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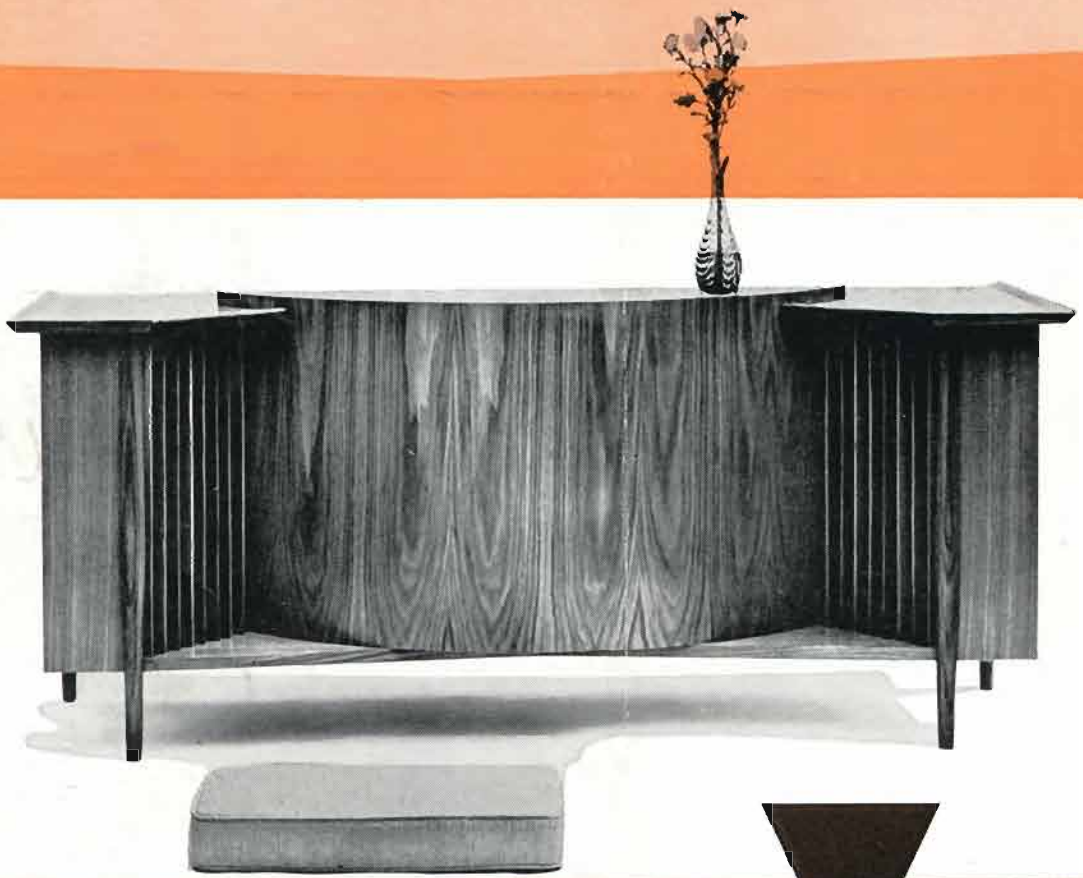
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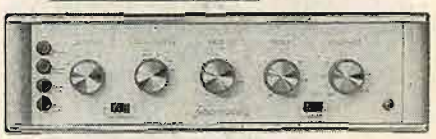
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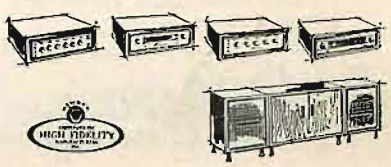
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AUDIOCLINIC??

JOSEPH GIOVANELLI*

Capacitance and resistance

Q. Please give me the proper method for calculating the results of (1) wiring two or more resistors in parallel, (2) wiring two or more resistors in series, (3) wiring two or more capacitors in parallel, and (4) wiring two or more capacitors in series. Boyd H. Redner, Battle Creek, Mich.

A. The sum of two resistors wired in parallel can be found by the following formula: Total resistance equals the product of the resistances divided by their sum. This formula applies to capacitors wired in series, also. Example: Two 5-ohm resistors are connected in parallel. What is the resultant resistance? The product of the two resistances is 25 ohms, which must be divided by their sum, 10 ohms. The resistance of this parallel combination is, therefore, 2.5 ohms. This formula does not hold where two or more resistances or capacitors are involved. In such instance, proceed as follows: Invert each of the resistance values, add the resulting fractions, and invert the result. This final inversion will give you the answer. This method may be used for any number of units, including two. Example: Three resistances having values of 3, 4, and 5 ohms are connected in parallel. What is the resistance of the network? Solution: First, invert the fractions, and obtain ⅓, ¼ and ⅕. The least common denominator for these fractions is 60, so we must add 20/60, 15/60, and 12/60. This totals 47/60, which, when inverted, becomes 60/47, which equals approximately 1.27 ohms.

The total resistance of resistors wired in series or the total capacitance of capacitors wired in parallel is equal to the sum of the individual values. Example: Resistances of 5, 10, and 20 ohms are wired in series. What is the resistance of the network? Add 5, 10, and 20, and obtain 35 ohms.

Be sure that all resistances and capacitances are computed in the same values. Do not work with 1000 ohms and 1 megohm without converting both into ohms or into megohms. 1000 ohms equals 0.001 megohm, and 1 megohm equal 1,000,000 ohms. Don't add micromicrofarad with microfarad values. 1 micromicrofardad equals 1/1,000,000 of one microfarad.

Crackling in Amplifiers

Q. I have on hand an old 50-watt PA amplifier. The tube lineup consists of two 6J7's, two 6N7's, four 6L6's, one 6X5, and two 5V4's. The nature of the trouble is a crackling noise in the output. I have replaced many resistors and electrolytics with no improvement. J. L. Cosette, Quebec, Canada.

A. First, check the tubes. This is always the first thing to do when servicing equipment, partly because they can cause a multiplicity of troubles, and partly because they are the easiest to check, especially when you have replacements. If tubes check normal, look to the coupling capacitors. Since your unit is an old one, it probably contains many waxed paper capacitors, and such units often give rise to the type of trouble you described.

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

Hiss Level in Preamplifiers

Q. How can I reduce the background tube noise which occurs when the preamplifier is in the phonograph position? The noise shows up especially when solo instruments are playing. C. I. Schup, Lawndale, Calif.

A. Perhaps the background noise you notice is the result of running your power amplifier at excessively high level compared to the level of the preamplifier. In some instances, the stages following the preamplifier volume control have considerable noise content. If the gain of the power amplifier is set too high, too much of this noise will get into the amplifier. Simply reduce the gain of the power amplifier and increase that of the preamplifier.

Unfortunately some power amplifiers are not equipped with input gain controls. In such cases, you may find it advisable to modify your unit to include such a control. If, for some reason, you are unable to include the control, make up a voltage divider of fixed resistances.

Sometimes the noise results from poor signal-to-noise ratio in the phono stage of the preamplifier. The signal-to-noise ratio becomes worse as pickups with smaller and smaller outputs are used. If the trouble is in the phono stage, you can determine it by raising and lowering the volume of the preamplifier. If the hiss level changes as the control is rotated, the trouble lies in the phonograph stage. There is probably little you can do about this trouble except to use a cartridge whose output is higher than that of your present cartridge. Before doing this, however, check to see if the manufacturer of your present cartridge has a stepup transformer designed to work into preamplifiers requiring higher input drive.

If you are handy with a soldering iron, you can try replacing some of the resistances in the phono stage with others of larger wattage rating. This step may be especially helpful if the resistors now in the circuit are of half- or quarter-watt rating.

Hum and Oscillation in Home Music systems

Q. My sound system consists of a Miracord XA100, Miratwin cartridge, EICO HF61K preamplifier, EICO HF60K amplifier, and an AR-1 and AR-2 speaker systems. With the above equipment there are two difficulties which I have been unable to locate and correct.

1. The system will oscillate at a low frequency when volume is fairly high and the input signal consists of a low frequency. It may be made to occur in the runoff grooves of some recordings. At times it may be caused by a tap on the turntable spindle while the arm and cartridge are in the operating position. From material appearing in AUDIO, *I understand that the feedback in amplifiers can be quite critical, and when improperly adjusted because of parts failure, can cause the oscillation of which I spoke. Could this be the cause? Of course, the trouble may be coming from the preamplifier.*

2. During the first half hour of operation, there is no more than a trace of

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60-cps hum heard in the loudspeakers. After this period the hum becomes quite pronounced. After the equipment has been off for half an hour or more, it can be operated for a half hour before the hum reappears. The actual timing is only approximate. Tubes check satisfactory. Any suggestions you can furnish will be greatly appreciated. W. H. Focht, Tipp City, Ohio.

A. 1. I recommend that you check the electrolytic capacitors. If these are low in capacitance, they will present a means of common coupling to all stages. Before looking into the feedback loop, first determine whether noise is generated within the preamplifier or power amplifier. Disconnect the preamplifier and feed a signal directly into the amplifier. If you cannot cause the oscillation, it is possible that the preamplifier is involved. If the trouble is in the power amplifier, and you find that the trouble is in the feedback loop, you will probably find that the feedback resistor has changed value. A further discussion of the problems of checking feedback loops can be found later in this column.

The oscillation may be caused by acoustic feedback, rather than from any electrical failing of the preamplifier or power amplifier. It may be of two kinds. One is the result of the turntable being vibrated by the loudspeaker. Those vibrations are passed on to the amplifier and fed back to the speaker which then vibrates the turntable again, thereby sustaining oscillation. The other type of feedback is similar, but in it, the vibrations are picked up by a microphonic tube instead of by the cartridge. The elements in such a tube are free to move slightly, changing the gain of the tube. This causes a noise to be heard from your loudspeakers.

2. The 60-cps hum is probably caused by a heater-cathode leak in one of the tubes in your equipment. This leak will not show up on a tube tester because it does not exist until the tube has been in operation for some time.

Low Gain of Power Amplifiers

Q. Thanks for your reply to my recent letter. I have another problem which has plagued me for some time now. Several years ago I built a 20-watt Ultra Linear amplifier using two 807's, two 6SN7's and a 5U4. It has served me faithfully for some time but it has developed troubles which I cannot locate. The gain has fallen off considerably, and new tubes did not help. Voltages all check normal. I replaced the filter capacitors because, with my input level control rotated all the way to the left, motorboating was audible. The replacement of these capacitors did not help. I would appreciate hearing from you concerning this matter with any advice you can give. James O. Valestin, St. Louis, Mo.

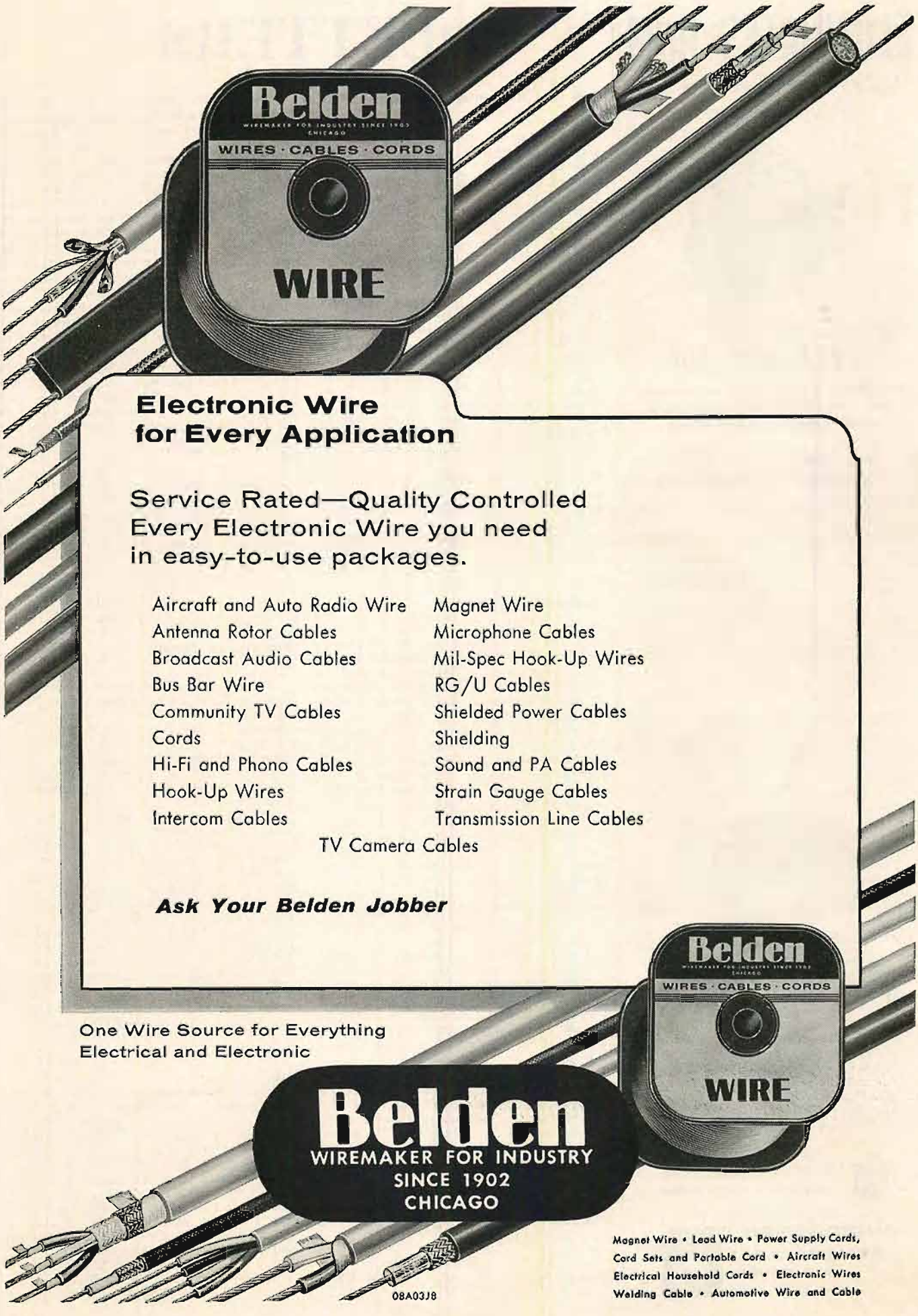
A. The first thing to check is the cathode bypassing. Failure of such a component will result in a reduction in gain and perhaps some instability. A drop in gain accompanied by an even greater reduction in bass would be further evidence that a cathode bypass capacitor is open.

Sometimes the amplifier will behave abnormally if there is an open grid resistor present. Under this condition, the grid is charged excessively with electrons from the cathode of the tube, thereby cutting itself off.

Another possible source of the loss in

(*Continued on page 65*)

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LETTERS

Sum and Difference Broadcasts

SIR:

Concerning Mr. Canby's excellent articles regarding sum and difference broadcasts, I venture to add a point which may have escaped his attention in regard to the undesirability of combining AM and FM in broadcasts of stereo programs. This is the fact that the AM signal may not be received at all, especially if the broadcaster is a "daytime" station and thus required to operate on a directional antenna system after sunset.

This situation may not be obvious in the New York area where strong AM signals may abound, but those of us who live in suburban areas can sometimes actually see the AM antennas of the broadcast stations we cannot receive, due entirely to the use of "directional" antennas. Our case in point is station WCRB-AM-FM some four miles airline distant from this location—a station which often employs AM-FM stereo broadcasts.

Thus the AM-FM hybrid combination does suffer from all the ills Mr. Canby pointed out, but may also reach the absurd extreme of becoming a one-channel system in effect.

CHARLES A. CADY,
Baker Ave.,
West Concord, Mass.

Loudspeaker Comments

SIR:

It would be difficult for me not to comment on the article "Improvement in 'Air Suspension' Speaker Enclosures with Tube Venting," by Philip B. Williams and James F. Novak of Jensen Mfg. Company, in the November issue. (It is clear that "air suspension" is used here to mean the same thing as "acoustic suspension." I originally conceived of the latter term because the controlling stiffness of the system, that of the air-spring, would be called "acoustic stiffness" in a standard text,[1] but "air" is just as apt.)

I will confine my comments to only one statement made in the article—a statement included in the discussion of the closed box enclosure:

"A fact of life must be pointed out here, however. A large box always allows *more* and cleaner bass than does a small box."

In an article which contains so much interesting documentation it is surprising to find this statement, with its sweeping implications, made without support or explanation. I myself can find no basis for it, and so I invite Messrs. Williams and Novak either to explain or amend it in this column.

A speaker is a dumb brute, so to speak, and cannot sense directly how large a volume of air exists behind it. It's voice coil reacts only to the total stiffness, mass, and mechanical resistance that it encounters. Further, it reacts only to the instantaneous quantities of those impedance elements, and it cannot tell whether it is being restrained by the mechanical stiffness of its suspensions or the acoustic stiffness of the air-spring when these two quantities are the same.

Thus the diaphragm of an acoustic suspension system sees exactly the same value of elastic restraint and the same impedance as it would if it were relatively stiffly suspended mechanically and placed in a large cabinet—assuming that the final resonant frequencies are the same—with one very important difference. The usual stiffness of the mechanical cone suspensions, which is the controlling stiffness in the case of the big box, is replaced by the almost ideally linear acoustic stiffness of the air-spring in the small box. Even if the high-compliance suspensions of the latter system were poorly designed and were non-linear, they would have been made to surrender their control of cone movement to the air-spring.

Unless there are additional elements of which I am unaware (and which the authors of the article have not bothered to point out), a conventional speaker in an infinite baffle or large box has only one characteristic that will make it reproduce bass differently from an acoustic suspension system designed for the same quantities of mechanical impedance—the predominance of mechanical rather than acoustic stiffness in its moving system. This certainly cannot be considered an advantage, whatever the excellence of the stiffer cone suspensions.

EDGAR VILLCHUR,
Acoustic Research, Inc.,
24 Thorndike St.,
Cambridge 41, Mass.

Binaural vs. Stereo

SIR:

When is everyone going to be convinced that binaural reproduction is *not* better or more realistic than stereophonic reproduction? A proponent can claim a closer tie to the original recording because room acoustics do not exist as a problem. From that point on, the earphone method just doesn't produce what its proponents keep claiming.

With the sound entering only from earphones, how does one create the direction of the basic sound source as being in front? Why not in back? By means of binaural reproduction we succeed in moving the near-far characteristic into the same plane as the left-right characteristic. Realistic—who sits in the center of an orchestra? Depth perception—what sort of depth is there with only one dimension? In other words, how does one make an angle in front when all dimensions are left-right in binaural?

HOWARD A. ROBERSON,
45 Easter Ave.,
Pittsfield, Mass.

Erratum

SIR:

Just a brief note to mention, as you have probably discovered, a typographical error in my article "Understanding the db, dbm, and VU" which appeared in the November issue. The error is in example 4, on page 89, just below the calculations. As it appears in the magazine, a subtraction of 19 from 9 is indicated. This should have read to subtract 10 from the 9.000 number given. Otherwise, the balance of the arithmetic in the example is correct, and the end result is correct.

JULIAN L. BERNSTEIN,
67-36 214th St.,
Bayside 64, N. Y.

[1] For example, *Acoustics*, Leo L. Beranek, McGraw-Hill Book Co., New York, 1954, p. 9.

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Edward Tatnall Canby

Broadcast Stereo

AS YOU ARE PROBABLY AWARE, the big news in the audio world is broadcast stereo, the coming last (?) link in the huge stereo chain that has been so rapidly beaten into shape during this last year. But there are heavy complications that must be resolved before we'll be getting regular stereo broadcasts.

Ever since my first mention of FM multiplex stereo broadcast last June (AUDIO, ETC) I've been up to my neck and ears in the subject, in dozens of discussions, demonstrations, in arguments both warm and cold—indeed, in the audio bull-session department broadcast stereo took over from stereo disc a good many months ago and as I now write the whole thing is fairly crackling with enthusiasm and controversy. Big stakes appear to be involved, too. This article started out to discuss FM stereo, but spang in the middle it was rudely interrupted by a sudden new widening of the field, still another proposed stereo broadcast system, as put forth in demonstration by RCA. This is all-AM stereo, two stereo signals on one AM carrier, using the two sidebands for the dual modulation, as suggested by the editor of this magazine as long ago as 1951.

Right now, then, we have the following concrete possibilities for stereo broadcast, each system already worked out, tested, publicized, even broadcast experimentally.

A. Two-station stereo, mainly AM-FM. (Also, occasionally, FM-FM or AM-AM.)

B. FM Multiplex stereo via the Halstead system; one FM carrier.

C. FM Multiplex stereo via the Crosby system; one FM carrier.

D. AM sideband stereo via the RCA system; one AM carrier.

As to the first of these, I will not even discuss it. I've had my say on two-station stereo (June, 1958) and I still feel that it is on the way out and a good riddance.

All-AM Stereo

This newest entry in the stereo broadcast stakes might seem at first to be an all-out contender, designed to fight it out on an either-or basis with the proposed FM multiplex systems. I don't think it is.

Rather, I see RCA's AM stereo as a complementary system, designed to bring stereo to the present AM station in order to meet the competition of FM. It is the AM answer, for present AM transmission and in most present AM areas of usefulness, to the threat of FM stereo as an "added feature." If stereo were to be a big success on FM, the AM stations would be left out on a long, long propaganda limb. Like Ford, like Chevy; like FM, like AM.

But there's sense to it, if a slightly zany sense, given our slightly zany permanent radio set-up. FM radio and AM radio do serve different areas as you are obviously aware. Maybe FM has the higher fi, but AM hasn't died because it has proved much too useful. FM has not been able to dislodge it and probably won't.

The same reasoning will apply to stereo broadcasting, from top to bottom and side to side. You'd be surprised at how far stereo is likely to go, given adequate mass production, economy, simplicity.

The way to think of stereo broadcast, I suggest, is to put it straight into the present very large over-all audio picture—not only component hi-fi but everything, right down to the kitchen radio and the beach portable, not to mention the pocket transistor miniature. In a good many of these areas, stereo has already found a place, most notably in the hi-fi component field, but also in a large variety of home "hi-fis" and even into the portable phonograph area —with stereo speakers placed all of a foot or so apart.

(Don't laugh. Stereo can add a good deal even in this fashion—perhaps more, in proportion, than it adds to the superduper hi-fi system.)

Radio, more and more clearly, is the big missing link in the large picture as far as stereo is concerned. People have stereo tape recorders, stereo records and tapes; they can copy from one of these to another. But they can't hear stereo on the air and they can't take down stereo broadcasts on tape, though this is a now accepted part of mono hi-fi activity in large numbers of homes.

Therefore it seems logical to me that stereo broadcasting soon must fill in *every* area where it is at present missing. If AM monophonic broadcast is still important in so many ways, then AM stereo must take on a corresponding importance, in corresponding ways.

Yes, I know as well as you do that this is going to mean some dizzy complications. There will probably be such monstrosities as stereo-AM-stereo-FM tuners, complete on one chassis! Not so improbable come to think of it, and not so dreadfully complex either. Who was it that once groaned about the two-speed record changer? It wasn't the end, and never forget, in all this seeming duplication and overlapping, that this is a dual age. The Dems and the Republicans keep on going, both of them; TV didn't kill off radio; the 45 and the LP both still are going strong and so are all four record speeds. Way back, radio itself didn't succeed in killing the phonograph, as was everywhere expected.

In all these cases, an either-or battle ended with both sides winning, thanks to differing characteristics and usefulnesses. And so it will be with AM stereo and FM stereo, I'm guessing. That much for AM.

(Note that the AM stereo sideband system allows for complete monophonic detection of *both* sidebands—i.e., the entire mono sound—in all standard radios that have full-wave detector circuitry. On half-wave detection systems only one half of the stereo sound will be heard; but as demand develops, more and more AM radios will be designed to detect both sidebands and so insure complete AM compatibility between stereo and mono. No need for sum-and-difference matrixing. This info thanks to the editor, who is one of my most convenient sources of enlightenment.)

Multiplex Soup

Now turn to stereo via FM. Which of the several proposed FM stereo systems will win out? Can there be a compromise or combining of features?

Right now in FM we're deep in a bowl of multiplex soup. Another of those heady engineering "wars" has been shaping up, pending an F.C.C. decision. At the moment (and probably when you read this, too) things have reached a stage where everybody concerned is blowing his horn as loudly as possible, each "system" of FM multiplex broadcast is being plugged on an all-out basis and nobody is conceding anything in the way of a possible over-all reconciliation and settlement.

In the middle, of course, is that durable and patient federal body, the F.C.C., which is used to this sort of thing. The F.C.C. has charge of the public's air and is therefore directly concerned—where in the stereo disc arguments of last year the getting-together came from inside the industry.

Let me say quickly that I'm far from being against a good solid spell of public argument. After all, there is no other way for the thing to be settled. And I think we can expect that in the earlier stages of any controversial technical development the normal situation is for people to take unshakeable stands and argue therefrom. It always happens, and it has been happening, via papers, demonstrations, publicity, letters to editors, and actual experimental broadcasts in the course of the present excitement. Good—so far. (You've been reading some of it in our LETTERS column for November and in the EDITOR'S REVIEW for October.) But is is vexing to see the out-and-out engineering disagreements and it's hard not to feel that these arguments are now growing somewhat emotional.

Perhaps it is an opportune moment for those of us who are not directly involved with any of the "systems" to throw in our oars, from an outside viewpoint. On the technical side, this magazine has already made a proposition, both editorially and before the F.C.C. I'm taking the listener's viewpoint—for the doughty consumer of broadcast goods is very much concerned with this matter, though he doesn't know it yet.

The Silent Commercial

Our biggest difficulty right now is that the multiplexing of an FM broadcast signal is no new proposition but is already going on all over our fair country and all over the FM broadcast band—on a strictly commercial basis, non-stereo.

The multiplex territory is not virgin. It's already occupied and the present occupants have an emphatic vested interest in things as they stand. These promoters of paid multiplex music services, for background music in resta rants and the like, look dimly on the intrusion of stereo into their already-authorized area of operations, and especially if it means that home listeners may be able to pick up their signals, in any form or shape, via their home hi-fi sets. Many of them feel this way, anyhow, and I find myself agreeing with them, in spite of

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Mr. Crosby's and Mr. Cowlan's persuasive letters of principle in last month's issue.

Multiplex commercial service may or may not make a fortune for the small radio station, but it is very much a going business arm of radio, now sealed off entirely from all but the special receivers that provide the service to customers. In my small corner of Connecticut I can hear nine stations with multiplexed second channels (not counting WBAI's Crosby-type stereo). Every one of these is hard at work emanating a second and saleable broadcast on its primary FM channel. This is pay broadcasting, paid for directly by those who subscribe.

Yet here I am, eavesdropping on nine different programs every one of which is for sale, not for free. I'm no restaurant; I'm just Mr. Average Home Owner, who happens to have got hold of a Crosby-type adapter ahead of most of the rest of the listeners.

Who's air *is* this, anyhow? Don't we all have the legal right to "eavesdrop" on any broadcast that we can ensnare in our antennas? Isn't our air free?

Free Air

Let's dispose of one thing at a time. Yes, the answer is plain enough, the air *is* free and you do have the right to eavesdrop —though you do *not* have the right to make use of what you receive for profit. But this, unfortunately doesn't solve our problem at all. Just because FM multiplex eavesdropping may be technically legal doesn't make it desirable or advisable. Sure —nobody has been caught breaking the law yet, not even me. Maybe nobody ever will. But I maintain that it's good policy to keep friction and trouble away by removing all possible causes, fancied or otherwise, justified or no. Avoid potential trouble when it is clearly giving its advance warning. Let sleeping dogs sleep.

Therefore, we must somehow keep the background music services entirely out of the home to begin with, if it is physically possible to do so. More of this shortly.

Oomcha Music

Look again at these commercial music services, which can be heard in the home via one of the proposed stereo systems, the Crosby system. First, I must say that personally I couldn't care less about the sort of stuff they feature, the most insipid sort of mealy-mouthed background music. I call it oomcha music, scornfully; it just goes *oomcha, oomcham oomcha*, hour after hour. It sounds the way thin dishwater-soup tastes—to me, anyhow.

Moreover, though the Crosby-type multiplex adapter punctuates this music, at the end of each number, with an unbearable blast of violently loud hiss (when the audio carrier goes off), I am definitely not the guy who will build a squelch into my adapter so I can listen—though as you know, it can be done, both at home and commercially. No—don't look at *me*, you commercial operators, when you talk about pirating, about unauthorized free reception. Not me!

You might think, then, that I agree with the Crosby people. But I don't. Nor do I think that this multiplex background service should be quietly removed, in favor of hi-fi stereo broadcast.

I respect the multiplex services, in the first place, as a legitimate commercial interest of considerable proportions, on the part of radio stations who need it and don't have fortunes with which to re-equip themselves and their restaurants, *et al*, for some expensively different arrangement. Maybe they'll have to give a bit, in the interests of all. But they certainly can't be ignored —and they won't allow it, anyhow. They'll make a righteous row, as anybody can imagine. Nor will they be inclined to trust those assurances that nobody is going to bother to listen to their services in the home. This argument looks thoroughly fishy to them, any way you put it. Ask them.

The Silent Commercial

Secondly, from the home listener's point of view, I must point out that these multiplex transmissions, unheard by any listener to standard FM or AM, constitute the greatest silent commercial ever dreamed up. This was drummed into my head on recent listening when I discovered, time after time, that a station broadcasting the sleaziest junk on its background music multiplex channel would be sending out the fanciest highbrow, hi-fi FM sound you could ask for on its main channel.

It is obvious that the good-music channel is paid for at least in part by the sleazy music channel—yet *you don't have to hear it*. Terrific! I can listen to Bach and Bartok to my heart's content on station WXYZ, or what have you, and the stuff is paid for by a batch of restaurant customers, somewhere off on the other side of nowhere. Little do they know how I love 'em, bless their souls! Let 'em have their background music, I say.

The argument is quite serious. Commercial music service can make a high-quality station pay off. So let's not tip the apple cart.

So—for these reasons, I am unhappy about any FM broadcast stereo that makes this sort of free home listening possible, in any way at all. I feel that we must begin with the principle that, somehow, stereo multiplex must keep away from background music multiplex, even if this perhaps means a hypothetical compromise in basic stereo quality.

I'm not convinced that the compromise need be serious, in practice, though as a non-engineer I claim the right to be influenced by further information, as it unfolds. I just hope and pray—and urge—that the technicians get together so that a maximum stereo FM quality will be available under the basic condition—clear separation between commercial music service and FM stereo. That is Requirement No. 1.

But let's go on to an evaluative look at the proposed systems themselves. In one respect, I am 100 per cent for one Crosby-type feature, sum-and-difference compatibility.

Licensed Sum-and-Difference

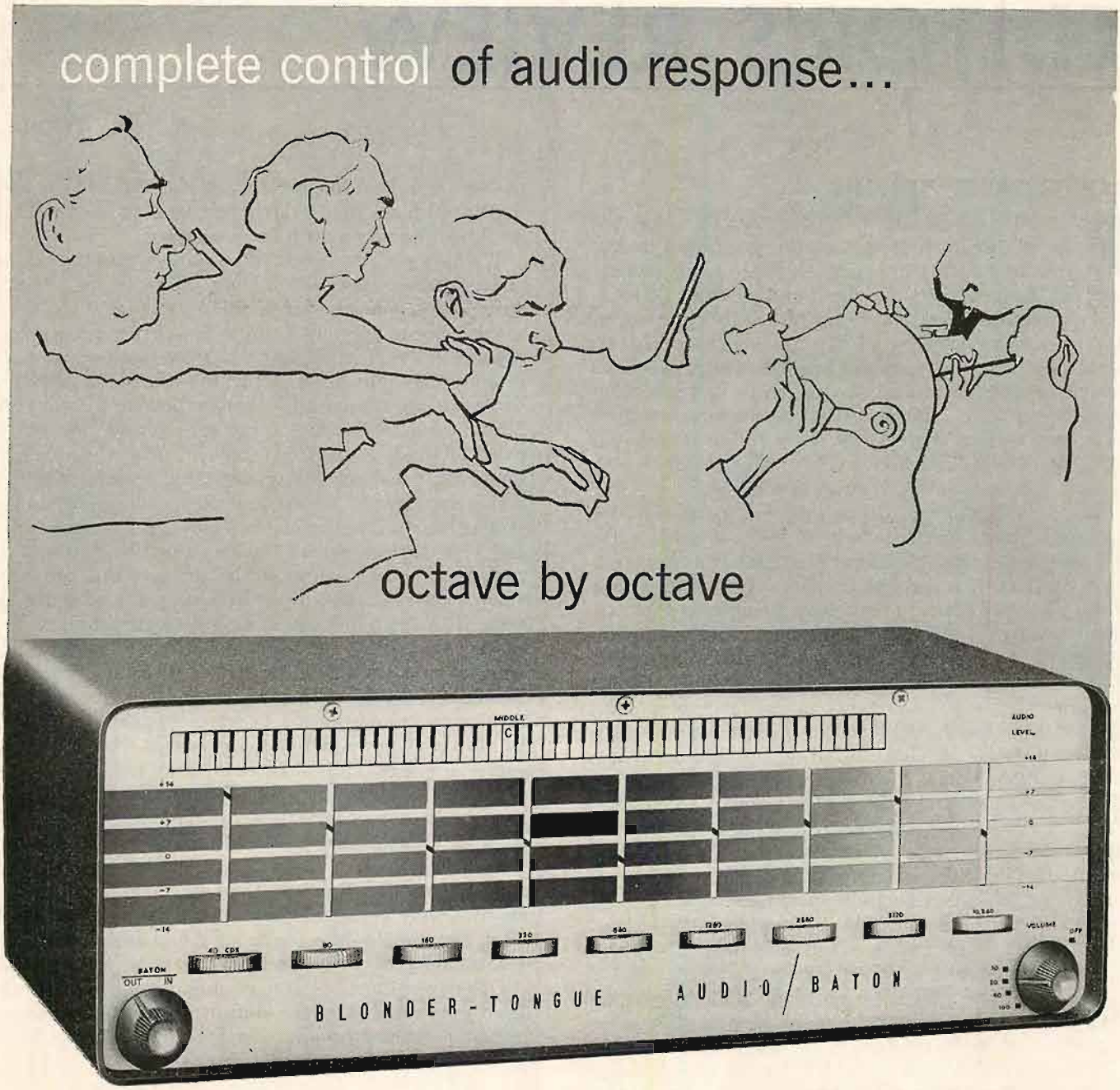
Multiplex stereo FM involves the transmitting of two sound channels via one FM carrier, the second superimposed upon the first. One channel goes via the main FM signal, the other is frequency modulated on the supersonic audio region, above the range of hearing—somewhere between 20 and 80 kc. The audio signal itself, in other words, has a frequency modulated "tone" added to its upper portion. This, of course, is common to all FM stereo proposals and to all commercial multiplex music service as well. Everybody does it.

But the Crosby stereo FM system is the only one so far that adds the vital sum-and-difference principle to this basic two-channel broadcast, thereby providing compatible stereo FM sound—compatible, that is, with standard FM, minus multiplex reception.

In this arrangement, the stereo right and left source signals are matrixed, combined, into sum and difference signals; the sum signal is fed to the main channel and the difference signal goes out via the multiplex

(*Continued on page 73*)

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NEW, UNIQUE BLONDER-TONGUE **audio baton**

Never before has the audiophile, the music lover or experimenter had such a versatile high fidelity component at his command. Nine individual controls enable you to boost or attenuate any one, two or more, up to nine octave bands in the audio frequency spectrum — as much as ± 14 db. What's more, an ingenius visible indicator for each control instantly shows the degree of boost or attenuation for any octave as well as the response curve over the audio spectrum.

