

the

# stereophile

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For the High-Fidelity Stereo Perfectionist



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## The Cover

Some of our readers are very ingenious people. One such, who did not want his name mentioned, submitted this suggestion for saving money on replacement styli.

Said Mr. X, "It is possible to extend the useful life of a diamond stylus almost indefinitely by piling as many pennies on top of the tone arm as are needed to keep the needle in the groove." To prove his point, he sent us a photo (cover) of his record-player successfully tracking one of the most heavily-modulated sections of the CBS Labs STR-100 Test Record with a stylus that has accumulated 27,844 hours of service. The odd change in the lustre of the grooves that are so played is explained as follows: "Perfect groove contact is assured by the re-shaping of the groove to conform precisely to the shape of the stylus."

Our correspondent went on to explain that this technique will work only with old pickups whose styli are stiff enough that they don't retract into the pickup body. High-compliance pickups won't do at all.

In closing, Mr. X added that the money he was able to save by not having to buy replacement styli has enabled him to pay for replacing almost eight of the 411 records he has ruined this way.

# A Dolby In the House

By the time you read this, the "Dolby system" will probably be old hat to you. Every other audio publication has been describing it, discussing it, and hailing it as the greatest invention since sex.

We've seen that kind of press ballyhoo before, about such significant advances as the Edsel, the 16-rpm LP and the "thin-profile" loudspeaker, so our first inclination was to be a wee bit skeptical of the Dolby. It seemed too good to be true.

Since then, we've learned more about the Dolby system, and we've listened to some Dolby-ized records with a show-me attitude. And we've been shown. Not only is it entirely as good as it's cracked up to be, it may well be the best news audio perfectionists have had in years.

Just in case you haven't been keeping up with your outside reading, here's a brief description of the why and the how of the Dolby.

Traditionally, recording engineers have had such a phobia of background noise that they would blithely ruin the frequency response and dynamic range of any musical recording if this was felt to be necessary to reduce background noise. And it has often been necessary, thanks to the current commercial practice of duplicating an original tape two to four times over before it is finally used to master a disc. Hiss, print-through and scrape flutter accumulate with each duplicating step, until the final playback may have as much extraneous noise as an original tape made on a not-too-excellent home tape recorder. The disc itself may have the potential of almost 70 db of signal-to-noise ratio, but this was hardly relevant in view of the 50 to 55 db of s/n ratio fed to it by the final "master" tape. Now, finally, the Dolby has changed all this.

Basically a volume compressor-expander, the Dolby has no effect on loud signals, but it raises the level of low-volume signals during the initial recording phase. This compressed recording is then duplicated as often as necessary, and the Dolby is reinserted into the final playback circuit, but this time in the expansion mode. Again, the loud passages are unaffected, but the quiet ones are reduced in volume by the same amount

as they were originally boosted. The original dynamic range is restored to the music, but all the accumulated background noises are reduced by 10 to 15 db, leaving a background of silky silence. And if you've never heard a Dolby-ized disc, you'll never believe just how much noise we'd gotten accustomed to accepting from previous discs.

But as far as we're concerned, the commercial version of the Dolby is only a first, small step. Why not, for instance, include a Dolby expander in the home high-fidelity system, where it can work its wonders on the background noises from our own discs and tapes?

Obviously, at least one manufacturer — KLH — has asked the same question, and plans to answer it soon with the first Dolby-equipped tape recorder ever made for home use. It will compress when recording and expand in playback, and if their necessarily simplified Dolby circuit (the original version costs around \$2000) works as they hope it will, KLH's debut in the tape recorder field will produce the quietest tapes you've ever heard.

But why not go a step further, and produce commercial discs and tapes embodying the Dolby's compression phase, but possibly to a somewhat lesser degree? This could neatly resolve a dilemma that has been plaguing record manufacturers and audiophiles alike for years: How to produce a single recording that will satisfy both the narrow-dynamic-range requirements of the background-music listener and the wide-dynamic-range requirements of the serious listener.

The average record buyer would hear pretty much what he hears today, but with somewhat less dynamic range, which wouldn't bother him at all. The Dolby owner, on the other hand, could restore the full original dynamic range (and do away with most of the background noise) for serious listening, or he could shut off the Dolby for background listening. With the Dolby turned on, he could hear the closest thing to live sound that commercial discs and tapes have ever provided, and if that isn't an advance in the state of the art, then we don't know what is.



# stereophile reports



o n e q u i p m e n t

*Stereophile Reports on Equipment are primarily subjective reports, based on actual use of components in the home. Components for testing are taken from dealers' stock or, when not available locally, are obtained from the manufacturer, and only one sample is tested unless indications are that it is defective. If a retest is necessary, our experience with both samples will be reported. The manufacturer is sent a copy of the report prior to publication, and may if he wishes append a manufacturer's comment. He cannot, however, demand that the report be changed or that it not be published. Stereophile Reports on equipment are copyrighted, and may not be reprinted or quoted in whole or in part without the written permission of the publisher.*

## Janszen Z-900 Speaker System

**MFR'S SPECS—Type:** Two-way system with dual woofers and 4-element electrostatic tweeter. **Frequency range:** 20 to beyond 30,000 Hz. **Impedance:** 8 ohms. **External power supply requirements (for electrostatic elements):** 115-volts AC, 50 to 60 Hz, 3 watts. **Dimensions:** 28 inches H by 31¼ W by 15½ D. **Price:** \$390. **MFR:** Neshaminy Electronic Corp., Furlong, Pa. 18976.

Every loudspeaker design must embody various compromises with absolute perfection, and while we have long felt that Janszen's Z-600 system was the most musically natural reproducer available for under about \$500, we have also recognized the fact that some things about it could be improved. Its treble dispersion is not as wide nor as uniform as it could be, its low end (although better defined than that of most other low-efficiency systems) does not go quite as deep as, say, an AR-3, and its low-frequency power-handling ability, while very good, could nonetheless be made better.

The new Z-900 system was intended to have all the advantages of the Z-600, but with fewer of its disadvantages. Instead of the two tweeter elements used in the Z-600, the Z-900 has four elements, so arranged that their treble beams span a wider angle and with more uniform coverage. And instead of the single woofer in the Z-600, the Z-900 uses two woofers, to extend the low-bass range and power-handling ability and to reduce bass distortion.

The four-element tweeter arrangement offers another advantage, too. With more total radiating area, the tweeter section's low-

frequency limit is lowered, permitting the electrostatic elements to operate over a wider range of the audio spectrum, and the over-all tweeter response is made flatter and smoother. A two-position tweeter-level switch is mounted at the rear of the speaker enclosure, to provide about 3 db of adjustment.

We tested two versions of the Z-900: an early model with what struck us as a rather unattractive grille comprised of dark-colored fabric with criss-crossed strips of wood veneer, and a later model with a choice of front grilles and a modified crossover network.

We were not very happy with the sound of the early model. It *did* have quite good treble distribution, along with the superb mid- and upper-range transparency and smoothness that we've come to expect from good electrostatic-tweeter systems, but the deep-bass improvement resulting from the two-woofer arrangement was somewhat offset by a noticeable mid-bass boominess, and the over-all sound was strangely hollow and lifeless. Removing the grille panel (or replacing it with one of the later plain ones, without the criss-cross wooden strips) reduced the impression of hollowness, but did not entirely eliminate it.

The later model, with the modified crossover, had considerably better over-all naturalness and sounded more alive, but we found there was still a slight tendency toward mid-bass heaviness and a certain subtle mid-range coloration

that imparted an "aw" quality to the sound.

The Z-900 has a superbly smooth, lucid high end—smoother and sweeter even than that of the Z-600—and an unusual degree of transparency throughout its entire range, and pickup tracking distortion, when it occurred, was noticeably less unpleasant-sounding from the Z-900. Yet there was no shortage of detail at its high end. It will put out a very strong 30 Hz without audible distortion and at almost the same intensity as its 50-Hz output, which allows it to rattle windows in a most satisfying way when the occasion calls for it, and the bass is very clean and tight. But some of the impact of this remarkable bottom is lost because of the slightly stronger mid-bass output, which the ear tends to latch onto as the "normal" low-end balance. Indeed, there were some locations in our listening rooms where a pair of Z-900's produced very oppressive mid-bass boom—something that is not easy to get from the smaller Z-600's—but careful choice of placement eliminated most of this. Perhaps the best way we could describe our feeling about this would be to say that the Z-900's yielded the kind of bass fullness we are accustomed to hearing from most other systems of comparable size, whereas the Z-600's have the kind of unobtrusive low end that you're not aware of until a bass note comes along. To us, the latter is more like what one hears in the concert hall.

