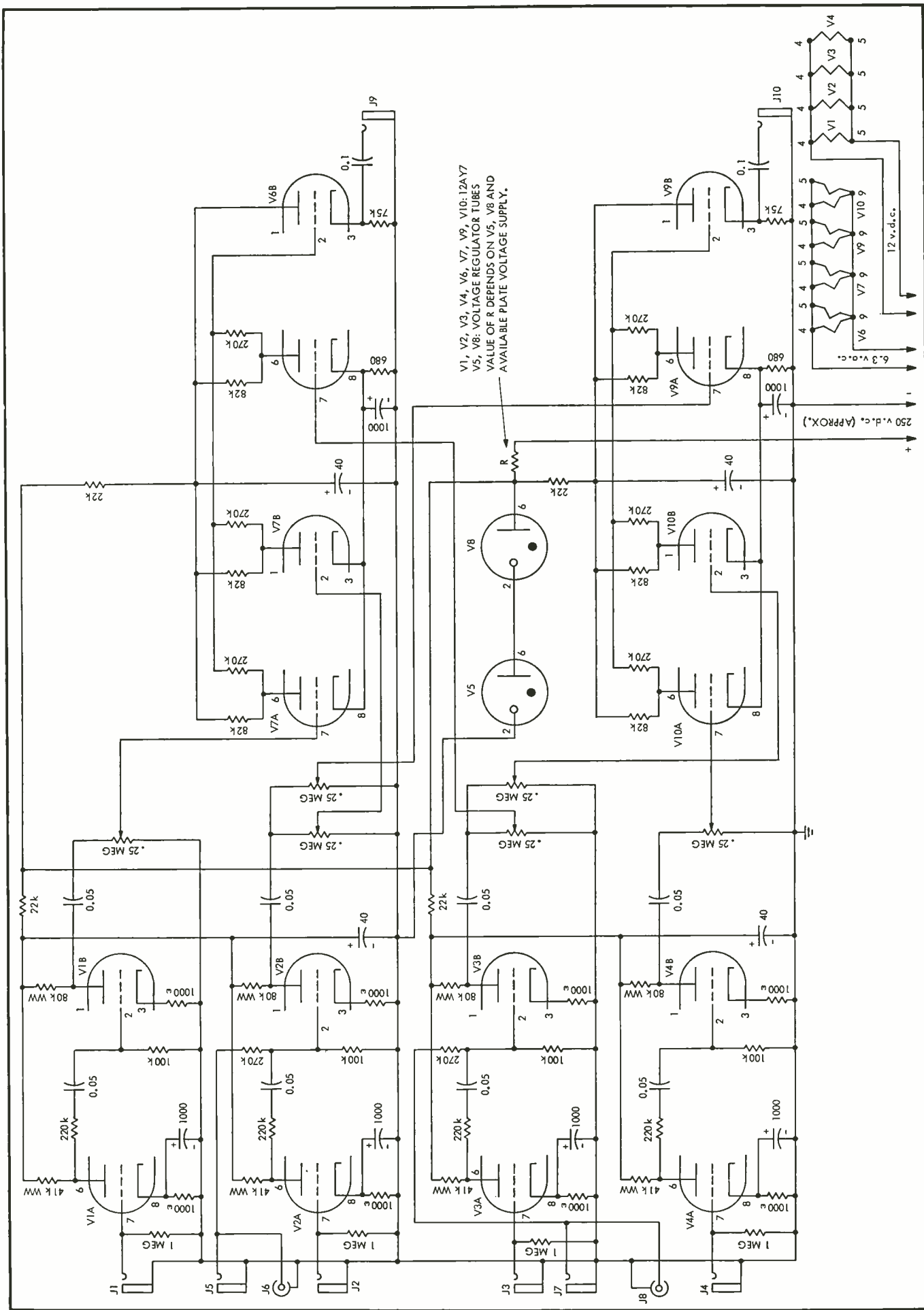


Fig. 5. Schematic diagram of mixer circuit.

is  $(L - R)$ . These signals are identical except for sign: the signal in one speaker is exactly out of phase with the signal in the other. Listening shows that this condition is unlike anything normally experienced: it is generally unpleasant. We may expect, then, a limit to the magnitude of  $k$  for effective increase in angular spread. It will be shown later that there are further limitations in some cases.

The writer required a device which would permit rather complete control of the amount of cross-feed. In addition it was desired to include a few other features which might be useful in the making of duplicate tapes from original masters. Actually, there are several ways of cross-feeding signals from one channel to another. The circuit to be described is not the simplest but it appears to be about the most versatile. The term *matrixing* is used to denote the particular process employed in this device.

The two signals of a two-channel stereophonic program are said to be *matrixed* when they are combined first by addition and then by subtraction. When the two signals,  $R$  and  $L$ , are matrixed they are first added to form  $R$ -plus- $L$  and then subtracted to form  $R$ -minus- $L$  (or  $L$ -minus- $R$ : either is suitable). The matrixed signals  $(R + L)$  and  $(R - L)$  can be *rematrixed* in a similar manner:  $(R + L) + (R - L) = 2R$  and  $(R + L) - (R - L) = 2L$  whereupon the two original signals are obtained once again. (Actually, each signal is doubled. This has no particular significance: any incidental amplification or attenuation can be disregarded provided they are the same in both channels.) The functional diagram for a circuit to accomplish this matrixing and rematrixing is shown in *Fig. 1*. In this diagram the letter  $P$  signifies a split-load phase-inverter,  $A$  represents a single-stage amplifier, and  $CF$  is a cathode follower. The signals will be as shown at various points in the diagram provided the two potentiometers are set at electrical mid-position.

Suppose now that in *Fig. 1* the setting of the left potentiometer is altered in such a way that the ratio of the gains of the two matrixed signals is as follows:

$$\frac{\text{gain of difference signal}}{\text{gain of sum signal}} = \frac{(1+k)}{(1-k)}$$

The signals at various points in the circuit will now be as shown in *Fig. 2*. Notice that the output signals are now  $2(R - kL)$  and  $2(L - kR)$ . Now if  $k$  is a positive number between 0 and 1 these signals are the same composite signals which would result when a portion of  $L$  is *subtracted* from  $R$  and the same portion of  $R$  is subtracted from  $L$  as discussed earlier. On the other hand, if  $k$  lies between 0 and *minus* 1 the compo-

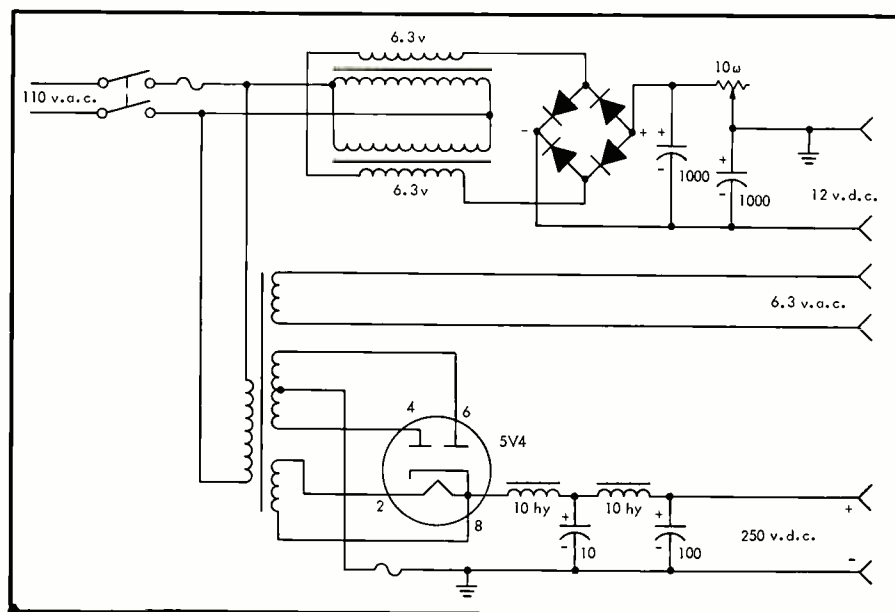


Fig. 6. Schematic of power supply.

ments are *added*. Apparently, if  $k$  lies between 0 and plus 1 the stereo-spread is increased: between 0 and minus 1 it is decreased. Normal stereophonic reproduction (*i. e.*, spread unchanged by *matrixing*) occurs when the potentiometer is set at mid-position. If the potentiometer is set for  $k = \text{minus } 1$  the magnitude of the difference signal  $(R - L)$  is zero, the output signals are identical in magnitude and phase, and monophonic reproduction is the result. The composition of the two output signals for various values of  $k$  can be seen in Table I.

A four-input mixer was added to the matrixing circuit to form the completed unit. A complete functional diagram is shown in *Fig. 3* where the term *adder* is used to emphasize that the input signals are mixed *in phase*. Two-stage low-noise preamplifiers are employed. Six potentiometers are used so as to permit placing of two input signals on either or both  $R$  and  $L$  channels at the same time. This feature is useful in "centering" solo voices or instruments where desired. (The same result could be obtained by using a four-channel mixer-recorder for the original master tapes. However, we are amateurs, not professionals!)

The actual circuit employs vacuum tubes rather than solid-state devices because work was started before the writer had much experience with transistors. The matrixing circuit is shown in *Fig. 4*, the mixer in *Fig. 5*, and the power supply in *Fig. 6*. Standard audio practices are used throughout and the power supply is mounted on a separate chassis. There results a very stable and quiet unit. Low-noise resistors are used in plate and cathode circuits in the low-level stages. "Type AB" potentiometers are recommended.

Switches have been provided to defeat the matrixing and rematrixing functions to permit "straight through" operation.

Moreover, by defeating only the rematrixing function the sum and difference signals can be recorded directly on tape for later study and observation. Also, jacks are provided in both channels to permit insertion of filters and to facilitate visual monitoring of the sum and difference signals using electronic volt meters or a single X-Y oscilloscope (*i. e.*, an oscilloscope with identical horizontal and vertical amplifiers.)

Klipsch<sup>1</sup> and others have pointed out the advantages of using a center speaker for eliminating the "hole-in-the-middle" experienced with wide-angle stereophonic reproduction. The signal fed to this speaker is (usually)  $M(L + R)$  where  $M$  is some positive number, generally less than unity if the center and flanking speakers have similar efficiencies. But Tappan<sup>2</sup> has pointed out that the addition of this *sum* signal is in some respects equivalent to increasing the over-all *monophonic* content with a reduction of stereo-spread. He suggests that this reduction can be offset by a deliberate increase in the difference signal. Obviously, the device described here can accomplish this nicely, restoring part of the perspective lost by the addition of the center speaker. However, there are limits.

In many miking situations there are certain instruments, performers, and voices which are picked up by both microphones in a two-microphone set-up. When the distance from these two microphones to the source are approximately equal the two microphone signals are nearly equal in magnitude and, at low frequencies, nearly in phase. Any attempt to increase the *difference* signals in a matrixing circuit will, under these circumstances, reduce the low-frequency response over all. This is easily demonstrated. This suggests that low-frequency

(Continued on page 51)



# Temporary Sound Amplification Systems

DAVID L. KLEPPER

Temporary systems can be well engineered, even though the time allowed for design and installation is limited. Here are two systems, one indoors and the other outdoors which demonstrate the point.

## In Two Parts—Part One

### The Boston Common System

The Boston Common sound system presented many of the problems one might expect when asked to install a temporary system in an outdoor area on short notice. There was little time for detailed engineering; the "go ahead" for the system design was given, only a few days before the single expected use, a Sunday afternoon outdoor service for the Billy Graham Crusade.

The most important considerations in the design and installation of the Common system were: 1. High speech intelligibility for the very large crowds expected (50,000–75,000 people), crowds which might be scattered anywhere over a wide area around the speaking position; and 2. recognition that there would be little or no time for trial runs for fine adjustments.

The location chosen was the Common's Parkman Bandstand. A small extension platform was constructed on one side of this bandstand, and the front of this extension served as the pulpit.

Although the author believes that point source speech reinforcement systems have a wide area of application, single-source systems of any type run into difficulties outdoors because of wind turbulence

problems. Spread-source or multiple loudspeaker outdoor sound amplification systems have the advantage that when turbulence decreases high-frequency signals from one loudspeaker to the listener, it is likely that he will receive strong high-frequency signals from another loudspeaker.

To the author, the "hopping of a signal between left-hand and right-hand loudspeaker" noticeable with "split" monophonic sound system installations has always been unpleasant; but the fading of high-frequency signals noticed when central systems are used to project sound energy considerable distances outdoors is far more unpleasant.

A brief analysis indicated that minimum power would be needed and the system vastly simplified if the low-frequency cut-off of the system were set at 300 cps. This avoided the use of large low-frequency horn loudspeakers, permitted the multicellular-horn high-frequency loudspeakers to be used at maximum efficiency, without the padding required to match their response to the less efficient low-frequency loudspeakers and reduced the amount of required power amplification. The same equipment rack used in the Garden sound system, with four 160-

watt amplifiers, was also used for the outdoor system.

The loudspeaker equipment used for the Common system can be divided into three general categories:

1. Four loudspeaker clusters provided coverage at the sides and behind the bandstand. Each of these loudspeaker clusters consisted of two  $2 \times 4$ -cell multicellular horns, with the lower horn receiving a signal 6-db less than the upper horn. These clusters were mounted 60-deg. apart around the roof of the bandstand, with the vertical axis of each upper horn approximately 15-deg. below horizontal. (See Fig. 3.) All these loudspeaker clusters were connected to one 160-watt power amplifier.

2. Two line-source loudspeakers were placed on each side of the front of the podium to cover the area immediately in front of the podium. (See Fig. 4.) Each of these line sources employed five 8-in. 755C cone-type loudspeakers with level-tapering of the outer loudspeaker.<sup>1</sup> The power amplifier driving these two line-source loudspeakers was fed via a time-delay tape loop, and the time delay was set for 25 milliseconds, the minimum possible. Here, the time delay was employed to insure that directional realism would be maintained for listeners in front of the podium, despite the use of a "split" sound reinforcement system, with loudspeakers on each side of the podium. In other words, delay permitted precedence effect to be employed.<sup>2, 3</sup> The distance

(Continued on page 44)

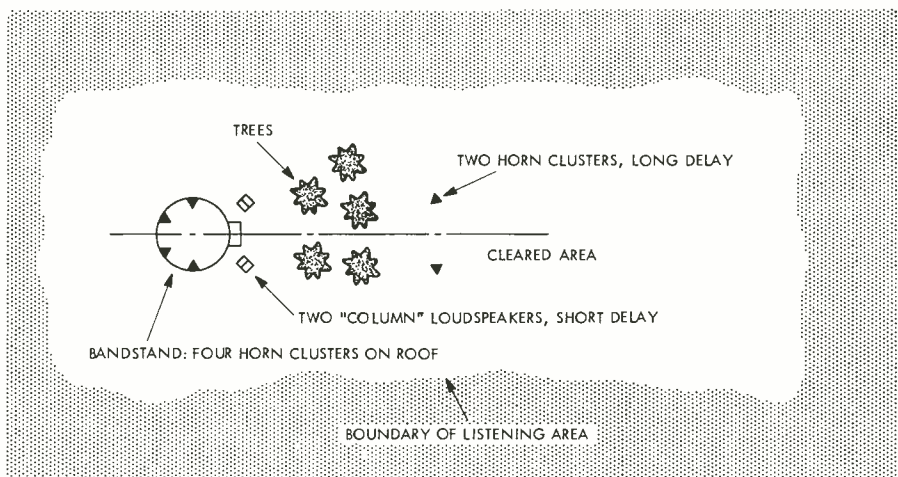


Fig. 1. Boston Common system.

<sup>1</sup> Each line-source loudspeaker was identical in design to the line-source loudspeakers used in Harvard's Memorial Church. See D. Klepper, "Room Acoustics and Sound System Design" *IRE PGA*, May-June 1960, pp. 77-86.

<sup>2</sup> H. Wallach, E. B. Newman, and M. R. Rosensweig, "The Precedence effect in Sound Localization," *Amer. J. Psychol.*, vol. 62, pp. 315-336, 1949.

<sup>3</sup> S. S. Stevens and E. B. Newman, "The Localization of Actual Sources of Sound," *Amer. J. Psychol.*, vol. 48, pp. 297-306, 1936.

# Shaping Electronic Organ Tone Envelopes

D. WOLKOV

Percussion, vibrato, tremolo, reverberation, and other techniques for shaping tone envelopes

**I**F YOU WOULD LISTEN to the organ tones as they leave the formant filters, you would find them musical. With a switchboard for selecting notes and filters, one could play a melody. But something would be lacking. The omission would be in the rise and decay envelope of the sound. In what we have pictured, the sound wave would begin and end abruptly; a square wave envelope.

In musical instruments the note begins with zero intensity, reaches a maximum rather abruptly, and then decays gradually. It is the "attack" of the note that provides the character.

The electronic organ too, must have means for providing characteristic envelopes. Because it is possible to provide a multiplicity of attacks in the one instrument, the organ is frequently called "The King of Instruments."

## Declicking

Before discussing the techniques and circuitry that are used to obtain desired attacks, it is necessary to look at means for removing or obliterating a most undesirable attack, the keying transient which is heard as a click.

Keying a continuously running sinusoidal oscillator with a conventional switch generates a transient. Several schemes have been designed to provide noiseless keying. One is to use a sawtooth oscillator rather than a square or sinusoidal wave form. In a method used by Schober the transient is superimposed on the ramp or decay, and thus is never heard.

The sawtooth has a very fast flyback, almost perfectly vertical. When the sawtooth tone is keyed at some point in the

rise, the vertical rise added by the keying is just like the vertical part of the sawtooth. Thus the transient is not heard.

Another effective technique employed by Baldwin, utilizes multiple leaf switches in which a resistive element is momentarily keyed into the circuit. Baldwin believes that there are distinct advantages for using such electro-mechanical switching elements: A. Undesirable keying transients are eliminated. B. The sharpness of attack or release is under the organist's control. C. Tone waves are combined with a minimum source interaction.

The Allen organ employs an interesting alternative to the electro-mechanical declicking. Since the oscillators are not free-running, keying actually keys the oscillator. The emf rise of the oscillator is exponential. Such keying is very effective because the transistor oscillator places only 12 to 18 volts across the switch contacts.

## Stops

In a high-quality formant organ there is a one-to-one correspondence between the filters and the stops. If there is a compromise because of cost, there will be circuit elements shared between the filters. While the individual stops will have proper tonal variations, the pulling of two or more of such stops simultaneously would preclude the proper additive effects.

Partly for cost reasons, and partly for musical reasons, different sets of stops are provided for the different manuals. Through a technique called coupling, it is possible to switch the stops between the two manuals.