The Blonder-Tongue Audio Baton, an entirely new concept in high fidelity components, is self-powered and easily connected between the preamplifier and the power amplifier stages in any hi-fi or audio system—also compatible with many preamp—amplifier combination units.

The possible applications for the Audio Baton are virtually unlimited — for correcting speaker and other system deficiencies as well as deficiencies in program material; for deliberately emphasizing or de-emphasizing certain sounds (accompaniment, noise, etc.) in re-recording; for changing the timbre and character of certain sounds (for singling out individual instruments for study). In music reproduction, the Audio Baton is just that: a conductor's baton in the hands of the owner.

The Audio Baton also finds ready use in public address and call systems, where it is desirable for specific frequency bands to be peaked or attenuated in order to achieve maximum intelligibility for minimum listening fatigue. And for stereo, two Audio Batons may be employed for the ultimate in a stereo system.

Housed in a modern, streamlined cabinet with handsome front control panel, the Audio Baton lists at 119.95.

For an unforgettable experience, hear the Audio Baton at your high fidelity dealer today, or write for details: Dept. A-12

BLONDER-TONGUE LABORATORIES, INC. 9 Alling Street, Newark 2, New Jersey

Manufacturer of High Fidelity components • UHF converters • Master TV Systems • Industrial TV Systems

SPECIFICATIONS: • nine octave compensator controls (40/80/160/320/640/1280/2560/5120/10240 cps) with illuminated vertical indicator • frequency response: flat from 20 cps to 20,000 cps ± 2db • by-pass rotary switch • 0 insertion loss • 1.5V. RMS maximum input with less than 1% harmonic distortion

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EDITOR'S REVIEW

LOUDSPEAKER TESTING

RUSHING IN where angels fear to tread, the country's self-styled leading consumer reporting organization now feels competent to judge loudspeakers, and has done so with vim, vigor, and precious little intelligence. Of course, this may be one of Æ's pet peeves, but even with some years of experience in this field, we would not rate loudspeakers comparatively. We have often *described* them, outlined maximum and minimum usable frequencies, and so on, but as to absolute testing of speakers—that's not for us. Even Julian Hirsch and G. B. Houck—as Hirsch-Houck laboratories—decline to review speakers for their magazine client.

As to the findings of the consumer organization, we couldn't agree more with their choice of three acceptable speakers—*anybody* knows that Acoustic Research and KLH both make fine speakers. But to say that these three are the only ones good enough for the "acceptable, very good" category is going too far. At the other end of the listings we find a Hartley, a James B. Lansing, and a Wharfedale as "not acceptable." There are several speakers that only made the "acceptable, fair" category—among them some Altec models, some more James B. Lansing models, a Bozak model, and another Wharfedale. As a matter of fact, no Altec or James B. Lansing models ever got above "acceptable, fair," and Bozak—another respected name in the speaker field—was listed in the lower half of that group. But imagine either a Hartley, a Wharfedale, or a JBL as being unacceptable anywhere.

To be sure, the organization's "engineers" told how the AR and KLH models could be improved—by the simple addition of a $27.50 electrostatic tweeter and a dividing network. We know nothing about the tweeter recommended, but the text indicates that an attenuator must be used in the *woofer* circuit to match levels with the recommended tweeter, which, by the way, is separately rated as "acceptable, very good," whereas the Janszen 130 and the JBL 075 tweeters are just rated "acceptable, good."

One thing was missing in the report—just how each of the separate speakers was housed for the listening. As is generally well known, the housing is rather more important to over-all performance than the speaker mechanism itself, and it should certainly have been specified. The information also indicated that speakers were compared with equal loudness (which we believe is correct unless you are testing for efficiency), and "with optimum tone control settings for each." This we do not go along with for a moment.

We have always suggested to readers that the choice of loudspeakers was an entirely subjective one. Obviously, each manufacturer wants to make the best speaker he can possibly produce for a given price; also, obviously, the main objective of a loudspeaker is to reproduce the sound as much like the original as possible. Yet when one compares the best speakers of a dozen different manufacturers—or the speakers at any other price level—it is perfectly obvious that they do not sound alike, not by a long way. Our recommendation is that any one who wishes to make a choice of speakers should hear a number of them in direct comparisons, and then simply choose the one that he, personally, considers the best sounding. No one can tell you how much sugar you should put into your cup of coffee to make it taste right *to you;* no one can tell you which loudspeaker will sound best *to you.* Listen for yourself, and of course you should hear the AR and KLH models that are "acceptable, very good." You might even hear them with the suggested tweeter—you might like it. But be sure you would like to live with it for the coming years—a few minutes of listening may not tell you the whole story. Chances are that if the AR or KLH people thought their speakers needed that kind of improvement they would have built it in already—they are far from being dopes, obviously. And just to be on the safe side, listen to the Hartley, JBL, and Wharfedale models that were rated unacceptable. That way you will learn two things—how they sound, and how much trust you should put in reports from others.

Of course, the whole report may have been written from tests made after the staff performed neshesshary teshts on anozzer product reported in the shame issue —whiskies, hic.

END OF YEAR

It is a shame to be so incensed over something so near the Christmas season—but we seem to remember something about incense and myrth in history, and we must try and tie them together. (And no, that's not a printer's mistake two lines up, but it wouldn't have been funny any other way. Maybe it wasn't anyhow.)

But seriously, the Editors and Staff of AUDIO wish you the best of

Season's Greetings

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Precision...

precisely for music!



A pickup precisely designed for music! A stereo pickup with all the compliance, frequency response and distortion-free performance required for the highest quality music reproduction. This...is the STANTON Stereo-FLUXVALVE...where quality starts and the music begins!

Hermetically sealed for a lifetime of trouble-free use, the STANTON Stereo-FLUXVALVE performs in a way no other pick-up can equal. Use it in automatic or manual record playing systems.

The STANTON Model 196 UNIPOISE Arm with integrated Stereo-FLUXVALVE pickup mounts easily on all quality transcription turntables. Precision single friction-free bearing adds *gentleness* to quality. $59.85 with replaceable 0.7 mil diamond T-GUARD Stylus.

For use in all pickup arms—automatic or manual—choose the STANTON Model 371 Stereo-FLUXVALVE cartridge. On monophonic records it will outperform any other pickup *except the original FLUXVALVE . . . on stereophonic records it is peerless!* $29.85 with replaceable 0.7 mil diamond T-GUARD Stylus.

PHOTOGRAPHED BY MORT WELDON

"For those who can hear the difference" FINE QUALITY HIGH FIDELITY PRODUCTS BY

PICKERING & COMPANY, INC., Plainview, N. Y.

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Address Dept. A128 for a free copy of IT TAKES TWO TO STEREO by Walter O. Stanton.

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MECHANIZED ORACLE EXPLORES BELL SYSTEM COMMUNICATIONS



At monitoring console, designer H. D. Irvin watches performance of "Sibyl" during test of user-reaction to experimental telephones. A computer-like machine, Sibyl simulates the functions of future communications devices and records interplay between phones and users. Sibyl is named after the women oracles of ancient Greece.

A mechanized "oracle" is helping Bell Telephone Laboratories predict the future in communications devices and systems.

The oracle is "Sibyl," a computer-like machine developed by Bell Laboratories engineers and psychologists. It can simulate the action of many kinds of communications devices. Through Sibyl, new kinds of telephone service can be evaluated without the considerable expense of building actual equipment. Observing and recording users' reactions to the simulated equipment, Sibyl provides indications of how users would react to proposed new systems features and equipment.

Sibyl, for example, is used to test the reaction of Bell Laboratories people to experimental push-button telephones. Each test subject has a push-button telephone in his office and he uses it in the ordinary course of his business. But the set is not connected directly to the local PBX: it is connected *through* Sibyl, which performs the special signaling functions required by such a push-button telephone. In this way, push-button telephone service is given to a group of people without modifying the PBX, or providing completely instrumented push-button telephones.

At the same time, Sibyl gathers information on how the call was placed—date, time, originator, speed of operation, errors, whether the line was busy or the call completed. Sibyl does all this without violating the privacy of telephone conversations.

Bell engineers expect that Sibyl will provide a better understanding of the relationship between telephone equipment and the people who use it. Sibyl's rapid and economical technique for evaluating new types of telephone sets is an important contribution to the art of telephony.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

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The VU Meter in Tape Recording

There are many advantages to the use of a standard VU meter as a level indicator and the author clarifies them, in addition to telling how the meter is connected and what it does and does not indicate. Every serious tape recordist will find this information valuable.

HERMAN BURSTEIN* and HENRY C. POLLAK

RECORDING A TAPE at too high or too low a level respectively entails excessive distortion or a poor signal-to-noise ratio. There is no great margin of safety between these dangers even in the best of tape machines. Consequently the record-level indicator plays a vital role in tape recording. How well it serves depends upon type of indicator, its stability, accuracy of calibration, manner of connection to the record-amplifier circuit, the prevention of false readings due to bias pickup, and the operator's skill in interpreting what he sees.

The VU meter is not inexpensive, and its use as a record-level indicator was largely confined to professional machines until recently. Other machines employed an electronic indicator, either an electron-ray (magic eye) tube or neon lamp. But with expansion of the home market for tape recorders suitable for high fidelity application, the VU meter has come into increasing use. Now it is found in a number of semi-professional tape recorders favored by audio fans and in several of the still lower-priced "home-type" machines. There is a continuing trend to ever-greater use of the VU meter or a similar meter by home units.

A full understanding of the role of the VU meter in tape recording should be of value to the technician and audio-fan concerned with the repair, maintenance, modification, selection, or use of a tape recorder.

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

Advantages of the VU Meter

The VU meter has a number of advantages over the electron-ray tube and neon lamp. Among them are:

1. It indicates the extent to which the record level varies from that producing maximum permissible distortion. The neon lamp can only indicate when level is too high or too low, but not by how much. The electron-ray tube does show a continuous variation, from open eye to closed eye, but its meaning is uncertain. The VU meter enables the recordist to make adjustments in record level easily and accurately on the basis of what he is recording and for what purpose.

2. It is a standard, relatively uniform product. If replaced, the new meter gives essentially the same readings as its predecessor. Electronic indicators have tolerances such that individual tubes or lamps of the same type may produce significantly different readings in a given circuit.

3. It is stable over time.

4. It is very sensitive and therefore has minimum driving requirements.

5. It permits the very important function of checking bias current accurately. Too much bias reduces both distortion and high-frequency response; too little has the opposite effects. The optimum amount of bias is fairly critical, particularly at 7.5 ips, if high fidelity results are sought. By means of a switching arrangement (*Figs.* 1, 2, and 6), the VU meter can measure bias current flowing through the record head. A calibrating resistor is employed so that optimum bias corresponds to a specific point on the meter, usually 0 VU.

6. It permits measuring playback level (*Figs.* 1, 2, and 6). This is important in professional applications, so that the amplitude of the playback signal can be adjusted by means of the level control to meet the requirements of following equipment in a recording or broad-

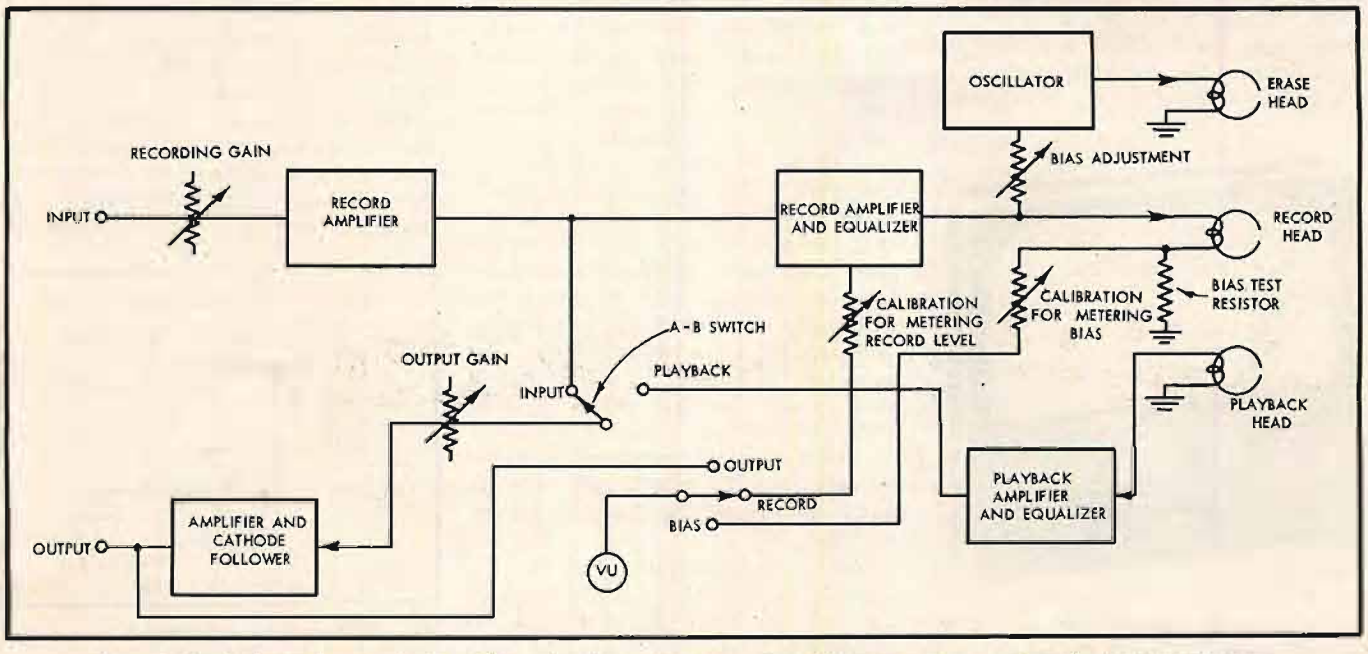


Fig. 1. Typical employment of a VU meter in a tape recorder with separate record and playback heads.

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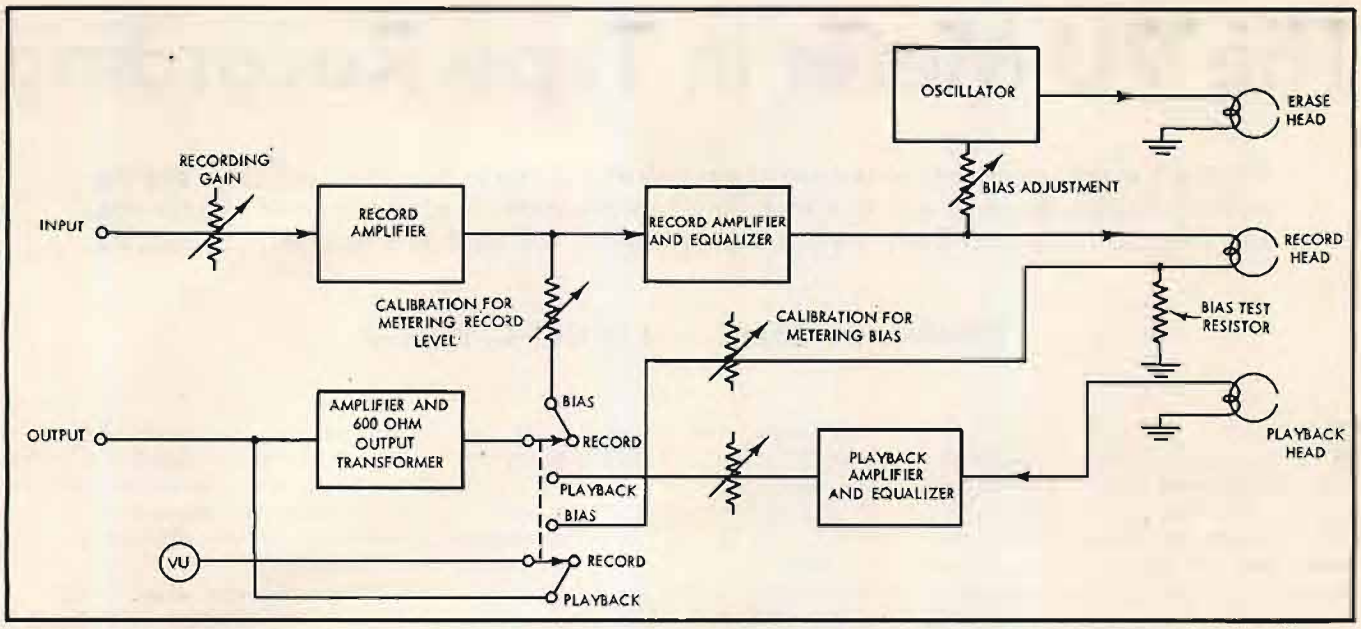


Fig. 2. Alternative employment of the VU meter in a tape recorder with separate record and playback heads.

east studio. If the signal is too low, there may be interference from adjacent audio lines operating at a higher level, or the following equipment may produce insufficient amplification. On the other hand, a playback level that is too high may produce crosstalk on other audio lines, or cause distortion or unnecessary compression in associated line amplifiers without level controls.

Characteristics of the VU Meter

The VU meter (*Fig.* 3) contains a 50-microampere d.c. movement with a full-wave copper-oxide rectifier. The standard meter has a 4 in. dial with a double scale, one reading from −20 to +3 VU, and the other from 0 to 100 (percent). Usually the VU units are featured, with the VU scale in black, this being known as an "A" scale. In the "B" scale the percentages are featured and show as black figures. The secondary scale is in red, and the color of the dial background is standardized as an "easy-on-the-eyes" yellow.

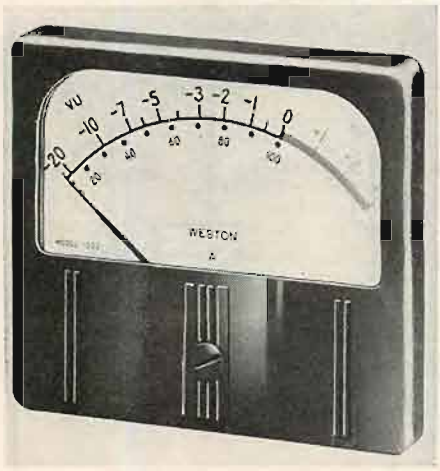


Fig. 3. Photo of a Weston VU meter with the "A" scale. (Courtesy Daystrom, Inc.)

VU units are simply decibels, with 0 being an arbitrary reference level: one milliwatt of power passing through a 600-ohm resistance.

The VU meter is designed to be placed in series with a 3,600 ohm external resistor, as shown in *Fig.* 4. Resistance of the meter movement plus that of the rectifier plus that of an enclosed resistor totals 3900 ohms. Therefore the total load of the *meter circuit* across the 600-ohm line is 7500 ohms. And now the meter reads 0 VU for 2.5 milliwatts of power in the 600-ohm line, which is actually +4 VU, since volume units are by definition referred to 1 mw in a 600-ohm circuit.

When employed in the standard manner (across a 600-ohm line and in series with a 3600-ohm resistor), the standard VU meter must exhibit certain characteristics, which enable the practiced operator to rely upon its readings and interpret them correctly. The overshoot must be between 1 and 1.5 per cent when a sine wave of 2.5 milliwatts power is suddenly introduced in the line; the pointer must reach 99 on the percentage scale within 0.3 seconds; frequency response must be within ± 0.2 db between 35 and 16,000 cps; loading distortion must not exceed 0.2 per cent harmonic when the meter is placed across a 600-ohm line; the meter must withstand for half a second ten times the voltage which produces a 0–VU indication (1.228 volts), and to withstand continuously a five-fold voltage overload.

The very high sensitivity of the VU meter is due to a high-flux-density magnet of special alloy, and if the meter is mounted in a steel or iron panel some of the flux is shunted, thereby upsetting the calibration. VU meters intended for such mounting must be especially calibrated by the manufacturer upon the basis of panel thickness.

Drive Requirements and Circuitry

When the VU meter is used as a record-level indicator and as a means of measuring bias current, it is unimportant what the reading signifies in terms of power across a 600-ohm line. The important thing is that a given point on the scale, usually 0 VU, should correspond to the record level producing maximum permissible distortion on the tape, or to the correct bias current. On the other hand, when the VU meter is driven as it was designed to be (across a 600-ohm line and in series with a 3600 ohm resistor), its dynamic characteristics (overshoot and response time) will be preserved, which is important to the recordist.

Only 1.228 volts is required to drive the VU meter when it is connected in the standard manner. The necessary drive is easily available in the record amplifier. Also, it is consistent with the

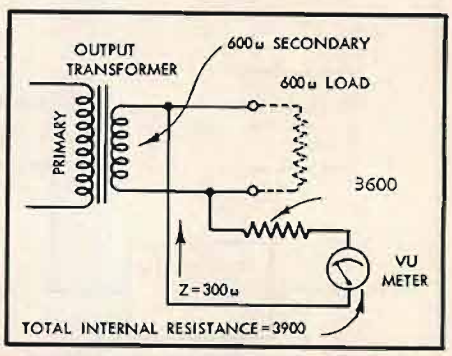


Fig. 4. Standard method of connecting a VU meter.

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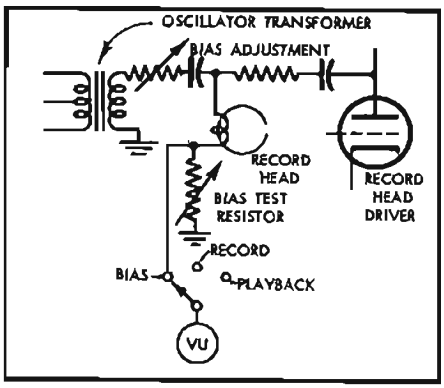


Fig. 5. Circuit for metering bias current and for calibrating the meter indication.

output that may be expected of the playback amplifier.

To measure bias current through the record head, a "test" resistor is employed between one lead of the head and ground; and the meter, via a switching arrangement, is placed across the test resistor. In order that a given point on the meter, usually 0 VU, should correspond to correct bias current, a variable calibrating resistor is used. Sometimes this calibrating resistor is the same as the test resistor, which is made variable, as in *Fig.* 5. Frequently, however, a separate calibrating resistor is employed, as shown in *Figs.* 1 and 2.

Figure 1 illustrates how the VU meter is driven in some tape recorders. The VU meter can be switched across a 600-ohm transformer, which is associated with a stage of amplification. This amplifier stage can be connected to the record section, via a calibrating resistor, so that it serves as a record-level indicator, or it can be connected to the playback section so that the meter serves as a playback-level indicator. In the third position the meter measures bias current.

A cathode follower typically has an output impedance of about 500 ohms, and can be satisfactorily used to drive the VU meter, as illustrated in *Fig.* 2. Here the meter is driven by the cathode follower only when measuring playback level. For measuring record level and bias current, it is connected to the appropriate points in the circuit through calibrating resistors. Note that by means of an A-B switch the meter can compare the incoming signal with the playback signal; this requires that the VU meter be switched to the "output" position.

In some circuits the VU meter is not placed directly across the output, as in *Figs.* 1 and 2, but is driven by its own cathode follower, as illustrated in *Fig.* 6. The advantage is that the VU meter does not load down the audio signal. Though specifications call for the VU meter to produce no more than 0.2 per cent harmonic distortion when connected in the standard manner, this may correspond to a greater, and significant, amount of intermodulation distortion.

Loading Distortion

If the VU meter, including its external 3600-ohm resistor, is placed across a signal circuit with an impedance much greater than 600 ohms, excessive loading distortion will result unless the external resistor is suitably increased. Impedance of the meter circuit must be at least ten times that of the signal circuit to avoid excessive loading. Heavy loading also attenuates the signal.

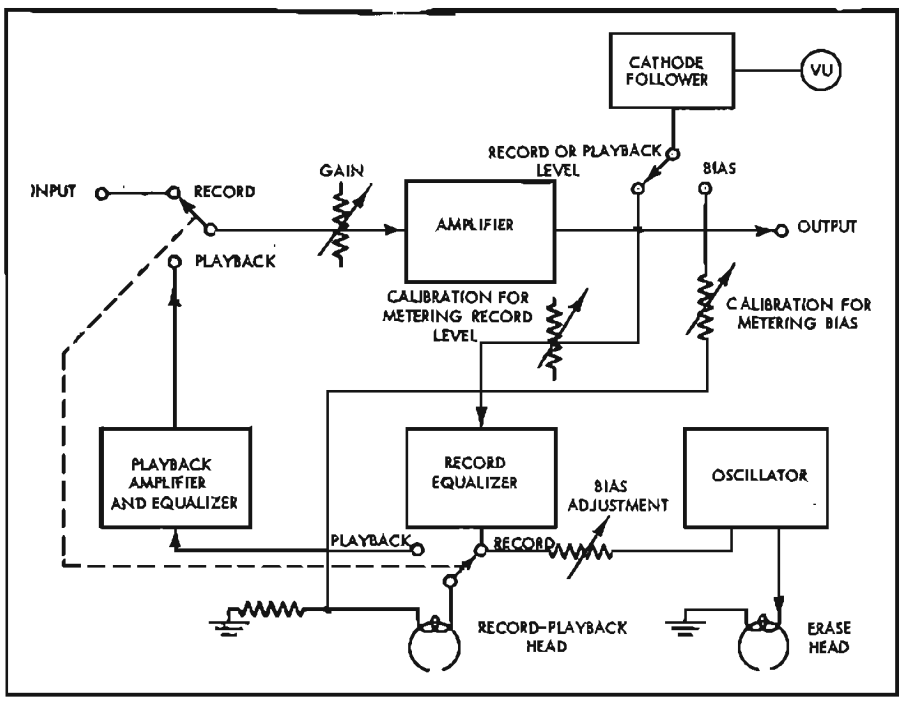


Fig. 6. Employment of the VU meter in a tape recorder with a combination record-playback head.

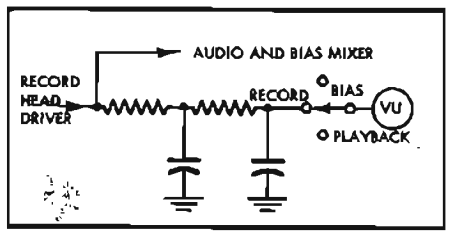


Fig. 7. Filter for preventing bias pickup by the VU meter.

The copper-oxide rectifier used in the VU meter (and other meters) has nonlinear characteristics. Its impedance varies with signal polarity and instantaneous voltage. Assume that the meter circuit, including the 3600 ohm external resistor, appears to the signal circuit as a 7500-ohm resistance fluctuating over a 10 per cent range. If a 10 per cent change in load resistance has a significant effect on signal voltage, which is the case if load impedance is appreciably less than ten times the source impedance, the nonconstant load resistance will cause significant distortion.

Record-Level Connection

In most instances the VU meter is connected to the record signal at a stage prior to equalization, as illustrated in *Figs.* 1 and 6, rather than after equalization as in *Fig.* 2. Record equalization in high-quality tape recorders generally conforms to NARTB standards, so that it consists of a little bass boost (about 3 db at 50 cps) and of considerable treble boost (20 db or more at 15,000 cps at 7.5 ips).

The post-equalization connection, *Fig.* 2, has the advantage of indicating the actual amount of signal applied to the tape at *all* frequencies, so that one may guard against tape overload at the high frequencies, which are so greatly boosted at the commonly used speed of 7.5 ips.

It may be questioned, then, whether the pre-equalization connection satisfactorily warns against distortion in the treble range. Essentially, yes. Record treble boost largely affects the audio spectrum above 3000 cps, and in this area the decline of audio energy with rising frequency tends to compensate the treble boost. Furthermore, for the same amount of distortion, somewhat more signal can be applied to the tape at high frequencies than at the mid-range and low ones.

The pre-equalization connection has the following possible advantages: (1) Taking the record signal at a point before the equalization stages will provide better isolation between the VU meter and the record head; this helps prevent bias current in the head from producing an unwanted and misleading indication on the meter. (2) After pronounced treble boost, high frequencies,

(*Continued on page 72*)

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Can you count the speakers in this array? A Japanese stereophonic speaker system, it includes two eighteen-inch woofers, two fifteen-inch woofers, two eight-inch mid-range cones, and an assortment of other units to cover the entire audio spectrum.

Hi-Fi with that Coffee Aroma

And why not couple the enjoyment of good coffee with an equally pleasant enjoyment of good music? The author suggests this might be an excellent method of attracting potential customers to the hi-fi salon—or maybe carrying it further and using two "o's" would be still more effective.

ED. SNAPE*

IN THE EARLY seventeen hundreds, coffee shop culture came into its own in Queen Anne's London. The world's largest city boasted coffee shops catering to wide social, political, literary, and business interests. Coffee-culture fathered those great periodicals, *The Tatler* and *The Spectator*. Lloyd's Insurance evolved from a coffee shop for exchange of shipping news. The art of conversation is said to have reached an all-time high in those London meeting places.

In the mid-twentieth century, a new coffee shop culture is growing up in what is now the world's largest city, Tokyo. There more than a thousand coffee shops attract millions of patrons to their friendly and relaxed atmospheres. The art of conversation is still practiced, but in lower tones than in London coffee shop days. High-fidelity music is now the main attraction.

The largest coffee shops, seating hundreds of patrons, feature the highest kind of high fidelity—live musicians. In one plush, five-story edifice the musicians play quite unconcernedly while riding an elevator stage from floor to floor. Since this moving stage can only be on one floor at a time, a high fidelity amplification system relays the musician's performance to other floors during the interim. In another downtown Tokyo shop the orchestra is suspended on a tiny balcony over illuminated fountains and fishponds, surrounded by tiers of circular balconies rising five floors toward a gigantic chandelier and mosaic ceiling. In a less exotic atmosphere, members of the JOKR radio orchestra perform nightly in a Shinjuku coffee shop, from which regular hi-fi broadcasts are originated.

The Smaller Shops

For practical reasons, live music cannot be featured in more than a handful of coffee houses, and more than nine hundred remaining shops offer recorded high fidelity performances for their musical offerings. These are a natural haven for stereofans and audiofans as well as music and coffee lovers. In the majority, the equipment is good but simple. Record changers are almost unheard of in Japan. Most coffee shops use a pair of the excellent Japanse viscous-damped pickup arms, magnetic cartridges, and well-made transcription turntables. The long-playing records are

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relatively expensive to the Japanese and are most meticulously cared for by their owners. Record attendants in Tokyo coffee shops are paragons when it comes to preserving the delicate micro-grooves which earn their livelihood.

With so many different coffee houses seeking his patronage, the Tokyoite may choose music in just about any vein imaginable. The majority of shops play "music-between" and light classics. A few have built reputations by specializing in French, Italian, or Spanish music—all quite popular with the Japanese. Some coffee shops cater to Japanese teen-agers by presenting U. S. rock-and-roll and hillbilly "cultural" offerings, occasionally interspersed with good jazz, but the best coffee houses offer a solid repertoire of serious classical music.

With record collections running to the thousands, many of the shops feature a continuous classical request program. Their patrons seem to have a wide knowledge and appreciation of serious music.

Other shops, however, hold to carefully selected and balanced program schedules. The schedules are published in program guides similar to those issued by our leading good-music broadcast stations.

A Typical Visit

Join me, if you will, for a visit to one such refined coffee house in the Shibuya area of Tokyo. The "New Lion Coffee House" is on a small lane away from the main thoroughfares of Shibuya. This is an amusement district and the lane is lined on both sides with theatres, restaurants, cabarets, pachinko parlors, and not a few coffee shops. A rock-and-roll record is blasting across the way. (Are rock-and-roll records ever played otherwise, anywhere in the world?) but here is the "New Lion" on our right. As we open the door and step inside, we step into another world. The din of taxi horns, street cars, and Elvis Presley is left outside. Instead, there is the solid but restrained sound of a symphony orchestra in the next room. An attractive young lady bows graciously and greets us. Do we prefer the balcony or the main hall? The balcony is not crowded today, so our hostess beckons us toward a small flight of stairs. At the top, we step out into a minature concert hall. Soaring music surrounds us. The lights are dimmed; the audience is hushed. We are guided quickly and quietly to our table where we are handed a menu and a program guide. Alas, we cannot read Japanese; but coffee is coffee and the music is unmistakably Mozart. In fact, it is a sterophonic tape recording of the Jupiter symphony. Here is stereo as it never quite sounded in the audio showroom back home. Perhaps this concert hall atmosphere does much to enhance the realism of the recorded performance, at any rate we are soon absorbed in the concluding movement of the symphony.

The audience does not applaud at the conclusion, most of the people engage in quiet conversation. We will take advantage of this short intermission to get a better look at the audio system. The speaker system is most fascinating and after several trys we succeed in counting all the various drivers and horns. There are two 18-in. woofers, two 15-in. woofers, two 8-in. mid-range cones, three electrostatics, and a full-complement of mid-range and tweeter horns. The woofers are horn-loaded in extraordinarily solid-looking folded theatre horns.

The remainder of this deluxe hi-fi system is housed in a rack and cabinet in an alcove beneath the speaker stage. Behind sliding glass panels in the cabinet are the two transcription turntables equipped with capacitor pickups. One turntable has two of the pickups mounted side by side to play Cook binaural disks. Dual AM tuners are provided for reception of weekly stereo broadcasts by the two government AM radio channels. An all-wave receiver and equalizer controls are also housed in the cabinet.

Power amplifiers and power supplies are rack mounted in a full-height standard relay rack. There are four separate power amplifiers, electronic cross-overs,



Records spin on high-quality transcription turntables in a glass-enclosed cabinet, which also houses an all-wave tuner and dual AM tuners. The latter pick up weekly stereo broadcasts by two Japanese government AM stations.

and individual level set controls. A professional looking stereo tape player occupies a position adjacent to the rack. Lining one side wall are shelves holding a collection of disks and tapes that would arouse the envy of any self-respecting radio station.

The attendant announces each selec-

(*Continued on page 65*)



Tuning in a stereo broadcast. The record playing equipment consists of two transcription turntables with capacitor pickups.

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Sound Recording and Reinforcing at The Monterey Jazz Festival

Details of the installation and operation of what is probably the largest outdoor stereophonic sound reinforcement and recording system used to date—along with some valuable pointers to anyone who may have occasion to duplicate the results, even on a much smaller scale.

R. J. TINKHAM*

SPEARHEADED by the well-known D. J., Jimmy Lyons, a group of enthusiastic townspeople in the historic first capital of Spanish California, Monterey, decided that the West Coast should also have its Jazz Festival. Three memorable days, October 4, 5, and 6, are just concluded.

Two lieutenants (musicians and "hi-fi" enthusiasts) from the U. S. Navy Post-Graduate School at Monterey, Ed St. Ville and Dick Avritt, counseled the local committee that since sound was what the people would pay their money for it had better be good. Upon their promise to contact Ampex for help, they were appointed to the committee.

Our first contact with the Festival came last July when they asked Ampex if we would assist the Festival organization acoustically. Since Monterey is a very pleasant place to be at any time, we agreed.

From a preliminary verbal description of the location chosen for the event, Harold Lindsay of Ampex, who operates a sound reinforcement (*not* "P.A.") business on weekends, Walter Selsted, Director of Research at Ampex, and the writer shuddered at the implied problems. The spot chosen was the outdoor horse-show arena at the County Fair Grounds. It was found to be directly in the approach path of the Monterey Airport, out of which operate numerous naval aircraft and commercial airliners. The approach to the airport is *from* the sea, and the takeoff is *toward* the sea, since a range of low hills prevents operation in the opposite direction.

