AUDIO

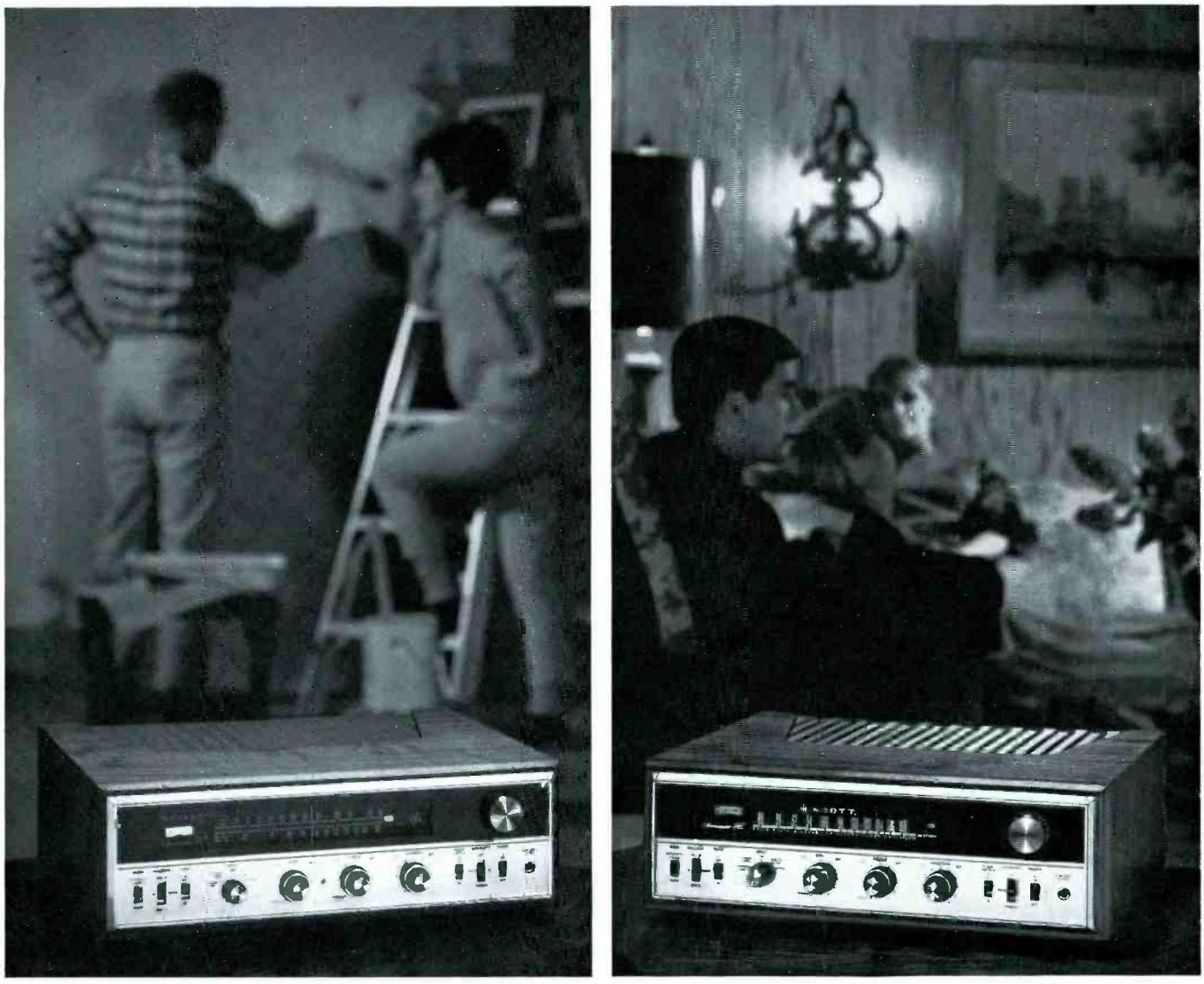
DECEMBER 1966 60¢

. . . the authoritative
about high fide

SPECIAL
TAPE
ISSUE

Film Star
Harold Lloyd's
Christmas Tree

SCOTT



Scott FET performance now available in two new low-priced stereo receivers

Now, even Scott's lowest-priced receivers offer you features you won't find anywhere else, regardless of price! *All* Scott receivers have Field Effect Transistor circuitry, enabling you to hear more stations more clearly . . . *all* have direct coupled all-silicon output and all-silicon IF circuitry . . . *all* are unconditionally stable, even with speakers disconnected . . . *all* are built to Scott's peerless standard of quality and reliability, and differ only in amount of power and extra features.

Scott 382 FET AM/FM Stereo Receiver. Here's AM reception so good it has to be heard to be believed. Scott's new 65-Watt 382 has the exclusive Scott FET AM *and* FM front end*. New Scott Signal Sentinel (Automatic Gain Control) increases tuner sensitivity for weak, distant stations, and increases resistance to cross modulation when signals get stronger. Best of all, the price is less than FM-only competitive units without FET circuitry.

Scott 342 65-Watt FET FM Stereo Receiver. AUDIO magazine says that Scott's new 342 provides ". . . a level of performance that far exceeds the relatively modest price asked." And you'll agree, when you see and hear this complete Scott stereo receiver, with new FET circuitry . . . at under $300! The 342 incorporates all popular Scott receiver features, including Scott's patented time-switching multiplex circuit* which instantly and silently switches the tuner to stereo operation when stereo is being broadcast.

382 and 342 specifications: Music power @ 4 Ohms load, 65 Watts; Frequency response, 18-25,000 Hz ±1 db; Usable sensitivity, 2.2 μV; Cross modulation rejection, 80 dB; Selectivity, 40 dB; Tuner stereo separation, 40 dB; Price: 382, $359.95; 342, $299.95. * Patents pending

Scott . . . where innovation is a tradition

SCOTT®

H. H. Scott, Inc., Dept. 395-10, 111 Powdermill Road, Maynard, Mass. 01754
Export: Scott International, Maynard, Mass.

Prices slightly higher west of Rockies. Subject to change without notice. We reserve the right to make changes and improvements without notice.

For your free copy of Scott's 16-page full-color illustrated 1967 Guide to Custom Stereo, Check 50 on Reader Service Card

AUDIO

December, 1966 Vol. 50, No. 12

Successor to RADIO, Est. 1917

AUDIO Articles

AUDIO Reviews

AUDIO Profiles

AUDIO in General

AUDIO (title registered U. S. Pat. Off.) is published monthly by North American Publishing Co., I. J. Borowsky, President; C. G. McProud and Arthur Sitner, Vice Presidents. Executive and Editorial Offices, 134 North 13th St., Philadelphia, Pa. 19107. Subscription rates—U. S., Possessions, Canada, and Mexico, $5.00 for one year; $9.00 for two years; all other countries, $6.00 per year. Printed in U.S.A. at Blanchard Press, Inc., Garden City, N. Y.

Second Class postage paid at Philadelphia, Pa., and additional mailing offices.

REGIONAL SALES OFFICES: Sanford L. Cahn, Art Sitner, Robert Cooper 663 Fifth Ave., New York, N. Y. 10022; (212) 753-8824. Richard Reed, 205 W. Wacker Drive, Chicago, Ill. 60606; (312) 332-3910. Leonard Gold, 1900 Euclid Ave., Cleveland, Ohio 44125 (216) 621-4992. Jay Martin, 9350 Wilshire Blvd., Beverly Hills, Calif. (213) 273-1495.

AUDIO, Editorial and Publishing Offices, 134 N. 13th St., Phila., Pa. 19107
Postmaster: Send Form 3579 to the above address.

Coming

Articles

Professional Tone Controls, by Arthur C. Davis and Don Davis, both of Altec Lansing. Beginning a series on this important subject.

The What, Why, and sometimes Why Not about Vibrato, by Lewis A. Harlow.

A Twelve-Tone Tuner, by James B. Hayes.

Profiles

Marantz Model 15 Solid-State Power Amplifier

EICO Model 342 Multiplex-Signal Generator

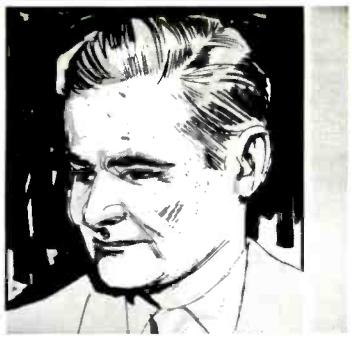
In the January issue on the newsstands, at your favorite audio dealer's or in your own mailbox.

About the Cover

We travelled six thousand miles to tuck those tape recorders under the World's Most Beautiful Christmas Tree. See the full story on page 22.

AUDIO CLINIC

Joseph Giovanelli



If you have a problem or question on audio, write to Mr. Joseph Giovanelli at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered.

FM Antennas and 'Static'

Q. I have a problem which is a real doozy. I hope you can help me with it.

I have fine stereo equipment. I have a TV and an FM antenna mounted on a common mast. The FM antenna is the lower of the two; the TV antenna is about three feet above the FM antenna. It is a 12-element FM antenna with a rotator. My mast and antenna are about 30 feet long over-all.

For a long time I have been getting static through my equipment. This electric static came through no matter what piece of equipment was turned on. I blamed all of the units of my stereo system. The manufacturers checked everything thoroughly. Everything was fine. The record player and other equipment were grounded accurately.

All this sort of got me. I finally disconnected my FM antenna from the tuner. The static stopped. I could then play the record player, but, of course, I had no FM reception. I put the FM antenna back on its proper connections; the electric static came right back again. I mean this electric static was not just a little; it was plenty, and it distorted everything. I checked as much as I could at the lead-in from the antenna, the antenna as it was mounted on the mast, and checked the lead-in at the tuner end of the line. I finally added another ground from my preamplifier to a pipe. This ground cut down the static considerably on all sources except the FM tuner.

Where would I be getting electric static from my antenna? There must be something strong being picked up by my antenna and passed into my outfit. My location has no mills or factories near, although there is a college about one-half mile from me with an FM station having a power of 10 watts.

Will you please advise me if you have run into anything like this? Is there more than one cause? Name Withheld.

A. Before getting to the tricky portion of your answer, I'll take another part of your problem, even though that section was not meant as a specific question.

Your TV and FM antennas are too close to one another. Their proximity is not contributing to the production of the static but it is interfering with the best performance of either antenna. The two antennas should be spaced at least 9 feet apart in order to eliminate interacting between the two antennas.

The static is puzzling to me. I can only guess that your antenna lead-in cable—either from the TV or FM or maybe both lead-in cables—are rubbing against a ground. I suspect that the insulation is worn. The static, then, could be the intermittent contact of the bare wire with the mast or with some other ground such as a rain gutter.

It is possible that the rotator cable is similarly involved. Check it to see that it is free from defects. Incidentally, keep all 300 ohm lead-in wire free from any surrounding objects so that its characteristics as a transmission line will be unaffected by the proximity of the building or other objects. Use stand-off insulators to mount the lead-in. The rotator cable need not be protected to this same degree but be sure that the cable is not strung up in such a way that it can be cut into by its surroundings.

If possible, ground the mast on which your antennas are mounted. This grounding is of help in some kinds of multipath problems. It is also a help in preventing lightning from entering your home. However, do not assume that merely by grounding the mast, your home is completely protected against lightning strokes. If you believe that such protection is needed, consult a specialist in this area of home protection.

Antennas and Auto Ignition Interference

Q. As a resident of San Diego, I am lucky in being able to receive all 12 VHF TV channels. In order to achieve this, I have used the following techniques: A high-quality antenna, coaxial or shielded twin-lead, rotator, tunable wavetrap, stepped attenuator, and a high mast.

I do have one problem, however, that of interference created by passing autos which have "noisy" ignition systems. As you would expect, this interference shows up on both the aural and video portions of the TV set.

1. Can the auto ignition interference be coming in via the a.c. power lines?

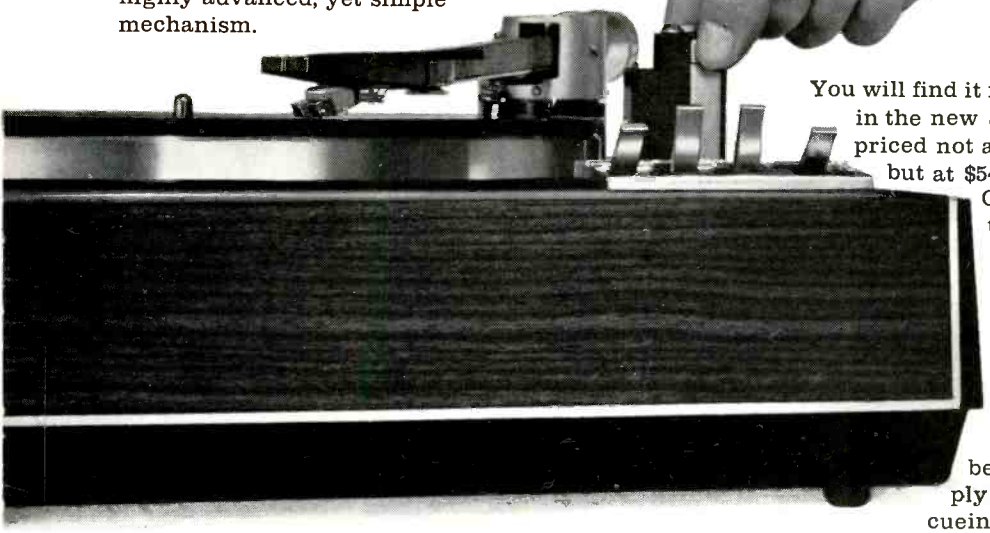
2. What is the nature of these electromagnetic waves that they cannot be filtered?

3. I am now using RG8/U coaxial cable which I obtained from a surplus sale—80 feet. Would the use of RG59/U coax make a visible effect on fringe area

GARRARD'S CUEING...

When one considers the modern tone arms which Garrard has evolved for its automatics—it becomes clear that such an arm is not an arm—it is a system by itself—a group of components of advanced design whose purposes are to transport a modern cartridge, track it perfectly, and protect it as well. The matter of protection for the stylus and the increasingly delicate record grooves, has become more important as tracking forces have become lighter. For today, it is no simple matter for the user to set a tone arm down on a record by hand, or to pick it up off the record manually. Sooner or later, there is damage to the record or stylus. Furthermore, a large number of records have multiple selections on one side of the disc. Finding these bands ("Cueing" the stylus into them) is also a frequent cause of damage to nearby grooves. Cueing devices have existed for some years on professional equipment used in broadcasting studios—but it remained for Garrard to be the first to apply the principle to automatics.

When they did—with the integral cueing control on the Lab 80, it was again with a highly advanced, yet simple mechanism.

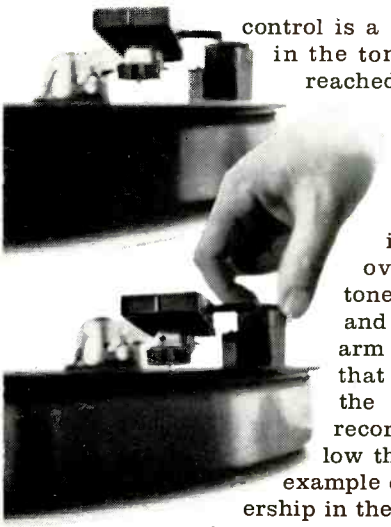


You will find it in the 60 Mk II and in the new 50 Mk II which is priced not at $130.00 or $150.00, but at $54.50.

One reason why the cueing device is very appealing is the pause feature. Should the record player be operating when the phone rings —for example— the music may be interrupted, simply by touching the cueing control—it may then be resumed at the very same groove when the interruption is over. Thus, a feature which was originally developed for professional applications in radio stations—has found its widest use in the home—safeguarding records and styli, and making the record player a greater pleasure to use than ever before.

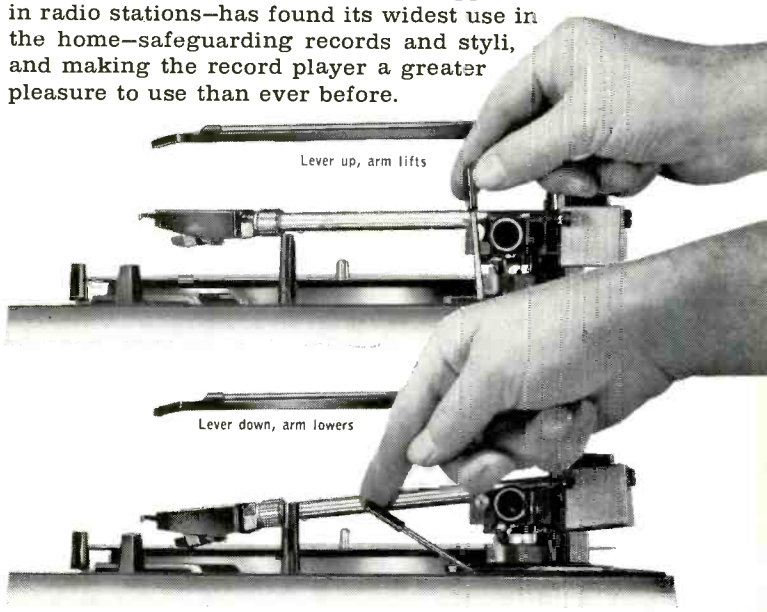
60 Mk II Cueing Control

50 Mk II Cueing Control



The Lab 80 cueing control is a squeeze device, cleverly located in the tone arm rest, where it is easily reached regardless of where the record player is installed. It is hydraulically operated. A touch of the finger on the manual tab starts the record player, activates the cueing device... smoothly raising the tone arm a safe half inch over the record. Then, move the tone arm over any groove desired and press the cueing control. The arm gently lowers to the groove. It is that simple, and that useful... now the most wanted feature on any record playing equipment. But follow the rest of the story for a typical example of Garrard's developmental leadership in the field.

Naturally, the cueing feature, per se, was soon imitated on other automatic turntables...all of them higher in price than the Lab 80. Then, recognizing this interest, Garrard developed a lever type cueing control similar in use to those which appear in the highest priced competitive automatics.



For a complimentary copy of a colorful Comparator Guide describing all five new Automatic Turntables, write Garrard, Dept. GX-16, Westbury, N.Y. 11590. Prices less base and cartridge.

Garrard®

CIRCLE NO. 103 ON READER SERVICE CARD

reception? I hesitate to recommend the more expensive cable to friends if the extra loss in the RG59U would not be excessive.

4. I have heard that the loss in a run of 80 ft. of shielded twin lead would be greater than 80 feet of coax plus two baluns 300/75 ohms. Is this true, false or insignificant?

5. I have a pretty good throw at the Los Angeles stations. The low mountains between us are quite far from me. In view of the extra 10 feet of coax required, would you think that the difference between 30 feet and 40 feet of antenna height will have any effect upon reception—good or bad?

6. Can coaxial cable and shielded, twin-lead be taped to the mast along with the rotator cable? I use standoffs, but was this precaution unnecessary?

7. Is TV antenna power similar to speaker power in that a doubled input has a small effect upon the sensed result? My friends are skeptical when I tell that even doubling the amount of signal received does not have a dramatic effect.
Marvin L. French, San Diego, California

A. I will attempt to answer your questions, although not necessarily in the order in which they were presented.

Unfortunately, no method that I know can eliminate ignition noise as a problem. You have already done what I might have suggested. Ignition noise is radiated over a wide band of frequencies. Hence, it cannot be filtered out by either a high-pass or a low-pass filter.

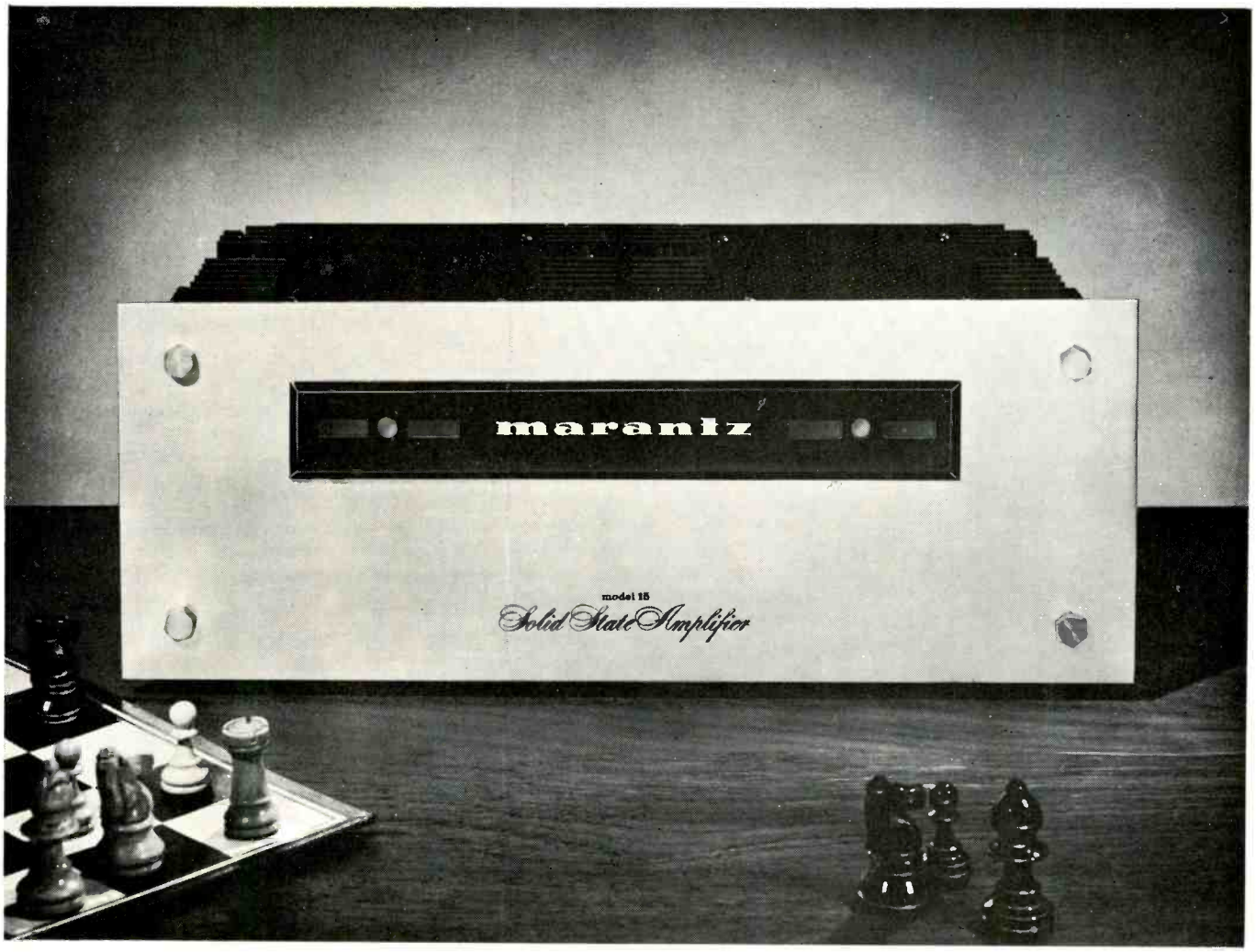
Coaxial line is better than open-wire transmission line for the purpose of eliminating some ignition noise pick-up. You see, some of this noise is picked up by the line rather than by the antenna directly. The shielding around the coaxial cable or around the 300-ohm twin-lead will eliminate this kind of pick-up. Of course, the antenna must be matched when using coaxial line. The transmission line, in turn, must be matched to the receiver. You took care of this when you used the baluns.

I do not believe your ignition interference is being picked up by the a.c. line. However, this can be proved very easily merely by disconnecting the antenna and observing the amount of residual noise remaining. I suspect that all traces of the noise will vanish with no antenna connected.

You mentioned that you purchased the coaxial cable at a sale of surplus items. You must watch this sort of thing when it comes to coaxial cable. The vinyl jacket between the shield and center conductor has a way of migrating through the shield and the center conductor. As the cable ages, the losses gradually increase. Because the cable is surplus, it is already old. Therefore it may be "lossy" indeed. I will not say for sure that replacing your coaxial cable with new cable will definitely help you. However, it may.

(Continued on page 8)

Marantz makes an incredible move *forward...*



model 15 solid-state 120-watt stereo power amplifier

With one devastating move, Marantz has check-mated all existing power amplifiers. The strategy was straightforward—build an amplifier to a set of specifications bordering on the far edge of the possible, then add a series of unique features to complete the coup. □ The 15's specifications are designed to test the mettle of your other components, while allowing them to perform to the limit of their abilities. *Power output*—60 watts per channel, with safe, full-power operation from 20 to 20,000 Hz. *Harmonic distortion*—less than .1 at full power, infinitely better than any other amplifier. *Hum and noise*—better than 90 db below 60 watts. *Response*—±1 db from 10 to 60,000 Hz. □ As playing partner to these performance characteristics, Marantz has created features of equal caliber. A safety circuit rendering short circuits completely harmless, even at full power. Instantaneous, distortion-free overload recovery. Separate power supply for each channel. High input impedance, permitting the use of even tube pre-amps without distortion. □ If having the finest power amplifier ever built is important to you, there's no need to ponder your next move. See and hear the 15 at your Marantz dealer's immediately.

marantz
A SUBSIDIARY OF SUPERSCOPE, INC.

FOR FURTHER INFORMATION, WRITE MARANTZ, INC., 37-04 57TH ST., WOODSIDE, NEW YORK 11377, DEPARTMENT C-17

Check No. 55 on Reader Service Card.

LETTERS

Indexing

SIR:

I have been a keen follower of your magazine for several years now and I would like to submit a suggestion, since AUDIO offers far more than casual reading—its articles form a most valuable reference library.

The difficulty, of course, is when one wants to refer to an article, he has first to remember in which magazine it appeared—was it AUDIO? *EW? PE?* Having solved that question, one has to turn to his 100 or so AUDIO magazines and start wondering about which issue.

In most technical publications the trend seems to be to print an index in the last issue of every year or in an early issue of the succeeding year. This is usually in detachable form and the articles are usually cross-referenced by subject as well as listed by authors.

I hope that you will give this a little thought and perhaps issue a starting summary covering, say, the last three years, and adding to it annually during December (when the staff is on holiday). (*What* holiday Ed?)

MICHAEL STACE,
358 Broadway,
Miramar,
Wellington, N. Z.

(Apparently Reader Stace is not a reader of our December issues. Since 1948 we have carried an annual index in each December issue. We are, however, considering an index of all *issues of* AUDIO *from 1947 through 1966 to come out in May, 1967, which is our twentieth anniversary. Does any other thousand readers think this complete index would be useful? You can help us decide. Ed.)*

Personalia

SIR:

For several years I have been a subscriber to AUDIO, and I enjoy all I can understand of it.

May I offer a suggestion? I'd like to know more about the people responsible for our audio equipment. Would you be interested in running articles about the leading persons in the high fidelity industry? The answers to questions like these, I think, would be quite entertaining: Who is Mr. McIntosh (or H. H. Scott, Paul Klipsch, Edgar Villchur, and son on)? What is he like—jovial, reserved, tall, young, old, soft-spoken? Where did he get his technical education? What were his first products? How large are his current manufacturing facilities? Perhaps an interview with questions on various aspects of the high fidelity business, industry, hobby, and culture would be readable.

You people intimately associated with the industry know all of these things about the interesting personalities of the field, but we everyday lay listeners seldom have sufficient contact with those who contribute so greatly to oudr music enjoyment.

JOHN R. EMBLEN,
411 South Vine Street,
Plainfield, Ind. 46168

(We think it is a great idea—we shall see if the personalities involved will agree. Ed.)

The Elusive Thermistor

SIR:

Can you please give me some information on the Veco 32A50 Thermistor, or any replacement for it? It was specified for the "Solid-State Wien-Bridge Oscillator" in the July, 1965, issue. This thermistor is not available in Canada nor is there any information available on it.

L. W. VYFSCHAFT,
801 Therrase Lecavalier,
Ste. Dorothee, Quebec,
Canada

(There have been many inquiries about this thermistor, so we will repeat the information. The Veco 32A50 is manufactured by Victory Engineering Company in New Jersey, and available from Newark Electronics Center, 160 Fifth Ave., New York, N. Y. 10011, at a cost of about $6.60 each. If you order one, be very careful when you open the pill box in which they are "packed." You will think they forgot to put the thermistor in the box. The author described it as "an anemic fly speck," which was a masterpiece of understatement. It looks more like a minute grain of ground pepper with two half-inch leads of (about) #40 wire attached. Ed.)

Meet the Mediterranean, the speaker she won't have to hide to enjoy.

Here at last is cabinetry she can revel in. Rich. Striking. Its deeply grained exterior hand-rubbed to a mellow butternut finish . . . accented with antique hardware.

And inside . . . the finest 3-speaker system with Sonic-Control.

But let her see it, hear it for herself. It's Mediterranean — the one both of you can live with — on demonstration now at University dealers everywhere!

SPECIFICATIONS: 12" ultra-linear woofer, 8" solid-back mid-range, reciprocating flare horn tweeter — 20 Hz to beyond audibility — 50 watts IPM (Music Power) — 8 ohms — ¼ and ½ sections, 6 and 12 db/octave electrical network — 800 and 5080 Hz crossovers — continuously variable Brilliance and Presence controls, 3-position variable bass switch—24⅜" dia., 22½" high—Shipping weight, 74 lbs.

UNIVERSITY SOUND
A DIVISION OF LTV LING ALTEC, INC.
9500 W. Reno Oklahoma City, Oklahoma 73101

Check No. 57 on Reader Service Card.

AUDIO CLINIC

(from page 4)

There was a time when I would have said very definitely that you should not use 300-ohm shielded lead-in cable because the losses in this cable were high. However, the picture is changing, and a good grade of such cable should have no more loss than coaxial line. This twin lead does have the further advantage that no baluns are needed to match the antenna's impedance to the transmission line and the TV set's impedance to the transmission line.

If you are to keep your losses in coaxial lines to a minimum, you should use RG9/U rather than the RG59/U. The RG9/U is harder to work with than the RG59/U and it is more expensive, but the losses are considerably less. The only cure for ignition interference is more and more signal, and this can be achieved in one way by keeping losses down to their lowest possible level. If you wish to reduce cable losses still further, you will find that there are some double shielded, silver-plated coaxial cables on the market which have very low losses per one hundred feet. However, they are very expensive, costing thirty-five cents per foot or more.

I would say that the increase of antenna height from 30 to 40 feet above the surrounding terrain will have little visible effect. You probably would have to double the height of your antenna if you are to receive better performance. Doubling the height would have two things in its favor. Signals would be received more strongly; ignition noise would be reduced because the antenna is further removed from the source of the noise. Sometimes, though, a small increase in antenna height as you propose can lead to dramatic improvement in reception, especially where there are some hills between the receiver and the transmitter. That extra height may be just sufficient to clear the tops of some of the hills and this will bring about a noticeable improvement.

You can tape coaxial line and shielded twin lead to the mast along with the rotator cable, but the use of standoff's makes for a neater installation, easier to dismantle if work has to be done on it.

I would not always say that doubling the signal strength at the receiver will not be too noticeable. True enough, there will be only a three-dB increase in signal strength, but, if the received signal is at the threshold of limiting, this extra three dB may be sufficient to give you a tremendous aural improvement in reception. I do not know how this might affect the video quality.

You might try a booster mounted directly at the antenna. This will increase the signal strength of all signals, plus the noise. However, the limiting in the set will offset the increased signal strength of the noise. Therefore, the signal-to-noise ratio of the booster must be better than that of the TV set or the signal will suffer from excessive hiss level. AE

Six ways to go stereo, Sony-style...

1 — Model 200 Portable Solid-State Stereo Tape System. Under $199.50
2 — Model 660 E.S.P.-Reverse Solid-State Stereo Tape System. Under $575
3 — Model 260 Radial Sound Solid-State Stereo Tape System. Under $249.50
4 — Model 350 Three-Head Solid-State Stereo Tape Deck Recorder. Under $199.50
5 — Model 250-A Perfect Playmate Solid-State Stereo Tape Deck Recorder. Under $149.50
6 — Model 530 Quadradial Sound Solid-State Stereo Tape System. Under $399.50

SONY SUPERSCOPE The Tapeway to Stereo®

AMERICA'S FIRST CHOICE IN TAPE RECORDERS

For information on any of the models illustrated or on the rest of the best from Sony, write Superscope, Inc., Sun Valley, California, Department L.

Check No. 59 on Reader Service Card.

AUDIO ETC.

Edward Tatnall Canby

I. 12-Trackery

I'll hafta pass on to you a bit of hot news out of our distinguished contemporary news sheet, The *Billboard*, sent to me by a Massachusetts AUDIO (and *Billboard*) reader. It concerns an old familiar name, familiar to me, at least—Muntz. Is this the same guy who used to be called Mad Man Muntz and sold something or other like mad—autos, I think?? (*Yes. Ed.*) Anyhow, now he's going in for 12-track.

Yeh, 12-track. *Billboard* says that originally the Muntz concern was going to call their new CAR-tridge tape player by some ordinary trick name, like Stereo-Pak, which is part of its name now. But they figured they'd do better by bringing in the 12-track aspect—people sit up and take notice when they hear that. Don't you? I did.

How does Muntz get 12 tracks on his stereo playback? Well, it's very simple, a combination of happy advertising semantics and ingenious engineering. Muntz knows that people like big numbers. Muntz says that one of the big auto makers went over to 8-track simply because they figured it sounded twice as good as 4-track. Probably very true. (And 4-track was twice as good as 2-track, which back around 1950 or so was twice as good as one-track.)