In order to avoid crosstalk and undesirable feedback, couplers are usually triode mixers rather than resistors or switches. The procedure is similar to microphone mixing and is straightforward.

One of the striking musical effects that can be accomplished by an organist is the changing of the voicing in the midst of the musical composition. In very large organs, as contrasted to home organs, it is possible to set up a combination of stops, so that a gang of stops can be pulled at once, or be cancelled at once. Such a technique is of great convenience to the organist when playing complicated rapid music. These interlocking stops are called pistons.

The pistons affect both manuals and

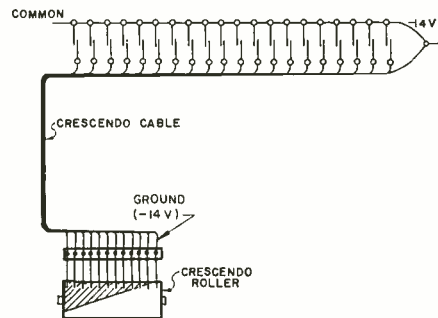


Fig. 2. Crescendo schematic.

the pedal division, assuring rapid tonal changes without interruption of the music. The present registrations provide soft to full-organ combinations, plus interesting solos, for a wide variety of applications.

Another technique for the sequential bringing in of stops is the crescendo pedal. Such a pedal in kit form is available from Artisan. With a bit of ingenuity and, of necessity, a considerable amount of knowledge about the circuits of the particular organ, it is possible to install the crescendo pedal in almost any electronic organ.

A typical crescendo pedal has a series of pins mounted in a helical manner to a supporting cylinder. Each pin corresponds to a stop. As the pedal is depressed, the cylinder rotates and engages the pins sequentially. These in turn close the circuits and provide the equivalent of a sequential pulling of stops. When the pedal is fully engaged, all of the stops have been pulled to full organ. A photograph of an Artisan crescendo pedal is shown in Fig. 1, with the schematic in Fig. 2.

## Percussion<sup>1</sup>

Another adjunct to the musical attributes of organ sound is "Percussion." The techniques of obtaining percussion vary. It is well to recall that the electronic organ is a keyboard instrument and the playing of the instrument is intimately related to keyboard techniques. Every pianist knows that *legato* playing is a skill mastered only after much practice. If the new note comes in before the old note has decayed, there is a blurring of the sound; if the new

<sup>1</sup> J. M. Hanert, "Electrical Musical Instrument with Percussion Apparatus," Patent 2,951,412, September 6, 1960.

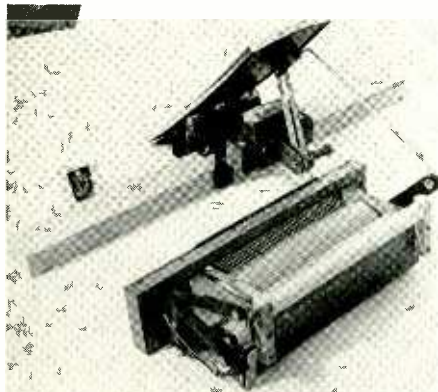


Fig. 1. Artisan kit crescendo roller and pedal.



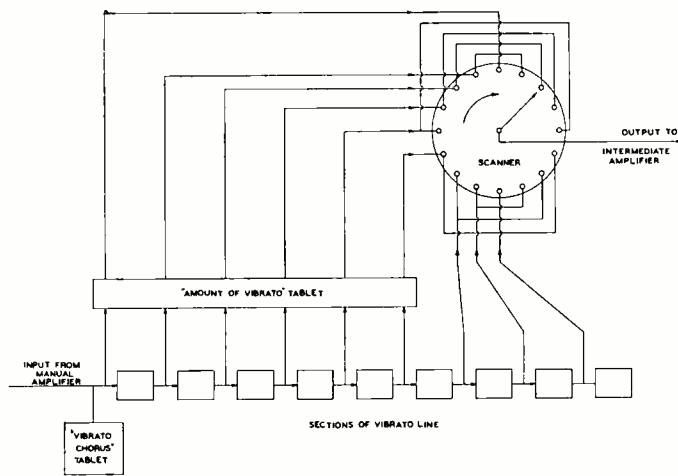


Fig. 3. Fundamental diagram of vibrato system.

note is delayed the music will sound disconnected.

In the organ, electronic decay circuits, as well as integrating circuits can be introduced which will provide the proper *legato* connection of notes. This operator variable control is called "percussion" in the organ. The beautiful celeste tones, the picturesque Hawaiian Guitar, the classical *legato*, and *pizzicato* are all accomplished in the percussion circuits.

The Schober organ percussion kit is an integrated unit mounted on a printed circuit board. Excellent circuit information is supplied so that one reasonably skilled in electronics could install it in almost any commercial organ.

The Schober percussion includes voicings for Hawaiian Guitar, Guitar, Piano, Vibraphone, Celesta and Harpsichord.

In this kit the percussion effect is achieved by sending a pulse through a neon lamp to a capacitor. When sufficient voltage is present, and the percussion control is on, the neon lamp conducts and charges the capacitor rapidly. The capacitor is discharged through a resistor, which is varied to change the decay rate.

There are other circuit methods for achieving percussion, but the Schober method is the simplest.

### Tremolo and Vibrato<sup>2,3</sup>

Two techniques for undulating the organ sound are frequently confused; they are tremolo and vibrato. We can agree with Richard Dorf<sup>4</sup>, who defines vibrato as a slowly changing phase relationship.

Vibrato in the electronic organ is analogous to the vibrations introduced by the violinist through the rhythmic rocking of the left hand. The violinist thus is undulating the string at sub-sonic frequencies.

The Hammond M-3 Organ vibrato equipment, Fig. 3, varies the frequency of all tones (excepting the pedal and

percussion tones) by continuously shifting their phase. The Hammond includes a phase shift network (delay line) composed of a number of low-pass filter sections. It also includes a capacitance pickup which is motor driven and permits uniform scanning back and forth along the delay line.

A shift in phase is equivalent to an instantaneous change in frequency, the continuous change in phase becomes a continuously varying frequency. Since the scanner sweeps from the start to the end of the line and then back, it alternately raises and lowers the output frequency. The average frequency being the same as the input frequency.

Ordinarily the frequency shift would depend on the phase shift in the delay line and on the scanning rate. However in the Hammond unit the scanner, Fig. 4, is driven at 412 rpm by the synchronous driving motor of the organ. The scanner is a multi-pole variable capacitor with 16 sets of stationary plates and a rotor whose plates mesh with the stationary ones. Signals coming from the vibrato line appear on the stationary plates and are picked up, one at a time, by the rotor.

The amount of vibrato is controlled by the selector switch which causes the entire delay line to be scanned for normal vibrato and only one fourth of the line for small vibrato.

A vibrato chorus effect is accomplished by taking only part of the outgoing signal from the vibrato line and the rest from a resistor in series with the line. As the vibrato effect is applied

to the part of the signal appearing across the line but not to the part appearing across the resistor, the combination produces a chorus effect.

The Schober vibrato consists of a dynamic phase-shift circuit. This causes all signals passing through it to be shifted as in frequency modulation. The circuit is shown in Fig. 5.

I prefer to define tremolo as amplitude or z-axis modulation. An effective tremolo is obtained by Leslie and Allen through mechanical manipulation of the sound-wave front, after the sound has left the sound reproducer.

A tremolo system which is completely electronic is used by Conn as shown in Fig. 6. Tremolo in the Conn Minuet is of two types: 1. Grid bias; and 2. acoustic.

The tone generator bias network is connected to 75 volts B+. This places a positive bias on the tone generator grid bias network at all times.

The tremolo generator feeds a signal to the grid circuits of the tone generators. The tremolo generator is a self-starting, push-pull oscillator that generates a frequency of 5.7 to 7.2 cps.

The secondary of a transformer tuned by capacitors is connected to the bias network. With the tremolo generator operating, the bias to the grids of the tone generator is modulated by the a.c. from the tremolo generator. This causes the signal level and fundamental frequency of the tone generator to vary at tremolo speed. The amount of tremolo voltage applied to the various notes is determined by the point of connection to the bias network.

In Fig. 6, the 5¼ in. speakers are electrodynamic. The driving signal for the tremolo modulator is taken from the tremolo generator. From this point it is coupled to the tremolo modulator on the power amplifier chassis. The tremolo modulator amplifies the a.c. from the tremolo generator and applies the a.c. to the fields of the 5¼ in. speakers.

With these coils so excited, the speaker phase will reverse every half cycle. During one-half cycle of the tremolo generator, the sound from the tremolo speakers is in phase with the main speakers, adding to the output. During the next half cycle, the tremolo speakers and the main speakers are out of phase causing cancellation of some of the sound. This adding and cancelling produces tremolo.

Another envelope modifying device is

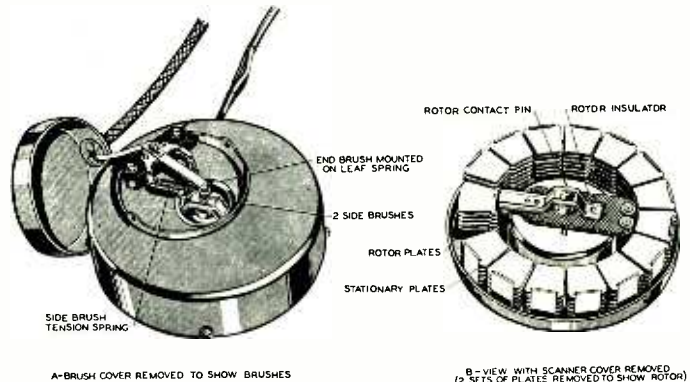


Fig. 4. Vibrato scanner.

<sup>2</sup> R. P. Mork, "Coupler System in Electric Musical Instruments," Patent 2,557,133, June 19, 1951.

<sup>3</sup> J. F. Jordan, "Vibrato System," Patent 2,545,469, March 20, 1951.

<sup>4</sup> R. H. Dorf, "Electronic Musical Instruments," Patent 2,835,814.

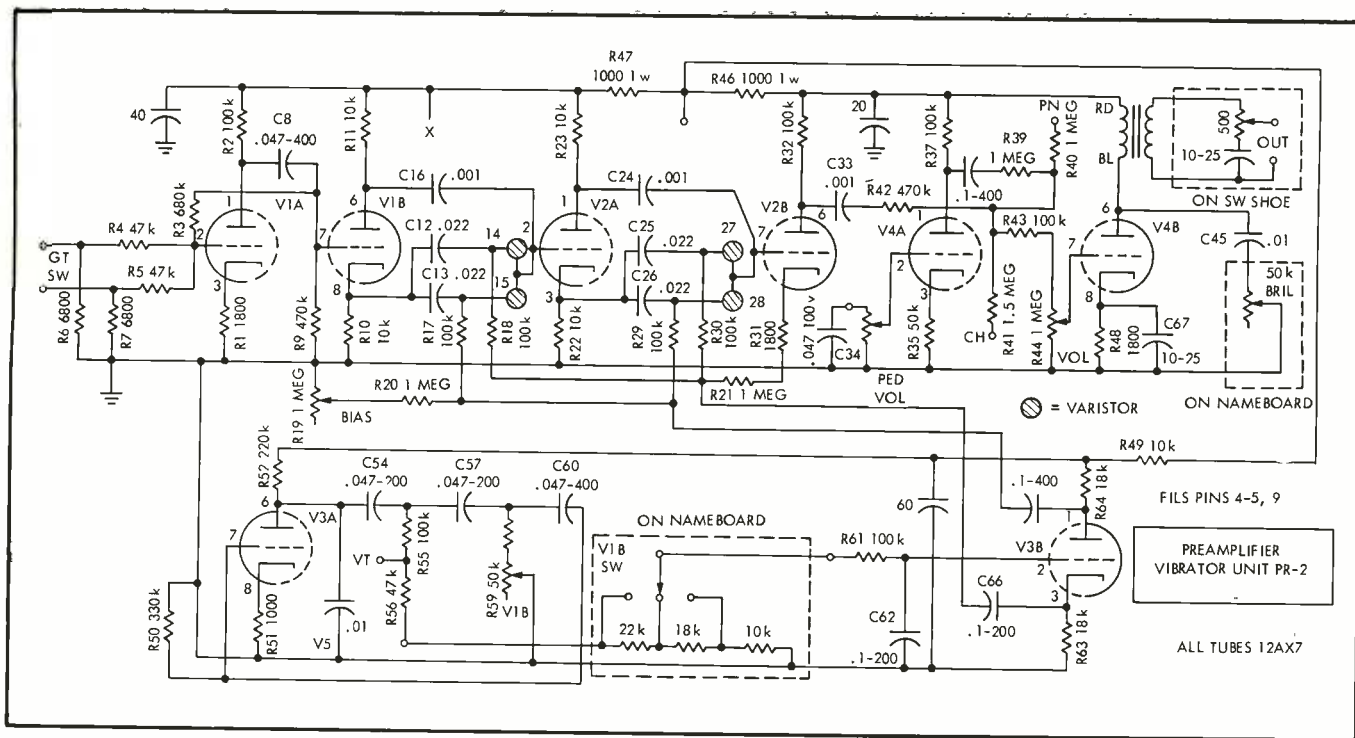


Fig. 5. Schematic of Schober vibrato.

the Hammond Reverb Unit.<sup>5</sup> Hammond has licensed other organ manufacturers, including Baldwin to use this device. It has also become a popular hi-fi adjunct, marketed by Fisher as the Space-expander<sup>6</sup>, Fig. 7.

A reverb unit is a useful accessory for an electronic organ. The electro-acoustical delay line simulates for the average listening room the acoustics of an auditorium.

Readers who have a 25 watt or larger amplifier and a large speaker system will find that the Fisher unit can be connected in a manner which provides reverb for their audio system as well as for the electronic organ.

The audio signal, after it leaves all of the various tone shaping units we

<sup>5</sup> J. M. Hanert, "Apparatus for Translating Electrical Musical Tone Signals into Sound," Patent 2,967,447, January 10, 1961.

<sup>6</sup> F. L. Mergner, "Artificial Reverberation," AUDIO, April 1961, p. 28.

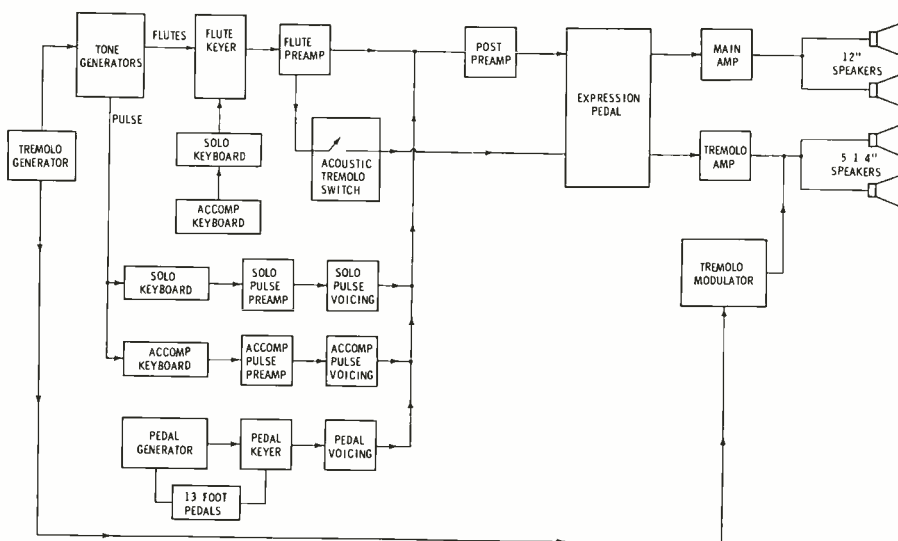


Fig. 6. Block diagram of Conn tremolo.

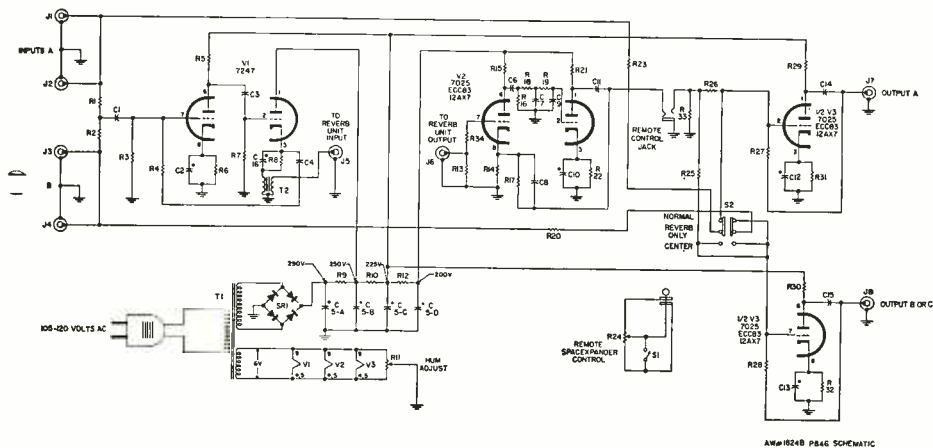


Fig. 7. Schematic diagram Fisher Model K-10 dynamic Space-expander.

have been talking about, is fed into the preamplifier of the organ. It is of the same level as the output of your FM tuner. It may be considered as another program source to be fed to the audio preamplifier, the power amplifier, and finally to the speaker system.

In general, amplifiers in electronic organs are not quite hi fi since they are designed to roll off rapidly after 10 kc. However good electronic organs have internal amplifiers with excellent low-frequency response and intermodulation distortion is kept to very low levels.

With this we complete our discussions of tone generation, tone keying, tone coloring, and tone envelope modification techniques.

TO BE CONTINUED



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We trust this brief recitation of the significant features covering the various members of the Shure cartridge family will help guide you to the best choice for you.

## THE CARTRIDGE



V-15



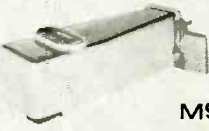
M55E



M44



M7/N21D



M99



M3D

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# A Basic Course in Commercial Sound

NORMAN H. CROWHURST

## Chapter X

This installment will tie off some loose ends left over from the earlier installments. We'll take three kinds of typical problem that may be presented to the aspiring sound man and see how to tackle them.

### School Music Programs

Few High School bands need sound reinforcement to enable them to be heard in the average High School auditorium. School orchestral groups may need a little amplification, particularly for some of the softer voiced instruments. But a valuable feature the soundman may be called upon to provide is recording of their efforts, both for self-examination and for pleasurable listening (when the efforts are good enough!).

