AUDIO ETC.

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1. CROSSTALK TALK.

Perhaps it's just as well that the new stereo tape magazine is taking its time about a public appearance. A good many of us have been fully occupied with the stereo disc, which finally became a commercial reality in force along in the middle of the summer. The problems inevitable in the first splurge of real, down-to-earth, practical disc stereo (as distinguished from advance hoopla, rosy demonstrations, tests, samples and so on) are now showing up and will continue to show up—I'll make a good guess—for at least a solid year before we reach the semblance of an even keel. It took a lot longer than that, remember, to stabilize the original LP development. More of this shortly. Meanwhile, back to the still-existing vacuum that is the stereo tape magazine.

The RCA Victor tape *magazine*—I hereby adopt that term for good, in place of the wholly confusing "cartridge"—was originally announced for release in June, more or less. My last unofficial checkup turned up the interesting thought (from sources usually reliable, etc., etc.) that the first of the stereo tape magazines would surely be in the stores somewhat after publication of this issue, in mid-September! The first magazine tape machines from RCA, on which to play the new tapes, are scheduled to make a nebulous debut at this point; I gather only that by Christmas time you'll be able to give the kiddies a magazine tape stereo record player without too much buying trouble. (Of course there are others than RCA Victor likely to offer tape magazine players in the near future; they may actually beat RCA to it.)

During the summer there were several repeat RCA Victor demonstrations, following up the excellent one that occurred in late May, as reported here in the July issue. There were only a few, I understand, because *the* tape player was constantly being shuttled back and forth from place to place and so was out of action, or elsewhere, most of the time.

Yep, I mean just that. The best of my guess is that there was exactly *one* RCA Victor tape magazine player in semi-public action during most of the summer. Commercial production of the product wasn't yet under way.

Now don't go jumping to wrong conclusions. I am not implying that there has been more than perfectly normal and expected launching trouble in the magazine tape project. I am *not* implying that things have gone wrong, in any but the usual minor and irritating ways. It's for this very reason that I throw out the above casual information.

What I mean is—do not allow the present slow-motion appearance of magazine tape to fool you into underestimating its coming importance and coming values. I'll stand by all I said in the July issue, perhaps even more strongly now, though no major new information has appeared since the first big publicity break and the stuff is still not available, at this writing, for home trial in person. What I wrote was, shall I say, interpretive speculation, based on the available information as released to the press and on brief press demonstration. What little I have learned indirectly since then has only bolstered me in my conclusions.

In this connection, I had an interesting letter from an Ampex official. (The four-track tape system is a joint enterprise involving both Ampex and RCA.) This official, who is on the inside, was "a little more than slightly disturbed"—as he put it—by the fact that I raised the question of possible cross-effects between the four channels on the new tape. There *is* none, he says, and describes his own Ampex demonstrations to the public, which I wasn't able to hear myself. He also gives technical reasons why there should be none, which I'll get to in a moment, since the idea is certainly interesting to all of us who work or play with magnetic tape.

I'll only suggest, for my own record, that I did raise the question of possible cross-talk between the four channels on one quarter-inch tape simply because it is the immediate and obvious question that will jump into any mind, professional or amateur, when the system is first described. *Four* tracks, on one skimpy little tape? No inter-action between the adjacent channels? Impossible! That is a logical thought, it seems to me, for anyone who is not directly involved in the highly technical area of principles and measurements and performances that are involved.

I suggested, rather circumspectly, that I didn't *hear* any cross-talk at the RCA Victor demonstration. That was at least a statement of fact, in the midst of a lot of speculation! I also suggested that neither RCA nor Ampex would be likely to embroil their respective reputations in a tape system where such an objectionable fault as this might occur in practice. The Ampex official—I'll omit his name merely to keep things for the time being on a plane of generalities—reiterated this idea, which I find thoroughly sound. Frankly, I think you can trust both RCA and Ampex not to have got themselves too far into a technical boo-boo in fundamental respects.