This Muntz Stereo-Pak, you see, is compatible. It will play anything. It'll take 4-track CAR-tridges and also 8-track CAR-tridges. That's where the ingenious engineering comes in. And the 12-track? That's where the semantics part takes over. The Muntz Stereo-Pak, the ad people say, and *Billboard* tells us, "offers 4-track for quality, 8-track for quantity, and 12-track because it's both combined." Happy days are here again. —And thanks, *Billboard!*

While I'm on the subject, I'm greatly bothered by a word increasingly being used instead of CAR-tridge, this insidiously, snobbishly frenchified thing called a *cassette*. A cassette is a cartridge in elegant language.

The trouble with it for me is that, being a French-derived word (with that suffix "ette," meaning little, on the end), it has for me French connotations. Now I speak French, elegant or otherwise. And so I keep hearing the rest of that word, cass—. *Casser* in French means to break. It's the standard word for general usage. *Cassé* means broken, smashed out of order, inoperable, snafued, unusable, etcetc. A *very* negative implication. It's even used the other way 'round—*incassable* means unbreakable. I got a gadget from France recently with a plastic handle that was marked *Nylon incassable*.

We looked up the word cassette in our Merriam-Webster. Ed. Canby is correct when he calls out the French word CASSER *as meaning to break. But cassette is derived from* CASSE, *French for case. If it had been spelled* CASSÉ *it would come from* CASSER, *but according to the dictionary, it is not. Ed.*

You get my feeling? When I see *cassette* I think of breakage. Now that's a very poor sort of thought to have, isn't it?

If 12-track is an optimistic, positive addition to 4-track and 8-track—then cassette is a decidedly negative word for CAR-tridge. All sorts of dangerous wrong ideas might get implanted in the consumer mind.

I've had enough trouble with cartridges for tape as it is without being reminded that sometimes, once in awhile, they BREAK tape, or tangle it up, or jam it into knots. Nobody would ever buy a tape cartridge (or a movie film cartridge) if they thought there might be even the SLIGHTEST possibility of a jam-up. There isn't now. Very, very seldom. So then why go around calling your plug-in tape something that means BREAK, or suggests that dire possibility to the sensitive, fear-stricken mind (and pocket book)?

So, why not a positive word instead? The power of positive thinking, à la Muntz! My helpful suggestion is as near as you can come to the word *cassette*, but it means—it suggests—just the opposite. In French, *fabriquer* (fabricate) means MAKE, just as *casser* means BREAK.

And so why not eliminate the unfavorable image, the negative thought, and call these little plug-in tapes *fabriquettes?* They MAKE (music); they don't BREAK (tape).

Come on now, Mr. Muntz, when is your new 12-track Fabriquette Stereo-Pak going to be ready? I'm getting positiver and positiver by the minute.

II. Two Omnis and a Cardioid

I mentioned in October that I had been using a very nice little mike—a pair of them—for my slow-speed super-fi experiments. They were Vega 20s, along with a pair of Vega power supplies, and I now report a bit more fully on their externals.

The Vega 20 is a condenser . . . oh-oh, I mean a *capacitor* microphone. Like all of its breed it must have an associated power supply, to furnish the super-beautiful d.c. that goes out to the mike head and comes back neatly modulated with a super-flat audio signal, than which there can be no whicher.

So we have two components to deal with for each condens . . . capacitor microphone. Though dynamics, ribbons, ceramics et al. continue to blossom forth in new and improved models, for the very finest in pure sound reproduction the engineers continue to use capacitor mikes in the majority of their fanciest operations. The Vegas are among recent newcomers in the field, out to compete in more ways than one with the established super-mikes, including the well-known German and Japanese models.

The Vega 20 is small and very good. It's the smallest mike (and the smallest power supply) I've run into myself, though I don't claim to survey the field every other day. This mike is up in the category where I really can't do much in the way of sound evaluating—I could not possibly hear its microscopically tiny aberrations, if there are any. I leave that to our competent measuring pros. This is like measuring the reflectivity and distortion of a top quality plate glass mirror! As far as the eye is concerned, the mirror isn't there. As far as the ear goes, the Vega sound is simply the source of sound. Period.

(Well, let's see now, they do give some specs, in case you'd like to know what *they* say. You get 20 to 20,000 Hz plus or minus 2.5 dB, which is getting down into the amplifier range of flatness; distortion figures are less than 0.3 per cent at 120 dB s.p.l.)

Always keep in mind that the transducers at the two ends of the audio chain are still the big sources of non-fidelity, speakers being by nature and bulk the most unfaithful of all. As you can see, mikes are now getting to be pretty close to sound-transparent transducers, from the physical sound wave into electrical signal.

Anyhow, on the first occasion where I used these Vega 20s—I got two separate power supply units, though there is a single stereo power supply unit for two mikes—I didn't actually get to operate them myself. I was conducting a public concert of my Canby Singers and I had a skilled audio pro on hand, who just happens to be the husband of one of the singers, to do the actual recording. I merely heard the results afterwards and was very impressed, as were we all. The little mikes worked flawlessly.

I noticed, by the way, that the problem we had under identical conditions several years ago with a pair of German capacitor mikes did not occur this time —overloading. The German model had a level-set on the mike. In the excitement of the concert we didn't turn them down far enough. So all the loud passages were distorted. Vega doesn't have any such adjustment, and the mikes took all we fed to them. (Choral music is notoriously tricky in this respect due to the violent peaks of transient sound which occur as the voices sing in en-

the smoothest, quietest, gentlest, automatic turntable ever designed

The new Miracord 50H achieves a playback quality beyond the capabilities of any other automatic available today. And it accomplishes this with the mechanical reliability, record-handling gentleness and operating simplicity, characteristic of all Miracord turntables.

The 50H embodies every feature known to modern turntable design, and includes several exclusive innovations of its own. It is strikingly handsome, trim and uncluttered, and its very appearance reveals the care and attention lavished on its construction.

The Miracord 50H is powered by a hysteresis motor, assuring locked-in speed accuracy. And it provides the simple, gentle facility of pushbutton operation.

It is also equipped with a dynamically balanced tone arm with interchangeable cartridge insert having a simple, slotted leadscrew control for precise stylus-overhang adjustment. A retractable stylus-position indicator is located on the turntable deck.

The 50H also provides cueing facilities, anti-skate compensation and direct-dialing stylus force adjustment to less than ½ gram.

At $149.50, less cartridge and base, the Miracord 50H is probably the most expensive automatic in the field. This is entirely understandable when you consider it is also the finest. See it at your high fidelity dealer, or write. Benjamin Electronic Sound Corp., Farmingdale, N.Y. 11736.

semble.) The Vegas don't seem to have an overload problem at all.

Our *only* problem, in the two-channel stereo tape we turned out, was in the acoustics of the building, the Town Hall at Cornwall, Connecticut. It's modest, peaked-roof auditorium is ideal for live concerts (and lousy for town meetings!) but isn't good for recording. A too-bright sound, a shortish reverb (by today's fashion) and a certain amount of wall "slap." Odd how different are the requirements for recorded and live musical sound!

On the second occasion when these mikes were used to take down a "formal" recording (as opposed to assorted trials of the "testing, testing, woof-woof" variety) I found myself strictly on my own. I wasn't performing this time—it was a home-grown folk-music evening, with audience. I presided at the tape recorder, off to one side, jumping up now and then to rearrange my mikes as the performing personnel changed—solos, duets, sometimes five or six people both playing and singing, occasionally the audience joining in too. That took a lot of jumping.

Now this time I did my own hauling and setting up and I really got to know the feel of these Vega mikes in person. And thereby hangs the rest of my tale. Or should I say tail? I committed an awful boo-boo and went home with my tail between my legs. Evidently at some point I managed to give one of the Vegas a solid whack. And I discovered that it was inoperative. That is, I did after I had spent the usual frantic fifteen minutes checking everything else *but* the mikes for one dead channel, while the concert went blithely on, unrecorded.

You see, this little mike is so tiny and inconspicuous that you have a sort of tail-wagging-the-dog situation. There's a great big 20-foot coil of 4-conductor cord, and at the end of it there's this little thing hanging, about as heavy as, say, a well-filled matchbox. When you pick it all up, you pick up the cord, of course. And the mike comes along for the ride, swinging loosely at one end. It doesn't have a handle on it and it's too small to grab without thinking, the way you grab one of the big old heavyweight mikes. Definitely, the 4-conductor tail wags the little mike.

In fact, the Vega is just exactly the right weight to swing around and hit things. If it were still lighter, it would be as safe as a feather. If it weighed more, you'd treat it more carefully. But what it does do is bounce. In fact as I was writing this, looking at it in my hands, the darned thing bounced itself off the edge of my typewriter table, right in front of my nose. It is dreadfully bounce-prone.

So mike No. 1 worked fine, No. 2 was inoperative—and I know very well that *both* mikes got bounced many times more than once while I had my nervous hands on them! Actually, they are very tough little mikes. The other one still works perfectly, bounce or no, and the inoperative one (it may have been no more than the nuvistor inside acting up, I could guess) was repaired pronto by Vega and is back in action again, ready for more whacks.

So—I drove hastily home 4 miles and back 4 miles, arriving at the concert about seven minutes later with a substitute—a cardioid mike. Interesting. The rest of the session was stereo with one cardioid and one "omni"—the Vegas are omnidirectional—and I found myself with the equivalent of a spot and a flood in lighting terms. That cardioid pattern turned out to be an unexpected bonus in terms of versatility for the ever-changing set-up of the folk-song groups. I could "spot" one singer against a "flood" of background accompaniment, accentuate this or that instrument, get close-up effects at quite different distances depending on whether I used the omni or the cardioid mike. I recommend this combination highly if you are recording any sort of quick-change situation and can rearrange your mikes to suit.

Anyhow (and back to Vega), I was happy as a lark with the Vega mikes except for the one trouble, the tail-wagging effect, and accordingly I have only one suggestion to the Vega people—they should make their little mike head detachable, like a pickup cartridge. It shouldn't be permanently hooked to those 20 feet of heavy cable. Then, you see, you could transport it in its own neat little velvet-lined box (or something), and plug it onto the cable when everything was set up.

Yes, I suppose this would add expense and maybe some problems of shielding and capacitance in the connectors. They could be solved, I'll bet. Worth it.

The Vega power supplies are also miniaturized, relatively speaking, and I found them happily designed for practical use. I remember my first condenser mike (it *was* a condenser in those days), the old Altec "bottle" mike, which seemed pretty tiny in its era. Its cable was a blarsted nuisance, stiff, uncoilable, with a nasty mind of its own. (Even the detachable feature didn't help much.) And the Altec power supply, was a small metal suitcase, heavy and sharp-cornered. Well—that was long ago and Altec didn't have transistors and nuvistors, nor the latest in miniaturized components, available to Vega today. The Vega power supply is a small miracle of lightweight compactitude, by 6½ by 2½ by 2¾ inches, weighing four pounds, in brushed aluminum and black leatherette with raised rounded edges so the box doesn't snag wires, clothing and flesh. Considering the requirements, notably that superduper filter to supply d.c. with NO hum, I figured they've done a very nice job. (Note the potent filter capacitor—1000 μF at 15 volts, double-pi arrangement I think.) There's a bass filter switch, an on-off and an impedance switch—very useful for the semi-pro recording man who is often involved with both impedance levels. Plus an IN Cannon socket, 4-prong, and a standard 3-way OUT socket. It draws all of 8 watts.

(Continued on page 73)

For people who really listen, we offer the first receiver with $400 specifications that sells for $279

ADC 606

90 watt, solid-state, FM Stereo Receiver

SPECIFICATIONS

Amplifier Section

Power:
90 watts (IHF) @ 4 ohms
70 watts (IHF) @ 8 ohms

Total Harmonic Distortion:
@ rated output, .5%
3 db below rated output, .2%

IM Distortion:
@ rated output, .5%
3 db below rated output, .3%

Frequency Response:
10-60,000 Hz ±1 db

Hum and Noise:
With volume control minimum, —78 db
Magnetic phono input, —65 db
Musical instrument input, —60 db
Auxiliary input, —75 db

Input Sensitivities:
Magnetic phono, 3 mv
Musical instrument, 50 mv
Tape, 100 mv
Auxiliary, 100 mv

Tuner Section

Usable FM Sensitivity IHF:
1.6 uv

Harmonic Distortion
(100% modulation): .5%

FM Stereo Separation:
35 db at 400 Hz
32 db at 1,000 Hz
20 db at 8,000 Hz

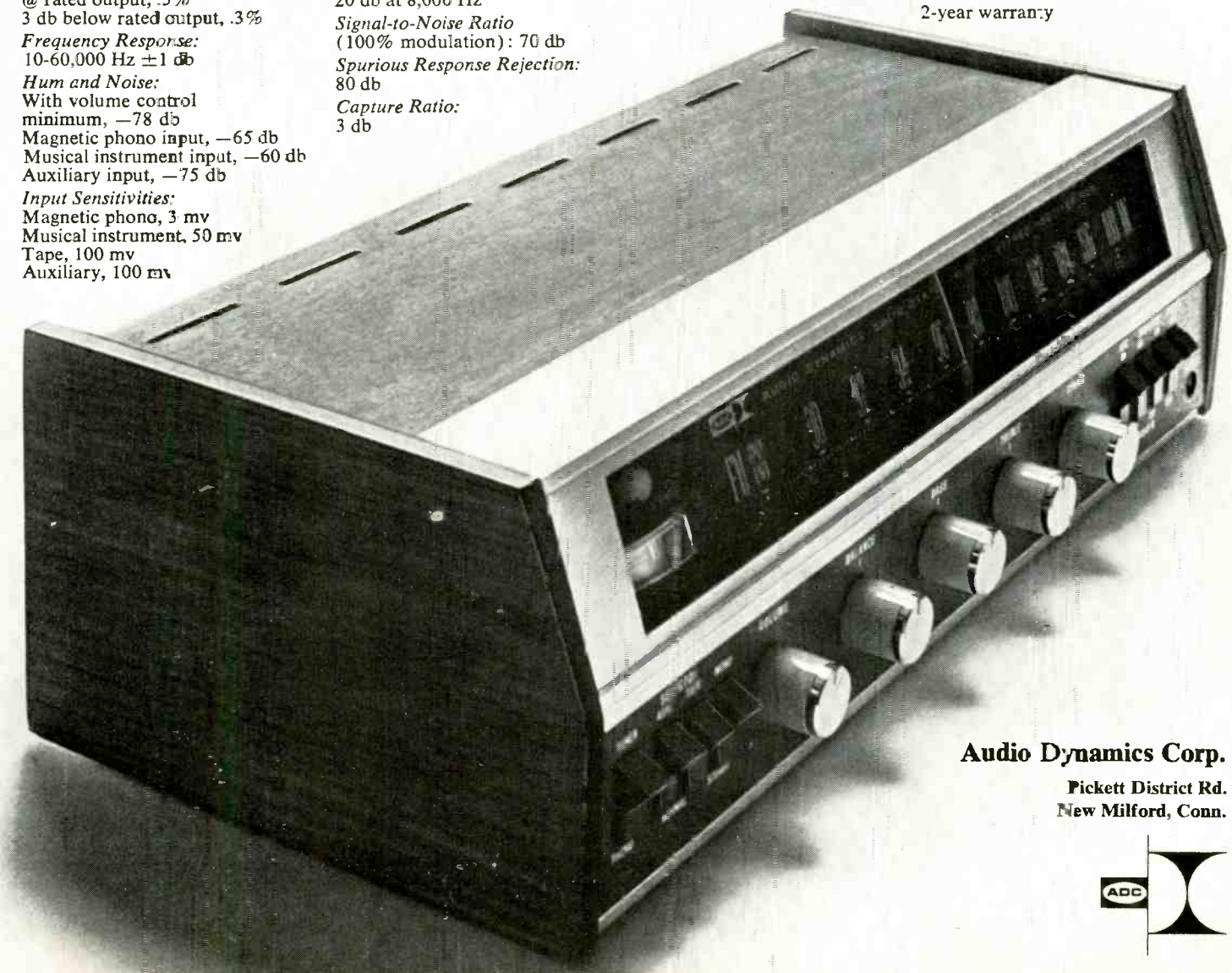
Signal-to-Noise Ratio
(100% modulation): 70 db

Spurious Response Rejection:
80 db

Capture Ratio:
3 db

FEATURES

First, true bookshelf depth: 17" wide, 5" high, 9" deep
Side panels eliminate need for separate cabinet
Large, readable, FM dial
Complete tape playback and monitoring facilities
Headphone jack
Musical instrument input
Automatic frequency control (switchable) for FM
Independent control for 2 sets of speakers
Each channel separately fused, plus main power fuse
Automatic FM stereo switching
2-year warranty



Audio Dynamics Corp.
Pickett District Rd.
New Milford, Conn.

ADC

AUDIO FUNDAMENTALS / *Ivan Berger*

This is the first of a series directed primarily toward the neophyte, though the more advanced audio buff will find much that is valuable here. Ivan Berger, who will host these pages is an audio columnnist for the Saturday Review and a well-established freelance writer. In coming months Mr. Berger will take us on a comprehensive tour of the essentials we sometimes take too much for granted.

EVERY MOVING OBJECT sets up vibrations in the air. If these vibrations are not too slow or too fast—occurring between about 20 and 20,000 times per second—we hear them as sound.

The basic aim of high-fidelity equipment is to reproduce, exactly, in your living room, sounds originally made at other times and in another place.

This aim of *exact* reproduction has not yet been achieved—if it had, this magazine might not exist—but every year brings us a little closer to fulfillment. We've known since the days of Edison and Bell how to reproduce sound, after a fashion. But to do it exactly—with perfect "fidelity" to the original sound—takes more knowledge of sound and hearing than we currently possess, not to mention more sophisticated engineering than we can currently boast.

Nevertheless, a modern high-fidelity sound system does its incredibly complex job superbly. Consider all that can happen to a sound between the time it is first produced and the time you hear it—perhaps many years and miles away.

First, a microphone must convert the sound into an electrical signal. Then this electrical signal may be converted to a series of magnetic impulses along a tape—in other words, recorded.

This tape recording may be played back at any time, its magnetic impulses re-converted into an electrical signal. If the tape is the master for a commercial recording, it will then be fed to a disc recorder. Here the electrical impulses move a stylus minutely from side to side and also up and down as it cuts a long, spiral groove in a blank phonograph record. These minute wiggles in the spiral groove make a trail that looks—under a microscope—like a track left in snow by a drunken bullmoose. Small as they are, these modulations of the groove embody, hopefully, the record of the original sound. And small as they are, these modulations must be reproduced faithfully when they are cast, and thousands of other records molded from them.

When these records are played back, the stylus of a phonograph cartridge must trace this lurching track, converting the resulting mechanical motions back into an electrical signal.

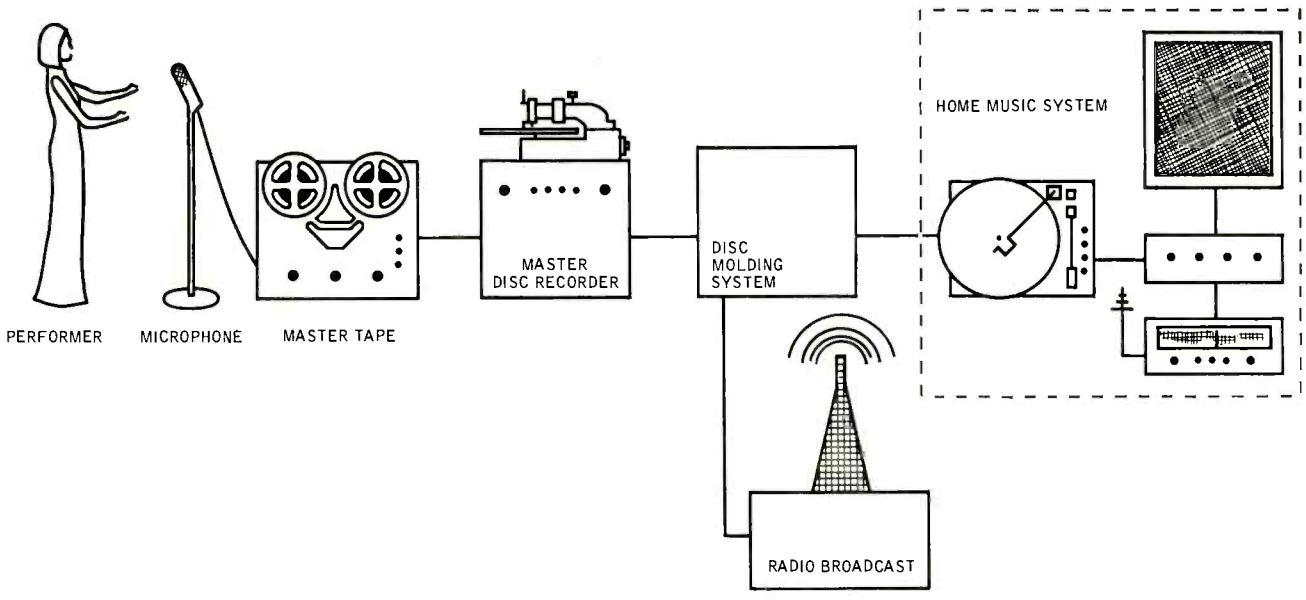
Perhaps the record will be played back at a radio station. If so, the signal will be used to alter either the frequency (FM) or the amplitude (AM) of a radio carrier wave whose frequency is far above the range of human hearing, and thus be broadcast.

Your tuner or receiver picks this signal from among thousands of others in the air and converts it back to a reasonable replica—if all is well—of the original output from the microphone. This signal is then fed to a loudspeaker, which converts it, at last, into sound again.

The astounding thing is not that what you hear is so close to the original sound picked up by the microphone—it's astounding that you hear anything intelligible at all. In its travels, the original sound has gone through perhaps hundreds of tubes and transistors in anywhere from a dozen to a score of amplifiers, has been converted from acoustical energy to electrical, magnetic, and mechanical forms and back again. It has been stored on both tape and disc, sent through miles of wire and transmitted through the air.

And these sounds themselves, were anything but simple to begin with. Virtually any musical recording contains thousands of different frequencies which start and stop at different times, each at its own intensity, within an intensity range of 10,000-to-1 or more.

Next month, we'll discuss the nature and quality of sound, how we hear it, and the two primary units of sound measurement: the hertz and the decibel. Æ



This, in vastly simplified form, is the chain of sound from the original performance to the final enjoyment in the comfort of your living room.

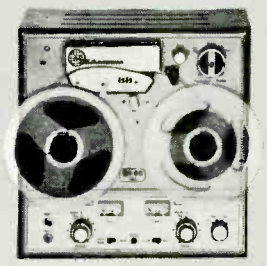
Soundsibility!

Soundsibility — superb sound with sensible features — it's a tradition with Viking tape recorders. In keeping with this tradition Viking introduces the new Model 423 — designed to bring you excellence in performance, true stereo fidelity and the utmost in practical operating convenience.

A three-speed unit with solid state stereo electronics, Model 423 also has three motors for highest reliability. Other features include hyperbolic heads, illuminated recording meters and directional control levers. A remote pause control* fits every Model 423 and lets you interrupt and resume recording or playback conveniently from your easy chair. So sensible even the model number is meaningful — 4 tracks, 2 heads, 3 speeds. Uniquely, with all these features, it's less than $250.00.

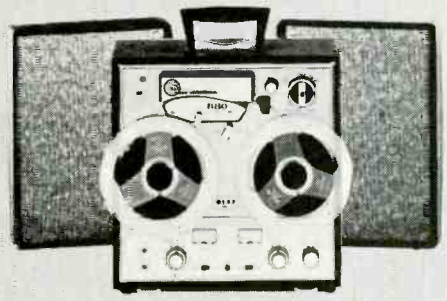
*Remote pause control and walnut base optional accessories.

You'll also find soundsibility in other Viking models which set a standard of excellence for tape recorders.



88 Stereo Compact

The "final touch" for stereo music systems. Features tape monitor with three heads, sound-on-sound recording, exceptional fidelity even at slow speed for less than $340.00.



880 Stereo Portable

Same features as Model 88 plus detachable speakers, power amplifier with stereo headphone output in portable case. Carry along for "on the spot" recording or connect to music system for less than $440.00.

807 "Tape Turntable"

Connects to music system for playback only of all standard monaural or stereo tapes. Features two popular speeds. Use it also to duplicate tapes with another tape recorder. Walnut base included for less than $125.00.

Viking OF MINNEAPOLIS
DIVISION OF THE TELEX CORPORATION
9600 Aldrich Ave. S. Minneapolis, Minnesota, 55420

Check No. 63 on Reader Service Card.

EDITOR'S REVIEW

EVENT OF THE SEASON

FIFTEEN YEARS seems like a long time, particularly in an industry as new, relatively, as is ours. But it will be remembered that last March, during the Los Angeles High Fidelity Music Show, AUDIO announced the formation of its Fifteen Year Advertising Club and the initiation of its first seventeen members —companies which had advertised for fifteen consecutive years or more in the pages of AUDIO or its predecessor, AUDIO ENGINEERING, as your favorite magazine was called in 1951.

Since practically every month brings another advertiser up to the required membership condition—fifteen years' advertising—the occasion of the New York High Fidelity Show in September/October brought in a new list of eligibles to the exclusive Club 15.

In the first home of New York Audio Shows—Hotel New Yorker—AUDIO hosted a luncheon in the Empire Room to which all of Club 15's members, both old and the new initiates, were invited. And just to show the non-member exhibitors at the Hi-Fi Show across the street what they were missing, AUDIO's president, I. J. Borowsky, invited every one of them to the luncheon, including the Board of Directors of the IHF, its headquarters staff, and its counsel, Isidore Minkin. Not everyone showed up, but some 65 did, and—in the words of the country weekly—a good time was had by all.

Seven representatives from the twelve new member companies in "Club 15," were present to receive their plaques in person. Left to right, they are: John Koss, Koss/Rek-o-Kut; Haskel Blair, University Sound, Charles Donohue, Reeves Soundcraft; Editor-Publisher McProud; Peter Schwartz, Magnecord Division of Telex Corporation; Warren Stuart, Belden Mfg. Co.; William H. Thomas, James B. Lansing Sound, Inc., and Ralph Weber, 3M Company.

This was the first time that AUDIO's new officers had an opportunity of meeting the industry leaders, and after suitable introductions the membership certificates, mounted on plaques, were presented to the new members' representatives who were present. Then AUDIO tendered a Certificate of Appreciation to the Officers and Directors of the IHF and its headquarters staff, headed by Gertrude Nelson, who has done yeowoman service to the Institute, to the Industry, and to both industry and general press. Similar certificates were later sent to each of the IHF Board and Staff members.

After pictures were taken, luncheon was served and the group became better and better acquainted—always a good sign at any industry affair.

THE NEW MEMBERS

Advertisers who became eligible to membership in Club 15 in the fall of 1966 are: Ampex Corporation, Audio Devices, Belden Manufacturing Co., David Bogen Co., Klipsch & Associates, James B. Lansing Sound, Inc., Magnecord, 3M Company, Reeves Soundcraft, Koss/Rek-O-Kut, H. H. Scott, Inc., and University Sound. Two were omitted from the list in the November issue.

ONE WE MISSED

We regret exceedingly that we were obliged to decline an invitation to attend a Fiftieth Anniversary celebration and a concert given by the symphony orchestra of Hong Kong on the occasion of the opening of the new North Point Branch of the Tsang Fook Piano Company at 480 Kings Road, Hong Kong.

We had the opportunity of visiting the Tsang Fook store way back in 1962, and meeting Mr. T. S. Law, the General Manager. The company is one of the largest hi-fi dealers in the Crown Colony, and helped to make our visit one to remember. The celebration was held on November 17, beginning in the grand ballroom of the Hong Kong Hilton and with the concert itself in the City Hall's concert hall.

We just can't make 'em all, we're sorry to say.

The total performance cartridge.

New Pickering V-15/3 Micro-Magnetic™ cartridge featuring Dustamatic™ stylus and Dynamic Coupling.

Now, Pickering offers you total performance from all your records with the newly designed V-15/3 cartridge.

The exclusive Pickering V-15 Micro-Magnetic cartridge assures you of the finest in natural sound, while the famous patented V-Guard Floating Stylus provides the ultimate in record protection.

And now, there's a new dimension in the V-15 line. The extremely functional Dustamatic brush assembly for cleaning records *as* you play them, and an entirely new moving system with Dynamic Coupling of stylus to record groove for positive tracking.

There's a Pickering for every installation, from conventional record changers to the most advanced turntable/tone arm systems.

That's *total* performance. Clean records for clean sound.

For free literature on the Pickering V-15/3, plus information on how to choose the correct "application engineered" cartridge for your system, write to Pickering & Co., Plainview, L. I., New York.

For those who can hear the difference. **Pickering**

Check No. 64 on Reader Service Card.

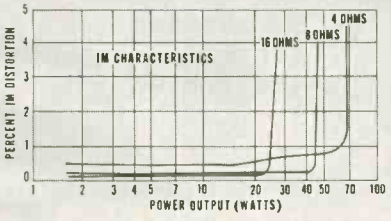
Compare these new Sherwood S-8800 features and specs! *ALL-SILICON* reliability. Noise-threshold-gated automatic FM Stereo/mono switching, FM stereo light, zero-center tuning meter, FM interchannel hush adjustment, Front-panel mono/stereo switch and stereo headphone jack, Rocker-action switches for tape monitor, noise filter, main and remote speakers disconnect. Music power 140 watts (4 ohms) @ 0.6% harm distortion. IM distortion 0.1% @ 10 watts or less. Power bandwidth 12-35,000 cps. Phono sens. 1.8 mv. Hum and noise (phono) —70 db. FM sens. (IHF) 1.6 μv for 30 db quieting. FM signal-to-noise: 70 db. Capture ratio: 2.2 db. Drift ±.01%. 42 Silicon transistors plus 14 Silicon diodes and rectifiers. Size: 16½ x 4½ x14 in. deep.

HIGH FIDELITY says*

"...WE HAVE COME TO EXPECT HIGH PERFORMANCE FROM SHERWOOD, and the S-8800 did not let us down. The tuner section, with its high sensitivity and very low distortion, is among the best in the business—clean and responsive. FM Stereo comes in loud and clear and, as the curves plotted at CBS Labs show, with very ample separation. The usual increase in distortion, when switching from mono to stereo in receivers, was in this set just about negligible. We would say that Sherwood has come up here with another typically 'hot' front end that makes FM listening a sheer joy.

"As for the amplifier . . . comparing the results with the specifications, it is apparent that the S-8800 does provide the power it claims, and this—for a popularly priced combination set—is considerable. A glance at the IM curves, for instance, shows how much power the S-8800 will furnish before it runs into any serious distortion problem at all three impedences. . . . For rated power bandwidth distortion of 1%, the curve ran below and above the normal 20 to 20 kHz band; and the 1-watt frequency response was virtually a straight line in this area, being down by 2.5db at 40 kHz—fine figures for a receiver . . .

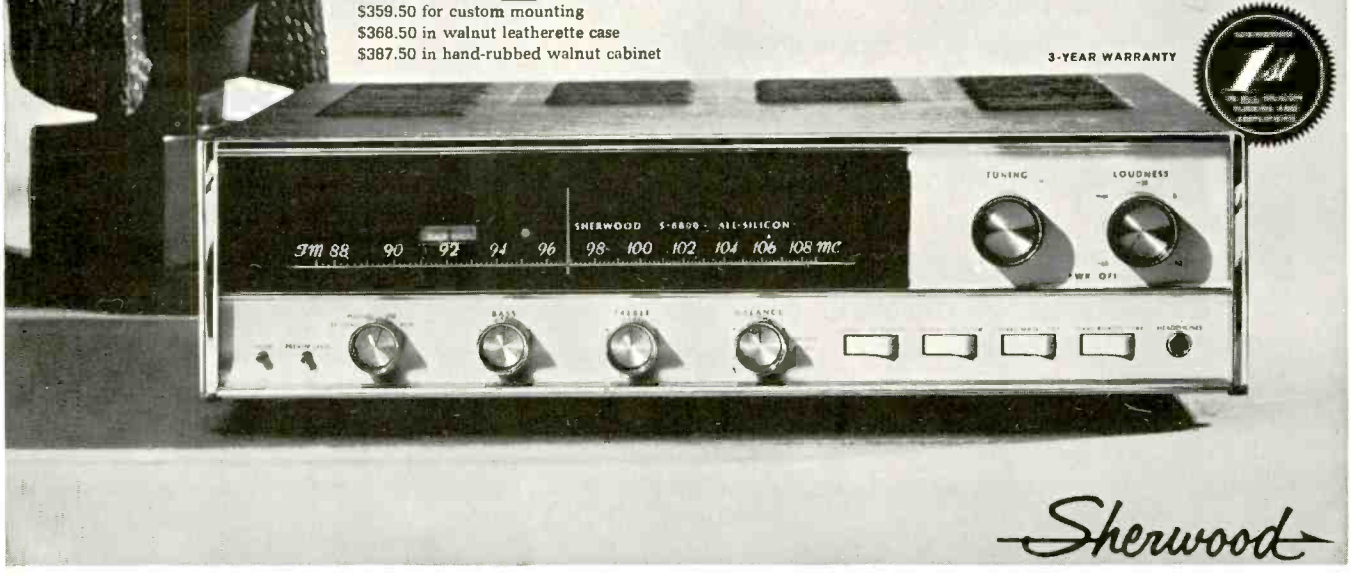
"Those heavy percussion and crisp castanets will come through with just about all the *con brio* the performers have put into them."