If you want monophonic recording, you'll need more than one good mike, and if you want stereo, you'll need more than two good mikes. Professional stereo recordings, using the best recording studios available, are seldom made with the minimum number of mikes (one for mono, two for stereo). The only way to achieve the superb quality that gives the impression of realism, is to have complete control of the whole sound, between the microphones at the individual instruments and the recording going on tape.

One thing not to do (that we have seen done—that's why we mention it): if the school has a PA system, don't just put a mike in front of a PA loudspeaker, un-

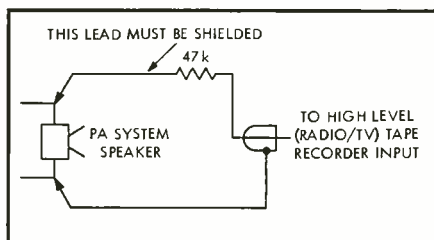


Fig. 1. Method of connecting tape recorder to loudspeaker in a small system.

less you want to record the poorest sound you've ever heard! If you want to utilize the PA system at all, connect to it electrically. At least that will be better than putting a mike in front of a loudspeaker. *Figure 1* shows one way to do that, if there is no better way to do it. But always make a trial recording to make sure that you get the level right and that the hum level is adequately low.

Whether or not you use the PA system, you will find it advantageous to make use of more mikes than are usually used merely for PA or sound reinforcement purposes. You can either add the extra mikes to the PA system with appropriate controls, and then tap into the system for recording or you can keep your recording system

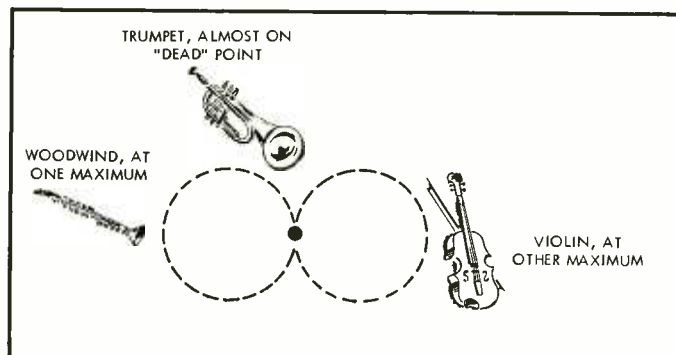
quite separate from any PA that may be used. The latter method will usually give the best results, because any PA system tends to exaggerate reverberation, and your objective is to minimize it.

It's true that professional recordings often use reverberation to add realism, but this is invariably well controlled. Most likely, for your purpose, you'll do best with as little reverberation as you can get.

This calls for close placement of the mikes, particularly to weak-voiced instruments. Where the number of mikes has to be limited, we have found the ribbon type very useful. This type has a smooth response, and can often double as two mikes in effect, by using both back and front pickup areas. Also, having dead spots, stronger instruments (such as brass) can be controlled by placement relative to the same mike used for weaker instruments (*Fig. 2*).

The way usually regarded as ideal is to have plenty of mikes on hand, and set levels electrically so each instrument contributes what it should to the

Fig. 2. Method of arranging instruments round a ribbon mike, to make the most of its particular pickup pattern.







# ALTEC ALL-TRANSISTOR PLAYBACK *Three Sixty* STEREO AMPLIFIER

The Only All-Transistor Stereo Amplifier Backed by  
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"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 *Three Sixty* reflects the experience Altec has achieved in making these amplifiers." *AUDIO Magazine, April, 1964*

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✓ Altec's wide experience in designing solid-state circuitry for audio frequencies has given us a lead over other companies. This experi-

ence made the *Three Sixty* possible. Over five years ago, we designed the first all-transistor amplifier (the 351A) for high quality applications. We also developed the first successful all-transistor repeater amplifiers for use by telephone companies. We also were the first to combine transistors with vacuum tubes in the famous 708A "Astro".

✓ All-transistor circuitry of the *Three Sixty* offers greatest possible durability because, unlike heat-generating vacuum tube amplifiers, it always runs cool. Hence, there's no deterioration of quality caused by heating and cooling of vital circuit components.

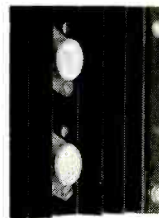
✓ The *Three Sixty* is a genuine Altec PLAYBACK Component. It is part of a line that has won acceptance by leading recording and broadcast studios. There's a world of difference between equipment designed for and used by professionals, and ordinary hi fi components made strictly for home use.

✓ You'll like the looks as well as the sound of the *Three Sixty*. And, its size is smallest of

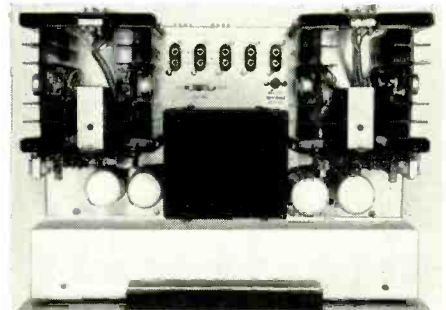
any integrated stereo amp/preamp on the market today. The *Three Sixty* is priced at \$389.00; matching cabinet \$11.00 extra.

In addition to those shown below, other studio-users of Altec PLAYBACK Equipment include: ABC, Universal Recordings, Columbia, Sam Goldwyn, Glen Glenn, United Walton, and just about every major concert hall, auditorium and theatre in the nation, including all Cinerama Theatres. At the New York World's Fair, some of the exhibitors who selected Altec equipment include I.B.M., Du Pont, Chrysler, Ford, General Electric, Heinz, Cinerama, Billy Graham, Texas Pavilion, Johnson's Wax, and many more.

Visit your nearest Altec Distributor (Yellow Pages) and hear the finest equipment in the world of sound: Altec PLAYBACK Equipment. Be sure to ask for your courtesy copy of Altec PLAYBACK and Speech Input Equipment for Recording and Broadcast Studios. Although prepared specifically for the recording/broadcasting industry, the conclusions to be drawn about your own home music center will be obvious. Or, for free copy, write DEPT. A-1.



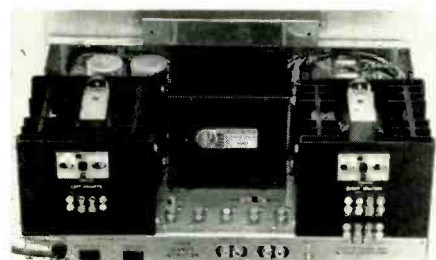
Four extra-heavy heat sinks in Altec *Three Sixty* make possible continuous operation with virtually no rise in temperature. Internal-external heat is kept well below industry standards to guarantee lifetime trouble-free, service-free operation. Two power output transistors (four per channel) on each heat sink.



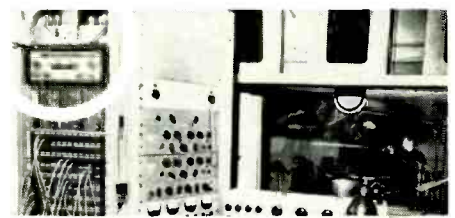
Top view of *Three Sixty*. All-transistor circuitry eliminates hum and hiss common with vacuum tube amplifiers. Features 3 automatic resetting circuit breakers—one in main power circuit, one in each speaker output circuit.



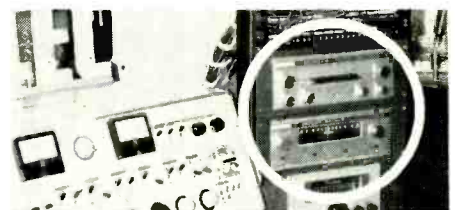
Modular preamplifiers are completely shielded from output and power circuits to assure long life, minimum maintenance. Another Altec exclusive!



Plug-in facilities provide independent voltage output to drive separate remote power or booster amplifiers (Altec all-transistor 351B) for patio, poolside, recreation room, other remote areas. Impedance selector switch eliminates confusion about multiple speaker terminals.



The *Three Sixty* is used by Dave Sarsar's and Skitch Henderson's famous "Studio 3" in New York.



Perfect partners! Rack-mounted Altec *Three Sixty* works with Altec 314A FM Multiplex Tuner at Sim-O-Rama Recording Studio, N.J.



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



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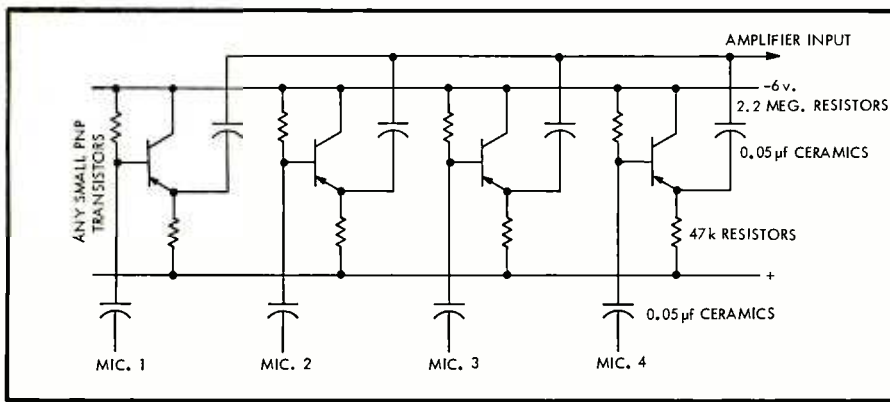


Fig. 3. A transistor mixing circuit that can be used with ceramic mikes, with shorting to inactivate mikes not in use.

total sound. This calls for extensive setup procedure and try-outs. Using fewer ribbon mikes will save on cost and electrical setup, but a little more care is needed in instrument placement, to get just the right balance.

### Masonic and Fraternal Meeting Halls

These vary in acoustic properties very considerably. With good acoustics, sound reinforcement is probably unnecessary. With poor acoustics (halls of this type seem to be either good or bad, never in between!) sound reinforcement may be needed to enable the program to be heard by all present, especially where participants may have weak voices. The program that emanates entirely from a central speaker's rostrum presents a problem that is quite conventional, but sometimes special coverage is needed from various stations around the hall. This means having mike pickup available from a number of points located the same area that has to be served by sound from loudspeakers.

A good way to do this is to switch on microphones at the time needed. Whenever a mike is switched on, the speaker or speakers nearest to it should be switched off. If mike switching is controlled at the mikes, this can be done with relays. Low-level sound distribution, requiring a relatively large number of speaker units, will be needed, so each loudspeaker delivers sound

to a small segment of the audience.

The relay that energizes each individual microphone must also disconnect whatever loudspeakers will be likely to cause feedback to the same mike. From some aspects, the best mikes for this kind of service are ceramics, because of their high level output. But if switching them off opens the input circuit (as it must if they use a common input), the switching is likely to inject undesirable noises. For this reason it may be best to arrange the relays to alternatively open the speaker circuit or short the mike. The contacts required are either a two-pole break or a two-pole make.

With this arrangement, each mike requires a separate input stage, but this is no serious setback, as little gain is required with ceramic mikes. A transistor amplifier for ceramic mikes usually provides an emitter follower input stage as impedance changer. A number of such followers can feed the same low impedance type input (Fig. 3).

This is a very simple addition that can be made to an existing amplifier.

Placement of loudspeakers can give problems. If the ceiling is low, they can be mounted in the ceiling (Fig. 4). But a high ceiling will take the loudspeakers too far above the audience's heads, so that a high level of sound distribution will be needed, and the feedback problem may become impossible. In halls of this type, it may be well to consider integrating loudspeaker units, as well as mike mounting, with the furniture.

Furniture used to identify ceremonial stations can incorporate both speaker and microphone and, if desired, the mike control button, with plug and socket connections that can be disconnected and removed when the hall is used for other functions.

Considerable cost in relays can be saved by providing for a competent operator to control the mikes. There are arguments in favor of both methods. Whichever method is used, the control for the mikes should be spring-loaded (except for the master mike), or arranged in some way to prevent them being left on forgetfully. An assigned operator, cued to the program, can see that every mike is alive the moment it is wanted. The only problem may then occur if someone else, less experienced, takes over the operator's job and gets confused.

The alternative can be worse:

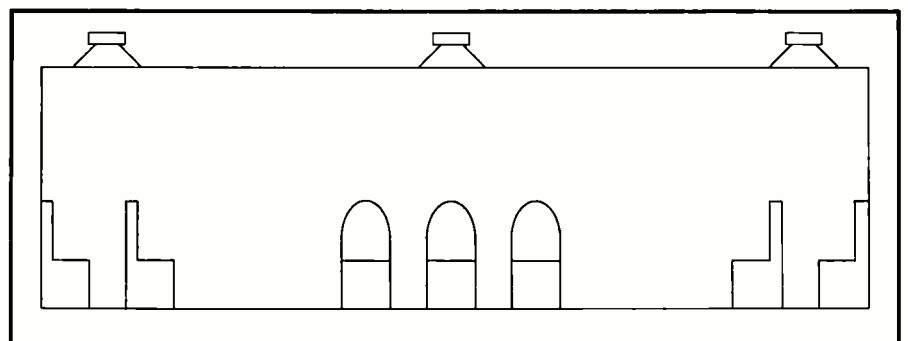
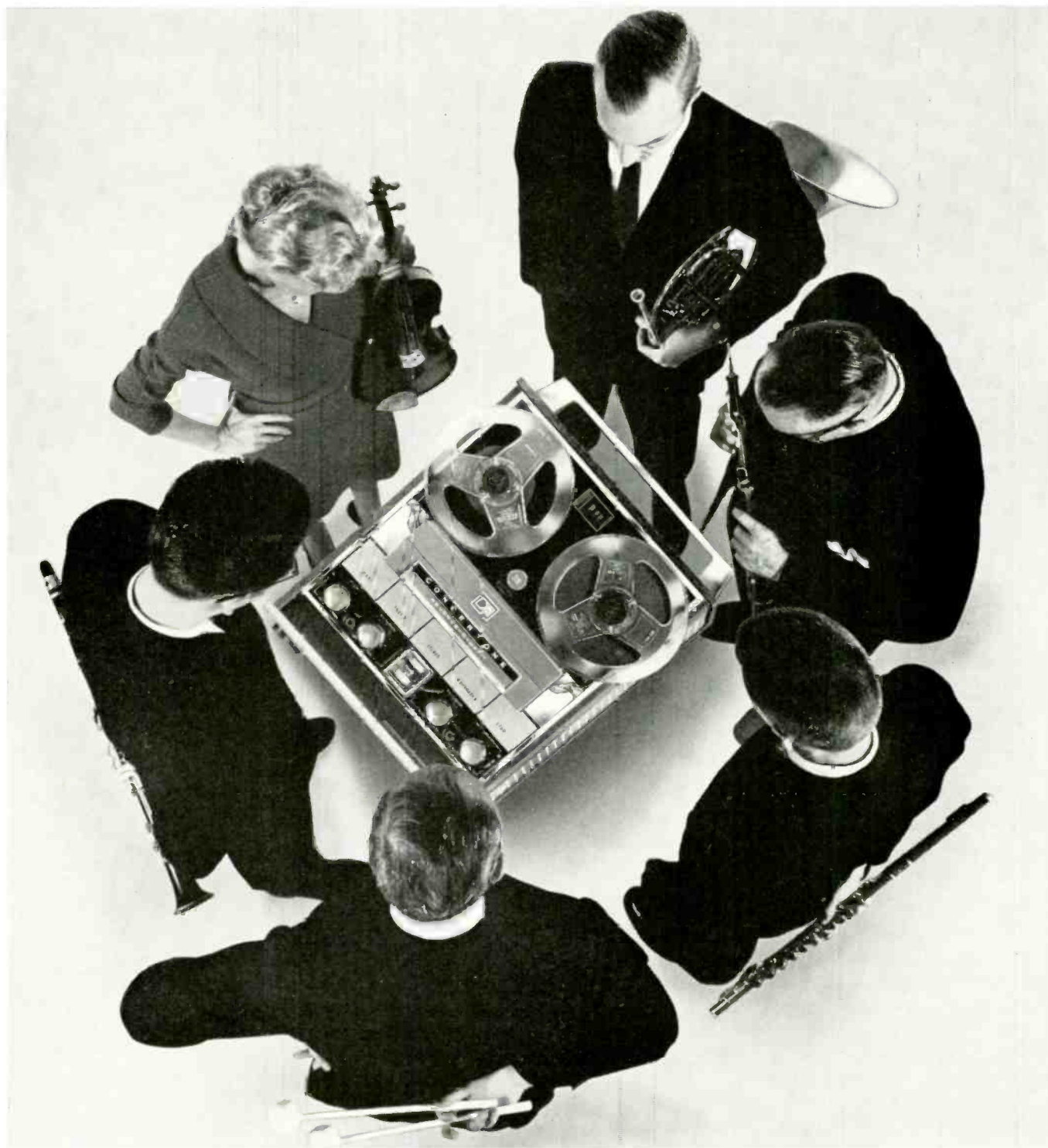


Fig. 4. A low hall with relatively poor acoustics can use speakers over each small group of the audience.





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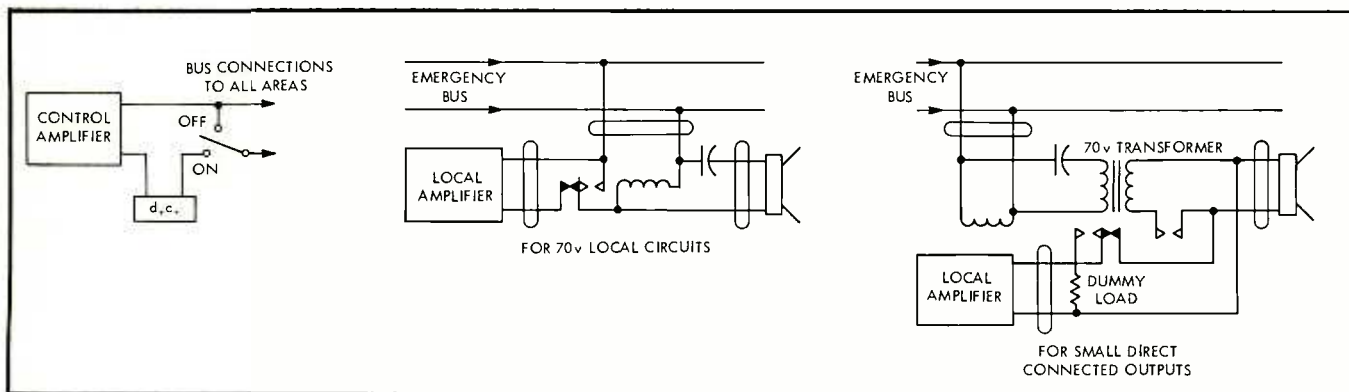


Fig. 5. An emergency annunciator system for fairgrounds, large convention buildings and similar applications, that enables a central announcement source to over-ride local programs.

people with weak voices are often that way through nervousness, so they may also forget to push the button that puts their mike on! Possibly a combined system that allows for operation either way would be a successful answer in some instances. This has to use relays with alternative control points. If the close-to-operate circuit is used, switches controlling the relays (central and local, at the mike) should be connected in parallel. If the open-to-operate circuit is used, switch contacts should be series connected.