Barring a few inevitable preliminary bugs which we can expect as normal, the four-track magazine system will work, will work well, and will satisfy its "most discriminating" users, as the old phrase used to go. Not everybody—Heaven forbid. There are still lots of people who stick by the 78 as the best record (in its hi-fi microgroove form—I'd go along with that, too, aside from the little matter of practicality) and who like to play their tape at 15 inches, or 30, for super perfection. But if you'll admit that some of the standard LP records are quite satisfactory and that at least a few 7½ ips commercial tapes are pretty good, then you will have no cause to expect less from the coming 3¾ ips tapes. That's my expectation. I can't say more, because I haven't done any first-hand home testing.

As to that cross-talk matter, Ampex points out a factor that I didn't know about and, I suspect, many tape users would not know about either. I'll quote directly from Mr. ———'s letter.

"It is *not* the proximity of the various tracks on the tape itself [that causes tape cross-talk between channels]. Cross-talk is a transformer coupling phenomenon between the windings on adjacent head stacks. In fact, in this new four-track system we have better isolation between channels than we have ever enjoyed in any previous type of equipment. This is because the tracks are narrower and the spacing between the heads is farther apart by one whole track width, thus allowing for more shielding between the heads."

"The RCA statement that cross talk just doesn't exist is correct. . . . This is no trickery; it is just good design. In fact, the technique of gaining the hitherto unheard-of quality which we have been able to come up with on 3¾ ips tape we consider to be a significant contribution to the art." That's just what I said, in July, you'll note.

In the space between the four dots, above, Ampex describes demonstrations of the system back in April for the recording companies, at which this question of cross-talk came up. The four-track tape, modulated on all four tracks, was pushed sidewise by hand on the heads, to prove that there was, indeed, sound recorded in both directions—that the two tracks not being played were silent until the tape was pushed off its proper alignment. I didn't hear this demonstration, again, but I don't doubt that it happened.

I think the points to note well, in the above account of cross-talk, are that it is not on the tape itself that cross-effects occur, but in the heads, after the signals have been picked up, and furthermore, that there is more space between playing tracks in this system than in the more conventional two-track system.

It would seem to me—speculating again—that this focusses the problem very nicely, on (a) stacked-head design and (b) mechanical alignment of tape motion. As to the first, Ampex would seem to have clinched the matter neatly as far as an outsider is concerned. There is more shielding possible between heads here than in the two-track system, due to the opposite-direction track that takes up space between each pair of tracks in use. Remember (to be simple-minded) that we *never* play all four tracks at once—there is always a blank or unused track next to a track in use. In the head configuration, this space can be given over to shielding. If cross-talk originates in the heads themselves, then Ampex certainly has a point very well taken.

As to the second point, mechanical tape alignment, I'm not quite so sure. I am sure as far as Ampex equipment is concerned. Obviously, Ampex will make its equipment so that the tape is held to accurate motion, minus any sort of side-play that might accidentally bring a piece of a wrong track—even a tiny fringe—under a playing head. I am reasonably confident that the RCA Victor equipment, on a lower price scale, will have licked this problem in principle, *and probably* in practice too, even at the beginning. But it is a problem.

Professional equipment for making com-

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mercial four-track tapes, the "slave units" that record quarter-inch tapes from half-inch masters, will of course operate within professional tolerances and should cause no trouble, at least in public—but what of home equipment?

My only question, at this point, is in respect to low-priced home equipment that may be put out by various other companies who merely take over the basic Ampex-RCA specifications, with few strings attached. As in every expanding area of production, there may well be various shades of shoddy, quick-profit designing in low-cost magazine tape equipment. Here, it seems to me, is a fine area for trouble with the tricky matter of mechanical tape alignment. What's more, many an honest and sincere design attempt may turn out to be bug-ridden, in spite of best efforts. Building to a price often involves miscalculations of this very sort. It seems to me likely that in the first rush of tape magazine equipment we'll run into some trouble here. A slightly wobbly tape drive (it wouldn't have to wobble very far)—and there'd be a resulting irregular cross-talk as the four tracks strayed off the straight and narrow path.

The straight-line tape drive problem, after all, isn't completely settled in conventional tape drive, even for two tracks or for a single track.