It is difficult to describe the mid-range character of the Z-900, as this varies perceptibly depending on where you sit in front of it. Unlike most systems, which give maximum high-end output when you're on-axis, the Z-900 gives maximum *mid-range* output when on axis. High-end distribution is subjectively uniform through an included angle of about 80 degrees, but movement through this angle causes the mid-range to vary from being quite forward-sounding on axis to fairly neutral at 40 degrees off-axis. Consequently we found that best stereo imaging was obtained when seated midway between and symmetrical to the speakers. Under these conditions, imaging was quite good—better than that of the Z-600—and the mid-range character of the sound could be adjusted to some extent by placing the systems flat against the wall or toeing them inwards as desired.

With most speakers we have tested, there was a marked change in sound when going from a good tube amplifier to an equally good transistor amp. The Z-900 showed the usual improvement in deep-bass output and detail, but otherwise there was less difference than usually noted. With a Dyna Stereo 70 tube-type amp, for instance, deep bass was quite adequate, with relation to the middle and upper ranges, but was slightly masked by the upper bass range. With the Stereo 120 transistor amplifier, the deep-bass range from a pair of Z-900's was strengthened to the point where it was almost overly heavy, a not-at-all-unpleasant condition, but one that some listeners may not like, in which case some adjustment in room location is all that is necessary to rectify the situation.

The Z-900 is just a shade more efficient than the Z-600, which would make it around 2% efficient, on a rough guess. It is still a low-efficiency speaker, but since it will handle almost twice the power of the Z-600, it can produce plenty of output with a high-powered amplifier. If you want Row-A-type sound, this is not your ideal speaker—you'd do better with a good horn

system—but it will easily put out Row-H-type levels with an adequate amplifier.

On the basis of objective criteria, then, the Z-900 should undoubtedly be judged superior to the Z-600, simply because of its smoother high end, higher power capability, and deeper, better-defined bass response. At almost twice the price, it *should* be better, and many listeners probably will prefer its fatter, more forward sound. After having lived with both systems for a while, though, we found that we derived more musical satisfaction, from a wider variety of program sources, from the Z-600 system. This is one case, however, where personal preference is clearly playing a major part in our decision, for whereas we are inclined to judge a system on over-all musical naturalness first, and bass/treble performance afterward, listeners to whom full, rich bass and silky, extended highs are of primary importance will more than likely prefer the Z-900.

MFR'S COMMENT: We emphasize that the Z-900 is a big speaker built primarily for use in big rooms. The variance in emphasis from bass to mid-bass and the occasional seeming boominess are, we believe, entirely a function of the characteristics of the listening room used for the tests.

The basic design principle of our speakers is to create individual components (electrostatic radiators and dynamic woofers) with the smoothest possible response, thus ensuring that combinations of these components will yield over-all balance and smoothness. This will however be affected by the listening room and by the speaker's location in that room, just as would be the case if live musicians were performing in the room.

We agree that the changes made in the crossover network of later-model Z-900's have improved their performance. Only 60 units were produced with the original crossover network.

### Ortofon S-15 Pickup

MFR'S SPECS—Type: Moving-coil magnetic. Frequency response: 20 to 20,000 Hz. Output: 7 mv (3.45 cm/sec). Static compliance:  $20 \times 10^{-6}$  cm/dyne. Channel separation: 20 to 30 db at 1 kHz. Equivalent stylus mass: 0.9 mg. Total weight: 18.5 grams (31 grams including Ortofon shell). Stylus radii: .0007 inch by .0003. Vertical tracking angle: 15 degrees. Recommended tracking force: 1 to 2 grams. Price: S-15/T (cartridge only): \$80; S-15M/T (mounted in Ortofon shell): \$85. IMPORTER: ELPA Marketing Industries, Inc., Thorens Bldg., New Hyde Park, N. Y. 11044.

In the Autumn '66 issue, we published a short report on an early sample of the Ortofon S-15, which was criticized for having a fairly significant response rise within the audible high-end range. A second sample of the pickup which was tested subsequently proved to have a slightly larger rise, this one starting at around 6 kHz and reaching a maximum of 4 db at around 12 kHz. Subjectively, this was reflected in a tendency toward

high-end zippiness and a marked accentuation of high-frequency surface noise.

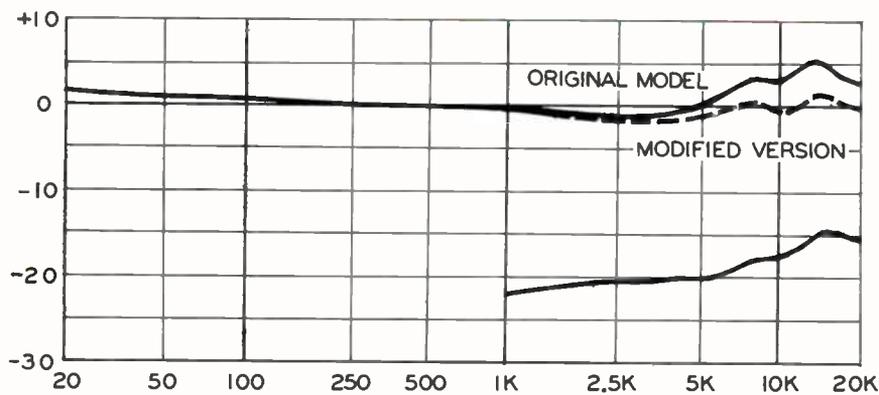
Evidently, we were not the only ones who had faulted the S-15 on these grounds, for ELPA Marketing distributed some brochures entitled "The story behind high frequency response peak rise." In this they stated unequivocally that the rise had been intentionally designed into the pickup, and went on to present Ortofon's reasons for doing this.

The gist of Ortofon's argument was that, since the linear speed of the record groove (past the stylus) diminishes as the groove spirals inwards, there is a progressive loss of high-frequency response. The high-end rise, according to Ortofon, was designed into the S-15 to compensate for these losses.

Frankly, we found it hard to take Ortofon seriously in this. With most other pickup manufacturers, we might attribute such a statement to ignorance, but a pickup manufacturer that also makes disc-cutting equipment (as Ortofon does) must certainly be aware of the fact that all record manufacturers add the necessary "radius compensation" equalization when they cut their master discs. Attempting to compensate, in the pickup, for what has already been compensated for on the discs cannot help but result in an over-all high-end rise, and this is exactly what the original S-15 pickups gave.

Whatever the reasons, it is clear that Ortofon did not just happen upon a peaky design and then try to justify it, for as soon as they started getting criticisms of their first models, they promptly announced the availability of a modified version having considerably less high-end rise.

The third sample S-15 that we tested was one of these "tamed-top" versions, and we are very happy to report that it not only sounds a whale of a lot better than the original version, it is up there among the very best of the pickups we've tested to date.



Response and separation of the original and modified S-15.

The new version is *not* “de-peaked” as some have claimed it to be; the original high-end rise is still there, but to a much lesser degree. But since the range around 4 kHz has been lowered slightly along with the high end, and further high-end reduction would knock the 4-kHz range down even more, we feel that the present response is the best compromise that is likely to be obtained.

With the S-15 mounted in an SME 3009 arm, we started with the stylus force set at 2 grams, the maximum permissible limit for a 3-mil radius, and then started reducing the force. At 1½ grams, the pickup was just as clean as at 2 grams, but below 1½ it started to break up on some heavily modulated discs, so we stayed with the 1½ gram figure. We would not advise going much below that figure, or above 2 grams, as either will tend to increase record wear.

The S-15 shares some of the earlier Ortofon SPE’s mounting problems and may not be usable in some tone arms. Its weight may be more than the arm can adjust for, and its size may not allow adequate clearance between its connecting pins and the terminals at the rear of the head shell. It will work with the SME arm (and is particularly easy to install using the clever spring connectors that Ortofon uses with their own shells), but you’d better check for suitability with other arms before buying.