A visit later in July to the site chosen reduced our shudders somewhat. The board fence along one side wasn't as high as first believed and the bleachers on the other side would probably be filled with people. However, if the stage were placed at the far end of the arena, as originally planned, there would be a decided backwall "slap" from the buildings at the near end. It was also planned to place folding chairs for the audience in the arena. The arena, itself, was high in the center and sloped downward in all directions for drainage. Numerous horse shows had been held; but they planned to grow rye grass before the Festival (and did!).

It was the cerebration of but a few moments following some hand clapping for illustration, plus not a little diplomacy, to convince the committee members to follow a logical plan in the seating and staging. The stage would be placed directly in front of the buildings which were causing the bad echo, and facing the open end of the arena where a number of live oak trees acted as a fair "rear wall" sound absorber. It was agreed to re-contour the arena by bulldozing the high center toward the rear. The resulting slope had a three-foot elevation to the back, about six inches at midfield and nearly flat for the fore portion. Seating for about six thousand persons was contemplated.

The stage budget was $1500—and it had to seat everything from a three-man combo to a seventy-five piece symphony orchestra. The first recommendation, considering the budget limitations, was to build a platform suitably high so that all could see plus a hard flat rear wall and two hard side walls at 45 deg.—all eight feet high. No ceiling was then contemplated. The walls would both help project the sound and reflect it back to the musicians who must hear themselves and each other if they are to give a good performance. As time progressed, and advance ticket sales came in better than anticipated, the budget for constructing the stage was increased. The stage finally ended up being fifty-four feet across the front, 22 feet along the eight-foot back wall, twenty-four feet deep, and with 45 deg. side walls extending two-thirds of the way forward. The front riser was five feet above grade and eight feet deep. Two more risers of the same depth, were provided, each six inches above the one

* *Ampex Corporation, Redwood City, California.*



Relative positions of stage, audience, sound control center, and recording booth.

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in the front. A hard ceiling was added. It sloped upward at 20 deg. from the rear wall, and was carried on a fifty-five foot transverse steel "I" beam eight feet back of the front edge of the stage. The overhead was cantilevered out to the front edge of the stage. A valance board across the front obscured the stage lighting.

Since the seating area was large (approximately three hundred feet long by one hundred fifty feet wide), and because of the present wide interest in stereo, it was decided initially to do the sound reinforcing job in three-channel stereo. The microphones used at the center of the stage would feed only the speaker system placed at the center, and the microphones on each side of the stage would feed only the speaker system on the corresponding sides. No electrical mixing between channels would be done. The only mixing would be the normal acoustic mixing reaching the microphones, and the acoustic mixing from the wide-angle speaker systems. This would also provide the necessary electrical signal for the three-track stereophonic recording of the entire Festival. It is believed that this is the first and largest such open air stereo sound reinforcing system to be used in this country. The results were gratifying.

The physical placement of the microphones and their corresponding speakers was a matter of acoustic judgement and involved many factors: the physical size and disposition of the stage with respect to the total audience; the arrangement of the audience; the sizes of the performing groups (three-piece, four-piece, fifteen to twenty-five piece, and seventy-five piece; with vocalists, instrumental soloists and piano soloists). Moreover, the stage was designed to reinforce the direct sound for the box holders in the front third of the audience space, thus making sound reinforcing unnecessary in this area. Another criterion was that the sound should be natural and not sound reinforced. The highest compliment that could be paid would be to have the audience unaware of the existence of the sound system as such. Furthermore, and unlike a studio recording session, there were to be no rehearsals other than minor rearranging of microphones during the show, a very stringent, but obviously necessary, requirement.



Truck sound control center and adjacent recording booth with the author at the recorder.

Setting Up

The sound crew consisted of Harold Lindsay to handle mixing, myself to handle mike placement and acoustics in general, ably assisted by John Deans, of Ampex' Engineering Department, with Bob Baker, experienced recordist, and Gordon Longfellow, accomplished entertainer and recordist from the public relations section of Ampex. The crew loaded up a small moving van, a panel truck, and two station wagons with $35,000 worth of gear, thirty miles of half-inch recording tape and all the other necessaries. They traveled the one hundred miles to Monterey before the first session, towing two large theatre speaker systems on trailer wheels, plus a third such system knocked down and packed inside.

It required most of two full days to install the system and check it out. The lineup of the equipment used is as follows:

Microphones:
Altec 21B for general pickup (three)
Altec 21D for floor stand accent (four)
Telefunken Stereo Model SM-2 "Crossed-mike stereo pickup comparison" (one)—(supplied through courtesy of Steve Temmer, Gotham Audio Sales Co. Inc., New York City).

Preamp Mixers:
Raytheon RPC-40 four-position broadcast mixer (two, for right and left channels)—(uses 6J7 input tube, a.c. heater.)
Altec four-position broadcast mixer consisting of: four A425B Preamplifiers, one A426B Line Amplifier, and one P505B Power Supply (one, for center channel).

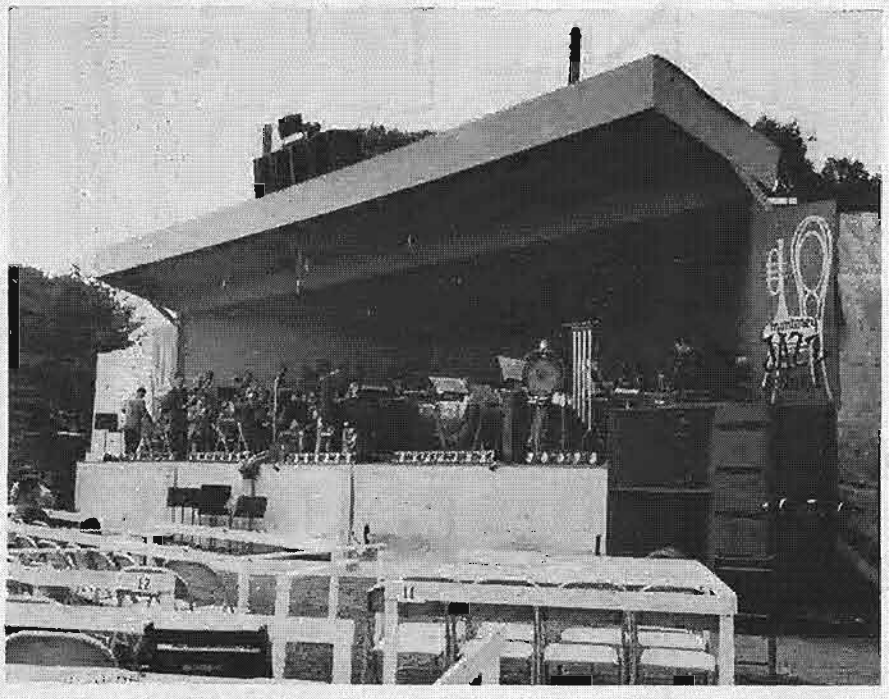
Power Amplifiers:
Altec 256C, 75 watts (push-pull throughout; uses 807's with fixed bias for output).

Right and Left Speaker Systems:
Altec "Voice of the Theatre" systems consisting of a pair of H210 units stacked one on the other, (uses four 15-in. horn-loaded drivers) for "woofers," and four 288 drivers on a 1004 cellular horn for a "tweeter." Crossover at 400 cps.

Center Speaker:
Fidelity Sound 5512, consisting of four Altec 515 (15-in.) theatre drivers (as in the other units) each horn loaded, for "woofer"; and two Altec 288 drivers on a 1005 cellular horn for "tweeter"; 500-cps crossover.

Speaker Equalizers:
Special; to equalize the three speaker systems for acoustically flat response to 12,000 cps, down 4 db at 15,000.

Recorders:
Ampex 300-3, three-channel stereo, using



Stage, showing relative positions of microphones and speaker systems.

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½-in. tape at 15 ips, with the new Ampex Master Equalization which yields 7 db. better S/N ratio than previous equalization methods. (Two recorders used, for master and protection master.)

Ampex 300, full track, ¼-in. tape at 15 ips, fed from center channel only.

Arriving on the scene, the two trailer-speakers were disposed at either end of the stage and on the ground. This placed the high-frequency units about nine feet above the ground. The knocked-down speaker system was hoisted up the back of the stage and mounted on a special platform constructed at the front edge of the swaying cantilevered stage overhead. During this latter maneuver, one of the local committee stepped off the runway and put his foot through the tarpaper roof dislodging one of the 4′ × 8′ plywood boards from the ceiling of the stage. It sailed majestically down, narrowly missing one of the star performers who was then practicing on the stage. The foot dangled grotesquely for a moment and was then withdrawn. No further mishaps occurred throughout the show.

Because of the several kinds of groups which were to perform, we decided to provide ourselves with a microphone layout that would be capable of handling almost any forseeable eventuality.

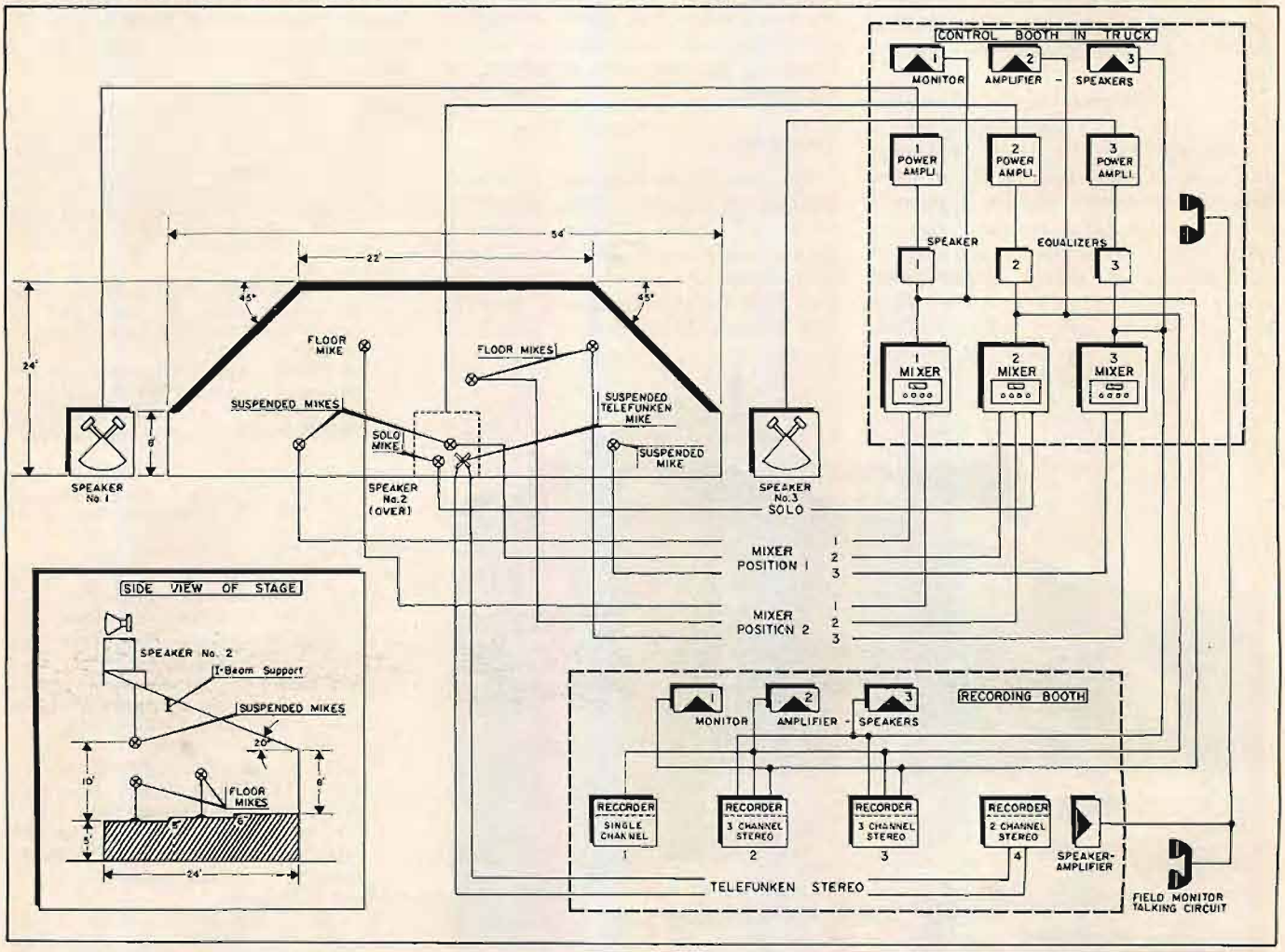
Microphone Placement

Most small groups are accustomed to working with close-mike technique, although it became apparent that virtually none had any previous experience with a stereophonic mike setup—outdoors! This was painful at times. Large groups require different mikeing of course. Therefore we suspended three microphones from the overhead about three feet back from the valance by driving staples into the joists supporting the ceiling skin. One mike was hung at stage center and the other two were suspended in a lateral line ten feet each side of the center. All were suspended ten feet above the front riser. This might at first glance seem to be rather close together for a fifty-four foot stage, but in analyzing the seating arrangements normally employed by the various groups of performers, this appeared best. And except for one or two instances, it worked most satisfactorily.

In addition to these three general pickup mikes, an announcer's mike was provided on a floor stand at center stage front. Three other floor-stand mikes were also provided with their cables disappearing through the top riser at stage center and ten feet either side of center. The cables on all four of the mike stands were tethered at ten feet to prevent their being moved too far into an adjacent pickup area which would destroy the stereophonic illusion. (But we didn't figure on Dizzy Gillespie!)

The center overhead mike, the announcer's mike, and the center stand mike were fed to one mixer. This output fed the speaker system on the roof center. The right suspended mike, and the right stand mike fed the righthand mixer and the lefthand pair fed the left mixer.

The outputs of the three individual mixers were fed through special equalizers designed to compensate for the normal roll-off of the speaker systems. The design of these equalizers was based on warble tone acoustic response measurements made several days prior to the installation. They yielded an essentially flat acoustic response to 12,000 cps at a distance of ten feet in front of each speaker system. The response was down four db at 15,000 cps, a point of aca-



Block diagram of complete system: Three-channel stereo sound reinforcing and three-channel stereo recording, together with two-channel and single-channel recorders for special applications. Dimensions of stage and mike positions are shown.

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From stylus to speaker,
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make music live

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40-watt Stereo Amplifier



FM-AM Tuner



12" Extended Bass Coaxial Speaker

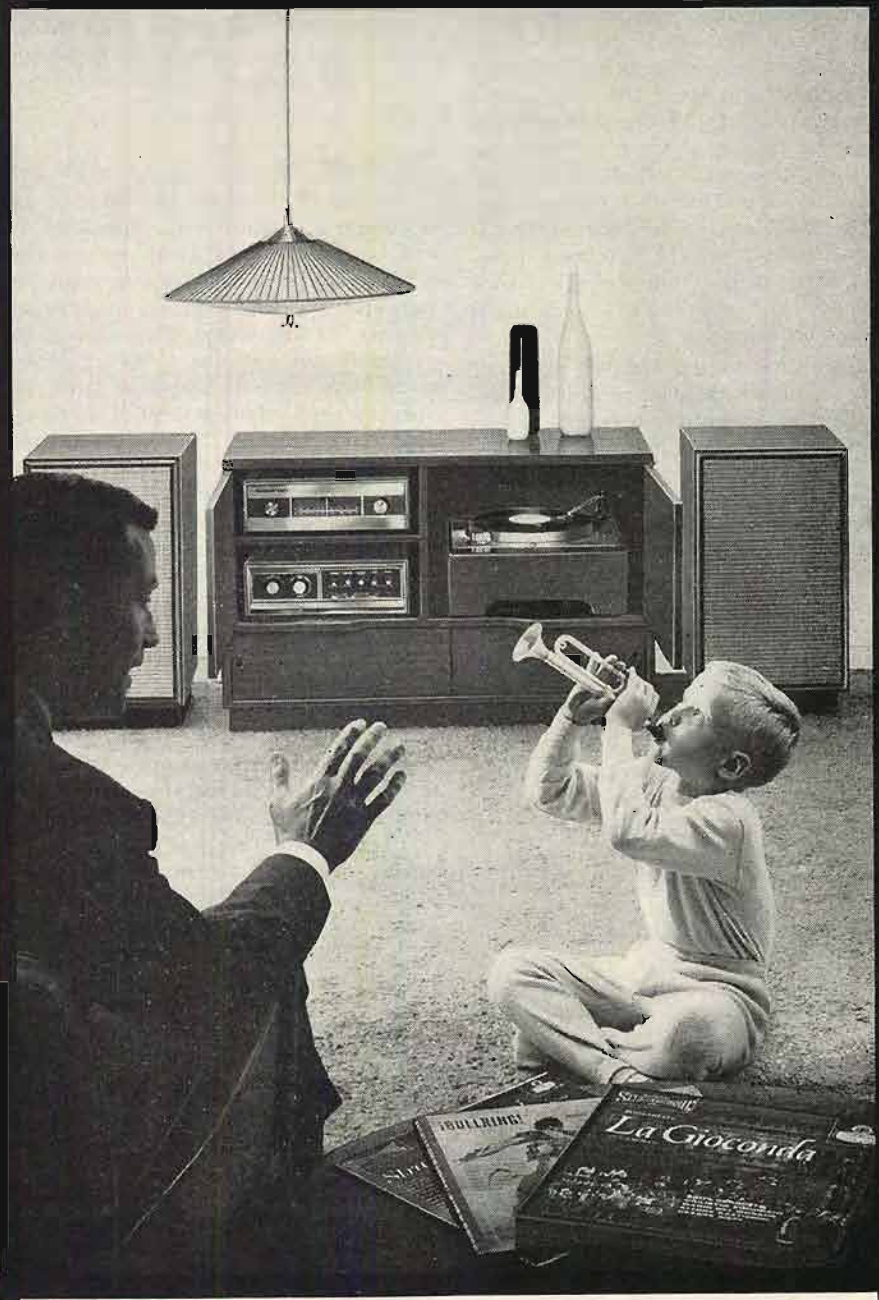


12" Extended Bass Speaker System



Equipment Cabinet





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demic interest only, as the absorption of the air reduces high-frequency response materially over the distances and under the conditions encountered here.

The equalizer outputs were fed to the three individual power amplifiers, of 75 watts for each channel, and their outputs fed directly to the three speaker systems.

The three-channel inputs to the stereo recorders were bridged at the output of the three mixers ahead of the speaker equalizers. The single-channel recorder, which was used to prepare tapes for the Armed Forces Radio Service for overseas broadcast, was fed from the center channel.

The output of the Telefunken double channel stereo mike was fed directly to a two-track Ampex Model 601-2 recorder. The mike was suspended at stage center eleven feet above the stage and at the very front edge. The associated compensating networks were employed as described in a recent article on the subject.[1] The tapes from this separate system are to be analyzed later in comparison with the resultant two-track processed tapes made from the three-track masters, which should yield some interesting conclusions.

In addition to the $35,000 worth of equipment used ($25,000 of which represented the sound-reinforcing system owned by Harold Lindsay—"Harold's Patio Hi-Fi Set," as someone has dubbed it), some other statistics may be of interest. Three thousand feet of cable were used—shielded mike cable, speaker cable, and so on. Nearly twenty of the thirty miles of ½-inch tape were used. These three-track masters are available to the various recording companies having contracts with the artists who appeared.

Among the outstanding performances were those by Louis Armstrong, Velma Middleton, Burt Bales, Lizzie Miles, Ernestine Anderson, Modern Jazz Quartet, Cal Tjader, Dizzy Gillespie Quintet, Dave Brubeck Quartet, Gregory Millar and the Monterey Jazz Festival Symphony of seventy-five instruments, and Harry James' Band, as well as numerous others.

Two demonstrations of the sound system itself were made: one planned and one impromptu. Greg Millar and the symphony orchestra recorded the opening two minutes of "Petrushka" during rehearsal. This was to be their opening selection. At the performance, we cued up the tape appropriately, and started the tape playback over the speaker system on Mr. Millar's down-beat. The members of the orchestra pantomined their part of the activity, and after a few bars they all stood up, stretched, shook hands and otherwise quit playing —except that the sound went on. The audience expressed its delight at the deception, as the sound was good enough to be live.

The impromptu demonstration came just as the last auditors were clearing the gates—homeward bound following the evening performance of "Satchmo" Armstrong. We played a few minutes of his performance over the speaker system. A goodly number of people filed back into the arena, looked at the stage, then stayed to sit and listen. The presence was uncanny. All of the sibilance was there. The blacked-out stage had ghosts! A couple of the clean-up girls started swinging and dancing on the sidelines to the amusement of those present. Then the police chief heard about it and made us turn off the system as he wished the field cleared for the night.

The Headaches

Outside of the usual problems of assembling the equipment, installing it, and tearing it down, there were a few others. The principle objective was to reinforce the sound in an unobtrusive manner, as was stated. The naturalness of the sound was due to two factors: a uniform acoustic response from the speakers, and running them at a reasonable level. One of the crew, equipped with a field telephone, served as listener three-quarters of the way back in the audience. There he could judge balance and phone in for more piano or what not. The unobtrusive level was found to be sufficiently below feedback, so that this did not become a factor . . . except once.

Usually we were able to have the performers sit on the middle and rear risers. But Harry James sat up well forward —on the bottom riser as well—before we could rearrange him. Consequently, we pulled the suspended mikes forward toward the front edge of the stage by means of black strings we had previously, and thoughtfully, run up over the forward edge of the roof for just such an eventuality. We couldn't at first find the ringing we encountered, as we had also used this approximate arrangement with the symphony orchestra which more than adequately filled the stage. We soon discovered that it was coming from the center suspended mike. It looked like an acoustical freak of reflection off the back and side walls. We pulled the mike up another foot and it cleared the problem. Moral: watch out for reflected foci of sound from various surfaces. Here it was the back and side walls, together, all equidistant from the mike.

Dizzy Gillespie, we believe, didn't "dig" the stereo idea. He moved the stand mikes every which way thus intermixing the three channels. One of the crew went up on the stage between two numbers and attempted to unscramble the situation. Dizzy looked puzzled, scratched his head, then shook it, and rearranged the mikes into a mixup again. In desperation we cut off all of the accent (stand) mikes, and he then unknowingly sounded terrific on the three he couldn't reach.

Regardless of the preliminary instructions we gave the performers, many of them would almost swallow the 21D announce mike. The result was a "p"-popping problem perpetrated p-terrifically. Next time an old clunker of an un-pea-popping variety will be used here for certain.

No matter how carefully the stage management endeavored to arrange to have intermissions fall during the arrival and departure times of the commercial airliners, we never seemed to be able to coordinate the situation. One night the low-lying fog required an I. L. S. approach, and one plane thundered overhead on four distinct passes (very distinct) before bedding down. The admiral of the local Naval installation cooperated by chasing his planes off to the side or grounding them during performances.

While Dave Brubeck was performing, a low-flying roar drowned him out completely for a few moments. Without missing a beat, this artist intermixed a few bars of "Wild Blue Yonder" in his theme to the utter delight of the audience. One of the committee stated that if ever these recordings were released, it would be a grand identification to inscribe on each jacket, "Not the genuine Monterey Jazz Festival performance without the stereo airplane sound." Another poor soul, a paid admission, asked how we were going to remove the airplane noise from the tape. He thought we could. We asked him to send along any ideas he had since we were stumped.

The *San Francisco Chronicle* had this to say:

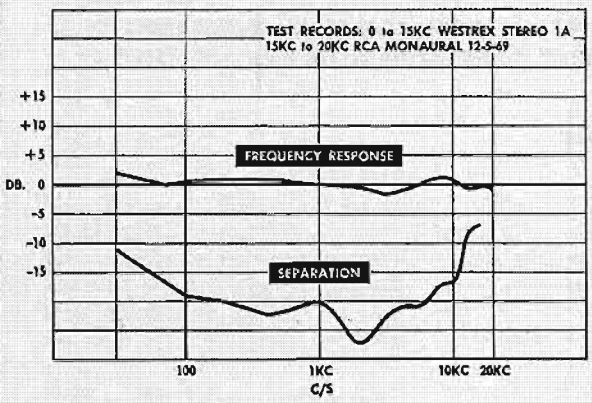
> ". . . The sound system, provided by Ampex Company, was superb and even those unfortunates who were seated in the rear of the arena had a better chance to hear the music than many much closer and at indoor functions in San Francisco . . ."

When the final "take" was tallied, it appeared that the Festival was in the black by enough for the Committee, who gave us excellent cooperation, to change the name from the "Monterey Jazz Festival" to the "First Annual Monterey Jazz Festival." We undertook this program at no cost to the Festival in the combined interests of community civic duty, experiment, and to give a demonstration of the fact that good results *can* be achieved in sound, if one knows what he is about and is willing to put forth the necessary effort to achieve good quality in sound. Æ

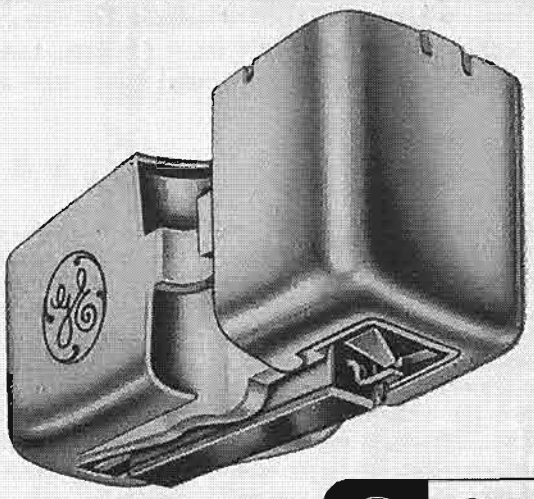
[1] G. Bore and S. Temmer, "'M-S' Stereophony and Compatability." AUDIO, April, 1958.

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New G-E "Golden Classic" stereo-magnetic cartridge



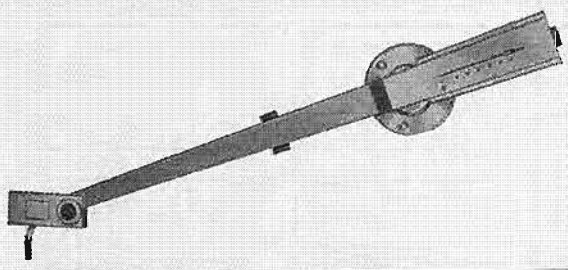
Smooth response on both stereo and monaural records. Consistently high separation between stereo channels.



• Compatible with both stereo and monaural records • Full frequency response, 20 through 20,000 cycles • "Floating armature" design for increased compliance and reduced record wear • Effective mass of stylus approximately 2 milligrams • High compliance in all directions—lateral compliance 4 x 10^{-6} cm/dyne; vertical compliance 2.5 x 10^{-6} cm/dyne • Recommended tracking force with professional-type tone arm 2 to 4 grams • Consistently high separation between channel signals. (Specifications for Model GC-5.)

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High-Fidelity Bass Cone Loudspeakers

Even when available, loudspeaker response curves seldom show the "hills" and "valleys" present in most models, but the author's new acoustical technique is claimed to give an improved bass response without appreciably affecting sensitivity.

A. B. SARKAR*

To the ordinary Hi-Fi fan who has no provision for measuring the characteristics of a loudspeaker, there does not appear to be any difference between the various loudspeakers available in the market. The published frequency response curves by various manufacturers are not comprehensive and sometimes often misleading, and only the acceptable information is being published. It is proposed to show the reasons for the "jaggedness" of actual curves and to show one method of smoothing out the performance.

Corrington[1] has given a response curve for an 8-in. loudspeaker mounted in front of an infinite baffle which is very typical of the behavior of the diaphragm. The suspension used there is felted-paper, a continuation of the paper cone. If we compare that curve with a theoretical one[2], we see that a peak and a dip occur around 950 cps and 1000 cps respectively besides the resonances above 2000 cps. The causes of the resonances have been attributed to the standing wave produced due to the combination of the transverse waves travelling out of the voice coil and the waves reflected inward from the suspension rim.

Theoretically, it is assumed that the voice coil and all parts of the cone move in phase with the same amplitude and that the mass of the system and the mechanical resistance to its motion can be regarded as lumped constants effective at the voice coil. But, in practice, the paper cone of a loudspeaker is not ideally rigid, and the transmission velocity for transverse flexural waves along the cone may be low enough to allow several nodal circles and regions of reversed phase to appear within the range of frequency covered by the speaker. Various methods of suspension have been suggested to absorb these unwelcome standing-waves and thereby to produce uniform response; but the appearance of the dip around 1000 cps can be explained as follows: The velocity of propagation of sound in air is about half that in the paper cone. For a 15-in. speaker the distance between the junction of the coil and the cone and the edge of the cone is 6¼ in. and the wavelength (λ) in air is about 13 in. (for 1000 cps). Hence, sound propagated from the area near the coil arrives at the suspension rim of the paper cone nearly a $\lambda/4$ out of phase with sound from the edge of the cone. Thereby a partial cancellation will occur, producing the dip in the response curve.

It is possible to predict mathematically with accuracy the operation of a 15-in. circular piston vibrating system. But, although a 15-in. cone loudspeaker has been stated to be equivalent to the ideal vibrating system, the vibration of the paper cone—having several degrees of freedom—is too unpredictable to represent with even fair accuracy by a mathematical argument and an equivalent electrical analogue. In fact, since the problem is very much acoustical, it provides a wide range of research and design possibilities. If we have to rely on paper cone, as we generally do, to produce uniform pressure/frequency and, for that matter, good transient response, we have to tackle the loudspeaker problem by acoustical means. For the effective application of acoustical treatment to achieve good results one must of course find out which part of the paper cone produces what band of frequency. This has been done, as explained later on.

Effect of heavy cone

In this connection it may be argued that the acoustical treatment on the cone

* *128, Macoma Road, London, S.E. 18, England.*

[1] M. S. Corrington, "Amplitude and phase measurements on loudspeaker cones." *Proc. I.R.E.*, 39, 1951. pp. 1021–1026.

[2] L. Beranek, "*Acoustics.*" McGraw-Hill, New York. 1954. p. 192. (*Fig.* 7.6.).

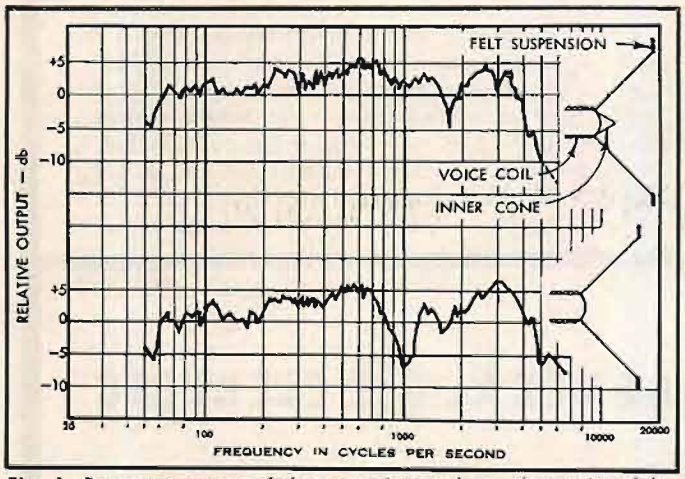


Fig. 1. Response curve of the experimental speaker using felt suspension: (A) with, and (B) without the inner cone.

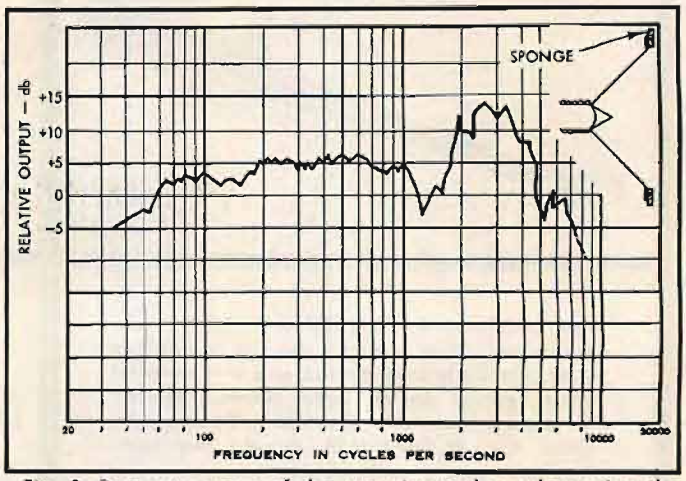
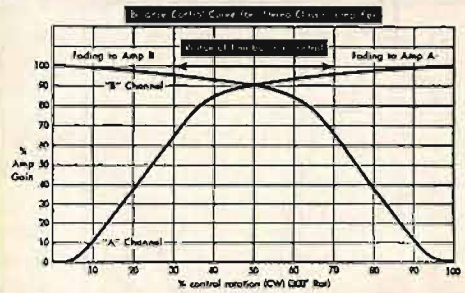


Fig. 2. Response curve of the experimental speaker using the inner cone and sponge surround as suspension.

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New G-E 40-watt "Stereo Classic" Amplifier





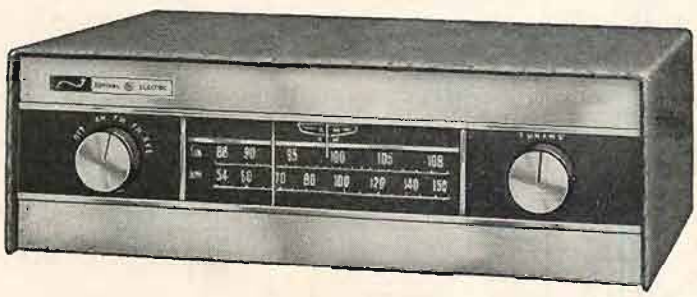
Versatile, convenient switches and controls. In this completely new and striking General Electric design you'll find every useful variation in stereo and monaural amplification, controlled swiftly and accurately. Balance control allows you to adjust for maximum stereo effect *without* overloading one channel when the other is cut down. New contour control boosts the bass smoothly, gradually, without increasing sound intensity. Each control handles *both* 20-watt channels.

• Full 20-watt power output from each channel at the same time. • No audible distortion at full power. • Flat response within .5 db from 20 to 20,000 cycles. • Outstanding sensitivity, extremely low hum and noise level. • Inputs: FM-AM tuner (and FM multiplex adaptor), stereo and monaural phono cartridge and tape, auxiliary. • Speaker modes: stereo, stereo reverse, single or two-channel monaural. • Speaker phasing switch saves manual phasing. **$169.95*.**



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Model FA-11 (left) has russet leather vinyl finish. Model FA-12 finished in willow gray vinyl. Both models are style-matched to the amplifiers. Cabinet removable for custom mounting.

*Manufacturer's suggested resale prices.