But, to turn about again, the fact is that it is already practical to make a drive system accurate enough to prevent "wandering" and four-track cross-talk, yet inexpensive enough for introduction into home equipment. Experience and mass production, as always, will do plenty to improve the situation later on.

I see no reason, then, why we should run into any major or inherently permanent cross-talk on this second score, due to mechanical drive trouble—though I strongly suspect that there *will* be some transitory trouble here and there in the early months. There is, as Ampex observes, even less chance of trouble via signal interaction between closely spaced heads. No chance, I'd say, except through grossly poor design.

Well . . . we'll soon know, in practical terms. Sometime between now and next spring, perhaps.

2. PHASED-OUT

As I started to observe above, we are now entering the birth-pang phase of practical stereo disc—that is, those of us who are already dabbling, wading, or plunging into the new medium to see what's there. Most people haven't got around to worrying about it yet. It takes a year or so and millions in persuasive advertising to "orientate" the general mass public towards something new that costs money, like disc stereo.

Thus, as you read this, there will be a handful of hardy consumers who actually own the new "hi-fi" home-type stereo disc equipment and records to match. There'll be more people who have bought into component hi-fi stereo, adding sections, duplicating existing channels, buying double preamps and the like. Oddly, since component stereo disc got an early start, there will be more component systems around, for a while, than ready-made disc stereo hi-fi.

And oddly, too, I suspect that the people who buy the complete and ready-made stereo phonographs this autumn will generally have an easier time, get better stereo satisfaction (and better musical pleasure) than those who elect to plunge into parts. That may sound traitorous, coming from me, but there's sound reasoning behind it. The ready-made systems may boast such hi-fi virtues as pairs of 3-watt amplifiers ("6-watt peak") and 3-inch "woofer" speakers. Yet the plain fact is that each of these handy home systems has been designed as a working unit and may be depended upon to work, at least for a while, without technical complications. The pick-ups match the amplifiers' needs, the speakers do likewise, the system is integrated, phased, de-hummed, as far as is commercially possible.

The big headache in stereo component equipment right now is, shall I say, the extensive unintentional mismatching between various excellent components—excellent in themselves but not yet standardized to the point where there is real, honest, true interchangeability. It's an old, old problem; we went through all this years ago with the standard monophonic, one-channel hi-fi. There, it is now solved, remarkably well, after these many years of adjustment and consolidation. Components do hook up easily, rightly, effectively, with remarkably little disagreement between them.

The trouble is that, superficially speaking, stereo components are merely an extension of standard component equipment and so, on the surface, can be too easily thought of as "the same." Alas, the differences, in practical stereo, are appallingly great. Great, worse luck, in that they are mostly small, but irritatingly important. All sorts of minor problems erupt—seemingly minor. A little bit of a mismatch here, another there; things that ought to be identical turn out not to be—speakers, amplifier characteristics, equalization; output is a little lower somewhere than it might be ideally, required gain higher than it really ought to be by a bit, impedances not quite rightly matched . . . all sorts of minor misfits.

Stereo in plain fact has brought tremendous behind-the-scenes engineering problems, such as few outsiders are likely to realize. The results show up in these seemingly minor divergencies, compromises, changes, the not-quite-matched characteristics, just a little different from things in the past, which actually are the final almost-heartbreaking result of engineering sweat over months and months of problem-solving.

When it comes to hooking up stereo components, then, you will be running into a nest of Nagging Incidentals, minor stumbling blocks of incompatibility or confusion that can turn a hi-fi holiday into a cumulatively bewildering set of frustrations.

Until we—i.e. the hi-fi manufacturing industry—can phase ourselves out of this stage, an inevitable and quite understandable one, you'll find that home stereo component listening isn't going to be all fun. If you don't care a fig for phasing and if constant 60-cps hum-music pleases your ear, then you'll have no trouble. But frankly, my disc stereo listening hasn't yet been happy, though my predictions for the future remain rosy—I like stereo.