Actually, it would seem to us to be about time that Ortofon con-

sidered some sort of alternative to the built-in transformer that has made their pickups so tricky to install. The S-15, for instance, has so much compliance that the total mass of itself and the arm will resonate in the vicinity of 3 cps, where it will respond to some record warps. The resulting signals aren’t likely to get into the power amplifier, but it is possible that the violent flexing of the stylus might do it some harm in the long run.

With some extremely quiet preamps, earlier Ortofon pickups could be used without their transformer, and the sound was somewhat improved as a result. We doubt that the lower output of the S-15 would allow this to be done, but we don’t see why the counterweight could not be separated from the pickup and installed in series with the tone arm cables, perhaps right at the preamp.

The S-15 has much better hum shielding than the SPE and SPU pickups, but it still has the same potent magnetic attraction to steel turntables, and although there are few such tables around any more, this potential incompatibility is worth remembering.

Channel separation was excellent on all three samples that we tested, averaging 20 to 25 db throughout most of the range, and dropping to around 16 db at 10 kHz. Subjective separation was almost complete, and stereo spaciousness was very well reproduced.

Despite its tipped-up top, the early S-15 was one of the cleanest-

tracking pickups we had heard. The later one is even better, which puts it a small notch below Shure’s famed V-15-II for trackability, while running circles around the Supertrack Shure for over-all naturalness.

It is perceptibly cleaner than the Decca Mark II on “difficult” discs, including the Shure Trackability Test Record, but it does not have quite the liquid transparency and the sweetness of the Decca. By comparison, the S-15 is just a little more “zizzy” at the extreme top, and small surface noise ticks are a bit more pronounced, although much less so than from most ellipticals. Sonically, then, we would rate the “modified” S-15 second from the top among currently available pickups, with the Decca Mark II above it merely because the S-15’s main point of superiority — its tracking ability — is evident only when playing heavily overcut discs, which aren’t all that plentiful.

Since it is necessary to make a distinction between early and later models of the S-15, we wonder how this might be done in a shop? The only visible difference between the ones we tested was in the length of the protruding “tongue” that protects the stylus and record from damage due to dropping. On the early models, this measured  $\frac{3}{16}$  of an inch from the diamond tip, while the later one measured  $\frac{1}{8}$  inch. Our sample “tamed-top” unit had a serial number of 616518, so it’s safe to assume that any higher number will be the later model.

We’re still waiting for the ultimate pickup, but this one is certainly in the top rank of those that are available now. We just hope that subsequent production models of the S-15 are at least as smooth as the sample we tested.

MFR’S COMMENT: We believe that the fourth paragraph contains an incorrect statement. None of the record manufacturers that we know of is using a radius-compensating device for maintaining equal reproduced frequency response at inner and outer grooves.

As we explain in our pamphlet—“Ortofon S-15—The Story Behind High Frequency Response Peak Rise”—the speed ratio between the inner and the outer grooves is 1:2.5, or about 8 db. But it is the conditions in the inner grooves which

determine the maximum velocity amplitude that can be recorded and reproduced without excessive distortion. So if you apply a radius-dependent compensation, giving an increasing high-frequency preemphasis up to 8 db at the inner grooves, you would have to lower the average level by the same ratio.

Any such decrease in cutting level would be objectionable to the record manufacturers, who have found an ever-increasing public demand for higher levels on their records. Automatic limiting devices such as the Fairchild Conax and the Ortofon STL have been developed and are widely used to suppress the worst high-frequency peaks, so as to allow a modest increase in the average recording level.

We are skeptical as to whether any manufacturer uses radius compensation. We know that some companies are using radius-dependent counterdistortion, but in the descriptions of these we find no mention of radius compensation for reproduced frequency response. Even if you find a manufacturer who says that he is employing radius compensation for frequency response equalization, we would suspect that he is using it only to a small degree, just to be able to say that his records have this feature.

The matter seems rather unimportant anyway, since by listening to a musical recording, no one will notice the difference in frequency response from the outer to the inner grooves because (1) the difference is small, (2) it is confined to the highest, partly inaudible frequencies, and (3) the difference occurs gradually, allowing the ear to adjust to the change. But, the difference can be measured.

If we cut the same frequency sweep at the outside and inside of the disc, we can measure the difference at high frequencies. Our idea in the S-15 was to provide just enough compensation to offset half of the measured difference, to provide an ideal balance between the response in outer and inner grooves. We still think that the idea was right. Our listening tests did not reveal any steely or zizzy sound, but we admit that this could be due to other links in the system, like the amplifiers and tweeters.

In any case, we have lowered the high-end frequency response in all S-15 pickups, starting with Serial Number 60100, and our new lightweight SL-15 has this modification as well.

The SL-15's small size and low mass (7 grams) eliminates the mounting problems sometimes encountered with the larger pickups. As suggested in the foregoing *Stereophile* Report, the SL-15 has a separate matching transformer, equipped with standard RCA plugs and sockets.

**REVIEWER'S ADDENDUM:** We checked with several U. S. recording companies, including Columbia and RCA Victor, and got conflicting statements about their use of radius compensation. Some said, "Of course we use it; everybody does." Some said, "Well, we have the facility on hand, but we rarely use it." And in one instance, two members of the same firm, both of whom should know what they're talking about, gave us conflicting replies. The final word on this will have to wait until the next issue, as we're already past our deadline for this one.

Meanwhile, though, we offer the following observations:

An old catalog for Cinema Engineering Corporation (makers of attenuators and equalizers for recording studios) lists an automatic radius compensator for use in cutting 33 $\frac{1}{3}$ -rpm discs. According to the accompanying curves, this provides about 7 db more signal at 10 kHz at a groove radius of 2 $\frac{1}{2}$  inches (the inner limit on most discs) than at a radius of 6 inches (outer groove). This corresponds closely to the 8 db figure cited by Ortofon. The same curve shows a rise of 5 db at 5 kHz, which is well within the hearing range of practically everybody.

If Ortofon was able to change the sound of the S-15 pickup from "tappish" to smooth by reducing its response in the 8 to 15 kHz range from 4 db up to a bit less than 2 db up, then we must certainly question their claim that the response change from outer to inner disc grooves represents a "small" difference, or that it involves only the "highest, partly audible" frequencies. And while even this amount of change might indeed pass unnoticed by some listeners because it does occur gradually, it should certainly be audible as a sudden change in musical overtone content when the listener flipped from the end of Side A to the start of Side B. We cannot ever recall having heard such a difference when flipping disc sides, and have actually encountered some recordings where outer Side B had a shade less treble response than inner side A, suggesting that there might actually have been too much radius compensation applied.

Actually, the discussion is rather academic at this point, because Ortofon has straightened out the high end of their S-15 pickup anyway. But a disagreement like this is not merely to be dismissed as a difference of opinion. Clearly, either the *Stereophile* or Ortofon is misinformed about

this, and we would like to see the issue resolved. We would appreciate hearing from any record manufacturers, anywhere in the world, which do not use radius compensation, either via actual high-frequency equalization or via the Dynagroove "stylus correlator" system, (which embodies most of the necessary response correction), for if we're wrong about this we want to know about it. We're sure Ortofon will agree.

## Acoustic Research AR-4x Speaker System

**MFR'S SPECS**—Type: Two-way acoustic suspension system with 8-inch woofer and 2 $\frac{1}{2}$ -inch cone-type tweeter. Impedance: 8 ohms. Power recommendation: At least 15 watts per channel. Dimensions: 19 inch W by 10 H by 9 D. Price: \$57 for oiled walnut, \$51 for unfinished pine. MFR: Acoustic Research, Inc., 24 Thorndike St., Cambridge, Mass. 02141.

In the Autumn 1966 issue, we reported very favorably on the diminutive ADC 404 "shoebbox" speaker system. The Acoustic Research AR-4x, an improved version of the original AR-4, costs \$1 more than the ADC and is slightly larger. And instead of a 6-inch woofer (this would have been a laughable thing to call any 6-inch speaker a few years ago), the AR uses an 8-inch unit and also includes a tweeter level control, which should make it a better buy than the ADC at the outset.