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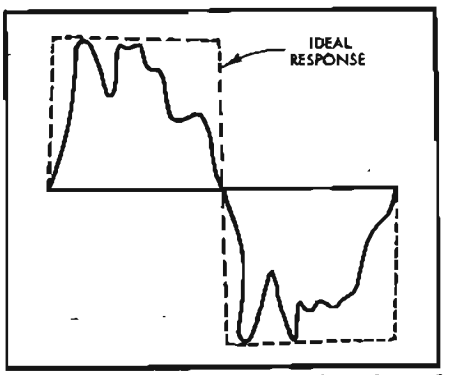


Fig. 3. Response of the loudspeaker of Fig. 2 to a 500-cps square wave.

will increase the mass of the cone, thereby the sensitivity will go down, but, as will be shown later, the acoustical technique has been applied without *unduly* increasing the mass of the cone. This increase of mass of the cone is not, after all, a hindrance to our operation. The reason is that one of the effects of nonlinearity in a speaker is the production of harmonics and sub-harmonics, and nonlinearity occurs when the force-displacement characteristic deviates from a straight line. In a light-weight cone, the deviation occurs at a small input, although the sensitivity is greater with such a cone, but the increased sensitivity is obtained at the expense of greater nonlinear distortion. It must be remembered that low nonlinear distortion and high sensitivity are incompatible. Hence for low distortion, a relatively heavy cone should be employed; again, a heavy-cone low-sensitivity speaker, when used with present day amplifiers, will actually deliver more acoustic power before it overloads than a speaker with a lighter cone. Furthermore, for home sound reproduction, high sensitivity is not a requirement since the power available from most amplifiers used in high-fidelity loudspeakers (at least 5 watt output) is quite adequate to get satisfactory sound levels. This sort of output from the amplifiers (say 5 watts) will, in turn, produce a sound level of (100 db) in the average living room and we know that this is about peak level of a full symphony orchestra, in the best seat in an orchestral hall.

Brief Theoretical Interpretation

Let us look at this problem from another angle. According to Morse[3], a dynamic speaker of radius a set in a plane wall, moving with velocity $V_0 e^{-i\omega t}$, radiates the total energy (avoiding the algebraic juggling since we are concerned only about the result)

$$\tfrac{1}{2}\pi a^2 \rho c V_0^2 \gamma = \tfrac{1}{2}\pi a^2 \rho c V_0^2 \left[\frac{1-2J_1(2\omega a/c)}{(2\omega a/c)}\right]$$

into the open, where, $\omega = 4\pi a/\lambda$. Now the transmission coefficient γ is small at low frequencies which means that the velocity amplitude must be increased at the low frequencies to obtain uniform response. This can be done by making the piston mass-controlled, for then the inertial reactance of the piston itself is the largest part of the total mechanical impedance over the useful range.

Increasing the number of turns on the coil increases the electromagnetic coupling constant, but it also increases the mass of the moving parts and the resistance of the coil.

The efficiency of the loudspeaker could be increased by decreasing the coil resistance, by increasing the magnetic field, by increasing the number of turns on the coil, or by decreasing the mass of the moving system. If we decrease the coil resistance much, the electrical impedance will not be constant over the useful range, and the resonance between the mass of the system and coil inductance will become prominent. If we increase the number of turns on the coil, we increase the resistance and also the mass, which is not desirable. It would be quite difficult to increase the magnetic field to any extent, although if this could be done the efficiency could be increased without any concomitant ill effects. If we decrease the mass of the system much, it will no longer be purely mass controlled and the response will not be so uniform.

[3] P. M. Morse, *"Vibration and Sound."* McGraw-Hill, New York, 1948 (2nd edition), p. 338.

Description

The stiff rigid cone offers better results, in many respects, than the corrugated one, so the present discussions will be based on stiff cone only. *Figure* 1 shows the response characteristics of a 15-in. loudspeaker with felt suspension (the paper corrugation at the periphery being avoided) with and without the addition of a central light inner cone. One can see that although the curves show better response, the dip around 1000 cps is still there, and the resonant peak above 2000 cps is not very much damped. (The application of inner cone of proper weight is important.) A new type of suspension, a ring of plastic foam, has been used by different manufacturers. It has been claimed that this does all the tricks both as the preventor of the dip as well as absorber of the resonant peaks and thus produces a very smooth frequency response. What happens is that air, in passing through the minute cells of plastic foam, offers viscous damping to the mechanical vibration of the diaphragm. This will act as self-damping, particularly in case of large excursion (at low frequencies) when the dimensions of the cells of the foam keep on changing, i.e. alternatively narrowed and elongated. The fundamental resonance is considerably lowered. The density of the foam or sponge is important since the inertance and resistance components are dependent on it and if the density is not properly chosen, it might introduce acoustical interference and thus cancel the front and back radiation. But from experience it is known that the plastic foam, when used for the

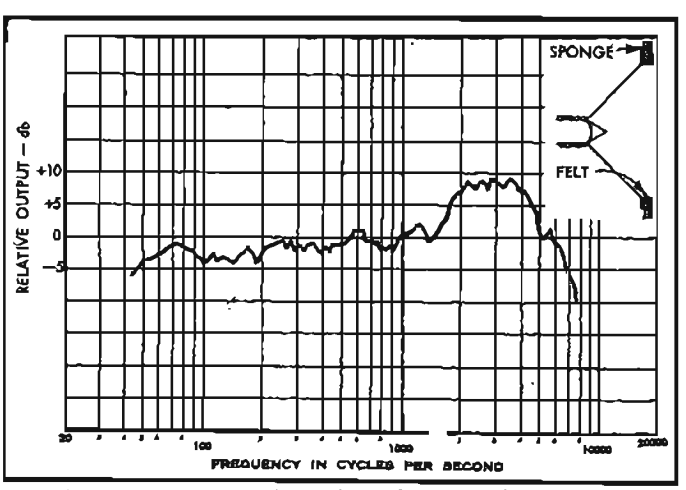


Fig. 4. Response curve of speaker of Fig. 2 when the sponge suspension is loosely covered with light felt. Note that the "dip" around 1000 cps has completely gone.

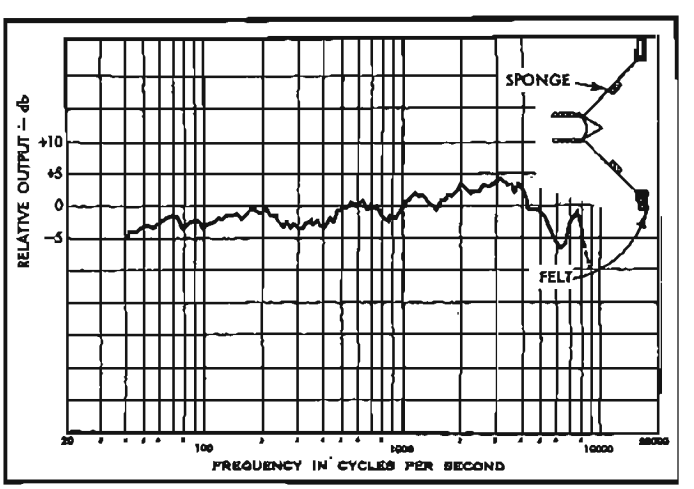
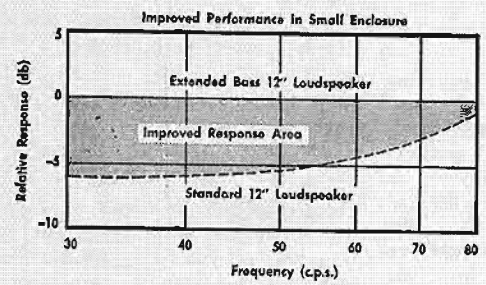


Fig. 5. Response curve of speaker of Fig. 2 when the resonance between 2000 and 4000 cps is suppressed by special acoustic treatment applied to the cone.

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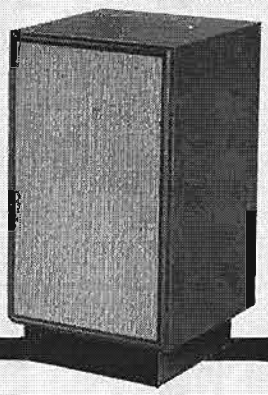
New General Electric "Stereo Classic" Speaker Systems

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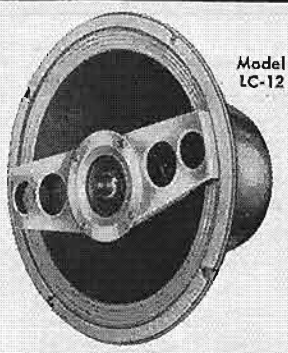
Model LK-12 (Kit)



Model LH-12



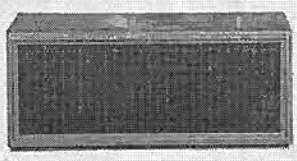
Model LC-12



"Stereo Classic" speakers are offered in three different forms: • Model LK-12 woofer-tweeter kit with crossover network for those who prefer a biaxial installation using their own enclosure. **$89.95*** • Model LC-12 coaxial speaker with crossover network. Same basic woofer with tweeter mounted coaxially in front. **$89.95*** • Model LH-12 speaker system. Separate woofer, tweeter and crossover factory-installed in a 2 cu. ft. wood enclosure. Available in mahogany, blond oak, cherry and walnut veneers. **$129.95***

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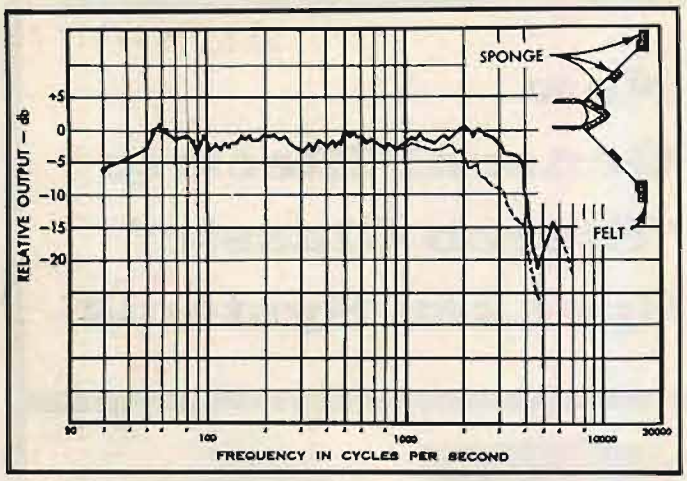


Fig. 6. Response curve of the speaker of Fig. 2 when full acoustic treatment is given. The irregularities in the lower frequencies should be attributed to the measuring station.

suspension rim only, does not act as a sort of "leveller" for both the peak and valley. From a study of the acoustical properties of such plastic foam, one finds that the foam suspension alone does not smooth the "dip" around 1000 cps, as is shown by *Fig.* 2 which is the same as *Fig.* 1 except that the higher frequency resonance in *Fig.* 2 shows a higher peak because the absorption co-efficient of the foam is such that it alone is not sufficient to damp the characteristic vibration (around the frequencies where "dip" occurs) near the apex. Something more must be done. It would also be interesting to note the square-wave response (*Fig.* 3) of the loudspeaker of *Fig.* 2 to a 500-cps square wave.

Now let us refer to *Fig.* 4. There one can see that the "dip" is practically eliminated. Here one can observe that the proper acoustic damping is provided by covering the foam suspension loosely with thin and light felt. The absorption co-efficient of the combination of foam and felt is thus suitable for the damping of vibration near the apex. This process does not hinder the operation of the loudspeaker at the lower or higher frequencies as can be seen by comparing *Figs.* 2 and 4; in fact this process acts favorably to damp the high resonance peak considerably. Once this "valley" from the response curve is levelled out, only one problem remains and that is to level the "highs" of the high-frequency resonance peaks. As is described above, these peaks are due to the standing wave pattern produced as the result of the combination of transverse flexural waves travelling from the voice coil out to the edge of the cone and being reflected back again. These two waves are out of phase. Now to reduce the standing wave there are two methods open to a designer:

(a) To absorb the waves travelling from the voice coil by some acoustic treatment at the periphery so that there will not be any reflected waves. Or, in other words, a proper mechanical impedance termination is provided at the periphery to absorb the waves travelling from the voice coil. Although this is possible it is not carried out because with the aconstic treatment at the periphery the suspension would be too heavy thereby introducing impedance to the necessary large motion of the diaphragm at the low frequencies and the acoustic output or the sensitivity would then be considerably reduced.

(b) To absorb the travelling waves from the voice coil before they reach the periphery. One way of doing this is to apply acoustic treatment near the junction of the cone and the voice coil, but there is a likelihood of interference to the free movement of the cone near the magnetic air gap. Another way is to select different portions of the cone responsible for reproducing higher frequencies and then apply acoustic treatment to damp the excessive radiations due to high amplitude of vibration at resonance which result in 'peaks' at different frequencies. This selection can be done easily by spraying lycopodium powder on the cone surface and observing the nodal patterns at various higher frequencies. This has been done and the results are shown in *Figs.* 5 and 6.

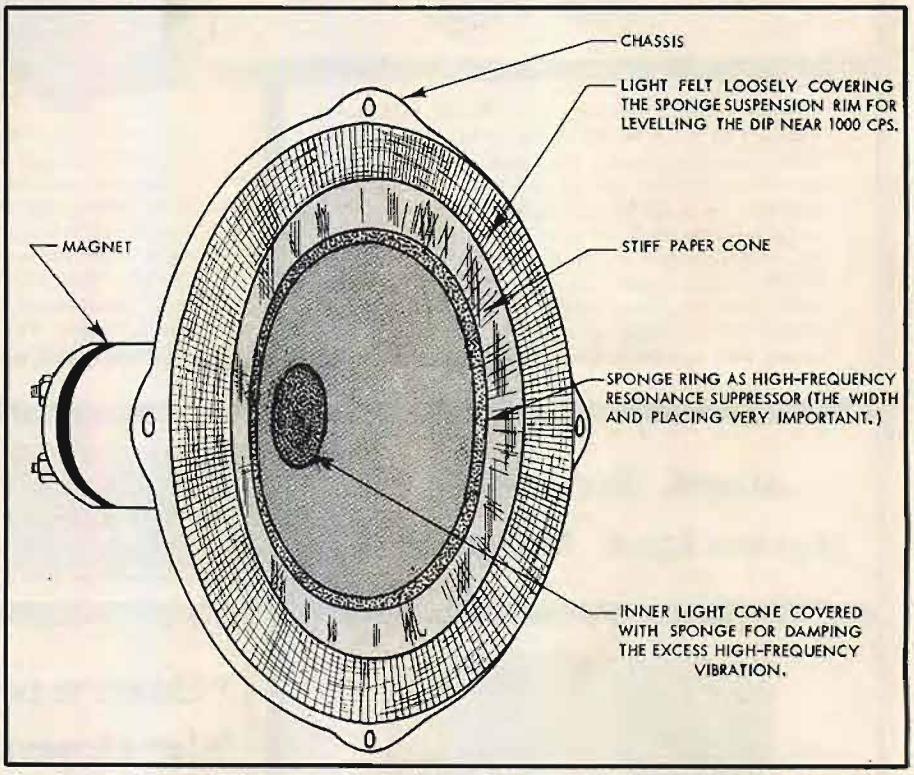


Fig. 8. Rough sketch of the improved design bass-cone speaker with the acoustically treated cone.

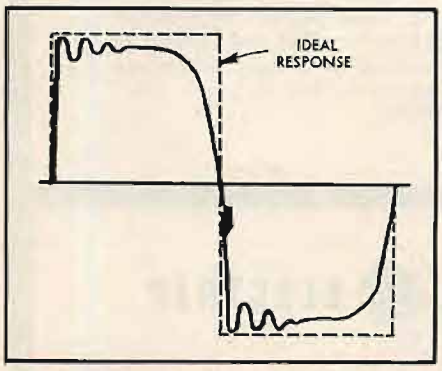


Fig. 7. Response of speaker of Fig. 6 to 500-cps square wave.

Results

Figure 6 represents the final response curve of a 15-in. stiff-cone loudspeaker when given full proper acoustic treatment and when mounted in an infinite baffle. The frequency deviation is spectacular being nowhere more than approximately ± 2 db from 40 to 4000 cps. The response is measured under free-field condition (i.e. measured in a re-

(*Continued on page 76*)

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Tape Tension—The Neglected Dimension

Excessive tape tension increases wear on magnetic heads, breaks or permanently distorts tape physically, and increases the possibility of magnetic print-through. Optimum results are obtained when tension is no greater than that required for adequate head contact.

DR. ERWIN J. SAXL *

TAPE TENSION must be kept to a minimum to avoid breakage during recorder operation. Moreover, excessive stress in the film will also set up changes in the character of the magnetically susceptible ferrous oxide layer that covers the supporting film and thus impair the quality of sound reproduction.

Tension also influences the internal pressure from layer to layer within the wound reel. Excessive pressures in the reel can be avoided and printing of the sound from one magnetically exposed location to adjoining layers above or below can be reduced by maintaining tension at the lowest practicable value

Tape tension is critical not only in recording and playback, but also in the manufacture of a high-quality tape. When operating with magnetic tapes for high-fidelity recording, the distance with which two signals are separated from each other is influenced by the stretch of the tape.

Stretching beyond the limits of elastic recovery of the film not only damages the tape mechanically but also engenders distortion in its ferromagnetic layers. Excessive pull produces an orientation of the ferrous oxide layer causing alignment of the magnetic domains and subsequent impairment of the electromagnetic quality. The erasing of the previous recording particularly becomes imperfect if same has been "set" by mechanical deformation, thus increasing the level of the background noise of subsequent recordings on the same tape.

Aside from influencing the structure of the tape proper and the ferrous layer covering it, there is the question of head wear. The heavier the film and its oxide layer (which is an abrasive equivalent to jeweler's rouge) presses on the head, the more the latter is worn. Add to this the braking action and there is considerable build-up of tension. Thus the minimum practicable pressure should be used which will maintain adequate, proper contact between tape and head.

* *President, TENSITRON, Inc., Harvard, Mass.*



Fig. 1. Tensitron's new Tape Tension Meter.

Everything else being equal, the tape recorder which has the minimum of tape tension has the better quality.

By keeping the contact pressure (which is a function of tape tension) between tape and head low, fewer oxides are removed, and with less flaking-off the life of the tape is increased. Furthermore, with less damage to the ferrous layer, the background noise level is reduced and the over-all performance of the tape is increased.

Aside from the deleterious effects high constant tension, variations in tension will affect reproduction quality. To maintain reduced flutter and wow, it is essential to have the lowest possible tension.

Low tension also permits the use of comparatively thinner film materials, permitting a greater length to be wound on a reel of standard size. Last but not least, less expensive tape base materials can be used because the less the tension the less the stretch. Inexpensive long-playing film carriers are usable provided they are not stressed beyond the limit of elastic recovery. Thus, low tension also has the indirect advantage of reducing the cost in the film material.

Methods of Controlling Tension

Several methods are possible for the control of tape tension and for the maintenance of its uniformity—from electrical means for controlling tape transport to flywheels for minimizing short-time fluctuations of speed. However, before one can approach the correction of tension fluctuations, *a quantitative knowledge of the true tensions under performance conditions* is necessary.

Damage is caused not only by the smooth running tension, but also by the peaks—the sudden starting, stopping, and reversing peculiar to the operation of recorders. This differs vitally from the static conditions when a tape is pulled at a quasi-stationary speed. Thus, the use of ordinary spring scales to measure tape tension is inadequate because they do not show tensions under *performance* conditions. Accordingly, an instrument was designed for checking tensions of films and tapes *while in operation*, and this novel Tension Meter[1] is shown in *Fig.* 1. It consists essentially of a tension-sensitive roller between two guide rollers. To insert the running tape, the trigger is pulled back in the same manner on a gun. Lowering the two outer rollers and opening the space for easy insertion of the tape. Even while it is running tape can be inserted in the Tension Meter. To do this, the tape is placed on top of the two outer rollers and the trigger is then released gently.

The position of the two outer reference points that lift the tape into test position constitutes a constant mechanical shunt. The center roller is connected to a lever which is pivotally deflected with a minimum of friction in response to the tension applied to the tape.

To keep the conditions of checking uniformly constant, the center sensing roller is only lifted a small distance.

[1] U.S. Patent No. 2,591,724.

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use this check list when selecting the record changer for your stereo/mono high fidelity system

RUMBLE, WOW AND FLUTTER—These mechanical problems, especially pertinent to stereo reproduction, require maximum attention to design and engineering for suppression. Check the new GS-77.

RECORD CARE—Dropping record on moving turntable or disc during change cycle causes grinding of surfaces harmful to grooves. Check Turntable Pause feature of new GS-77.

STYLUS PRESSURE—Too little causes distortion; too much may damage grooves. Check this feature of the new GS-77: difference in stylus pressure between first and top record in stack does not exceed 0.9 gram.

ARM RESONANCE—Produces distortion and record damage. Cause: improper arm design and damping. Check new GS-77 for arm construction and observe acoustically isolated suspension.

HUM—Most often caused by ground loops developed between components. Check new GS-77 and note use of four leads to cartridge, separate shields per pair.

MUTING—To maintain absolute silence during change cycle both channels must be muted. Check new GS-77 and note automatic double muting switch, plus R/C network for squelching power switch 'clicks.'

STEREO/MONO OPERATION—Stereo cartridge output signals are fed to separate amplifier channels. Record changer should provide facility for using both channels simultaneously with mono records. Check new GS-77 Stereo/Mono switch.

These are just a few important criteria to guide you in selecting the best record changer for your stereo and monaural hi-fi system. Some of these features may be found in changers now on the market, but only one changer incorporates them all—the modern Glaser-Steers GS-77. Only $59.50 less cartridge.

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For all practical purposes this can be neglected, since the influence of the testing instrument upon the tape remains essentially constant under all comparative tension conditions. The small lever motion is amplified over a gauge movement. It shows with clarity, directly on a dial facing the observer, the tension of the tape while in motion. The rollers over which the tape advances run on anti-friction bearings so there is no significant braking of the tape.

In view of the large range of tensions encountered under the practical conditions of recording and playback, a rather large tension range has to be considered for visual indication. To provide an easily read scale, the meter was designed for a dual range, using an extended dial. The first revolution of the pointer goes from 0 to 200 grams, calibrated in black figures, and the second revolution goes up to 1000 grams and is calibrated in red figures. This combines adequate sensitivity for low tension measurements (where discrimination between individual tensions is particularly necessary) and covers the larger variations of occasional shock tensions.

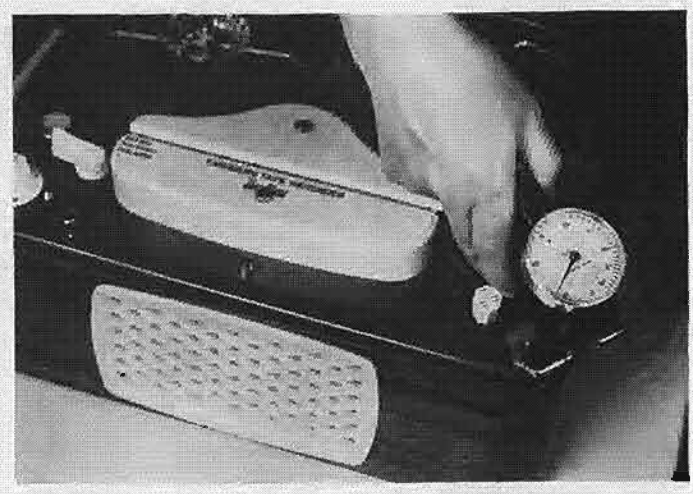


Fig. 3. Checking operating tension in a typical tape recorder. (Courtesy Reeves Equipment Corp.)

Measurement of Variations

It is known that the tension of a reel changes in relation to the volume of tape on the reel. There is the long-time change as the reel gradually builds up from the layers close to its mandrel until it reaches the maximum outside diameter when it is full. In addition, superimposed over the long-time variation, there are short-time tension fluctuations. This causes tension changes as the reels unroll and build up.

These and other factors, singly and together, must be summarized to arrive at a realistic picture of the tape tension. They present an involved relation for the tensions existing during normal recording and playback, as well as during starting, stopping, and rewind and fast-forward operation.

As the full storage reel is unwound and the finished form builds up, we are dealing with a relation that may be indicated as in *Fig.* 2. The radius of the large storage reel is shown as R_2. The tension, t_2, required to produce a given de-reeling action is then shown in the work necessary for unwinding the reel. In other words, for constant work in terms of a vector-diagram, the work is represented by the areas

$$r_1 \times T_1 = R_2 \times t_2$$

After the de-reeling from a storage package has progressed to a certain point, we are then dealing with a smaller diameter of the reel. A quicker rotation is now required to deliver the same amount of tape per time unit. Accordingly, more tension such as shown in T_1 is required now for the smaller radius r_1.

Thus between (A) and (B) we have a variety of conditions which indicate the gradual change from one to the other when a spool is de-reeled. As the storage reel gets smaller, tension has a tendency to build up unless compensation is made for this condition.

The opposite condition exists when we wind layers of tape upon an inner mandrel. Then we start with a small diameter such as shown in (B). It is gradually built up, finally resulting in a form which is shown in (A), and which is characterized by what may be compared to a larger lever.

Considering the entire system, we are confronted on one hand with the diminishing effective diameter represented by the de-reeling mechanism, and on the other hand with the increasing size of the wound reel which gradually is built up. This changes the relation between one reel which unwinds and delivers its tape to a mandrel that builds up by the same amount.

This condition of variable tensions is aggravated by the need for quick starting and stopping, particularly in computing, recording, and dictating work. Here we deal with the ambient tensions inherent in moving and stopping comparatively large masses of changing weights. This imposes difficult design requirements in order to arrive at a uniform rate of tape-transport tension. Since for adequate sound reproduction it is necessary to accelerate the tape from standstill to full running speed, the use of proper tension engineering becomes a necessity to avoid extremes of tension variations.

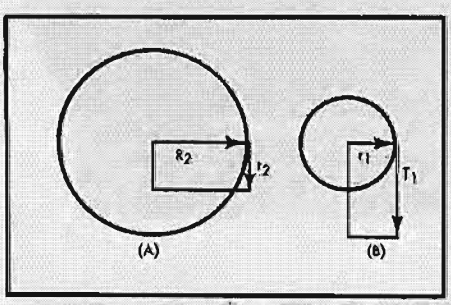


Fig. 2. Tape tension and the radius of reeled tape influence the work required to pull tape off a spool of large diameter (A) as compared to a near-empty reel (B).

Braking

The de-reeling tension as applied to the braking mechanism that is linked to the storage reel is but one part of the summation of all the tensions. Another factor is the frictional retardation incurred by contact between recording-head and tape. Accordingly, these restraints have to be added to the de-reeling tension in the reel to arrive at the final tension.

The establishment and control of tension as measured under conditions of dynamic transport are mandatory to reduce film breakage. It is axiomatic that the complicated tension picture has to be known quantitatively, if we are to engineer proper compensations into the tape-moving chain. If we want to avoid tape breakage and achieve uniform recording without stretching or damage to the tape, we have to make sure that ambient tensions are well within the limits of elastic recovery of the base material. Speed control to compensate for different effective reel diameters, flywheels, slipping clutches, eddy current devices, variable resistors contacted by dancer arms and other methods are known to compensate in part at least for this variation.

By the use of the Tension Meter, precise tension measurements can now be made on which proper corrective action can be based. For instance, the characteristics of torque motors can be engineered so as to standardize the tension with which they move tape. This results in fewer stresses imposed upon the supporting film, increases in life, and a more uniform translatory motion during recording and playback.

Figure 3 shows how the Tension Meter is used with an operating tape recorder, in this case the Tandberg, which has a tape tension of only 10 grams.

(*Continued on page 64*)

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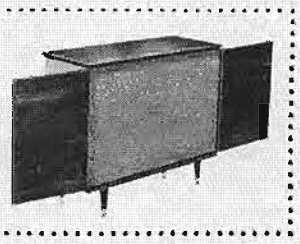
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Here the TMS-2 is shown with deflector doors closed for monophonic use.

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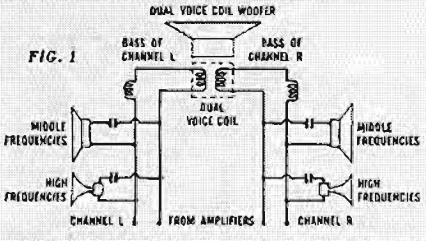
The TMS-2 with deflector doors opened for full stereo reproduction.

University's NEW 'trimensional' stereo speaker TMS-2

Here is the most significant loudspeaker achievement since the advent of popular stereo ... a University development which, at last, actually eliminates *all* the problems of placement, space limitations, decor and cost ... but most important of all, produces a new kind of stereo sound ... the authenticity of concert hall *depth*.

COMPACT By utilizing the exclusive *dual voice coil* feature of the C-12HC woofer, only one bass enclosure and woofer are required to handle the entire low frequency range of both stereo channels. Extended, undistorted bass is superbly reproduced by making use of the RRL enclosure design so successfully employed in University's Ultra Linear Response systems. *See fig. 1.*

FIG. 1



REALISTIC STEREO The breadth, depth and clarity of stereophonic sound is accomplished by utilizing the walls of a room, just as the symphony orchestra uses the acoustical properties of the concert hall. The woofer sound emanates at the rear of the enclosure; one mid-range and one high frequency speaker for each channel project sound from each side of the cabinet. By thus deflecting all frequencies, in proper relationship, to the rear and side walls of the room, multiple stereo sound sources are created that not only provide the otherwise missing dimension of depth, but also preserve the stereo effect virtually throughout the room. *See fig. 2.*

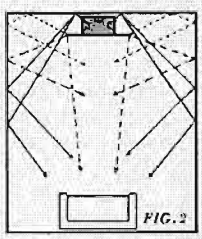


FIG. 2

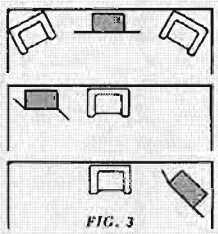


FIG. 3

USE ANYWHERE The unique design of the TMS-2 provides you with two distinct advantages: place it in a corner or *anywhere* along a wall, by merely positioning the deflectors as shown in fig. 3, and since there are *no particularly critical listening positions*, you, your family, your friends—any number of listeners—can enjoy the TMS-2 from most anywhere in the room.

MONOPHONIC OR STEREOPHONIC With deflectors closed, the TMS-2 is an outstanding, wide-range monophonic speaker system. "Presence" and "brilliance" controls are provided for both sets of mid and high frequency speakers. In addition to being used for balancing the system to room acoustics and personal taste, these controls and the deflectors may be adjusted to produce a pseudo-stereo effect with monophonic program material as well. Whether you start your high fidelity system with monophonic equipment, or go right into stereo, the TMS-2 is the best investment you can make... it is equally "at home" with any kind of program material, and *no further additions* to the speaker system are ever required.

DESIGNED RIGHT - PRICED RIGHT Flawlessly designed along simple, classical lines, beautifully proportioned to compliment the most exacting taste, the TMS-2 will enhance any decor. In fact, it looks more like a piece of fine furniture than a typical speaker cabinet. Breathtaking in its performance ... beyond the scope of conventional monophonic or stereophonic reproduction, the engineering concept of the TMS-2 eliminates redundant components; makes use of the latest, most advanced acoustic principles. RESULT: the ultimate in uncompromised value. *In Mahogany —$258, Blonde or Walnut—$263, User Net.*

See and hear the TMS-2 at your dealer . . . NOW! You too, will agree with musical and audio experts that it marks one of the most extraordinary advances in high fidelity and stereo history!

University

UNIVERSITY LOUDSPEAKERS, INC., WHITE PLAINS, N.Y.

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Output Power Measurements

Power ratings can be made to assume astronomical values simply by choosing the terms in which the ratings shall be expressed. The entire subject is now under consideration by the IHFM, and standardization is expected in the near future.

MANNIE HOROWITZ *

WHEN FIRST APPROACHED with the problem of peak power output from an amplifier, only the square-wave type of signal seemed significant. Since the square wave is the only measurable signal that delivers power throughout a complete cycle, I assumed this waveshape provided us with the only true means of measuring maximum power output. I assumed immediately that all manufacturers measure peak power by feeding a square-wave signal to the input of an amplifier and measure the power at the output.

To satisfy my curiosity, I decided to ask many of the high-fidelity amplifier manufacturers as to just what their methods were in measuring this characteristic. The audio show in New York was just the opportunity for doing this.

I spoke to engineers at about 90 per cent of the booths of amplifier manufacturers who use this rating as a specification. It seems that my method was not the one currently used in the various laboratories. Every one of these manufacturers arrive at the peak power merely by multiplying the average power by two.

When asked to justify this, I was amazed by how many people said, "Well, they all do it that way". This was, of course, a very poor reason.

In one booth, an engineer admitted to me, in as many words, that the number is not a true indication of the performance abilities of an amplifier. It was merely a method of presenting a larger number in the specifications to attract attention.

He nevertheless continued the discussion with the justification of this method of arriving at the peak-power figure. He went on to show me just what his company was now presenting in the specifications to indicate more amply the true performance ability of the amplifiers.

Before stating the pros and cons of each of these methods of indicating peak power, as well as showing just what should be stated in the specifications, a short discussion on average as well as peak power is useful.

The output power from an amplifier is measured by placing a resistor of known value across the output terminals to represent the speaker load. This is illustrated in *Fig.* 1.

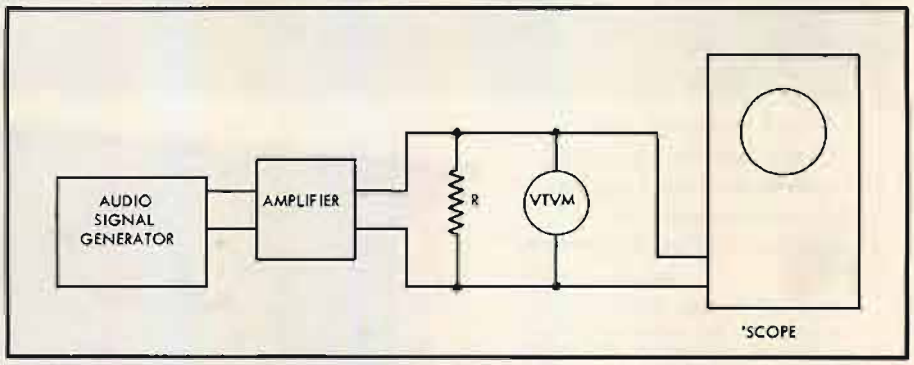


Fig. 1. Set-up to check power output from audio amplifier. Waveform can be observed on the 'scope.

An amplified signal appears across this resistor. The voltage of this signal is measured. The output power is then calculated from the usual equation,

$$P = E^2/R \qquad (1)$$

Sine-Wave Power

The voltage that appears at the output of an amplifier (across the load resistor) takes the same form (exclusive of distortion) as the voltage input to the amplifier. The usual input signal voltage is in the form of a sine wave (*Fig.* 2). It is obvious that the amplitude or voltage of this waveform varies through a complete cycle.

Just what voltage represents an average value for the sine wave, to be substituted into Eq. (*1*) to calculate the average power output can be derived mathematically. It is first necessary to set down the equation of the sine wave (or cosine wave—depending upon the placement of the zero axis or starting point of the wave).

$$E = E_{max} \cos 2\pi ft \qquad (2)$$

where E is the actual voltage at any instant of time
E_{max} is the peak or crest voltage of the cosine wave
f is the frequency of the cosine wave
t is the time for each cycle.

After some minor mathematical manipulations (see appendix) we conclude with the well known expression for the effective or rms voltage

$$E_{rms} = E_{max}/\sqrt{2} \text{ or } E_{max} = \sqrt{2}E_{rms} \qquad (3)$$

Substituting this into Eq. (*1*), the power in the sine wave becomes

$$P_{av} = E_{rms}^2/R \qquad (4)$$

One more factor plays an important part in this discussion. The sine wave goes through a peak. If this peak were extended over a complete cycle, it would result in a power

$$P_{peak} = E_{max}^2/R = (\sqrt{2}E_{rms})^2/R \quad \text{from (3)}$$

$$= 2(E_{rms})^2/R = 2P_{av} \qquad (5)$$

Thus, if the voltage at the peak of the sine wave were extended for a complete cycle (note the emphasis on *extended for a complte cycle*), the peak power output would be equal to twice the average sine wave power output.