The two biggest sets of bewilderments and confusions for me, so far, have involved those ancient and familiar problems, hum and phasing, both of which are a good

deal more than doubled in seriousness in the stereo components for disc. Transitory problems, of course. No excuse for either one of them. Day after tomorrow, all will be well. But not right now.

Situation Fluid

I've been working already for some time (as all this may suggest) with three or four specific makes of stereo cartridge, with any number of stereo discs—official and for sale, instead of the endless test discs we've been playing with in past months—and I've on hand a reputable, modestly priced stereo dual amplifier. (I chose the modest price range deliberately since I felt that stereo problems, if and when, would tend to concentrate in that area and engineering ingenuity in solving them within the cost budget would be at its most intense.)

But in all honesty, I am not yet ready to report on these products by name, model by model. Black print is much too final, too positive, to be realistic at this point. Things are too fluid—not the products but the situation. Stereo is not yet solidified, in the area of evaluation. Evaluation means judging a product in the light of its relations to other products, and to a hypothetical norm of "good" performance that comes from long experience and constant acquaintance. We can do that sort of judging with almost any kind of monophonic equipment for the home. There, critical standards (production standards as well) are fairly clear, accepted, understood.

Even (I would like quickly to point out) stereo tape is now in the settled, judgeable, to-be-counted-on-for-performance category. This is amazing, after so short a time. It crept up on me. But, paradoxically, I have suddenly realized that stereo tape (non-magazine, 7½ ips) *has* settled down—at least for me. Surely for many others, too. I know what it can do, is supposed to do, I can judge it and judge its associated equipment without heart-rending uncertainty. Best of all, I can listen to stereo tape for its end-product, music, without undue technological or mechanical interference, I can enjoy it for what it was always intended to be, at leisure and in relaxation.

Not so with stereo disc—yet. There are flashes of sheer joy to be had from it (otherwise I would long since have given up in disgust!) and much satisfying, pleasing listening. But in between there is H. to pay. Granted, a lot of it is my fault, at least on the surface. I'm just dumb; I don't get things right, I get tangled up in confusions. I spent a good half hour, one recent hectic stereo day, trying to figure out what strange stereo technique the Vanguard Recording Society had used to produce one of its new Beethoven symphonies on stereo disc. Believe me, I was so addled at that point that I didn't even notice I was playing the non-stereo version of the record. The album covers are almost identical; I had both versions on hand.

My fault for being a dope—but that sort of thing wouldn't happen if I hadn't gone through fifty-nine other confusions and indecisions that same day. Beethoven tends to get thoroughly lost in the shuffle, for the time being. Maybe the performance is good—or bad—but what worries me most is whether the cellos should be on the right side or the left, whether I'm hearing music from the middle, whether—above all—the sound is in phase, or out of phase. Also, whether I'll ever be able to get rid of the constant, nagging hum problems that have risen out of the particular combination of circumstances I have at hand. Rather typical circumstances, I fear.

Phasing

Two things are dreadful about phasing. One, it is so very hard to determine consistently, so ephemeral, in the midst of constantly changing musical sound—and yet it is so very important. You can't tell the difference when you want to; yet if you are wrong, you'll have hours of ill-defined discomfort and falseness of effect in your stereo listening, until you fix it.

Secondly, wrong phasing is so very simple and yet so devilishly hard to locate—it can happen in so many places, both legitimately and not-so-legitimately. There are dozens and dozens of possibilities, even such unthinkable (but likely) matters as reversed phasing in a master recording tape, or in the recording amplifiers, or in any one of the many tape-playing steps *before* there is a thought of a disc master; or in the disc cutter itself.

Or in various types of supposedly simon-pure commercially-released home stereo equipment. Witness my fine RCA Victor Stereotape player, described here a year or so ago, which arrived from the factory with its speakers out of phase. (Or was it somewhere else, inside?)

The worst—the very worst—thing about phasing in stereo is that it depends 99 percent on the ear. Very seldom can you check it via a strictly electrical or mechanical test, minus listening. An out-of-phase sound is just the sort of audible subtlety that is most easily ignored by 99 percent of the technicians who deal with stereo equipment. They can't hear the difference, can't take the time, or haven't the curiosity, to study it and learn what the difference is; and therefore they simply do not take phasing seriously. Hence—phasing trouble, here, there and everywhere.