### Emergency Annunciator Systems

In modern county fairs, exhibitions, conventions, and similar functions, there may be many small PA systems, phonograph players, and what-not, sounding forth in various parts of the complex area served. Booths or rooms will have their individual background sound, spieler mike, and speaker combinations, PA units, and so forth, which they may provide as entities separate from the main installation. It may not be practical for the main installation to provide a central service of this kind, because some users may have special requirements for which they already have special sound equipment and for which a 'regular' installation might not serve.

From time to time an emergency announcement may be needed, such as a call to find a

doctor present, in the event of a serious accident. Normally there are several places where local sound sources will prevent the usual installed annunciator system being heard. In such circumstances a relatively simple arrangement can be wired round the whole installation so that every sound system in the place can have its loudspeaker circuit connected to it (Fig. 5).

Whichever kind of impedance the local system uses, a box with three pairs of connectors is provided. One pair connects to the emergency 'bus', one to the local amplifier output and one to the speaker(s). By using polarized connectors for the emergency bus, suitable polarized electrolytic capacitors can be used in all the boxes. The central amplifier must supply liberal audio power to feed the maximum number of speaker systems that may be connected. Of course, management will want to make it a condition of using a booth or room in such a system, that no sound system may be used without its being connected to the emergency system.

The system allows each operator, booth or room, to have and use his own system, and when necessary, each will carry the emergency announcement when the over-ride relays go into operation. The power for the over-ride relays is conveyed by the same pair as the audio power for the speakers, and a 24 volt d.c. supply, with relays coiled to

match, is recommended. Distribution can be made at constant voltage (70-volt) line level, and the transformers in the boxes supplied to the users should provide for different impedance loudspeakers.

The matching transformer also provides line isolation, so that trouble is not encountered from interaction between inexpensive transformerless sets that connect directly to their speakers. For local systems that use 70 volt line to a larger number of speakers (such as an arena, for example, or a theater) a different form of box, that does not need the transformer, can be used.

Here we have discussed three typical kinds of problem. Others will come up, but these examples give some of the methods of attack necessary for practically any kind of problem.

### NOTE

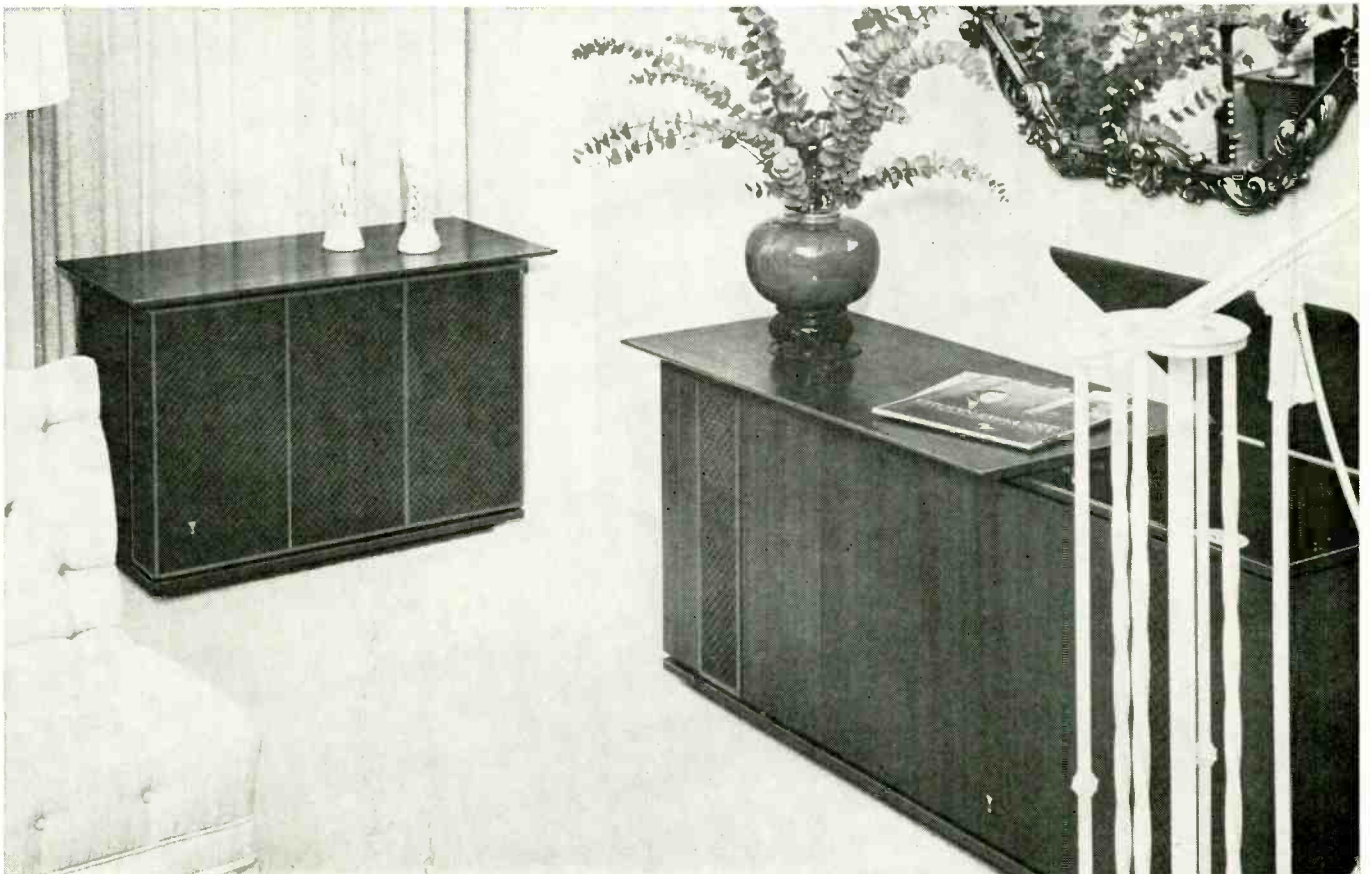
Many readers have expressed an interest in having the entire Crowhurst series in a handy form. In order to satisfy these audiofans we will make "A Basic Course in Commercial Sound" available as a booklet in the near future, hopefully in the next few months.



How will an Olympus Energizer/Transducer look in your home? Elegant, whatever your style. Accustomed as we are to viewing the Olympus in a contemporary setting, it is revealing to see here how comfortably it belongs among the rich and carefully selected traditional furnishings of an actual owner. This universal compatibility is the result of a manufacturing philosophy . . . a determination to handcraft components of such enduring excellence that they are destined to become heirlooms, passed on from one generation to another. The photograph shows only one Olympus of a matched pair powered by a JBL solid state stereophonic Energizer that is precisely matched to the characteristics of the transducers.

# JBLegant

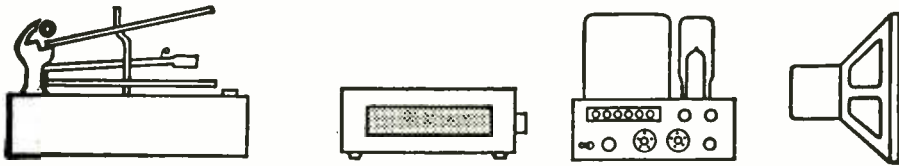
At the foot of the stairs we see the new JBL Delphi, an equipment cabinet styled to complement the Olympus, and in which this owner has installed a Graphic Controller, JBL's latest solid state component. There is a completely new JBL catalog which we will be happy to send at your request.



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# EQUIPMENT



# PROFILE

## PERPETUUM-EBNER MODEL PE-34 TURNTABLE

Fortunately for the equipment reviewer, there is never any dearth of new items which one can pore over, handle, mishandle, and pull to pieces. This month's subject is a four-speed turntable from Germany just now being introduced in the U.S. by Elpa Marketing Industries. This model mentioned briefly in the "Audio & Hi Fi in West Germany" section of the November issue, was not available here until recently, but purely on its merits it is a welcome newcomer. As one might say about any turntable, it is a revolutionary product.

The PE-34 Hi Fi is a compact unit, with the chassis measuring  $10\frac{7}{8} \times 13\frac{1}{8}$  in., but because of arm overhang requiring a space of  $11\frac{1}{2} \times 14$  in. for mounting. It requires a clearance above the motor board of 3 in. and below the top of the motorboard  $3\frac{7}{8}$  in. Its over-all weight is 11 pounds, which is mounted on three cylindrical coil springs damped with poly foam "cores." These cores add sufficient resistance to the mechanical resonant circuit comprised of the mass (inductance) of the unit and the compliance (capacitance) of the mounting springs so as to eliminate any tendency for continued vibration. The unit is not susceptible to floor jarring, and it will work well in a sliding drawer with as little as  $1\frac{1}{2}$  grams stylus force, which is adjustable over the range from 1 to 6 grams.



Fig. 1 Perpetuum Ebner 34 Hi Fi Turntable.

The arm is of the counterbalanced type and balancing is done with the stylus-force spring in the relaxed position. Once the arm is balanced, the desired stylus force is achieved by moving a sliding collar along the arm to the indicated figure—which is, by the way, accurate up to 4 grams, and only 1 gram off at an indicated 6-gram force.

The controls provided are as follows: speed selector, at the left front corner, for the four speeds provided; on-off switch, which also moves the idler away from the stepped intermediate drive, and located at the right front corner; vernier speed control, just to the left of the on-off switch; and the arm-lift and arm-locking lever, under the arm and just back of the pickup head.

This lever provides a number of functions: in the forward position, with the arm at rest, it serves to lock the arm firmly. Pushed back, it releases the arm, but raises it slightly so that the stylus is clear of the record surface. In this position the arm is free to turn, and small notches in the lifter signal the right position of the arm for setdown on 12-, 10-, or 7-in. records. Placed at the appropriate position, the arm is then lowered by pulling the lever forward. The arm then drops slowly, being retarded by a viscous friction device. When the record is finished, a trip actuated by the rotation of the platter actuates the lever to the raised position, lifting the arm slowly from the record and holding it there. The trip mechanism is reset each time the arm is moved to the rest position. The arm pivot is at an angle to the arm itself, a design which is now almost universal.

The platter, weighing  $3\frac{3}{4}$  pounds, is non-ferrous and turns on a steel shaft with two bearing areas, one at the top and one at the bottom. The shaft diameter is 0.405 in., and two bronze bearings are  $\frac{1}{2}$ -in. long. Thrust is carried on a single steel ball.

The motive power is furnished by a four-pole induction motor, which drives the intermediate stepped shaft through

a rubber belt to isolate motor vibration from the idler, which in turn transmits motion to an 8-in. inner rim on the die-cast platter, with the four speeds being provided by four steps on the intermediate wheel. The advantage of this method is seen when it is noted that the  $16\frac{2}{3}$  rpm drive step is over  $\frac{1}{4}$  in. in diameter, instead of the  $\frac{1}{16}$ -in. diameter shaft usually found when the stepped drive is mounted directly on the motor shaft. The motor itself, dynamically balanced (as is the platter), is mounted by means of two coil springs, also foam damped. Locking means are provided when it is desired to transport the unit—both for the motor and for the platter, to keep it off its thrust bearing. A ribbed rubber mat covers the platter, finished off by a stroboscope disc in its center, marked on one side for 60 cps and on the other for 50.

## Performance

Measured rumble for the PE-34 Hi Fi was 44 db below 1.4 cm/sec velocity at 100 cps (NAB method). Wow and flutter measured less than 0.15 per cent. Speed variation available from the vernier control, which actuates a movable magnet over an eddy-current disc, was from  $34\frac{1}{2}$  to  $31\frac{1}{2}$  rpm when set for  $33\frac{1}{3}$  rpm corresponding to a variation from +3 to -5 per cent.

To dispel once and for all the idea that induction motors show a large speed variation with voltage changes, let it be stated that with the vernier adjusted for  $33\frac{1}{3}$  rpm at a 117-volt supply, the unit ran only 5 per cent slow at 85 volts, and 0.6 per cent fast at 135 volts—neither being very serious, considering the magnitude of the voltage change. From 105 to 125 volts, the speed variation was less than 2 per cent.

This medium-priced turntable is neat and attractive with its pearl gray chassis, chromed platter, aluminum arm, black pickup head, counterweight and control knobs, and black rubber mat. The pickup cartridge mounts on a plastic slide which is readily removable from the head without tools. And its over-all performance complements its handsome appearance.

Circle 208

## JAMES B. LANSING SOLID STATE STEREO PREAMP, MODEL SG520

Controversy still rages among manufacturers about solid-state versus tubes, wide versus narrow band, and on and on. This new preamplifier from James B. Lansing sides with the solid-state, wide-band groups and in the process succeeds in introducing a few innovations and advances of its own.

One of the most obvious can be seen from its appearance. The front panel sports no control knobs at all. Instead,



tone, volume, and balance are accomplished by sliders. Input selection is by individually illuminated push buttons. Below these eight buttons are six more. These are the selectors for the mode of operation. A loudness switch completes the visible controls.

The lower part of this preamp (JBL calls it a Graphic Controller) is a drop-front door that conceals the secondary controls. And, here we find some of the differences that prove that a great deal of practical use thought went into this product. True there are the usual scratch and rumble filters, a tape monitor switch, fuse post, headphone jack and phono input level and amplifier output level screwdriver pots. But there is more. There is a phono jack labelled channel A microphone input. There are two more jacks that are stereo aux front inputs and still two more that are stereo recorder outputs take off before the volume and tone controls. Anyone who has portable equipment that plugs in and out of a stationary built-in, will appreciate this. Just to complete the thoughtfulness, JBL has arranged the tape monitor switch so that it is returned to the *out* position by the flap latch when it is closed.

The back of the preamp has the two sets of stereo phono inputs, microphone inputs, and for high level, aux and two stereo tuner sets. Note that the rear aux is separate from the front one and is selected by different front pushbuttons.

As the unit is received the two sets of phono inputs offer RIAA equalization. Phono 2 has an inside chassis slide switch, reachable with the bottom plate removed, that converts this input to NAB tape head. No other equalization choices are offered. Completing the rear panel are five switched and one unswitched ac outlets. There are also remote relay connections for use with the JBL speaker/amplifier units.

#### Test Results

This preamplifier delivers much of the promise that solid-state technology has held forth. Easily the most impressive specification is in total hum and noise, an area where transistors have been noticeably poorer than vacuum tubes in preamp applications. At full gain, with shorted inputs *in phono* there is only 0.3 mv of noise in the output. This translates to more than -80 db below a 2.5 volt output. In high level inputs there was a further reduction of at least 10 db.

These noise figures are not at the expense of sensitivity. At 1 kc the JBL will deliver 1.5 v with an input of 2 mv in phono or mike. 0.2 v into high level inputs will provide the same output.

With input pots set at the least sensi-

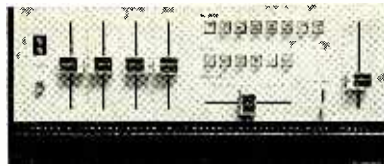


Fig. 2. The JBL Graphic Level Controller, Model SG520.

tive position, clipping overload in phono was at 110 mv, again at 1 kc. Wide open clipping level was 65 mv. This is quite satisfactory to handle overloads from a high output cartridge.

Phono equalization was almost in perfect adherence to the standard RIAA curve. The *greatest* deviation we were able to measure was less than 1 db from perfect over the 30 to 15 kc specified range. The extensions beyond to 20 and 20 kc appeared equally accurate.

Frequency response measured (unity gain in aux) +0 -2 db from 5 cycles to 64 kc. In the low level inputs this top end mark was reduced to 38 kc; in both cases though the rolloff was quite gradual.

Square waves were quite good. At 50 cycles there was only slight tilt, at 1 kc it was almost as crisp as the generator and at 10 kc one could see the high-end roll-off and the attendant reduction in rise time.

This preamp will deliver undistorted output to any normal requirement. Our sample would not begin to clip 1 kc output until 6 volts. And IM distortion measurements were in agreement. At any output from 0.5 to 1.5 v output, IM was 0.14 per cent in channel A and 0.12 per cent in channel B. At 3 v output it had only risen to 0.22 per cent in the poorer channel. Harmonic distortion at 1 kc at 4 volts output was 0.1 per cent.

Crosstalk at 15 kc was better than 70 db down with the opposite low level input shorted. With it open it was -34 db. Of course, a cartridge appears to be a short as far as the preamp is concerned, thus the -70 db figure is more nearly typical.

Bass boost and cut was completely adequate. 14.5 db of boost and 15 db of cut at 100 cps was provided. At 10 kc there was 10.5 db of boost and 11 db of cut. The rumble switch was quite effective for sub-audible rumble but less so for higher frequencies. At 100 cps there was only 1 db of cut; this reduced to -4.5 db at 50 cycles and -10.5 db at 20 cycles. The treble (scratch) cut provided an interesting effect. With reference to 1 kc it *raised* the level at 5 kc by 1.5 db. By 8 kc it was taking hold and was down 1.5 db. At 10 kc it was well down, -6 db. The listening effect of this slight boost before cut was that record hiss was not removed, rather it was

slightly accented. Noisier records and FM hash were, however, reduced.

#### Listening Tests

As the preceding specifications indicate, the listening quality of this pre-amplifier was only limited by the quality of the program content. The slider controls, no doubt partly responsible for the exceptionally low noise figures were smooth, precise and quiet. Our sample did have a noisy spot in the lowest part of the volume control (which tracked throughout its range within one db) but it was lower than the control would ever be operated.

The combination of low noise and high sensitivity allowed the use of low-output cartridges without the need of step-up transformers. With such cartridges full dynamic range and sound quality was realized. There aren't many preamps which will handle low-level outputs as well. For high output cartridges the effect was equally exciting.

The inescapable conclusion is that the JBL Graphic Controller is a magnificent instrument.

Circle 209

### HEATHKIT TRANSISTORIZED AM/FM TUNER, MODEL AJ-43

High-quality tuners suitable for home music systems are increasingly expensive, particularly when they combine AM and FM facilities. In this transitional period between tube and transistor equipment, most purchasers of new equipment—either factory-built or in kit form—lean toward solid-state units, particularly for amplifiers. It has really only been during the last year that comparable transistorized tuners have appeared on the market, and there are still relatively few of them.