Comparisons showed that it is, indeed, a somewhat better-sounding system. It goes deeper at the bottom — flat to about 70 Hz, with usable response to a bit below 50 Hz and effective cutoff at around 40 — and there is little trace of boominess. Throughout the system's useful range, oscillator sweeps failed to reveal any distortion, rattles, buzzes or high- and mid-range irregularities, and even at 40 Hz it was necessary to drive the speaker quite hard in order to elicit audible distortion. Consequently, it will accept enough amplifier bass boost to allow for some augmentation of deep-bass output without incurring troublesome distortion. Middles and highs sound very smooth, and treble dispersion is excellent—in the vicinity of 120 degrees. Highs, which sound flat out to around 12 kHz, are just a shade more open and airy than from the ADC, and overall efficiency is about the same (around 1%). Also like the ADC, the AR-4x is at its best when paired for stereo (bass is quite thin otherwise), and driven by a good transistor amplifier to help the low-end range still further.

Except for its more modest bottom, the AR-4x sounds quite similar to the AR-2ax, which is to say it sounds very good indeed.

Everything considered, the choice between the two almost-identically-priced systems should be clear to anyone, unless unusual space requirements or local discounts would make the ADC an obviously better choice.

Incidentally, the AR-4x is an improvement over the original AR-4, but only a slight improvement. Middles are very slightly smoother, highs a bit more extended, and treble distribution a shade better. Conversion kits are available to owners of AR-4's for \$15, but AR warns that the conversion is "a relatively difficult job, involving skills comparable to those involved in wiring an amplifier kit." We think it's worth both the cost and the effort.

## Audio and Design Tone Arm

**MFR'S SPECS**: Type: Viscous- and dynamically-damped unipivot mercury-contact tone arm for universal-mounting pickups. Length: 11 $\frac{1}{2}$  inch over-all; 9" from stylus to pivot. Overhang adjustment range:  $\pm 1\frac{1}{2}$  inch. Height adjustment range:  $1\frac{1}{2}$  to 2 $\frac{1}{2}$  inch. Effective mass: 9 grams with standard counterweight; 11 grams with heavy counterweight. Bass resonance: 8 to 10 Hz with pickup compliance of 20 X 10<sup>-6</sup> cm/dyne. Output cables: 24 inch long, 125 pf capacity. Accessories: Spare carrying arms, Thorens "Stickon" boards. Price: \$150. IMPORTER: IMF Products, 7616 City Line Ave., Philadelphia, Pa. 19151.

Back in the days of prestereo high fidelity, when a 6-gram phono pickup was considered to be "featherweight," the best universal-type tone arm we knew of was a bulky, very professional-looking device made by Gray Labs and designated the Model 108. One unusual thing about it was that, instead of using sleeve or cone-face bearings, it had a single up-ended needle — a so-called unipivot — for both the vertical and lateral modes of motion. The other unusual thing about it was that the pivot system was viscous damped, and it was this, we suspect, that was largely responsible for the arm's ability to make any pickup sound somehow sweeter and cleaner than it did in any other arm.

With the advent of lightweight

pickups, though, viscous damping fell into ill-repute, allegedly because it caused too much pivot friction. In truth, the criticism was valid only in that the existing viscous-damped arms simply had too *much* pivot damping for the new pickups.

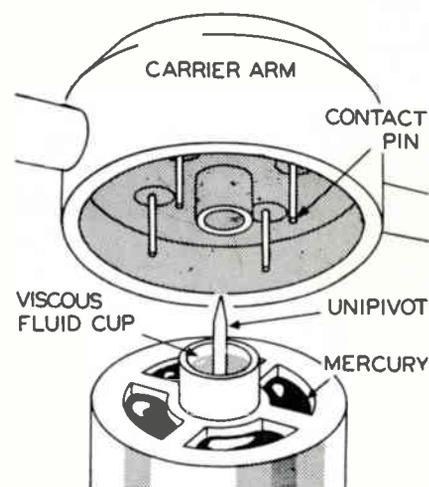
The main purpose of tone arm damping is to control the low-frequency peak that normally develops through interaction of the pickup's compliance and the combined mass of the arm and pickup. Depending on its frequency (and this in turn will vary from one arm-and-pickup combination to another), this bass resonance can cause acoustic feedback, exaggerated turntable rumble, heavy, muddy bass, and extreme sensitivity to floorborne vibrations. Unfortunately, there is usually no way of predicting, from published specifications, the frequency at which an arm and pickup will resonate,\* so the safest thing to do is suppress the resonance itself, and this is what tone arm damping does. One way of going about this is by applying a viscous fluid to the tone arm pivots.

The fluid has virtually no effect on slow movements of the arm, as when it is tracking a warp or an eccentric groove. But at the bass resonance, where the arm would normally vibrate rapidly from side

the arm and its counter-weight. When the arm vibrates very slowly, it and its counterweight will move in unison. But when the movements become more rapid, as at the bass resonance, the inertia of the counterweight tends to make it stand still, and the flexible coupling allows it to do so while the rest of the arm vibrates, so that the mass of the counterweight is effectively isolated from that of the rest of the arm. Thus, the more the pickup's compliance tries to resonate against the arm's total mass, the more this value of mass will be diminished by the isolation of the counterweight. Instead of a single, well-defined resonance, the resonance becomes smoothed out and spread over a wide range of frequencies.

Both damping systems are reasonably effective, but each one has its shortcomings. Pivot damping tends to increase tone arm friction if enough damping is used to completely suppress the resonance. And while the decoupled counterweight adds no friction to the pivots at all, it so happens that a certain amount of pivot damping is useful for controlling torsional resonance.

If the stylus in a pickup system were right at the end of the arm, and in line with it, we could probably forget about torsional reso-

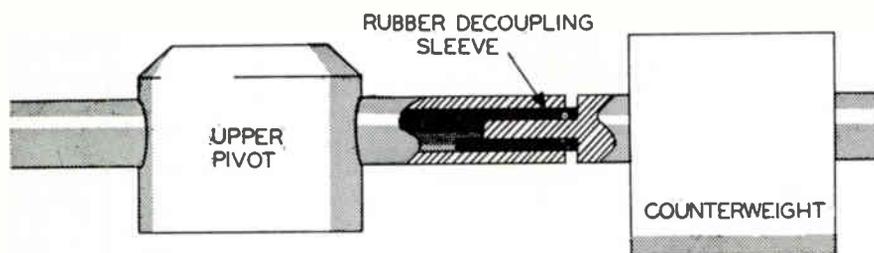


Unipivot and mercury contacts.

to tilt while the pivot end will stay put. And here we have the old familiar mass/compliance situation, between the mass at the pickup end of the arm and the flexibility of the arm. The result is a twisting or "torsional" resonance. This is by no means as intense as the main bass resonance, but it can have a subtle effect on the cleanness of the sound, particularly if the pivots have enough play in them to allow them to chatter when the arm is twisting back and forth. This is the second useful purpose served by pivot damping; it cannot eliminate the torsional resonance itself, but it does prevent the pivots from rattling. All of which brings us to the Audio and Design tone arm, which is the first design ever to incorporate *both* forms of damping in a single arm.

Superficially, the A&D arm looks rather like the SME 3009, minus the plug-in shell. The head is a lightweight "skeleton" mount, the arm itself is a light alloy tube with an offset counterweight at the rear end, and the pivot section of the arm is a small inverted cup with a tiny ball-bearing race at the center and four metal pins protruding from beneath.

The base of the arm has a single vertical needle-shaped pivot, which fits into the ball-bearing race, and a short tube inside the pivot cup dips into a small well full of viscous damping fluid surrounding the pivot. Around this



Cross section of a decoupled-counterweight damping system.

to side, the damping fluid applies a certain amount of braking power, so the movements, and the resulting resonant peak, are much reduced in severity.

A second way of damping the tone arm resonance is by using a slightly flexible coupling between

nance. In fact, though, the stylus is always a little bit below the axis of the arm (it has to be, to contact the record), so whenever it traverses a modulated groove, there is a tendency for it to tilt the arm back and forth. The arm pivots prevent any actual tilting from taking place, but there is always a certain amount of flexibility in the arm, so its pickup end will

\*Statements of "resonance frequency" in tone arm specs are meaningless unless related to a certain value of pickup compliance.

well are four other small wells, each with a contact at the bottom, and each filled with mercury which surrounds the arm's contact pins when the arm is assembled. This neatly eliminates problems of pivot drag due to the stiffness of the usual wire-type signal leads.

The arm base itself fits into a channeled slide, for tangency adjustment, and this plus the base height are both adjustable via small lever screws, thus obviating the need for adjusting tools. A lift lever is fitted to the arm for gentle handling, and this too is easily adjustable for precisely the same amount of lift all the way across the disc surface. The arm is not too difficult to mount—it requires a small rectangular cutout and four screw holes, and a pre-cut board is available for use with Thorens turntables. Templates are supplied for getting the channeled base located in the right place, and for adjusting tangency.