They should take it seriously, those who have any hand in the matter. It makes all the difference. The difference, that is, between satisfactory stereo listening and false. It is the sort of difference that a rank outsider, a musical amateur, will disconcertingly spot for you on the instant, where a hardened critic like myself may have been overlooking it for days.

I had this happen to me on three occasions last summer. Two of the people had never heard of stereo—but they were right. The third was editor of one of our co-publications in hi-fi and he thereby earned his medal as a good Hi-Fi Ear, as far as I was concerned. (These people spotted the out-of-phase RCA Victor machine, each in his or her own terms. The amateurs described the out-of-phase effect itself, accurately, though not knowing what it was. The editor just said "it's out of phase."

It's subtle but devastating, this phasing. You can't hear it at all when you're tired or out of sorts or discouraged or confused, or fed up with the kids or acid indigestion or traffic jams. Your mental ear just shuts up and doesn't hear—or everything seems out of phase, right or wrong. The best hours for phase testing are between 8 and 11 in the morning. You are fresh in mind and body, your ears still have that sound of bacon frying in them, the daily routine is not yet wearing you down. Later on—you can't be sure. Sometimes you can tell, sometimes you can't. What seemed right at 11 a.m. is horribly wrong at 3 p.m. You are uncertain. And yet the phasing *must* be right, you *must* fit it. Or you'll go crazy trying to figure out why your stereo sounds wrong, wrong, wrong. Yep, it's really a problem.

And the goad that sticks into your back is that you have always that 50 per cent chance of being right, willy-nilly. Is it right because it *is* right—throughout your stereo system? Or because the sum-total of eight or nine phasing mistakes happens to come out correctly phased? Not a pleasing thought, and you can't ignore it as academic; chances are that when you switch to some other medium, some other record, some other cartridge, you'll be in the phasing soup for fair.

It's here that I'm presently going nuts. I want to be right ALL the time, and not by any fifty-fifty accident. The way things are shaping up now, I'd say I'm right maybe 52 per cent, allowing a whopping two per cent for deliberate, calculated, checked correctness. The rest is happenstance. Each time I think I've got phasing licked, a new contradiction pops up and I start all over again.

The most exasperating part of the whole problem is the way it keeps popping out improbable contradictions at you, springing unforeseen traps, confusions, redundancies, until you don't know whether you're coming or going. Maybe I should say, whether you're in phase or out. (Am *I* out of phase, or is IT?)

For instance, here's one of my unresolved little phasing mysteries, as of this moment. I found out that a certain highly reputable magnetic stereo cartridge was in phase for stereo sound, dual-track, but that when I switched to one track alone (in both speakers) the sound was out of phase. Same with my radio input or any standard mono cartridge—when they were in phase, from the two speakers, the stereo cartridge's stereo sound was out. I have a phase switch in my speaker line, of course, to check AB on these matters. (So should you.)

No doubt about it—I've checked this again and again. To shift from playing stereo to playing the radio through both speakers (or to a standard monophonic cartridge) I have to change the speaker phasing. Why? I really don't know. I'm no chess player nor a mathematical game fan. Maybe you are—in which case, you can try it out for yourself, on your own equipment. I'll bet you I'm right.

(*See page 38 for some possible explanation.* ED.)

A simple reversal of phase can happen in so many, many places! I had already checked two pairs of speakers. One pair (still nameless, for this month) was definitely opposite. The other pair were identical. Or maybe the first pair was identical and the second pair opposite—for my equipment? It's all relative. Anyhow, indubitably the two pairs were *different*. One I hooked up with the connections the same on both units, the other with the connections opposite. . . . Then there's the amplifier—or amplifiers. Two circuits, switched together in all sorts of combinations. How do I know what goes on inside that mass of interconnected complexity? Output transformers? They could be oppositely phased—why not. Or could they?

And, of course, there are my own home connections. Yep, it turned out that my two stereo arms were hooked up with the channels reversed. What came out "right-speaker" on one arm was "left-speaker" on the other, until we corrected this. But phasing?