The Heathkit AJ-43 satisfies all of these criteria—it is both AM and FM-Stereo, it is fully transistorized, and still is not prohibitively expensive. Furthermore, it fulfills the desire of the experimentally inclined kit-builder enthusiast who prefers to build his own equipment, yet insists on good performance, attractive appearance, and assurance that his completed product will perform to his satisfaction.

While it is true that AM is not now as much in demand as FM, there are some areas where AM is the principal source of radio programs, and the additional cost of the AM section is not an appreciable amount, particularly in a kit.

#### Circuit Description

The AJ-43 is built up from four separate units—the FM "front end," the FM

High Fidelity Magazine  
on New Acoustech  
Solid State Kit:

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PERFORMANCE..."



"... 'state of the art' ...  
one of the truly  
'perfectionist' units..."

Here are further comments from the November, 1964 report on the new Acoustech IV solid state stereo control center kit (reprinted with permission):

"... harmonic distortion was literally too low to be measured ... IM at the 2-volt level was a mere 0.05% ... These figures are among the best ever obtained ... Frequency response was literally a flat line over the audible range ... the 50 cps and 10 kc (square waves) were virtually replicas of the input test signals ... superior, professional grade construction ... listening quality ... 'wide open,' clean, utterly transparent and noise free. The Acoustech IV, in a word, does credit to its designers ... and should serve admirably in the finest of music-reproducing systems."

For the complete report plus detailed specifications of the Acoustech IV (\$149) and its companion power amplifier kit, the Acoustech III (\$199), mail coupon below.

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CIRCLE 120

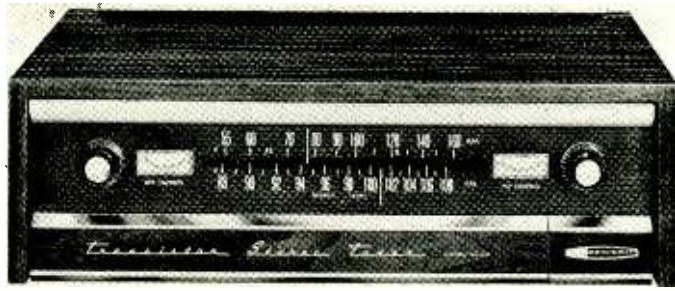


Fig. 3. Heathkit  
Transistorized  
AM/FM Tuner,  
Model AJ-43.

i.f. amplifier and detector, the multiplex circuit, and the AM section. The FM tuning unit is an assembled device employing three transistors, a 2N2495 as a grounded-base amplifier, tuned-circuit coupled to a 2N2654 mixer, and a 2N2671 oscillator, with a.f.c. being supplied by a voltage-variable diode capacitance which derives its controlling voltage from the detector circuit.

The i.f. section employs four AF114 transistors, three as amplifiers and the fourth as a limiter, with a.g.c. voltage being supplied by the latter. The ratio detector consists of two diodes in a conventional circuit. The varying emitter voltage of the limiter is used to actuate the FM tuning indicator. Like the tuning unit, the i.f. section comes already assembled.

The multiplex circuit must be assembled by the builder on the printed-wiring board furnished. It employs thirteen 2N2712's and one 2N408, the latter serving as the squeelch amplifier. The signal from the detector is first amplified by one stage, then fed to an emitter-follower/tuned-collector in which the audio signal comes off at the emitter and the 19-kc pilot from the tuned circuit in the collector circuit. The 19-kc signal is amplified by the next stage and fed to the indicator light driver which actuates another transistor that turns on the 38-kc oscillator in the presence of the 19-kc pilot, which also synchronizes the oscillator. A switch on the rear apron removes the synchronizing signal to permit adjustment of the free-running 38-kc during alignment. The function of sub-carrier detection, which is actually a switching process, is provided by a pair of transistors with their bases fed by a 38-kc push-pull signal while the audio is fed to their emitters by an emitter-follower. The right and left signals appear on the respective collectors, and are amplified by a pair of conventional stages and fed to a pair of emitter-followers from which the output signals are derived. An SCA filter and a noise filter, both switchable, are provided in this circuit, and a switch ahead of the output stages connects them parallel and to the AM signal to provide outputs to both right and left amplifiers, thus avoiding the need for switch-

ing to mono in the control amplifier when listening to AM. A separate jack is provided for the AM output, however, so that both AM and FM programs may be received simultaneously.

The AM section consists of a tuned r.f. amplifier employing a 35070 transistor, followed by two T1364's as oscillator-mixer and i.f. amplifier. A diode serves as detector and a.v.c., and the resulting audio signal is fed through a 10-ke filter to a 2N2712 audio amplifier stage.

Power is furnished by two silicon rectifiers feeding an RC filter circuit, followed by a 9.1-volt zener diode, which stabilizes the voltage supplied to the entire tuner. A power-line FM antenna is provided by an r.f. transformer with one winding in series with the power transformer and the other winding being led to the FM signal switch, which has three positions—local, in which the only pick-up is from internal wiring; medium, which employs the power-line pick-up; and distant, which connects to an external antenna. A built-in ferrite rod serves as the AM antenna, although a terminal is also provided for an external AM antenna.

In appearance, the AJ-43 seems to be the essence of simplicity to the operator. At first glance, one sees only two knobs—the AM and FM tuning controls. The dial scales are separate, and a tuning meter is provided for each section. The power switch is actuated by pressing a short section of the sub-panel door. Four dial lights are located behind a plastic bezel above the dials, giving the general impression of a fluorescent-tube lighting strip. Upon opening the remainder of the hinged sub-panel, one encounters a number of controls and switches in this order: left channel level-set, right channel level-set, AM level-set, stereo balance control, stereo separation control, squeelch control, stereo phasing control and switch, stereo noise switch and SCA filter switches, AM/FM selector switch, antenna switch, stereo converter switch (automatic or off), and a.f.c. defeat switch. On the rear apron are the two meter adjusting pots, the antenna terminal strip, the three output jacks, and the 38-kc alignment switch.



With all of this flexibility, this makes an ideal tuner for the home builder, since it is easily possible for all adjustments to be made with no additional equipment—which has long been one of the virtues of Heath kits. Nearly every one of their kits can be assembled and calibrated with no additional equipment whatsoever. (We can think of only one exception—an audio oscillator is needed to calibrate the IM distortion meter in the Audio Analyzer, in addition to the ones in the unit itself.)

#### Construction

Construction is comparatively simple, since the FM i.f. strip and the FM tuner are factory assembled, and the AM and MX sections are on printed-wiring boards which are well marked. We found that approximately 23 hours time brought us to the end of the construction, and another three hours sufficed to complete the adjustments, mainly in the multiplex circuitry. The instructions are exceptionally clear and accurate, and are well illustrated. A large part of the wiring is by an already-prepared cable harness which is simply dropped into place and the 62 wire ends soldered to the correct points. This saves a lot of time, and reasonable accuracy on the part of the builder is practically ensured.

#### Performance

Once the tuner is completed and aligned, it is a good performer, more than adequately sensitive for the majority of locations, and excellent in sound quality. FM sensitivity is rated at 1.5  $\mu$ v for 20 db of quieting on mono signals, and capture ratio is rated at 3 db. Channel separation is rated at 40 db up to 2000 cps, 30 db at 10,000 cps, and 20 db at 15,000. Hum and noise was measured as 54 db below 1 volt output, the rated value for both AM and FM sections.

Listening tests showed clean quality on both AM and FM, and the automatic stereo switching "turned on" stereo just as effectively as a switch, and also lighted up the stereo indicator light just under the dial scale. Recording stereo on a conventional tape machine showed no interference from the 38-ke switching frequency nor from its harmonics, which makes this a good choice when one plans to do any stereo recording off the air.

On the whole, the AJ-43 fills the bill for a reasonably-priced all-transistor tuner, with the saving in outlay which usually goes with kit construction. Equivalent factory-built tuners should most likely cost twice as much, and many do not have the extreme flexibility this one does.

The AJ-43 comes with a vinyl-covered steel case, but is also available as the AJ-43C with walnut cabinet at a small additional cost.

Circle 210

(Equipment Profile continues on page 50)

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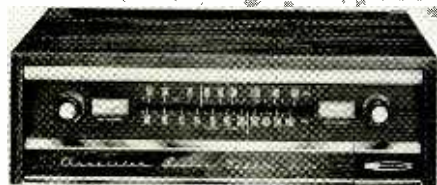
†one year parts, 6 months labor

\*manufacturer's suggested list price

CIRCLE 121

# NEW PRODUCTS

● **New Heathkits.** 26 transistors and 10 diodes are used in this new integrated amplifier to provide 35 watts per channel of continuous power from 13 to 25,000 cycles  $\pm 1$  db. All controls are front-panel mounted for convenience. The hinged lower front panel conceals and protects all secondary controls such as tape monitor switch, speaker phase reversal, loudness and all input level controls. The major, exposed controls include a five position mode switch, dual concentric volume, bass and treble controls. Circuit safety is assured by 5 fast-acting bi-metal



circuit breakers; there are no fuses. No special skills are required to construct the kit; preamp components are encapsulated in six epoxy covered modules—all factory sealed. Designated the AA-21C the amplifier kit is priced at \$149.95.

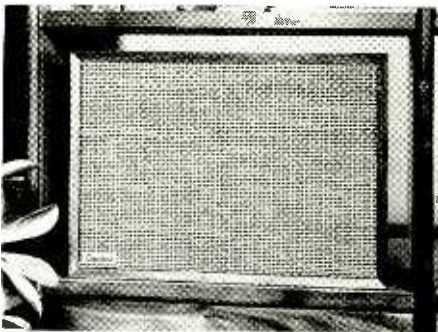
Simultaneously announced is an appearance matching AM-FM-MX tuner. With automatic switching to stereo in the presence of a signal, a stereo indicator light, AFC, and individual AM and FM tuning meters, this is a easy-to-operate tuner. Its 25 transistor, 9 diode circuitry makes for an easy-to-build kit since both front end and IF strip are factory pre-assembled and aligned. Designated the AJ-43C, the tuner sells for \$129.95. **Circle 200**

● **Making Music.** If you can use (or learn to use) a pencil soldering iron you're on your way. So says a release from the Schober Organ Company announcing their new all-transistor electronic organ kit. No technical or musical skills are needed for construction. To insure that soldering ability is there before starting the estimated 80 to 100 hours needed, Schober supplies a sample circuit for wiring. This is completed by the purchaser and sent into the company for grading. If it is satisfactory he will get the green light to go ahead. If it is not, a second sample and



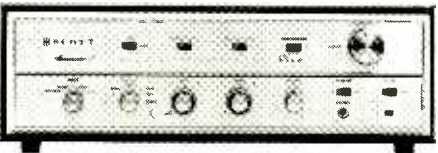
critique will be sent out. A wise procedure to insure success on a project that costs \$850. The organ itself is equipped with two 61 note manuals and 17 pedals. 22 stops cover the whole gamut of organ sounds. For your \$850 (you can buy sections at a time) you get all electronics, a pre-assembled console, bench and keyboards. The completed model, the Console II, will play through your existing amplifiers and speakers. **Circle 201**

● **Pocket Bookshelf Speaker.** All of  $14\frac{1}{2} \times 10\frac{1}{2} \times 7\frac{1}{4}$ " and 12 pounds this new Sonotone system has a claimed response of 45 to 20,000 cycles. Wide high-frequency dispersion is also claimed as is smooth response and low distortion. Inside this



small walnut box is a six-inch high-compliance woofer and small tweeter. An L/C network crosses over between the two. A level control is provided to adjust the tweeter to individual preferences. The RM-1, that's the model, will handle up to 40 watts of continuous power. **Circle 202**

● **Solid-State Integrated Amplifier.** This new H. H. Scott 260 claims superiority over the finest vacuum tube units in power, reliability and performance. Backing up these claims the manufacturer states that heavy-duty pre-tested components such as massive heat sinks, heavy printed circuit boards and silicon output devices are used thruout. Special features



include a front panel headset jack; separate bass and treble controls for each channel; complete tape recorder input and output facilities and a massive power supply more than equal to the heaviest demands of the amplifier. Important specifications include a steady-state power output of thirty watts per channel, harmonic distortion below 0.8% and a frequency response of 20-20,000. Price of the new model 260 is less than \$260. **Circle 203**

● **Stereo Earphones.** A new wide-range stereo earphone set has just been announced by the David Clark Company. Rich, full-bodied bass and non-strident highs are claimed for this new model, the Clark/200. A six foot cord and standard



stereo phone jack is supplied. These phones are designed for connection to an amplifier's output in the same manner as speakers. Most modern amplifiers have stereo jacks that will directly accommodate these phones. Available in a two-tone brown the Clark/200 is priced at \$26.95. **Circle 204**

● **Sound Level Meter.** The Type 1565-A General Radio solid-state sound level meter will fully comply with the American and International Standards for Sound-Level Meters, yet it fits into one hand. It will measure from 44 to 140 db (re 0.0002 microbar). Weighting networks and both slow and fast meter responses are in accordance with ASA and IEC specifications. The measurement



grade ceramic microphone is built-in and, combined with the tapered cabinet configuration, yields an essentially non-directional response. Vibration pickups and other transducers can be connected in place of the microphone through an auxiliary adapter. An output jack allows for connection to an analyzer or recorder. The unit uses one "C" battery for 35 hours use. Dimensions are  $3\frac{1}{16} \times 7\frac{3}{8} \times 2\frac{1}{8}$ ". Weight is  $1\frac{3}{4}$  lbs. Price is \$240.00. **Circle 205**

● **Battery Recorder.** Craig has just released a new low-priced battery portable tape recorder that offers both 1 1/2 and 3 1/2 ips speeds. Drive, from four standard flashlight batteries, is via a capstan for constant speed. The unit can be adapted by an accessory for household AC operation. Design features include single-lever control for record, playback and rewind; record interlock; inputs for remote control microphone and for radio recording; outputs to earphone and 8 ohm external



speaker. The recorder will hold up to a five-inch reel for a maximum of four hours recording time. Total rewind time for a full reel is under 2 1/2 minutes. Weight is only 9.9 lbs, dimensions are  $4\frac{3}{4} \times 11\frac{1}{4} \times 9\frac{1}{4}$ " D. Designated the Craig model Vista TR-510 the unit is \$59.95 complete with remote microphone, empty and full reel, batteries and earphone. A leather carrying strap is also included. **Circle 206**





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- MX 110 stereo tuner/preamp

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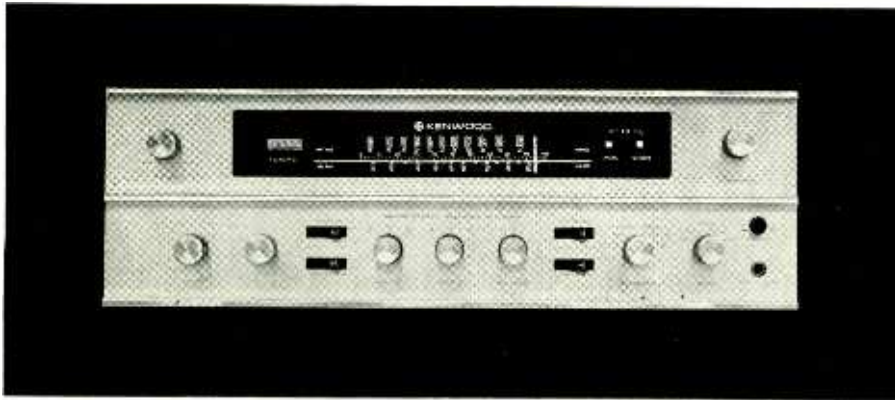
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## AUDIOCLINIC

(from page 2)

likely to be in operation.

Because of the relationship between these harmonics and the frequencies of broadcast stations, the interfering whistle can be heard at almost any frequency. Therefore, no filter can be really effective against this kind of interference. You will just have to live with it.

To summarize, if you are receiving interference from broadcast stations operating on channels adjacent to the one in which you are interested, a filter can often work well in eliminating the beat tone. However, if you are severely plagued with interference from television receivers, there is no cure for this.

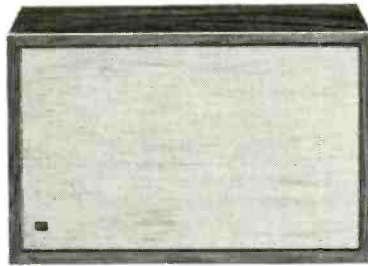
It is possible that the local signal is overloading your tuner and causing it to respond to spurious images. This overload, however, should be present night and day unless the transmitter pattern is altered during the evening hours as is sometimes done. Such alterations take the form of shifting from a nondirectional radiation pattern to a directional one. If you are in line with this directional pattern, the amount of energy will increase in your neighborhood at night and cause this overload problem.

Finally, then, if the whistles do not vary in pitch as the tuning dial is slowly tuned across a station, the condition is caused by either adjacent channel interference or by a television receiver. Further, if the tones are ragged and tend to shift in frequency in a random manner even when the tuning dial of your AM set is not moved, the cause is almost certainly TV receiver radiation. If the tones are clean sounding but vary in pitch as the receiver dial is moved slowly across the station, then you will know that you are getting overload from your local AM station. There is probably little which can be done to eliminate this trouble except possibly that a trap can be used in series with the antenna, assuming that the receiver is a loop type, perhaps orienting it differently will reduce the strength of the local signal sufficiently to keep the whistles down to a more acceptable level. Accurate alignment of the front end of the receiver sometimes helps. Æ

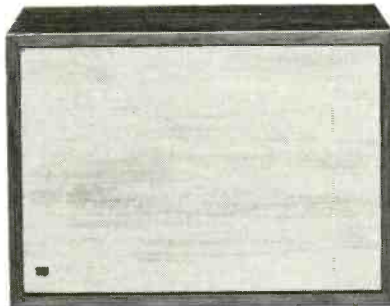
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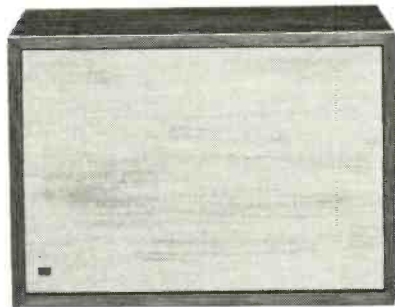




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Circle 125 on Reader Service Card

## InZide Audio

Larry Zide

Before sitting down to this month's column, I did manage a look at the Editor's Review in the December Issue. In that column, our esteemed Editor made some kind comments about me and then went on to mention the masthead this column would carry. Let me clear up one point. I did not veto the title of "InZide Audio", instead of "Inside". . . . Rather, I modestly made a wry face when the title was suggested. I have been besieged at home and elsewhere, so the title is herewith commuted to the aforementioned InZide etc. So much for that.