*As appeared in HIGH FIDELITY Magazine Equipment Reports by CBS Labs. November 1966 issue.

S-8800 140-watt FM *ALL-SILICON* Receiver
$359.50 for custom mounting
$368.50 in walnut leatherette case
$387.50 in hand-rubbed walnut cabinet

3-YEAR WARRANTY



Sherwood

Sherwood Electronic Laboratories, Inc., 4300 North California Avenue, Chicago, Illinois 60618. Write Dept. A12

The Early Flutter Spoils the Recording

LEWIS A. HARLOW

Every user of a tape recorder occasionally encounters flutter which may be in the recording itself or simply in the playback process. The suggestions given here will aid in eliminating flutter wherever it occurs.

THE EXPERTS WHO USE tape recorders in telemetry and other rarified applications have coined the word "stiction" to describe a fault which, if present at all, nullifies the best professional efforts and makes the tapes completely worthless. "Stiction" is a sticky kind of friction that causes the tape to chatter rather than to flow smoothly by the heads of the machine. In music recording and reproduction with tape, stiction at a somewhat lower frequency is better known as flutter, and with rare exception, the causes of the fast stiction and the slower flutter are the same.

NAB standards specify that flutter shall not exceed 0.2 per cent when recording and reproducing from the same equipment. Most of the good brands of recorders claim this low level of flutter (or even better) in their specifications, and can justify the claim with tests of a new machine under laboratory conditions. An audible flutter is very likely to appear at some later time in the output from this good machine, but fortunately it can usually be reduced to satisfactory inaudibility without the need for outside professional service. The corrective is mostly a matter of a change or two in your habits of tape handling and tape selection—plus a little more good housekeeping than is presently being practiced.

If audible flutter is present in playbacks in the better music room, it is most frequently heard at the start of the PLAY cycle, and often it disappears completely after the first four or five minutes of playing. Slow sustained tones from a piano recording are the most likely to be superimposed with flutter. Almost as bad an offender is the slowly played classic clarinet, probably because the rank and file clarinetist is taught to play with less vibrato than is traditional from any other solo instrument. The classic organ—if its tremulant stop is deenergized—is also very sensitive at showing up the flutter problem in your recorder, but from an organ you never know exactly what to expect in the way of sound and are likely to blame the flutter on the instrument of origin or the taste of the performer. Unless the mechanico-electronic flutter of your tape recorder is very bad, the normal vibrato of a human voice or most of the other solo orchestral instruments will conceal the flutter effectively.

But why should this flutter be worse at the beginning of a tape than later? Why does it usually disappear completely after four or five minutes into the tape? What condition is different at the start to cause the phenomenon?

The obvious difference and the important one is that the take-up reel is starting empty. The function of this reel is to accept and store tape that is fed to it at a constant speed by the capstan. Uninhibited, the take-up reel should want to turn faster than it does—but just a little faster. When empty, the reel turns rather rapidly because the tape is coming onto a core of modest circumference. As the reel fills with tape, as shown in *Fig.* 1, the circumference increases and the reel speed becomes slower and slower. There is a clutch somewhere belowdeck, and the slippage of this clutch permits the speed variation.

By NAB standards, the take-up reel should accept the steadily arriving tape under a constant tension of 5.5 ounces, but it rarely does. The clutch effect, attained in some designs of recorder by motor slippage and in others by slippage of belts or spring-loaded or weight-loaded felt washers, is rarely precisely adjustable. In many recorders, the clutch tension is maintained by coil springs, adjustable by cut and try if at all.

Then there is the matter of FAST FORWARD function which this same reel must perform. This forward movement should be at least fairly fast, and there is required a bit of the clutch which can be considerably more vigorous than the ideal minimum for take-up service.

Suppose, then, that your clutch, by design or disrepair, does not yield to the theoretical demand for uniform tape tension of 5.5 ounces. On a seven-inch reel with standard 2.25-inch diameter core, *the pull at the start of take-up can be three times as strong as it becomes when the reel has filled with tape.* This is just a matter of leverage. It can contribute importantly to the stiction or flutter at the start of the RECORD and PLAY cycles.

the other tape tensions designed into the average-to-good recorder. The capstan pulls with an average tension of 23 ounces—against a drag across the heads of about six ounces. There should be enough factor of safety here so that a somewhat variable pull by the take-up reel will make no difference, but the evidence in practice is quite damning.

And there is professional corroboration that the small empty core of the take-up reel is a troublemaker. In the early days of tape recording, all of the tape manufacturers sold you tape on seven-inch reels with 1.75-inch cores. Then, suddenly and uniformly, the standard changed to 2.25-inch cores. These are compared in *Fig.* 2. Why? Certainly the tape producers would have liked to sell you the extra 150 feet of 1.0 mil tape that the older reels would hold, and certainly you would have appreciated the extra few minutes of playing time per side. Continuous playing time was then (and still is) an important sales feature of recorder and tape specification. There must have been a pretty good reason for the step backward—a reason like the stiction-flutter problem that could be eased by increasing the diameter of the reel core. Commercial recorders have always been equipped for large-core reels, and the very-small-core experiment on the household recorder had turned out to be a bad idea. No better reason has been advanced, and the increase in the standard of core size for the home recorder is still not quite enough.

What to do about it

As previously mentioned, the tape tension adjustments on your recorder (if there are any) are probably extremely inaccessible and should only be approached with professional equipment and skills. This should not be a deterrent, though, to the project of reducing flutter to an inaudible level.

Ideally, there should be no pull at all from the take-up reel. You can prove this for yourself by running the tape over the edge of the recorder and letting it fall to the floor by its own weight and collect in a pile. Try this as you record a test sampling of slow piano, live or from a disk. Now play back the sampling, again disposing of the tape over the edge of the recorder and onto the floor. If you have been bothered by flutter at the start of your piano tapes, now it will probably have disappeared. This cure—playing onto the floor—is of course impractical for a long selection, either recording or playing back, and what you will be needing is a special take-up reel with oversize core—the more oversize the better.

Your special reel with oversize core will require a little finding. It is only recently becoming available as an "empty reel" through the better electronics supply stores and catalogs. The seven-inch reel with four-inch core pictured in *Fig.* 3 was acquired with a recorded RCA-Victor tape on it. The tape, a satisfactory investment in its own right, was then transferred to a standard reel, thereby releasing the special reel for service of great value as a flutter-resistant take-up reel.

Somewhat surprisingly, you can play or record onto this big-cored reel the entire contents of a standard seven-inch reel, the 1200 feet of 1.5-mil or the 1800 feet of 1.0-mil that you would buy as a reel of tape (but not as much as you yourself could wind onto it to its absolute capacity). The 1200 or 1800 feet will load the special reel full but not to the point of spillage, though the reel would not hold this much if loaded by fast forward or rewind; both of these processes tend toward rather loose winding. You can rewind *from* the special reel safely and easily, and this of course you may wish to do to free the special reel for other service as may be needed in flutter-free recording and playback.

If your recorder happens to accommodate no larger than a five-inch reel, your shopping expedition is slightly different. Recorded music tape or a catalog is not the source for a five-incher with oversize core. The five-inch special reel shown in *Fig.* 4 has a 2.75-inch core (instead of the standard 1.75), and it was acquired with a Dubbings test tape on it. Right away the Dubbings tape was respooled onto a standard reel so the big-core special would be available for critical take-up service—like, for instance, a test tape. (And please note the importance which a manufacturer of test tapes attaches to the big-core idea).

This big-core five-incher will accept in take-up the full 600 or 900 feet of tape sold commercially on five-inch reels. Again the special reel is loaded to capacity and would be overloaded if charged by the fast forward or rewind process. The Dubbings Company tape came from Long Island City, New York, and its reel is stamped "American Molded Products Co., Chicago." You can try either source in your shopping. Of course you will not need a big-core five if your recorder will hold the even bigger cored seven previously suggested.

Big-core reels are a chore at best if

(Continued on page 68)

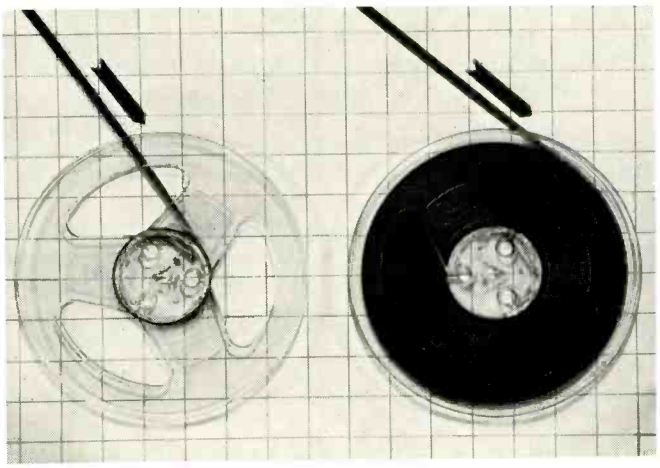


Fig. 1. If the clutch slippage of your take-up reel is poorly adjusted or sticking, the tape pull at the start of take-up (left) can be three times as strong as it becomes later in the take-up cycle.

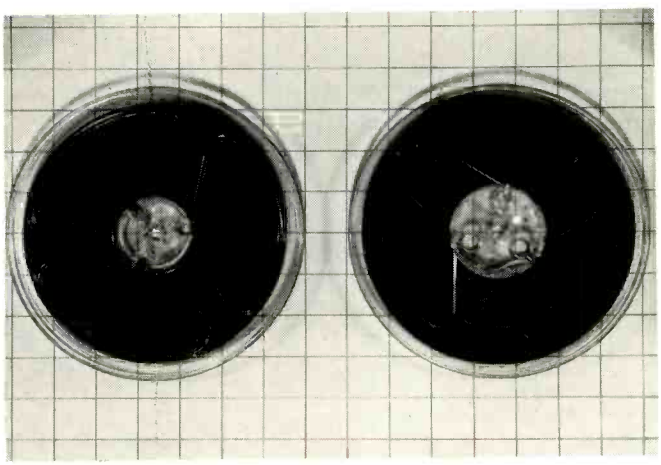
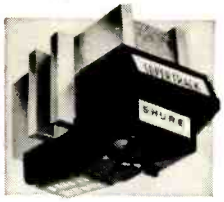


Fig. 2. About ten years ago, the industry increased reel core size from 1.75 inches (left) to 2.25 (right). The loss was playing time but the gain was minimized flutter at the start of play.

the most important advance in phono cartridges since the advent of stereo

THE TYPE II SHURE V-15



...a new genre of cartridge, analog-computer-designed, and measured against a new and meaningful indicator of total performance:

"TRACKABILITY"

The radically new V-15 TYPE II heralds a new epoch in high performance cartridges and in the measurement of their performance. We call it the era of high *Trackability.* Because of it, all your records will sound better and, in fact, you will hear some recordings tracked at light forces for the first time without distortion.

THE PROBLEM:

While audiophiles prefer minimum tracking forces to minimize record wear and preserve fidelity, record makers prefer to cut recordings at maximum levels with maximum cutting velocities to maximize signal-to-noise ratios. Unfortunately, some "loud" records are cut at velocities so great that nominally superior styli have been unable to track some passages: notably the high and midrange transients. Hence, high level recordings of orchestral bells, harpsichords, pianos, etc., cause the stylus to part company with the wildly undulating groove (it actually ceases to track). At best, this produces an audible click; at worst, sustained gross distortion and outright noise results. The "obvious" solution of increasing tracking force is impractical because this calls for a stiffer stylus to support the greater weight, and a stiffer stylus will not track these transients or heavy low-frequency modulation, to say nothing of the heavier force accelerating record and stylus wear to an intolerable degree.

Shure has collected scores of these demanding high level recordings and painstakingly and thoroughly analyzed them. It was found that in some cases (after only a few playings) the high velocity high or midrange groove undulations were "shaved" off or gouged out by the stylus . . . thus eliminating the high fidelity. Other records, which were off-handedly dismissed as unplayable or poor pressings were found to be neither. They were simply too high in recorded velocity and, therefore, untrackable by existing styli.

Most significantly, as a result of these analyses, Shure engineers established the maximum recorded velocities of various frequencies on quality records and set about designing a cartridge that would track the entire audible spectrum of these maximum velocities at tracking forces of less than 1½ grams.

ENTER THE COMPUTER:

The solution to the problem of true trackability proved so complex that Shure engineers designed an analog-computer that closely duplicated the mechanical variables and characteristics of a phono cartridge. With this unique device they were able to observe precisely what happened when you varied the many factors which affect trackability: inertia of tip end of the stylus or the magnet end of the stylus; the compliance between the record and the needle tip, or the compliance of the stylus shank, or the compliance of the bearing; the viscous damping of the bearing; the tracking force; the recorded velocity of the record, etc., etc. The number of permutations and combinations of these elements, normally staggering, became manageable. Time-consuming trial-and-error prototypes were eliminated. Years of work were compressed into months. After examining innumerable possibilities, new design parameters evolved. Working with new materials in new configurations, theory was made fact.

*Thus, the first analog-computer-designed, superior trackability cartridge was born: the Shure SUPER-TRACK*V-15 TYPE II.* It maintains contact between the stylus and record groove at tracking forces from ¾ to 1½ grams, throughout and beyond the audible spectrum (20-25,000 Hz), at the highest velocities encountered in quality recordings. It embodies a bi-radial elliptical stylus (.0002 inch x .0007 inch) and 15° tracking.

It also features an ingenious "flip-action" built-in stylus guard.

It is clean as the proverbial hound's tooth and musical as the storied nightingale.

THERE ARE MANY WAYS TO PROVE ITS SUPERIORITY TO YOURSELF:

(1) Shure has produced a unique test recording called "An Audio Obstacle Course" to indicate cartridge trackability. It is without precedent, and will be made available to Shure dealers and to the industry as a whole. You may have your own copy for $3.95 by writing directly to Shure and enclosing your check. (Note: The test record cannot be played more than ten times with an ordinary tracking cartridge, regardless of how light the tracking force, because the high frequency characteristics will be erased by the groove-deforming action of the stylus.)

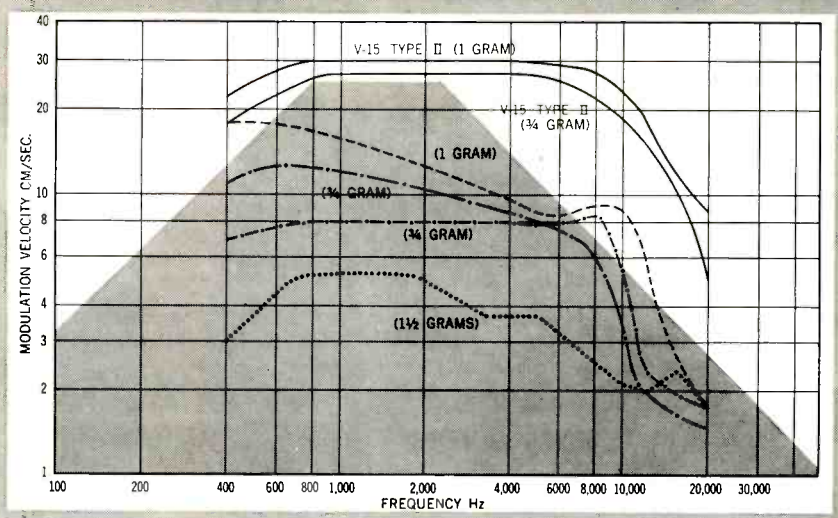
(2) A reprint of the definitive technical paper describing the Shure Analog and trackability in cartridges, which appeared in the April 1966 Journal of the Audio Engineering Society, is available (free) to the serious audiophile.

(3) A representative list of many excellent recordings with difficult-to-track passages currently available is yours for the asking. These records sound crisp, clear and distortion-free with the Shure V-15 Type II.

The Shure Super-Track V-15 TYPE II is available at your dealers at $67.50.

Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois 60204

TRACKABILITY AS A NEW SPECIFICATION:



This chart depicts the new performance specification of *trackability.* Unlike the oversimplified and generally misunderstood design parameter specifications of compliance and mass, trackability is a measure of total performance. The chart shows frequency across the bottom, and modulation velocities in CM/SEC up the side. The grey area represents the maximum *theoretical* limits for cutting recorded velocities; however, in actual practice many records are produced which exceed these theoretical limits. The smoother the curve of the individual cartridge being studied and the greater its distance above the grey area, the better the trackability. The trackability of the Shure V-15 TYPE II is shown by the top (solid black) lines. Representative curves (actual) for other cartridges ($80.00, $75.00, $32.95, $29.95) are shown as dotted, dashed and dot-dash lines for comparison purposes.

*T.M.

Check No. 67 on Reader Service Card.

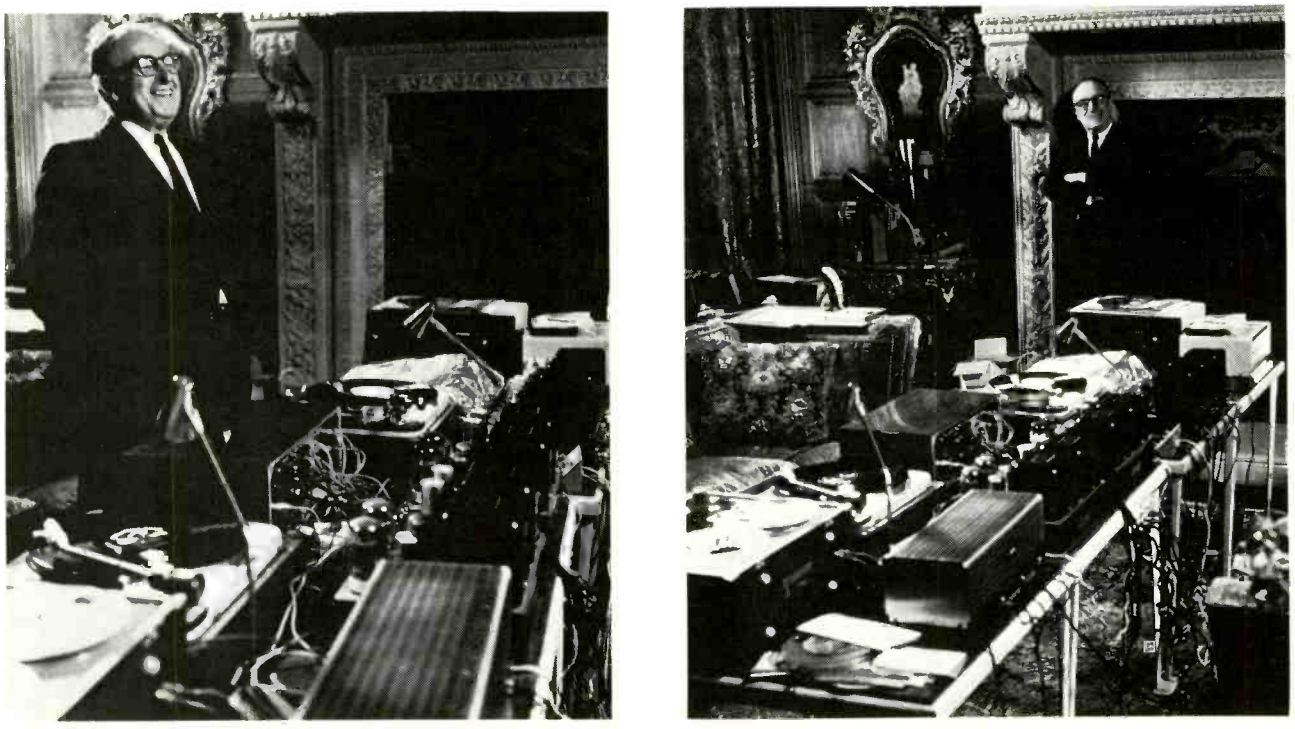
Christmas Is For Tape Recorders

C. G. McPROUD

Shown under what is probably the most famous Christmas tree in the world is an assortment of suggested presents for the audio buff, regardless of his age or current equipment roster — there is always a use for another tape recorder.

OUR CHRISTMAS TREE cover actually did entail travelling some 6000 miles to get the photo, which was shot in the home of Harold Lloyd, who will be remembered by many readers, and whose name is certainly known to all. To the younger generation who were not around in the 20's, Harold starred as a comedian in a series of pictures in which he struggles through the first nine reels as a typical patsy, then came out in the last reel as the real hero, winning the girl and fame and usually his fortune.

A few years ago, Harold started his now famous Christmas Tree, and it is now completely hung with ornaments from admirers from all over the world. We added the recorders ourselves. The tree, which has been written up in many home magazines before, gets fuller and fuller as the years go by. It occupies a good portion of a room in Harold's 40-room Florentine-type villa atop one of the Beverly Hills in California, where he lives with his wife, the former Mildred Davis, who co-starred with him in many of his pictures. In another room —one which most of us would call the living room, even though it is like 25 feet by 50—Harold has some of his hi-fi systems, as can be seen in



The four card tables in the "living room" of Mr. Lloyd's Beverly Hills home.

the photos. When we first saw this installation two years ago, it occupied ten card tables—six have since been transferred to his bedroom, along with their equipment. The "living room" also accommodates three stereo speaker systems, an Ampico reproducing piano, a pipe organ console—the pipes are behind a screen on one of the short walls—and considerable furniture. In spite of appearances, Harold is no midget—that fireplace actually *could* serve as a VW carport.

It was largely because of Harold's hi-fi interest that we were able to invade his home for the picture, along with the fact of having a mutual friend, Dick Simonton, the local Muzak entrepreneur. It was in Dick's home the day after the photo was taken that we were treated to a showing of one of Harold's 1924 pictures, "The Kid Brother," complete with full Wurlitzer organ accompaniment, just as in presentation houses in the silent days. Gaylord Carter, well known theatre and radio organist, officiated at the console of the four-manual, 36-rank organ. (Dick is the only person we know who has two pipe organs in his home, not just one like most people.)

Former screen star Harold Lloyd today.

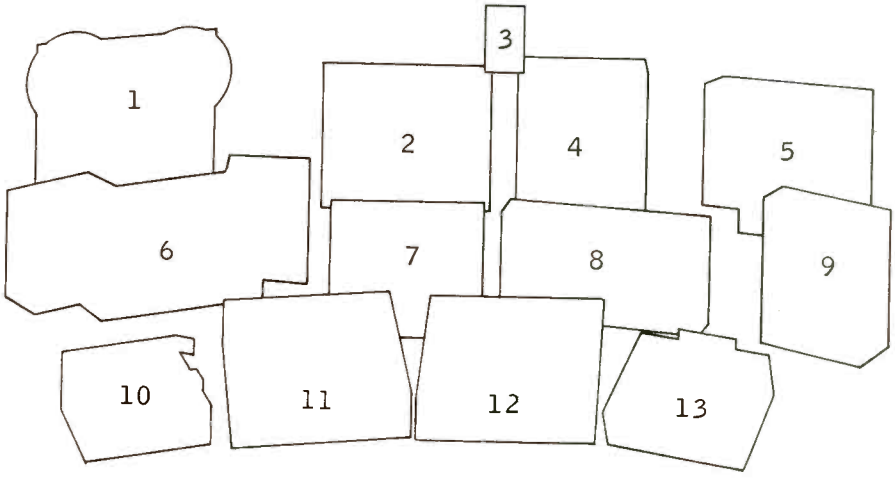
Getting the Tape Recorders

Once the concept of the cover was established there remained only getting permission from Harold, assembling the recorders at a suitable time, and then photographing. Did you ever try to get together seventeen different makes of recorders on a day's notice? We didn't make the seventeen, which was what our Marketing Director told us we should have, but we came close. We missed Viking, Revox, Oki, Lafayette, and Newcomb, although all of these are listed in the Compendium starting on page 51. Our man in Los Angeles drove us around all of one day while we picked up five units, one flown in specially for the occasion. The morning of the scheduled picture taking we visited Magnetic Recorders Company, 7120 Melrose Avenue, in Hollywood, where its president E. G. Van Leeuwen, and sales director George Bozanic, loaned us eight more on our signature, a mere $3350 worth. But we got our signature back when we returned the recorders three hours later.

When we arrived at Harold's home, his houseman carried several of the machines into the living room, mistakenly believing that Harold was only getting some more equipment for his hi-fi installation. We finally put him right, and placed the suggested Christmas gifts at the base of the tree.

When Sid Avery, the photographer, first looked into his ground glass, his remark was, "Ooh, instant Christmas." We decided that since we had called our July cover our first four-color one, we should call this one our first 400-color cover. We got the picture of the tree, then filed into the "living room" for the candid shots. We feel that Harold's installation could well be the inspiration for many hi-fi buffs who also haven't cleared up all the cables in their own rigs. Æ

THE RECORDERS UNDER THE TREE



Recorder identification: (1) Crown 800; (2) Magnecord 1020 (also Heathkit AD-16); (3) Norelco 150 "Carry-Corder; (4) Knight KN-4450, (practically the same as Knight-Kit KG-415); (5) Ampex 890; (6) Concord 700; (7) Uher 9000; (8) Wollensak 5740; (9) Concertone 727; (10) Roberts 6000; (11) Tandberg 12; (12) Sony TC-350; (13) Martel 301.

The WHY'S and HOWS of TAPE SPLICING

JOEL TALL

FIRST OF ALL, like one of the ancients, let me make my apoligia: for one thing, for not having written anything about tape for you since 1952, and for another, for deceiving you for so long by the pseudonym "Edi—." I have been greeted for years by that name and accepted it in good faith, although both you and I know that my real name is Joel. Now, let's get back to the ranch and I shall try to enlarge a bit on the mechanics of tape splicing, a topic which was first discussed at length in my series of articles "The Art of Tape Recording," published in this magazine in 1950. Of course, I may stray a little occasionally in order to intone a stern warning about some malpractice or other, but I'll endeavor to stay with the subject of the above title.

Audio old-timers will remember the work of Jack (John T.) Mullin when he edited the tapes of the old Bing Crosby Radio Show. Watching Jack at work was like watching a magician produce rabbits from a silk hat—it was true magic! He found his edit, cut both tapes with a snip of the scissors, stuck a bit of splicing tape across the joint, trimmed it—and that was that. My splicing speed at that time, by comparison with his, was like the plodding gait of an ox team compared with the flashing speed of a racing car. Then I discovered why. Mullin's recorders, adaptations of Magnetophones (the beginnings of the Ampex), ran at 30 ips, while my recorders, Brush machines then, ran at a speed of 7.5 ips. As you know, difficulty in editing doubles with halving of tape speed—it was about four times as difficult to make a good edit at 7.5 ips as at 30 ips. A noisy splice at 30 ips would be so high in frequency that it would be above the audio range, or so short in duration as to escape recognition entirely, while the same bad splice at 7.5 ips would sound a loud and discouraging "clack." The lesson I want you to absorb, dear readers, is that with tape speeds becoming lower and lower, due to increasingly good quality of tape, play heads and drives, it becomes essential to splice tape with the utmost precision.

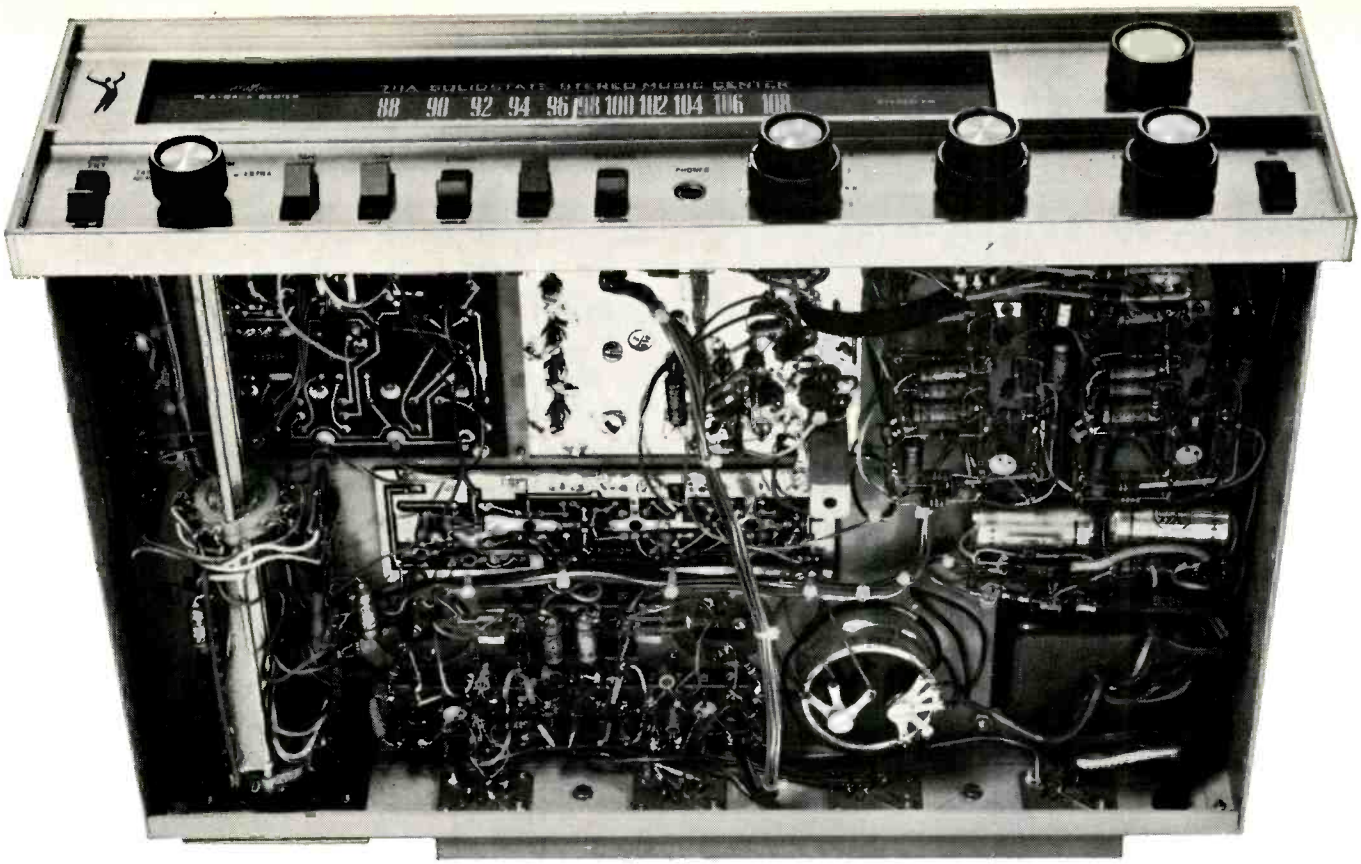
For many years newcomers to tape editing have asked "Just how DO you make a good splice?" There is no single, simple answer to that question. Someone else might say "Buy a ****** tape splicer and follow the directions." Well, no manufacturer as yet has found a way to get users of his product to read and follow directions. It seems that all audio buffs, upon buying a new piece of equipment, figure that their innate abilities make it unsporting to read directions! Nope! Let's turn the durned thing on and see what happens! So, dear readers, I shall not tell you to buy a ****** splicer and follow directions. I shall give you them here, with the *reasons* for giving them, in the hope that when you get through with this article you will join the direction-reading fraternity.

How to Start

Let's suppose you've never spliced a tape before. (I know that is not true but we've got to start somewhere.) Let's say you want to find out where, in that shiny plastic ribbon, you want to stop the recorder, take the tape out of the head assembly and cut it, and then splice it. How can you find out WHERE to cut it? Answer: when you hear the spot at which you want to cut the tape, that spot has JUST PASSED the gap of the playback head. Unfortunately, there is no tape yet that automatically—and visibly—marks tape in writing, or in musical notation. Visible registration systems have been invented, but then you've got to learn to read the registration marks, so you are right back where you started. The most practical way to learn *where to cut* is to train yourself to recognize sounds *at very low speeds* of the tape, as when pulling the tape through the playhead manually with the motor drive turned off. When you have done this, the next time you head what sounds like a sneeze followed by a grunt you will know you have just heard the word "to"! After a few weeks of practice—or a few years—(it took me almost twenty years to learn to edit French!) you, too, will be a top-grade tape editor. Incidentally, although there is no room here to discuss it adequately, when you are in doubt as to where a word—or, rather, a collection of continuous sounds—comes to an end, listen to it backwards. In that way you can recognize beginnings and ends of words or sounds more easily. Be warned, however, that you may be shocked. The word "this," for instance, then sounds like a word not used in polite company since the days of Shakespeare!

So far all the really useful information I've given you is that when you hear a sound it has just passed, or is even just passing, the play-head gap. Should you rip off the covers of the head structure and punch a hole in the tape—or mark the tape with a grease pencil on the head? *No!* Both have been done, but please don't do it. There is a far simpler way—one which is easier for you and creates less wear on your recorder. Find some some place to the *right* of the play head where you can easily mark the tape, on the base side of course. Then *measure* the distance between this spot and the cap of the play head. Then *reproduce* this measurement on your tape splicer, starting from the center of the diagonal cutting slot and measuring to its right. If the splicing block is not long enough, attach it to a hunk of wood or metal, so that you can reproduce this measured distance. If you have one of my blocks, all you have to do is attach it (follow directions!) to the tape deck. After you have performed

(Continued on page 66)



LAST CHANCE TO SEE THE GUTS

(The Altec 711A FM Stereo Receiver is so reliable you'll never have to see it like this again)

Take a close look while you have a chance. That's what all-silicon-transistor circuitry looks like. No audio transformers to cause distortion. No heat-producing vacuum tubes. No heat-sensitive germanium transistors.