We've gone over every foot of yards of hookup wires, we've color-coded connections, tested circuits electrically, and I'm sure—I *think*—that what goes in one way comes out the same way. But there's always a tiny, gnawing doubt in my mind . . . one slip, one connection overlooked, and the whole system is 180 deg. out.

I don't know the answers to most of these nagging doubts on phasing, at this stage. I haven't had the patience to try *all* my equipment, systematically, and keep log books on what happens. I haven't tried, for instance, to find out whether a ceramic stereo pickup also produces the curious phase-reversal noted above with the two

magnetics. I haven't tried my *two* ceramics, to see whether they act alike. Dollars to doughnuts they won't, and the fault might be mine, in the connecting, or the maker's, in the making.

I just don't have enough ear left.

Correction: I had just barely enough ear left to listen monophonically, in a simple, happy state of bliss minus any phasing complications at all, to the vast number of non-stereo discs you'll find reviewed in this month's Record Revue. So far, I haven't listened to disc stereo; I've listened mainly to phasing. And I'm tired of it, I can tell you. Also to hum.

3. Ho-Hum.

I will effuse briefly on hum; it is a subject that oughtn't to be mentioned in polite hi-fi circles. It is my most cordial hate, above all other sounds.

Stereo hum is just around the corner in a great deal of present component concatenations. At the present moment, I hear hum on *all* stereo disc reproduction, with all my cartridges (in different ways, degrees) and in all possible set-ups, using the presently un-named stereo amplifier. Some aspects of my hum are still inexplicable to me—various mysterious ground-loops and the like that defy detection. Other hum situations I have cleared up in part, reduced the hum to a satisfying degree, without quite eliminating it.

But what gets me down is that with any one of a half dozen fine monophonic magnetic cartridges I can play ordinary records with *no hum at all*, on the very same amplifier. That galls me. I like stereo, but I like standard sound better—if it has no hum. I'm still tearing my hair. I still have hum and I cannot take the blame for all of it.

Plural Trouble

Since this month's writing is deliberately in general terms, I'll mention no cartridges nor other equipment. But the combined source of my hum is not hard to apportion out. The trouble is never serious in any one place or component. It is the combination of minor ills that makes the major one, the sum total of hums.

1. Stereo magnetics, so far, are often very low-level as compared to well known high-quality standard magnetics, monophonic.

2. Some that produce a healthy output do it via transformers—and thereby risk jumping from the frying pan to the fire. Transformers love to pick up hum, especially two of them.

3. Some ceramic stereo cartridges, with high-level non-preamplified output, nevertheless produce (a) relatively low level for this stage, requiring plenty of work on the amplifier's part—hence more amplifier hum; and (b) the ceramics now available tend to rate a very high impedance input, which makes for more and easier hum pickup.

Thus for a variety of reasons, my first batch of stereo cartridges all involve an objectionable hum level, as compared to monophonic standard cartridge equivalents.

4. Stereo discs tend to be cut lower in level than standard discs—considerably lower in many cases. Hence—more gain needed in the systems and more hum produced in the final sound, from wherever it may come. Bad!

5. Admittedly a somewhat special set-up, my pickup connections allow for switching from standard to stereo operation, using either type of cartridge. In the same manner, with standard equipment and standard records I experienced no hum trouble—but along comes stereo and I find *myself* involved in a lot of private hum, induced along the way in my own hookup. The switch has had to be heavily shielded, the "shielded" leads I have twisted into odd positions to keep them as far as possible from contamination, and so on. My biggest unsolved problem, with the transformer-coupled stereo cartridge, is an unexplained ground loop (?) that acts this way: When only one channel is connected —either one—there is only negligible hum. But when the second channel is hooked up—either one—there is loud hum *and* a very unpleasant pickup of motor noise from the turntable. So, at the moment, I'm "testing" that particular stereo cartridge on one channel only.