The height and arm lift adjustments had us chewing our fingernails, though. They were spelled out clearly enough in the instructions, but since the lift lever only lifts the pickup about  $\frac{1}{8}$  of an inch, the lift position was adjustable, and the arm base would fall down the instant we loosened its height adjustment, it took us a little while to arrive at the proper setting.

The necessary mercury and viscous damping fluid are supplied in small plastic vials, along with a tiny medicine-type dropper for handling the mercury. Once the mercury is installed the phono unit should not be moved, or the mercury may roll out of its wells. If you wish to move the unit, it's safer to take the few seconds necessary to suck the mercury into the dropper and replace it in its vial.

The viscous-damping fluid won't exactly spill, but it *will* tend to crawl out of its well if the arm base is left lying on its side for more than a few minutes. So if you have to ship the arm somewhere, seal off the bottom well

with a wad of used chewing gum. The top sleeve won't retain enough fluid to run all over the place.

Two adjustments are provided by the counterweight. Besides the usual force adjustments, the offset counterweight can be rotated around the arm to counteract the effect of the offset head, which would normally cause the arm to tilt to one side on its unipivot when playing a record. With careful adjustment in the initial setup, the arm will hold the pickup perfectly vertical to the record surface.

Stylus force is adjustable by a vernier thumb screw at the rear of the counterweight, and no force gauge is needed. You set the arm for perfect balance, locate a small red dot on the adjusting screw, and use the dot to count turns. A full turn gives  $\frac{1}{4}$  of a gram change, and the adjustment proved, not surprisingly, to be more accurate than any of the scales we have on hand. One suggestion, though: set the stylus force before adding the viscous damping material. That way, the position of perfect balance is easier to see. It *can* be done with the fluid installed, but it takes a bit longer.

Mounting the pickup was easy, and we noted that even the Ortofon pickups can be accommodated by bending the tabs at the rear of the pickup and installing the extra, heavy counterweight that is supplied with the arm.

Connecting the arm was a bit less simple, because its output leads are only 2 feet long. Just on a hunch, we checked the lead capacitance (by resonating it against an inductance of known value), and found it to be in the vicinity of 180 pf. This explained the short leads, as 180 pf capacity is already high enough to resonate within the audible range with a few pickups. Making the leads longer would cause serious resonance problems with many currently available pickups. There is really no excuse for using such high-capacity leads, though; shielded cables with less than 20

pf capacity per foot are readily available, and we see no reason why they weren't used, to allow at least four feet of cable length.

We found one other mild problem, too. When the lift lever is lifted, the arm swings to one side by a good half an inch, making it impossible to lower it into the same groove it was lifted from. It would also be a great help if the lift lever had some damping in it, to prevent the pickup from being lowered too rapidly onto the disc, for the main purpose of a lift lever is to minimize the chances of pickup and record damage due to accidental dropping.

Aside from the lift lever and cable problems, both of which should be easily remediable by the manufacturer, the A&D arm performed better than any tone arm we have ever tested. With a pickup that resonated with the cables at beyond audibility, the A&D arm made it sound sweeter and smoother than any other stereo tone arm we've tried to date, and it did a remarkable job of tightening up the low end, while reducing tendencies toward rumble and acoustic feedback. Our Thorens/SME combination, for instance, has always been somewhat prone to feedback, not because of any intrinsic flaws but because the side-mounted tone arm panel (or plinth, as the British call it) acts as a sounding board. We were able to hold both problems to a minimum with the SME arm, but the A&D arm virtually eliminated them. The A&D arm is also unusually resistant to physical shocks that knock every undamped pickup right out of the groove. It doesn't make shock isolation unnecessary, but it does make a given amount of it much more effective.

The carrying arm is easily lifted off its base to facilitate cartridge replacement, but we doubt that many people will have the spare cash on hand to follow the manufacturer's recommendation and use a separate "pre-calibrated carrying arm" (at \$45 each) for every pickup cartridge. We'd like to have

seen the arm equipped with plug-in shells, even if the fittings did add a gram or so to the total arm mass. Of course, if you *can* afford one arm per cartridge, it's an ideal way to achieve quick changes, but when removing the arm, hold its pivot above the damping fluid well for a few seconds after you lift it off, to give the pulled-off strand of fluid time to drip back into its well.

The A&D arm uses a unique system of magnetic bias compensation which is built directly into the base of the arm. This is not adjustable, and A&D's data sheet states that it is optimized for elliptical pickups tracking at between  $\frac{1}{2}$  and 1 gram. Apart from the fact that we have yet to find a pickup that would perform at its best at a gram or under, the bias compensation did appear to be right for ellipticals tracking at between 1 and 2 grams.

The basic design of this arm, then, appears to be markedly superior to anything else on the market, in that it can make most pickups perform better than in any other arm. But the very fact that it is so good in most respects makes us less tolerant of its minor shortcomings than we would otherwise be. There's been some highly successful pioneering in the pivot and counterweight design of this arm, but other manufacturers have solved the cable and lift lever problems long ago, so there does not really seem to be any reason why A&D couldn't have paid closer attention to these details. We don't expect perfection in anything, but for \$150 we should at least be able to expect freedom from problems that have been solved in \$70 arms.

As it is now, we will probably adopt the A&D arm as our primary test standard (with suitable pickups), but not as gleefully as if it were debugged.

**MFR'S COMMENT:** We are gratified to note that The Stereophile observed the same improvement of a pickup's sound when using the A&D arm that we have observed.

As for the minor criticisms aimed at the arm that was tested, we should emphasize the point that nothing is perfect. The arm was put into production when it was simply because, even with its "faults," it had proven to be better than any other arm that was available, and it

was felt that such an improvement in pickup performance was more than adequate justification for putting the arm on the market.

The arm that The Stereophile tested was one of the first production units. Even before the Stereophile report was completed, we had recognized, and taken steps to correct, the things for which Stereophile criticized the arm. The adjustment and operation of the lift lever have been made more positive on later models, and the output cables have been lengthened and reduced in total capacitance.

A&D have also recently introduced an experimental model of carrier arm designed specifically for Decca plug-in pickups, and initial tests have proven most promising.

## Futterman H-3A Amplifier

**MFR'S SPECS:** Type: All-tube output-transformerless stereo power amplifier. Output: 90 watts per channel with 16-ohm load. Frequency response:  $\pm 0$  -0.5 db, 5 Hz to 90 kHz; -3 db at 200 kHz. IM distortion: less than 0.05% at 90 watts (continuous sine wave) into 16 ohms. Damping factor: 200. Stability: Unconditionally stable with any kind of load. S/N ratio: better than 93 db below 90 watts. Sensitivity: 2.0 volts in for 90 watts out. Input impedance: 270,000 ohms. Dimensions: 17 in. W by 10 $\frac{1}{4}$  D by 7 $\frac{1}{2}$  H. Weight: 29 lb. (Relatively light weight due to absence of output transformers). Price: \$288, including cage. MFR: Harvard Electronics Co., 2768 Broadway, New York, N. Y. 10025.

It is not at all unusual these days to find manufacturers producing "matched" speakers and amplifiers that are designed specifically for one another. But it is very unusual to find this being done by an amplifier manufacturer who doesn't make loud-speakers. The Futterman H3-A is one of these rarities — an amplifier designed primarily to complement one of the best, and one of the hardest-to-drive loudspeakers on the market: the KLH Model Nine.

The H-3A is unusual in another respect, too. It is probably the closest anyone has come to combining tube and transistor technology, for although it uses vacuum tubes, its output circuit and its lack of interstage capacitors and output transformer have more in common with transistor amplifiers than with tubes. Thus, although it runs at the typical high temperature of high-powered tube equipment, it can also have the ruggedness and dependability that are claimed for but rarely achieved from transistor amps, and it has the cardinal virtue of being repairable in the field, unlike transistorized units which must usually be returned to the factory or an authorized repair station.

Another difference between the H-3A and most transistor amplifiers is that, while the latter are

designed to deliver maximum power to a load of between 4 and 8 ohms, the H-3A yields its maximum power (100 watts) into 30 to 40 ohms. At 16 ohms, it gives 90 watts (continuous sine-wave) per channel, and will put out about 45 watts per channel with 8-ohm loading. At 4 ohms, output drops off to around 19 watts per channel, which is a bit ridiculous for a \$288 amplifier. So although the H-3A *can* be used with 4-ohm speakers, it would be rather foolishly wasteful.