Square-Wave Power

Amplifiers are not meant to deliver sine-wave power only. Audio amplifiers are required to reproduce the more complicated wave shapes created by speech and music. The ultimate combination of an infinite number of sine

(*Continued on page 69*)

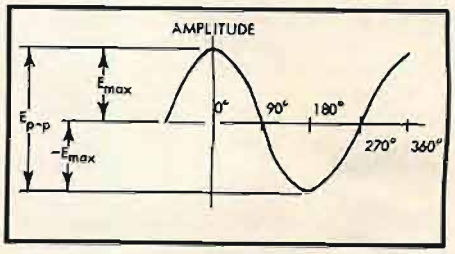


Fig. 2. Shape and dimensions of an a.c. Cosine Wave.

* *945 East 26th St., Brooklyn 10, N.Y.*

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Spiral Steel Shielding for Audio Circuits

RONALD L. IVES*

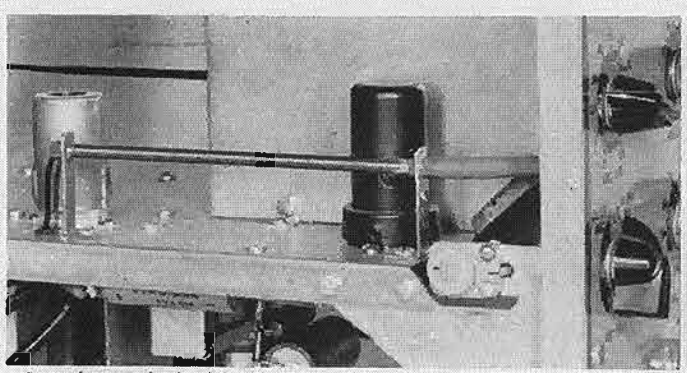
Both mechanical and electrical protection is afforded by the use of ordinary steel springs which may be liberated from the screen door or purchased anew from the local hardware store.

ALTHOUGH BRAIDED COPPER shields over audio frequency leads are now standard, and are quite satisfactory, many installations require a somewhat better shield. Braided permalloy mike cable shielding would be ideal, but this is not commercially available, and would cost a small fortune if it were.

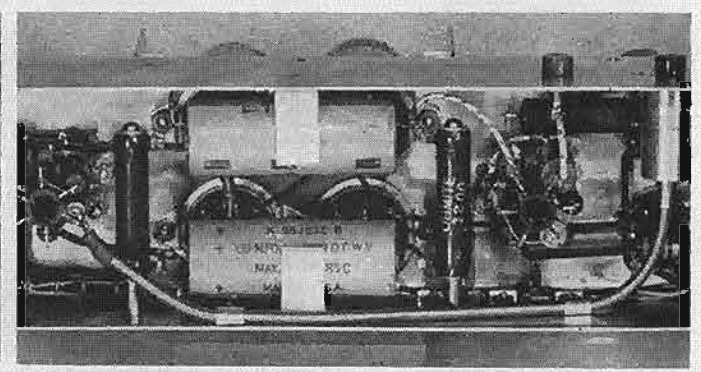
Happily, mild steel spiral shielding, suitable for most types of installations, and far superior to braided copper for some a.f. uses, is commercially available, and is quantity produced at low prices. It is carried at most hardware stores, where it is sold in various lengths, such as two feet, under the name

(*Continued on page 64*)

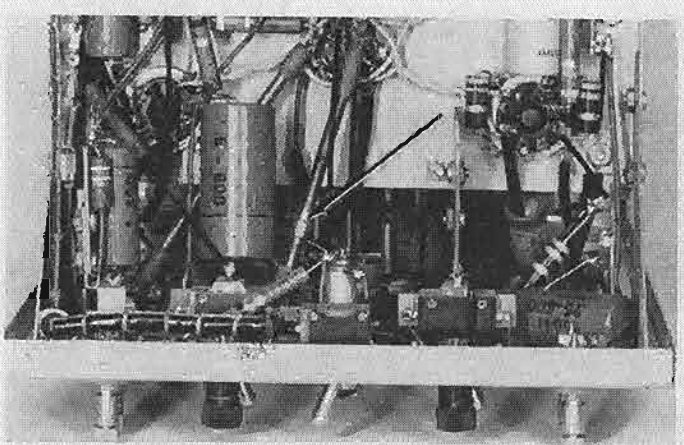
* *2075 Harvard St., Palo Alto, California.*



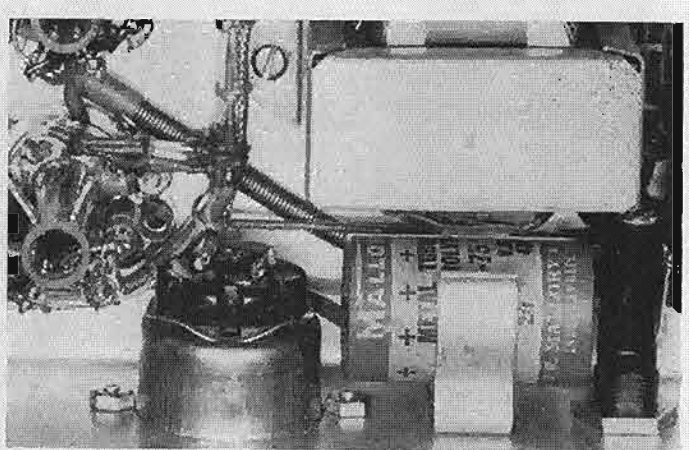
Spiral metal shield applied to oscilloscope lead. This gives very effective shielding, but at the cost of top a.f. response.



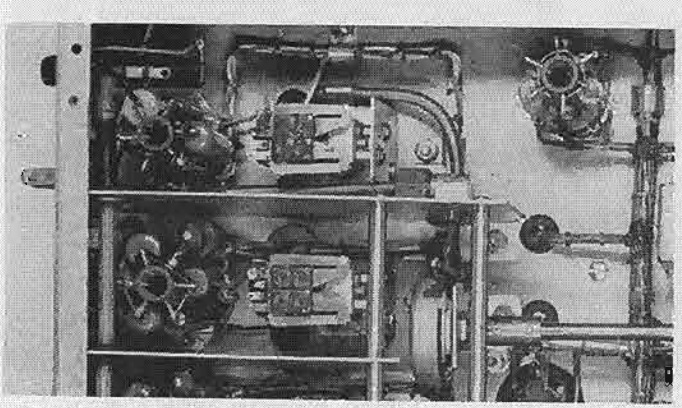
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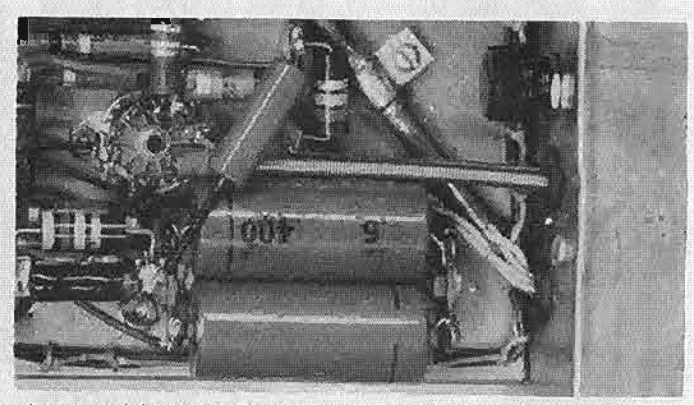
Shielding over low-level grid leads reduces hum and coupling. Arrow indicates single-point ground connection.



A.f. lead shielded against transformer leakage field with spiral shielding. Better cure is re-routing of the a.f. lead.



Shielding and ¼-in. Weatherhead fittings to isolate low-level a.f. leads where they pass through a shield partition.



Long grid lead shielded against a.c. pick-up from adjacent heater leads is effective in all but the lowest level circuits.

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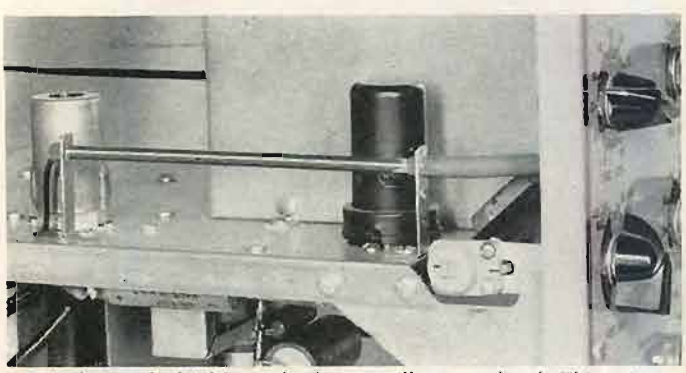
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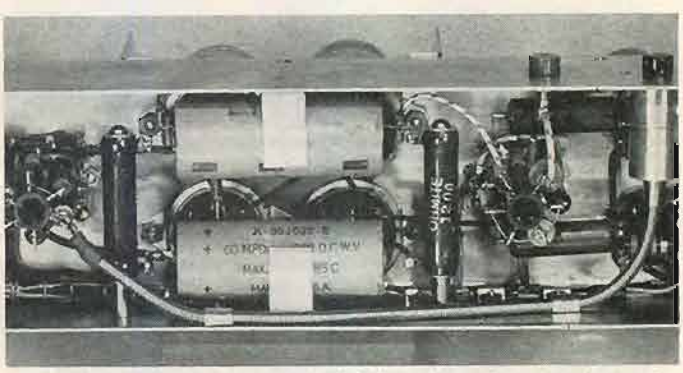
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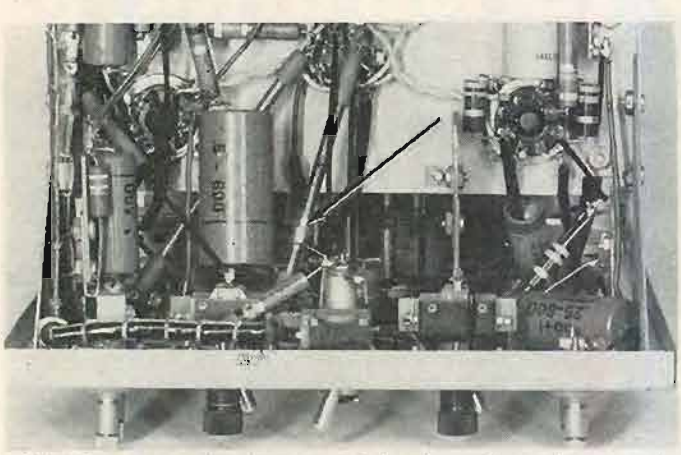
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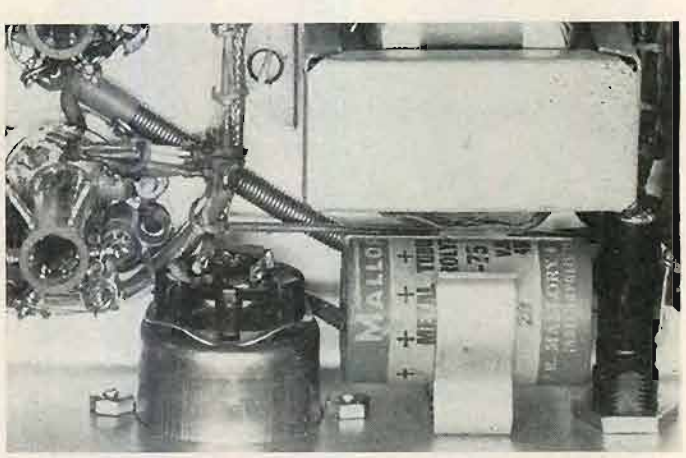
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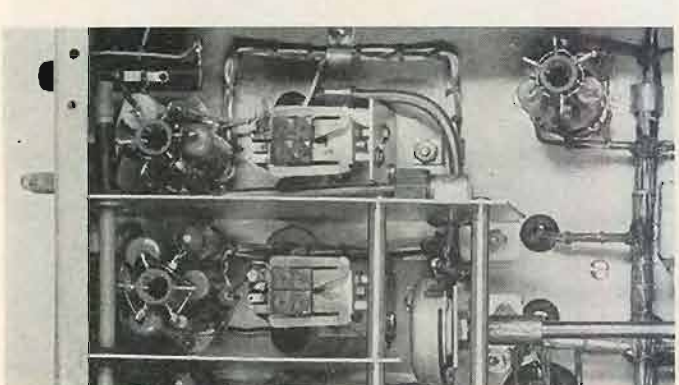
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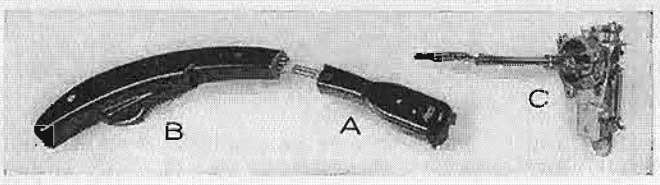
Ralph Bellamy, starring in "Sunrise At Campobello", listens to stereo on his Collaro changer and Goodmans Triaxonal Speaker System.

Collaro—your silent partner for Stereo

Listen to stereo records and discover the most exciting way of listening to music in your home. Listen to the new Collaro stereo changer and discover *the* changer which provides truly *silent* performance to meet the rigid quality demands of stereo. Here's why Collaro is your best buy:

A. Five-terminal plug-in head: Exclusive with Collaro. Provides two completely independent circuits thus guaranteeing the ultimate in noise-reduction circuitry.

B. Transcription-type tone arm: As records pile up on a changer, tracking pressure tends to increase. Result may be damage to records or sensitive stereo cartridge. This can't happen with the Collaro counter-balanced arm which varies less than 1 gram in pressure between the top and bottom of a stack of records. Arm accepts any standard stereo or monaural cartridge.



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There are three Collaro changers priced from $38.50 to $49.50.

The changer illustrated here is the new Continental, Model TSC-840.

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Equipment Review

Acrosound Ultra-Linear II amplifier—Viking 85 tape deck and RP-62 amplifier—General Electric GC-5, GC-7, and CL-7 stereo cartridges—Fairchild Model 248 preamplifier-equalizer.

ACROSOUND ULTRA-LINEAR II

For those who like the work of assembling kits but prefer as little work as possible, the new Acrosound Ultra-Linear II amplifier kit is one of the answers. With an output of 60 watts rated continuous power at an IM distortion of less than 1 per cent, this is an amplifier of highest quality. Combined with a variable damping factor control ranging from 0.5 to 10 and a sensitivity of 1.57 volts (measured) for the 60-watt output, the unit will serve with any good preamplifier, and two in a stereo system readily show how much better stereo is when one does not make compromises with power output. While it is agreed that two 10- or 12-watt amplifiers in a stereo system are better by far than one of the amplifiers alone in a monophonic system, there is no question about how much better a system sounds with more powerful amplifiers.

The UL-II employs a 12AX7 as an input stage operating as a "long-tailed pair," with the cathodes returning to about −40 volts, the plates working at 101 volts and directly connected to the grids of the second stage, a 12AU7. This stage has an 18k-ohm common cathode resistor, which makes it also a long-tailed pair. Between the two, the phase splitting is just about perfect, since one tends to equalize the other—with both being aided by feedback from the secondary of the output transformer in a hybrid arrangement as described in the September, 1958, issue. The output stage uses a pair of EL34's, with a GZ34 providing high voltage and a selenium rectifier providing the negative voltage for bias and for the return on the first-stage cathodes.

Construction

The amplifier is of rather unusual physical design, since the chassis is composed of the four side aprons which are held together at the corners and by the two transformers. The open space in the center is occupied by a printed circuit panel on which are mounted all the tubes and all other circuit components except for two resistors and the variable damping control. *Figure* 1 shows the finished unit from the control panel side, *Fig.* 2 shows the amplifier from the underside with the bottom plate removed, and *Fig.* 3 shows the printed-circuit unit by itself. There are 13 mechanical operations in the preassembly of the front panel apron, 12 wiring operations on the front panel, 5 final assembly operations, and 24 final wiring operations —then the amplifier is ready for testing. The entire printed circuit panel comes already assembled and tested, and the kit

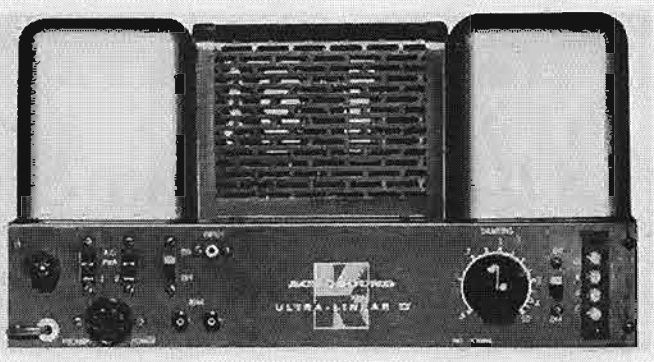


Fig. 1. Acrosound Ultra-Linear II amplifier constructed from a kit.

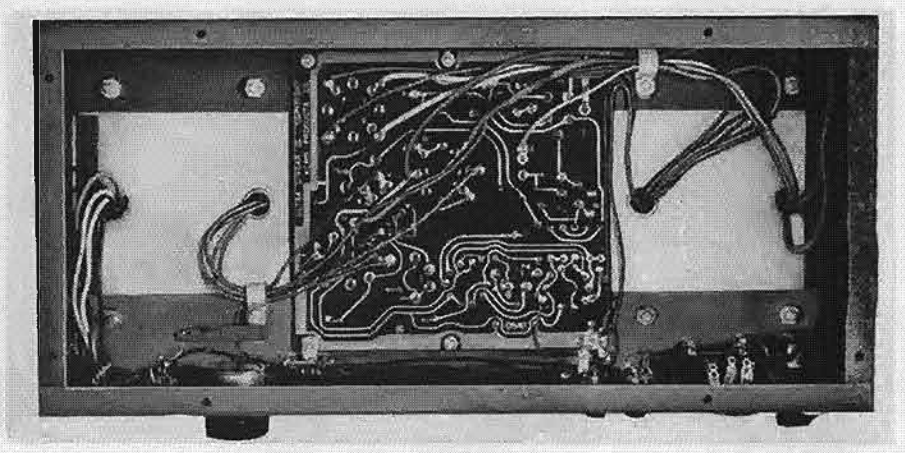


Fig. 2. Bottom view of the Acrosound amplifier showing simplicity of wiring, since the printed-circuit panel is furnished completely assembled.

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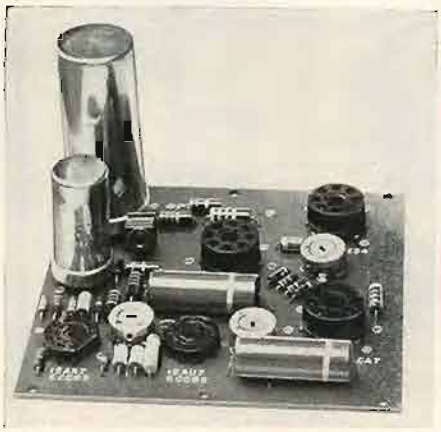


Fig. 3. Printed circuit for the Ultra-Linear II is completely wired and tested as received by the kit builder.

builder has only to connect leads to the panel and insert the tubes. The entire construction operation should not require more than two hours by the most inexperienced. A little extra time might be needed to connect the power supply socket to accommodate your particular preamp, and instructions are supplied for the Eico HF-61 and the Heathkit WA-P2, which indicate the general type of connection required for any preamp. The unit will furnish power up to 1.5 amps. at 6.3 volts and 20 ma at 485 volts, which indicates that a series resistor would likely be necessary to drop the plate voltage to a more suitable value for the average preamplifier.

Performance

The output transformer, Acrosound TO-600, is designed with a separate feedback winding and thus isolates the load on the amplifier and the feedback circuit so that feedback stability is of a high degree. This arrangement also provides for the variable damping feature without necessitating a dual control to maintain constant gain regardless of damping-control setting. The circuit is arranged with three separate operating adjustments—bias on the output stage, balance between the two output tubes, and an a.c. balance control in the second stage which aids in reducing IM distortion to a minimum by dynamically balancing the driver and output tubes. Without suitable IM test instruments, this control is normally set at midpoint, and distortion is in the vicinity of 1 per cent at 60 watts. However, if one has access to IM testing equipment, this control may be reset for minimum distortion, which is claimed to be about 0.4 per cent at 60 watts.

Using 60 and 7000 cps in a 4:1 ratio, an IM distortion of 0.9 per cent was measured with the control set at the midpoint and at an output of 60 watts; adjustment of the control for minimum distortion resulted in a figure of 0.47 per cent on the unit tested.

In addition to being extremely easy to construct, the Acrosound Ultra-Linear II is handsome in appearance and lives up to its specifications. The variable damping control is of no great help with speakers of the best quality, but with those in poor enclosures the boominess can be controlled quite readily. So for either the best or the poorest loudspeakers, this must be rated as an excellent amplifier. N-25

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The induction tweeter employs a Stromberg-Carlson design principle that results in an extremely light and sensitive moving system. This flat and extended frequency response characteristic is a direct result of our patented design. A carefully calibrated diameter and shape of cone afford dispersion capabilities that are definitely superior. PRICE: $149.95 (Audiophile Net, Zone 1).

*Featuring Barite Ceramic Magnet and "Slimline" design.

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VIKING MODEL 85 TAPE DECK and RP-62 RECORD-PLAY AMPLIFIER

Practically anyone with a high fidelity system will admit that one of the important elements is the tape recorder, and when the tape equipment is operating properly the enjoyment of the entire system is increased immensely. One of the difficulties of installing tape equipment in a home system has been the lack of availability of good machines which were adaptable to building in except in the very-high-price bracket. Furthermore, most of the medium-priced units were complete recorders, with portable case, built in loudspeakers, and 2- to 4-watt "power" amplifiers. As far as the audiofan is concerned, all this is superfluous, since he wouldn't be caught dead with some of the speakers which are built into the portable cases, and he already has amplifiers which are better in both the quality and power departments.

The current Viking models, from the 75 to the 95, fit the home requirement admirably. The model tested was the Model 85, with a sub-designation "RQ," the "R" signifying a recording model, and the "Q" indicating that it would accommodate the quarter-track system. Practically any arrangement of heads may be installed on the Viking 85 to provide a variety of services, and the user would do well to check exactly what he wants when ordering a machine. The unit will accommodate up to five separate heads, in any order, and the heads available include: half-track erase, in-line half-track erase, half-track record/playback, in-line half-track record/playback, and in-line quarter-track record/playback.



Fig. 4. Viking Model 85 Tape Deck.

The deck employs two motors, both four-pole types. The capstan is driven by a belt from the rubber floated motor platform, and a 1½-lb flywheel holds flutter and wow to less than 0.25 per cent. All controls are on the front panel, with fast forward and rewind actuated by the outer knob shown at the upper right of *Fig.* 4, while the bar knob selects the record/playback mode, or the CUE mode in which the brakes are released but the pressure pads hold the tape against the heads so that the reels may be turned backward or forward for editing and cueing. The two knobs are interlocked so as to prevent improper operation which might result in tape spillage or breakage. Two additional controls appear on the front panel—the speed control, just below the head housing, which sets the mechanism for 3¾ or 7½ ips, and the head-shift adjustment, which positions the heads for either half- or quarter-track operation. At the bottom of the panel is the digital counter, which aids in locating any portion of the tape that has been catalogued in advance.

As for handling, the tape deck is extremely smooth and convenient. We could find no normal operating procedure which either spilled or broke the tape (there are some *abnormal* operating procedures which will break tape, such as making a quick switch from fast forward to record, but that will happen with any machine). Tape tensions are moderate, brake action effective and consistent.

RP-62 Record/Playback Amplifier

While several types of amplifiers are available for use with the Viking decks, the RP-62 is one of the basic types needed for recording and playback of a single-channel tape. For stereo recording and playback, two such units would be required —the second unit's bias oscillator being synchronized to the first so that no beat note will result from differing bias frequencies.

The amplifier provides for inputs from a tuner or other high-level source, or from a microphone, and from the record head on the tape deck. Outputs to the erase head and to the record head are provided, as well as an additional output to the amplifier for playback. The entire unit employs a 12AX7 and a 12AU7 in the amplifier section, a 12AV7 or a 12AU7A for the oscillator, a 6E5 as a recording level indicator, and a 6X4 as a rectifier. Rack-mounting models are available with a VU meter instead of the indicator tube, and a single preamp for playback only is also usable.

At first observation, we were inclined to wonder why the playback equalization was adjustable from the front panel of the amplifier unit, but after using the system for some time the advantages became obvious. The control permits a variation of response at 10,000 cps from 5 db below to 5 db above the standard NARTB curve, which makes it possible to accommodate tapes made on practically any machine. With a standard tape, however, one can easily determine the correct setting and for tapes made on the user's machine, he would be assured of uniformity in playback. In accordance with NARTB standards, the high-frequency boost is applied in the record amplifier, and the low-frequency compensation comes from the playback operation, so with the standard recording curve and an adjustable playback curve, consistent quality will result, and excellent results will be had from recorded tapes. For the home user of tape, the Viking system seems to fill a variety of needs in a fairly simple manner, and as the user's needs change, he may build up to them gradually. N-26

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This uniquely-angled two-speaker system was designed to take advantage of the acoustics of any room. Featuring two Hartley full-range 217 wide-dispersion speakers, this amazing new single-unit system makes use of adjoining walls and ceiling to "reflect" sound waves. There is no directional or "beamed" effect because the "217 Duo" diffuses sound over a wide arc . . . so that wherever the listener may be, he will hear both channels and appreciate the full stereo effect. There is no need to find an optimum listening point. The "217 Duo" is beautifully designed and available in walnut, mahogany or blond finishes . . . a fitting complement to any decor.



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GENERAL ELECTRIC STEREO CARTRIDGES

With three different models of stereo cartridges on the market, it appears that General Electric covers the entire field. The "Golden Classic" type GC-5 is designed for top performance in transcription type phono arms, and is fitted with a 0.5-mil diamond stylus. This model is intended to work at a tracking force of two to four grams, and the specifications claim a lateral compliance of 4×10^{-6} cm/dyne and a vertical compliance of 2.5×10^{-6} cm/dyne.

Model GC-7, slightly less in price because of the stylus assembly, employs a 0.7-mil diamond, and is intended for tracking forces of 3.5 to 7 grams. The compliances are slightly less than in the GC-5, being specified at 3×10^{-6} cm/dyne for lateral and 2×10^{-6} cm/dyne for vertical. Model CL-7 is the same in all particulars except for the stylus, which is a 0.7-mil synthetic sapphire. Actually, all models are identical except for the stylus assembly, and any stylus may be used on any model, since they are interchangeable.

All are intended to work into a load of 100k ohms for flat output, and the nominal output signal is 6 mv for a stylus

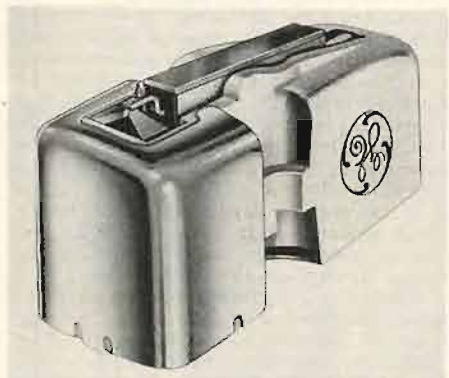


Fig. 5. General Electric "Golden Classic" Stereo Pickup Cartridge.

velocity of 5.5 cm/sec. Later models have an 8-mv output, we are told, but have not yet had an opportunity of checking.

The physical construction of the GE stereo pickups is similar to that of the VR-II. The two coils are mounted vertically at the forward end of the unit, with their cores extending to form pole pieces which are bent at the tips to form a V, open at the bottom. The tip of the stylus arm is in juxtaposition to the pole tips, and its movements are translated into varying reluctances in the two cores, with varying voltages induced in their surrounding coils. Four terminals are brought out, eliminating one of the problems of stereo pickups—that of serving as a common ground for two separate amplifier systems. The "ground" terminals of the two coils are strapped together at the back of the unit by an extension of the shield, but the shield is scored so that it may be separated readily to provide a four-terminal operation when necessary, or it may be left as supplied if the installation will operate satisfactorily with three terminals.

The principal problem with the GE cartridges is, however, induced hum from external fields. When used with a system with good low-frequency response, the hum is likely to be objectionable with any record changer we have tried so far; we noted no trouble with two different transcription turntables. With the two coils paralleled by shorting the two "hot" terminals, as they would be for monophonic reproduction, the coils are in a hum-



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Sound Talk



by J. J. Noble
Chief Engineer, Electronics

AMPLIFIER POWER

Power is an important factor in the selection of a high fidelity amplifier. It is the controlling factor in the degree of loudness that can be obtained without coloration or distortion.

Power specifications, however, are sometimes written in an inadequate or misleading manner. Such terms as "program peak," "instantaneous peak," "tone burst peak" and others are used to make an amplifier seem more powerful than it is. But, since their meaning is not accurately defined, these terms are of little use in judging the true capabilities of the unit. An RMS continuous duty rating is the only one for which there is an accepted standard, therefore the only rating that gives a true picture of an amplifier's power abilities.

Yet such a simple statement of power is not enough. It is also necessary to know over what frequency range this power capability extends. This relationship of power and frequency should not be confused with the normal "frequency response" specification, which is only a statement of the range over which the amplification is constant within the limits specified, and is usually measured at power levels far below the maximum capability of the amplifier.

Frequency response is simple to achieve. Power capability, however, is expensive and progressively more costly as the frequency range of the power capability is extended. It is this all-important "power frequency range" that is the true criterion of an amplifier's quality and abilities; and it is the difference in this frequency range of full power ability that accounts for the wide variation in price for amplifiers of the same specified output.

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bucking configuration, and there is no noticeable hum. As we pointed out in our construction article last February with the VR-II, when the coils are used in stereo, there is no hum-bucking action. One cure we worked out is to connect a low-inductance choke (0.5 H, for example) between the two "hot" terminals, and this reduces hum by about 12 db without appreciably affecting stereo separation. A choke recommended for this purpose is made by Aladdin Industries, number 18-476, and may be obtained from most jobbers. Any choke used in this application must of itself be kept out of a.c. fields, but the Aladdin units are well shielded and not troublesome in this respect. Such a cure is recommended in severe cases of induced hum. N-27

FAIRCHILD MODEL 248 PREAMPLIFIER-EQUALIZER

Even if one could say no more about this unit than that it is extremely attractive, it would at least deserve that title. But it must be admitted that its performance also matches its appearance. Covering this aspect before going on to its "insides," the 248—which is made up of two Model 245 Preamplifier-Equalizers and a Model 247 Stereo Control in a single external housing—looks as though it was styled by a top-flight industrial designer (which it was, by Raymond Loewy Associates). The cover is made of ⅛-in. solid aluminum, anodized to a permanent black. The panels are available in white, aqua, or cocoa, the borders—the areas around the panels from which the illumination is diffused over the control sections—are of a comfortable orange. The colored panels may be interchanged at any time, permitting a seasonal variation to suit milady's taste.

Since the 248 consists of two 245's and one 247, we will discuss a single 245 first and then show how they are connected to form a complete stereo console. Each 245 consists of two low-noise EF86's as the preamplifier, followed by a selector switch, an interconnection socket, the tone controls, and the two sections of an ECC83 in cascade. There are inputs for changer, transcription turntable, tape head, tuner, and the usual "aux;" there are two outputs for normal use, paralleled, and another output for tape recorder feed—the latter being taken off ahead of volume or tone controls.

The selector switch is unusual, but follows the basic philosophy of the design—simplicity. This switch is a 7-circuit device, with the first selecting between the low-level inputs, the second and third adjusting the equalization, the fourth and fifth select the source, and the sixth and seventh ground out unused inputs. The interconnection socket is fitted with a dummy plug when the 245 is used in a monophonic system, or feeds the 247 control unit in a stereo system.

A 6X4 rectifier tube provides plate power, and a selenium rectifier furnishes 12 volts d.c. for the heaters of the three amplifier tubes. Two power receptacles are mounted on the rear apron for external loads.

In the CHANGER position, RIAA equalization is used, together with a rumble filter which is down about 12 db at 50 cps; in the PHONO position, for transcription turntable, three equalizations are available—RIAA, POP, and FLAT. Turnover is 500 cps for RIAA and FLAT positions, 800 for POP; the high end of the POP setting is intermediate between flat and RIAA. Tape head equalization is provided with a turnover at about 2500 cps for 7½ and 15 ips, and at about 700 cps for the 3¾ speed.

The input signals required for a 1-volt output are 1 mv for phono and tape, and 0.18 volts for the tuner and auxiliary inputs. Noise and hum levels are extremely low, resulting in a usable signal-to-noise ratio of better than 70 db with average magnetic pickups, and better than 80 db from high-level inputs. Tone controls provide ranges of ±12 db at 20,000 cps and ±14 db at 30 cps, and the volume control is a two-section device which employs a small amount of feedback which is frequency compensated to maintain flat response throughout the entire range.

The Model 247 Stereo Control is equipped with four-position switch and a volume-loudness control, along with two short cables to connect to the sockets on the two 245's, a power cord, a power switch, and two power outlets. The selector switch is labeled STEREO LOUDNESS, STEREO FLAT, MONAURAL FLAT, and MONAURAL LOUDNESS. The power switch is on the volume-loudness control, and the equalization networks are shorted out in the FLAT positions; both channels are connected together in the MONAURAL positions. The essence of simplicity, even though it does not provide for right-to-left reversals (for which we could never see any good reason).

One of the attractive features of this as-



Fig. 6. Fairchild Model 248 Stereo Preamplifier-Equalizer, which combines two separate monophonic units with a stereo control unit to provide a complete console.

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sembly is the over-all solidity of the entire construction, the smoothness of the controls, the "class" of the control knobs. As seen in *Fig.* 6, the selector and volume controls are round knobs, while the tone controls are short bar knobs, showing the positions at a glance from almost anywhere in the room. One other feature that is attractive is the provision of shorting plugs in the low-level jacks that are not in use to avoid the possibility of hearing an "open" circuit in the form of increased hum or noise as the switch passes the unused positions. All switching is provided with bleed resistors so there is never a click as the switches are turned—a saving on the ear *and* on the high-frequency units. We have heard some very bad examples of noisy switching, and in most instances it is simply a case of not providing bleed resistors to bypass charges accumulated on coupling capacitors.

The Fairchild preamplifiers are noticeably quieter than the average preamplifier offered for stereo use, and the controls are held to sufficiently close tolerances that gain variations between channels are less than 1 db throughout their entire range. The same applies also to the tone controls, and curves held within 2 db throughout. The equalizations in the preamplifier sections of the two 245's in the unit tested were so close as to indicate that they must have been hand picked. The use of d.c. on the heaters of all the tubes is one of the reasons for the low hum and noise, and EF86's, along with the Z729's which are essentially interchangeable, are intrinsically the lowest-noise pentodes in common use.

Operation

As a complete unit, the individual volume controls on the 245's serve as balance or level-set controls for the individual channels, allowing operation of the loudness control in the stereo unit at its optimum position. We have long believed that both volume and loudness controls should be provided, even though separate level-set controls were available on each input, so that complete control of the compensation was in the hands of the user. The only other logical arrangement, in our opinion, is the use of a contour control, which is set by the user to fit the level at which the listening is being done. Thus if all the listening is to be done at, say, 30 db below performance level, the control contour would be set at −30 and left there during that particular listening session. The dual control arrangement is, however, the more flexible, and as used in the 248 provides the functions of level setting, channel balancing, and optimum loudness compensation.