Our 711A was the first stereo receiver in the world to use silicon transistors exclusively. That way, you can enjoy years of listening, not tinkering. Silicon transistors are the most ruggedly reliable solid-state devices known to date. (If you need to be convinced, just remember that the military specifies them because they can take up to 100% more heat than germanium.)

Frankly, it's just a matter of time before all components use 100% silicon-transistor circuitry. We were first because we already knew how. (We've been building solid-state audio amplifiers for professional, commercial, and military users for nearly ten years.)

This unique Altec experience has other advantages. It not only made the 711A possible, but possible at the practical price of $378. (You don't wind up paying the cost of educating our engineers.) You do get the kind of over-all quality, reliability and performance that only tangible, state-of-the-art experience can bring. You also get some remarkable specs: 100 watts of power at .5% thd (only .25% thd at 70 watts); frequency response of ±1 db, 15-30,000 Hz; and a sensitive FM stereo tuner with a four-gang tuning condenser that provides the best possible ratio of sensitivity to selectivity to reduce cross-modulation through 80 db image rejection, 100 db IF rejection.

But that's only part of our story. To get all of it, visit your Altec dealer. While you're at it, ask him for the new 1967 Altec catalog.

Forget the guts. This is how the 711A will look to you, year after year.

ALTEC LANSING

A Division of LTV Ling Altec, Inc., Anaheim, California

Check No. 66 on Reader Service Card.

Audio Measurements Course

PART 11

Measurements in the realm of acoustics are considerably more difficult than those of purely electronic components, but they are equally important. In this installment the author introduces the subject and clarifies what is to be measured.

NORMAN H. CROWHURST

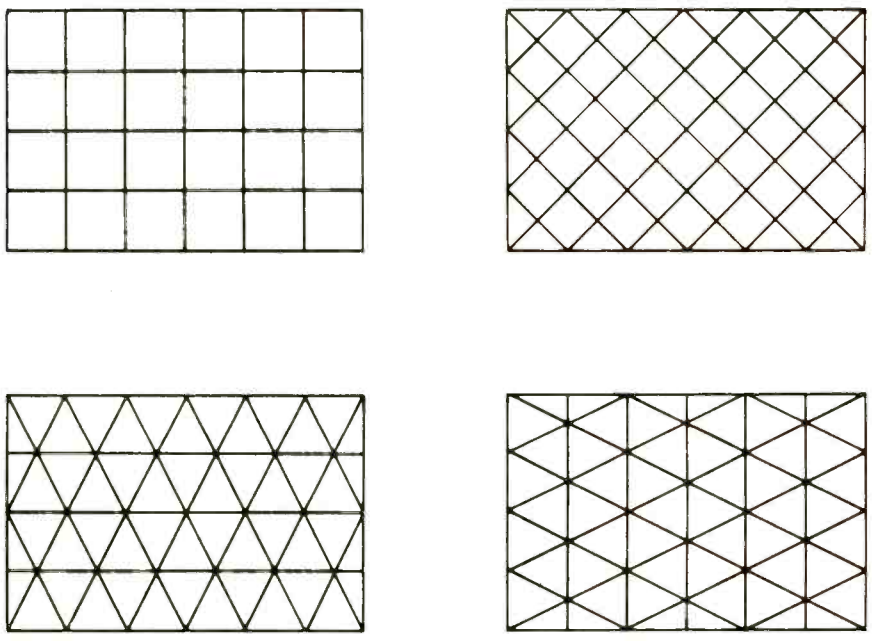


Fig. 11-1. Different standing-wave patterns that build up in the same space, due to different wavelengths corresponding to the different frequencies.

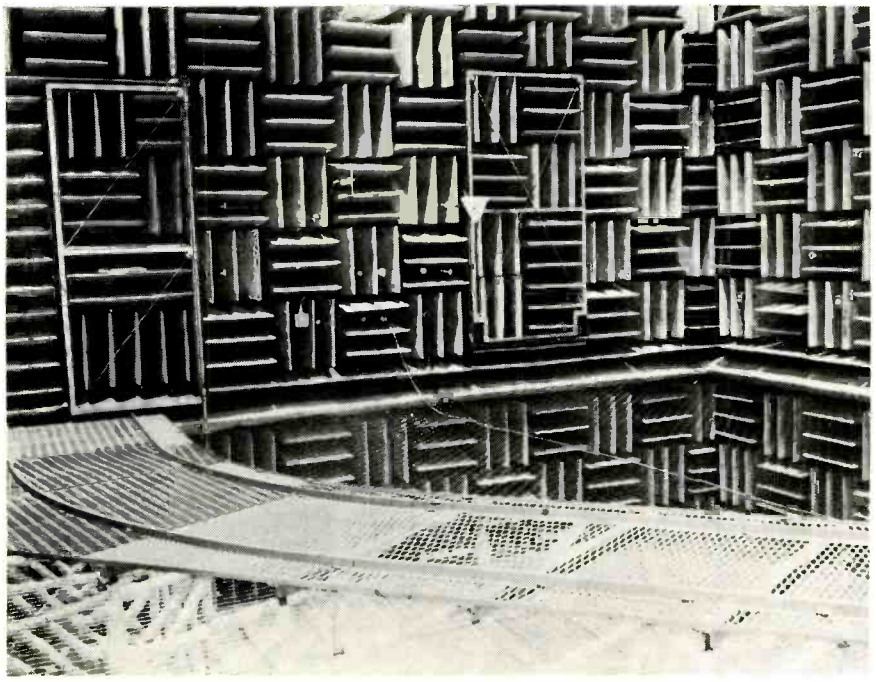


Fig. 11-2. View of a large anechoic chamber. The "dragon's tooth" wedges are made of a highly absorbent (acoustical) material. The expanded-metal or wire mesh floor provides support for equipment and anyone working on it.

AS SOON AS AUDIO MEASUREMENTS begin to include acoustical elements—the radiation of sound waves in space (by which acousticians mean air: in this context the word "space" implies three dimensions, not vacuum!) complications arise. We questioned the obvious one at the end of the last installment: determining the true relationship between electrical and acoustical signal level as reference for frequency losses. We have no way of providing either a perfect loudspeaker or a perfect microphone as a starting point for measurements.

But there are other complications. The three-dimensional nature of acoustical space causes the first: a sound wave does not have the same intensity at any two points in space. In particular, reverberation causes standing waves, which make a pressure pattern build up that is different for every frequency generated in a certain space (*Fig.* 11-1). So points in any particular physical relationship will not exhibit a consistent relationship between their respective sound intensities at different test frequencies.

This source of deviation can largely be overcome by making tests in a free field—that is, out in "the middle of" space, where no reflecting surfaces are within a distance that can cause a significant standing-wave pattern. This procedure is frequently impractical. If you go outdoors, in a really quiet area, miles from any significant reflecting surface, the skylarks will bother you! (Or maybe jet aircraft at 35,000 feet.)

Anechoic Chambers

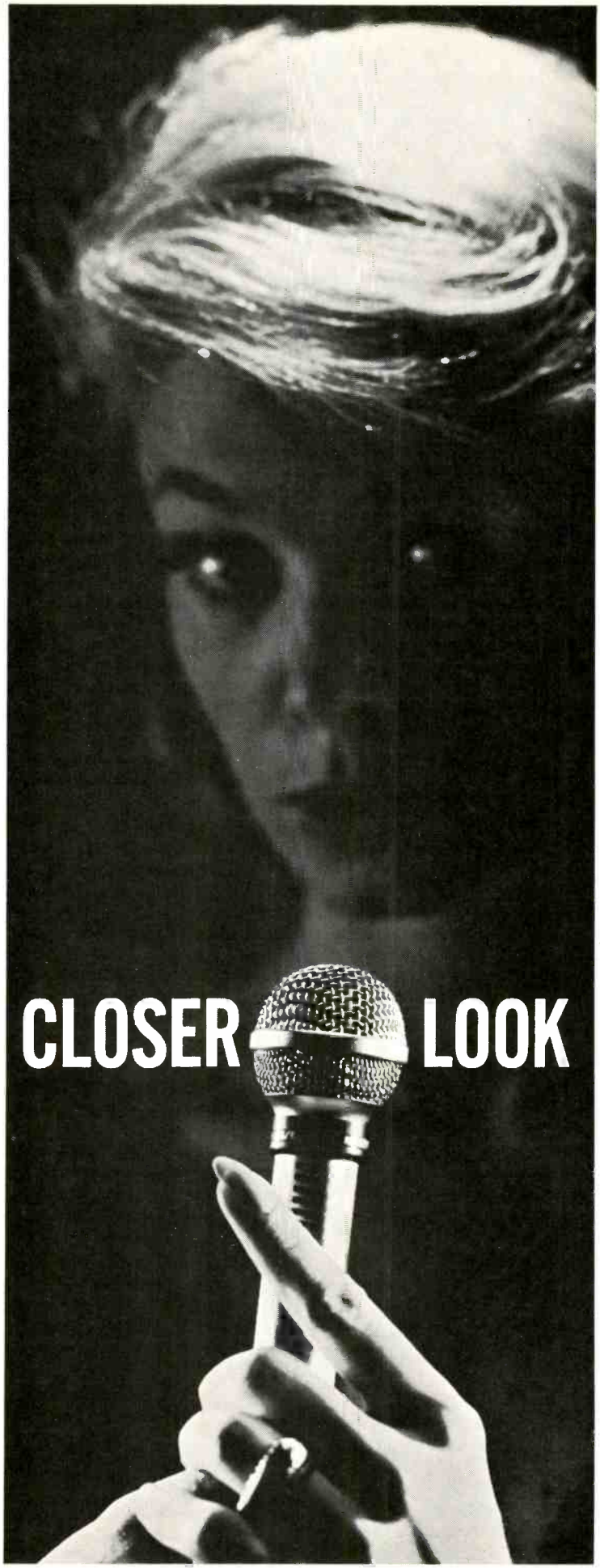
A more practical solution achieves a close approximation to this condition by using an anechoic chamber. This is a room, as large as economically feasible, lined with highly absorbent material, usually in wedges, on all sides, walls, floor, and ceiling, even the door.

In the larger chambers a functional floor (for standing equipment and yourself on, while making adjustments) usually made of expanded

Take a real close look. We are proud of this original microphone used by so many top recording artists. Now, like any successful product, *it is being copied in appearance.* However, there are any number of top performance characteristics, *which we doubt can be duplicated,* which will continue to make the **D-24E** first choice of foremost entertainers as well as recording and broadcast engineers.

The **D-24E** boasts a wide and smooth frequency response (an individually plotted frequency curve is supplied with each unit); no popping nor harshness, plus above average cardioid characteristics to guard against feedback.

Write for details or see your local dealer today. He will show you many more advantages.



COME ON, TAKE A CLOSER LOOK

One step removed, the **D-119ES** provides similar characteristics such as good cardioid and freedom from popping. It may be connected directly to any amplifier — *high or low impedance.* With on-off switch.

MADE IN AUSTRIA BY **AKG** GMBH.

1-66

Norelco® **PROFESSIONAL SOUND PRODUCTS**

NORTH AMERICAN PHILIPS COMPANY, INC.
Professional Products Division, 100 East 42nd St., New York, N.Y. 10017

Check No. 68 on Reader Service Card.

metal, does not materially interfere with sound waves, but provides adequate mechanical support. (*Fig.* 11-2). Tests are made with only the equipment (speaker and microphone) in the chamber, with the door closed. The floor is necessary in the walk-in type, for working access. Smaller chambers used for routine testing don't need any floor, adjustments being achieved by reaching in.

Such enclosures come close to perfect, except at low frequencies (how low depends on chamber size) where the wedges cease to act as absorbers because there is not enough volume for the wavelengths involved. Such low frequencies, with their large waves, "see" the room with its outer walls only.

To avoid spurious sound transfer, the whole room is usually suspended on a mechanical filtering system so that outside sounds and vibrations cannot get transmitted into it by purely mechanical means.

Propagation

So far, so good: we've created artificially an almost perfect environment in which to make measurements. Now we encounter complications connected with an aspect of three-dimensional propagation that only a scientist could anticipate. In electrical circuits, we deal with simple impedances—resistances and reactances. These relate voltage and current in different, but relatively simple ways. In three-dimensional space, the quantities corresponding to voltage and current are pressure and velocity of particle movement.

Sound pressure at a point has a simple value and the pressure at various points in free space, or an approximation to it, will follow a consistent pattern. But the velocity of particles conveying sound has not only a value but a direction. This is related not to simple pressure at a point (as current is to voltage, in an impedance) but to pressure gradient, as viewed in three-dimensional space. Normally, but not always, the movement will be along the direction of maximum gradient.

This gets us into aspects of acoustics that have no counterpart in electrical or electronic circuits. Transducers can be divided into two primary categories: pressure and velocity. This statement may be open to criticism academically, but it simplifies things for those of us not equipped with ultra-scientific brains.

The pressure transducer transforms acoustic pressure fluctuations into electrical voltages or vice versa. The velocity or pressure-gradient transducer transforms air particle movement into electrical voltages or currents or vice versa. The term "pressure gradient" is preferred to "velocity" by some academic people, because there is a cause and effect relationship. Which is which may be a moot point.

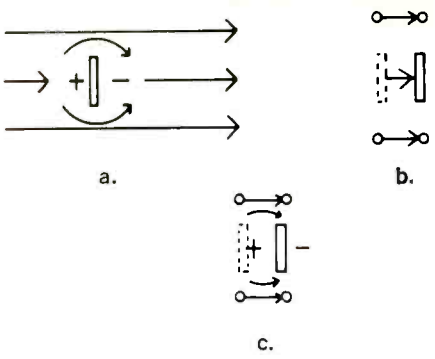


Fig. 11-3. The distinction between velocity and pressure gradient: (A) if the ribbon doesn't move, particle movement in the vicinity creates pressure gradient but not velocity; (B) if the ribbon moves with the air particles perfectly, then there is velocity without pressure gradient; (C) in practice, the ribbon doesn't move as much as the air particles around it, so both velocity and pressure gradient are present.

At the microphone, of which the ribbon is the best example of the velocity type, air-particle velocity past the ribbon would create a pressure gradient at the ribbon, if it didn't move (*Fig.* 11-3). This pressure gradient tends to move the ribbon with the particle velocity, because it is lightly suspended. If it moved with complete freedom, as unimpeded air particles would, there would be no pressure gradient, only velocity.

But as the ribbon is heavier than air, it will never move as much as the air particles in surrounding free space, and so pressure gradient is what directly drives it, although the pressure gradient is derived from the air movement or velocity.

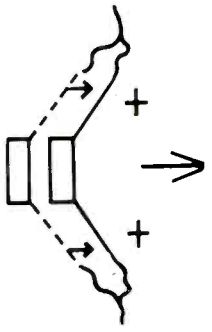


Fig. 11-4. The relationship in a free-cone speaker: movement of the diaphragm creates air pressure, or pressure gradient, which promotes particle movement or velocity.

At the loudspeaker, of which the open-backed cone type is an example of a velocity radiator, the movement of the diaphragm causes movement of air in contact with it. It also causes pressure differences, or gradient, because of the air's inertia, and it is these pressure differences that propogate the wave by particle movement (*Fig.* 11-4).

As all that relation of cause and effect, which are closely inter-related, seems highly academic, we prefer to speak simply of pressure and velocity, at the risk that some academic persons will take us to task.

A pressure transducer, which is formed by any movable-diaphragm device in which only one side of the diaphragm has access to sound waves (for sending or receiving), does not involve this complicated relationship. The ideal pressure transducer (to the academic scientist) is regarded as a miniscule pulsating sphere, called a "point source" (*Fig.* 11-5).

Fig. 11-5. The academic "point source" is viewed as a pulsating sphere (like a tiny balloon) that is alternately inflated and deflated at the audio frequency.

But a typical practical pressure transducer requires only part of the outside surface to pulsate. So long as the over-all dimensions of the transducer are small compared to the wavelength considered, the approximation to true pressure transduction is good, because the pressure equalizes around the outside before the wave has time to move, to any extent.

Inportance of Wavelength

Introducing wavelength into the picture adds the third complicating ingredient to acoustic considerations that does not occur in electrical or electronic circuits. A transducer may be virtually pure pressure or velocity in its action at some frequencies, but not at others, because of the different wavelengths involved.

Some examples of wavelength effects are: The anechoic chamber ceases to be anechoic at low fre-

Sony has developed the world's finest audio transistors...

here's the proof

Many manufacturers have made fairly good transistor amplifiers. Until now nobody has made a great one. And everybody knows the reason: distortion. Unfortunately, most transistor amplifiers distort in a very special way. Not so much at top power, but rather more at normal listening levels where it hurts most.

The Sony TA-1120 integrated amplifier and TA-3120 power amplifier are the first high-powered transistor units to really overcome the problem of distortion. At all power levels, at all frequencies distortion is kept below that of the finest tube amplifiers. The TA-1120 and TA-3120 both provide 120 watts IHF at 8 ohms, both channels operating. Distortion, at rated output, is 0.1%. And at normal listening levels it is even less, 0.05% at ½ watt. In addition, they have achieved an extraordinarily high damping factor, better than 70 at 1000 cps to assure clean, low-frequency power response. Frequency response is practically flat from 10 to 100,000 Hz (+0 db/−1 db). For safety's sake, an SCR (silicon controlled rectifier) protects the power transistors against accidental shorts and other overloads.

The integrated amplifier, the TA-1120 features a sensible arrangement of the front-panel controls for the greatest versatility and ease of operation.

We believe that these are the first great transistor power amplifiers. How can Sony do what other manufacturers couldn't? Sony is a pioneer in transistors. With first after first. Such as the tunnel diode. Transistor television. And the all transistor video tape recorder. The point is that Sony knows transistors. To the 'n'th degree. And designed new, advanced types especially for the driver and output stages of these amplifiers. And silicon transistors are used throughout. They are the most stable. The TA-1120 integrated amplifier, $399.50. A handsome oil-finish walnut enclosure is optional. The power amplifier, TA-3120, $249.50.

Visit your Sony high fidelity dealer and make him prove that Sony is worth the money. Make him compare it with the finest tube amplifiers. We think you'll end up with a Sony. For a free brochure write:

All prices suggested list.

SONY® Corp. of America, 47-37 Van Dam St., Long Island City, N.Y. 11101 Dept. H

quency; pressure transducers cease to be pure pressure devices at high frequency; velocity transducers cease to give pure velocity response at high frequency.

We could go into a discussion of the way waves form up at different frequencies and in various directions from the source, but that is beyond the scope of the present course. We are concerned with measuring what actually happens, and this much explanation has been necessary as background for the methods used. Now we move on to the question posed at the end of the last installment. How can one establish sound pressure or velocity in such measurement?

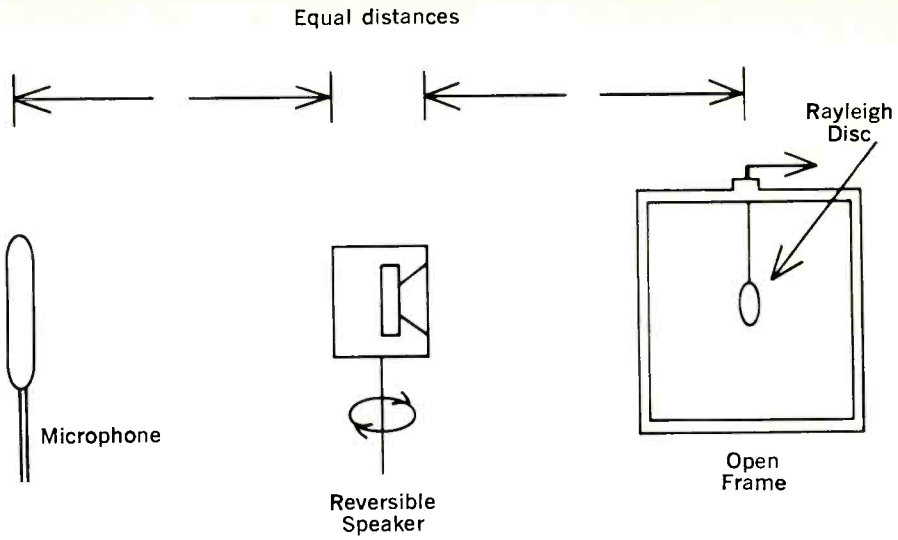


Fig. 11-7. Set-up for using a Rayleigh disc to calibrate the response of a microphone.

Rayleigh Disc

For velocity calibration, the Rayleigh disc, based on a principle discovered by Lord Rayleigh, yields an accurate correlation. A disc suspended on a fine thread at an angle to the incident wave is subject to torsion tending to set it at right angles to the direction of wave motion (*Fig.* 11-6). This is true from d.c. (wind) up to a frequency such that the wavelength is comparable to the disc size (which should be small).

The principle is evident from the behavior of leaves on a tree when blown by the wind: they tend to set themselves at right angles to the wind, but the slight torsion of their stem causes them to move sideways, setting up the back-and-forth fluttering movement.

By using a carefully controlled suspension, the torsion can be calibrated so that a measured wind velocity can provide the basis for sound-wave particle-velocity measurements.

Then a pressure-type speaker unit (one with enclosed back) is set up in a symmetrical relationship to the microphone to be tested (*Fig.* 11-7). Swivelling the speaker either way enables identical sound waves to reach the Rayleigh disc one way or the microphone being calibrated the other way.

This method is primarily applicable to velocity microphones, but can be applied to pressure types by calculating pressure from the measured velocity, using the transmission constants of air, particularly its density.

Reciprocity Method

Because of the complicated way in which velocity or pressure-gradient transducers behave, the reciprocity method (using the same transducer alternately as microphone and loudspeaker) is better applied to units employing the pressure principle (i.e. with closed back).

For proper use, the reciprocity method requires three transducers, used in three combinations (*Fig.* 11-8). The main (power) speaker is used only as a producer of sound and the professional quality microphone is only suited to pick up sound (it radiates too little energy to be usable as a speaker). The third unit serves as a go-between: it is usually a small-unit speaker with enclosed back that serves almost equally well as a microphone.

Because this reversible unit is used twice over, in different places, all three responses can be deduced. First, suppose the reversible unit has a perfect response (a very unlikely assumption!): the result of adding the responses of the speaker taken with the reversible unit for microphone (A) and of the microphone taken with the reversible unit for speaker (B) would then be the same as the response of the loudspeaker directly into the microphone (C).

As the two obviously won't add up so miraculously, because the reversible unit is not perfect, we can add the two responses and take the difference with the single over-all (A + B − C). This difference will be twice the response of the reversible unit, as either microphone or speaker (which are the same, if it is a pure pressure unit).

Having thus found the response of the reversible unit, it is relatively simple to subtract its response from the ones taken with the speaker and microphone respectively, to find these individual responses. The results are a consistent set of formulas.

Provided a reasonably anechoic room is used, this method will also eliminate room effects from the deduced responses of the loudspeaker and microphone. Room effects occur twice with the reversible unit as an intermediate link, and only once by the direct response from loudspeaker to microphone. Thus any room effects present get subtracted from the final results, just the same as does the response of the reversible unit. In fact, room effects and reversible-unit response are not separated by this test.

(Continued on page 64)

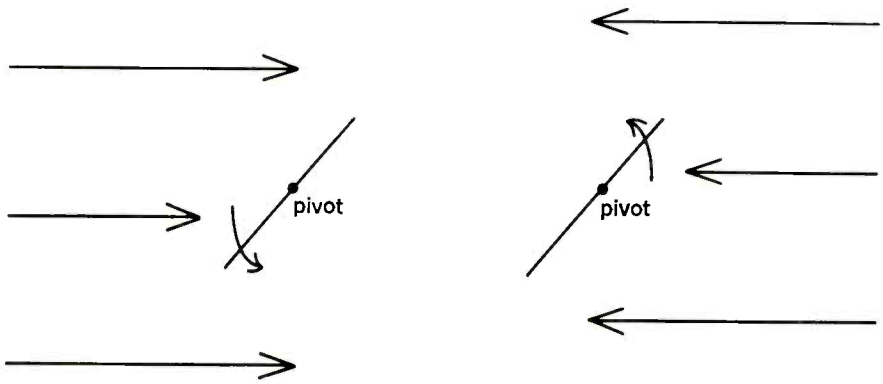


Fig. 11-6. Whichever way an air current approaches a free-floating disc at an angle from the back or front), the tendency is to turn it towards a position at right angles to the air movement. This is also true for vibrating air particles. So the disc is a means of measuring air particle velocity in a sound wave.

PHOTOGRAPHED AT CAPITOL RECORDS BY FRANZ EDSON

Good records start with Stanton.

A professional needs to know for sure. When he listens to a test pressing, he needs a cartridge that will reproduce exactly what has been cut into the grooves. No more, no less. Otherwise he would never be able to control the final product. The record you buy in the store.

That's why the professionals keep using Stanton. It tells them the whole truth, and nothing but.

In the photograph above, studio engineers are shown listening to a test pressing. This is a critical stage in record making. The stereo playback system they are listening through is fronted by a Stanton 581 EL Calibration Standard. (The turntable also happens to be a Stanton. Other fine turntables will work, too.) They're getting the whole message. You'll get it, too, in an upcoming release.

Each Stanton Micro FLUX-VALVE® Calibration Standard is custom made. That means that each will perform exactly as the original laboratory prototype. We laboriously adjust them until they do. It also means that you will get the same accuracy that the professionals get. Guaranteed.

Stanton Calibration Standards are hard to make. And the price reflects it. $49.50. But that really isn't much to pay for uncompromising accuracy.

STANTON

Stanton Magnetics, Inc.
Plainview, L. I., N. Y.

Check No. 70 on Reader Service Card.

Equipment Profile

THE SONY COMPONENT LINE

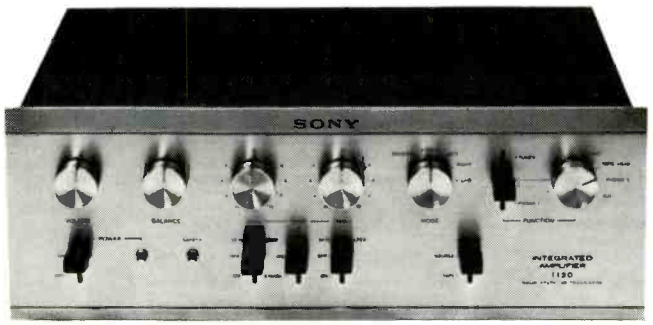


Fig. 1. The SONY SONY TA-1120 integrated amplifier.

TA-1120 INTEGRATED AMPLIFIER

It has come to be almost axiomatic that when Sony introduces a piece of equipment it is likely to be excellent in performance and equally excellent in appearance—or perhaps we should say elegant. The TA-1120 integrated amplifier certainly fulfills whatever expectations we would have from Sony.

Figure 1 shows the over-all appearance of the unit. with a black ventilated case and its gold-colored panel and knobs. The top and bottom bands on the panel are satin finished, while the center section has a brushed surface. Departing from the usual symmetry in design, the controls are functionally placed, and offer some innovations. From left to right, the knobs are volume, balance, bass tone, treble tone, function, and selector. The lever switch between the last two knobs is a "quick-action selector"—in the upper position the tuner is connected; in the lower position is phono 1; in the center the right knob is operative, with positions for microphone, tape head, phono 2, and aux. Thus for the most common uses, the lever switch does the selecting of source, giving three choices, depending on the setting of the knob for the third one. Along the lower portion of the panel are five more lever switches. At the left is the power switch, and its related red indicator light. Next comes the green safety light, about which more later. Then comes the 50-Hz high-pass filter switch, the tone-control-cancel switch, and the 9000-Hz low-pass filter switch. Finally there is the monitor switch, which permits listening to the source while recording, or to the tape itself, when used with a transport having three heads and a preamplifier.

The rear panel mounts all inputs and outputs, arranged in two rows—the upper row for the left channel and the lower the right. Two switched a.c. receptacles and one unswitched are provided. In addition there is a ground terminal—all too often missing in high-gain amplifiers. Level adjusting controls for tuner and the aux input are also on the rear, as is a 5-terminal Hirschmann-type receptacle for input and output connections to a tape recorder. Two more pairs of phono jacks provide the user with the output from the preamp section and the input to the power amplifier section, thus permitting a wide variety of circuit variations—additional power amplifiers can be connected at this point, for example, or an electronic crossover may be used, with the TA-1120's amplifier used for one band of frequencies, and a pair of stereo power amplifiers used for the other two. (At the New York Hi-Fi Show Sony exhibited a three-channel electronic crossover which should be available in a few months, and the TA-3120 stereo power amplifier is already available.)

CIRCUIT DESCRIPTION

The TA-1120 employs 46 transistors and 23 diodes, with all transistors being silicon types. Both channels are the same, of course, and are built up (in the preamp section) mainly with feedback pairs, each of which has nearly 40 dB of feedback around it. There are two preamps, with the one used for phono 1 having a sensitivity of 4 mV, while that for tape head, microphone, and phono 2 has a sensitivity of 1 mV. Equalization is switched as the rotary selector is rotated. The tape-head equalization is provided with a control, accessible from the bottom of the chassis, which varies high-frequency response over a range of about 10 dB at 10,000 Hz to compensate for the recorder.

The second feedback pair comes next in the circuit, and after it is an emitter-follower stage which feeds the hi- and lo-cut filters. Another feedback pair provides additional gain, while still another furnishes the gain required by the step-type tone controls. When the tone-control-cancel switch is operated, this pair is out of the circuit, as are the tone controls themselves, leaving the amplifier in a flat position—and by flat, we mean within less than half a dB from 40 to 60,000 Hz. *Figure* 2 shows the effect of the hi- and lo-cut filters.

Following the tone controls is another feedback pair and the balance control, and finally a bridged-T filter which serves as a high-pass filter to cut off at about 30 Hz, thus eliminating the extremely low frequencies which can damage loudspeakers when tuning across the band with an FM tuner or when the phono stylus drops on a record, for example. Also, the filter effectively eliminates rumble from poor turntables. The output of the bridged-T filter is the final point in the preamplifier section, and is fed to a phono jack. A short jumper carries the signal to the input jack for the power amplifier section which employs nine transistors, four of them being the power stage. The first three transistors provide the signal for the quasi-complementary driver stage, which uses a pair of transistors which have a current capacity of 2 A and a cutoff frequency of 9 MHz. The driver stage feeds the output transistors in a parallel single-ended push-pull configuration, with 4-amp transistors having a cutoff frequency of greater than 15 MHz. Thus high-frequency performance is maintained way above the audio spectrum.

From the output stage the signal is fed to the loudspeakers, and to an SCR which "dumps" the supply to the drivers in case of too great a signal or if the speaker leads are momentarily shorted. Because of the use of the SCR, the operation is practically instantaneous, so the output transistors are not likely ever to be damaged. When overload or shorted speaker lines occur, the green "safety" light goes out, and no sound is

We didn't invent stereo.

(We just widened its scope.)

In 1933, Bell Laboratories transmitted the first public stereo concert. The Philadelphia Orchestra performed this concert in the Philadelphia Academy of Music using three microphones. It was received over three speaker systems set up at the Constitution Hall in Washington, D.C.* We had absolutely nothing to do with it.

In 1963, Empire created the Grenadier. The first speaker system designed and engineered for stereophonic reproduction.

It contained a mass loaded woofer, four inch voice coil, and the world's largest ceramic magnet structure. (By placing the woofer downward, feeding through a front loaded horn we were able to create a 360 degree dispersion of sound.) The next step was the revolutionary wide angle acoustic lens, for fuller frequency and phenomenal stereo separation.

By enclosing these features in a flawless hand-rubbed walnut finish with perfect symmetry of design, (crowned with an imported marble top) we achieved the first speaker system that lets you sit anywhere—hear everything, naturally.

Alexander Graham Bell—move over.

Empire Grenadier. One of the great firsts.

Great new 16 page color catalog is now available, write: Empire Scientific Corp., 845 Stewart Ave., Garden City, N.Y.

*Audio Magazine, June, 1957

Circle 88 on Reader Service Card

arm. Some anti-skating devices provide the correct compensation at one radius, but the required amount varies as the radius is changed. On this arm, however, the amount of compensation is changed as radius changes. The arm is of the balanced type, with a double counterweight which permits accurate balancing, then a separate weight is moved to achieve the required stylus force, which is adjustable from 0 to 3 gms. A cueing lever raises the arm, or lowers it gently under control of a damped piston. Tracking error is held to less than ±2 deg. throughout.

THE VC-8E MOVING COIL CARTRIDGE

With the relatively high output for moving-coil cartridges of 4 mV, the VC-8E does not require a transformer, but will work into any conventional phono input. The cartridge is fitted with an elliptical diamond stylus, and tracks well at 1½ gms. Compliance is of the order of 30 x 10^{-6} cm/dyne, and frequency response extends to well over 20,000 Hz.

The entire Sony line of components thus appears to be of a high quality, and the prices are not low, as might be expected. The TA-1120 is just under $400.00; the TA-3120 is just under $250.00, and the "phono package" is almost $300.00 (TTS-3000, $149.50, the PUA-237 arm—12 in—is $85—a 16-in. model is available as the PUA-286, $99.00, and the VC-8E is $65.00.)

But these days the prices are not excessive, particularly when one considers the quality of each individual item.

CIRCLE 1

PIONEER ER-420 STEREO RECEIVER

In this day and age of transistor technology, you may well wonder why we are presenting a profile of a vacuum-tube operated device. We must confess that when Pioneer presented us with this unit we shared the same thought.