The literature supplied with our H3-A also recommends it for use with Quad electrostatics, and this we must take very strong issue with. The Quad speakers are designed to handle about 15 watts per channel, and can be damaged by even momentary application of power in excess of 30 watts per channel. With the Quads' 16-ohm impedance, the Futterman could deliver almost 100 watts to one of them as the result of an inadvertent loss of a ground connection at one of the phono input leads. Although one might avoid such accidents for a long period of time, the consequences of such an occurrence could be a bit too serious to allow the possibility to exist at all. Better to use a lower-powered amplifier with the Quads.

As a matter of fact, the KLH Nine is the only 16-ohm speaker system we know of that can use more than about 25 watts of power. In general, 16-ohm designs tend to be horn-type systems, which can blow you out of the room with an honest 10 watts of input signal, and all of the less-efficient 16-ohm systems we know of have maximum power ratings of 50 watts or less. So in order to justify the use of the Futterman on anything but very inefficient 16-ohm speaker systems, it would have to be demonstrably better-sounding than competitive amplifiers at output levels of about 40 watts or less. And there's some very stiff competition in this power class.

The circuitry is very well thought out and the amplifier is beautifully put together. Indeed it looks more

like a piece of laboratory equipment than a home high-fidelity component, with clean, very neat wiring and (among other things) an array of 14 machine screws fastening the bottom plate to the chassis. We couldn't find a single sheet-metal self-tapping screw in the whole amplifier, and we looked carefully.

In addition, the H-3A is more thoroughly fused than anything we've ever seen before, and in quite an unusual manner. Apart from the two standard front-panel fuses, for the B+ supply, there are *eleven* circuit fuses inside the chassis, each one consisting of a single strand of ordinary hookup wire—a thick strand for heater circuits, a thin strand for the lower-current plate circuits. And fastened to the underside of the chassis, via its own little holddown clamp, is a supply of the two different sizes of fuse wire. If this sounds like a slightly shoddy way of doing things, remember that many industrial and laboratory-type electronic instruments are protected by just such bare-wire fuses, soldered into the circuit.

Frankly, we very much like this idea, because it allows for comprehensive circuit protection at a cost far below that of an equal number of conventional fuses. The H3-A's extensive fusing, incidentally, is not because the unit is more likely to blow up than any other amplifier, but simply because without such protection, its high-current circuits could do serious damage to themselves (and possibly to the loudspeakers, too) if anything ever did let go.

The H-3A has eight internal setup adjustments—more than we've ever seen in a power amp, and detailed instructions are provided for making the adjustments "every thousand hours or so, or whenever tubes are changed." We checked the adjustments when we received our H-3A and again after about a couple of hundred hours' use. They were right on the button each time, so there's certainly nothing unstable about them. Some of them *are* fairly critical, though, so

they should be maintained at the recommended settings if the amplifier is to give minimum distortion and maximum output without burning up the tubes. The H-3A normally runs quite hot, so it should be well ventilated or, if it's located where you won't accidentally touch the uninsulated output tube caps, it could be used with its perforated cover removed. Despite the high operating temperature, though, none of the H-3A's tubes had the dull red plates or blue glow that are often a sign that tubes are being overworked. And the fact that it ran for about 200 hours without a measurable change in characteristics suggests that the tubes should last a long time.

Because it seems (to us) obviously better suited for use with the KLH Nine than with any other speaker system, we did the bulk of our listening on that system, comparing it with the two best amplifiers we had found for use with the Nine: The Marantz Model 9 and the Dyna Stereo 70. We also tried it on two 8-ohm systems—the Janszen Z-600, with its electrostatic high end, and the Ampex 4010 all-dynamic system, and compared it again with the other amplifiers.

With the KLH Nine, our initial reaction to the H3-A was that it was far and away the best thing we'd ever driven that speaker with. Highs were very crisp without being hard or brittle, and the overall sound was highly transparent and effortless. With prolonged listening, however, we became aware of a certain heaviness in the mid-bass range, which had the effect of covering up some of the output in the range below about 60 Hz. Neither the Dyna Stereo 70 nor the Marantz Model 9 amplifier showed any tendency to do this, with the result that both of these gave the impression of tighter mid-bass and considerably more deep-bass output. Highs from both of these were somewhat softer than those from the Futterman, and although the Futterman's crisper highs did not seem to add any

roughness to record groove breakup, we found that we preferred the slightly sweeter high end with most program material. There was not, however, a trace of the typical transistor hardness from the Futterman, even at very low listening levels.

At high levels, approximating a row-H seat in the concert hall, the Dyna was showing marked signs of breakup on power peaks, the Marantz was showing some roughness, and the Futterman was still as effortless-sounding as it was at low listening levels. Our efforts to overload the Futterman yielded nothing more than a succession of blown fuses in the KLH Nines. Normally, one would not expect to notice this much difference between a 70-watt (Marantz) and a 100-watt amplifier, but we've observed this seeming ability of transistor amps to put out more than their rated power, so it is not really so surprising that a transistor-oriented tube amplifier would behave the same way.

On the Janszen Z-600's and the Ampex 4010's, there was less tendency toward mid-bass heaviness, but the loss of deep bass seemed even more marked. The rest of the range, through the Ampex speakers, was superbly reproduced, with the same over-all timbre and transparency as from the other top-grade amplifiers. Strangely, though, highs from the Janszen speakers were somewhat softened, as though there was a gradual rolloff above about 8 kHz. Highs from the Janszen were in fact a shade softer than when using either the Dyna or the Marantz. We found the softening a help with some program material, but the majority of discs and tapes came through with a bit too much edge removed from them. The Ampex speakers, on the other hand, were not at all affected in this way. Their highs sounded almost exactly the same with the Futterman as with the other amplifiers.

With both of these 8-ohm speakers the Futterman's loss of power (due to the impedance mis-

match) made it only slightly cleaner than the Dyna at output levels barely exceeding 35 watts on peaks. At the same level, of course, the Marantz was cleaner than either of the others, but again, not as much so as the power difference would suggest.

We found one other thing about the Futterman H-3A that may or may not be significant, depending on the circumstances. When using three-terminal pickups or a tone arm with a common grounding circuit—a bad arrangement to begin with—the Futterman exhibited fairly severe ground-loop hum. This could be reduced to a tolerable level by disconnecting the ground at one of its inputs, but was not entirely eliminated. For instance, we had the trouble with a Decca pickup (3-terminal output) and a Dyna PAS-3 preamp or a pair of PAM-1 preamps with the stereo adapter. A 4-terminal pickup worked fine with the PAS-3, and hummed with the two PAM-1's until we opened up an input ground, which then eliminated the hum entirely. The PAM-1 combination, with its separate chassis, is especially prone to hum-loop problems anyway, but the PAS-3 is unusually good in this respect. With other preamps, it would be best to try the combination before buying.

This is one of those puzzling instances where an objectively superb amplifier just does not seem to deliver quite what one would expect in the way of subjective performance. Every instrument test we gave the Futterman H3-A (response checks, square waves, IM distortion measurements) showed it to be one of the best amplifiers we've ever encountered. Yet its low end performance on every speaker we tried it on was less satisfying to the ear than was that of some other amplifiers that don't measure as well. We wish we could at least volunteer some educated guesses as to why this might be the case, but we're stumped.

We can only say—with much regret, because the manufacturer clearly set out to produce an abso-

lutely no-holds-barred unit—that we feel there are other amplifiers better suited for most loudspeakers, and that the H-3A does not sound quite as good to us on the KLH Nine as do some other amplifiers.

**MFR'S COMMENT:** We did not design the H-3A specifically for use with the KLH Nine. In fact, monophonic versions of the basic design were in use 15 years ago, mainly with the RCA LC-1A loudspeaker, with which it gave superb results.

There is one coupling capacitor in each channel of the H-3A; computer-grade 800-mfd capacitors are used to isolate each loudspeaker from the output tube circuitry. In our opinion, direct-coupling a power amplifier to a loudspeaker (especially with transistor amplifiers) is inherently dangerous to the speaker system. In fact, some of the latest high-powered transistor amplifiers use elaborate and expensive transistor circuitry to protect the loudspeaker from damage due to the direct coupling should some "unlikely" defect occur in one of the output stages. We emphasize this point because the subjective listening results that *Stereophile* obtained in the low-bass region may well be due to the size of the coupling capacitors used in the H-3A that was tested. We are currently experimenting with much larger values of capacitance, as this is the only part of the H-3A's entire circuit that could affect the very low bass response.