The high performance quality extends also to reproduction from tape heads directly without feeding through the usual tape preamps provided with the recorder. It may be a bit inconvenient to run the extra connection and/or provide switching at the recorder, but it is well worth the extra effort. With even ordinary tape recorders the quality is greatly improved, and even with the best machines you are likely to hear a little improvement—principally in the signal-to-noise department. In all particulars, the Fairchild 248 is an exceptionally fine preamplifier-equalizer, and it may be truly called a "professional" unit. Distortion is extremely low—less than 0.25 per cent at a 1-volt output, and below 1 per cent at 20 volts, which is considerably higher than anyone is ever likely to use—unless he is trying to drive the output stage directly, and if he is he should not be allowed to have such a fine unit as this anyway. **N-28**



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EDWARD TATNALL CANBY*

More Non-Stereo

1. CLASSIC

Brahms: Symphony #4. Berlin Philharmonic, Kempe. Capitol-EMI G-7100

Funny. When I first tried this, I didn't like it. But I was suspicious and put it aside—now, when I've played it through on a second try I'm enthusiastic. (I had taken an overdose of Brahms the first time, and I knew it.)

The symphony seemed highly intellectual to many when it first came out—and yet it was also white-hot emotionally and surely must have been played that way before Brahms himself, in 1897, a month before he died. Today, the intellectual side sometimes seems tired, the white-hot furor easily fades. But not here.

This performance is warm and lovely, which is as near as we can come to the feeling of urgent newness that the music once had. The recording is equally warm, and wonderfully revealing of instrumental details, to a degree that has seldom been equalled. Note the controversial (in 1897) triangle in the third movement. Until hi-fi came along, not one of us had ever heard it on records. Then it took on exaggerated telephone bell sonorities, for the hi-fi fans. Now it is back to normal, and to Brahms' own intention.

Brahms: Magelone Songs, Op. 33. Dietrich Fischer-Dieskau, baritone, Jörg Demus, pf. Decca DL 9401

If you happen to have any interest in the German *lied*—songs by Schubert, Schumann, Wolf, Brahms and the like—this set may well astonish you. It is Brahms' only song cycle and it must be very rarely performed—few of us will have so much as heard of the music.

The series is a medium-early Brahms work, mid-way between the lusty period of his early piano sonatas and the full-blown Romantic music of the well-known "Requiem." (All the big orchestral works came later.) It deals with a super-Romantic Medieval epic of two lovers, as re-fashioned by an early-nineteenth-century German poet; Brahms sets the incidental commentary on the various situations, like the arias in an opera, in an effective series of songs; the story itself is recounted in detail in an attractive insert booklet, illustrated with old woodcuts.

Fischer-Dieskau was a superb choice for the music, with his beautiful voice and diction, his dedicated, serious approach; Jorg Demus does as well with the florid Brahms piano parts, as rich as any he wrote.

The thing to do is to sit down with this attractive album and follow the songs through, with the story and pictures. It's a fine participation album. (You'll find the entire text, in both German and English, as well as the story continuity.) By themselves, without the connecting tissue, the songs will be too much of a dose for most listeners, but if you will put your attention on the booklet and leave those dishes to be washed later, you'll be well rewarded.

Mozart: Symphony #40 in G Minor; Eine Kleine Nachtmusik. Pittsburgh Symphony, Steinberg. Capitol PAO 8432

I had been looking forward to this recording as a definitive one, for awhile—it is, with some interesting reservations.

I like what Steinberg does with such classics as these, adding no extra frills, no eccentricities, no super-tension, playing them musically and naturally. His Beethoven is good where other famous conductors flounder in self-aggrandizement; his Mozart is the same.

The reservations are minor and have to do with musical acoustics. The fast movements of the famous G Minor symphony are done with unusually slow tempi here. The best reason, and a good one, is that Steinberg is adjusting the music to fit the very large, resonant hall in which he is playing.

Other conductors might well ignore this serious matter of reverberation and the false blending of chords, via too-rapid playing, that should be held apart. Here, you'll find that the tempo is just right so that the end of each important phrase dies away before the next is taken up. The conductor waits—listens—for the echo. So should every performer. Most don't.

Bartok Records Sampler. Bartok BR 391

Peter Bartok made a sensible decision in abandoning all distribution through regular record stores in favor of a mail order business, and this LP is a sensible aid to his customers. With tens of thousands of LP records supposedly "available" at record shops and hundreds of new one coming in (not to mention tapes, magazines, stereo discs), the record dealers today just groan when somebody asks for a small-company release. Most of them don't know the names of many an important label, let alone the address. Mail order is the obvious answer and it offers—with the sampler disc to help—a way towards virality for many an ailing but important collection of recorded material.

The Bartok catalogue remains choice and small, so sampling is easily done. The Bartok tapes have always been of top quality. What other label, I ask, would dare begin a sampler systematically with the earliest offerings in the line? You'll find no appreciable difference in sound between the oldest and newest items here.

Musically, this is a model sampler, done with unusual forethought and intelligence. The selections are grouped, on each side, as a sort of continuous "program," the succeeding items well balanced, following each other naturally and interestingly without jolts and shocks. The endings are never an arbitrary fadeout but are chosen carefully at good musical stopping points, even though some items must run to considerable length before such a spot appears. This was done intentionally, for most people listen straight through a sampler of this sort, and a second playing, or even a tenth, should be possible without unpleasantness. The record, in fact, is a kind of concert in itself and an excellent cross-section look at Bartok's music.

Most of the music is by Bela Bartok, but there are related works, mostly performed by Hungarian musicians—Liszt piano music, Kodaly songs, etc. You pay a dollar for all this and if you order any of the records you get your dollar back in credit. What more could you ask?

Bartok Records is at 113 West 57th St., New York 19, N. Y.

Prokofiev: Symphony #1 ("Classical"). Shostakovitch: Symphony #1. Philharmonia Orch., Kurtz. Capitol-EMI G-7118

I put my money on Kurtz awhile back in an earlier release—here he fulfills the best I could have hoped for.

These are warm, glowing, highly musical performances, of both works. The "Classical," for once, and thank the Lord, goes slowly enough in the first and last movements so that you can hear the notes. Kurtz plays them, believe it or not, as music. Most other conductors seem to think these movements are speed demonstration tests or exercises, in orchestral cuteness.

The casual, witty Shostakovitch First, from his youth, is still to my mind his most musical and spontaneous symphony. Its first movement invariably reminds me of a batch of contented hens clucking away to themselves. Kurtz makes them cluck with utter pleasure—they sound more contented than ever. The bigger, noisier parts of this work, though, lend themselves to over-fancy drama and plenty of conductors go all-out for it, with disastrous effect. Kurtz keeps the bombast under control, strengthens the line, firms up the shape and keeps the tempi rolling along. Shostakovitch never had it better.

Fastes et Divertissements de Versailles. Vol. 1: Lalande: Les Fontaines de Versailles; Bernier: Le Cafè (Cantata #4). Assorted soloists, chorus, orch, Maurice Hewitt. Epic LC 3487

"Annals and Entertainments at Versailles" might be a translation of this title. The two works here, one large and one small, both belong to the enormous body of music that was part and parcel of the famous establishment at Versailles, under the great Kings Louis XIV and XV. Until quite recently, nobody ever thought to play any of it, but now this immense store of French music is coming out right and left—and it is generally lovely stuff, too, though quite unlike anything many of us have heard before.

The big work here is "The Fountains of Versailles," which is a far cry from Respighi's "Fountains of Rome." The piece was a welcome-home entertainment for Louis XIV, and is packed with gods and goddesses—seven of them having singing parts—bent upon the monarch's praise. It was very much the fashion then to invoke the classical gods,

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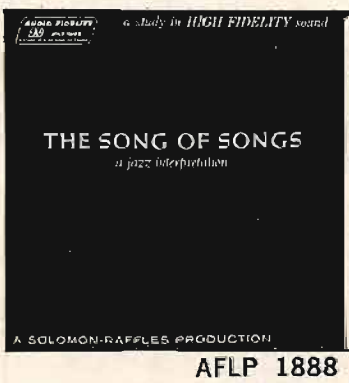


AFLP 1859
◀SD▶



AFLP 1860
◀SD▶



AFLP 1895
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AFLP 1888
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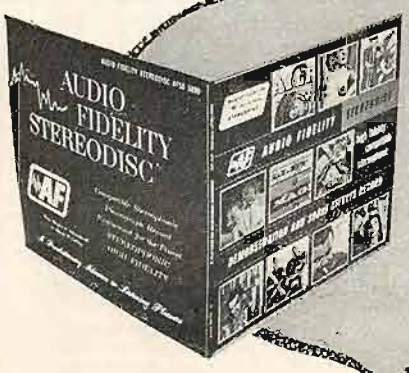
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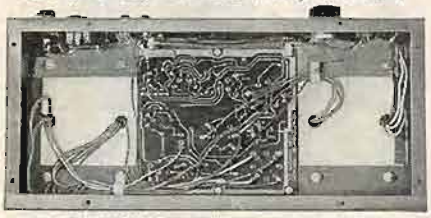
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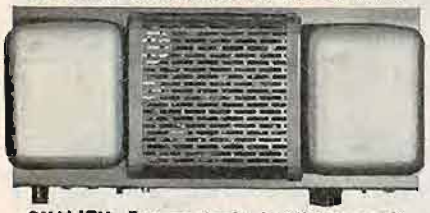
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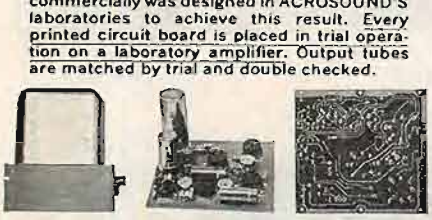
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humorously, and entangle them in current matters, so Louis probably felt it only his due when Apollo came out to sing for him and to praise his gardens.

It must have been a grand occasion; the music is all pageantry and pomp and we can assume that the costumes and lighting were of the most splendid sort, to set off these proud singers, chorus, and large orchestra. This performing group, however, does a mixed job. Maurice Hewitt, an old-timer (relatively) in old music, has an inadequate feeling for the rhythms and tempi of this period; several of his soloists shout and strain instead of singing sweetly. But the sound is opulent throughout and some of the eight singers are quite lovely in their solos.

The little "Coffee Cantata" by Bernier, another Louis XIV satellite, is a graceful sonata in praise of the drink—as a time saver, putting off sleep, as a sharpener of the eyesight and as a virtuous substitute for the juice of the vine. Here, too, the eternal gods are invoked, as well as the stars, Nature, and what-not. It's sung entirely by a single soprano (Janine Micheau—excellent) along with a flute plus a harpsichord and viola da gamba accompaniment. Simple and quite beautiful.

Handel: Four Organ Concertos, Op. 4. Eduard Müller; Schola Cantorum Basiliensis, Wensinger. **Archive ARC 3100**

Almost every time I review these Archive discs I have to remind you that the mumbo-jumbo all over the cover, mostly in Latin, shouldn't be allowed to get in the way—it's just scholarly window dressing. Many of the discs themselves are full of sparkle and life musically—even without benefit of a gorgeous gal in four colors on the cover.

If you know old Papa Handel, you know that his main eye was always on good entertainment; it was sort of an accident that he also was an unerringly top-rank composer, though this would not have been his idea of the matter, of course. Here, as a point in illustration, are four of his Organ Concerti. They were written as intermission entertainment, for his concerts; he played them himself between the sections of the big oratorios—which were almost in the nature of spectacular musicals. Imagine "The Ten Commandments" today and you'll have an idea of the appeal of the oratorio to the then huge audiences that flocked to listen.

Imagine Handel himself coming out to play a little organ music for the people, between the acts, and you'll see how these short pieces fitted into the entertainment scheme.

But don't think that it was "background" music for intermission talking! When old Handel came out to play his organ, "Silence, the truest applause, succeeded the instant he addressed himself to the instrument, so profound that it checked respiration . . ." That's what somebody who was actually there has written, on the subject.

These are neatly played and well recorded examples of Handelian charm, taken close-up, with a properly small orchestra, beautiful solo coloration—solo violin, solo cello, etc.—and the right sort of snappy rhythm, minus dragging sentimentality. The organ is so authentic it fairly squeaks, though it's a modern instrument. Sounds like a steam calliope in miniature. The real trouble with the instrument here, though, is simply that it is played in a very dead studio and recorded at close range. Organs don't like that sort of treatment. Shows up all the pimples in their tone.

Buxtehude: 5 Sacred Cantatas. Helmut Krebs, tenor, D. Fischer-Dieskau, baritone; instr. solos, strings of Berlin Bach Orchestra, Gorvin.
Archive ARC 3096

These friendly, buxom little works in popular German style were composed in the prolific musical period before Bach, the end of the seventeenth century, when the decimation of the Thirty Years' War had led to a wonderfully economical sort of church music in the Protestant style, using a solo voice or two and a handful of instruments but boasting such a variety of rhythms, moods, colors that for today's ample recorded sound they make ideal material.

Three pieces for tenor, one for baritone, and a final duet for both solos fill up this disc, each with a group of strings featuring the tell-tale two-violin duet of this period, plus a nicely balanced steam-calliope organ accompaniment in the background; two oboes join in for part of the music. Except for one Latin text, the words are in German.

If you shy away from that word "sacred," don't assume that all sacred music has the slightly sanctimonious sound of so much of our own Sunday music today. This is warm, human, approachable music, popular in the best sense. The only thing difficult about it is simply that it happens to come from an earlier time and so speaks a musical language not instantly familiar. That is hardly the composer's fault, and he gets around the difficulty soon enough if you give his stuff time to sink in.

The words are provided, in the original and in parallel translation in case you are no German scholar, or Latinist; best way to enjoy the music is to follow what's going on in this way. Herr Krebs, the tenor, is a fine singer, if a bit nasal (probably exactly what Buxtehude would have wanted) and Fischer-Dieskau is one of the finest German baritones of this generation.

Bach: Magnificat. Soloists, Singgemeinschaft Rudolf Lamy, Solistenvereinigung der Bachwoche Ansbach, Leitner.
Archive ARC 3098

If I listed all the soloists here, both vocal and instrumental, I'd take up most of the page—but once again, you must ignore the mouthfuls of German and consider the music they indicate which is fresh, enthusiastic, sonorous, well recorded. The Bach Magnificat is in his junior Cadillac size, a big piece on the grandest scale but shorter, terser, more economical than the big Passions and the B Minor Mass. It makes an ideal opener if you want to get to know the big-Bach pieces but quail at the thought of the hours-long larger works. There's a plenty-big chorus here, a large orchestra with trumpets at the beginning and end, a couple of potent chorus fugues and a series of utterly lovely quiet pieces for the typical Bach solo voice, with an *obligato* instrumental accompaniment, each one unique in the sound-color itself.

These are good stock-variety vocal soloists, all of them; the orchestra is dreamy and the chorus earnestly muscular, with a preponderance of young voices, sweet and brash. Sounds really very fine.

I threw in one perennial complaint—I can't understand why conductors don't treat Bach the way they treat other composers in regard to the simple matter of phrasing, of making a shape out of a tune or melodic idea.

These people prance through their Bach, thumping the strong beats, pounding all the weak accents in the text—like saying in so much English, "We PREfer to sing it with the acCENTS on the wrong syllABle."

Nothing unusual—since most choruses sing Bach the same way. But it can be done differently, and should.

Bach: Violin Concerti in A Minor, E. Major; Concerto for Two Violins in D. Minor. W. Schneiderhan, R. Baumgartner; Festival Strings Lucerne.
Archive ARC 3099

Here are three familiar Bach fiddle concerti in one package, all up-to-date, no-nonsense authenticity, well worth owning if simply to provide a reasonably close idea of the actual, physical sound of these works in Bach's own day. Again, the orchestra is the right sort, small and with the harpsichord-and-cello background continuous accompaniment harmonies (continuo); even the violins are right—both Strads were made very nearly at the time the music was composed.

There is the usual good, clear, transparent Deutsche Grammophon recording here, the usual excellent balance between solos and small orchestra. The performances are earnest, matter-of-fact, straightforward—all these things combined; no romanticizing, no high-

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tension trip-hammer modernism, just solid playing, a wee bit on the unimaginative side (can't help feeling) and inclined to be a bit bumpy.

An interesting point in the two-violin concerto: the two instruments are quite unlike in sound, both intrinsically and in the performance by the two players—and this is very much as it should be.

A number of trick versions of this concerto have been made where the two fiddle parts are played by the same fiddler via re-recording, including the early one by Heifetz. The results are unutterably dull, redundant, colorless. For the music is written to contrast two different human beings playing very much the same music. If only one man does all the playing, the contrast vanishes and the whole intention is flubbed. About as exciting as Laurel and Laurel, or Hardy and Hardy.

2. THE RAIN IN SPAIN

Agrupacion Coral de Pamplona De Espana (Pamplona Choir of Spain). Luis Morondo, conductor. **Columbia ML 5278**

This is one of those amazing choruses that imitate instruments and make themselves into a sort of choral orchestra, accompanying their soloists' voices with assorted BUMMM, BUMMM sounds. Virtually every one of the Spanish numbers here makes use of this technique, accompanying a quartet of passionately Spanish solo voices, the soprano (Amalia Urquijo) particularly lovely.

Much of the music, by numerous present Spanish composers, is of a piece—Spanish-idiom stuff with all the trimmings and some semi-modern harmonies that I found not very impressive, musically speaking. The choir does such enormously difficult stunts that sometimes it tries to outdo itself and the music is shaky in pitch. (No instrumental accompaniment to help.) But, particularly on side 2, there are many items with faultless execution in remarkably accurate pitch. Credit some of this to the better composers on side 2, whose music makes more sense to the singers themselves!

Best of all—as so often in Spanish recordings—is the group of works by De Falla. The Five Songs have a scintillating, imitation-guitar accompaniment for piano in the original—here the singers take on the entire piano part, breakneck speed and all, and the result is astonishing. It's here that the soprano solo is most passionately good, too. The rest of the side is fine. If you sample this, try side 2 first.

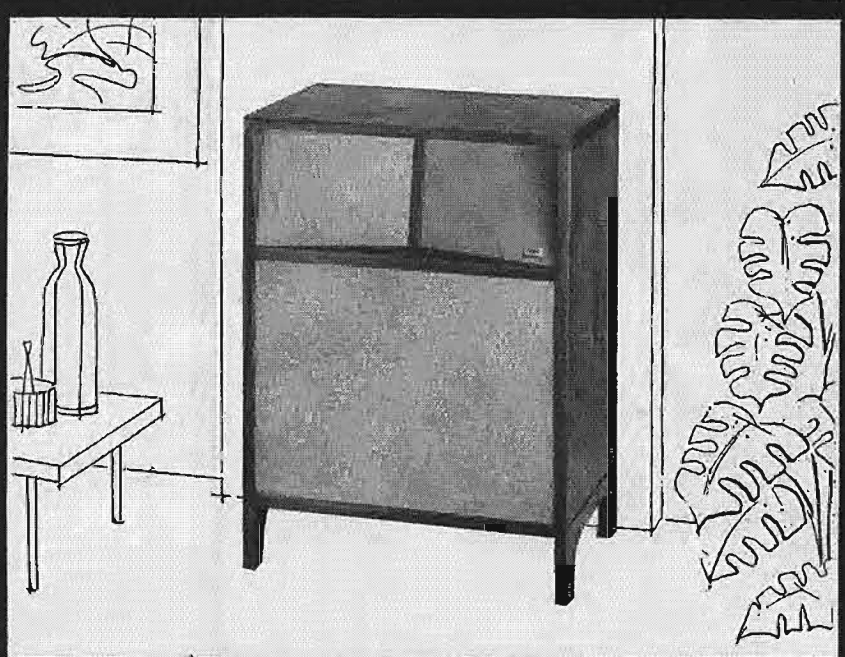
Victoria: Requiem Mass. Choir of the Abbey of Mt. Angel, Portland Symphonic Choir (Oregon).
RCA Victor LM 2254

—And here is a lovely classic of Spanish music by Spain's finest older composer, Tomas Luis de Victoria. The music is based on the Gregorian Requiem chant, much of it sung spread out in long notes in the soprano part above the chorus counterpoint, more of it sung in the original form. The ingenious arrangement here has the Monks of the Oregon abbey singing the pure Gregorian, their specialty, and the somewhat more worldly Portland Choir singing the composed portions of the music. Both groups are excellent, the monks with that peculiarly dedicated unity of sound, so passionate yet so utterly selfless, that develops out of the monastery life, the good people of Portland like plump, prosperous angels, well fed and benign. They may be worldly but they sing the music with lovely tone and expression, unusually good pitch and phrasing. Thanks goes to their conductor, C. Robert Zimmerman, as to the monks' leader, Dom David Nicholson, O.S.B.

An idle question: did the two groups get together? I found myself pleasantly imagining the scene, with monks and townspeople gathering for a common effort and interest. But my sober ear tells me that maybe the recordings were made in different places and at different times, then taped together. If so, it's a splendid match, except for at least one very doubtful joint where there is no discernible relation between the monks' key and that of the choir. Only bothers you for an instant.

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Songs and Dances of Spain, Vol. 1. Cities of Andalusia. Alan Lomax, ed. **Westminster WF 12001**

The prolific Alan Lomax, America's most industrious roving folk music collector, finished off the enormous Columbia series of Folk and Primitive Music recordings—something like fourteen or more volumes—and dashed away to make a series for Westminster. This is merely Volume 1. There are three or four more records out already and, presumably, dozens more on the way, if I know Lomax and Westminster.

You'll never fail to enjoy Lomax's material. It is invariably vivid, colorful, unusual, almost always taken on location in some utterly unlikely place—inside a gypsy cave, for one item on this disc—and the performers never by any chance show the slightest tinge of Broadway sophistication. They may be professionals and probably aren't averse to going on the local TV or equivalent, but they are genuine entertainers in their own medium, unwatered, undiluted.

I say this merely because, I gather, Lomax's enthusiasm sometimes takes him a bit beyond strict scholarly propriety, I've heard a few rumbles here and there on this score, but I can't find much reason to worry—considering how dreadful so much so-called folk music manages to be! Lomax's may not please all the experts but musically it's up in the 90 per cent ideal category.

A half-dozen-odd Spanish cities are represented here, with both gypsy and non-gypsy music recorded mostly at the more exuberant sorts of Spanish dancing fests. There are shrieking women, stamping feet, guitars, castanets and all the rest, and a running account by Lomax on the album cover, of all that goes on.

If you like this, you can go on buying succeeding volumes *ad infinitum*, though I can't go on reviewing them *ad similem*.

3. PROBLEM GOLD

Josef Hofmann Plays Chopin (via restored piano rolls). **Rondo Gold 1002**

Well if this isn't the darndest. You'll remember the somewhat ill-fated Columbia series of a few years ago, reproducing from master piano rolls, made on the finest and most accurate of the earlier machines, a whole battery of famous pianists including such as Debussy. Maybe they didn't sound like real, and there were doubtful elements, notably the pedaling, which is almost impossible to capture by mechanical means; but I enjoyed them.

This Hofmann recording is of the same sort, but the pianist himself was involved in the restoration—and approved the results heartily, according to the information on the album cover. But what he approved was what seems to me a monstrous distortion—the insertion of "dynamics" by volume control *after* the recording was taped. So I understand the process, and so it sounds to my ear.

Apparently, these Hofmann piano rolls did not include mechanical volume control. If I am right, the master player piano used for the Columbia recordings *did* have a dynamics control, which at least to some extent made the playing louder and softer as the master rolls went through the playback mechanism. The Hofmann rolls—these rolls, anyhow—were played loud or soft solely by the listener, who worked the controls on his home player piano, either ad lib or according to indications printed on the roll itself—I remember playing that sort of roll in my childhood. (I used to stick matches through typewriter paper and make my own tunes, to be drawn across the air-suction holes.)

At least, in that case, the actual piano sound was louder or softer—the hammer blows upon the string varied in strength, producing typically "loud" or "soft" tones, with their very different overtone coloration. Here, if I can really believe it, the piano roll was simply played loud, without any dynamics; then *afterwards*, the tapes were run at half speed and copied with the volume being turned higher or lower according to Hof-

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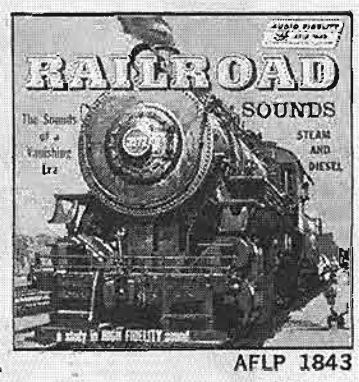
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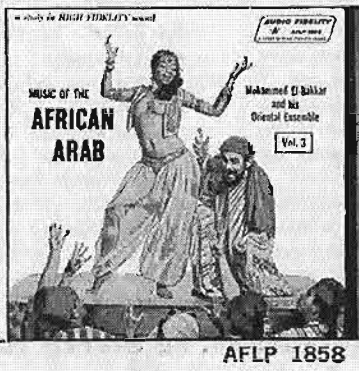
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dance bands. Especially organized for these recordings, its guest conductor is Herman Clebanoff, formerly concert master of the Chicago N.B.C. orchestra. In constructing models for students in high schools and colleges, he avoids the pedestrian and never permits the tempos to lag.

Don Jacoby leads the trumpet trio on his set of four variations on the *Carnival of Venice* theme, arranged for band by William McRae, who contributes three other titles. Woodwinds color *Pastels*, a lilting waltz, and both *El Dorado* and his modern adaptation of Dett's familiar *Juba Dance* build to a shattering climax. Latin rhythms enliven Fred Kepner's *Latin Lament*, and Stewart Schaefer's *Autumn Beguine*. William Latham provides a processional march, *Proud Heritage*, and the delightful *Swingin' Reel*.

Bill Putnam of Universal Recording does an exceptional job on a program that follows Harry Budka's quietly pastoral *Night Clouds* with George Kenny's dynamic rouser *Jubilee*. On stereo disc, he gives it pleasing breadth and reverberant depth. A monophonic version and condensed score are available.

MONO

Dukes Of Dixieland: On Campus **Audio Fidelity AFLP1891**

As the title suggests, The Dukes venture through the portals of higher learning for the theme of their eighth album. They score high on an aptitude test composed of such college standbys as *Sweetheart of Sigma Chi, Stein Song,* and *Varsity Drag*. A stirring tribute to his alma mater, *Roll on Tulane*, finds Papa Jac Assunto revisiting scenes of his youth. And the fires smoldering in the breast of many another old grad will be fanned into flame by *Fight On, Ohio, Notre Dame Victory Song, Rambling Wreck,* and *On, Wisconsin*.

Since their last appearance, the addition of a full-time tuba player has swelled the ranks to octet size and the rhythm section is realigned around a new drummer. Bill Porter now devotes all his energies to stringed bass. Lowell Miller introduces himself with a mellifluous chorus on *Whiffenpoof Song*, providing tuba phrases deep enough for a quartet of basso profundos. The swift brushwork of Red Hawley effectively thwarts any tendency toward chunkiness, and he swings lightly behind the ensembles. A hearty fullness of sound is achieved without the heaviness which afflicts some dixieland groups. Frank Assunto continues to improve and his trumpet style is acquiring a distinct personality. He sings on *Jamboree Jones*, and the high standards of the recording make this a choice item for past and present residents of academic halls.

Louis Smith: Smithville **Blue Note 1594**

Since his recorded debut on this label in the spring of this year, Louis Smith has fallen heir to the trumpet post in the Horace Silver Quintet. The title tune, a rugged, basic blues of his own devising, indicates his certain potential as a creative jazz force and his growth should be accelerated under the watchful eye of his new employer. In this, and a lyrical *Embraceable You*, he plays well-ordered choruses with a clean, full-bodied tone. The brisker numbers find him more concerned with musical content than technical flamboyance, a pleasant change from several new names on his instrument in recent years.

A distinct help toward putting Smith at ease is the zestful Charlie Rouse, a mobile and seasoned veteran of the tenor sax, whose conception follows a similar line. Pianist Sonny Clark adds an absorbing solo on the blues and is invaluable throughout. Paul Chambers plays bowed bass on *Weiu*, and Art Taylor drums with restraint.

Theodore Bikel: Songs Of A Russian Gypsy **Elektra 150**

These romantic and fiery songs made a lasting impression on Theodore Bikel at the age of nineteen and he continued to collect them throughout his travels. At the start of his acting career at the Habimah in Israel, they were introduced to him by a member of the cast who had studied with Stanislavski. He sings some of them in a Gypsy dialect, translated in the booklet of texts, and prefers the older ballads or the declarative *Hussar's Song*. Present in song and the hands of the singer and Fred Hellerman is *Two Guitars*. The distinctive sound of Sasha Polinoff's balalaika is featured in a typical Russian ensemble on *Brightly Shines The Moon*, where it contrasts vividly with Yurka Sutotsky's bass balalaika. Lonya Kalbouss plays accordian and George Greenberg is violinist. The recording by Leonard Ripley is excellent.

Bobby Hackett: At The Embers **Capitol T1077**

Pete Kelly Lets His Hair Down **Warner Bros. W1217**

The influence of the successful album format unveiled by Jonah Jones in his current series for Capitol is felt on this pair of LP's. Leading a quartet in the room where Jones perfected his best-selling formula, Bobby Hackett falls heir to it naturally, and the same easy, intimate manner pervades his velvety tone. There is a distinctive styling of tunes not often associated with solo trumpet —*That Naughty Waltz, Paradise, C'est Magnifique,* and *Spring, Beautiful Spring*. Peppi Moreale is a pianistic descendant of Teddy Wilson, and drummer Buzzy Drootin swings lightly. Bassist John Guiff was graduated by the Hartford Symphony and Max Kaminsky. *Rosalie* is dusted off by Hackett, who sparkles on *Monday Date*. The recording and the sentiments are soothing.

Jack Webb's latest production gathers an octet of Hollywood dixielanders in the studio and then separates them for long ad-lib choruses on the blues. They are given slightly less than three minutes each to express their views on a slow blues before moving to a faster tempo on the second side, where an added track features bassist Jud de Naut and drummer Nick Fatool. Leading off is tenor saxist Eddie Miller, followed by Matty Mat-

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lock, clarinet; Moe Schneifer, trombone; Ray Sherman, piano; George Van Eps, guitar; and cornetist Dick Cathcart. There is more space for improvisation than in the usual dixieland set and little of it is wasted. A stereo version is available.

Julian "Cannonball" Adderley: Somethin' Else **Blue Note 1595**

An adjective "best" or "most" to qualify a jazz album in connection with a time period of a year or so now is used so loosely, appearing almost monthly in some periodical or other, that it has lost all meaning, but this session is clearly "somethin' else." Its significance in the growth of Adderley and Miles Davis is likely to be felt for some time. It indicates that Adderley finally has consolidated his individual strivings and an admiration for Charlie Parker into a style bound to become more emphatically personal. He is one of the few alto saxists who absorbed the teachings of Parker and has emerged with the ability to use them to further his own development. May he never return to the slavish copying of tone, or of frantic tempos and vacant exercises which characterize the student.

A great deal of his new stature comes from his recent entry into the sextet headed by Davis, who has consistently shown a reluctance to imitate a static Miles Davis. Despite his position as one of the most influential trumpeters of his generation, he is carefully broadening the base of his playing. And he is remarkably candid about some of his sources of inspiration, having recognized long before anyone else the appeal Ahmad Jamal would have for the public. On the liner notes, he acknowledges the Chicago pianist's contribution to his ballad style on *Autumn Leaves*, and there are traces of it in his muted elaboration of *Love for Sale*.

But the more revelatory portions of this LP are found on two blues, where Adderley proves to be a real stimulus and serves notice that the new alliance will yield mutual benefits. On the title tune, Davis generates considerable heat, and on *One for Daddy-O*, brother Nat Adderley's tribute to a Chicago disc jockey, his steady movement into upper register might be attributed to his willingness to listen to Louis Armstrong. *Dancing in the Dark* exhibits Adderley's way with a ballad, and the talents of Hank Jones as piano accompanist. Sam Jones is the competent bassist and Art Blakey is a pillar of strength on drums.

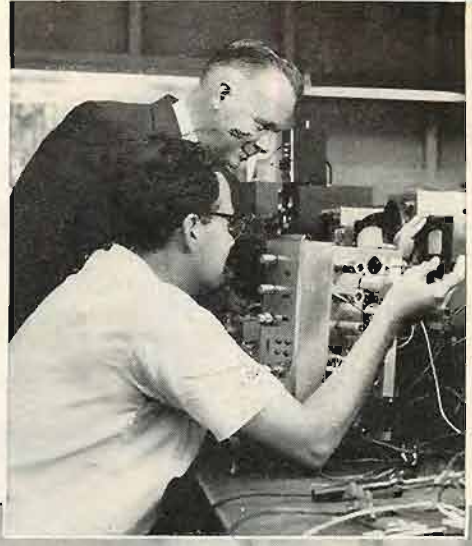
Harold Land: Harold In The Land Of Jazz **Contemporary C3550**

Two years spent in the company of Max Roach and Clifford Brown enabled Harold Land to start on a promising career, interrupted when family matters forced his return to Los Angeles before that locality had warmed up to his particular brand of tenor-sax playing. As a consequence, a share of the acclaim which fell to Rollins, a successor with Roach, was forfeited and his exposure on records limited. This impressive LP, his first as leader, should serve to restore much lost ground. Just as Rollins and John Coltrane stand at the top of the heap of the younger generation on the instrument in the East, so is Land paired with James Clay on the other Coast. Perhaps because of the musical climate in which he operates, Land exercises more control than his rivals and his solos are fully digested. He is no less intense and venturesome, but any excesses are curbed with a firm hand.

Some of the credit for this is probably due Elmo Hope, his collaborator on the arrangements, who seems to have functioned as an editor of the creative flow of Land and his fellows, aside from writing the lightly exotic song, *Nicta*. The most telling interludes are a fast blues by the pianist Carl Perkins, appearing on this session shortly before his death last Spring, followed by a slower blues from Land. In matching their earthy qualities here, trumpeter Rolf Ericson turns in his best recorded work. Frank Butler revives the vanishing art of using a bass drum pedal with discretion on *Speak Low*, and bassist

(*Continued on page 62*)

This Man is Using an Electronic Crystal Ball



The H. H. Scott advance development team must foresee the future. They must design new products so that they stay current for many years. Hermon Hosmer Scott insists on this as a protection to your investment.

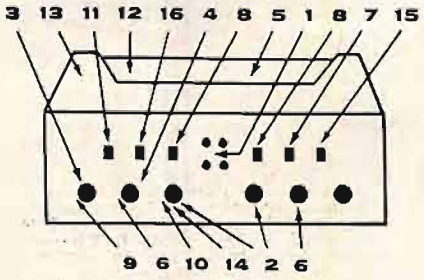
The new 130 Stereo preamp is an example of the way Scott engineers work ahead. Engineering of this brand new product was started when stereo was nothing more than a hobbyist's delight. This allowed time for thorough testing of its many advanced features.

Every H. H. Scott component is designed to defy obsolescence. Careful planning, fine engineering, exceptional quality mean your investment in the new H. H. Scott stereo-preamp . . . or any H. H. Scott product . . . is an investment in a component that will still be up-to-date many years from now.