The subject at hand involves a trend, in the component industry, that has me quite fearful. This is the move to *modularization*. More specifically, it is the entry of component manufacturers into the pre-packaged goods market. As of this writing there is a speaker manufacturer, another who makes cartridges, two electronics firms, and a turntable distributor, all manufacturing complete pre-assembled music systems. Note that in all cases these are not *component* systems put into complementary cabinets. Rather, they are systems where one or more parts are specially designed for the particular set. In short, they are table model or portable record players with, at most, a component heritage.

I am not, at this point, discussing the qualities of these sets. Most of them are quite good, considering their price and size, but this is not germane to the problem at hand. My concern is, rather, for the portent that these products represent.

The component industry always kept itself aloof from the pre-packaged boys. And there was good reason. Components offered, and still do, superior quality and value than the consoles. But, let's face it, there is a big buck to be made in consoles and portables. And, the components companies have always kept a sideways cocked and covetous eye on that area. In fact, I've had the feeling for some time, that the components group seems to be looking everywhere *but* where they ought.

The merchandising of *portables* is radically different from components. These sets are distributed through local jobbers to the dealer. Each jobber, in turn, warehouses and field represents the company. Portables, therefore are a two-step operation. Manufacturer to whole-



salers/jobber to dealer. And the stores that end up selling portables are not component wise, they are, for the most part, a different sales breed.

Components are sold directly. Manufacturers employ field representatives, independent sales organizations that may represent several non-competitive components and electronics houses in their respective areas. For the most part, they do not warehouse. When they do, they are merely consignment holders of the merchandise for the manufacturer. The dealer, through the rep, deals with the manufacturer directly.

This has worked out well for the relatively small component industry. The giants of the packaging industry, however, must two-step because of the complexity and diversification of their product. There are many more stores that sell an RCA product than sell Fisher.

In spite of all this, a number of components firms *are* marketing what are pre-packaged sets. And, I would not at all be surprised but that some, at least, are doing very well indeed with them. But, to whom are they being sold? Remember that they are distributed in the manner of components. And that component dealers are selling them. In the situations where a chain store is in the component, and console business, these sets might be put out side-by-side with RCA, Magnavox, *et al.* And here they (the component portables) must suffer by comparison. The component sets may or may not *sound* better. But, *price*, rather than sound, is paramount in portables. And the package companies can beat the pants off any components firm when it comes to making low-priced merchandise. This is basic economics. A company that makes 200,000 units makes each one more economically, *for equal quality*, to one that may make 20,000. But, you will say, quality will probably not be equal. True enough, but so what. In a portable there is not a vast difference between a great one and one merely good.

These trends lead to two dangers. The first is that the components industry will lose, to pre-packaging, any number of fine companies that may, by their standards, make out well, *for a while*. But supposing the idea for high-priced (\$250) portables really catches on. This gives the entertainment industry *giants* a reason to pursue it themselves. And they can do that so much better than a components firm, that, I fear, they will bury them. The only reason they have not done this already to the components industry is that the whole components field is simply too small to bother about. And, here, the distribution system of components is protective. The two-step firms are not geared to sell the audio

market. But they sure can sell portables and consoles.

The danger, I fear, is not now but a few years hence. Component firms that expand to meet the demand for portables may find themselves too far out on that limb should the *big* companies lower the boom. And, in the meantime, the consoles that they have sold, through components dealers, have gone to customers that probably would have bought components to begin with. So, these companies have cut off their trade at both ends. This is the path to suicide, nowhere else.

I am fully aware that any commercial market, if it is to survive, must

continually grow. But, I believe, the direction of growth must not be into an area where someone else can do better. Components people make components best. This is what they should continue to do. The growth of real cultural values in our country has opened up the way for the component industry to move. A sophisticated and quality-hungry public is out there waiting to be educated to the value of components. Components can make better music. Components are *for* music. Therefore if music in the home is to be had at its best it will be through components. This is the direction to go. Æ

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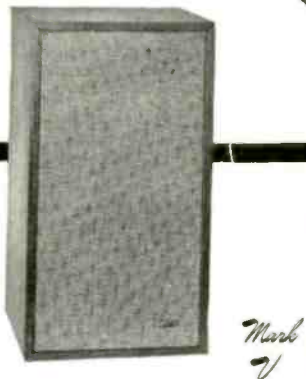
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## SOUND SYSTEMS

(from page 23)

between the line-source loudspeakers, approximately 15-ft., was small enough so that no artificial echo effects were introduced by the use of a split system.

3. Approximately 100-ft. beyond the podium another time-delay "split" loudspeaker system was used to cover the area beyond that point. Two loudspeaker clusters, each consisting of two  $2 \times 4$  multicellular horns, identical to those used on the roof of the bandstand, were suspended from the limbs of trees, approximately 20-ft. apart and at a height of approximately 25 ft. (See Fig. 5.) Here, each upper horn was aimed ap-

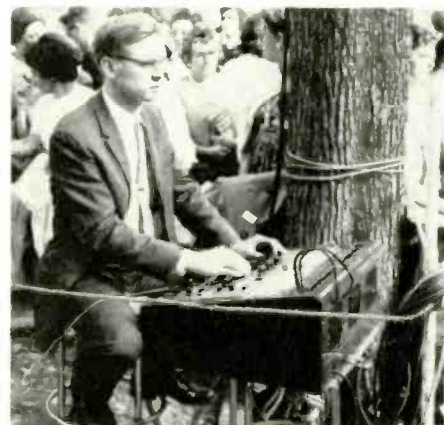


Fig. 2. Control console with two mixers, frequency shifter, and Boston Garden and Common patch field, used for both systems.

proximately 10-deg. down from horizontal, and the lower horns 40-deg. In the horizontal plane, the center line of each loudspeaker cluster was aimed outward at 30-deg. Again, the amplifier driving these two loudspeaker clusters was fed by the time-delay tape unit, and this second delay was adjusted for approximately 80 milliseconds to assure no artificial echo effects in the overlap zone covered by both the column loudspeakers on each side of the podium and the two multicellular horn clusters.



Fig. 3. Loudspeaker clusters on Boston Common bandstand.





Fig. 4. Dr. Graham speaking (close scrutiny would reveal his lavalier microphone). The two line source speakers are shown mounted on trees.

The reader may ask why the multicellular clusters themselves were not used at the podium to form a split "central" sound system. There were numerous trees in the area covered by the two line source loudspeakers; high level operation of loudspeakers in this area would have inevitably produced reflections from these trees back to the podium, with the possibility of feedback.

The microphones and control equipment used for this system were the same as those employed for the indoor Garden system. Neither the frequency shifter nor the narrow-band equalization was employed outdoors, although the wide-band equalization was retained as a first approximation for smoothing the response characteristics of the multicellular horns. A UTC HML 300 high-pass filter replaced the narrow-band equalization to make sure that no low-frequency energy would be delivered to the multicellular horn drivers.

Avoidance of "split" systems, whenever possible, is one of the authors most cherished "rules-of-thumb," but violation of this rule was essential for the results obtained. The Sunday service took place with winds of 15-20 miles an hour; yet high speech intelligibility was maintained for everyone attending the service. Attendance exceeded expectations, with 77,000 people covering the Common to a distance of 1000 feet in front of the bandstand and approximately 500 feet behind and at the sides. Responses to questions from the podium indicated that everyone could hear, and a newspaper reported that the sermon could be heard on Boylston Street, roughly a quarter mile away.

TO BE CONTINUED

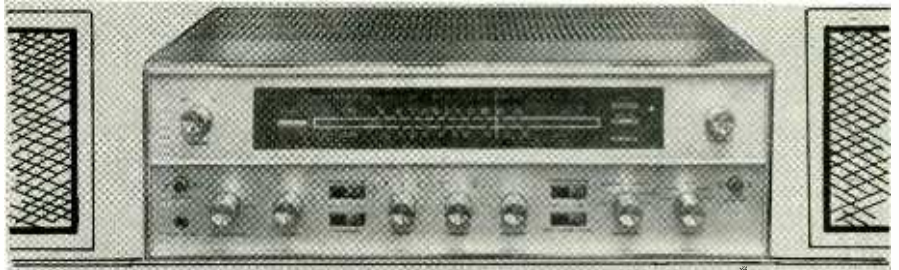


Fig. 5. Two loudspeaker clusters covering an open area from 100 to 1000 feet from the bandstand.

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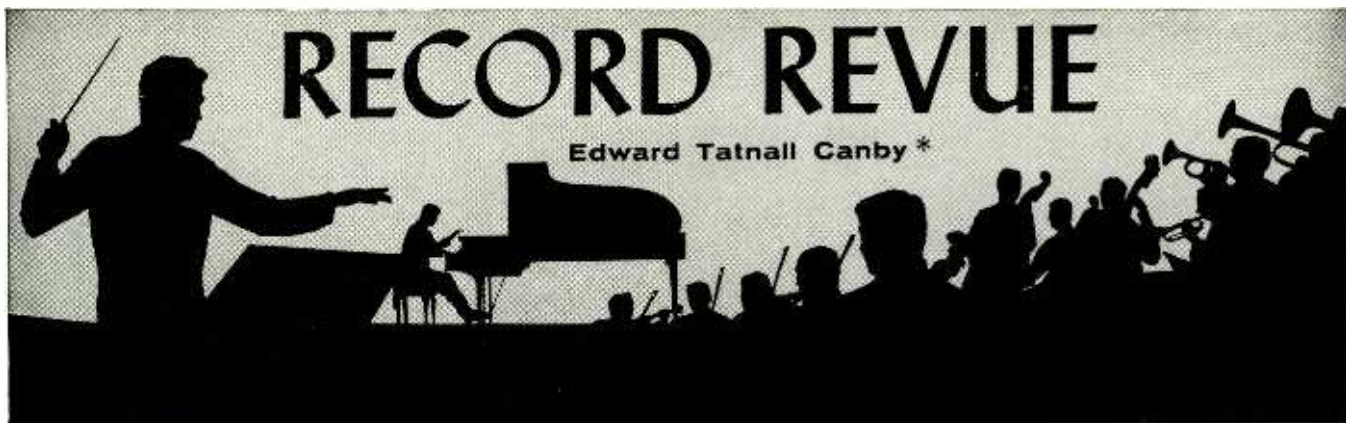
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## A NUMBER OF SUCH

**Rameau: La Guirlande (The Enchanted Flowers).** Claudia Saneva, Jean-Jacques Lesueur; Eliz. Brasseur Chorus, Versailles Ch. Orch., Wahl.

**Nonesuch H-71023 stereo**

In the great renaissance of French "Baroque" music, out of the 17th and 18th centuries, this recording is important and rewarding. Rameau, after all, is one of the big names in past French music but his actual stage works have long been dismally neglected. Too complicated to restore, too out-of-style (for "live" opera performance) and especially, too difficult to perform.

This is a first performance of a restored "pastoral ballet," a ballet with vocal music attached in the style of the mid-Eighteenth century, based on a wisp of a shepherd-shepherdess "plot" plus vast amounts of pretty scenery, (on the original stage) and scenery in the music itself, via enchanting tone painting. The music will be strange to unaccustomed ears at first—though of the Bach-Handel period, it is far removed from that familiar music. Both instrumental and vocal lines are full of profuse ornamentation; the florid recitatives flow into short "ariettes," minus the big set-pieces of Italian and German Baroque music; there is very little that is monumental and grandiose. But after a bit, the peculiar Rameau delicacy begins to get through. I ended up quite enthusiastic about this piece.

The two French soloists struggle earnestly and often with success at the now-strange and elaborate vocal lines. The soprano is the most conventional of the pair, though she does an excellent job. The tenor has an incredibly high "counter-tenor" role, replete with ornaments; he is full of passion and occasionally gets derailed for a note or two by sheer intensity; but generally his singing is lovely, the music a quite new sort for most of our ears.

**Bach: Cantatas No. 140 ("Wachet auf"); No. 57 ("Selig ist der Mann").** Ursula Buckel, Jakob Stämpfli; Chorus Univ. Sarreburch, Ch. Orch. of the Sarre, Ristenpart.

**Nonesuch H-71029 stereo**

The well known "Wachet auf" is paired in this perceptive recording with another on a closely related theme. Both feature as solo voices a bass, Jesus, and a soprano, the human soul. In "Wachet auf" it is a symbolic marriage between the soul and its Saviour, whereas in "Selig sind" it is a uniting in Death. There is surprisingly little difference between the two, for the "love-death" aspect of Lutheran thinking was in Bach's day one of its most poignant appeals to the Christian congregation.

The performers in this Sarre complex are now appearing extensively on Nonesuch (via the French Club Français du Disque) as well as other U. S. labels. They are good. Two excellent soloists here, the soprano and bass, plus a persuasive and earnest student choir for the big choral movements of "Wachet auf" and a good Baroque orchestra under Ristenpart. I'd say this one ranks among the better versions of "Wachet auf."

**Monteverdi: Madrigals. Nuovo Madrigaletto Italiano, Gianni.**

**Nonesuch H-71021 stereo**

As chief annotator for the Nonesuch label (I wrote the notes here) I trust I won't get canned if, as a record reviewer, I pan this one! (I listened once to the tapes and then hurriedly put them aside and wrote my notes from the printed music.) It is an earnest and sincere recording and the Italian singers do stay in tune—which is more than many of their professional colleagues can manage. But beyond this, there is precious little feel for the drama in these works. And thanks to the excessive modern brilliance of the voices and their extreme vibrato, plus generally very slow tempos, in march-time, the musical sense does not easily get over to the inquiring ear.

Not in any way harsh, crude, or unmusical. Just out of style and performed by the wrong "instruments."

The recording features three memorable sets of madrigals, each a coherent, continued "story" on its own. The famed *Lament of Ariadne (Arianna)*, adapted from the solo part in Monteverdi's opera, "Arianna," is followed by the *Tears of a Lover at the Tomb of the Beloved (Lagrima d'amante)* and a much-less-well-known set, *Ecco Silvio*.

**Haydn: Organ Concerto in C; Sinfonia Concertante for Violin, Cello, Oboe, Bassoon and Orch.; Two Nocturnes, in C and G. Soloists, Ch. Orch. of the Sarre, Ristenpart.**

**Nonesuch H-71024 stereo**

If you enjoy Papa Haydn add this one to your collection. The two major works are both little known and delightful; the organ concerto is very early, a pure entertainment piece (much like the similar concerti of Christian Bach, for outdoor pleasure gardens in London), the big Sinfonia concertante is a very late piece, from the time of the last symphonies and the visits to London, and while a characteristic Haydn work in it prevailing lightness of texture it has a marvelously well-made structure and fine tunes plus some extraordinary solo writing for the four carefully balanced solo instruments, two strings and two winds, one each low and high.

The Nocturnes are movements from a set of pieces composed for a mechanical freak of a machine, the *lira organizzata*, a viola-like string instrument with a tiny air-pumped organ attached, the whole driven by a hand crank! Alas, there is no *lira* here; Haydn re-wrote the pieces for more conventional instruments. Nice, just the same.

**Mozart: Concerti for Two Pianos and Orch., K. 365, Three Pianos and Orch., K. 242. Pierre Sancan, Jean-Bernard Pommer, Catharine Silie; Lamoureux Orch., Chorofas.**

**Nonesuch H-71028 stereo**

This is the first time, I think, that these multiple-piano Mozart concerti have appeared on one disc together (see the parallel Bach multi-harpsichord concertos on Nonesuch 71019) and I found this French performance

a very satisfactory one, if subtly different from the Austrian-minded playings we are most likely to hear these days. Three competent, well-trained pianists, cool customers but well versed in good Mozart phrasing and not one of them trying to show how "easy" it all is (a familiar failing among pros who play Mozart). They know well enough that it isn't easy at all.

The three pianos, moreover, are somewhat unlike each other in tone quality, which adds a subtle touch in the recording to the interplay between the instruments. It shows in both mono and stereo, abetted in stereo by the right-left positioning.

One piece is a major work of Mozart, that for two pianos in E Flat, composed for Mozart himself and his sister. The other is a light-hearted threesome, written for three lady amateurs, very *galant*, not very profound but polished to perfection. Nice.

## PROKOFIEFF

**Prokofieff: Violin Concerto No. 1; Piano Concerto No. 5. Erick Friedman, vl., Lorin Hollander, piano; Boston Symphony, Leinsdorf.**

**RCA Victor LSC 2732 stereo**

This was a bright idea (and convenient for RCA Victor)—the Boston orchestra has long been a Prokofieff specialist orchestra; two solo concerti would do very nicely for two young recently come-forward RCA soloists. And so we have two quite different young personalities, their work here unified by the common orchestral backing as well as the composer in common.

The First Violin Concerto is well known in numerous performances, the most notable in the past being those incisive, mature readings by Joseph Szigeti. Erick Friedman, for my ear, just isn't the man for this job. He has worked enormously on it and his technique is perfectly adequate for its plebeian difficulties. But Prokofieff's violin was often an acid, percussive instrument, hoarse, almost gypsy-like, especially in this early period (1917). Where Szigeti's fiddle scrapes with convincing eloquence, as gratefully beautiful as you could wish, Friedman's seems merely to go through the proper scraping motions. There isn't really much conviction; he is by nature a more lyric fiddler, more fit for the elegant 19th century violin style. On the whole this performance seems to me derivative in style, technically competent and well played but lacking in real projection. At least in the solo part.

Last time I heard Lorin Hollander (on records) was as a brash, enthusiastic 14-year-old whamming out Chopin with trip-hammer force and utter good humor. Phew! Well, now he's a powerful, still-brash but much matured young pianist who seems here to meet the somewhat older composer of 1932 just at the right point. For in 1932 Prokofieff was still in the latter part of the brash 1920's modern period, not yet arrived at his later, more lyric and newly Romantic style. Hollander is exactly right for this enormously difficult piano part. (Prokofieff was a fabulous pianist himself.)

So—Side 2 is the best. But the Boston Symphony has got the right idea on both sides with its new conductor, Erich Leinsdorf.

I still deplore the wooden effects of the



Dynagroove process, though it doesn't do much musical hurt here. Just a monotonously level volume (the beginning, which should be soft, is too loud), a curious dead vacuum around the soloist, who sounds as though in a separate room, and an odd smallness to the space in which the orchestra plays plus a disturbing balance between its parts, near and far. Maybe this isn't all Dynagroove; but the volume-dullness is and so is the dun color of the less loud parts, which ought to shimmer.