We have found, and eliminated, the ground loop that was causing hum from three-terminal pickups.

**REVIEWER'S ADDENDUM:** We, too, had wondered if the output coupling capacitors might not be responsible for the slight rolloff at the extreme bottom, but could find no conclusive objective evidence to support this. There was some tilt on bass square waves, but no more so than from other top-grade amplifiers, and the measured frequency response was within 0.5 db of flat down to a bit above 25 Hz. On the other hand, since there isn't anything else in the circuit that could affect low end, it is quite likely that increasing the size of the coupling capacitors will indeed improve the low-bass response.

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## Shure V-15 Type II "Supertrack" Pickup

**MFR'S SPECS:** Type: Moving magnet. Frequency response: 20 to 25,000 Hz. Output: 3.5 mv. Channel balance: within 2 db. Separation: Over 25 db at 1 kHz; over 17 db at 10 kHz. Recommended force:  $\frac{3}{4}$  to  $1\frac{1}{2}$  grams. Typical trackability (at  $\frac{3}{4}$  gram): 17.9 cm/sec at 400 Hz; 26 cm/sec at 1 kHz; 26 cm/sec at 5 kHz; 15 cm/sec at 10 kHz. Weight: 6.8 grams. Price: \$67.50. MFR: Shure Bros, Inc., 222 Hartrey Ave., Evanston, Ill. 60204.

In theory, the elliptical stylus offered a significant improvement in the ability of a pickup to trace the high-velocity treble grooves of modern souped-up recordings, but in practice, it also introduced some side-effects which tended to negate the advantages. The smaller area of contact between the stylus and the groove created higher contact pressures whenever the stylus pressed against the groove wall (as when a treble modulation forced the stylus to move more rapidly than its inertia wanted to let it move), and the "tighter" groove/stylus coupling acted to lower the frequency of

the high-end resonance, usually bringing this down to within the audible range.

In addition, the same reduced contact area meant that the stylus force had to be set at a lower value to prevent permanent indenting of the vinyl groove walls. And when this was done, of course, distortion due to mistracking tended to increase. The combination of the audible high-end peak and the reduced tracking force caused many ellipticals to sound just as fuzzy with many records as the old spherical styli, and the slight mistracking, combined with the smaller contact area, made early ellipticals more harmful to records than the sphericals they had replaced.

All pickup designers realized that the answer to the dilemma was higher compliance and lower stylus mass, both of which would allow the elliptical pickup to track cleanly at forces below the critical groove - deformation point. But Shure Brothers was the first, to our knowledge, that set out to find exactly how *much* compliance and lightness were needed to track commercial recordings. Their research and their findings have been the subject of so many ads and articles that we needn't go into them again. Suffice it to say that the V-15 Type II "Supertrack" pickup was the result of their investigations.

In appearance, the Type II makes even Shure's original V-15 look as delicate as an anvil. The Type II weighs but 7 grams, compared to the V-15's 11 grams, its stylus armature looks about  $\frac{1}{3}$  as large as that of the V-15, and the pickup is equipped with a small plastic guard that folds down to protect the stylus when not in use, so the cleaning woman won't wreck it with a flick of the feather duster.

Installation is just as simple as with other Shure pickups, and the pickup can be properly counterweighted with any tone arm that will accept it. (Old arms, designed for earlier pickups, won't counterbalance it without the addition of

extra weights under the pickup. But such arms are too massive for use with it anyway, so avoid them.)

Also like other Shure pickups, the Type II has excellent hum shielding, no magnetic pull, and the usual 4-terminal output arrangement that virtually insures freedom from hum-loop problems.

Our first listening tests were made with discs that we know to be cut with moderate levels — discs that have never bothered any other reasonably good pickup. Predictably, there was no evidence of breakup, but our immediate reaction was that something had gone wrong with our tweeters: the sound was markedly dull and lifeless. We didn't even go on to the hard-to-track discs before we hauled out the meter and test records and ran some response checks. The results explained the sound.

Below 1 kHz, we could almost have laid a straight-edge along the pickup's response (down to about 30 cps, where arm resonance started to cause a gradual rise). Slightly above 1 kHz, though, the response started a slow decline, and hit almost 6 db down between 8 and 12 kHz. Above that, in the barely-audible range, it rose back to a mild hump at 19 kHz. The result of the dip was a form of coloration that would make the V-15 Type II sound very pleasant on loudspeakers that tend to whoop up the high end, but we found it rather distressing on speakers that could reproduce tapes and FM transmissions *without* excessive high-end tip-up.

While we were at it, we checked out the Type II's separation, and found this to be around 22 db from 200 to 5,000 Hz. There was a mild drop to 19 db at 6 kHz, and then it increased to 22 db at around 10 kHz, which is phenomenal! Needless to say, the pickup's subjective separation was excellent, yielding a very nice sense of space from recordings that had it, and providing total separation of extreme right-left solo instruments.

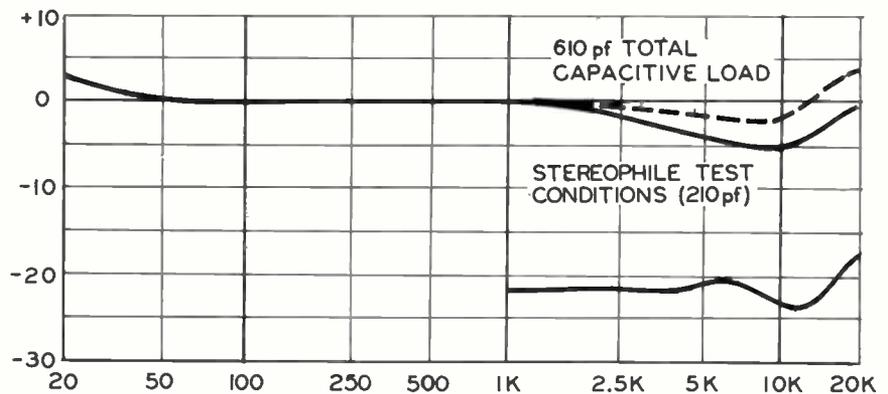
Shure recommends a tracking force of between  $\frac{3}{4}$  and  $1\frac{1}{2}$  grams

for the Type II. Our usual inclination is to set the stylus force at the highest value that the tip radius will allow without incurring permanent groove deformation, but since Shure made such a point about the Type II's trackability, we decided to see just how lightly we could track it without running into trouble. Starting with  $\frac{3}{4}$  grams, we auditioned some of our difficult discs as well as Shure's own Trackability Test Record (see the review in this issue). We found that there was some breakup at  $\frac{3}{4}$  grams, even from the Shure test disc, but we also found that  $1\frac{1}{4}$  grams was the maximum force needed to get maximum cleanness from every disc. Going to  $1\frac{1}{2}$  grams made not the slightest difference on any of the discs, so we chose to stay with the  $1\frac{1}{4}$  grams. This is the lightest force we have been able to get away with, with any pickup hitherto

ture to take on a permanent "set" that will reduce its compliance.

On our "difficult" recordings, the V-15 Type II did indeed track more cleanly than any other pickup we have tested to date, but we found that when we boosted the treble until the pickup's high-end balance resembled that of its competition, there was much less audible difference in cleanness. The fact that the Type II pickup's high-end peak occurred beyond audibility (our audibility, anyway) made it sound sweeter and smoother than the other ellipticals we've heard, which was a blessing. But the fact that our tone controls could not correct for the high-end dip without also increasing the "presence range" made it impossible to get as natural a sound from the Type II as we have had from some other pickups.

There is no doubt that the tracking ability of the Type II



Response and separation of V-15-II with different capacitive loads.

tested, and despite this, tracking was unprecedentedly clean. What little breakup we did notice from some discs has been present, in greater quantities, from every other pickup, and is probably the result of groove damage.