* * *

If I seem to grouse, and if my problems seem particularly fuzzy and ill-assorted, I bring them upon this generalized way simply because, the world being imperfect, I suspect that many a home buyer of very high quality stereo disc equipment is going to run into the same tangled confusions as to phasing and, very likely, as to hum, and I further suspect, people being what they are, that many a hi-fi dealer and, perhaps, even many a professional engineer, is going to find himself disagreeably ensnared too in a few of these minor but irritating plural-problems.

As I've often said, if every audio problem had *one* inescapable, exclusive, single cause, if every single fault could be cured with a single solution—then hi-fi life would be a dream come true. Also the rest of life. But as things usually are, trouble is virtually always plural trouble, a combination of factors, a plurality of causes. And most of us, being typical, find that to pinpoint plural trouble is the nastiest small job in the world.

It never was more typically nasty than in stereo hum and stereo phasing. Pluraled plural.

(P.S. I trust that by next month I'll be back in my usual optimistic frame of mind, with most of my plural problems reduced to singular. In any case, I'll be more specific then as to equipment and, in the Record Revue, as to records.)

I'll throw out one specific product, for your inspection, in case you have hum troubles and haven't run into it. It's sticky aluminum tape in rolls and it makes a marvellous shielding material to cover those inaccessible unshielded sections of hi-impedance lead, out of pickups into preamps, that add to the total hum in critical situations.

My own hi-impedance hookup, as mentioned above, had an unshielded switch (stereo-monophonic) in the pickup line, plus several sections of unshielded connection. The hum pickup was inaudible in all applications other than stereo disc—but when I threw in my stereo cartridges, something had to be done.

There are probably many brands; the stuff I got, via my engineer assistant, is called Pressure Sensitive Electronic Adhesive Aluminum, put out by Modern Adhesives and Electronics (what a sticky corporate name!) of Garden City, N.Y. Came in a 900 foot roll, three-eighths in width, .0008 gauge and sort of crimped. As far as I can tell, you can make contact through the adhesive backing but to be sure you can always crimp over a bit of the edge on each layer. It greatly reduced the hum pickup at and around my hi-impedance toggle switch, and took only a few moments to apply. Look out for accidental shorts with the signal "hot" lead, though.

3. MAGNETIC CARTRIDGES

It's getting so that I can't find anything to say at all about the best of the newer

magnetic cartridges; they all sound alike, and they should, considering the extremely low distortion factors present. Normally, I don't go around AB-ing cartridges one after the other. I prefer to put them to work on music, over a good span of time. This tells me more of what I need to know than any AB test.

Shure and Norelco

Two new units that recently reached me are in this category and use the same basic principle, a novel one, the moving magnet. Which of them came first I do not know; one, Norelco, comes from Philips in Holland, the other, Shure Dynetic, comes from the U.S., and both produce top-quality sound from a removable stylus that is also a magnet, oddly magnetized in a sidewise manner so that one side of the pencil-like shaft is North, the other South.

Whether the moving-magnet magnetic is now the ultimate ultra I don't know. It certainly works beautifully and sounds the same. Output in both of these cartridges is enough to avoid any thought of a transformer. The compliance in the Norelco is somewhat higher than in the Shure—but this all-purpose model of the Shure Dynetic is made somewhat more ruggedly than the original studio Dynetic (the one on its own spear-shaped arm), for use in changers and in standard arms to choice, and thus it has a slightly heavier, slightly less compliant stylus assembly. Even so, it is plenty compliant enough to give ultra-smooth response on the loudest recorded passages. Both cartridges will zoom easily over stereo vertical bumps. Both are well worth investigating if you want the latest in top quality sound in a separate cartridge, to fit in any good arm.

I must say in all honesty, now that I have my cartridges rigged up for frequent and quick interchangeability, that most of the time I can't possibly tell these superduper newer units apart. Is it the Fairchild 225, the ESL (the older model, with transformer—still a terrific cartridge), the Norelco, the Shure-by-itself, or the Shure-built-into-its-own-arm? or the Grado?

What I hear, as you can guess, is music. Unless something about the cartridge's performance distracts me, I tend to forget it, in favor of the music itself, or the sound itself, whatever it may be.