**Prokofieff: Violin Concerti Nos. 1 and 2.**  
Isaac Stern; Phila. Orch., Ormandy  
Columbia MS 6635 stereo

These are definitive performances of the two concerti, at least for the mid-sixties, a time when both are at last established classics of the repertory and almost old fashioned in sound. They once were far from that! Especially the First, which was a shocker even as I first remember it in the Szigeti 78 rpm performance.

Isaac Stern is truly one of our great violinists—though of the short-haired breed, down to earth and no nonsense. His playing doesn't lend itself to long-hair rhapsodizing, nor does his presence. But the man plays everything and anything, with intelligence as well as superb musicianship, superb technique and lovely tone.

He projects the exotic, gypsy-like coarseness of the Prokofieff fiddle in the earlier concerto with the most happy effect—guttural, solid, sardonic-humorous, as it surely was intended! Szigeti, the original performer, did it too; but Stern's is more fluent. In contrast, the long, almost sentimentally lyric lines in both concerti are equally well brought out. Perfect.

Ormandy, as I've noticed before, is an excellent accompanist with his big orchestra when there is a soloist who can lead and shape his own performance with authority. That's Stern, Columbia's hi fi is big, shiny-smooth and yet delicate in effect, especially the piano passages; the sound is well placed and beautifully balanced in all its parts in the big hall; the solo is very much in the same room as we listen. Good.

**Prokofieff: Romeo and Juliet (excerpts).**  
Philharmonia Orch., Kurtz.  
Angel 36174 stereo

Efrem Kurtz is one of those roving, free-lance conductors who turn up here and there and do a splendidly professional job wherever they go. I found this new set of excerpts from the Prokofieff full-length ballet not only well chosen (items from both of Prokofieff's two suites, arranged in a new order) but splendidly played, with some new slants on how to project some of the heavier and often flat-footed passages. I wouldn't want to vouch for the balleticity of these interpretations (their aptness for the actual dancing of the ballet) but I do think that Kurtz has found some fine keys to better listening, more uniform projection of musical interest. Well worth trying.

## POTPOURRI

**P. C. Wodehouse: Jeeves.** Terry-Thomas, Roger Livesey, cast.  
Caedmon TC 1137 mono

Here's a lovely Xmas present for the giver who wants a record minus music! Two of the stories about the inimitable gentleman's gentleman, the famous Jeeves, are here inscribed with high humor and delightful underplay. "Indian Summer of an Uncle" on Side 1. "Jeeves Takes Charge" on Side 2. Mr. Wodehouse himself introduces these—in print on the jacket, of course—remarking that he had already written eight Jeeves novels and thirty-nine Jeeves short stories and that though maybe Jeeves doesn't really fit into modern Britain anymore, nor his doxy young master, Bertie Wooster, Mr. Wodehouse is "hooked" on Jeeves and really can't be stopped.

You'll see why if you try these two bits of Jeevesiana. A bit mumbly and awfully British, first time through, but the sense soon begins to penetrate if you listen hard. Capital stuff, definitely.

**Seven Steps to Better Listening.** CBS Laboratories.

CBS Labs STR 101 stereo-mono

This is one of the few "popular" test records in the CBS Labs series but its interest may well extend to many professionals in our area. Its intention—and there isn't a tougher proposition—is to adjust the home listening system to its local acoustics and listening situation, *via the instrumentation of the ear alone.* No test instruments.

The main facility on the disc is an ingenious sound called "pink noise" used in third-of-an-octave bands as well as in wider spectra. In case you hadn't heard of this particular pastel shade (I hadn't), it's like white noise only with energy content equal for any octave band, high or low. (White noise is equal for any frequency, which is something else again.) Since this is approximately in line with the characteristic of our hearing in terms of loudness, the tool is obviously useful here. In addition, the random "pink" bands of frequencies, a cross between a hiss and a tone, are useful in dodging sharp room resonances in favor of a broader response. (A single-frequency glide tone picks out the room resonances in a separate test.)

Given an amplifier control with near-infinite, continuously variable controls at all frequencies, you could, via this record, adjust your sound contour to your listening spot with considerable precision according to an objective standard—almost any room, any more or less normal ears. The tests measure the final sound, as actually heard. Since we have only limited "tone control" facilities, the record is more capable than your equipment itself but, even so, useful adjustments can be made towards a mean standard of heard sound which are far more objective than the usual personal judgment. We have woefully little comparison-material by which to set our own listening standards, most of us.

Beyond the actual measurements and adjustments, one can learn a lot about sound fundamentals in home reproduction (both mono and stereo) via study of the extensive (but popularly written) booklet that comes with the disc. I should know. I wrote it. And it took me months of study to get the whole thing straight, before I could write an intelligible and authoritative word! Quite an education for me, and I hope I've passed some of it along.

**Steam in the Snow (Canadian Pacific, 1960).** Extra 1235 East (Norfolk and Western, 1959).

Allan Sherry

(5445 Netherland Ave. Riverdale, N. Y.)

I always like to cite earnest efforts in recording by small companies, so often one-man operations and labors of love. This outfit is too small to afford stereo as well as mono and they don't even send review copies—that would take up most of their modest production. I'm returning mine. But, as is always possible these days, the sound quality is up to anybody's. And if you like the contents, who cares if it's RCA Victor and its millions or a one-man producer?

Mr. Sherry's railroad god is O. Winston Link, who is, of course, a first rate god to have. If the Sherry recordings, similar to the Link ones, are not quite dramatically up to the Link standard, they are thoughtfully made and show no ineptness in the assembling and editing. They are more like those of the West-coast producers in format, with shortish sequences for the most part. (Link's forte was long, long sequences, often with huge patches of near-silence and no train sounds at all. Very dramatic!)

I could skip a good many of the desultory switching engines herein inscribed—they still bring back to my mind the dismal, dirty yards of so many railroads on the edges of towns I've lived in. But the bigger sequences here are often excellent. One in particular—uncut, for once—ticks off something like a hundred and ten freight cars clanking by at a fantastic speed. What weight in motion! What fabulously dangerous inertia, at maybe 80 mph!

Mr. Sherry also has a brief 7-inch item on the Canadian National. ZE

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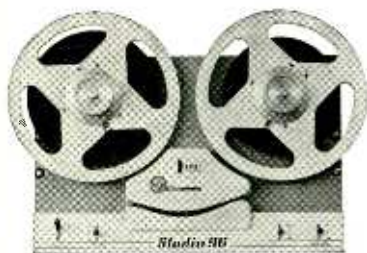


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CIRCLE 131



## HERMAN BURSTEIN

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

Herman Burstein  
280 Twin Lake E., Wantagh, N. Y.

(Here are some letters from readers which may be of interest to all readers.)

### Are Tapes Long Lived?

I would like to make some comments about tape life and quality:

a. In spite of manufacturers' claims to the contrary, magnetic tape will not retain high quality recordings for a period of years. I have used tapes in standard, professional, and telemetry grades and the results are the same for all. Within 3 to 5 years the highs have almost vanished, the lubrication is almost dry and the oxide begins to wear off.

b. Regular periodic re-lubrication of the tapes will keep them smooth and will reduce the amount of oxide that wears off on the heads, but it will not retain the highs.

c. Tape over 5 years old may become unsuitable for high-quality recordings of any sort, due to lack of high frequency response and output efficiency (i.e. output level for a given record level).

d. Where a magnetic tape record is critical, as in the care of master program and library tapes for our computers, these tapes must be re-recorded every 6 to 9 months, even though they are kept in steel safes away from any possible stray magnetic fields. Tape records kept much longer than this, even under strict environmental control (i.e., temperature, humidity, and no stray magnetic fields) have a tendency to become unreliable due to attenuation of the recorded information.

e. "a, b, and c" above pertain to my personal tapes kept in my home, whereas "d" pertains to tapes used on computers and kept in an area where the environment is controlled.

JAMES W. POPE

### Takeup Reel Slows Down

In your answer to the problem of the Viking 85 Deck slowdown of the takeup reel, there is one very possible explanation to the trouble experienced.

Due to low line voltage, the takeup reel motor will very definitely slow down and lose torque, causing the identical trouble described. The fact that the trouble cannot be duplicated at the audio repair shop supports this theory. Also, since the trouble only occurs in the normal playing location, I am led to suspect some loss of voltage there (to this motor), which could be easily measured while operating the deck.

I experienced a similar condition in Fairfield County, Connecticut, after installing

a Viking playback deck for Commander Whitehead. He complained of the same trouble, although it only happened during evening hours. Upon checking the line voltage at the meter, I found that during the evening hours it dropped below 100 volts. Due to air conditioners, ranges, and so on, being turned on by most of the customers along the line, it was actually overloaded.

Connecticut Light & Power Company ran a recording meter check and verified the condition. Steps were taken to correct this, and the result was worth the effort, not only to Commander Whitehead but to all of the customers on the line who had experienced excessive fuse blowing and poor operation of equipment without realizing the cause.

C. F. BARTON

### Taping Old Records

The letter on taping old phono records in The Tape Guide, December 1962, was interesting to me because I have encountered the same problem in taping still older records, and have a partial solution to it.

What is needed is a variable low-pass filter, such as the one which appeared in the March 1954 issue of AUDIO (by Basil T. Barker). The filter affords 18-db-per-octave attenuation, starting anywhere from 2.5 kc to 20 kc. This is adequate to handle the noisiest records. I do not hear any of the transient distortion that is said to result from so steep an attenuation slope. Since records differ with respect to noise, it is necessary to audition each record before taping it. One then adjusts the filter to give the best compromise between complete removal of noise and complete rendition of the highs. One is bound to lose something, but the filter makes possible pleasurable reproduction at minimum loss.

BOB CONWAY

### Long-Life Tapes

Q. I have not yet solved the question as to which kind of tape should be used for recordings intended to be permanent. It seems that mylar has longer life than acetate, but does this imply also that fidelity is retained longer, and that there is less brittleness and curling with age? For low print-through, is it necessary to use the 1.5-mil tape, or are some of the 1-mil tapes just as good?

A. For long life, mylar (polyester film) tapes are recommended in order to preserve both the magnetic and physical properties of the tape. The thicker the tape, the less the print-through. Thus, other things being equal, 1.5-mil tape has less print-through than 1-mil tape. At least one company, 3M, is making low-print tape of 1-mil thickness, which more or less compares with conventional 1.5-mil tape with respect to print-through. **AE**





**Jacques Loussier Trio: Play Bach, Vol. 4  
London Stereo PS 365**

After three discs of Bach in swing, it seemed unlikely that a fourth volume would cover any unexplored ground, but the latest set in Monsieur Loussier's reediting of the Gesellschaft Edition offers the stimulating addition of a baroque organ to the piano, drums and bass of the first three records, thereby giving a whole new dimension to the works undertaken and a quite different aural perspective. Loussier plays both piano and organ, and the difference in acoustic quality between the left and right tracks suggests that the organ was recorded in a quite different surrounding from the other instruments. The close pickup of the trio emerging from the left speaker does not blend too successfully with the more distant sound of the organ on the right channel, and I was unable to arrive at any control setting that produced a satisfactory perspective. I suspect that the mixed sound of the mono version is actually more pleasing than the stereo edition, and I intend to acquire it with all due speed, for these are fascinating performances that include three Choral Preludes: 'Erbarm' dich mein, O Herre Gott, Christ, unser Herr, zum Jordan kamm und Wachtet auf, ruft uns die Stimme, the Overture from Cantata No. 28 and the Fantasy and Fugue in G Minor. Loussier's conversations with himself on piano and organ offer an interesting juxtaposition of the original settings and his swing commentary, and the rhythm backgrounds of Pierre Michelot, on bass, and Christian Garros, on drums, are models of bright, alert playing and impeccable taste.

**Dave Brubeck Quartet: Jazz Impressions of Japan  
Columbia Stereo CS 9012**

Titles of Brubeck's latest set of travel recollections sound varied and suggest great opportunity for imaginative flight—Tokyo Traffic, Rising Sun, Zen Is When, Osaka Blues, Koto Song, etc., but Dave's impressions of Japan are not only superficial, they are full of the tinkle, tinkle western orientalisms that one encounters in movie and television background music. There is a growing tendency on Brubeck's recordings for him to hog the spotlight most of the time, affording Paul Desmond very few moments for expression, and Joe Morello, who in the past has contributed a wide variety of effects with his drumming, has little more to offer than a cymbal crash or two for local color. Whatever the musical shortcomings, the recording is all that one could ask for, with excellent stereo separation and rich, clear reproduction of Gene Wright's bass.

**Stephen C. Cheng: Flower Drum and Other Chinese Folk Songs  
Monitor Mono MF 420**

This is orientalism of a higher order, and this recording fills a real need in the American record catalog. Although there are several excellent collections of Chinese classical music available, there has been a serious lack of folk song recordings on discs (a few stereo tapes from Hong Kong can be obtained in New York's Chinatown, but are not available elsewhere). The present recording is a recreation of a concert given in March, 1964 by the Society for Asian Music at Asia House in New

York City. It offers songs from all of the major areas of China and includes lullabies, drinking songs, work songs and songs of love. Four instrumental players accompany Mr. Cheng on a variety of Chinese instruments, including the *san-hsien*, *sheng*, *erh-hu*, *yan-ch'in*, transverse flute, and an assortment of bells, drums and cymbals. The instrumental arrangements were made by Mr. Cheng, who also contributes the album notes. As a performer he displays an attractive voice, and he is inclined to emphasize the melodic, rather than the dramatic aspects of his material. The songs are sung in Mandarin, with the exception of two songs in Cantonese, and the recording is clear and close up, allowing one to follow each syllable.

**The Original Cool Jamaican Ska  
London Mono LL3384**

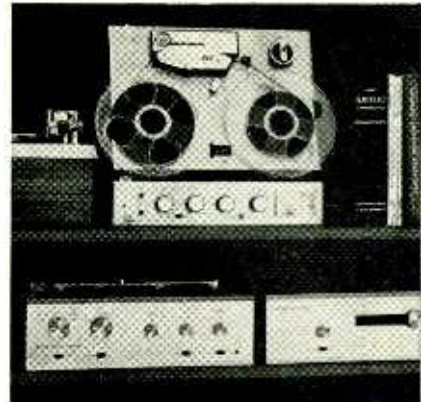
A new dance form, with emphasis on the up beat, has created a stir in Jamaica, and according to London Records, it is likely to inundate this country in the near future. A four-page illustrated leaflet accompanies the present set offering instructions to the younger and more agile on how to perform the Ska. This set would appear to be an lp transfer of a number of Jamaican made singles, most of them performed by Bobby or Laurel Aitkin, that varies considerably both in musical interest and in recording quality. Tunes like Laurel Aitkin's *Bad Minded Woman* and Bobby Aitkin's *Devil Woman* offer clever, calypso-like lyrics, and the former features some very attractive trumpet playing. But a Ska version by Vic Brown's Combo of *My Old Kentucky Home* and Laurel Aitkin's *You Are My Sunshine* are simply dreary.

**Yugoslav Hit Parade  
Monitor Mono MP 601**

Persons who bemoan the present day paucity of good pop tunes in the U. S. may be comforted to learn that things are tough all over, at least the present disc indicates that Zagreb has a profusion of talented musicians who also suffer from a lack of worthwhile material. The recordings, taped in Yugoslavia by Jugoton, feature a dozen different singers with various dance, jazz and radio orchestras. Tape to disc transfer was accomplished in the United States, and the finished product compares favorably with the average domestic recording, displaying the same echo chamber and off-mike chorus effects used on American and Western European pop discs. All of the songs are sung in Serbo-Croatian. Unlike most Monitor recordings, no texts are included.

**Barbara Dane Sings the Blues  
Folkways Mono FA 2471**

An able and experienced performer, Barbara Dane is a strong, emotionally disturbing singer who can express worry and defeat in a very real and personal manner. With meager vocal resources, Miss Dane manages to make a very substantial impression, largely because of the great control and restraint with which she expands her vocal endowments and also because of her fine guitar playing. There is no shouting, posturing or apeling of classic blues mannerisms; she has found a quiet style of her own through which she can communicate, and she does so in a direct, musically satisfying way.



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## EQPT. PROFILE

(from page 37)

### JFD FM ANTENNA, MODEL LPL-FM10

Most FM fans are well aware of the need for an antenna to improve reception, especially in the case of FM-stereo broadcasts. The sad fact is that many people may come to the conclusion that stereo broadcasts are of poor quality (technically, that is) when the difficulty may really be an insufficiency of signal level. Stereo reception really does require significantly more signal level than does mono reception. In fact we were surprised at the amount of improvement we achieved with JFD LPL-FM10 antenna over the already good reception we were getting with the Yagi we replaced.

The JFD LPL-FM10 is a new species of FM antenna based on the relatively new log periodic design which has proved so effective in recent years. In contrast to previous log periodic designs however, the LPL-FM series uses full wavelength "L" dipoles. Thus, instead of the common "V" dipoles we have observed in previous designs, we see an array which resembles a Yagi, except much bigger. The difference lies in the rather unique way that the elements are connected.

A full wavelength dipole has a much higher impedance than a half wavelength unit, therefore the LPL-FM antennas use a transmission line transformer to reduce the impedance to the customary 300 ohms. In fact, one of the claimed advantages for the log periodic design is that it exhibits constant impedance and gain characteristics over wide bandwidths, certainly over the entire FM band.

The LPL-FM10 is the largest of the log periodic "L" dipole antennas made by JFD. It consists of 5 active cells and 5 directors. Gain is about 9.5 db and front-to-back ratio about 25 db. Its beamwidth is in the area of 40 deg. The LPL-FM10 measures about 12 ft. long and a few inches less in width. Weight is about 9 lb. The dipoles are made of 1/2 in. aluminum tubing and the transmission line transformers and feeder harness are made of solid aluminum rods. Top suspension crossarm supports permitted us to mount the antenna close to the rotator. The entire antenna is gold alodized.

This particular antenna is intended for far fringe reception of up to 175 miles. We found that rating somewhat conservative, although for all practical purposes it is more than sufficient. After all, stations which are further away are not usually line of sight. We chose this large antenna for our own very special application, most people who live in the suburbs of a large city would not need as much gain or directivity.

### Performance

Using a tuner we had tested before with our Yagi, we were able to receive 6 more stations than we had been able to receive previously, a gain of about 15 per cent. Even more important, we were able to receive good stereo signals where before we had only good mono signals. In all cases, the stereo signal produced sound as good as the mono signal did, certainly the best stereo we have heard from some stations.

Although it is hard to give exact measurements of reception angle, it certainly is in the 40-deg. range based on the evidence of the compass indicator of our rotator.