The fact of the matter is, of course, that the tube is by no means an antique. Far from it. Pioneer designers were after a moderate-power, good-performance receiver that could be sold at a low price. Thus came the ER-420, made to sell for $210 and sporting a modest 15 watts per channel.

Naturally, if you are used to seeing solid-state units, the ER-420 immediately strikes you as large-sized. And when you turn it on and let it cook for a while you are reminded that two pairs of 6BQ5's, even in AB, configuration, along with fourteen other 'valves' make a lot of heat.

A look at the illustration may serve to indicate (as it does to us) that this is a well-appointed and handsome unit. All of the expected amenities are there. Some special features are a double-duty AFC switch. It is an AFC switch when the tuner section is on FM; but when it is on AM the same rocker switch sets a broad or narrow bandwidth.

Tuning is aided by a signal-strength-type meter. The mode selector has separate positions for FM Mono and FM Stereo. There is no automatic switching although there is a neon indicator that will ignite if it is tickled by 19 kHz.

Fig. 5. The Pioneer ER-420 AM/FM Stereo Receiver.

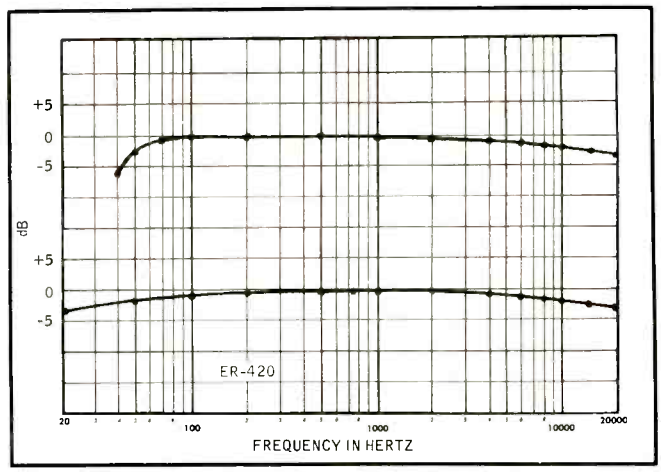


Fig. 6. Upper curve power response per channel with both channels driven. 0 db = 15 watts. Lower curve —over-all frequency response at 1 watt, tone controls flat.

With the receiver set up and driving a pair of moderate-efficiency speakers of 8-ohm impedance, we were pleasantly surprised by the over-all quality of sound from so modestly priced a unit. Also pleasurable was the feel of the unit; switches are tight but not stiff, and tuning is exceedingly smooth.

THE TESTS

Pioneer does not recommend the ER-420 for use with 4-ohm speakers. The output transformers are tapped for 8 or 16 ohms and a rear-panel switch determines which pair is directed toward the screw-type speaker connectors. Most of our tests were made with 8-ohm resistive loads but we also verified 16-ohm performance.

With both channels driven the ER-420 will deliver an honest 15 watts per channel. Power response is attenuated at the bass level to be sure, but it is to be expected that a modest-cost receiver will be used with modest-cost speakers so the lack of 30 Hz capability will go unnoticed. Do notice, however, that the unit will perform admirably as low as 50 Hz. And notice too that the RIAA equalization was within 3 dB of perfect over the entire range.

Sensitivity into the magnetic phono is 3 mV for 15 watts out. Overload will not occur until 0.14 volts. That's something a 12AX7 can do and a transistor cannot. Noise was a satisfactory 61 dB below a 3 mV input.

IM distortion through the high-level inputs was as follows for the specified power:

	Left	Right
1 watt	0.06	0.81
5 watts	0.23	0.60
10 watts	0.77	0.89
12 watts	1.60	1.40
15 watts	2.30	3.20

If these are not spectacular figures neither are they figures that Pioneer need hide in shame. For a unit at this price level (and that, after all is how any component must be judged) the ER-420 has low distortion. Incidentally, the over-all S/N is 70 dB.

The tuner acquitted itself admirably on our test bench. Sensitivity for 30 dB S/N is 4 μV, full limiting occurred at 100 μV where the S/N reached its best figure of 58 dB. In the stereo mode, midband separation was 31 dB falling to 18 dB at 10 kHz. Frequency response was ± 2 dB from 30-15,000 Hz in mono or stereo modes.

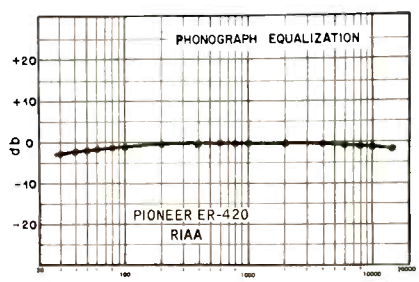


Fig. 7. Accuracy of the magnetic-phono input to the RIAA curve.

We have to stress again that this is a low-cost component. It would be unfair to ask performance of it that compares with $400-and-higher units. The real question to be asked is: does this unit represent high quality? is it also representative of what we call 'high fidelity'?

We think it is. CIRCLE 2

AR INC.'s dirty laundry— the repair room

This AR-2a was bought in 1962. Three years later it developed a buzz and was returned to us under the terms of our five-year guarantee.

We fixed it, sent it through regular production test channels, and returned it to its owner in East Hartford. We also sent him a check for $3.95 to reimburse him for his expenses in shipping the speaker to us.

The entire transaction didn't cost him anything—we had even sent him a new shipping carton in which to return his speaker. It did put him to a lot of trouble, and we're sorry about that. But we don't think that the return rate of AR-2a's and AR-2a[x]'s (less than nine-tenths of one per cent over the five-year life of the guarantee) can be reduced much. It is already lower than the figures projected by many carton manufacturers **for shipping damage alone.** AR speakers are packed in heavy, over-designed cartons, and before being packed are subjected to testing and quality control procedures that border on the fanatical.

Reliability backed up by a complete guarantee is important, though certainly not enough reason to choose a particular speaker. The advanced design and superior performance of AR speakers is recognized almost universally. They have consistently been rated at the top by equipment reviews, and they are used in critical professional installations and by distinguished jazz and classical musicians.

AR speakers are $51 to $225. Literature will be sent on request.

ACOUSTIC RESEARCH, INC., 24 THORNDIKE ST., CAMBRIDGE, MASS. 02141

Check No. 71 on Reader Service Card.

AUDIO MUSIC AND RECORD REVIEW

Record Review • Edward Tatnall Canby

The Case of the Undetected Boo-Boo

Tchaikowsky: Piano Concerto No. 2 in G. Emil Gilels; Leningrad Philharmonic, Kondrashin.

Baroque 2865 stereo

Thousands and thousands of copies of this record have been sold in a huge rush, thanks to an undetected boo-boo. The New York Times pointed out what I suspect Everest (Baroque's parent) had not even noticed—that the great Russian pianist suddenly gets lost in the middle of the last movement; there is brief chaos, both piano and orchestra careening along derailed, until they find each other again and continue as though nothing had happened. That was enough to start the collectors going!

I suspect that at least 90 per cent of the thousands who grabbed the disc were disappointed. The boo-boo isn't that easy to locate. If you just listen casually (and maybe if you listen carefully) you'll never hear anything wrong. It was a skillful cover-up job.

Where this record comes from is, of course, a minor mystery. The performance is a live concert, with applause. The sound is so lousy it might have been taken down via shortwave. I wouldn't think the Russians would produce tapes of this quality. And I am sure the Russians don't habitually release performances with mistakes in them—unless *they* didn't notice.

As for the stereo, it sounds like an afterthought. And it probably is.

The performance saves all. Super-hi-power piano, and orchestra too, high-voltage precision, speed like lightning, especially in the whirlwind last movement (where the boo-boo is hidden). The Second Concerto has never been as popular as the First, but this performance shows what a fine piece it can be when properly souped up with pyrotechnics.

Crossroads of Central Europe

(Crossroads, the CBS entry into the low-price record field via Epic, is interesting because it taps heretofore sparsely known Czech musical sources, performing musicians who are still physically removed from contact with the West, whose traditions have gone along parallel to but separated from Western Europe. Also, Crossroads' Supraphon Czech recordings have all been made within the last five years. None is a reissue. E.T.C.

Mahler: Symphony No. 1, "The Titan." Czech Philharmonic, Karel Ancerl.

Crossroads 22 16 0011 stereo

One senses the affinity here between these Czech players and Mahler, who was born in Bohemia—the Czechs always go for lushly dance-like melody and Mahler's music is full of that. Indeed, the only part of this big, youthful work which is less than admirable in the playing is the final movement, which is more dramatic and intense than these orchestral players can quite manage. They aren't helped by what seems to my ear to be some old fashioned volume compression—it's been a long time since I've heard that sort of thing! The superbly lovely soft parts simply are not in balance with the hugely loud climaxes.

In this Czech orchestra the woodwinds and brasses are lively and alert, their phrasing dramatic, their recorded tone wonderfully natural. The percussion department is the same—terrific tympani. But the strings tend to be a bit soft and overripe in ensemble, not as crisp and clean as we seem to expect in orchestras West of Prague. Nevertheless—in the over-all this is one of most accessible performances of the Mahler First that I can remember. At any price.

Bach: Violin Concerti in A minor, BWV 1041, E major, BWV 1042; Concerto for Two Violins in D Minor, BWV 1043. J. Suk, L. Jasek; Prague Symphony Orch., Smetacek.

Crossroads 22 16 0038 stereo

Three standard Bach concerti done up in ample style with a biggish orchestra and a pair of good fiddlers. (Josef Suk does the two solo concerti.) Like most of this Prague music, the sound may seem a bit old fashioned to those who follow the latest trends in Baroque practice—but the performances are plenty adequate for anyone who wants to get to know these pieces in bargain fashion.

One slightly more serious complaint: the sound here is not good. It is grainy and slightly raspy, especially in the two-violin concerto. Don't know what could have happened. (Amusing note—I also hear a familiar pre-echo every so often, just like on regular Columbia Masterworks! Family resemblance.)

If your mind is more on the music than on the fi, you won't be too much bothered by the graininess.

Mozart: Sinfonia Concertante in E Flat for Violin and Viola, K.364; Duo in B Flat, K.424. J. Suk, M. Skampa; Czech Philharmonic, Redel.

Crossroads 22 16 0016 stereo

Mozart: Sinfonia Concertante in E Flat for Oboe, Clarinet, Bassoon, and Horn, K.297b; Horn Concerto in E Flat, K.447. Soloists, Czech Philharmonic, Smetacek/Ancerl.

Crossroads 22 16 0036 stereo

A Mozart festival here—four major works, including the two *sinfonia concertante* pieces and one real bonus, the seldom-heard Duo for violin and viola, a complete little "symphony" for the two instruments alone. The Czech Philharmonic plays these works in a large and resonant hall for a huge sound and the instrumental balance in all the works is excellent, the soloists just forward enough to be clear against the orchestra, without being too close for comfort. (The viola in the first work could even be a bit more prominent—it sometimes is lost a bit.)

The violin-viola "concertante" (as these works were called for short), one of Mozart's largest and longest orchestral works, gets a rather placid, if careful, orchestral treatment; the soloists are more alive than their orchestra is. Not

A PARTIAL LISTING OF FRANCHISED TANDBERG DEALERS

The Mall Music Center, Huntsville, Ala.
Telecommunications, Inc., Mobile, Ala.

Audio Specialists, Phoenix, Ariz.
Hi Fidelity Sound Systems, Phoenix, Ariz.
Niles Radio, Tucson, Ariz.

Allegro Hi Fi, San Francisco, Cal.
Barcus Television, Long Beach, Cal.
Breier Sound Center, San Diego, Cal.
Carlsbad Stereo Hi Fi Center, Carlsbad, Cal.
Dow Radio Milo, Pasadena, Cal.
Emmons Audio Equip., No. Hollywood, Cal.
Henry Radio, Los Angeles, Cal.
Hi Fi Corner, Los Angeles, Cal.
Hi Fi Haven, Whittier, Cal.
Magnetic Recorders Co., Los Angeles, Cal.
San Marino Hi Fi, San Marino, Cal.
Jack Schiefer Sound Equip. Co., Fresno, Cal.
True Recording Corp., Oakland, Cal.

Howard Sound Company, Denver, Colo.
Voice and Vision, Denver, Colo.

David Dean Smith, New Haven, Conn.
Stereo Shop, Hartford, Conn.

Fidelity Sound Co., D.C.

Frutchy's Audio Lab, Winter Park, Fla.

Hi Fi Sight, Sound Systems, Atlanta, Ga.

The Audio Center Limited, Honolulu, Hawaii

Allied Radio Corp., Chicago, Ill.
Musicraft, Chicago, Ill.

Graham Electronics Supply, Indianapolis, Ind.

Arthur P. Griggs Piano Co., Davenport, Iowa

Stromboli Enterprises, Lewiston, Maine

Custom Music System, Baltimore, Md.
High Fidelity House, Baltimore, Md.
McGuire Audio Shop, Bethesda, Md.

Audio Lab, Inc., Cambridge, Mass.
Cramer Electronics, Boston, Mass.

Hi Fi Buys, East Lansing, Mich.
Karns Electronics, Grand Rapids, Mich.
Stereoland West, Detroit, Mich.

Hi Fi Sound Company, Minneapolis, Minn.
Finn's Cameras, St. Paul, Minn.
Minnesota Audio Visual, Minneapolis, Minn.

Aeolian Company of Missouri, St. Louis, Mo.
David Beatty Hi Fi, Kansas City, Mo.

Federated Purchaser, Springfield, N.J.
Hi Fi Haven, New Brunswick, N.J.
House of Hi Fi, Trenton, N.J.
Lafayette Electronics, Paramus, N.J.
Perdue Radio, Montclair, N.J.
Wally Smith, Cherryhill, N.J.

Sam Goody East, N.Y.C.
Grand Central Radio, N.Y.C.
Harvey Radio Corp., N.Y.C.
Leonard Radio, N.Y.C.
Liberty Music Shop, N.Y.C.
Lyric High Fidelity, N.Y.C.
Packard, Electroncs, N.Y.C.
Peerless Camera, N.Y.C.
G. Schirmer, N.Y.C.
Sonocraft, N.Y.C.
Terminal Hudson Electronics, N.Y.C.

Arrow Electronics, Farmingdale, N.Y.
Audio Exchange, Jamaica, N.Y.
Craig Audio Laboratory, Rochester, N.Y.
Electronics Unlimited, Merrick, N.Y.
Lafayette Radio, Jamaica, N.Y.
Newmark and Lewis, Hempstead, N.Y.

Audio Craft Company, Cleveland, Ohio

High Fidelity Unlimited, Inc., Portland, Ore.

High Fidelity House, Wayne, Pa.
Opus One, Pittsburgh, Pa.

Audionics, Providence, R.I.

Mitchell's Audio Center, Greenville, S.C.

Nicholson's Hi Fi Center, Nashville, Tenn.
W & W Distributing, Memphis, Tenn.

Gramophone Shop, Dallas, Tex.
Li'l Pal, Inc., Houston, Tex.
Sterling Electronics, Houston, Tex.

Audio Visual Center, Inc., Seattle, Wash.

Wack Sales Co., Milwaukee, Wis.

Check No. 72 on Reader Service Card.

bad at all, though I've heard the music done with more profundity. The Duo, not unlike the Bach unaccompanied sonatas for solo violin and for cello, gets an astonishing amount of music out of the two instruments, ending with a superb set of variations on a theme. On this disc there is some of the unpleasant graininess heard on the companion Bach concerto disc, though it seems less here.

The second disc, with the other "concertante," this one for four wind instruments and orchestra, is unaccountably much cleaner in sound. Mystery of mysteries! It also is livelier in performance (a different conductor here? Smetacek instead of Redel) and, aside from the somewhat annoying mannerism of very short staccato notes in the woodwinds, found throughout this Prague music, it is a first-rate record. The horn concerto is excellent—a French horn played midway between the German and French manner, with a very slight vibrato but a rich, Germanic tone.

Just for your edification, the four wind soloists are named Hantak, Kopeck, Vacek, and Stefek, and their conductor is Smetacek! That's Czechoslovakia for you.

Mozart: Serenade No. 10 in B Flat for 13 Wind Instruments, K.361. Prague Chamber Ensemble, Pesek.

Crossroads 22 16 0020 stereo

Mozart was a prime favorite in his own day in Prague, where this music is played—but that doesn't necessarily guarantee an understanding of the music among today's performers, though tradition is strong. Even so, this compares very favorably with the Angel recording that came out only last summer (at more than twice the price), the principal differences being relatively minor ones of interpretation and recording. Both are worthy efforts. (See below.)

Yes, I think Angel's famous (and expensive) Dr. Otto Klemperer does add a degree of depth and intensity to his English performance on Angel, and his players are better balanced in the recording itself, the upper melody instruments coming through well—the oboes and clarinets. But the Prague version, in a bigger liveness and at a greater distance, brings out the unique sound of the pair of basset horns (tenor clarinets) as the English version does not, and the Prague bottom end is better, having only the double bass (a peculiar "wind" instrument, but specified by Mozart as alternative to the hard-to-come-by double bassoon) whereas Dr. Klemperer uses *both*, for an over-thick texture.

The Prague people do put out some rather odd staccato phrasing, somewhat exaggerated, (as they do in other discs of this series—evidently it is a local mannerism) and the more profound parts of this lilting Serenade are not really given their full due; the music is rather casual throughout. Even so, I'd rate this one at least seven-eighths as good as the Angel version on all counts, which is a lot considering its low price.

Brahms: Two Cello Sonatas (No. 1 in E minor, Op.38; No. 2 in F, Op.99). Andre Navarra; Alfred Holecek, piano.

Crossroads 22 16 0026 stereo

Two sonatas for the same instrumental combo, one early and one late, and the second of the two comes off best in this recording—the reason is perhaps purely technical, in the sound of the recording itself.

The fi is entirely OK. But the microphone placement is of a sort we used to use thirty years ago and long before stereo, the solo cello placed uncomfortably close and the piano somewhat in the background. The result is that the cello low notes sound huge, like a very fat double bass. This is particularly noticeable in the first sonata, which is written with a good deal of low cello sound. In the second, many years later, Brahms featured the high, singing upper registers of cello tone more often—and so the tubby bass is not as prominent. Odd how the music itself can affect the recorded sound!

The joint performances are, by average European standards, on the slow side, solid and heavily Romantic but very musical and quite without the harsh, over-wrought intensity that often mars Brahms playing today.

Madrigals by Lasso & Monteverdi. Soloists and Members of the Prague Madrigal Singers, Venhoda.

Crossroads 22 16 0024 stereo

The Prague Madrigal Singers are already familiar to us on other U.S. labels (imported before Crossroads came along). They are old fashioned, but highly musical, a big, wobbly vocal ensemble which gets over the music thanks to sheer musicianship and understanding, even if the voices do wobble so you can hardly tell what pitch they are singing sometimes.

On this record their Monteverdi is better than their Lasso. Monteverdi is richly Romantic, any way you try him; and these singers really *sing* the sense of the music, where so many groups plough through it with total incomprehension. There is plenty of evidence of real understanding and intelligence in these interpretations. For that—I would take any amount of wobble!

The Lasso pieces (he's also called Lassus) are of a slightly earlier period, just before 1600, and depend more on lightness and transparency of tone, plus clear harmony in the sung chords—so these people are less comfortable here by far. Still, they make sense if you listen with care.

The works are strung out peculiarly, without a break between many of them (and no banding either). But the complete texts, plus condensed translations, help you keep your place.

Stamitz (Johann) Orchestral Trios. Members Czech Philharmonic, Munclinger.

Crossroads 22 16 0006 stereo

Here's a very welcome disc of previously unheard music by a man who is plenty famous in history but, until now, has been virtually unknown in his actual music. Jan, or Johann Stamitz founded the famous Mannheim Orchestra and was largely identified with the new "Mozart-like" style of music that developed in the middle Eighteenth century, before Mozart was born.

The Stamitz who gets heard most often is his son, Carl. Carl's music is all frittery elegance, almost foppish in sound and minus very much content. His papa, here, shows a more solid ability, without folderol, as we should expect in view of his dynamic leadership at a time when all conductors were also composers.

These are semi-symphonies, four of them, of a light, gentle sort, written for three string parts; with a bit more harmonic stuffing and maybe an oboe, a flute and a horn they would be classic pre-Mozart symphonies. The style is most interesting to those who know the high Baroque—Bach, Handel, Telemann—and also their Mozart and Haydn: Stamitz falls squarely in between, after the most advanced Telemann, but just before the earliest Haydn. Very pleasant listening for anybody who likes mellifluous, well written string-orchestra music.

From The Eighteenth Century

Handel: Messiah (Complete—original instrumentation). Harper, Watts, Wakefield, Shirley-Quirk; London Symphony Chorus, Orch., Colin Davis.

Philips PHS 3-992 (3) stereo

By golly—at last! An "authentic" *Messiah*. This is the recording which our Harold Lawrence has recently discussed in his department. I got an advance copy from him and I am delighted. I've always hoped for it, but each time (though I once wrote notes for a supposedly "authentic" version) I've been disappointed. Until now.

This *Messiah* is virtually a new piece for those who know it in the usual format—a fast-paced ultra-Baroque work instead of the stodgy monster of an oratorio that has so bemused listeners these several centuries. About time!

What is an "authentic" *Messiah?* To put it simply, it is one in which the performance corresponds in style and manner of production to that of current practice in other less-celebrated Baroque music. I.e., a restoration of the original, according to our present ideas and scholarship. Sounds easy; we do hundreds of other Baroque works that way. But not *Messiah!*

For this big work is much too well known in its traditional form to give way easily, for such a drastic reconstruction. Like other great works that have remained more or less continuously alive, it has changed radically—it is traditional in special sense, a tradition that has gradually altered to fit the circumstances and thinking of each new generation. Lagging behind—as all great traditions

do—Messiah now tends to express a late-Victorian viewpoint, roughly as of the 1870's very far removed from Handel himself. It is often a huge affair, a static musical pageant with enormous chorus and a big, Romantic orchestra, solemn, deliberate, with an atmosphere of Victorian sanctity that was not at all in the original work, in spite of the subject. (Sacred—yes. But in a joyous Baroque fashion whenever joy was appropriate.)

The restoration of *Messiah* is not merely in the instrumentation, though that is a major first step in the process, with the harpsichord/organ continuo brought back, the band now of Baroque size, the complement of oboes increased (as was the known practice) and the original instrumental solos reinstated. In addition there is profusely added ornamentation, both instrumental and vocal, in line with common practice in other Baroque music today. And rhythmic alterations are made, notably the double-dotted figure, as is now routine in "authentic" playing. But most important of all, the tempi are brought into line with Baroque practice in other music—which means they go very much faster, for the most part, than the traditional *Messiah* interpretation.

What a whooping difference *that* makes! Gone is the massive pageantry, the solemn processional-type music, the overwhelming weightiness. Now, all is quick, passionate, active, exciting. In fact, we must now revalue our whole concept of *Messiah* as a ponderous, not-very-dramatic piece. As we hear it in this version it really moves—it is a *show*. In fact, done this way, Handel oratorio is obviously much more dramatic than the Italian opera which it replaced in public favor. Now we can understand why oratorio was so successful in its day! No wonder.

In the performance the orchestral playing is first rate for the most part (though the fiddlers still have trouble with their Baroque ornaments), and this includes the solo *obbligati*. The well known trumpet solo ("The Trumpet Shall Sound"), for instance, sounds at last like other Baroque trumpet music, instead of something out of Barnum and Bailey!

The chorus is superb and, indeed, "makes" the whole show—for it is the primary dramatic element in the music. This one is full of extraordinary intensity, vigor, and enthusiasm and it is accurate as well, as few professional choirs are. Never heard anything like it.

As for the solo voices, the two ladies are no less than wonderful, especially Heather Harper, one of the loveliest and most utterly musical sopranos I ever hope to hear. Her colleague, Helen Watts, is a perfect Little Buttercup of a contralto, out of Gilbert & Sullivan, gone miraculously serious. The two males are of a more conventional mold. The tenor John Wakefield is the weakest; he is entirely too familiar with the old-fashioned *Messiah* style, and flounders heavily in the rapid Baroque running passages. J. Shirley-Quirck is no quircky basso; his musical dignity is impeccable, if not particularly Baroque.

My only reservation, not very serious,

is in the bouncy, unphrased styling of the rapid choruses, a mannerism that is evidently standard in England; I've heard it elsewhere too. With such immensely musical performers, it doesn't make too much trouble.

Handel: Nine German Songs. Edith Mathis; Ens. of Baroque Instruments.
Seraphim S 60015 stereo
Odeon C 91262 stereo
(via Capital Imports)

Here are two versions of the same recording—one direct-imported earlier last season and selling at a top price, the other reissued on the new Seraphim label from Angel (E.M.I. in England) and yours for considerably less than half as much! The original recording is a German Electrola item. There you have the present import situation in a nutshell. Of the two, the Seraphim has the better, louder, quieter-surfaced, smoother sound—at least on U.S.—equalized equipment. (See AUDIO, ETC in the November, 1966, issue.

Handel's German period came in his youth before he travelled to Italy and then on to his permanent station in England. But these nine songs, really short concert arias, were written much later in 1729, as a result of a business-pleasure trip back to his old haunts in Germany.

Each work has an *obbligato* accompanying solo instrument, plus *continuo;* evidently the choice of solo instrument was left somewhat free. In our day, the *continuo* parts would all be quite adequately rendered by the now-standard harpsichord and cello, and the solo instruments would likely be standard too—violin, oboe, flute. But these indefatigibly anonymous Germans have worked up an amazing variety of unusual "authentic" instrumental combinations—old-type flute and oboe (a strangely hollow sound, this last), violin, two sizes of recorder, plus a harpsichord *and a* theorbo (a species of lute) for the accompanying chords; on the bottom bass line the cello alternates with an old-style bassoon and a viola da gamba. A quite remarkable variety of novel tone color to go with the single soprano voice.

Edith Mathis is an expert and very musical young singer who does the ornamentation and the florid "runs" of the music with both authority and real agility. Her vocal tone is sometimes a bit uneven and her upper notes seem forced; but musicianship wins out—and the lovely Handelian music is a delight to hear. At either price.

Mozart: Serenade for 13 Wind Instruments, K. 361. London Wind Quintet and Ensemble, Klemperer.
Angel S 36247 stereo

The largest of Mozart's Serenades is a true serenade, i.e., outwardly a kind of polished entertainment music with an outdoor quality to it—but, as always in his big works, this one has fathomless moments of seriousness, half-hidden behind the gay exterior.

The famous Dr. Otto Klemperer conducts it that way with success except, oddly, in the one *really* serious movement, the large-scale opening movement with its breathtakingly expressive slow introduction. There, the old man seems to return to the didactic, rigid sort of conducting he used to do in his middle-late years a quarter-century ago. It isn't very good. Strictly a mechanical beat, and just fast enough so that his musicians can often be heard scrabbling to keep up. Un-plastic is the best word for that movement.

The rest, though, is true serenade playing. The individual instruments are excellent and the sound is particularly nice in the array of bottom instruments—the four horns on occasion, the two bassoons, and a croaking double bassoon. Also, incongrously, a double string bass (it was an alternative in the original).

The piece probably didn't have a conductor back some 180 years ago. Maybe it shouldn't have here, either—big-name or no.

Thoughts for Xmas

Canteloube: New Songs of the Auvergne. Netania Devrath; orch. cond. Kingsley.
Vanguard VSD 79209 stereo

The "old" Songs of the Auvergne, famous in phono history, were recorded in the 'Thirties by Madeleine Grey and many times reissued, including a recent

LP. Netania Davrath did a modern version, including more of the songs, on two very successful LP's; hence this further exploration. (Canteloube went right on making his arrangements for many long years after the original Grey recording.) Note the power of a successful title! Only one very short song in this whole collection is actually from the Auvergne. All the rest are from other regions of France—with less sales-appeal.

The Canteloube settings are the far-extreme opposite of our present-day "authentic" folk music. The tunes are 19th century "fixed-up" folk songs, though often quite lovely; and the accompaniments, whether via piano or orchestra, are elaborately classical affairs, lush Romantic-Impressionist. Fittingly, Devrath sings in an old-fashioned style, sometimes almost too "cute" and coy but as often with a lovely sensuousness. Nevertheless, this collection is by no means as moving nor as worthwhile musically as the original Auvergne items, nor can Devrath match Madeleine Grey's astonishing delivery.

Mozart: Die Zauberflote (The Magic Flute); excerpts. Lear, Peters, Otto, Crass, Fischer-Dieskau, Hotter, Wunderlich; Berlin Philharmonic, Bohm.

Deutsche Grammophon 136 440 stereo

Save cash if you must, and buy these excerpts. But keep in mind that what you get today on this type of disc is a batch of small slices taken straight out of a larger whole—the complete recorded performance. They frequently sound just that way. Out of context, out of their dramatic background in the complete tape, they often sound strained, seemingly nervous, somehow not "right." There is every reason why they should be.

Opera, remember, is a big show with large-scale over-all dramatic shape. Good singers know this and sing for the whole, not merely for the separate parts. Even when the parts are nominally separated, as in Mozart. If you eavesdrop on their whole, as here, you can expect to find things less than perfect for your bits-and-pieces listening. The thing to do is to splurge and get the whole opera! It's worth it.

I enjoyed most the singing of Fritz Wunderlich, the tenor (his music is slow and contemplative, hence easier to get into in excerpt form) and least that of Roberta Peters, who sounds too American in this very continental ensemble. But don't judge *any* of these singers on this excerpt basis.

Audities

Sound of Steam—Excursion Portland Me. to Island Pond, Vt.

Sound Service Co. S-2660 mono

(P.O. Box 51, Woodfords Sta., Portland, Me.)

Tired of all this classical music stuff? So was I, when I got this in the mail. I enjoyed every steamy moment.

A good idea: there's a second-by-second log, on the jacket, telling what's happening and when as you follow your

own stop watch or timer. Helps a lot—especially the brief, one-word aids next to the timings: Take Up, Slipping, Petcocks, Echoes, Slow Down, and so on. You can follow it all very easily. I had a timer in action and things didn't come out quite right, but presumably that was the timer's fault.

The train was a 1965 fan train from Portland Northwards, and the engine came down from Canadian National to pull the cars up into Vermont on the way back home. It's no petty little switcher—this is a big one, to wit, No. 6218, 300 tons big, looks like a 4-10-4 to me. We are on board the train (portable recorder) all the time, mostly out between cars, sometimes inside.

Neatest trick of the year: The two timed sides add up to 51:05, under an hour, and the sound is uninterrupted—the engine's beat is heard steadily, faster or slower, right through. No sudden changes, denoting an edit. Yet the total distance is 149 miles. Maybe they took out a few stationary moments, but I didn't spot any tape joints while in motion. Darned good job! *Or maybe they really went that fast???*

Ives: Symphony No. 2; The Fourth of July. N. Y. Philharmonic, Bernstein.
Columbia MS 6889 stereo

Good old Ives! As I always say, if you don't take this old man too seriously, he is bound to be the best of fun for any solid hi-fi American ear. Just think. The Symphony No. 2 dates from the turn of the century. And the incredibly wonderful cacaphony of the "Fourth of July" was composed in 1913.

The Symphony isn't really very dissonant. But it has all the Ives hallmarks, including old fashioned hymns, "Turkey in the Straw" and, especially "Columbia, the Gem of the Ocean" (remember that one?). All woven into a sort of Brahms-Berlioz-Wagner texture—European music trying its damndest to acclimitize itself into primitive Danbury, Connecticut! It's a grand, indigestible mixture as usual; but Ives is for real, even so. A great old guy.

"Fourth of July" is Ives in his later stages. Same old mixture of tunes—but now he's found the way to thumb his nose at everybody and say what he *really* wants to say—dissonance. It's crawling with it. But the old tunes are still there, including—natch—"Columbia, the Gem of the Ocean." The fireworks in this piece make for the most outlandish orchestral noise anybody will ever hope to hear. It took two conductors to manage it. Seymour Lipkin helped Mr. Bernstein out in the musical crisis.

Frescobaldi, Monteverdi: Arie musicali. Collegium Musicum of Berkeley.
Cambridge CRS 1708 stereo

For many years the difficult late music of Monteverdi has been oohed and aahed at by the dedicated. But in most performances it has made precious little sense. You just can't do Monteverdi with big, Romantic, opera voices and at a dirge-like crawl! That's been the (mistaken) style, nevertheless, and still is in plenty of performances. Nor do fancy modernized arrangements, with piano or orchestra, do any more for the music.

This scholarly performing group makes better sense, and hence communication, than any I've heard so far. Their scholarship is excellent—that's easy. But they also have a feeling for proportion and word-rhythm that prompts them to sing the music "up to time," so it actually moves—instead of perpetrating the usual religious snail's-pace. Done in this reasonable fashion, the music makes sense for anybody's ear. Both Monteverdi and Frescobaldi, he who was once thought of as a keyboard-only composer. Here, Frescobaldi is acting like M. himself, and doing it very nicely.

The principal singer is the soprano Carole Bogard. She's good. She comes nearer than most to making intelligible not only the fancy turns and twists of the music but even the strange ornaments, notably that strangled "uh-huh-huh-huhhuhhuh" ending which was the precursor of the later and much more familiar trill. Some singers get apoplectic over this thing, they try so hard. Bogard just sings it, as though it were easy. (It was—once.)

Bogard is a curious mixture here. Her lighter tones are lovely, she makes ravishingly accurate sounds in many of the complex passages in this music. But when she sings loud, the typical American "shatter" occurs—hard on the mike; the tone goes unfocused, the pitch becomes vague, the musical sense suffers. Some of her colleagues do the same thing.