I find it very difficult to concentrate on the performance of an extremely fine cartridge—and this is precisely as it should be. If it shows no unpleasant peaks, tracks nicely and cleanly in the loud parts, gives enough wallop, if the stylus stays clear of the side-guards or pole pieces (one of my GE 78 styli keeps buzzing against the pole-piece on one side—stylus is bent a bit), if dust refrains from collecting and jamming the point en route (which happens plenty often with some cartridges)—then I just listen. That's what a cartridge is for.

It's only afterwards—after many playings—that I suddenly wake up one day and say, hey, that cartridge is *good*. Cumulative high performance. It's likely to be that way with these moving-magnet jobs, the Norelco and the Shure Professional (the separate cartridge). At this early point they're both too good to tell apart, my style. Give 'em time.

Grado

I've had a Grado cartridge in use, too, for a longer time, and am pleased with it, decidedly. It's made like a watch, by watchmakers, etcetc. but what really sells it to me is simply the fact that it works, sounds extremely good, is rugged so far, in spite of a seemingly risky suspension of the stylus, out in front of the cartridge. I was sure it would break or get caught in something, but it hasn't yet, after many months of solid use as my main radio broadcast pickup. I've really banged it around, too, under duress.

The compliance on the Grado is fantastic, and the play of the projecting stylus "bar", both vertically and horizontally, has to be felt to be believed. It is of the type that sticks far forward at a diagonal and in this respect is extremely useful for all who need to pinpoint record groove positions by eye, as in radio stations and in all situations where records are played by hand, by the LP band. This is a blessing to me.

So far—there are no quirks and tricks along with this extreme compliance. The stylus is still centered; it doesn't stick over to one side of its long almost-free movement, it doesn't hit anything and buzz, as many styli do on provocation. It doesn't distort when you weight it downhill sidewise, as is so easy to do with a slightly off-level playing surface. It doesn't make funny noises on extremes of vertical warping (the compliance allows it to track warped records unusually easily). Altogether a reliable and top-sounding unit, so far, with no reservations that I can think of. More can't be said; if you want engineering details go check the specs yourself.

Volpar

Finally, still another cartridge that is unusual, though a bit on the delicate side for a rough user like me. The Volpar, made in Florida, is a unique cartridge-and-arm combo, a long, thin aluminum tube supported on a simple and ingenious nylon bearing, the end of the tube flared out to house the tiny magnetic cartridge, all of a piece. No springs—the tube is counterweighted and point pressure is adjustable by a simple screw-on weighted tube at the rear, slightly larger in size than the arm-proper. Balsa wood and such aside, this is about the lightest arm I've seen. You pick it up and put it down yourself, without handles, pushbuttons, or fingerlifts. Economical and ultra-simple.

I can't tell you at this point what construction the cartridge uses, but in working with it for my weekly broadcast (temporarily in place of the Grado) I found quickly that it is sensitive to sidewise pull and, oddly, to sudden pressure from above, as in dropping it or accidentally pushing it down with a finger. Side-pull makes it distort; the stylus is centered in a very narrow space—but stays centered very nicely when you aren't mauling it. (To maul, in this case, means barely to touch the feather-weight arm.)

The effect of dropping this cartridge, or pushing down gently on it, is strange—a kind of amplitude flutter. It sounds like a vibrato, but obviously can't be frequency-modulated. The pulsing, only for an instant, sounds like the quick flutter when a tape recorder starts up. It must, however, be an oscillation that affects the output level, not the frequency, and has to do, I'd guess, with the (vertical) stylus suspension. Unimportant, but I've never heard this particular effect before. Interesting.

The Volpar was sent me for trial some time ago, and I suspect that it was a hand-made prototype. It just looks that way. If the pickup has got into production, it should be of considerable interest to a lot of readers. It comes, if I remember rightly, from Panama City, Fla. Don't have the address with me at the moment. I haven't bothered to say that the sound of this unit appears to be excellent. Negatively speaking, I haven't noticed anything wrong with it. Good sign, especially with all of the above competition. (P.S. I've found the address—it is 4404 W. 22nd Panama City, Fla.) AE