On the basis of these performance tests, the LPL-FM10 is the most powerful FM antennas we have tested so far. We would certainly recommend it for anyone who is experiencing problems in FM-stereo reception. Of course, as we noted before, the LPL-FM10 may be much more powerful than most users need therefore we would suggest investigating others in this log periodic series by JFD (LPL-FMS, LPL-FM6, and LPL-FM4).  
Circle 211

## ABOUT MUSIC

(from page 14)

4-rpm motor, which will turn the knob on the Variac. "There's nothing unique or original about it," Stanleigh insists, "but nobody seems to have designed anything like it for such a purpose."

By recording "movements" on tape, Lye can examine his work with new eyes. "Now I can program 'Ring,' for example, and watch it without touching the Variac. How marvelous!" In addition, he will be able to dub programs and exhibit several simultaneously. He will also be able to edit tape in order to achieve certain effects.

One of Lye's schemes is to record the sound of the sculpture itself, submit it to speed mutations, and use the final result to accompany the sculpture's "live" sound.

Unlike most of his sculptor colleagues, Lye is keenly aware of the "acoustics" of metals. His work is informed with a deep knowledge of sound, as well as form and light. "There is no incompatibility between technology and art," Lye maintains. "Forms of motion sculpture will be of value in both natural and architectural environments, in that it reveals the harmonious relationships between the natural vibrancy of materials and the motorized force that drive them. It reveals, also, that the swaying of grass, trees, rippling of water, and flight of a bee are nature's forms of this same principle."

Someone described sculpture as "frozen music." In his "Tangibles," Lye demonstrates that sculpture can sing as well as move. Æ



# MATRIXING AMPLIFIER FOR 2-CHANNEL STEREO SIGNALS

(from page 22)

sources might well be placed so that the resulting pickup in each microphone is different or that the bass response of the difference channel be attenuated so the low frequencies will not tend to cancel. This is important when there is any serious attempt to increase the "separation" by the introduction into the right channel of reversed-phase signals from

the left channel and *vice versa*. Perhaps the situation will be clarified by inspection of Table II where it is assumed for simplicity that each entering signal contains a portion which is unique to that channel and another portion which is shared equally by both channels. The two output signals are given for various values of  $k$ .

The reader who wishes to understand the theoretical aspects of stereophonic reproduction should consult the work of Bauer.<sup>3, 4</sup> Additional means for increasing the stereophonic spread are given by Tappan, *loc. cit.* Perhaps better circuits can be devised for achieving the desired results but the unit described has been in use for two years without a single modification. Yet, the reader is cautioned not to expect too much from this or similar devices. They should not be used to provide "gimmicked" stereophonic sound. However, the device presented here has been a useful tool in situations where recordings were necessarily made under less-than-optimum circumstances.

The writer is grateful to Mr. Wayne Gano and Mr. James Harrington for their help in developing and testing the circuits used in this device. Æ

<sup>1</sup> Paul W. Klipsch "Circuits for Three Channel Stereophonic Playback Derived from Two Sound Tracks," *I. R. E. Transactions on Audio*, Nov.-Dec., 1959; pp. 161-165.

<sup>2</sup> Peter W. Tappan "An Improvement in Simulated Three-Channel Stereo," *I. R. E. Transactions on Audio*, May-June, 1961; pp. 72-79.

<sup>3</sup> B. B. Bauer "Phasor Analysis of Some Stereophonic Phenomena," *J. A. S. A.*, November 1961; pp. 1536-1539.

<sup>4</sup> B. B. Bauer "Some Techniques Toward Better Stereophonic Perspective," *I. R. E. Transactions on Audio*, May-June 1963; pp. 88-92.

$k$	$2(L - kR)$	$2(R - kL)$
+1	$2(L - R)$	$2(R - L)$
+1/2	$2(L - 1/2R)$	$2(R - 1/2L)$
0	$2L$	$2R$
-1/2	$2(L + 1/2R)$	$2(R + 1/2L)$
-1	$2(L + R)$	$2(R + L)$

Table I. Output signals from matrixing circuit for various values of  $k$ .

$k$	$(R - kL)$	$(L - kR)$
+1	$B + C$	$C - B$
+1/2	$1/2A + B - 1/2C$	$1/2A + C - 1/2B$
0	$A + B$	$A + C$
-1/2	$3/2A + B - 1/2C$	$3/2A + C - 1/2B$
-1	$2A + B + C$	$2A + B + C$

A = SIGNAL COMPONENT COMMON TO BOTH R AND L  
 B = SIGNAL COMPONENT PRESENT IN R BUT NOT IN L  
 C = SIGNAL COMPONENT PRESENT IN L BUT NOT IN R  
 $R = (A + B)$   
 $L = (A + C)$

Table II. Output signals when input signals contain both common and unique components for various values of  $k$ .

## A Wall Rack Audio System

The system shown on the cover this month features rack-style mounting on a wall. Placing components over each other makes for convenience in minimum space.

The system is located in the home of Bruce S. Gladwin, a California audiofan. His system consists of:

- Acoustech I & II amplifier and preamp;
- EICO power amplifier to feed speakers other than in the listening room;

- Fisher FM-1000 tuner;
- Magnecord 728-44 tape recorder;
- Miracord automatic turntable;
- Empire 208 turntable with 980 arm;
- ADC-4 cartridges (2);
- Fairchild Comander;
- JBL 001 speaker systems in C35 enclosures.

The cabinetwork was custom built by Greens HiFi of San Jose, California. It is constructed of walnut with stainless steel trim.

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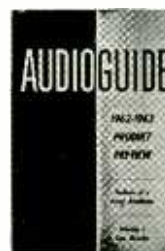
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## AUDIO ETC

(from page 12)

and give exasperation-free service in the process. I hate to disappoint my engineer friends, but I rate them as important as circuit design and electronic performance. So do the people who buy. We're talking practical portability, remember—which means a lot more than just an inevitable negative compromise with stationary, built-in equipment.

In this vein, I must beef briefly about one aspect of this particular portable changer, an old beef with me: that eternal extra overhead arm. It is annoying enough in a stationary system but somehow (to a manual-player man like me, at least) in a portable it is just too much of an awkward muchness. (I'm not being reasonable, I know; I'm merely reacting like a customer.) The arm is just one more excrescence to snag sleeves, catch records, get knocked into, one more means to topple the whole machine over by accident, one more thing to fasten down in the carrying—or else. And there's an extra impediment, here, ready to mar your records on manual play; if you want automatic shut-off (the essential manual-automatic function); you must keep the arm across the table and work your record in underneath it onto the manual spindle. If you push it off to the side and out of the way, the mechanism repeats and won't shut off.

The pickup? Excellent for a portable. The light Garrard arm is coupled with a new Pickering cartridge—not the more compliant type but the least complaint model, a very wise idea in a portable! The changer itself, given a solid anchoring-down, will play with very light point pressure; but portable phonos are seldom anchored down and they are often subject to bumps and jars and vibrations. Part of the nature of their use. The Garrard-Pickering combo under these blithely routine tortures has excellent stability and, equally vital, plenty of ruggedness. Could anything be more important?

Well, maybe sound quality could. I leave it for last merely to emphasize the portable's rather special character. The idea in a portable is, inevitably, to find the most practical compromise, granted less-than-ideal working conditions and a lowish over-all price. I'm not ready to throw out my whole house system and substitute a pebble-gray portable such as Fisher's (or many another) even though plenty of people might be. I can only suggest that the Fisher Model 50 at its price offers a very fair and consistent compromise—the sound is con-

sistent with the rest of the machine. The speakers are small and they can't produce much bass, at best. The highs aren't exactly perfection in these tiny units, but they are definitely not raucous nor unpleasant—I found them moderately easy to take on a long listen. The little speakers are not violently "colored"; no extreme peaks, no golden "presence", no tubby upper-bass boom; just an honest modicum of good sound, consistent with the size and shape of the unit. Naturally, bigger units would do a musically better job. *But do you want to carry them?*

Just as a working check on the rest of the system, I made a pair of cable converters and ran the Fisher 50 into my main home stereo system with its "big" speakers. I was able to use the portable "power plant" for my general listening during a number of successive days without trouble; the little transistor unit made a lot of sound on the big speakers and overloaded only with really heavy recording played at considerable volume. I did notice that a better balance was obtained when the tone controls were swung off to the side, representing a likely and quite legitimate pre-shaping



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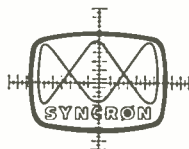
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of the output, to aid the tiny portable speakers in their job. Entirely permissible—in a portable.

I also tried the Fisher with Shure's portable speakers and vice versa—no significant results. Worked quite OK, either way. (They use the same RCA connectors.)

There is of course no question that the speakers are the weak links in *any* portable machine. There, you are bound to pay the biggest penalty for convenience. The only answer to the penalty, for my money, is more and more ingenuity, of the have-your-cake-and-eat-it sort, in the designing of tiny speaker systems. We have a lot more progress to make in this area, I'd say, before the theoretical limits are reached. The old (and wood-boxed) KLH Model Eight small speaker is still the finest of its type in my estimation, size for size—but I'll bet it can be bettered. The pebble-gray portable people should be especially concerned here. It's their life blood.

#### Shure M100L

A few big words about the fabulous Shure M100L. Portable pebble gray, which I've had on hand for quite some time and have admired with considerable awe—for this is a super-de luxe home system, practically hand made and produced in small quantities. I should explain at once that the M100 system is primarily a component system designed in the "library" format, in furniture cabinets, one for the table and amplifier and two for the speakers. The sections are sold separately and there's no reason at all why, once in place, they need be moved anywhere. Therefore, weight and susceptibility to jars and bounces did not figure in Shure's choice of elements—only that old ideal, "the best." Not the best for portable use—just the best.

But for reasons of its own, probably to meet the incredible (to me and to Shure) demand for pebble gray, Shure has made available an alternative version, packed in suitcases, which are beyond any question pebble gray and "portative"—i.e. with large, very visible handles. Other than that, and choice of somewhat smaller speakers in order to pack two into a clamp-together suitcase (pebble gray), this Shure M100L ("L" for luggage?) is identical to the non-moveable version, all the way through.

Well that makes it interesting, because as I say, portable equipment requires very special portable thinking, right from the word go. I think it is instructive, without the slightest aspersion upon Shure, whose engineers had different criteria on their minds, to look at this alternative M100L "luggage" model and see where it might run into a bit of trouble with us free and easy portable users. Mostly it would do so

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because its components are simply too good for portability.

Weight I have mentioned. But why so heavy? The basic reason is again—that weight was not being saved in favor of carryability! The M100 sports a terrific table, the fancy Dual 1009 Auto/Professional (which Does Everything, even to pitch adjustment, and has NO extra overhead arm, at that). It just happens that the Dual uses a “massive” turntable, for excellent reasons. Massive and HEAVY, quite deliberately. That’s one big element in the weight. Also the big counterweight at the rear of the large arm, which is spring loaded for point pressure.

In the arm goes Shure’s newest and fanciest cartridge of all—what else?—the Shure V-15 Stereo Dynetic, with an elliptical stylus. Wowie! You can’t do better! But, it happens, the V-15 quite properly boasts a very finely tuned stylus assembly with the expected high compliance. The combination is rock-solid, I quickly found, so long as the base from which it operates is the same. Righto! Who buys that sort of equipment to install on top of a card table or maybe on the edge of a rocking chair? But alas, in portable form, the V-15 objects to being jarred and bounced. Just give the luggage tray a quick nudge and watch the agonized arm and stylus go hopping o’er the grooves. Nope, this isn’t portable-type equipment.

Finally (since I must skip large quantities of needless detail), there are the Shure speakers. The very fact that they are good little portable pebble grays, shaped so the two can be clamped into suitcase shape puts them out of the running as far as this superb equipment is concerned. For, after all, previous to the speakers the Shure M100 system is absolutely top bracket; it cries out for the very finest speakers of any sort that can be carried or hoisted or built into your living space. Two tons, five tons, ten tons: no matter.

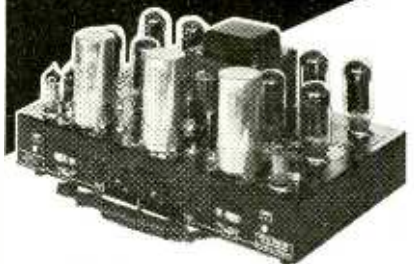
This doesn’t mean that Shure “portative” M100L has no usefulness. I am certain that, knowing what is included in it, a good many people will be very much interested in acquiring this particular superb combo, being thankful that it comes with handles and can, if need be, get itself moved without complete dismantling. My Ampex 350 tape recorder has precisely the same advantage; its luggage covers and handles are stored in my back closet for months or years at a time, only to come out when the moment arrives for transportation. Useful.

But please, please, don’t take the Shure M100L to the beach in Florida, or to that summer camp in the woods next July. Go get a pebble-gray portable, not a pebble-gray portative, if you insist on something “practical”. **Æ**

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## ADVERTISING INDEX

Acoustech, Inc. ....	36
Acoustic Research, Inc. ....	15
Acoustical Manufacturing Co., Ltd. ....	12
Akai Electric Co., Ltd. ....	42
Altec Lansing Corporation ....	29
Audio Bookshelf ....	52
Benjamin Electronic Sound Corp. ... Cov.	111
Bozak ....	41
British Industries Corp. ....	3
Chancellor Electronics, Inc. ....	37
Classified ....	54
Concertone ....	31
Dynaco, Inc. ....	50, 51
EICO Electronic Instr. Co. ....	47
Electro-Voice, Inc. .... Cov. IV,	1
Electro-Voice Sound Systems ....	55
Empire Scientific ....	56
Fairchild Recording Equipment Corp. ....	6
Finney Company ....	56
Fisher Radio Corp. ....	9
Frazier Incorporated ....	44
Garrard Sales Corp. ....	3
Gotham Audio Corporation ....	11
Harman-Kardon, Inc. ....	13
Harvard Electronics Co. ....	55
Heath Company ....	7
Hi Fidelity Center ....	55
Kenwood Electronics, Inc. ....	40
Lafayette Radio ....	45
Lansing, James B., Sound, Inc. ....	33
LTV University ....	43
McIntosh Laboratory, Inc. ....	39
Multicore Sales Corp. ....	56
Pickering & Company, Inc. ....	17
Scott, H. H., Inc. .... Cov. II	11
Sherwood Electronic Laboratories, Inc. ...	18
Shure Brothers, Inc. ....	27
Sonotone Corporation ....	44
Syncron Corporation ....	54
Tandberg of America, Inc. ....	53
UTC Sound Division ....	4, 5
Viking of Minneapolis, Inc. ....	48, 49

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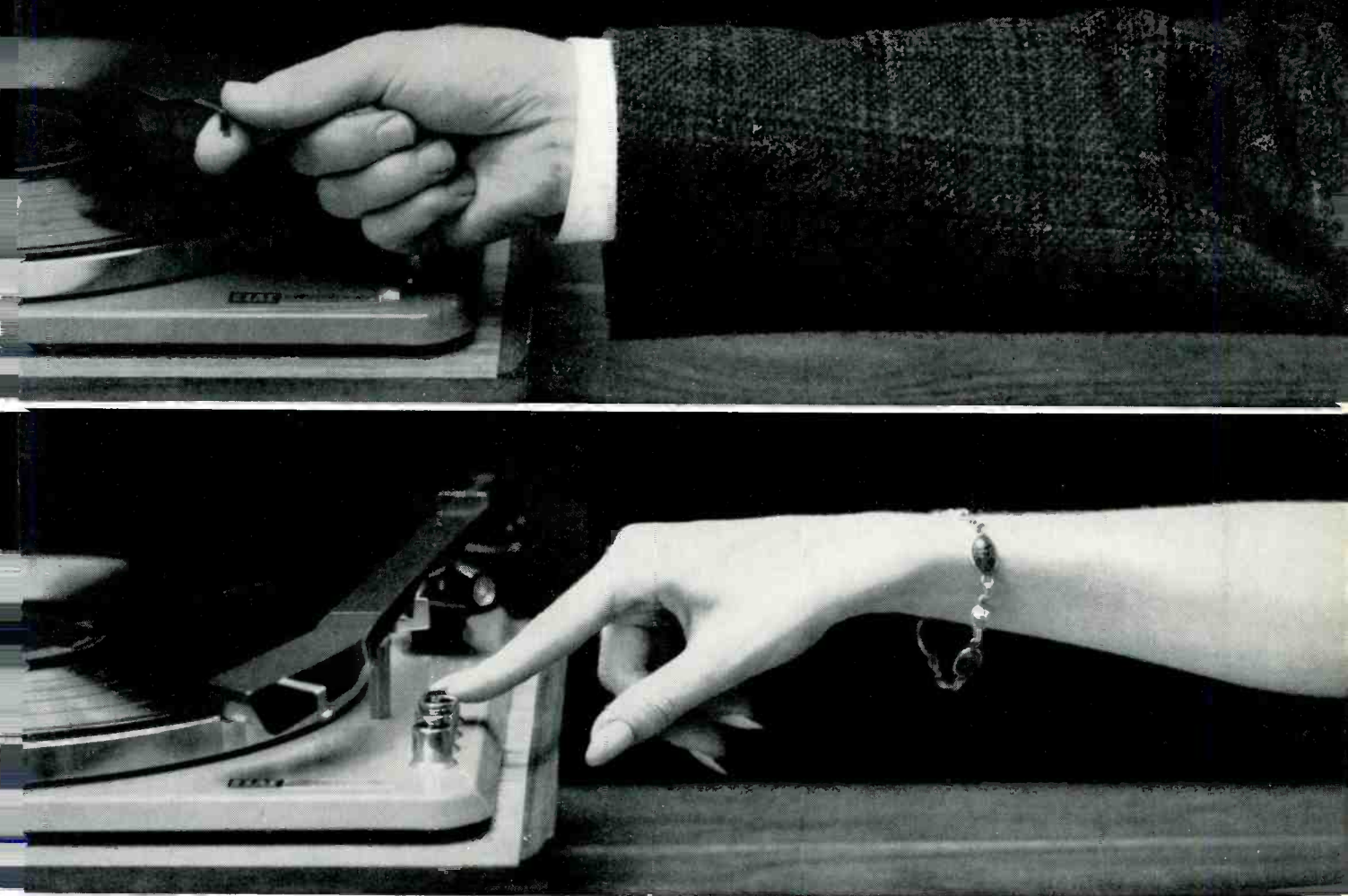
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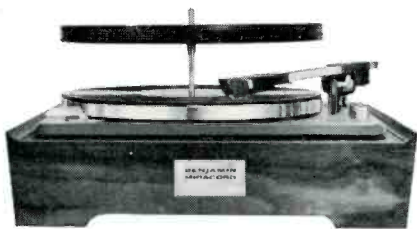
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