It might be added that the California Italian produced by these singers ain't much. It's too diphthongic. "Che" (with a K) is not "Kaye" nor is "mio" a species of cat's miouw. What is needed is the pure vowel sound of any Latin language, mostly absent in English and American, essential in Italian.

The numerous works are accompanied by two small sizes of harpsichord, once an organ, and once a chitarrone, a long-handled lute-like instrument. More instrumental bass support would have helped sustain the interest, I think. Most items are vocal solos or duets. Beyond these, the trios and one quintet tend towards the usual non-blend of today's pro voices. Two solo keyboard pieces, one to a side, are played by the group's leader, Alan Curtis.

Special P.S. That second soprano you hear on band 4 of Side 1—he *is* a soprano, not a contralto—is the countertenor John Thomas. Highest I've ever heard.

Hither and Yon

Edward R. Murrow—A Reporter Remembers. Vol. One: The War Years.
Columbia 02L 332 mono

There are only two voices on these four long LP sides, and one of them, an announcer, merely says occasional dates. All the rest is Edward R. Murrow, speaking from London in the original and (for us oldsters) vividly remembered on-the-scene CBS broadcasts during the war years. It is a most moving slice of real history-in-the-act, such as no later "re-creation" could ever possibly achieve.

At first you think it's going to be

monotonous as all get out. That flat, straightforward voice, always the same, the lo-fi sound (but clear enough, always), the very brief interruptions between the successive broadcasts, all favor somnolence—if you don't listen too hard.

But you will. You can scarcely help it. The man was a natural dramatist and word painter, he had an entirely easy American style without fancy pretention, yet expressing profound ideas and emotions. His casual accounts of what was going on in those crucial days, his fervor and anguish and his admiration, all come over with amazing immediacy, as he takes us here and there, recounting the day's events or, occasionally, giving us on-the-spot coverage of the war itself.

The most dramatic moments in these accounts are two. First, an actual London air raid warning very early in the war, before any actual bombing; you hear the sirens going off, guns and shells popping, and your hair curls—mine did, anyhow. A terrifying sound. The other is entirely drama—Murrow's recounting of a bombing flight to Berlin, very soon after he got back. No sound effects here; just words. But the picture of war in the air over Berlin is shudderingly real.

I think the most important message one gets from these Murrow talks is the actual sense and feel of war-time—the heightened awareness, the tension, the heroics, the "we" and "they," friend and enemy, the sense of monsters on one side and saints on the other, the humble gratitude of people for the mere existence of other people on their own side, a most revealing contrast to our own present terrible sense of frustration and insecurity. It is an implacable fact that war brings out both the best and the worst in men. That is what you hear in this recording.

The Moldau And Other Favorites. N. Y. Philharmonic, Bernstein.

Columbia MS 6879 stereo

It doesn't take much to describe this record. Lennie B. has always had a way with sweet-type Romantic music and he has a good orchestra which Columbia knows how to record very nicely. So here you have a lovely collection of old Bohemian favorites. I like, I like! Definitely. *Æ*

LIGHT LISTENING

Chester Santon

HAVING ATTENDED ALL the New York High Fidelity shows, I'm tempted, in weighing the 1966 affair, to think back to earlier shows when the sound the budget could afford fell very sweetly upon the ear. You don't have to be a millionaire to select a system at the N. Y. show these days that will perform well in the home but a well-heeled imagination doesn't hurt. Far too often, you have to imagine, on the basis of fairly wide experience, how a particular component or complete setup will sound in your living room. Perhaps the acoustics of the earliest New York display rooms really did have a sweeter sound, as some veterans contend to this day. We've now reached the point where components aimed at the highest audio budget fare little better at the N. Y. show than current low-ticket items if the exhibitor is off on his luck when he draws for the room that will be assigned to him. Even with the best of luck, he can still run into difficulty. This can be downright rough when over a year's investment of time and money has gone into the design of a 200-watt solid-state amplifier (a limited-market item at best) only to have a peak in the display room acoustics hobble its performance. Anyone building a sophisticated product for today's market can only hope that visitors attending the New York show will be sophisticated in their ability to make allowance for the display facilities. As a visiting record reviewer, most of my attention, as usual, was directed this year to improvements in the stereo pickup cartridge. The disc is still the major source of music on the market and a better cartridge can frequently be the biggest factor in updating an already presentable sound system. While advocates of both moving coil and moving magnet had improved versions of their respective designs on hand, I came away from cartridge displays this year with the distinct impression that, for the second year in a row, the biggest breakthrough in dollar value for the consumer had occurred in the ceramic pickup. In an exhibitor's room smaller than most, a ceramic cartridge with lower mass (and letters LM in its designation) promised to turn out a very good account of itself in living rooms next year at the amazing price of 15 smackers in American currency. The pickup brought back memories of pioneer high fidelity shows when the very reasonably priced General Electric mono cartridge lured much of a nation into giving components a try.

Manny Albam: Brass on Fires
Solid State 18000

The appearance of a record label with a title such as Solid State can be taken as a sign that disc makers who've never shown interest in component playback equipment are becoming aware that it exists. This new label is a division of United Artists, whose devotion to good demonstration material on discs has been sporadic at best. Solid State's initial release consists of six records, none particularly serious in nature. Included are albums by Jimmy McGriff devoted to soul and big band material, an exotic Kokee Band, whatever that is, some jazz by Thad Jones and Mel Lewis, and a vocal disc by the Will Bronson Singers. Manny Albam's album featuring brass instruments is as stringent a test vehicle as any in this new series which employs solid-state equipment in all principal phases of the record making process. UA's new recording console contains today's apparently inevitable twenty-eight microphone inputs, thereby giving the producer a potential for seven times the "adjacent mike" distortion he could theoretically command with only four mike inputs. All post mixing (a corollary evil once you're committed to a sizable bundle of mikes) was done on transistorized gear and monitoring is stated to have taken place on home music systems. Neither homes or systems are identified. The studio recorder was a solid-state Scully four-track, model #280. Amid the array of microphones was a Sennheiser MKH 404 with solid-state r.f. circuitry. The other mikes included Telefunkens, Altecs, and AKG's. It's quite possible that most knowledgeable listeners, upon screening this record, will go along with the producer's contention that less limiting and compression took place in the manufacture of this record than we usually find in pop releases. The sound is pleasantly

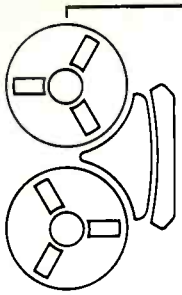
free and wide in range even on a good tube system. (There are such, you know.) The only hitch, if you can call it that, occurs during the work of the quartet of trumpeters hired by Manny Albam for the occasion. Some good pickups of fairly recent design may not be too happy when tracking the quartet. The 1967 crop of pickups introduced this fall may have less difficulty with the trumpet passages or they may merely reinforce my present suspicion that the roughness on the record occurred when sound waves of these instruments made first contact with the single Telefunken set aside for their pick-up. The four trumpeters were seated around this mike facing one another as each man boxed the compass in a tiny circle. The diaphragm of the mike was directly in line with the height of the instruments and at no point was the bell of a trumpet more than two feet from the mike. Does one have to be a physics major to suspect that some distortion took place before the sound entered the microphone as the wave forms of opposing trumpets met head on? At any rate, the rest of the orchestra—trombones, french horns, drums, bass, guitar, and bongos—fare better than the trumpet quartet under the searching scrutiny of solid-state recording gear. The tunes selected are fine old favorites that lend themselves easily to the Albam brass treatment. The release is a good start in the right direction on the part of United Artists. It would have been better still but for the arbitrary placement of the four trumpets.

Saxes Mexicanos

RCA Victor LSP 3640

Some musical outfits exert an influence on the record-buying public far greater than their size would indicate. On this new disc we find the influence of the Tijuana Brass style in the playing of two alto saxophones. The result is a sound few of us expected to hear in wind instruments so closely identified with non-Latin music. When Herb Alpert's Tijuana Brass made its very first appearance on records and tapes in the summer of 1965, few people in and out of the industry suspected that this would be the hottest attraction in many a musical moon and that its enormous appeal would persist for an entire year. Any one who heard the early Tijuana Brass releases at the 1965 N. Y. High Fidelity show had reason to suspect that Alpert would go far on the basis of sound alone. His label, A and M, was totally unknown at the time but shrewd exhibitors at the show were quick to press his discs into service. Manufacturers of solid-state amplifiers and preamps were particularly pleased with the way Tijuana Brass discs revealed the crisp response their luxury-price units were capable of turning out. Now, after a year of listening to the Alpert group on all sorts of equipment, including the mundane sound of TV, it is easy to see why his music sounds as clean as it does on a good

(Continued on page 69)



Tape Guide

HERMAN BURSTEIN

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered.

Q. The problem appears to be that my tapes are sticking together—each layer sticking to the layer below. When the tape becomes unstuck, it causes a bad flutter in the recording. At first I thought it might be the particular tape reels that I was using, having sharp underedges. While this may be a contributory cause, I do not entirely get away from the sticking by going to other reels. The problem is less with Mylar tapes, but it is still present even with these. All this has brought me to the tentative conclusion that the present dry weather has caused a static charge to be built up on the tapes, causing the layers to stick to each other. Do you believe this could be the cause? Is there some way that I could disperse a static charge?

A. I have discussed your problem with an authority in the tape manufacturing field, and his opinion is that the problem is not one of static charges but of the chemical formulation employed in the binder that holds the tape oxide and bonds it to the base. His suggestion is that you try other brands of tape than the ones you have been using. If, however, the problem *is* one of static charges, try winding the tape from one reel to another *at operating speed* before you use it for recording. This slow winding process may release the charges. Alternatively, you might try rapidly winding the tape from one reel to another.

Q. In the January, 1965, issue of AUDIO *there was an article on taping old records. The article mentions a variable low-pass filter that appeared in the March, 1954, issue of* AUDIO. *I would like to know if you would send me instructions on how to build the filter or if it is possible to buy such a filter.*

A. I suggest that you query the author of the article about the filter. However, I would like to mention that there are other ways of reducing record noise when copying a record onto tape. One way is to record at slow speed, which results in treble attenuation. Another is to use the treble filter in an audio preamp. Some preamps have the tape-output jack *after* this filter, which is what you want. Others, however, have the tape-output jack before the filter. In this case you would have to feed the tape recorder from the preamp's regular output instead of from the tape-output jack. Still another, but less convenient, technique is to increase the bias current employed in the tape recorder, thereby achieving a sharp treble cutoff; but this is only suitable for the person with the necessary instruments for measuring bias, so that correct bias can be restored; sometimes the tape recorder includes a VU meter that can be switched to read bias.

*Q. In playback, I pick up a nearby radio station with my **** tape recorder. Can you please suggest a remedy?*

A. Try placing a 1000-ohm resistor between the playback head and the base of the transistor in the first playback stage. Also try a capacitor of about 25 pF between the base side of this resistor and ground. I have discussed your problem with the manufacturer of your machine, and he thinks your problem might be solved simply by shielding the playback head. He recommended that you try placing a piece of aluminum foil about this head. If this doesn't work, he suggested that you write to him and he can supply a shield designed for your tape machine. Another suggestion is that you try an earth ground, namely a heavy wire from the chassis of the machine to a cold water pipe or similar object (never a gas pipe) that makes firm contact with earth.

*Q. I intend to purchase a high fidelity stereo tape recorder costing between $300 and $500. I would prefer that the machine be a complete reproduction system, although I have not excluded the possibility of obtaining separate speakers, and I am therefore leaning to the **** tape recorder. I would like your opinion with respect to the quality of this machine, of its speakers, of its tape handling characteristics, of the difficulty of getting replacement parts, and of difficulty of getting adequate service. I would also appreciate your opinion of the quality and relative merit of the following tape recorders* (six were listed by the correspondent). *Important factors to be considered are reliability, quality, quality of workmanship, and ease of getting repair service.*

A. As I have pointed out before, and apparently it requires repeating, this column cannot comment on specific audio components. Therefore I can only make some general remarks about your choice of a tape recorder. In picking a unit, you should rely as much on the evidence of your ears as on any other single factor. If one machine sounds as good as another to your ears, then you don't need anyone else's opinion as to which machine sounds better. On the other hand, you can be guided by competent opinion, particularly as expressed in equipment reviews, with respect to quality of construction, durability, and similar matters that are not immediately apparent to the ear or eye. If you buy a well-known brand, it is not likely that you will have difficulty in obtaining replacement parts and service.

Q. I would like to buy a high-quality FM tuner and play this through the amplifier and speakers of my tape recorder, instead of having to buy a separate amplifier and pair of speakers. How good a system is this likely to be, and would there be any harmful effect on the equipment?

A. I see nothing wrong with playing a tuner through the amplifier and speakers of a good tape recorder, except that the sound quality will not be as good as through a high-fidelity amplifier and high-fidelity speakers. There would be no harmful effect on the tape recorder or tuner.

Q. I would like to play my a.c.-d.c. FM-AM stereo radio through my tape recorder, but have been told that this would make for excessive hum. Is this true?

A. I strongly discourage the use of an a.c.-d.c. device, such as your radio, with other audio equipment. Not only is there the hum problem but, more important, there is the problem of a.c. on the chassis and consequent danger of a lethal shock to the user. Connecting the radio to your tape recorder would possibly put a.c. on the chassis of the recorder. The radio itself is constructed so the user doesn't come in contact with its chassis.

*Q. I am using a **** tape transport for playback only. I plan to equip it with a two-track playback head and a four-track playback head, and I am in search of a playback amplifier with the appropriate equalization for 7.5 and 3.75 ips. Can you recommend a commercial unit or supply a schematic from which I could construct such a unit?*

A. I cannot recommend a commercial unit but can direct your attention to what appears to be a fine circuit described in the October, 1964, issue of AUDIO. This is in the article by Abajian and Jones beginning on page 22. For your purposes you would be interested in constructing only the playback amplifier portion of the tape preamp described there. The circuit appears relatively simple and provides for 7.5, 3.75, and 1.875 ips equalization.

Q. Where can I buy a stroboscopic indicator of the type that is rested lightly against the moving tape?

A. I suggest that you write to the following:

1. Dubbings Sales Corp., 226 Franklin Avenue, Hewlitt, L. I., New York.

2. Orrtronic, P. O. Box 27, Opelika, Alabama.

(Continued on page 71)

The AUDIO Annual Tape Recorder Compendium

ANY COMPILATION OF FACTS regarding tape recorders is subject to the inevitable weaknesses (and strengths) of such projects. We have tried to be as accurate and complete as possible, but we are, after all, as human and thus as fallible as anyone. Between editorial, typewriter, and typographer many an error can creep in. We can only hope that we have been successful in catching every one of them.

No attempt is made herein to list every machine that is being distributed. We have deliberately left out those blocks of manufacturers that do not offer equipment primarily to the components field. However, we have listed non-component machines when they are products of makers that do primarily service this market.

The layout is simple. All listings are alphabetical by manufacturers' popular name. Nothing original here. What is unique about this tabulation is that we have left out some specifications that are normally quoted for tape recorders. These are those figures that are so non-standard (or similar) that their inclusion has no meaning. In the everybody's-got-the-same category is frequency response. Omitted by reason of non-standardization is signal-to-noise ratio.

We have tried to make the charts self-explanatory. This is the same format that is now standard in our annual August Product Preview issue.

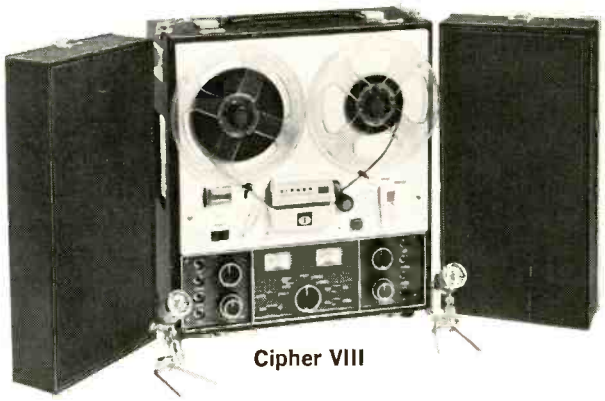
It thus remains only to say that a blank space in a particular column is indicative of non-relavancy, while a dash is a mark of our lack of this particular information. The last column of Special Features represents manufacturers' own comments about their products. The prices quoted are the 'list' prices. Some will be discounted, others will not. We can only continue to advise shopping for price as well as quality. Remember that tape recorders are sophisticated components. Something can go wrong with a machine, new or otherwise. So be as sure of the reliability of your dealer as of the price.

Ampex 800 Series

Ampex PR-10

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD% max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Sens. mV.	Mic. Input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
AMPEX	860	1⅞, 3¾, 7½	2	R/P -E	4	Stereo	1	Ind.	–	Belt	7	0.15	0.2	–	–	160	Yes	1	250k	–	No	2 VU	Low imp.	19 x 13½ x 7½	37	319.00	Basic deck without power amps; Model 850-$269. Reverse playback: Model 890-$389.
	985	1⅞, 3¾, 7½	3	R/P E R/P	4	S	1	Ind.	–	Belt	7	0.15	0.2	–	–	–	Yes	–	–	–	No	2 VU	–	–	–	599.95	Built-in FM-Multiplex tuner all enclosed in a walnut cabinet. Reverse play
	1160	1⅞, 3¾, 7½	3	R/P E	4	S	1	Ind.	–	Belt	7	0.15	0.2	–	–	160	Yes	3	250k	–	No	VU	Low imp.	19 x 13½ x 7½	37	469.00	Automatic threading. Model 1150 deck: $399. 1165 unit has reverse play: $489.
	2060	1⅞, 3¾, 7½	3	R/P E R/P	4	S	1	Hyst. sync.	–	Belt	7	0.12	0.15	–	–	115	Yes	3	250k	–	No	Neon	Low imp.	19 x 13½ x 7½	37	509.00	Automatic threading, automatic reverse play.
	RP-10	15/16, 1⅞, 3¾, 7½, 15	4	E R P P	4,2	S	1	Hyst. sync.		Belt	7	0.18	0.25	–	–	–	No	–	–	–	–	VU	600	19 x 8¾ x 6	44	1295.00	Deck only. May be remote operated. Has additional 2-track play only head.

Concertone 803



Cipher VIII

Concord F-100

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Sens. mV.	Mic. input imp. ohms	Mic. input Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
CIPHER	11	3¾, 7½	2	E R/P	2	M	1	Ind.	–	–	7	–	–	–	–	–	Yes	–	–	–	No	VU	–	–	17	109.95	Built-in speaker, self-contained carrying case.
	77	1⅞, 3¾, 7½	2	E R/P	4	S	1	Ind.	–	–	7	–	–	–	–	–	Yes	–	–	–	No	2 VU	–	–	36	249.95	Speakers in case lid, automatic cutoff.
	98	1⅞, 3¾, 7½	3	E R P	4	S	1	Ind.	–	–	7	–	–	–	–	–	Yes	–	–	–	No	2 VU	–	–	37	350.00	Speakers in case lid, automatic cutoff, S-O-S, S-W-S, dual earphone outputs.
	300	1⅞, 3¾, 7½	2	E R/P	4	S	1	–	–	–	7	–	–	–	–	–	Yes	–	–	–	No	2 VU	–	–	38	169.95	Two built-in speakers in self-contained carrying case.
CONCERTONE	803	3¾, 7½	6	E R P P R E	4	S	3	Hyst. sync.	Ind.	–	7	–	–	–	–	75	Yes	–	hiZ	hiZ	Yes	2 VU	Low imp.	–	–	519.95	3+3 Reverse-O-Matic operation, all transistor-design, add-a-sound and echo recording, self-contained in carrying case. Model 804B is deck only version, price $449.95. Model 805 is the complete unit plus the Norton power amplifier, list price $589.95.
	727	15/16, 1⅞, 3¾, 7½	3	E R P	4	S	1	d.c.	–	–	5	–	–	–	–	–	Yes	–	hiZ	hiZ	No	2 VU	–	–	16	289.95	Battery-operated stereo recorder. Has built-in stereo speaker pair, self-contained carrying case, uses 6 "D" cells, may be used with included a.c. adapter. S-W-S, provision for microphone control of type motion.
CONCORD	776	3¾, 7½	2	E R/P	4	S	1	Sync.	–	Belt	7	0.15	0.18	–	–	–	Yes	2	–	–	Yes	2 VU	30	13 x 13 x 20	40	349.95	Automatic reverse play. Automatic shutoff. Two speakers in split-type case, S-W-S.
	727	3¾, 7½	2	E R/P	4	S	1	Sync.	–	Belt	7	0.15	0.18	–	–	–	Yes	2	–	–	Yes	2 VU	30	13 x 13 x 20	40	299.95	As above with no reverse record or play.
	700	7½, 3¾	2	E R/P	4	S	1	Sync.	–	Belt	7	0.2	0.24	–	–	–	Yes	2	–	–	Yes	VU	High imp.	11 x 12 x 18	30	249.95	Automatic shutoff, two detachable speakers.
	444	1⅞, 3¾, 7½	2	E R/P	4	S	1	Sync.	–	Belt	7	–	–	–	–	–	Yes	–	–	–	Yes	2 Neon	–	–	–	199.95	Self-contained carrying case, S-W-S, one speaker in case with second in detachable cover.
	F100	1⅞	–	E R/P	2	M	1	Servo drive	–	–	Spec. cart	–	1⅞ 0.025	–	–	–	Yes	1	–	–	–	VU	–	8 x 4¾ x 2⅞	3	99.95	Battery operation from 5 "C" cells or from a.c.

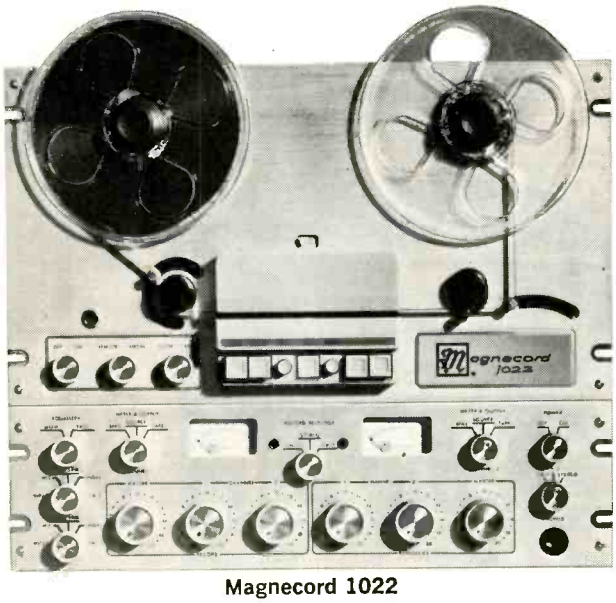
Crown 800 Series

Heathkit AD-16

Knight-Kit KG-415

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Sens. mV.	Mic. input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
CROWN	SS724	1⅞, 3¾, 7½	3	E R P	4	S	3	Hyst. sync.	Ind.	Belt	10½	0.9	0.18	1	99.8	38	No	0.15	100k	100k	Yes	2 VU	5k	19 x 9 x 17½	46	1240.00	Plug-in modules; glass lifters, remote control option. Other speeds and head configurations available.
	SS822	3¾, 7½, 15	3	E R P	2	S	3	Hyst. sync.	Ind.	Belt	10½	0.9	0.18	1	99.8	38	No	0.15	100k	100k	Yes	2 VU	5k	19 x 9 x 17½	50	1440.00	As above.
DYNACO	Beocord 2000	7½, 3¾, 1⅞	3	E R P	4	S	1	Hyst. sync.	–	Idler	7	0.07	0.11	1	–	180	Yes	0.05	200	100k	Yes	2 VU	–	18 x 14 x 10	46	498.00	Slide mixing controls; 6 selected inputs by means of plug-in boards. 2-track recorder avail.
EICO	RP-100	7½, 3¾	3	E R P	4	S	3	Hyst. syn.	Ind.	Belt	7	0.15	0.29	–	–	45	No	0.5	3k	600	Yes	2 VU	–	15⅞ x 13¾₆ x 7¼	48	299.95K 450.00W	Deck only, S-O-S.
HEATH	AD-16	7½, 3¾	3	E R P	4	S	3	Hyst. syn.	Cap. ind.	Belt	8¼	0.18	0.25	1.5	99	120	No	0.28	50k	50k	Yes	2 VU	Low	17⅝ x 13⅛ x 8½	35	414.00	All solid-state kit. This is a Magnacord 1020 in kit form.
KNIGHT	4450	7½, 3¾	3	E R P	4	S	2	4-pole	Take-up Direct ind.	Belt	7	0.02	0.03	1	99.8	90	No	3	3000	1k	Yes	2 VU	Low imp.	14 x 14 x 8	30	299.50	All solid-state. Three hyperbolic heads; has sound-on-sound and echo. Selector control keyed to six indicator lights.
KNIGHT-KIT	KG-415	7½, 3¾	3	E R P	4	S	2	4-pole	Take-up direct ind.	Belt	7	0.02	0.03	1	99.8	90	No	1-5	3000	50k	Yes	2 VU	Low imp.	–	–	249.95	As above. Earphone output for low-impedance phones.
KORTING	TR-4000	1⅞, 3¾, 7½	3	E R P	4	S	1	–	–	–	7	0.17	0.2	–	–	120	Yes	–	200	–	–	Eye	–	20¼ x 14 x 8	33	399.95	Self-contained carrying case, echo, S-O-S, S-W-S.
	TR-3000	3¾, 7½	2	E R P	4	S	1	–	–	–	7	0.1	–	–	–	–	Yes	–	200	–	–	Eye	–	20¼ x 13 x 7½	36	299.95	

Lafayette RK-880



Magnecord 1022

EICO RP-100

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Mic. Input Sens. mV.	Mic. Input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line-feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
LAFAYETTE RADIO	RK-880	1⅞, 3¾, 7½	3	E R P	4	S	1	Hyst. syn.	–	Belt	7	0.15	0.25	1.25	98.8 1.25	–	No	0.4	10k	500k	–	2 VU	–	11¾ x 7 x 11¼	22	249.95	S-O-S; individual bias adjustment; tape equalization adjust; headphone jack.
	RK-860	1⅞, 3¾, 7½	2	E R/P	4	S	1	4-pole	–	Belt	7	0.15	0.03	1.3	99	–	Yes	1.6	–	–	–	2 VU	–	15¾ x 7⅞ x 14	25	219.95	S-O-S; S-W-S; two 5-x 7-in speakers; direct phone pick-up.
	RK-840	1⅞, 3¾, 7½	2	E R/P	4	S	1	4-pole	–	Belt	7	0.2	0.3	1.4	98.6	–	Yes	0.2	10k	500k	–	2 VU	–	15¾ x 7⅞ x 14	24	169.95	Two 5-inch speakers; S-W-S; direct mag-phono pickup; solid-state circuitry.
	RK-820	1⅞, 3¾, 7½	2	E R/P	4	S	1	4-pole	–	Belt	7	0.15	0.25	–	98.6	–	No	1.6	10k	500k	–	2 VU	–	–	15	109.95	S-W-S; solid-state pre-amps; automatic shut-off.
	RK-830	1⅞, 3¾, 7½	3	E R P	4	S	1	4-pole	–	Belt	7	0.15	0.25	1.5	99	–	No	1.6	10k	500k	–	2 VU	–	12⅝ x 6 x 10⅜	15	159.95	Tape and input monitoring; S-O-S; S-W-S; solid-state preamp.
MAGNECORD	1020	3¾, 7½	3	E R P	4	S	3	Hyst. syn.	Ind.	Belt	8¼	0.18	0.25	1	–	80	No	1	50k	22k	Yes	2 VU	Low imp.	17¼ x 13¼ x 6⅞	35	570.00	Dual stereophone jacks; all solid-state.
	1024	3¾, 7½	3	E R P	4	S	3	Hyst. syn.	Ind.	Belt	8¼	0.18	0.25	1	–	80	No	0.32	50k	22k	Yes	2 VU	Low imp.	19 x 15¾ x 12	48	648.00	As above plus 2-speed motor; separate meter switching; master gain control.
	1021	3¾ 7½	3	E R P	1	M	3	Hyst. syn.	Ind.	Belt	8¼	0.17	0.25	1	–	80	Yes	.038	150	22k	Yes	VU	150-600 bal.	19 x 15¾ x 12	48	708.00	Broadcasters special-speed and track options.
	1022	7½, 15	4	E R P+P	2	S	3	Hyst. syn.	Ind.	Belt	8¼	15/ 0.15	7½/ 0.17	1	–	80	No	.038	150	22k	No	2 VU	150-600 bal.	19 x 15¾ x 12	48	1788.00	As above plus ¼ track play head.
	1028	7½, 15	3	E R P	2	S	3	Hyst. syn.	Ind.	Direct	10½	15/ 0.1	7½/ 0.15	1	–	45	No	.90 dBm	150	50k	No	2 VU	150-600 bal.	12¼ x 17⅝ x 12	55	1995.00	As above without extra head.
NEWCOMB	TX-10-4	3¾, 7½	3	E R P	4	S	1	Hyst. syn.	–	Belt	10½	0.15	0.2	–	99.5	90	No	2	–	500k	Yes	2 VU	Low imp.	12¼ x 6⅜ x 9½	–	–	Joystick operation. Has S-O-S.

Newcomb TX-10-4

Norelco 150

Korting TR/4000

Norelco 201

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amp?	Mic. Input Sens. mV.	Mic. Input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output-imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
NORELCO	Carry-corder 150	1⅞	2	E R/P	2	M	1	d.c.	–	–	cart.	–	0.35 9+ 1⅞	–	–	70	Yes	–	–	–	No	VU	–	7⅛ x 4½ x 2⅛	3	90.00	Battery operated-5 'C' batteries, uses the Norelco cartridge. This cartridge is also used in a variety of mono and compatible stereo machines for home and auto.
	201	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	0.14	–	–	–	90	Yes	–	–	–	No	Eye	14'4 x 10 x 5	15⅜ x 13⅜ x 6⅜	18	149.50	Pause control, 1 speaker in self-contained case, dual amp outputs.
	350	1⅞	2	E R/P	2	M	1	d.c.	–	–	cart.	–	0.1 9+ 1⅞	–	–	70	Yes	–	–	–	No	Auto	–	14½ x 8½ x 3½	8½	130.	Cassette player/recorder. Automatic record level.
	420	1⅞ 3¾ 7½	2	E R/P	4	S	1	–	–	–	7	–	0.1	–	–	120	Yes	–	–	–	Yes	Eye	–	17 x 14 x 9	22	239.50	Pause control, duo play, S-W-S, one speaker in self-contained carrying case, second in removable lid.
	95	3¾	2	E R/P	2	M	1	–	–	–	7	–	0.2	–	–	–	Yes	–	–	–	No	Auto	–	14½ x 10 x 5	12	179.50	Self-contained case with speaker, automatic record level.
OKI	222	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	0.2	–	–	–	–	Yes	–	10k	500k	No	VU	–	11⅞ x 7 x 12⅝	16	149.95	Mono record, stereo play.
	555	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	0.12	–	–	–	–	Yes	–	10k	500k	No	2 VU	–	–	–	349.95	S-O-S, S-W-S, separate speakers.
	300D	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	0.2	–	–	–	–	No	–	10k	500k	No	2 VU	–	11⅞ x 6 x 10⅜	–	159.95	Deck only, walnut housing.

Revox G-36

Roberts 1725-8L

Panasonic RS-780

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Mic. Input Sens. mV.	Mic. Input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
PANASONIC	RS-1000S	3¾, 7½	4	E R/P R/P E	4	S	3	–	–	–	7	0.15	0.25	–	–	–	No	–	20k	80k	–	2 VU	2.5k	16 x 21 x 9	55½	699.95	Deck only, stereo phone output, automatic reverse record and play, S-O-S, S-W-S, echo.
	RS-770	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	–	–	–	–	–	Yes	–	–	–	–	2 VU	–	16 9/16 x 19 5/16 x 11 13/16	30	279.95	S-O-S, S-W-S, automatic shutoff, two speakers in hinged case covers.
	RS-755S	3¾, 7½	2	E R/P	4	S	1	–	–	–	7	0.25	–	–	–	–	Yes	–	–	–	–	2 VU	–	13⅜ x 16½ x 8	27½	199.95	S-O-S, S-W-S, two built-in speakers in self-contained carrying case.
	RQ-705	3¾, 7½	2	E R/P	2	M	1	–	–	–	7	–	–	–	–	–	Yes	–	–	–	No	2 VU	–	13⅛ x 6¼ x 13	17	99.95	Built-in speaker in self-contained carrying case.
	RS-780	1⅞, 3¾, 7½	4	E R/P R/P E	4	S	1	–	–	–	7	0.2	0.3	–	–	–	Yes	–	–	–	–	2 VU	–	18 x 18 x 12	45	349.95	Automatic reverse record and play, two speakers on removable wings of self-contained carrying case, stereo phone output.
REVOX	G-36	3¾, 7½	3	E R P	4	S	3	Hyst. Syn.	Ind.	Direct	10½	–	–	1	–	45	Yes	3	500k	1 meg	Yes	2 VU	Low imp.	11½ x 13½ x 18½	45	500.00	Also available in 2-track version or in 7½-15 ips version. 2-track unit is also $500. 15 ips unit is $700.
ROBERTS	1725-8L	3¾, 7½	2	E R/P	4	S	1	Ind.	–	Belt	7	0.2	0.25	3	99	75	Yes	2.5	2 meg	500,000	No	2 VU	High imp.	13¼ x 17½ x 13¾	33½	389.95	Records and plays back Lear-Jet type 8-track cartridges and reel-to-reel.
	770X	1⅞, 3¾, 7½	3	E R/P	4	S	1	Hyst. syn.	–	Belt	7	0.15	0.25	3	99.5	75	Yes	1.5	500,000	1 meg	No	2 VU	Low imp.	20 x 13 x 9	47	399.95	S-O-S, S-W-S; Cross-Field head; 4-digit counter.
	5000	3¾, 7½	4	E R P X	4	S	3	Hyst. syn.	Ind.	Direct	10½	0.12	0.18	3	99.7	45	Yes	0.5	5000	100,000	Yes	2 VU	15k	15⅛ x 16⅞ x 9¾	70	699.95	S-W-S; Cross-Field head; piano key controls.
	7000RX	1⅞, 3¾, 7½	3	E R/P X	4	S	1	Hyst. syn.	–	Belt	7	0.15	0.25	3	99.5	75	Yes	0.5	5000	100,000	Yes	2 VU	15k	15⅛ x 16⅞ x 9¾	45	579.95	Automatic repeat; automatic reverse; Cross-Field head.
	400X	7½, 7½	4	E R P X	4	S	3	Hyst. syn.	Ind.	Belt	7	0.12	0.18	3	99.7	45	Yes	0.5	5000	100,000	Yes	2 VU	15k	17¼ x 16 x 12¼	69½	799.95	As above plus S-O-S; S-W-S.