17 reasons why you should buy the

New H. H. Scott Stereo-Preamp



1 Visual signal light display panel shows mode of operation at a glance. 2 Completely separate bass and treble controls on each channel so that different speakers may be matched. 3 Play stereo from any source — Records, FM-AM Tuner, Tape. 4 Reverse channels instantly, or play monaural from any source through both channels doubling your power. 5 Play Trereo — a center channel output lets you use your present speaker as a middle channel. 6 Special circuitry lets you balance channels quickly and accurately. 7 Reverse the phase of one of your channels 180 degrees instantly. Lets you correct for improperly recorded tapes. 8 Separate 12 db/octave rumble and scratch filters. 9 Complete record equalizer facilities. 10 Use as an electronic crossover at any time. 11 Two stereo low-level inputs. You can connect both a stereo phono pickup and stereo tape head. 12 Stereo tape recorder inputs and outputs. 13 Provision for operating stereo tape heads without external preamps. 14 Quick-set dot controls allow any member of your family to use equipment. 15 Loudness-volume switch. 16 Stereo tape monitor switch. 17 The exceptional quality of all H. H. Scott components . . . PLUS all the features and specifications long associated with H. H. Scott monaural preamplifiers.

Sensitivity 1½ millivolts on tape head input, 3 millivolts on phono for full output. Hum level 80 db below full output on high level outputs. Size in accessory case 15½w x 5h x 12½d. Model 130. Price $169.95 (*$172.95, West of Rockies*).



Write for complete technical specifications and new catalog A-12.

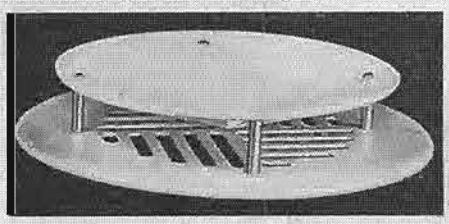
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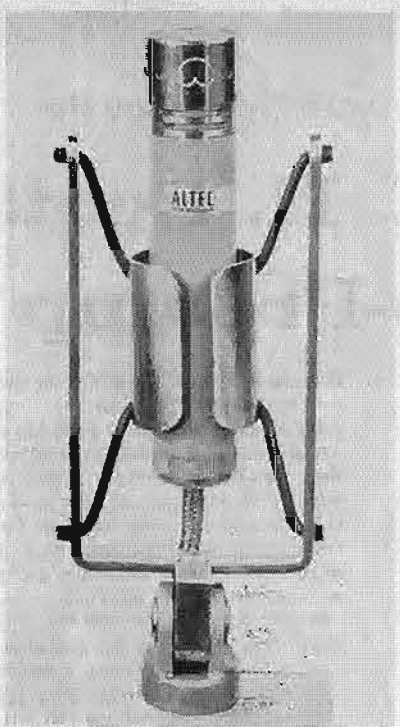
NEW PRODUCTS

• **Architectural Speaker Baffles.** Builders and contractors will find distinct interest in a new series of fiberglass baffles recently introduced by Fourjay Industries, 2360 W. Dorothy Lane, Dayton 9, Ohio. Included are round and square faceplates, complete bass-reflex units, and a full line of accessories for installation in new or



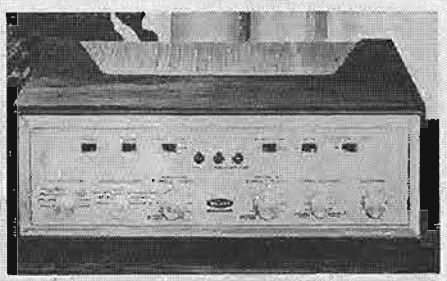
existing construction. Highlight of the new series is the "Spiral-Jector" baffle, available in two types for 8-in. speakers. Made of pre-formed fiberglass, it has the impact strength of steel, the lightness of aluminum, and the beauty of wood. Sound is dispersed by a non-resonant diffusion plate. A folder rescribing the new line is available from the manufacturer at the address shown above. **N-1**

• **Altec Lansing Microphone.** Engineered specifically for high-quality broadcast and recording applications, the new Model M-30 condenser microphone system features high sensitivity and discrimination, and has a smooth frequency responce extending to 18,000 cps. Because of its small size it will not cause distracting shadows and can be worked close to performers. It can be used near Kleig lights or other strong magnetic fields without fear of hum pickup. Unexcelled directional characteristics make possible the



pinpointing of sound sources while excluding unwanted noises of studio activity. The M-30 cannot be overloaded because there is a 15-db margin between the maximum (120-db) expected level encountered in an orchestra and the mike's ability to act without distortion. It complements the Altec M-20 omnidirectional "Lipstick" microphone, the two units offering perfect balance and match since their operational characteristics are similar. Altec Lansing Corporation, 1515 S. Manchester Ave., Anaheim, Calif. **N-2**

• **Scott Stereo Amplifier.** This complete 40-watt 2-channel stereo amplifier consists of dual 20-watt power amplifiers and dual preamplifiers on a single chassis. Designated Model 299, it can be used with any stereo source, with any monophonic source, or as an electronic crossover. Front panel controls include: pickup selector switch for selection between two separate stereo phono pickups, scratch filter, rumble filter, loudness-volume control switch, input selector, function se-



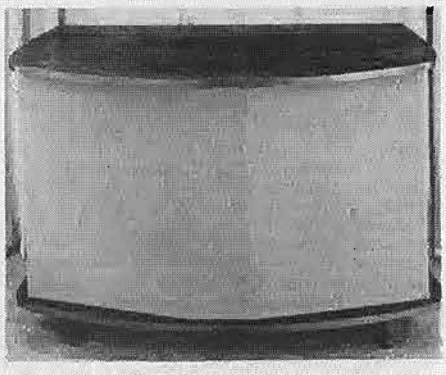
lector, separate treble and bass controls for channel A and channel B, stereo balance control, loudness control, and phase-reverse switch. A unique indicator panel gives quick visual indication of the mode of operation. The 299 has special facilities for quick and accurate balancing of of both channels. NARTB tape equalization has been included for direct connection to stereo tape heads without exterior tape preamplification. Inputs are provided for two low-level and three high-level stereo inputs and a switch allows the 299 to be used as an electronic crossover when desired. For complete technical information, write to H. H. Scott, Inc., Dept. P, 111 Powdermill Road, Maynard, Mass. **N-3**

• **Gonset FM Car Converter.** This converter operates in conjunction with existing standard AM car radio sets, eliminating the need for separate FM and AM equipment. The unit operates to change incoming FM signals to an input compatible with the AM car radio. It covers the standard 88–108 mc FM band, bringing virtually constant program level without severe fading or signal drop-out, and with a minimum of static or man-made noise



even when near power lines. Installation is non-technical, do-it-yourself, and requires no alterations or internal connections to the auto set. The converter is simply connected to the antenna input of the existing AM car radio. A switch is provided to restore the AM set to conventional operation when desired. Operating power is obtained from a battery connection under the dash. The converter is operable only on cars with 12-volt electrical systems. Manufactured by Gonset Division, Young Spring and Wire Corporation, 801 S. Main St., Burbank, Calif. **N-4**

• **Frazier Stereo Speaker System.** The Stereorama Jr. consists of two independent enclosures mounted with 30-deg. angular separation and contained in handsome contemporary cabinetry. The 30-deg. separation at the source permits excellent stereo effect at distances ranging from five to fifty or sixty feet. Since the back of the two speakers is joined at the apex of the angle, the "hole in the middle" frequently experienced with some speaker systems is eliminated. Frequency response of the Stereorama Jr. is good from 40 to 15,000 cps, and efficiency is such that excellent results are obtained from use of a 12-watt (each channel) stereo amplifier. Impedance is 8 ohms, each side. Power handling ca-



pacity is 15 watts continuous with complex wave form. Available in a variety of handsome finishes. Dimensions are 45¾"w x 18"d x 30¼"h. International Electronics Corporation, 2649 Brenner Drive, Dallas 20, Texas. **N-5**

• **Collaro Transcription Turntable.** Featuring a specially-balanced non-magnetic turntable weighing 8½ lbs., this unit is ideally suited for playing both stereophonic and monophonic recordings. Rotor of the 4-pole driving motor is dynamically balanced to zero. The turntable shaft runs in a self-lubricating bearing with a steel ball pressed into its lower



end, the ball taking the total thrust and resulting in virtually friction-free motion, with no detectable wow or vertical rumble. Further elimination of rumble is afforded by mounting the motor resiliently through use of three tension springs parallel to the unit plate. The turntable is handsomely styled and finished, and includes a static-free rubber mat to prevent record slippage. Rockbar Corporation, Mamaroneck, N. Y. **N-6**

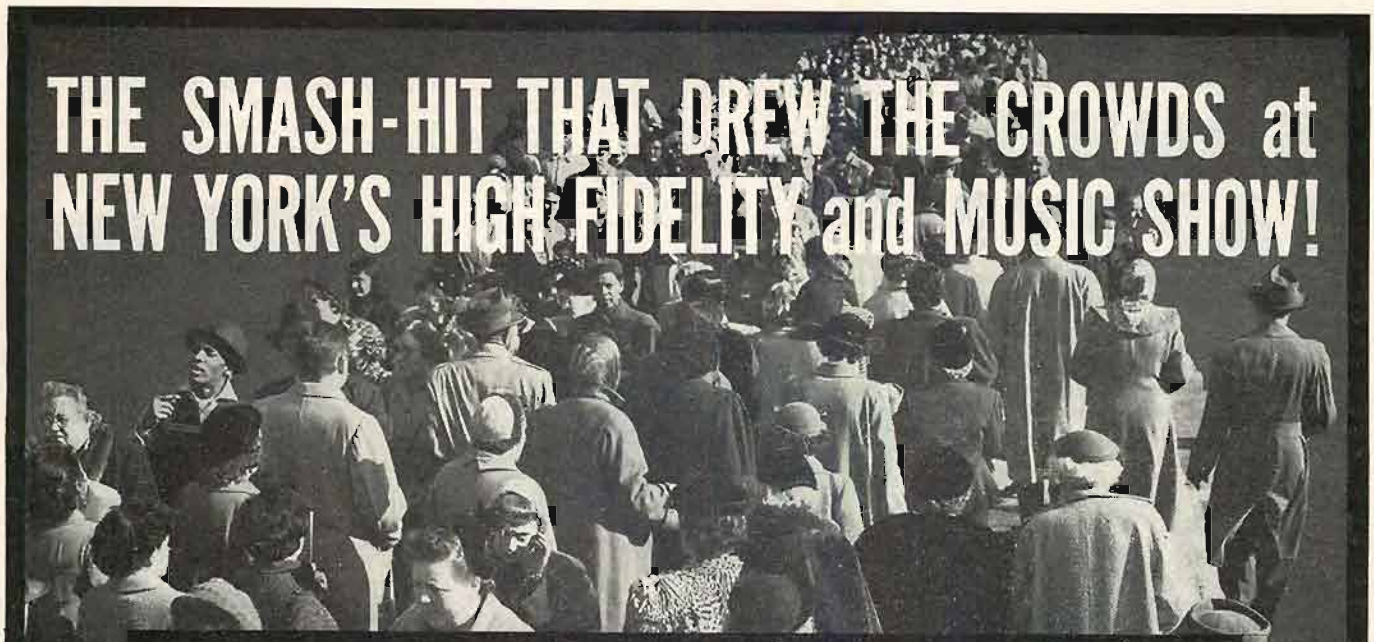
• **Matched Output Tubes.** One of the great inconveniences suffered by professional engineers and hi-fi enthusiasts alike, namely, obtaining output tubes with matching characteristics, has been eliminated with the announcement that Tung-Sol 6550's



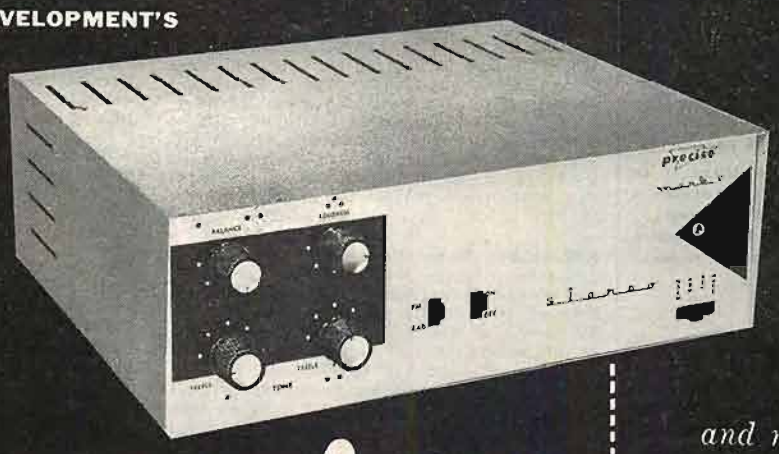
and 5881's are now performance-tested at the factory to very tight tolerances and twin-packed in matching pairs. The 6550's and 5881's are for service in amplifiers and commercial sound equipment rated up to 100 and 50 watts, respectively. Tung-Sol Electric Inc., Newark, N. J. **N-7**

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• **Garrard Transcription Turntable-Tone Arm Combination.** Responding to the demand for a professional-type 12-in. turntable, complete with a tone arm of correspondingly high quality, all mounted on a single unit plate, Garrard Sales Corporation, 80 Shore Road, Port Washington, N. Y., has introduced the new moderately-priced Model 4HF. This deluxe player, fully wired for stereo and monophonic operation, provides a plus-or-minus adjust-



ment on each of its four standard speeds. A unique push-button system controls the stop at the end of each record. Pressing one button disengages the tone arm completely from the motor; pressing another causes the unit to shut off automatically after a record is completed. The tone arm is newly designed with plug-in universal shell to take all standard stereo and monophonic cartridges. It is equipped with a simple, accurate stylus-force adjustment. The heavy steel turntable is equipped with a rubber traction mat. For full information write Dept. K52 at the address shown above. **N-8**

• **Heathkit Tape Recorder.** Popular request for quality low-cost tape recording and playback facilities prompted the addition of this unit to the expanding Heathkit line. The Model TR-1A provides monophonic record/reproduce with fast forward and rewind. Either of two speeds, 7½ and 3¾ ips, is selected by changing a belt drive. Flutter and wow are held to less than 0.35 per cent. The simple mechanical assembly is ideally suited to kit construction. A single control lever selects all func-



tions, and the unit can be used in either horizontal or vertical position. The Model TE-1 preamplifier, supplied with the mechanical assembly, incorporates a 60-kc push-pull oscillator for bias-erase voltage. A two-position selector switch provides for microphone or line input. Separate record and playback gain controls. Filament-balance control allows adjustment for minimum hum. Signal-to-noise ratio is better than 45 db below normal recording level. Tape mechanism is not sold separately. For further information write Heath Company, Benton Harbor, Mich. **N-9**

• **Pilot 40-Watt Stereo Amplifier.** A complete all-in-one unit, the Model SM-245 is a compact stereophonic control system containing two 20-watt power amplifiers. It can be operated stereophonically or monophonically from all of its six inputs. Frequency response is 20 to 20,000 cps within ± 1.0 db. Harmonic distortion is less than 1.0 per cent and intermodulation under 1.5 per cent at full output. A five-position loudness contour control provides Fletcher-Munson compensation for bal-



anced response even at low listening levels. Included among its features as an audio control center are stereophonic or monophonic operation through both speaker systems, a left-to-right stereo reverse switch, stereo balance control, separate bass and treble controls, dual microphone inputs for stereo recording, and dual outputs for tape recording. Controls are ganged to simplify operation. A unique automatic shut-off position on the power switch turns off the entire music system, when desired, after the final record in a stack has been played. Complete technical data on the SM-245 is available from Pilot Radio Corporation, 37-50 36th St., Long Island City 1, N. Y. **N-10**

• **All-Transistor Tape Recorder.** Both small in size and light in weight, the Steelman "Transitape" operates on standard mercury penlight cells and uses conventional 3-in. reels with quarter-inch tape. Operating speeds are 1⅞ and 3¾ ips. Battery complement is 13 cells, six for the amplifier and seven for the motor, with operating life said to be 300 and 50 hours, respectively. Battery life can be extended at home or office by use of a simple converter which permits operation from a standard a.c. outlet. Only an extension

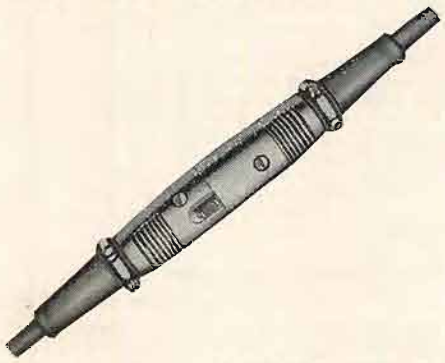


cord is required to operate the Transitape directly from a 12-volt car battery. Jewelled and Oilite-type bearings in the drive assembly require no lubrication. A neon indicator gives warning when batteries reach minimum operating voltage. Playback is afforded by means of a 4-in. p.m. speaker. An output jack permits private listening or feeding an external amplifier-speaker system. In addition to nor-

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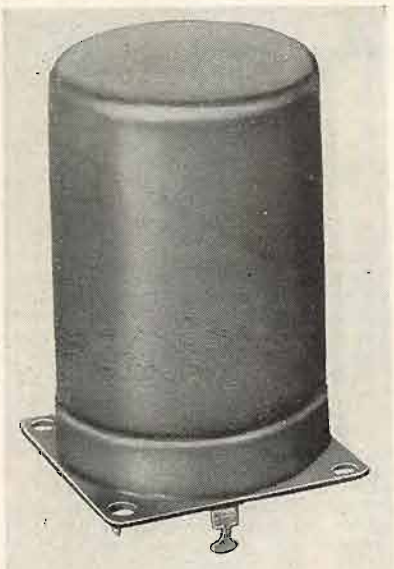
mal forward and rewind operation, a fast-forward speed is provided to permit rapid skipping to a desired section of tape. Weight of the Transitape is approximately 5 lbs., less batteries, and dimensions are 2⅞" × 6½" × 9¾". Manufactured by Steelman Phonograph & Radio Co., Inc., 2-30 Anderson Ave., Mount Vernon, N. Y. **N-11**

• **Cannon Audio Connectors.** Many improvements are incorporated in the new XLR Series of audio connectors, recently introduced by Cannon Electric Company, 3208 Humboldt St., Los Angeles 31, Calif., to replace the well-known XL audio series which has been an industry staple for years. The new connectors provide extremely quiet operation by use of resilient inserts and shock-absorbing ribs in all



socket assemblies. Other features of the XLR are serrated finger grips, ample space for wiring contacts, streamlined shell design, and newly-developed cable-relief bushings and cable clamps. The complete XLR series includes round and rectangular wall/panel-mounted receptacles, straight and 90-degree plugs, microphone adapter receptacles, two-gang wall-mounted receptacles, and dust caps. Further information will be mailed on request. Ask for Bulletin XLR-3-1958. **N-12**

• **High-Power Transistor Transformers.** Announced in both driver and voice-coil types, these UTC transformers are designed for high-reliability service, hermetically-sealed in drawn cases to MIL-T-27A specifications. The H-280 driver unit has a primary impedance of 280 ohms center-tapped with secondary 400 ohms split. The



H-281 is a 5-watt output transformer from 48 ohms center-tapped, to 16, 8, and 4 ohms. The H-282 is a 10-watt output unit from 20 ohms center-tapped, also to 16, 8, and 4 ohms. All transformers are of the wide-frequency-range type and are suited for service calling for 30–20,000-cps response. Additional information is available from United Transformer Corporation, 150 Varick St., New York 13, N. Y. **N-13**

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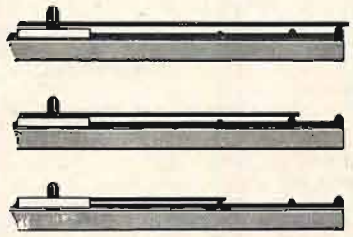
Light: Light construction eliminates the mechanical noises inherent in weight and mass—to a noise level which is 25 db less than the noise recorded on the best phonograph records available today.

Compact: Motor and turntable (with your tonearm) can be assembled on a 14⅛" x 15⅛" motorboard with a total overall height of only 2½".



Smooth: The Weathers Turntable comes up to synchronous speed in ¾ of one revolution of the platter. Its very small 12 pole synchronous motor drives the aluminum turntable at exactly synchronous speed regardless of variations in line voltage or load.

Silent: The unique Weathers Turntable Bearing Assembly is the lowest friction and quietest bearing ever produced. The new principle drive system eliminates the mechanical noise caused by heavier equipment. Acoustic feedback, rumble, wow and flutter are practically eliminated from the Weathers Turntable. This kit includes the Weathers conical spring shock mountings which isolate the turntable from floor and table vibrations.



Plus the Weathers Discushion: A turntable pad of such design that records are suspended by their outer dimensions only, with no part of the playing surfaces touching any supporting areas, eliminating the greatest source of record contamination and noise.

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JAZZ AND ALL THAT

(*from page 57*)

Leroy Vinnegar is always propulsive. The recorded balance and sound are excellent.

The Eddie "Lockjaw" Davis Cookbook
Prestige 7141

The principal staple from the Davis kitchen is the blues served in all tempos, shapes, sizes and flavors, with a choice ballad as specialty of the house. A self-taught musician, he collected recipes not conveniently reduced to the printed page, while jousting with a long line of tenor saxists during a decade spent in numerous bands. In 1952, Basie engaged him as featured soloist, an association renewed on last year's tour of Europe and currently at the Count's club where his trio is the main attraction. His partners are Shirley Scott, a 24-year-old electronic organist whose emulation of Jimmy Smith is fresh and feminine, and Arthur Edgehill on drums.

For this banquet, Jerome Richardson is added on flute by way of leavening, along with George Duvivier's well-seasoned bass. *But Beautiful,* a tender tune previously recorded by Davis and rapidly becoming his trademark, finds him intent on developing a phrase with the care of a Herschel Evans and the rich, full tone of a Coleman Hawkins. He keeps his blues basic and goes to the heart of the matter, revealing an insight possessed by few younger practitioners. Richardson switches to tenor sax for a series of bright exchanges on *Three Deuces.*

Clark Terry: In Orbit
Riverside RLP12-271

Since its adoption as a second horn by various jazz trumpet men, the fluegelhorn is turning up in unexpected places, sprouting in the brass sections of big bands to lend a mellow tone on a ballad or appearing at a recording date where its sound, somewhere between trumpet and French horn, is in increasing demand. This opening wedge is broadened appreciably on this unusual album, which contrasts sharply with the one Miles Davis made playing the arrangements of Gil Evans with a large orchestra. Clark Terry is intent on deft improvisation and his five originals are constructed with emphasis on a sturdy blues flavor. To show off the possibilities of the instrument, he indulges in a few eccentricities and witty half-valve effects that find a ready response from his piano accompanist, the undaunted Thelonious Monk.

Together they cleave a straight blues-oriented path on *One Foot in the Gutter,* a strong Terry theme with a telling exposition by Monk. He contributes *Let's Cool One,* spotlighting drummer Philly Joe Jones on their first meeting at a session, and bassist Sam Jones completes the quartet. A latin interlude, *Moonlight Fiesta,* comes from Juan Tizol, a mate of Terry's in the Ellington band. Sara Cassey wrote *Very Near Blue* for the date, and there is a sensitive *Trust in Me.* The fluegelhorn will never replace the trumpet, but after this experience more musicians will be meeting its challenge.

Hank Jones: The Talented Touch
Capitol T1044

Wynton Kelly
Riverside RLP12-254

Two working pianists, highly regarded for their reliability behind a vocalist and in the ensemble of a big band or small, are awarded the chance to show their solo skill in the spare frame of a rhythm section. The special gift that sets Hank Jones apart is aptly put on the album title. A perfect touch, in this instance a phrase not bandied about lightly, is as much a rarity in jazz as it is nowadays on the concert stage. Not many pianists in either field can regulate their tone with the accuracy Jones displays on *If I Love Again, My One and Only Love,* and *Try a Little Tenderness.* His control is extraordinary on any grounds and you can absorb his lessons in shading again and again. The support of Barry Galbraith, guitar; Osie Johnson, drums; and bassist Milt Hinton is relaxed and unconstricting.

Kelly, the younger of the two by a good dozen years, follows closely on his heels and proves to be equally versatile. Neither is a stylist bent on forming every tune to a preset mold. Those persons conditioned to believe an unwavering dominance of the keyboard is a sign of strength in a soloist will be disappointed, as will those who regard as uneven a lack of sameness. But more than a few will enjoy the proper coloration this pair affixes to each theme. Kelly plays two originals and Benny Golson's *Whisper Not.* Kenny Burrell, on guitar, becomes a flavorsome second voice, and bassist Paul Chambers is joined on the second side by drummer Philly Joe Jones. Oddly enough, Kelly's most rounded conception, a melodious *Dark Eyes,* is close to Benny Goodman, a recent employer of Jones. In turn, Jones is most rewarding on Gigi Gryce's *Blue Lights,* a number akin to Dizzy Gillespie, Kelly's former boss.

Kenny Burrell: Blue Lights, Vol. 1
Blue Note 1596

As the nominal leader on this informal session, Burrell lives up to the designation, taking full charge and setting the course for the soloists from his post on guitar. He invokes a smoky blues atmosphere on his own *Yes Baby,* a compelling theme which brings a spontaneous reaction from Louis Smith, on trumpet, and his co-workers. He aids pianist Duke Jordan on an effective reworking of his *Scotch Blues,* a playful reincarnation of the hardy *Campbells Are Coming,* in which he imitates the skirl of bagpipes in full cry. The guitar tone and a loping street beat, set by Art Blakey, make them seem less dour.

Burrell's showpiece, Vernon Duke's lovely *Autumn in New York,* is played with only rhythm backing and allows him to develop the melody in long, pulsing lines. Producer Alfred Lion makes use of the occasion to introduce to his label two young tenor saxists of promise who work well in unison. Florida's Junior Cook exercises a firm, full tone and Tina Brooks, from North Carolina, sounds slightly drier. Bobby Timmons takes over as pianist to encourage Smith as he expedites *Caravan.*

Ernie Ford: The Star Carol
Capitol T1071

A songbook of good tidings from "Tennessee" Ernie introduces six seasonal additions to the special Christmas series begun on Capitol of the World last year in visits to Italy, Holland, Mexico, England, France, Germany, Sweden and Spain. The familiar baritone voice is heard on trusted favorites, including *We Three Kings, Joy to the World,* and *O Holy Night,* with a chorus and orchestra conducted by Herb Geller. Besides traditional hymns, he sings a trio of more recent American carols from the pen of the late Arthur Burt, who wrote them for his father's congregation. Ford's performance will help *The Star Carol, O Harken Ye,* and *Some Children See Him* gain the wider acceptance they deserve.

"Christmas in Austria" (Capitol T10164) heads the list of holiday albums from various foreign lands. It marks the debut of the Vienna Boys Choir on this label and is a handsome present for the music lover and audio fan. Director Xaver Meyer delves into the archives for several lesser known works, including *A Rose Sprang Forth, Come Little Children,* and *Soon It Will Knock.* A fresh beauty pervades *Adeste Fideles,* and *O Tannenbaum.* Their organ accompaniment is played by Alois Forer, and the swelling voices of the choir in a large auditorium are faithfully conveyed on the fine recording. An interlude is devoted to the campanile of St. Florian, as the ancient bells ring out in a joyous serenade of greeting.

"Christmas In Cuba" (Capitol T10165) was recorded in Havana and is sung in Span-

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ish. A choir of mixed adult voices, the Coro de Madrigalists, is selected to portray the spiritual peace of *Cancion Alegre, Little Green Vines,* and several other fetching rounds. A more secular note sings *Silent Night,* with the help of a large chorus, and effectively latinizes *White Christmas.*

"Christmas In Portugal" (Capitol T10166) was recorded in Lisbon and features five diverse groups. The Salesian Choir of Mogofores, singing *a capella,* is heard in four arrangements prepared by Prof. Filipe Rosa de Carvalho. The Rancho Dos Ceiferos De Cuba is a powerful male chorus, in contrast to the mixed Polyphonia Choir, and each sings two numbers, also without accompaniment. The tinkling sound of a music box brightens the songs of the Trio Odemira, a popular group which avoids an excess of sentiment. And Portugal's favorite male vocalist, Carlos Ramos, adds his solo voice on *Song of Christmas* to an observance which begins on the Eve and lasts until Epiphany.

"Christmas in Brazil" (Capitol T10168) also is sung in Portuguese and was recorded in Rio de Janiero. It is for children and all who believe the holiday is meant for children. The voices are those of the teen-aged orphan girls who live together at the city's Casa de Lazaro. They are largely untrained, but the group is well-schooled and enters into the seasonal spirit with verve and simple sincerity. There is an entertaining march, *Happy Celebration, The Christmas Waltz,* and *Prayer to St. Francis of Assisi.* Chimes, guitar, and a rhythmic organist make their small orchestra pure delight, matched only by the honesty of the youthful soloists.

"Christmas In Poland" (Capitol T10198) in circumventing the Iron Curtain, presents this country's Schola Cantorum of S. S. Cyril and Methodius Seminary. Conducted by the Rev. Henry A. Waraska, who first joined the group in 1938 when he too studied for the priesthood, it sings six medleys of two distinct types of carols. The pastoralki are folk songs enjoyed for generations in the home, social gatherings and pageants outside the church. Dancing rhythms and an accordion accent the lively melodies. The ten kolendy are church carols, although the gaiety of some may restrict them to festive occasions outside its doors. On those more suitable, the chorus is joined by a grand organ. All are authentic and fittingly preserved for a generation that may never hear them in a native setting.

"Christmas In Australia" (Capitol T10167) reflects a land where the holiday falls in midsummer and the customary family reunion and dinner is quite likely to be a picnic on the beach. Twelve compositions appropriate to the climate, written by William G. James and John Wheeler, replace the traditional songs, and *Christmas Bush For His Adorning* makes up for the absence of evergreen balsam and fir. The A.B.C. Adelaide Chorus, directed by Norman Skinner, sings ten of them and the Hurlstone Choral Society performs *The Country Carol,* and *Merry Christmas.* Each is a new and rewarding experience.

This growing collection is remarkable for its scope, care of production, and the absence of an attempt to commercialize the season. A few familiar tunes appear more than once, but every setting is varied. Let's hope for another set next year.

Viennese Zithers

Capitol T10076

Those persons who are waiting for another collection from Anton Karas may be appeased by the debut in this country of two similar virtuosi. Zither players are as individualistic as jazz pianists and their styles are as distinctive. Here the material is fresh, unpretentious, and well recorded. In sharing the disc, Franz Brandlhofer confines himself to four of his own compositions. Of the eight numbers by Karl Jancik, two are his own. Both show a fondness for march and polka tempos that are almost as dear to the Viennese as the waltz, but are lingeringly romantic on the heady strains of three-quarter time.

Sutton Place South
Audio Fidelity AFLP1873

Jackie Gleason: Rebound
Capitol W1075

Robert Farnon: Cocktails For Two
Richmond B20005

The plush world of the mood album is often as attractive to the classical musician as to the jazz performer, and the viola virtuoso Emanuel Vardi is the latest to succumb to the lure. In arranging a dozen ballads for a string sextet, he makes few concessions by way of useless ornamentation and inflated emotion. Except for a slightly more opulent tone and a comforting shimmer from the violins, Vardi lavishes the same care he would give any other classic composition on *Laura, Yesterdays,* and *In the Still of the Night.* Just as the jazz artist does from another direction, his forthright and honest treatment brings a breath of fresh air into a cloistered environment. The recording is close, brilliant, and pleasantly dry.

Jackie Gleason never respects the conventions in his approach to a mood and his fourteenth undertaking is no exception. The romantic oboe d'amour of Romeo Penique is matched with the personable piano of Bernie Leighton over a distant background of a large string section. The tempos are indolent and his sentiments are those of regret on *Nevertheless, Close Your Eyes,* and *Without Love.* He challenges Vardi only on Jerome Kern's *All the Things You Are.*

But stereo is making inroads into this lush area, a sign of the times exemplified by London's new low-priced line. Much of its early LP product seems destined to appear on the Richmond label, with a preponderance of mood music in the first popular release. Robert Farnon heads the list, being allotted three albums to two each from Ronnie Munro, Monia Liter, and Stanley Black. Although the plastic is not the same grade used by the parent label, the pressings are durable and free of surface noise, unlike some marketed in this price range. Æ



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CIRCLE 64A

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CIRCLE 64B

CIRCUITS

(*from page 40*)

"Spring Curtain Rod." One popular size is ¼" in outside diameter, about ⅛" in inside diameter, and is cadmium plated which facilitates soldering and prevents rust. It sells for about 25 cents a length.

This ¼" O. D. spring curtain rod just fits into the brass fittings designed for ¼" copper tubing, commonly sold under the trade name "Weatherhead." Most of the couplings also fit the threads of Amphenol microphone plugs, so that a complete shield from the back of the plug to the internal connection can be obtained by use of an Amphenol microphone socket, a Weatherhead sleeve, and a length of ¼" spring curtain rod.

In critical circuits, the spring curtain rod is insulated from chassis at all points except one, where it is intentionally and firmly grounded. This eliminates ground loops.

Tests with this material show that it is very effective at low and medium frequencies, but causes marked attenuation and wave form distortion is used at frequencies above about 100 kc. Æ

TAPE TENSION

(*from page 36*)

Since the effective tension with which the tape operates represents the total history of all the tension events encountered during its passage from reel to reel, the tension measurement should be made just before the tape enters the final wind-up reel. Under operating conditions tension measurements have shown as much as 300 per cent variation between different makes of recorders. The lower and more uniform the tape tension is, the better the condition for the proper performance of the recorder.

From the viewpoint of computation and high fidelity recording the distance between two signals can be made precise at uniform tension since the tape is stretched the same amount at all times. This is an important factor in data handling, in precise computing mechanisms, magnetic tape memories, and similar applications where the distance from peak-to-peak of the magnetically recorded signal is critical.

Tension, a factor still frequently neglected in electronic engineering and its associated fields, should be given the serious consideration it deserves. Tension measurement and subsequent tension control will help the engineer to improve the mechanism for the adequate translatory motion of tape in recording devices of every type.

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HI FI WITH COFFEE AROMA

(*from page 21*)

tion and displays its album cover for the audience. Patrons are welcome to stay and enjoy the music as long as they like; with no compulsion to buy more coffee. We find the hi-fi music-coffee combination a delightful one though, and order several times during the recorded concert. Therein lies the economic soundness of good sound.

A few hours spent in one of Tokyo's better coffee shops are enough to convince one that good coffee, pleasing and imaginative decor, and high-fidelity music are an extraordinarily good combination. The coffee shops create among their patrons a desire to own their own recordings and equipment. They offer a superior standard of audio reproduction for the active audiofan to aspire to. Most important of all, they offer the man in the street an opportunity to enjoy full-length musical performances by the world's best musicians, reproduced on top flight equipment in an atmosphere conducive to listening.



Coffee-shop manager displays his amplifier equipment mounted in a professional relay rack.

In the author's opinion, the coffee shops of Japan do a far superior job of championing high fidelity and stereo than do most radio parts houses and audio showrooms; here or abroad. An enjoyable full-length musical performance presented in a relaxing atmosphere seems far more apt to sell audio equipment or records than is a raucous demonstration in the hustle and bustle of a typical showroom. It is suggested that a coffee shop would make a profitable adjunct to a high fidelity store. A well-managed coffee shop could earn profits on its food and beverage sales and at the same time serve as the finest kind of advertisement for its parent organization. The shop would allow music lovers and audiofans to sharpen their ears to the superior performance of high-grade equipment, thereby easing the job of selling and educating in the actual store next door .