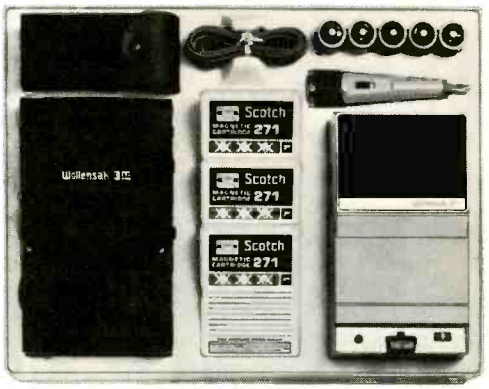
Uher 7000D

Tandberg 12

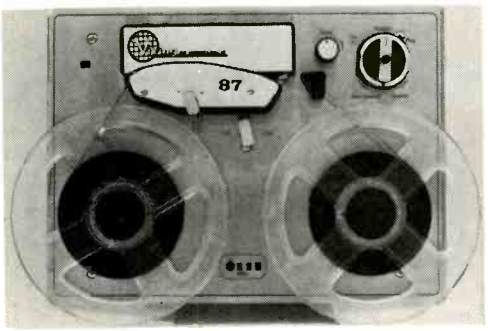
Sony 660

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Mic. Input Sens. mV.	Mic. Input Imp. ohms	Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output/imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
SONY-SUPERSCOPE	660	3¾, 7½	4	E R/P R/P E	4	S	3	Hyst. syn.	Ind.	Belt	7	0.06	0.1	1.5	99.8	60	Yes	–	Low	High imp.	No	2 VU	–	17 x 17 x 10¾	55	575.00	ESP automatic reverse; quad-radial 4-speaker system.
	530	1⅞, 3¾, 7½	2	E R/P	4	S	1	Ind.	–	Pulley	7	0.1	0.12	1.5	99.8	120	Yes	–	Low	High imp.	No	2 VU	–	19¾ x 10 x 15¾	38	399.50	Quad-radial 4-speaker sound; 20 w.p.c. amplifiers; RPR auto retracting pinch-roller.
	260	3¾, 7½	2	E R/P	4	S	1	Ind.	–	Pulley	7	0.19	0.25	1.5	99.8	120	Yes	–	Low	High imp.	No	2 VU	–	21⅜ x 15½ x 7¾	34	249.50	XL-2 Radial 2-speaker sound; solid state; 10 w.p.c.
	350	3¾, 7½	3	E R/P	4	S	1	Hyst. syn.	–	Pulley	7	0.19	0.25	1.5	99.8	120	No	–	Low	High imp.	No	2 VU	–	17⅞ x 12⁹⁄₁₆ x 6⁹⁄₁₆	20	199.50	Tape/source monitoring; phone jack; solid-state,
	250A	3¾, 7½	2	E R/P	4	S	1	Ind.	–	Pulley	7	0.19	0.25	1.5	99.8	120	No	–	Low	High imp.	No	2 VU	–	14¼ x 11⅜ x 6½	15¾	149.50	Solid-state.
TANDBERG	11	15⁄16, 1⅞, 3¾, 7½	3	E R P	2	M	1	d.c.	–	Belt	7	0.2	0.3	0.5	99	80	Yes	4.5	200	–	No	VU	600	13 x 10 x 4	71	595.00	Electronic tape speed control. Solid-state.
	12	1⅞, 3¾, 7½	2	E R/P	4	S	1	4-pole	–	Belt	7	0.15	0.2	0.5	99	115	Yes	0.15	200	1 meg.	Yes	Eye	Low imp.	15¾ x 11 1³⁄₁₆ x 6⅞	23	498.00	Bass and treble playback control. Solid-state.
	64	1⅞, 3¾, 7½	3	E R P	4	S	1	Hyst. syn.	–	Belt	7	0.1	0.15	0.5	99	100	No	1.25	5 meg.	1 meg.	Yes	Eye	Low imp.	–	–	498.00	Deck only. Solenoid operation for remote start-stop.
	92	1⅞, 3¾, 7½	2	E R/P	2	M	1	4-pole	–	Belt	7	0.15	0.2	–	–	–	Yes	–	1 meg.	100,000	No	2 eyes	–	15 x 6¾ x 11⅝	22	256.10	Model 92F identical except it has remote control solenoids built in.
UHER	5000	15⁄16, 1⅞, 3¾, 7½	2	E R/P	4	M	1	Hyst. syn.	–	Idler	6	0.1	0.15	–	–	–	Yes	.075	200	1 meg.	No	VU	Low imp.	6 x 10 x 12	16	300.00	Self-contained carry-case, provision for slide-sync. One built-in speaker.
	6000	3¾, 7½	2	E R/P	2	M	1	Hyst. syn.	–	Belt	7	0.1	0.15	–	–	–	Yes	.075	200	1 meg.	No	VU	Low imp.	14 x 13 x 7	–	160.00	Self-contained carry-case, provision for slide-sync. One built-in speaker.
	7000D	3¾, 7½	2	E R/P	4	S	1	Hyst. syn.	–	Belt	7	0.1	0.15	–	–	–	Yes	.075	200	1 meg.	No	VU	Low imp.	15 x 14 x 7	16	230.00	Two built-in and two extension speakers.
	8000E	3¾, 7½	4	E R P D	4	S	1	Hyst. syn.	–	Belt	7	0.1	0.15	–	–	–	Yes	.075	200	1 meg.	Yes	2 VU	Low imp.	15⁹⁄₁₀ x 6⅘ x 13	23½	420.00	Special slide-sync head.
	9000	3¾, 7½	3	E R P	4	S	1	Hyst. syn.	–	Belt	7	0.1	0.15	–	–	–	Yes	.075	200	1 meg.	Yes	2 VU	Low imp.	–	22	400.00	Deck with remote control, equalization selector.

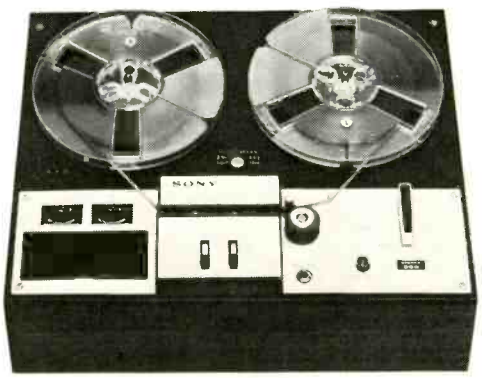
Viking 96/RP-100



Wollensak 4100



Viking 87



Sony 350

MANUFACTURER	MODEL NO.	Speeds	Number of heads	Head config.	Tracks	Mode	Number of motors	Drive motor type	Reel motors type	Capstan drive	Max. reel size in.	Wow and Flutter % 7½	Wow and Flutter % 3¾	THD % max. record level	Timing accuracy %	1200 ft. rewind sec.	Has power amps?	Mic. Input Sens. mV.	Mic. Input Imp. ohms	Mic. Input Hi-level input imp.	Mixing facility?	Vol. indicator type	Line feed output-imp. ohms	Dimensions W x D x H in.	Weight lbs.	Price	SPECIAL FEATURES
VIKING	807	3¾, 7½	1	P	4	S	2	4-pole	Ind.	Belt	7	0.2	0.3	–	99.5	90	No	–	–	–	–	–	–	16½ x 13½ 16	15½	124.95	Playback only. Base included.
	88	3¾, 7½	3	E R P	4	S	2	4-pole	Ind.	Belt	7	0.2	0.3	1	99.5	90	No	1	High imp.	0.1	No	2 VU	Low imp.	13 x 13 x 7½	22	339.95	Deck has source/tape comparison and tape pause control.
	880	3¾, 7½	3	E R P	4	S	2	4-pole	Ind.	Belt	7	0.2	0.3	1	99.5	90	Yes	1	High imp.	0.1	No	2 VU	Low imp.	22 x 15 x 9	44	439.95	As above but with satellite speakers in portable case. Head phone output.
	Studio 96	3¾, 7½	3	E R P	1, 2 or 4	M or S	3	Hyst. syn.	Ind.	Belt	10½	0.2	0.3	1	99.5	30	No	–	TRANSPORT ONLY			–	–	–	–	585.00 and up	Professional tape transport with automatic sequence function. Speed options.
	230	7½	3	E R P	1, 2 or 4	M or S	3	Hyst. syn.	Ind.	Belt	7	0.2	–	1	99.5	45	No	–	TRANSFORT ONLY			–	–	–	–	346.00 and up	Transport has interchangeable head blocks. Momentary push button operation. Speed options.
WOLLENSAK	1500SS	3¾, 7½	2	E R/P	2	M	1	4-pole	–	Belt	7	0.25	0.25	1	–	135	Yes	2	50k	300k	No	VU	–	6½ x 10¼ x 11¼	18	184.95	Built-in speaker, provision for floor switch.
	5710	1⅞, 3¾, 7½	1	ERP	2	M	1	2-pole	–	Idler	7	0.25	0.25	1	–	70	Yes	1	50k	300k	No	VU	–	16 x 7 x 10	20	159.95	Wood cabinet, built-in speaker.
	5740	1⅞, 3¾, 7½	1	ERP	4	S	1	2-pole	–	Idler	7	0.25	0.25	1	–	70	Yes	1	50k	300k	No	2 VU	–	21⅛ x 10²⁵/₃₂ x 10½	27¼	229.95	As above for stereo, automatic shutoff.
	7000	1⅞	2	E R/P	2	S	1	4-pole	–	Idler	Cart.	1⅞ 0.3	–	–	–	60	Yes	2	10 meg.	1 meg.	No	2 neon	–	16 x 8½ x 15½	43½	459.95	Accepts up to 20 3M cartridges for automatic play.
	4100	1⅞	2	E R/P	2	M	1	d.c.	–	Belt	Cart.	1⅞ 0.35	–	–	–	70	Yes	–	–	–	–	Meter	–	4½ x 2¼ x 7¾	3	99.95	Uses Scotch/Philips cartridge. Battery operation. Includes 3 cartridges, patch cord and mike.

MANUFACTURERS' NAMES AND ADDRESSES

Allied Radio Corp.
100 N. Western Ave.
Chicago, Ill. 60680
Ampex Corp.
Consumer Products Div.
2201 Landmeier Rd.
Elk Grove Village, Ill. 60007
Cipher (see Inter-Mark)
Concertone
9730 Factorial Way
South El Monte, Calif. 91733
Concord Electronics Corp.
1835 Armacost Ave.
Santa Monica, Calif.
Crown International
P. O. Box 261
Elkhart, Ind. 46515
Dynaco, Inc.
3912 Powelton Ave.
Philadelphia, Pa. 19104
EICO Electronic Instr. Co.
131-01 39th Ave.
Flushing, N. Y. 11352
Elpa Marketing Industries
New Hyde Park, N. Y. 11044
Inter-Mark
29 W. 36 St.
New York, N. Y. 10018
Knight (see Allied Radio)
Korting (see Matthew Stuart & Co.)
Lafayette Radio
P. O. Box 10
Syosset, N. Y. 11791
Magnecord
(see Midwestern Instruments)
Martel Electronics
2339 S. Cotner Ave.
Los Angeles, Calif. 90064
Matthew Stuart & Co.
3650 Dyre Ave.
New York, N. Y. 10466
Midwestern Instruments
P. O. Box 7509
Tulsa, Okla. 74105
Newcomb Products Co.
6824 Lexington Ave.
Hollywood, Calif. 90038
Norelco-
North American Philips Co.
100 Park Ave.
New York, N. Y. 10017
Panasonic-Matsushita
200 Park Ave.
New York, N. Y.
Revere-Mincom Div. 3M Co.
2501 Hudson Rd.
St. Paul, Minn. 55119
Revox (see Elpa Marketing)
Roberts Electronics, Inc.
5920 Bowcroft Ave.
Los Angeles, Calif. 90016
Sony-Superscope, Inc.
8520 Tujunga Ave.
Sun Valley, Calif. 91352
Tandberg of America, Inc.
P. O. Box 171
Pelham, N. Y. 10803
Uher (see Martel Electronic Corp.)
Viking—Division of TELEX
9600 Aldrich Ave. South
Minneapolis, Minn. 55420
Wollensak (see Revere-Mincom Div.)

sound&sight

HAROLD D. WEILER

At the recent High Fidelity Music Show in New York City we saw another interesting and unusual application for video recording and closed-circuit television. One which we believe will be of inestimable value in education, industry and medicine. In fact, anywhere an oscilloscope is employed to teach, demonstrate, or observe.

Some months ago, McIntosh Laboratory of Binghamton, N. Y. began a series of unique experiments to determine exactly what was required to recreate an exact acoustic facsimile of a musical performance. They started their research at the very beginning—with the musical instruments themselves. The waveforms of the various sounds created by different instruments, played by "live" musicians, were carefully studied by means of a storage oscilloscope.

McIntosh sought the answer to a number of important questions. Did the sound of any instrument start from zero loudness and rise to full loudness in a fraction of a microsecond? Did any musical instrument require frequency response up to a megacycle? Actually how important was the leading edge of percussive sounds?

For months the laboratory sounded as though it was a combination concert hall and rehearsal studio, as the sound created by the musicians playing various instruments were photographed and recorded through a video camera. A detailed analysis of the video recordings and photographs revealed exactly what was required to recreate music accurately. The results were so interesting and enlightning that McIntosh decided to make them public at the High Fidelity Music Show in New York.

This was more easily said than done! It was one thing to display the information obtained to two or three engineers in a laboratory and quite another to show it to the fifty or more people expected at each demonstration. The images to be displayed on the oscilloscope screen were only 3x4 inches. The obvious solution was to employ a closed-circuit television system to enlarge these small images to a point where they could be seen easily by everyone present at the demonstrations.

There were problems, however! As we indicated in our previous articles on the vidicon tube, there is a minimum amount of light required to obtain a usable picture for both video recording and closed-circuit television, just as in film photography.

The minimum amount of light required to provide a usable picture with most video cameras employing the conventional 7038 vidicon tube is of the order of 10 foot candles. The amount of light

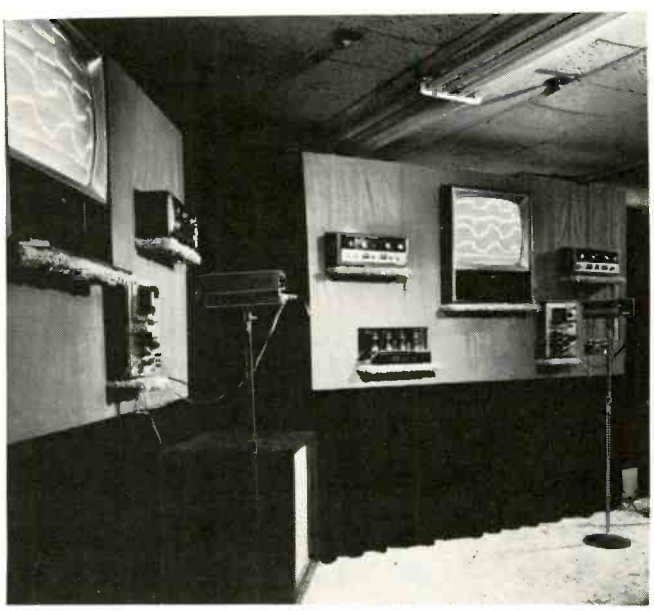


Fig. 1. The display setup at the McIntosh room of the N. Y. High Fidelity Music Show.

Fig. 2. The new miniature, solid-state Vidifax video camera designed for video recording and closed circuit application.

available from the faceplate of the oscilloscope was considerably below this level. In consequence, it was found necessary to employ a camera which was much more sensitive. We checked the available light from the oscilloscope with the extremely accurate Spotron Professional Light Meter and found it was only 0.05 foot candles. It was not just a question of additional video amplifier and preamplifier gain, since there is a limit to the usable gain imposed by the increase in signal-to noise ratio. The camera finally chosen employs a 7735A vidicon tube which provides up to twenty times more signal output than the 7038 tube, with the same "on scene" illumination. Even this extremely high sensitivity would have been insufficient had the camera employed the conventional f 1.9 lens. The camera used included an f 1.4 lens as standard equipment. This lens requires only half the light necessary with the f 1.9 lens.

This was only one of the requirements! Just as McIntosh had sought and found the requirements for recreating an acoustic facsimile they also had to find a video camera which would accurately reproduce a visual facsimile of the images on the faceplate of the oscilloscope. Any linear distortion in either the vertical or horizontal planes of greater than plus or minus 1.5 per cent would completely destroy the effectiveness of the demonstration by distorting the waveforms to be displayed. Sweep linearity is a particularly important consideration when oscilloscope patterns are to be recorded or displayed.

The third requirement was high resolution, since McIntosh was planning to show that concealed in the shape of a square wave there were a multitude of sine waves. To accomplish this the resolution of the system had to be greater than 500 600 lines. The average video camera did not provide the required resolution. Some idea of the resolution requirements for both the camera and monitors can be obtained when we realize that the resolution provided by the average TV receiver is of the order of 225 to 275 lines.

To obtain sufficient image magnification of the desired information to fill completely the screens of the 25-inch monitors employed, a camera-to-subject distance of about six inches was required, as may be seen from *Fig.* 1. At this short distance most video cameras could not be brought into sharp focus. The Vidifax Model 100B camera finally chosen by McIntosh, since it met and exceeded all previous requirements, included an optical focus control in addition to the conventional electronic focus control found in other video cameras. This additional control provides razor-sharp images at camera-to-subject distances as little as one inch and also makes it possible to provide image magnifications of up to 400 to 1, (with a 23-in. monitor). A postage stamp can be magnified to the point where its image will fill the screen of a 25-in. monitor.

The details of the research involved in presenting the McIntosh demonstrations intrigued us and aroused our curiosity. We subsequently discovered that Vidifax Corporation of Wheaton, Maryland, had another version of the same camera which we believe will be of even greater interest to our readers.

This camera provides "Better than Broadcast" composite video-plus-audio signals to any existing educational or industrial TV system, video recorder, or commercial television receiver, without alteration or modification of the original equipment. Unlike other video cameras, the Vidifax Model 100 does not require expensive monitoring equipment nor separate audio facilities to provide video-plus-audio programs, such as are broadcast by commercial television stations.

The modulator section which converts and combines both the picture and the sound information picked up by the camera and the microphone into a standard r.f. carrier (adjustable for any channel from 2 to 13) is controlled by four simple adjustments which are pre-set for optimum performance under average conditions. These controls are variable to provide any degree of video contrast and/or brightness and any audio level required for specialized medical, educational, or industrial applications.

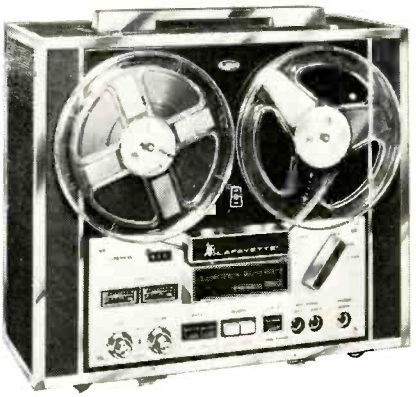
Another interesting feature, incorporated in all Vidifax cameras is their use of plug-in solid-state modules. The cameras are completely transistorized with the exception of the vidicon tubes. This method of construction permits easy maintenance, even with untrained personnel. Each of the ten individual modules—video preamp, video amp, vertical and horizontal deflection, blanking, power supply, video amplifier and r.f. modulator, audio amplifier and r.f. modulator are mounted on plug-in glass/epoxy printed-circuit boards which can be removed and replaced instantly. Close manufacturing tolerances allow the replacement or substitution of any module with a similar unit without the necessity for individual adjustment.

We believe these excellent cameras will open many new fields for video recording and closed-circuit television.

Any of our readers who are interested in obtaining additional information regarding the McIntosh demonstrations, the findings revealed by their original research and photographs of the sound wave shapes of various musical instruments may obtain them. free of charge, by contacting McIntosh Laboratory. *AE*

NEW PRODUCTS

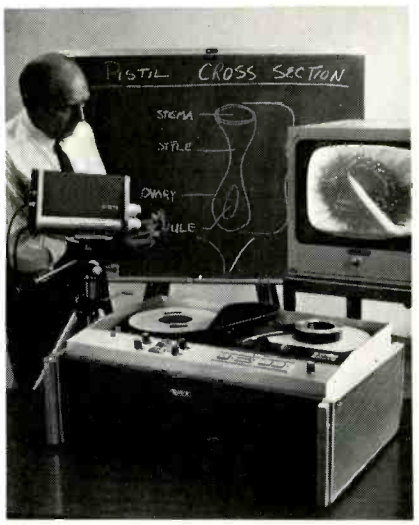
Deluxe Tape Recorder



"Top-of-the-line" is the billing attached to this new recorder from Lafayette Radio. This is the model RK-860, a self-contained complete solid-state stereo recorder. Three speeds, 1⅞, 3¾, and 7½ may be used for play and recording in quarter-track stereo or mono. Sound-on-sound, sound-with-sound, plus direct stereo disc to tape recording via inbuilt magnetic phono inputs, are possible. Sound facilities include two full-range 5- x 7-in. speakers fed by a 12-watt amplifier. Other features include two illuminated record / playback VU-type meters, 3-digit pushbutton-reset counter, pause control, dual volume and tone, and pushbutton monitor speaker switches. Specifications include ± 3 dB frequency response of 30-22,000 Hz at 7½; wow and flutter less than 0.15 per cent at 7½; s/n 53 dB; input sensitivities on mike of 0.12 mV, on mag phono of 0.7 mV, and on AUX of 100 mV. Weight is 26½ lbs. Lafayette stock number is 99-1530 WX and price is $219.95.

Check 5

VTR Package



Ampex Corp. has recently announced the availability of its VR-6000 series video tape recorder systems. The 6000 series is completely compatible with the existing Ampex VR-7000 higher-performance, heavy-duty series. The new line is priced as low as $1095 in contrast to the 7000 series units which start at $3150. Thus the new series comes more in reach of budget-minded educational systems seeking quality closed-circuit TV recording systems. Initial deliveries have been of the model VR-6000, a luggage-mounted portable VTR selling at $1450. A new companion camera, the model CC-6400, sells for $549. So a chain can be assembled for under $2000. Ampex states that this series, which will include a VTR deck at $1095, has the highest performance specifications in its price range and offers guaranteed interchangeability of tapes between all recorders in the VR-6000 and VR-7000 series. The VR-6000 operates at a tape speed of 9.6 ips and 1000 ips writing speed. Output of the VTR includes both video and RF outputs so the units may be used with standard TV sets. Video response is 30 Hz to 2.5 MHz ±3 dB; Horizontal resolution is 250 lines; video s/n is 39 dB minimum; audio response is ±4 dB over the range of 90-9000 Hz.

Check 6

Bulk Eraser

There are many times when a bulk eraser—that is one that will quickly erase a complete tape—offers specific advantage. Careful use of such a unit, with the disconnection of a recorder's own erase head, can often lower the subsequent noise level of a new recording below that possible with the recorder alone. This new unit from Robins is designed to erase tapes up to one inch wide, thus it becomes useful for video as well as audio tapes. In addition, the erase field is sufficiently large so that the unit will work with reels up to 17 inches in diameter. This is the model TM-120. It has a blower system that permits a 10-minute-on/10-minute-off duty cycle. An overheat indicator is part of the unit. The TM-120 lists for $165.

Check 7

Professional Recorder

The newest version of Premier's Tapesonic is all silicon solid-state, and features three heads, three motors, and three

speeds (3¾, 7½, 15). Capstan drive is directly from a two-speed hysteresis-synchronous motor. Takeup and rewind are provided by two Bodine high-torque motors. The resultant speed accuracy is stated to be better than 0.14 per cent. Flutter and wow is 0.08 at 15, 0.12 at 7½, and 0.23 per cent at 3¾ ips. Mike and high-level input mixing is provided for each channel. Dual 4½-in VU meters

monitor recording, playback, and bias. A separate switch sets equalization for the selected speed. Reels up to NAB 10½-in. size may be used. A tension switch adjusts holdback and takeup for reel size. All operation is via electric pushbuttons. Frequency response is 35-26,000 Hz at 15,30-20,000 Hz at 7½, and 30-10,000 Hz at 3¾. S/n at these respective speeds is 56, 53, and 50 dB. The unit fits standard 19-in. racks. The stereo version is available in half- or quarter-track configurations at a price of $615. A half-track mono version is $480, while a full-track mono unit is $542. A portable case for any version is $34.50.

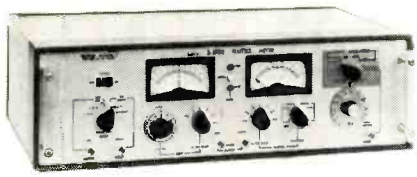
Check 8

Stereo Tuner Kit

The march of transistor technology has not left the kit builder in the dust. Here is a new tuner kit from Scott that utilized an FET front end and is all-solid-state throughout. Scott states that it takes all of one afternoon to build the LT-112B FM-Stereo tuner kit. All difficult or critical circuitry is pre-wired, pre-tested, and pre-aligned at the factory. The kit utilizes a tuning meter that serves several functions. During construction, it is used to align the tuner, then, it may be used to indicate signal strength, zero-center tuning, or multipath distortion. There is also rear-panel provision for connecting a 'scope for ultra-precise correction of multipath distortion. Usable sensitivity of the LT112B is 1.8 μV; cross modulation rejection is 90 dB; selectivity is 45 dB; stereo separation is 40 dB. Price of the kit package is $189.95.

Check 9

Flutter Meter



There is no substitute for this sort of instrument when it comes to evaluating the performance of tape and disc players. This solid-state unit from Mincom features considerable versatility. The unit will operate from the reproduce electronics of a tape recorder, or directly from the tape head. There is separate metering for flutter and drift; rms and peak measurements may be made, weighted or unweighted. Full-scale flutter readings range from a low of 0.01 to 10 per cent. Full-scale drift ranges are of ±0.03 to ±10 per cent. Input sensitivity is 5 mV to 5 volts. An available option includes a tunable wave analyzer to determine the frequencies of observed flutter. In this way the determining cause of a flutter condition can often be readily detected.

Check 10

Deluxe Speaker System

This model Z-900 is the largest speaker system ever offered by Neshaminy Electronic Corp. It contains four JansZen electrostatic radiators for mid and high frequencies. A pair of matched model 350D dynamic woofers are used for bass. Neshaminy states that this system has been expressly designed for large home and professional installations. The weighted high-compliance woofers are each capable of ⅝-inch cone excursions without breakup or doubling. They are sealed in the glass-fiber filled enclosure along with the four electrostatic units. Over-all response of the system is stated to be from 27 to beyond 30,000 Hz. Dimensions of the unit in its oil-walnut enclosure are 28-in. high, 31¼-in. wide, and 15½-in. deep. The speaker may be used with amplifiers of 20 watts or more. List price is $399.95.

Check 11

CROWHURST

(from page 32)

To determine the room's response, or the environment effect, a second reversible unit may be substituted, whose response is found by the same difference method as with the first (*Fig.* 11-9). This result will also include the room response (E) twice. Adding the calculated responses of the two reversible units (R_1 and R_2) will thus include room response twice ($2E$). But taking the response from one reversible unit to the other (either way, G, but do it both ways as a check for true reciprocity) will contain the room response only once (E). So taking the difference between the last result and the calculated combination will give the room response alone (E).

In earlier times, this kind of work would have been so tedious as to be impossible, because each algebraic expression represents the point-by-point plotting of the respective curves, their combination and recombination, also point by point. There would be so much margin for error that the end result would be virtually meaningless.

Modern computers take most of the work out of this. But be very sure of frequency calibration at every step, to make sure that the same point on each curve represents exactly the same frequency.

Also, results will be much less subject to error if unnecessary deviations with frequency are minimized. One step toward this is the anechoic chamber, which reduces standing waves to quite a low magnitude, compared with the direct waves.

Another helpful feature is the use of a warble tone. The test frequency is warbled up and down a few hertz at a rate just fast enough to prevent standing waves from building up. This warble tone makes reading easier, but can also lose definition: a sharp, bad peak in one of the transducers will not show up at its true value, because the warble will not give the instrumentation time to record it. So the modern computerized method, conducted in an anechoic room to minimize undesired room effects, is the better approach.

Having thus found a way to calibrate both microphones and loudspeakers from first principles, these calibrated units can be used as secondary standards: the loudspeaker as a tone source and the microphone for field measurement. This is commonly done, because the full calibration procedure just described is so protracted (even with computers to help). However, secondary standard loudspeakers and microphones should be checked by primary-method measurements

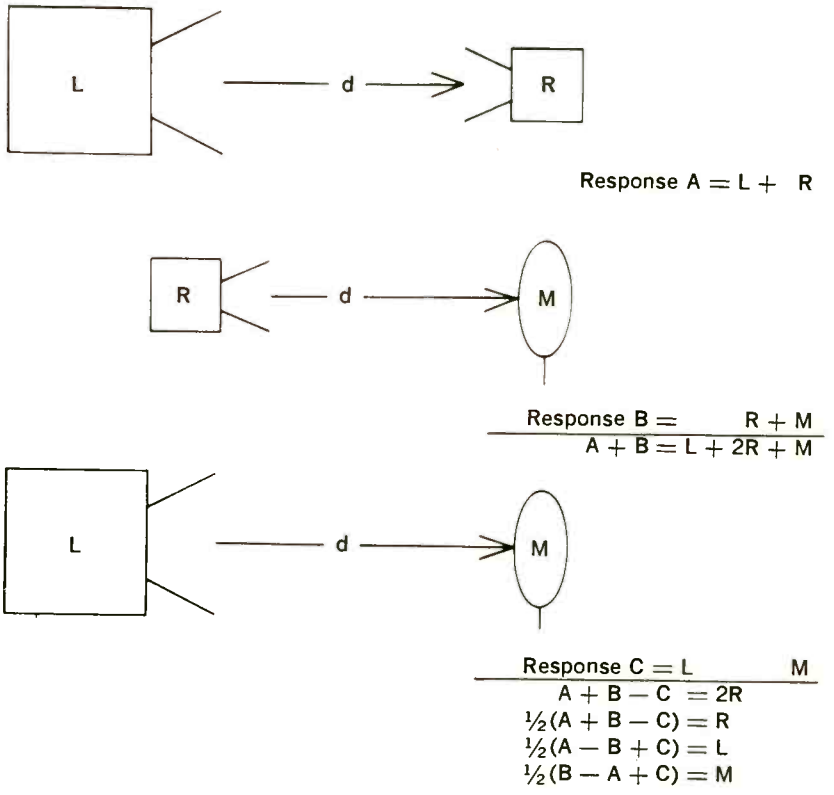


Fig. 11-8. Three measurements necessary for reciprocity test, with the basic calculations necessary to arrive at the microphone and loudspeaker responses.

from time to time, as they are subject to change with continued use.

In this installment we have covered the answer to the main questions in transduction. In the next installment of this series, we shall discuss the taking of responses of microphones and loudspeakers in detail, following which we will go into the collecting and correlating of subjective data. Æ

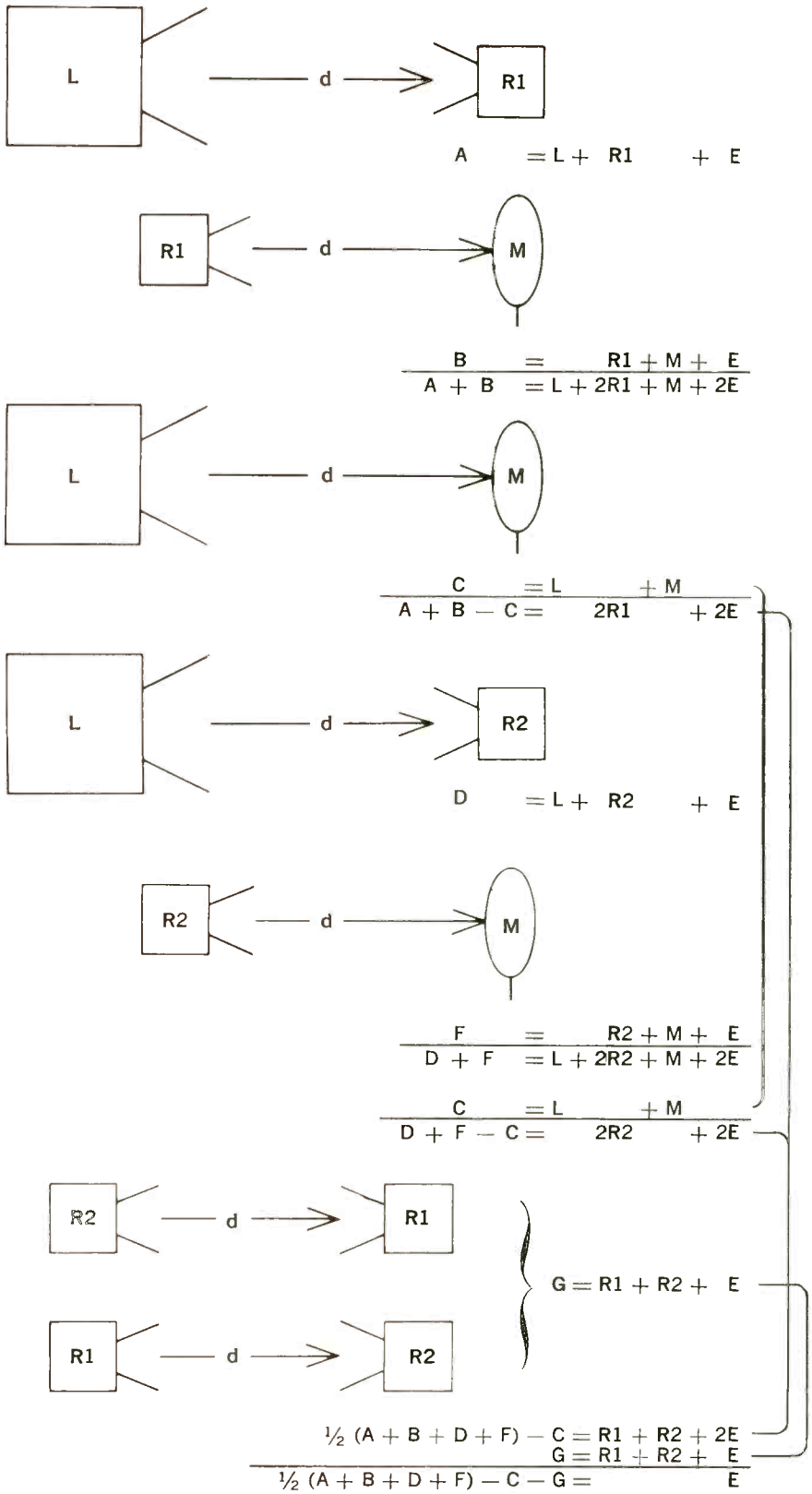


Fig. 11-9. The methods for determining room response or other environment effect.

TAPE SPLICING

(*from page 24*)

this uncomplicated rite, you can put the head covers back on again and you won't ever again have to take them off—unless you are one of the unusual recordists who clean heads and demagnetize them periodically!

If you can't find your screwdriver to remove the head covers, or if the play-head gap is microscopically small and your microscope has been stolen by your three-year old researcher in microbiology, there is still an easy way to measure the play-gap-to-tape-marking-point distance. Record any continuous sound for a few seconds—whistle or pitchpipe or anything like them—on the beginning of a reel. Then cut into the middle of this recorded tape, throw away the end piece, and attach a couple of feet of blank or leader tape. Play this back (after reeling back, of course) until you hear the *beginning* of the recorded sound. Stop there *precisely* and mark the leader or blank tape at the tape-marking point you had decided to use. Then place this marked tape in your splicing jig (or in line with it, if the block is too short) with the SPLICE you made (connecting the recorded tape to the blank tape) precisely *on* the diagonal slot in your splicing block. Got it? Good!

Here I would like to digress a bit, reveal a bias, (personal, not a.c.) and castigate a few professional tape editors. My bias is simply this: I invented a tape editing block many years ago and have taught tape editing and written about it. I have always pointed out the dangers inherent in marking tape with grease pencils on the play head surface. Some tape editors still persist in doing so. It sounds logical, of course, to mark on the play head, since it is there that sound is reproduced, but actually it is a very bad practice. Grease pencil marks get on its polished surface with disastrous results: the heads get pushed out of alignment, get scored from the abrasive action of the grease marks—even a fraction of a thousandth of an inch of grease pencil markings can drop the top frequency response of the recorder by many thousands of Hz.

Moral: Make yourself a marking point and use it! It is actually more precise to mark tape this way than to open headgates and mark on the head. With an Ampex, for instance, opening the headgates and marking tape puts you a sixteenth of an inch out, away from where you should have marked the tape. This can in some cases make an awfully sloppy edit. Personally, I always preferred editing with the splicer to the right of the drive puck. This way I never had to open the headgate to remove tape for splicing—just pulled the tape loose, placed it in the block, cut it and pulled it out to the joining point, cut again and spliced. If editors would adopt this method, I am sure they would be able to edit more precisely and more rapidly—and reduce maintenance on head cleaning and realignment.

We now know the ways in which to measure the play-head-to-tape-marking-point distance and how to reproduce this measured distance on your splicing tool—or in line with it. By this time you should know if your recorder has been made so that you can play back a tape "by hand"—by moving the reels manually with the motor drive in the off position. If not, if shutting off the drive shuts off all the amplifiers, you may have to install a motor switch, so that the electronics can be left on (at least the play system) with the drive off and brakes off. Now you begin to learn tape editing. All I can do here at this time is to pass on a few hints, some of which will not be news to you, I suppose. In editing any kind of sound, try not to cut in so-called "silent" spots. They are really not silent at all. There is always something recorded on the tape in these silent areas, even if it is only the bias wave. There is vague background sound, room tone—even hard-to-hear sounds of air coming out of an air conditioning duct. The safest point to cut and splice tape, from the point of view of leaving out all recognizeable noise, is within noise that is part of the recording. By that I mean impact noise. Impact sound, which actually is wide-band noise, is just what it says: sound created by impact. The first sound from a piano hammer hitting the strings, plucking a string or drawing a bow across a violin string is noise. If you can edit within this "noise," the splice noise itself will be submerged. The same thing is true, of course, in editing speech. In speech you can cut to advantage, also, in "S" and "T" sounds and within aspirate sounds. Try never to cut within a steady note. If you do so, no matter how carefully you do it, you will get a tiny click at the splice or some other indication of transition. With sufficient practice you can educate yourself to mark the tape for cutting at two points somewhat similar in their sound (or noise) characteristics, so that the splice will not be noticed.

Now that we know how to find the

spot where we want to cut and are beginning to find out something about tape editing, how do we make a splice? The most used method nowadays is to place the cut tape ends in some kind of splicer jig that holds the tape in alignment, butt the two ends tightly together and apply a piece of splicing tape. That's all there is to it —except that even this seemingly simple chore can be performed so ineptly that a poor splice may result.

At this late date I do not suggest that you begin learning how to splice tape just with using scissors. It is difficult to learn, there is great difficulty in holding the tape in alignment while you apply splicing tape, and it is difficult to trim off the splicing tape at the edges without cutting into the recording tape, which latter, of course, would result in a drop in volume at that point. Buy a tape splicer and learn how to use it correctly. Do not use ordinary household mending tape for splicing—use one of the specially made splicing tapes, preferably one using a polyester base. Although acetate-base splicing tape is adequate for most purposes, it does not perform as well in cartridges (it tends to break after about two hundred bendings) and may, under certain conditions, become absorbed into the acetate base of the recording tape after long storage.

It is a good idea, after tape has been spliced and the reel has been played back, to store the tape "tails out," that is, just let it wind off its reel completely and store the "right-hand" reel. Then, next time you want to play the tape, rewind it and play it. In this way any tendency of a splice to stick, due to too high a tension on rewind or to humid storage conditions, will be overcome. Splices nowadays should not stick. Adhesives are very good and splices should be made so that no sticky material will get stuck to the next round of tape. If you are suspicious of your splicing tape, or if you are splicing in the jungle, it is a good idea to dust the splice with talcum powder after making it.

In handling tape and splicing it, do so with clean, dry fingers. About fifteen years ago, while I was editing a lengthy documentary for radio broadcast, I kept my director busy cutting up strips of splicing tape and sticking them to the edge of a unused recorder ready for me to use. I found out later that every one of these splices was noisy and had to be replaced. I never was able to take the time to find out exactly why this happened. Perhaps this director perspired metallic salts which combined with the aluminum in the recorder deck. I just don't know, which is quite an admission from me!

However, I remembered that lesson and just this year finished designing a tape splicing tab which combines all the advantages of using a cut strip of tape without any of the messiness of handling it. It is called the "Editab" (Reg. trade mark of The Tall Company) and a photo of one appears as *Fig.* 1. It is simply a die-cut piece of polyester-base splicing tape adhered to a sandwich surround which is not adhesive and which strips off from its sandwich in only one direction. The splicing tab itself, as you can see, is slightly narrower than the surrounding carrier, so that if the EdiTab is slid into precise position (its edges are NOT adhesive) on any splicing block for quarter-inch tape and then smoothed down, the carrier can easily be removed by stripping it off, starting from the transparent end which has a little protruding lip on it. This method of applying a piece of splicing tape eliminates many of the bugbears of splicing. The ends are diagonal, so that there is no impact of the kind that takes place when a perpendicularly cut end of splicing tape hits the drive puck. (The result of this impact is increased flutter). Then, the splicing tape, being narrower than the carrier, is easily centered on the recording tape, leaving no sticky edge. The splicing tape itself is considerably stronger than any recording tape and its adhesive is the best that the present state of the art permits. I hope you will like it. Æ

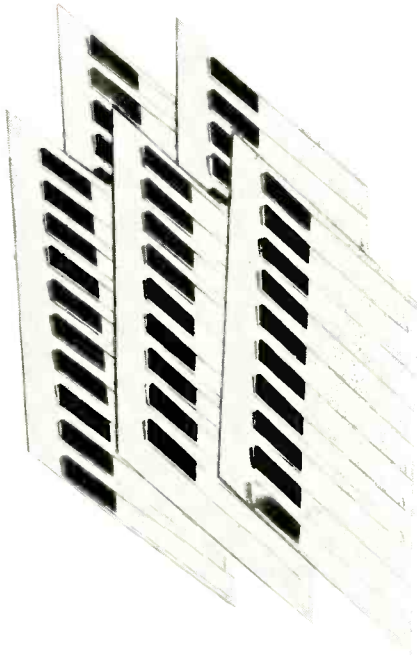
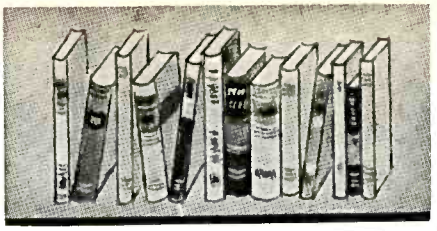
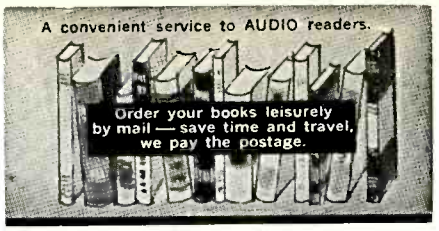


Fig. 1. A view of the author's "Editab," a commercially available product.





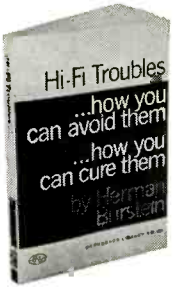
Maintaining Hi-Fi Equipment
Joseph Marshall

A valuable reference for anyone whose living or hobby is servicing hi-fi equipment. Outlines the professional approach for servicing all types of hi-fi components. Covers trouble-shooting of electronic, mechanical and acoustic problems. 224 pages.
No. 58 Paperback $2.90*

Designing and Building Hi-Fi Furniture
Jeff Markel

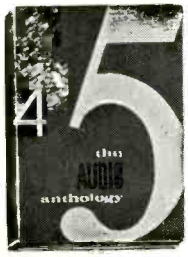
Written by a professional hi-fi furniture designer who has taught furniture design at leading colleges, this book is an authentic reference of value to the hi-fi fan and professional custom builder. Covers everything from types of woods to furniture finishing for the mechanically adept; design principles, styles and arrangements for the decor minded. 224 pages.
No. 79 Paperback $2.90*

HI-FI TROUBLES
By Herman Burstein



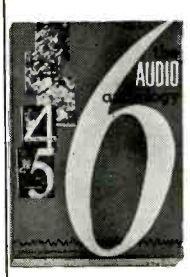
HOW YOU CAN AVOID THEM
HOW YOU CAN CURE THEM
Just published! At last, a book which deals directly with the problems you face in maintaining your audio system in peak condition. Tells you how to locate troubles, what to do about them and how to do it—and, just as important: what NOT to do. Helps you to achieve the best in listening pleasure from your equipment.
No. 120 $3.95

The 5th AUDIO Anthology



Edited by C. G. McProud, publisher of AUDIO. An anthology of the most significant articles covering: stereo recording and reproduction; stereo multiplex; measurements; stereo technology, construction and theory — which appeared in AUDIO during 1958 and 1959. The 5th is truly a collectors' item and a valuable reference for the professional engineer, teacher, student, hobbyist and hi-fi fan. 144 pages.
No. 125 $3.50

The 6th AUDIO Anthology



Edited by C. G. McProud, publisher of AUDIO. Includes articles on the two most significant milestones in the field of high fidelity: FM STEREO and TRANSISTORS IN AUDIO EQUIPMENT. A meaningful reference for everyone in the fields of audio engineering, recording, broadcasting, manufacturing and servicing of components and equipment. A necessary book for the high fidelity enthusiast. 144 pages.
No. 130 $3.95

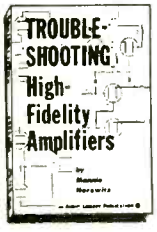
"The AUDIO Cyclopedia"
Howard M. Tremaine

- **1280 pages**
- **3400 topics**
- **1600 illustrations**

Here is one single volume with the most comprehensive coverage of every phase of audio. Concise, accurate explanations of all audio and hi-fi subjects. More than 7 years in preparation—the most authoritative encyclopedic work with a unique quick reference system for instant answers to any question. A vital complete reference book for every audio engineer, technician, and serious audiophile.

No. 123 $19.95*

TROUBLESHOOTING High Fidelity Amplifiers
Mannie Horowitz



Written specifically for the servicemen and audio hobbyist who wants to get into the profitable field of stereo hi-fi service. 12 fact-filled chapters with a plain and simple approach to troubleshooting all types of stereo and mono amplifiers—a direct text on curing both, vacuum tube and transistorized amplifier ills. Easy to read—includes data on test instruments and procedures. 128 pages.
No. 128 $2.95

McProud High Fidelity Omnibook

Prepared and edited by C. G. McProud, publisher of Audio and noted authority and pioneer in the field of high fidelity. Contains a wealth of ideas, how to's, what to's, and when to's, written so plainly that both engineer and layman can appreciate its valuable context. Covers planning, problems with decoration, cabinets and building hi-fi furniture. A perfect guide.
No. 115 $2.50*

Harold Burris-Meyer and Vincent Mallory

SOUND in the THEATRE
First book of its kind . . . nothing like it has ever been published before! It is an authoritative text on electronic sound control for theatres, auditoriums, concert halls and other large enclosed areas where the source and the audience are present together. Contains complete procedures: For planning, assembling and testing sound control installations — Articulating sound control with other elements of production — Operation and maintenance of sound control equipment. Describes and illustrates 32 specific problems.
No. 126 $6.95

SAVE • MONTHLY SPECIAL • SAVE

Save over 35% with this collection of AUDIO books
5th AUDIO ANTHOLOGY ($3.50) — 6th AUDIO ANTHOLOGY ($3.95)
McProud HIGH FIDELITY OMNIBOOK ($2.50)
TROUBLESHOOTING HIGH FIDELITY AMPLIFIERS ($2.95)

Total Value All Four Books . . . $12.90

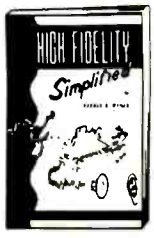
YOUR COST ONLY . . . $8.95 POSTPAID in U.S.A. & Canada
CIRCLE OS500

This Offer good only on direct order to the Publisher

High Fidelity Simplified
Harold D. Weiler

3rd Edition

The complete hi-fi story — answers all questions about tuners, changers, amplifiers, tape recorders, speakers, record players, etc. Lots of ideas for custom installations. Tells how to achieve concert hall reception in your home. 216 pages.
No. 142 $3.30



Getting The Most Out Of Your Tape Recorder
Herman Burstein

Written in "plain talk" for the man who has, or wishes to buy, a tape recorder. It answers the myriad questions raised by tape recording enthusiasts. Its chapters cover every phase of operation and maintenance—from adding a tape recorder to the hi-fi system, to a thorough dissertation on microphones. Lots of practical information on how to buy 176 pages.
No. 251 $4.25

AUDIO Bookshelf

134 N. 13th Street, Phila., Pa. 19107

*All U.S.A. and Canadian orders shipped postpaid.

Please send me the books I have circled below. I am enclosing the full remittance of $..... (No C.O.D. or billing.)

58	79	115	120	123	125
126	128	130	142	251	OS500

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TAPE GUIDE

(from page 50)

Following are excerpts from a letter from W. A. Keutgen, Martinsville, New Jersey, on the problem of "intermittent dropouts" discussed in the March, 1964, installment of TAPE GUIDE. "I have just been through this problem, and you may be interested in my experience. I purchased a **** tape deck and immediately ran into intermittent dropouts. I carefully went over the electronics, but to no avail. I took the unit to a local tape recorder specialist, who reported that my trouble was two cold-solder joints. When I got the set home it performed just as before. I made a long distance call to the manufacturer of the machine, but all I got out of it was the name of a local authorized service agency. This worked! The agency found that the idler assembly was defective and tape tension was out of proper adjustment. It may be that these tape decks are not tested adequately or lay around quite a while after inspection so that the rubber of the idler develops hard spots. I find that economy acetate tape is poor; I can hear the dropouts. But with 1-mil polyester tape of good quality I get near-perfect results."

Q. I often wonder why most home tape recorders are made so that it is almost impossible to edit tape on them accurately.

A. It costs money to provide editing facilities. Most home machines are made for multiple track operation in two directions, so that it is not feasible to do editing anyway, unless you are willing to record only in one direction. If you do record only in one direction, it is possible to do editing and to locate the exact spot to be edited by exercising a little skill and ingenuity. Measure the exact distance between an identifiable spot on the tape deck and the gap of the playback head; of course this spot should be on the path followed by the tape. By measuring off this distance on the tape, starting from the point on the tape opposite the spot, you have the place to be edited.

Q. The European equivalent of 7.5 ips tape speed is nominally 19 cmps (centimeters per second); however, a direct conversion gives 19.05 cmps. While this is within the generally accepted 1 per cent speed error, I would expect one or the other to be an absolute standard since European and American recorders are generally interchangeable (with a line-frequency and -voltage conversion). The same question holds for tape width, since 6 mm (millimeters) is not exactly ¼ inch. Do American manufacturers make a tape of slightly different width for distribution in Europe?

A. My information is that the standard speed in Europe closest to our 7.5 ips is exactly 19 cmps, rather than 19.05 cmps, which would be an exact translation. Thus a European machine operating at precisely 19 cmps would be 0.26 per cent slower than a U.S. machine operating precisely at 7.5 ips. The difference is very close to the professional tolrance of 0.2 per cent, and it is appreciably smaller than the 0.5- to 1.0 per cent inaccuracy of the better home machines. According to my source, nothing is done to eliminate the small difference which exists between the European and U.S. standards.

The same source states that European tape is interchangeable with our nominally ¼-inch tape. U.S. tape is 0.246" wide, plus or minus 0.002". Correspondingly, the central dimension of European tape is 6.25 mm. I might add, according to my informant, that European reels are different and will not fit U.S. machines. Moreover, the European tapes usually have appreciably different magnetic characteristics than ours and therefore require substantially different amounts of bias current. Also, they may require significant changes in record equalization. Æ

CLASSIFIED

Rates: 10c per word per insertion for noncommercial advertisements: 25c per word for commercial advetisements. Rates are net, and no discounts will be allowed. Copy must be accompanied by remittance. Closing date is the 20th of the second month preceding the date of issue.

FOR SALE

TAPE RECORDERS, Hi-Fi components, Sleep Learning Equipment, tapes. Unusual Values Free Catalog. Dressner, 1523T, Jericho Turnpike, New Hyde Park, N. Y. 11040.

FREE! Send for money saving stereo catalog A9M and lowest quotations on your individual component, tape recorder, or system requirements. Electronic Values, Inc., 200 West 20th St., New York, N. Y. 10011.

HARPSICHORD: Same as owned by Philadelphia Orchestra and RCA Victor. In kit form for home workshop assembly, $150. Clavichord kit, $100. Free brochure. Write: Zuckermann Harpsichords, Dept. R. 115 Christopher St., New York, N. Y. 10014.

WRITE FOR LOW QUOTES, fast service, everything in audio. Special Dynaco kits or custom wired plus walnut cases for complete Dynaco line. Kitcraft. 738A Washington Ave., Brooklyn 11238.

"CROWN" Professional Recorders: New and used. Reasonable prices. Wiegand Audio Labs, 221 Carton, Neptune, N. J. 07753.

DISC RECORDING EQUIPMENT: Cutterheads, Recording Amplifiers, and Lathes. New and used. From Rek-O-Kut to Scully. Send requirements. Wiegand Audio Labs, 221 Carton, Neptune, N. J. 07753.

PROTECT YOUR LPs. Heavy poly sleeves for jackets, 5 cents. Round bottom for records, 3 cents. Minimum 100. May Assort. Poly Co., Hillburn, New York, Post Office.

SPEAKERS—EV-15W, University Mid-Horn, EV-T35 Tweeter, X-overs, & T-pads. All for $75 F.O.B. Charles D. Haupt, 5736 S. Broadway, Box 16, Wichita, Kansas 67216.

EICO MX99MPX adaptor. Guaranteed $30. H. H. Scott LT-10 FM Tuner $60. Plus Shipping. Will sell separate! Wm. A. Banton, 504 Higuera Street, San Luis Obispo, Calif. 93401.

PROFESSIONAL AUDIO DEALER: Altec, AKG, Ampex, Bozak, C/M Labs, Crown, Hartley, Magnecord, Marantz, McIntosh, ReVox. Information write: SOUND STUDIO, 1201 Ellis, NW, Cedar Rapids, Iowa 52405.

FOR SALE: Sony 500 Export Model; 50 and 60 Hz, 110, 200, 220, 240 V., as new, $240.00. Capstan Motor Bodine for Concertone 50 Hz. Leak stereo preamp. Box #AD-2.

SELL: Fisher KS-1B Speaker—$35. Ampex 1260 Recorder—$325. Used 1800' Tape—$1.00. RDD, 4022 Medford, Huntsville, Alabama 35802.

REPLACE worn Lp jackets. White 20c. Colors 25c. Min. shipment 20 jackets. Hillborn, P.O. New York.

SONY 777 S-2 Tape Recorder, Sony Stereo Mixer 2—Sony C37A Condenser Microphones, Best Offer. Eldon Liefring, 1030 Atlantic, Apt. 108, St. Paul, Minn. 55106.

EQUIPMENT WANTED

WANTED: USED SCULLY LATHE. Age and condition not important. Peter J. Helffrich, 419 W. 4th St., Bethlehem, Pa. 18015.

WANTED: One Berlant Concertone 20/20 Tape Recorder Carrying Case. Please state price and condition. Eugene Weaver, 173 W. 133 St. Apt. 5F., New York, N. Y.

WANTED: FM-MPX adaptor. Desire plug-in for Fisher FM-100. Will consider other units. R. G. Musgrave, P.O. Box 57746, Webster, Texas 77598.

WANTED: Crown Recorder, New or Used. George Stamm, 451 Linden, Aurora, Ill. 60505.

SERVICES

HI-FI SPEAKERS EXPERTLY REPAIRED
USED SPEAKERS BOUGHT
AUDIO SPEAKERS TECHNICS
22 Astor Place, New York, N. Y. 10003
AL 4-2140

HIGH FIDELITY SPEAKERS REPAIRED
AMPRITE SPEAKER SERVICE
168 W. 23rd St., New York, N. Y. 10011
CH 3-4812

TAPE DUPLICATING. Low prices. Any quantity. G&G Recording Service, Box 412, Peekskill, N. Y. 10566.

POSITION WANTED

YOUNG MAN 20 years old, with competent basic knowledge of electronics; sound and recording systems, components-theory and practice. Also knowledge of systems and components requirements and specs for pro. and/or hi-fi recording and reproduction equipment. Desires position with recording studio or sound co. in N. J., N. Y. area. Reply Box No. AD-3.

MISCELLANEOUS

JOIN "Abundant Sounds Swing Club," 6 South Mole Street, Philadelphia, Pa., $3.

TO OUR READERS

A new post office directive requires publishers to pre-sort magazine mailings by 5-digit zip codes. In order to ensure the same prompt delivery of your copy of Audio, please check the address label from this issue. If it does not contain the 5-digit zip code, please write it in and mail it back to Audio, 134 N. 13th St., Phila., Pa. 19107.

AUDIO ETC.

(from page 12)

Only one minor "warning"—bring your own mike extension cables. I didn't the first time! That big coil of cable attached to the mike looks so convincing that you forget you must also have another length, from power supply to your recorder. Vega leaves that to you.

A brief note on the substitute cardioid (above). Medium-priced cardiods are now getting around widely in the home and semi-pro market in a number of ingenious models, generally new to that area, and I am all for this development. The one I had on hand was the Shure Unidyne, model 580SB, low impedance (the 580SA is high impedance). There are others somewhat similar now on the market—the Ampex 3001, for instance. All of them, if I am right, use the tricky acoustical cardioid principle that has found its most sensational embodiment in those huge "telescope" mikes put out by E-V, which can "spot" a speaker in a large audience at hundreds of feet from the stage; they look like machine guns. The idea is a set of carefully calculated acoustical side-entrances for the sound, so arranged that sounds coming from a side angle cancel out, while those entering dead-ahead get into the mike full strength. There are many variations in detail but basically the principle is practical for a low-cost, general-purpose mike and so it has been put to use, for a very great gain in versatility under difficult recording conditions.

The Shure 580 is, of course, relatively inexpensive; but I found that it gave a good, smooth sound for its price and a very definitely cardioid response, nicely cutting out the room "slap" of the typically unsuitable home living room acoustics, allowing close-up effects at a greater distance. I would suggest one, or even a pair of these modest mikes for every recordist who wants to get really worthwhile musical pickup, or speech, in a variety of unpredictable non-studio situations. The biggest problem in home-type recording is, after all, unsuitable acoustics. The new cardioids do wonders to help. *Æ*

Light Listening

(from page 69)

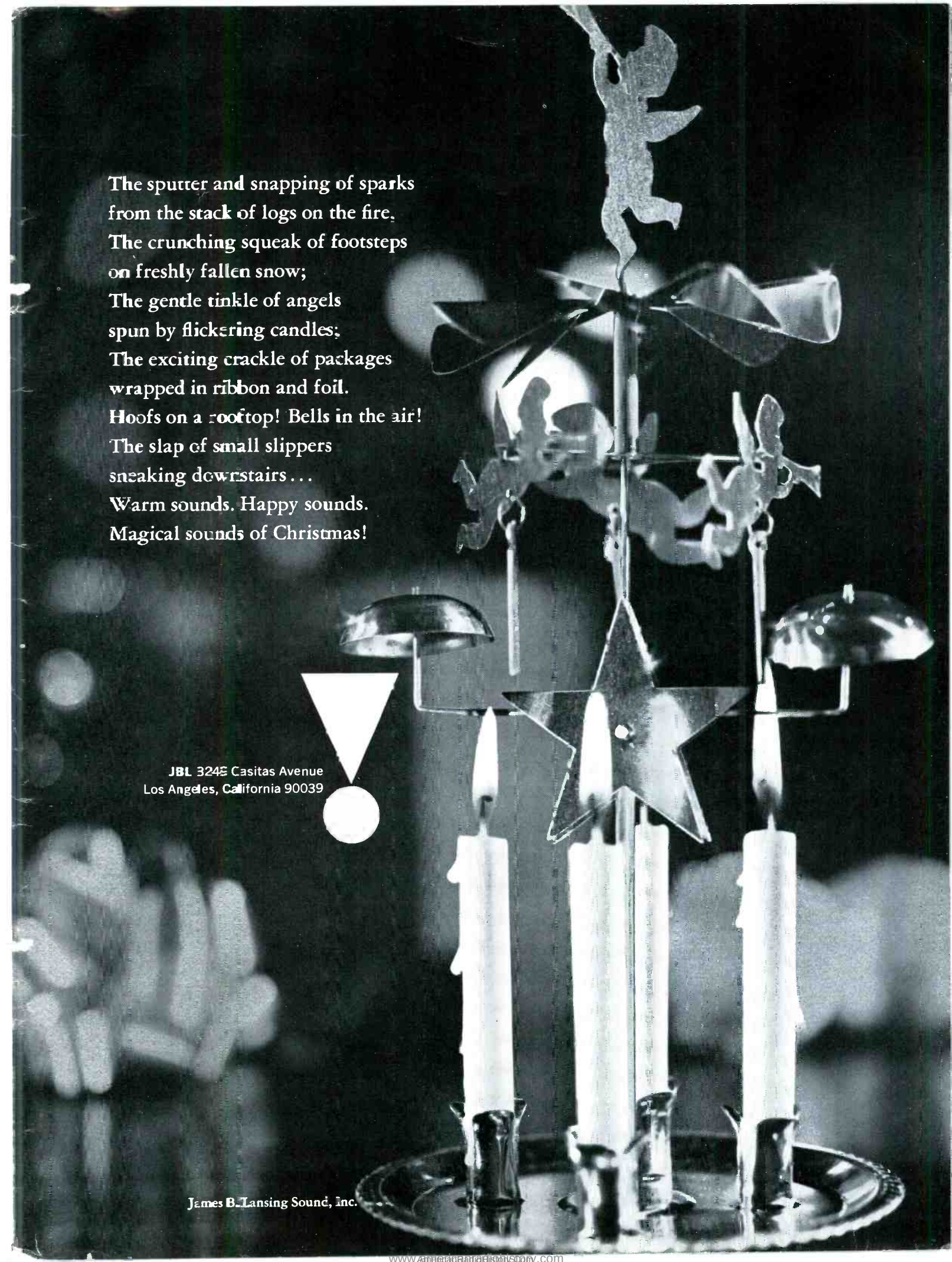
preceding sentence. When Goulet is singing a low-pitched, quiet selection, the mike is a good performer. Low distortion, smooth presence, and a very respectable frequency range recommend this particular transducer. Sonic troubles occur only when Goulet opens up with one of his theatre-filling specialties at full voice. The last few recordings made by Goulet have not been noted for a softening of the distinctive metallic quality that has been creeping into his voice. Chances are no mike, studio or stage, could overcome these conditions with ease. Most performers invariably give more before an audience than they do in a recording studio. This mike just can't take all that Goulet dishes out. *Æ*

subject index / 1966

author index / 1966

Advertising Index

JBL Check No. 51 on Reader Service Card. →


The sputter and snapping of sparks
from the stack of logs on the fire.
The crunching squeak of footsteps
on freshly fallen snow;
The gentle tinkle of angels
spun by flickering candles;
The exciting crackle of packages
wrapped in ribbon and foil.
Hoofs on a rooftop! Bells in the air!
The slap of small slippers
sneaking downstairs...
Warm sounds. Happy sounds.
Magical sounds of Christmas!
JBL 3248 Casitas Avenue
Los Angeles, California 90039
James B. Lansing Sound, Inc.

The E-V SEVEN was born in the eerie silence of an anechoic chamber — the world's largest devoted to high fidelity design. This vast sound absorbing room let E-V engineers get right down to basic engineering. Nothing disturbed their silence — or their concentration on the subtle differences that distinguish a great speaker.

After months of experimentation, the E-V SEVEN met every design objective. Then expert listeners were invited to judge the sound — again and again — until engineers and critics were fully satisfied with E-V SEVEN performance.

But superb sound, once established, can easily slip away in the routine of mass production. We don't let it. A completely equipped anechoic chamber — right on the production line — measures every speaker against perfection. And it's ruthless. All this may seem rather elaborate for a $66.50 compact system...and it is. You can hear the difference!

Any fine component amplifier can display the E-V SEVEN at its best, but the new E-V 1144 stereo amplifier is uniquely suited to the purpose. Like the E-V SEVEN, the E-V 1144 is compact, handsome, and modest in cost (just $124.50).

We threw tradition to the winds when we built the E-V 1144. Tossed out "old-hat" ideas about size and weight. Put 50 watts of stereo power in an attractive walnut-paneled cabinet no taller than a coffee cup. It's easier when you can start from scratch — yet have years of experience in miniature solid-state electronics behind you. The young tigers in the E-V lab took it on as a personal challenge — and solved it beautifully.

So plug in any stereo phono, tape recorder, or matching E-V stereo tuner. Connect a pair of E-V SEVENS. Then turn up the volume of your E-V 1144. Natural sound? Absolutely. And that's what high fidelity is all about!

Window-shop through our complete high fidelity catalog for the answer to your high fidelity needs. It's free.

Electro-Voice, Inc., Dept. 1125-A, 602 Cecil Street, Buchanan, Michigan 49107