Hi-fi coffee shops here in the United States would bring many of us an inexpensive respite of pleasure and relaxation to the tune of good music, faithfully reproduced, in pleasant surroundings. Æ

AUDIOCLINIC

(*from page 4*)

gain is that of defective coupling capacitors.

Still another source of trouble can be a cold-solder joint. Such joints seem good at the time they are made and indeed, they may work properly for some time, but ultimately some resin will penetrate among the various leads making up the connection and this will cause the resistance to rise, sometimes to infinity.

Another possibility is that one half of the output transformer has opened. This can lead to both loss of gain and to instability, especially when the output stage derives its bias through a dropping resistor in the cathode circuit.

Another possibility is that the feedback-loop resistor has changed value. If it has become smaller, more and more voltage will be fed back from the output stage, thereby reducing the gain of the amplifier. Further, excessive feedback can cause instability because of shifts in phase of some of the components, especially the output transformer. Although there are always phase shifts, they are not always great enough in their effects until the feedback increases beyond that intended by the designer of the equipment.

If feedback capacitors open or become larger, depending upon their location in the circuit, instability can arise because of excessive feedback or by additional phase shifts which the capacitor was designed to counteract.

If you have an AC VTVM, check the gain of each stage and find the one which is causing the trouble; then concentrate your search there. It may be helpful to disconnect the feedback circuit, lest it influence the gain. If all stages operate normally, you must then look into the feedback circuit. Measure the gain at various frequencies with and without feedback; if it is reduced when feedback is applied by more than 20 or 25 db, than excessive feedback is probably present. For an accurate appraisal of the feedback problem, consult the design notes of the equipment to see just how much feedback is supposed to be present. Æ

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That was 15 years ago, when only 1 out of 4 persons with cancer was being cured. Today, thanks to improved methods of treatment, and earlier diagnosis, 1 person in 3 is being saved.

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AMERICAN CANCER SOCIETY

ABOUT MUSIC

The Music Goes Round and Round

HAROLD LAWRENCE*

IN 1887, the year of Queen Victoria's Jubilee, Her Majesty was said to have been presented with a rather unusual gift: an ingeniously contrived bustle containing a music box whose mechanism was triggered when the wearer sat down. Appropriately, the tune it played was "God Save The Queen." This contraption was one of the more outlandish varieties of mechanical instruments that have titillated the world ever since the invention of the weight-drawn clock. Only the advent of the phonograph brought to a halt the voluminous outpouring of barrel organs, flute clocks, music boxes, nickelodeons, and related musical mechanisms. In recent years, however, we seem to be witnessing a revival of interest in some of these relics, particularly in music boxes. The new trend is sending Americans scurrying up to their attics to rummage through old trunks and dressers. The reason: antique dealers today draw prices from $1 up to $5000 for old music boxes. In 1949, an international music box society was founded with 16 members; the figure last year was 200. More than 40,000 LP's, recorded from the collection of music-box dealer, Ruth Bornand, have been sold since 1947. Player-pianos, too, have come back into fashion. A New York music house, for example, hires a man to sit in a display window demonstrating the joys of operating the instrument. Last month, a record company cut an LP of popular music especially arranged for player-piano with small band.

The role of mechanical instruments in musical history is assuredly of minor importance. In a masterpiece of understatement, the late British musicologist, Percy Scholes, wrote, ". . . they have sometimes been inspired rather by the desire to astonish than by definitely artistic aims."

Early Beginnings

For more than three centuries, the musical world has been regaled with automatic organs, harpsichords, pianos, violins and carillons; it has gaped at the spectacle of Lilliputian musicians, singers, and full orchestras performing everything from anthems to operatic preludes. For visual embellishment, doll-like ballerinas and folk dancers in colorful native costumes executed splits and *entrechats* atop tiny harpsichords and on miniature stages, in time with the automatically produced music.

Until the 19th century, mechanical instruments operated on the barrel-and-pin principle. One of the earliest and most celebrated of these devices was a mechanical virginal found in the collection of Henry VIII. It was described by a contemporary as "an instrument that goethe with a whele without playing uppon." The "whele," or barrel, was clockwork-driven and its projecting pins engaged levers that raised the jacks. While this gadget must have elicited cries of amazement from the English court, half a century later, Henry's daughter, Elizabeth, sent an extravagantly complex automatic instrument to the Sultan of Turkey which put the mechanical virginal to shame. Actually, the queen's gift was a combination of several instruments: a 16-foot-high organ (driven by a mechanism similar to that of the virginal, except for the addition of bellows), a carillon, "trumpeters," "singing byrds," and other miraculous features. Performances took place every six hours. The program consisted of the following:

1. A 16-bell carillon played a four-part melody.
2. A pair of tiny men raised silver trumpets to their lips and "sounded a tantarra."
3. The organ was heard in a five-part tune "played twyse over."
4. Blackbirds and thrushes shook their wings and sang.

Singing birds figured in a later invention called the *serinette*, a little high-pitched barrel organ designed to teach canaries to sing. Other versions of serinettes included the *merline* (for blackbirds), and the *turlutaine* (for curlews ?). Not for the birds was another barrel organ, the *orgue de barbarie*, a street organ closely identified with London. According to ear-witness reports, it is still heard in the English capital from time to time. Equally durable as an out-of-doors instrument was the *omnibus*, the invention of a Parisian serinette manufacturer. With this mechanism, a driver could sound coachhorn tunes by means of a pedal-pushing device. In Switzerland, a descendant of the omnibus is still being used by postmen.

The Barrel Organ

The barrel organ was alternately referred to as a "musical clock" or "flute clock." Handel, Haydn, Mozart, and Beethoven wrote pieces for this instrument, but only Mozart's contributions transcended the toy-like nature of the medium. Curiously, he found it difficult to compose for the mechanism: "If it were for a large instrument and the work would sound like an organ piece, then I might get some fun out of it. But, as it is, the works consist solely of little pipes, which sound too high-pitched and too childish for my taste." In view of this, how can one account for the monumental *Fantasia in F Minor* (K. 608), one of the great works in the entire organ literature?

* *26 W. Ninth St., New York 11, N. Y.*

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is Ukranian—or Caucasian, Armenian, Lithuanian, Latvian, and I don't know how many other regionalities. Most of them will be pleasurable to anybody who likes the type of folk music dished out so widely in those Eastern countries—popular local tunes fixed up with melodious orchestrations, symphonic but with accordions, zithers, local instruments, sung by genial solo voices in the local language, or by enthusiastic choruses, older people and kids too. Fun, and hi-fi as well.

This one is really quite pleasing, though I haven't the vaguest idea what they're laughing, or sighing, or singing about. Nice tunes, inoccuously musical arrangements, gorgeous singing voices, excellent choirs. If it weren't for the mass of other stuff on hand, I'd just as soon spend a couple of days in the Monitor catalogue.

Maybe you have time to. You'll be glad.

Diesel and Steam Locomotives. Silent Movie Music. Calliope Music. Carousel Music. Chime Music. Authentic Coinola Sampler. (All Major LP records)

I hadn't heard from my old acquaintance Thomas J. Valentino—for a good dozen years. He used to put out those ten-inch 78-rpm Major sound-effects records that were stock in trade in every radio station for years. (I once made a zany radio program out of them in the days before hi-fi.)

Now he's out to beat the competition in hi-fi (he named it, I won't) and these are his bids, each a single 12-inch hi-fi LP with a pretty cover.

Nope, I haven't played 'em all. How can I keep up with Bach *and* Valentino? But I sampled here and there. The Chimes are technically tops, very sharp and clean, the single melody backgrounded with vibraharp. (Musically: ugh.) The Coinola is terrific—best I've heard. The Movie Music is authentic as all get-out. The Calliope, alas, is an electric one. What we want, obviously, is steam—and the sound "that can be heard ten miles," recorded preferably outdoors, about half a mile down the line. This one is maybe ten inches away and *very* docile, as well as out of tune. (*Thos. J. Valentino, 150 West 46th St., N. Y. C.*)

5. CLASSICS YOU MIGHT LIKE TO TRY

(Note: I have a very limited ear for repetition of a given piece in numerous versions—good *or* bad. The third version of a Beethoven Symphony or "The Moldau" begins to pall on me and the fourth is unbearable, regardless. So I put many of the endless duplications aside, hoping to get around to them impartially later on. Still later, they are buried dozens deep in newer arrivals, and that is that.

You might want to try some of these—they look like good-to-excellent bets to me (but I gotta stop somewhere). Those with a star are particularly good bets, I'd expect. Make good Xmas presents. E.T.C.)

* **Prokofiev: Classical Symphony. Weinberger: Schwanda—Polka and Fugue. Bizet: Symphony in C.** Phila. Orch., Ormandy. **Col. ML 5289.**

Moussorksky: Night on a Bald Mountain. Borodin: On the Steppes of Central Asia. Glinka: Kamarinskaya. Orch. Conc. Lamoureux, Fournet, Dorian. **Epic LC 3432.**

***Wine, Women and Song.** Men's Choral Soc. of Vienna, Vienna Symphony, Etti, Strauss. **Epic LC 3469.**

* **Leonid Kogan—Tchaikowsky Violin Concerto, Vivaldi, Locatelli. Angel 35444. Paganini Violin Concerto. Angel 35502.**

Schubert: Symphony #8 (Unfinished). Mendelssohn: Midsummer Night's Dream. Phila. Orch. Ormandy. **Col. ML 52221.**

Schubert: Symphonies #6, #8 (Unfinished). Concertgebouw. Van Beinum. **Epic LC 3441.**

* **Stravinsky: Petrouchka.** Philharmonia, Kurtz. **Angel 35552.**

* **Berlioz: Symphonie Fantastique.** Orch. Nat. Rodiodiffusion, Cluytens. **Angel 35448.**

Bartok: Concerto for Orchestra. Berlin Radio Orch., Fricsay. **Decca DL 9951.**

* **Bruckner: Symphonies #4, #7.** Symph., Bavarian Radio, Berlin Philharmonic, Jochum. **Decca DXE 146 (3).**

* **Bizet: Carmen, L'Arlesienne Suites** Vienna Opera Orch., Rossi (demo. disc). **Vanguard SRV 107.**

Merzhanov Plays Rachmaninoff Piano Concerto #3, Paganini, Liszt. Monitor MC 2012.

Francescatti. (Sarasate, Saint-Saëns, Chausson). **Col. ML 5253.**

Francescatti Plays Kreisler. Col. ML 5255.

Jean Doyen—Chopin Waltzes. Epic LC 3468. Æ

OUTPUT POWER

(*from page 38*)

waves, superimposed upon each other is the square wave (*Fig.* 3).

The square wave does not vary throughout the complete cycle as extensively as does the sine wave. During each half of the cycle, the square wave behaves as if it were d.c. Since the voltage, E_{max}, remains constant through 180 deg., the average voltage is obviously E_{max}. Since the same voltage exists in the negative half of the cycle, the effective or rms voltage of a square wave through a complete cycle is E_{max}.

Measuring the square-wave power delivered by an amplifier is analogous to that of the sine-wave example (*Fig.* 1). An audio-frequency square wave is fed into the input of the amplifier. The output is observed on an oscilloscope. The gain is turned up until the maximum

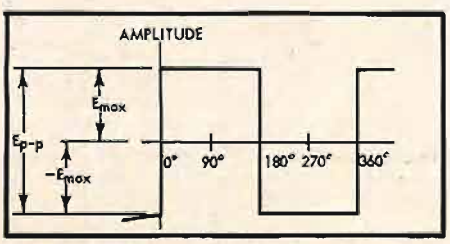


Fig. 3. Shape and dimensions of a square wave.



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output is reached while the rectangular shape is retained. A peak-reading voltmeter is connected across the output load resistor. The power is calculated from

$$P = E_{max}^2/R \qquad (6)$$

where E_{max} is the peak voltage.

Most meters are designed to indicate peak-to-peak rather than just one peak. In this case, $E_{p\text{-}p}$ (peak-to-peak voltage) is $2E_{max}$, or $E_{max} = E_{p\text{-}p}/2$, then the power is shown by the equation

$$P = \left(\frac{E_{p\text{-}p}}{2}\right)^2 \left(\frac{1}{R}\right) = \frac{E_{p\text{-}p}^2}{4R} \qquad (7)$$

Evaluation

At present, practically every manufacturer arrives at the peak power specification by multiplying the average power by two. They assume that the amplifier can deliver the peak of the cycle throughout a complete cycle. This is actually a square-wave voltage peak. My measurements on various output transformers shows that this is not always true.

Feeding a midband square-wave signal into an amplifier and measuring the peak to peak output from the amplifier due to the square-wave input signal seems to be a more exact and significant measurement of maximum power output.

The square wave is the only type of waveshape in which the voltage never goes below its peak value, E_{max}, at any point in the cycle. There is a peak voltage across the load throughout the complete cycle. Thus, when maximum or peak amplifier power output is specified, the figures would refer to the maximum square-wave power an amplifier can deliver. This is the actual peak-power capability under any conditions.

Criticisms of this latter method do exist. While in the sine wave method, the actual percentage of distortion can be measured on accurate instruments, the square wave form at the peak output can only be observed on a 'scope by eye. Although a valid criticism, this certainly does not, at the same time, justify the former method of doubling the sine-wave power output.

A further criticism is that at low square-wave frequencies, there is too much tilt due to phase shift to measure the voltage accurately. If this argument were valid, average power should be rated at the low frequency as well, where it usually takes a sharp drop. However, both average and peak powers are rated at their maximum undistorted frequencies in the middle of the audio spectrum.

Alternative Method of Specification

One manufacturer, although continuing to specify peak power output so as not to be outdone by the large figures given by other manufacturers, showed me his new specification sheet, which he considers the most accurate method of stating amplifier performance.

Besides the usual set of selected specifications, he also had a graph of power output over the entire range from 20 to 20,000 cps. He drew two graphs on one sheet.

First he plotted the power output for constant voltage input throughout the complete audible range. He did this at the rated power output, 3 db below rated output, 6 db below rated output, and at the ½-watt output level. In this way, he showed the complete power and frequency response curves.

In the second plot on the same graph paper, he showed the power output that can be obtained at six harmonic distortion levels between 0.1 per cent and 2 per cent.

This set of curves, when studied carefully can reveal much more about an amplifier's power output than any meaningless astronomical figures can. These curves should become part of the standard specifications supplied by manufacturers.

Appendix

The RMS voltage of Eq. (5) and the average power of Eq. (6) can be derived directly from the equation defining sine-wave voltage, Eq. (2).

$$E = E_{max} \cos 2\pi ft \qquad (2)$$

The meaning of the constants have been stated in the text.

Substituting this into Eq. 1, power at any specific instant of time during the cycle is

$$P = E^2/R = E_{max}^2 (\cos 2\pi ft)^2/R$$

The expression $(\cos 2\pi ft)^2$ can be expanded trigonometrically[1] as follows:

$$(\cos 2\pi ft)^2 = \tfrac{1}{2}[1 + \cos 2 (2\pi ft)]$$
$$= \tfrac{1}{2}(1 + \cos 4\pi ft)$$

and substituting this into the above equation for power, results in

$$P = \frac{E_{max}^2}{R} (\tfrac{1}{2}) (1 + \cos 4\pi ft)$$

This equation is an expression of the power at any specific instant of time during the complete cycle. The average power throughout the cycle, the actual measured value at the output of an amplifier, is derived by simply studying this last equation. Over a complete cycle, the term $\cos 4\pi ft$ becomes zero due to zero-axis symmetry. The power equation preceding becomes

$$P_{av} = E_{max}^2/R \; (\tfrac{1}{2}) \; (1 + 0)$$
$$= \frac{E_{max}^2}{2}\left(\frac{1}{R}\right) = \left(\frac{E_{max}}{\sqrt{2}}\right)^2 \left(\frac{1}{R}\right)$$

The quantity in the parenthesis, $E_{max}/\sqrt{2}$ is the rms value for voltage, as indicated in Eq. (3). The average power is as shown in Eq. (4). Æ

[1] F. Langford-Smith, *Radiotron Designer's Handbook*, Radio Corporation of America, 1952, p 278.

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NEW LITERATURE

• **Rangertone, Inc.,** 73 Winthrop St., Newark, N. J., will mail free a new 8-page illustrated catalog and price sheet covering the firm's synchronous quarter-inch magnetic recording equipment. Included are information and prices on the unique Rangertone "Sync Kits," which can be installed on practically any existing tape recorder, regardless of make, and which makes possible the recording of lip-sync sound for motion pictures with your present equipment. **N-14**

• **H. H. Scott, Inc.,** 111 Powdermill Road, Maynard, Mass., announces the release of a new 20-page high-fidelity guide and product catalog. In addition to illustrating and describing the Scott line of high-fidelity components, this free publication includes sections which explain both stereophonic and monophonic systems for sound reproduction. It shows a number of methods for building a home music system. Your request for a free copy should be sent to Department P, at the address shown above. **N-15**

• **Special Products Division, Stromberg-Carlson,** 1400 N. Goodman St., Rochester 3, N.Y., will mail free a colorful new brochure covering its entire new line of high-fidelity components. Besides illustrations of the products in actual color, a two-page spread in the back of the booklet details complete specifications of all amplifiers and speakers in easy-to-read tabular form. This publication is as handsome in design as it is serviceable in use, and should be in the hands of every potential buyer of high-fidelity components. Write for it. **N-16**

• **Amplifier Corp. of America, Transformer Division,** 398 Broadway, New York 13, N.Y., has just published a circular fully describing and illustrating a new line of mu-metal shielded, epoxy impregnated, miniature transformers explicitly designed for transistor application. This literature gives in detail features of thirteen basic types of input, driver, output, and interstage transformers which can be used in 90 different impedance-matching circuits. The transformers' four frequency-response curves ranging from high fidelity to general purpose applications are graphically depicted and coded to simplify selection. A complete listing of performance characteristics and direct factory prices are tabulated for easy reference and choice. Copies are available without cost upon written request. **N-17**

• **Commercial Engineering, RCA,** Harrison, N.J., announces the availability of Application Note AN-174 entitled "Design-Maximum System for Rating Electron Tubes." This publication reviews the significant differences between the three rating systems currently in use by the electron-tube industry—the Absolute-Maximum, Design-Center, and Design-Maximum systems. Copy will be mailed upon written request. **N-18**

• **Burgess Battery Company,** Freeport, Ill., has published as an aid to product design engineers what is said to be the most comprehensive manual on the use and selection of dry batteries ever prepared by the battery industry. The 100-page compendium was created to provide industrial engineers and research specialists with an invaluable engineering reference guide. Batteries covered in the handbook range from 1.5 to 510 volts and weigh from 0.013 to 16 lbs. To provide a scientific yardstick for designers to estimate the life of batteries, Burgess engineers have prepared 63 detailed graphs showing service life in hours at various initial current drains for both continuous discharge and for discharge of four hours per day at a 70-deg. F. controlled temperature. Engineers engaged in the design of battery-powered equipment may write to Dept. P to secure their copy of the battery engineering manual. Others may purchase the manual at a cost of $1.00.

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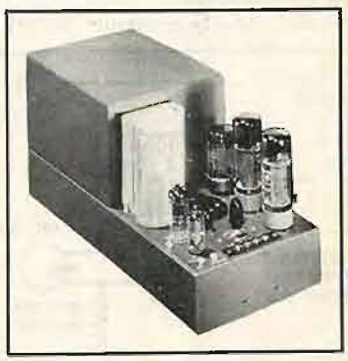
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A-440	120 watts	KT-88, 6550	39.95
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Conversion kits to permit stereo replay are now available in limited quantities to owners of non-stereo tape recorders.

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CIRCLE 72B

VU METER

(*from page 19*)

particularly transients, may be of such amplitude as to damage the meter, especially if record level were accidentally set too high. (3) If the meter is used to compare playback level with the incoming signal, proper comparison would not be obtained if the incoming signal were metered after treble emphasis.

Record Level Calibration

As shown in *Figs.* 1, 2, and 6, a variable calibrating resistor enables the VU meter to read 0 VU at a recording level which produces maximum permissible distortion on the tape. Miscalibration defeats the basic purpose of the indicator.

Calibration is usually based on a record signal producing 2 or 3 per cent harmonic distortion, although 1 per cent is also used. While these amounts of harmonic distortion seem relatively innocuous for peak signals, it should be borne in mind that the corresponding IM distortion may be much greater. Thus 1 per cent harmonic may correspond to about 5 to 10 per cent IM, while 3 per cent harmonic may entail 20 to 30 per cent IM.

The principal disadvantage of the VU meter compared with electronic indicators is that it reads average rather than peak levels. Due to mechanical inertia, it cannot follow sharp transients, which may exceed the average level by 10 to 20 db. Such transients can cause very severe, though brief, distortion.

Therefore in calibrating a VU meter it is desirable to allow for the difference between the indication of average level and the actual peak level. Many, though not all, professional machines provide a margin of 6 to 10 db by causing the VU meter to read 0 VU for a sine wave signal (usually 400 cps) which is 6 to 10 db less than that which produces maximum permissible distortion (1, 2, or 3 per cent, depending upon the manufacturer's sights).

It is not strictly necessary to set the

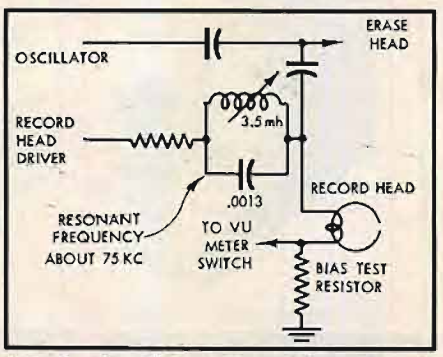


Fig. 8. Use of a resonant trap to prevent bias current from reaching the record head driver and earlier stages. (Presto SR-27.)

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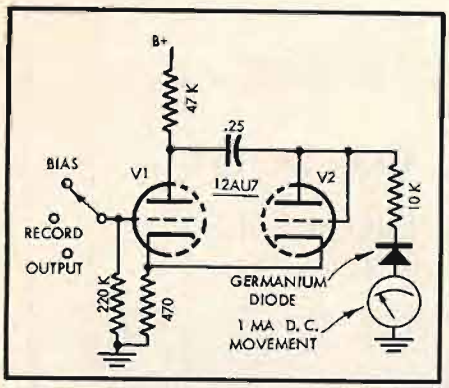


Fig. 9. A VTVM-type meter used in a tape recorder. (American Electronics.)

meter ahead in this manner, for the recordist could instead adjust record level so that the meter pointer always stays about 6 to 10 db below 0 VU. However, this crowds the working range of the meter into a relatively small part of the scale.

Interpreting the Meter Indication

Even though the VU meter allows for the difference between indicated and actual level, the recordist must still exercise judgment and bring experience to bear. Various types of sound have varying relationship between peak and average level, so that allowing the pointer to hit 0 VU may result in over-recording in one case and under-recording in another. Moreover, distortion is less objectionable in some circumstances than in others, and this too should be taken into consideration in setting record level on the basis of what the VU meter shows.

Eliminating Bias Pickup

Tape recorders must take precautions to prevent bias current from inadvertently reaching the VU meter and thereby causing it to indicate higher than it should. One measure has already been discussed, namely separating the meter circuit from the record head by connecting this circuit prior to the equalization stages.

Other precautionary devices consist of filters or traps. *Figure* 7 shows a two-stage low-pass filter, which permits the audio frequencies to reach the VU meter, but rapidly attenuates the bias current, which is much higher in frequency, 60 to 100 KC being typical in high-quality recorders.

Figure 8 shows a resonant trap having a very high impedance at the bias frequency and a relatively low impedance at audio frequencies. Audio current can flow from the record amplifier through the trap to the record head, but bias current cannot flow to a significant extent in the reverse direction.

A breakdown in circuits such as the above can impair the validity of the meter indication and thus affect the quality of the tape recording.

The VTVM Indicator

In closing it is appropriate to mention that not every meter with a VU scale is a standard VU meter. There are also some non-standard ones, which may or may not be equally satisfactory.

Since the standard VU meter is very sensitive and therefore costly, manufacturers of tape recorders sometimes employ a less sensitive movement, typically 1 ma, and drive it by means of a voltage amplifier. This is in effect a VTVM. An example of one appears in *Fig.* 9. Although 1-ma movements with the same characteristics as a VU meter are not available as a stock item, they can be obtained by a manufacturer on special order. In such a case there would be no disadvantage to the user. Æ

AUDIO ETC.

(*from page 12*)

channel.

This, I say, is the only way! On any FM radio the Crosby-type main channel brings not merely one side of the stereo sound but a complete monophonic transmission—for that is what a sum signal is. The multiplex adapter, bringing in the second channel, adds the stereo difference signal; re-matrixing sorts them out again into right and left stereo channels, for full stereo.

Now this use of sum-and-difference is, you'll see, strikingly related to many other aspects of present stereo. The stereo disc, with its single groove, contains the sum signal in its lateral modulation, the difference signal in the vertical. Via the same sum-and-difference matrixing you can cut a 45/45 disc with a lateral-vertical cutting head, or vice versa. The M-S stereo microphone system produces sum and difference signals, too, which are matrixed similarly into right and left channels.

But there's a big practical complication. Sum-and-difference as applied to FM multiplex stereo is covered, if I am right, by a Crosby patent or patents. It cannot be used indiscriminately, just because you think it's a good idea. Gotta have a license. The principle itself is tied up with the very practical arrangements that must be made with the Crosby interests, so to speak, on the hoof.

Surely this accounts in part for the fact that the other major stereo multiplex contender, the Halstead system, does *not* employ sum-and-difference. Maybe the Halstead people really feel that it isn't required. Perhaps they are enthusiastic about their argument that a straight right-track, left-track broadcast, one track on the main channel, one via multiplexing, is best because then you can substitute an AM station for the multiplex channel if you want. (I.e., one track via FM, the other via either FM multiplex *or* AM). I am not impressed with this argument at all, nor do I think it proposes any but a highly temporary "compatibility."

Any way you look at it, a stereo system that broadcasts without sum-and-difference

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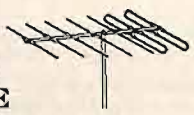
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Industry Notes . . .

ARMOUR INTRODUCES COMPATIBLE TAPE CARTRIDGE. Compatibility with both standard tape recorders and tapes is inherent in a self-threading tape cartridge shown to industry officials by **Armour Research Foundation of Illinois** at a meeting in Chicago on November 12. Consisting of a flanged spool and a graded leader with a catch, the cartridge is so designed that the catch engages with a pre-threaded leader in the mechanism. When recording is completed an end leader reverses the drive for rewind. According to John P. Skinner, manager of magnetic recording at Armour, the new device will not make obsolete recorders already on the market. Marvin Camras, senior physicist at the Foundation, designed the self-threading cartridge.

AUDIO DEVICES ADDS PLANT SPACE. Magnetic tape production facilities will be expanded by 20,000 square feet in the Stamford, Conn., plant of **Audio Devices, Inc.,** within the near future. The addition, the second within a year, will raise the company's production to 100,000 square feet. William C. Speed, Audio Devices president, stated that greatly increased activity in instrumentation tape sales was responsible for the expansion.

REK-O-KUT CONTEST WINNERS. Termed a glowing success by company officials, the recent window-display contest conducted by **Rek-O-Kut Company** to stimulate dealer interest in component merchandising was won by M. A. Gribble of the Sixth Avenue Record Shop, Portland, Ore., who was awarded a trip to Paris and the Brussels Worlds Fair. Second and third prizes of trips to Bermuda were won by Jim Conoscenti of the Concerto Room, Inc., Pittsburgh, Pa., and Dennis E. Wonn of Boyde-Wonn Hi-Fi Shop, Vallejo, Calif.

AUDIO FIDELITY ANNOUNCES CLASSICS. Primarily a popular record firm until now, **Audio Fidelity Records** will enter the classical field with a group of releases scheduled for February. Emphasizing its growth in the record industry, Audio Fidelity ran a six-page gate-fold advertisement in the November issue of "True" magazine to launch a $100,000 promotion built around a nationwide window display contest for record retailers. Present plans call for the new A-F classics to sell for the same price as regular popular releases.

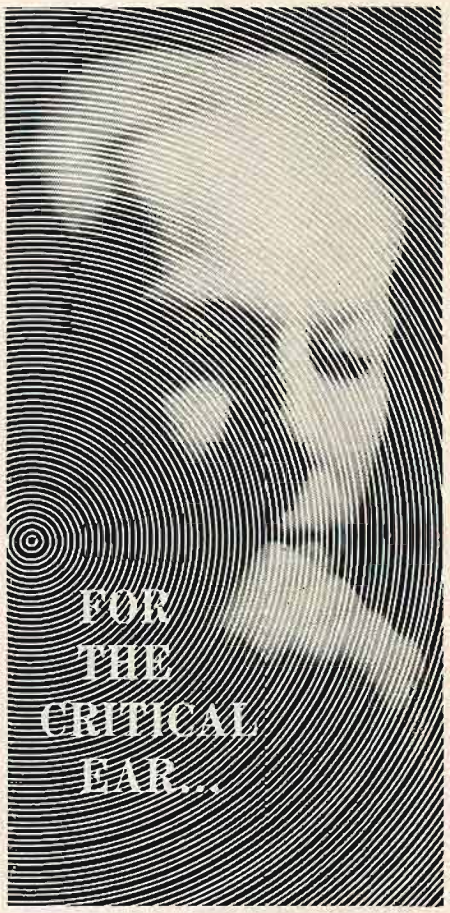
PEOPLE AND THINGS. Joseph N. Benjamin, formerly executive vice-president of Pilot Radio Corporation, and currently president of the Institute of High Fidelity Manufacturers, has been named president of the Bogen-Presto Division of Siegler Corporation. He succeeds **Lester Bogen** who resigned several weeks ago. For the time being Mr. Benjamin's responsibilities at Pilot will spread among other company executives . . . **Avery Fisher,** a director of the Institute of High Fidelity Manufacturers and president of Fisher Radio Corporation, has been named chairman of the Institute's nominating committee to select candidates for the posts of officers and directors. Elections will be held by the general membership in January . . . **Edward Claffey** has been appointed divisional sales manager for Reeves Sounderaft Corporation.

ADDITIONAL CLASSIFIED

MAGNECORDER PT-6 recorder amplifier, $375; Presto disc 6N turntable, 1D cutter, 112, 136, 188, 224 lpi, 3-speed, $350; 75A (Model Y) turntable, 1C cutter, 112, 224 lpi, 3-speed, $90; Presto tape RC-10/14 recorder and A920 record-playback amplifier, $350. All first class. Ace Sound Service, 1626 Federal St., Phila. 46, Pa.

Brook 7B preamplifier wanted. M. Seldman, Room 1916, 205 E. 42nd St., New York 17, N. Y.

CROSSOVER NETWORK KITS. Write Watson Industries, 110 Mildred Avenue, Venice, Cal.



introducing the incomparable

SHURE PROFESSIONAL

Stereo Dynetic
PHONO CARTRIDGE

The Shure Stereo Dynetic Cartridge is designed and made specifically for the listener who appreciates accuracy and honesty of sound. It separates disc stereo sound channels with incisive clarity. It is singularly smooth throughout the normally audible spectrum . . . and is without equal in the recreation of clean lows, brilliant highs, and true-to-performance mid-range. Completely compatible . . . plays monaural or stereo records. It is manufactured in limited quantities for the music lover—is available through responsible high fidelity consultants and dealers at $45.00, audiophile net, complete with 0.7 mil diamond stereo stylus.

A NOTE TO THE TECHNICALLY INCLINED

Individually tested . . . Frequency response: 20 to 15,000 cps. . . . Output level: 5 mv per channel at 1000 cps. . . . Compliance: 4.0 x 10^{-6} centimeters per dyne . . . Channel separation: More than 20 db throughout the critical stereo frequency range . . . Recommended Tracking Force: 3 to 6 grams . . . Fits all 4-lead and 3-lead stereo record changers and transcription-type arms . . . 10 second stylus replacement.

Literature available: Department 10-L

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

CIRCLE 77A

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ONLY 7.45 DOWN
7.00 MONTHLY

More than a year of research, planning and engineering went into the making of the Lafayette Stereo Tuner. Its unique flexibility permits the reception of binaural broadcasting (simultaneous transmission on both FM and AM), the independent operation of both the FM and AM sections at the same time, and the ordinary reception of either FM or AM. The AM and FM sections are separately tuned, each with a separate 3-gang tuning condenser, separate flywheel tuning and separate volume control for proper balancing when used for binaural programs. Simplified accurate knife-edge tuning is provided by magic eye which operates independently on FM and AM. Automatic frequency control "locks in" FM signal permanently. Aside from its unique flexibility, this is, above all else, a quality high-fidelity tuner incorporating features found exclusively in the highest priced tuners.

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The 5 controls of the KT-500 are FM Volume, AM Volume, FM Tuning, AM Tuning and 5-position Function Selector Switch. Tastefully styled with gold-brass escutcheon having dark maroon background plus matching maroon knobs with gold inserts. The Lafayette Stereo Tuner was designed with the builder in mind. Two separate printed circuit boards make construction and wiring simple, even for such a complex unit. Complete kit includes all parts and metal cover, a step-by-step instruction manual, schematic and pictorial diagrams. Size is 13¼" W x 10⅜" D x 4½" H. Shpg. wt., 22 lbs.

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KT-600 **79.50**
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- AMAZING NEW BRIDGE CIRCUITRY FOR VARIABLE 3d CHANNEL OUTPUT & CROSS-CHANNEL FEED
- PRECISE "NULL" BALANCING SYSTEM

A REVOLUTIONARY DEVELOPMENT IN STEREO HIGH FIDELITY. Provides such unusual features as a Bridge Control, for variable cross-channel signal feed for elimination of "ping-pong" (exaggerated separation) effects and for 3d channel output volume control for 3-speaker stereo systems; 3d channel output also serves for mixing stereo to produce excellent monaural recordings. Also has full input mixing of monaural program sources, special "null" stereo balancing and calibrating system (better than meters), 24 equalization positions, all-concentric controls, rumble and scratch filters, loudness switch. Clutch type volume controls for balancing or as 1 Master Volume Control. Has channel reverse, electronic phasing, input level controls. Sensitivity 1.78 millivolts for 1 volt out. Dual low-impedance outputs (plate followers), 1300 ohms. Response 10-25,000 cps ± 0.5 db. Less than .03% IM distortion. Uses 7 new 7025 low-noise dual triodes. Size 14" x 4⅛" x 10¼". Shpg. wt., 16 lbs. Complete with printed circuit board, cage, profusely illustrated instructions, all necessary parts.

- RESPONSE 10-25,000 CPS ± 0.5 DB
- 6 CONCENTRIC FRONT PANEL CONTROLS
- 4 CONCENTRIC REAR PANEL INPUT LEVEL CONTROLS
- 180° ELECTRONIC PHASE REVERSAL

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- EMPLOYS 4 NEW PREMIUM-TYPE 7189 OUTPUT TUBES
- 2 PRINTED CIRCUIT BOARDS FOR NEAT, SIMPLIFIED WIRING
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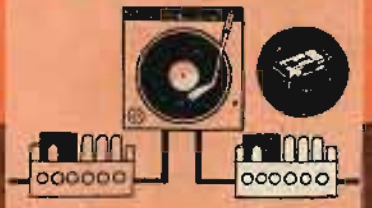
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STEP TWO



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OR

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OR



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[illegible] 3-way enclosure [illegible] (12TRXB) [illegible] Net $178

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