Note, though, that our tests were made with the Type II mounted in an SME 3009 arm and, subsequently, in an Audio and Design arm. Some other arms may require higher tracking forces for optimum tracking, but we would *not* advise going above  $1\frac{1}{2}$  grams. Even if the stylus doesn't start indenting the grooves, the excessive vertical force may cause the arma-

pickup represents a significant advance in the state of the art. But to keep things in their proper perspective, it must be realized that its tracking superiority will only show up on those recordings that have exceedingly high velocities cut onto them. It *will* do better than any other pickup we've tested on high-powered "demo records" such as Commands, Mercurys and London Phase-4's. But on the bulk of serious music releases, which are generally recorded a little more conservatively, we could not tell the difference between the tracking ability of our old Decca/IMF Mark II (0.6-mil spherical) and

the Shure V-15 Type II. And when it came to over-all musical naturalness, the Decca was clearly superior.

If the V-15 Type II could be produced *without* its high-end dip, we suspect it would be very difficult to beat on any count. As it stands now, though, we are forced to rate it a couple of notches below the top, simply because it does not do quite as good a job of reproducing musical sound as do some other pickups that have less spectacular tracking ability.

**MFR'S COMMENT:** The V-15 Type II was carefully designed to produce the flattest possible frequency response under conditions of typical use, which would normally involve having between 400 and 600 pf of capacitive loading across the pickup's coils. This capacitive loading, a combination of tone arm and preamp-input capacitances, yields a high-end response which dips to no more than 2 db below the zero-db point, and rises to only about +2 db at 20 kHz. Unless these actual-use conditions are met in testing, the V-15 Type II will show a slight dip in response in the 4- to 10-kHz region, although the dip we have measured has never been quite as significant as that reported by *The Stereophile*.

If it is found that a particular combination of arm and preamp does not provide the necessary capacitive loading, small ceramic capacitors or adjustable trimmers of the value necessary to correct the condition may be bridged across the pickup inputs in the preamplifier. More precise adjustments may then be made by judicious use of the treble tone control.

It is not altogether true that the benefits of high trackability are realized only when playing very "difficult" records. Even when a stylus with high mass or low compliance is tracking without audible distortion—that is, without losing contact with the groove walls—it may still be causing significant record wear by exceeding the elastic limit of the vinyl every time the groove changes direction rapidly. This kind of wear, while not usually showing up as increased distortion or surface noise, will tend to erase the recorded high frequencies, causing the sound to become progressively duller.

**REVIEWER'S ADDENDUM:** We tried Shure's suggestion with a pair of trimmer capacitors, and were able to duplicate fairly closely their measurements. This strikes us, though, as a strange way to design a pickup, because few users will have on hand the test equipment needed to arrive at the proper value of resonating capacitance. It seems to us that a pickup should be designed for optimum smoothness from any input capacitance of less than a certain "typical" value, so that as long as this value is not exceeded, the response will be uniform, and lower values will not affect the response either.

Our test system, which is not at all atypical (a Dyna preamp and Shure's own SME arm) has a total measured input capacitance of 210 pf, which explains why the pickup behaved the way it did. With additional capacitance added, the pickup sounded very similar to the later-model Ortofon S-15, and could be rated second in over-all performance, just between the Decca Mark II and the S-15. We'll have a more detailed report on the equalized V-15 Type II in the next issue.

## KLH Model Twenty Stereo System

**MFR'S SPECS—TYPE:** Complete three-unit stereo system comprised of 4-speed record changer, FM stereo receiver, and two small bookshelf-size speaker systems. Amplifier: Specs similar to KLH Model 16 (but w/lower power). Tuner: Specs similar to KLH Model 18. External input facilities: Aux 1 (Mono, fed to both channels equally); Aux 2 (stereo high-level); FM Antenna. Output connections: Three-circuit headphone jack (4 to 600 ohms), Tape Out. Slide switch shuts off main speakers when phones only are desired. Controls: FM Tuning, Input Selector, Mono/Stereo Switch, Off/On/Auto Switch (On position allows tuner and amplifier to be operated when changer is shut off), ganged Treble, ganged Bass, Balance,

Volume. Indicators: Neon AC on, neon stereo carrier, zero-center tuning meter. Speakers: each is two-way two-speaker system with 10-inch woofer and 1½-inch direct-radiator tweeter. Dimensions: Speakers—23⅞ inch H by 11¾ W by 9 D; phono/control center—4 inch H by 18¼ W by 14 D, over-all. Price: \$399.95. MFR: KLH Research & Development Corp., 30 Cross St., Cambridge, Mass. 02139.

This is a complete stereophonic FM and phono system in three compact sections: Two good-sized KLH bookshelf speakers, and a single compact phono/control section housing a specially-built Garrard AT-60 changer with Pickering V-15 pickup and a KLH "receiver" comprised essentially of the circuitry of a KLH Model 18 tuner and Model 16 amplifier.

This is not just an assemblage of good-quality components, though; it is a completely integrated system in the truest sense of the term, for it incorporates certain frequency response corrections to offset the slight inherent colorations of the pickup and the loudspeakers. We do *not* approve of this kind of thing in the manufacture of recordings or of components that are intended for use with a variety of associated equipment, because the "corrections" will be correct for some situations and will yield considerably *worse* sound in other situations than they would if there were no corrections at all. But an integrated system is another matter, for here the corrections are added to compensate for deviations that will remain constant as long as none of the original system components are replaced with other, different, ones. And if the corrections are judiciously applied, the resulting over-all sound quality can be better than the inherent capabilities of any one component in the system. We are very pleased to report that KLH has chosen very judiciously.

This is not the system to buy if you want to rock the room with thunderous bass, deafen yourself with volume, or communicate with bats, but it *will* produce almost shockingly (in view of its size) deep and well-defined bass, it *will* reproduce cleanly at levels approximating those of a row-M concert-hall seat, and its highs are sweet, open, and quite satisfyingly detailed.

Generally, we would describe the sound of the Model 20 as being re-

freshingly light and open, yet naturally full and solid at the bottom. All instrumental timbres are naturally reproduced, with virtually no audible coloration of any kind.

Surface noise from discs was soft, unobtrusive, and free from spit or sizzle. Tracking ability was very good, although noticeably less so than the best-tracking pickups available. More important, though, is the fact that when tracking distortion did occur, which was only rarely anyway, it came through only as a mild fuzziness or knocking sound instead of as the usual harsh tearing. This, combined with the high-end sweetness from discs, suggested that KLH might actually have applied some electrical filtering to the output from the pickup. If so, we can only say we liked the result.

The FM tuner behaved much like the Model 18 that we reported on in our Volume 1 Number 12 issue, which is to say it was very sensitive, highly selective, exceedingly stable, and very low in distortion, although a trifle brittle-sounding. When distortion did occur, because of a poor transmission or poor signal pickup, it tended to be somewhat harsh rather than just fuzzy.

Oscillator sweeps through the Model 20's Auxiliary inputs showed the subjective response to be essentially flat from about 14 kHz down to a phenomenal 50 Hz, with usable response to a bit below 40 and a bit beyond 16 kHz. White noise tests confirmed the system's remarkable smoothness, and revealed no perceptible coloration. High-end response through the KLH's phono unit showed a rapid rolloff above about 12 kHz, which could explain why the phono sounded less harsh than the FM tuner when reproducing tracking distortion.

Treble dispersion was very wide—spanning about 110 degrees—and was extremely uniform throughout this angle, resulting in excellent stereo imaging and breadth. (Placing the systems on their side causes some mild interference effects between the woofer and tweeter of each system, tending to degrade stereo imaging.)

There were only three things we weren't altogether happy about, and none of them was serious. Rotation of the function selector switch caused very loud pops, which were annoying rather than potentially damaging. Secondly, the Tape outputs deliver only about 0.15 volts of signal, which is not enough to drive some recorders to full recording level. KLH suggests feeding the signal into such recorders via their mike inputs, but many machines will be unable to handle that much signal into their mike inputs without severe overload distortion, while a few units have only low-impedance mike inputs, which are unsuitable for this kind of hookup. In other words, you'd best try and make sure a recorder will produce full record level with around 0.15 volts of line-level input before mating it with the Model Twenty.

Thirdly, presumably to facilitate hookup and to discourage experimentation with other speakers and amplifiers, KLH supplies the Model Twenty with two 24-ft. speaker cables with plugs at both ends. The plugs, though, are of the RCA type usually used for low-level signal cables, and it seems to us that this may encourage some users to try feeding external equipment (like a tape recorder) via the Model 20's speaker outputs, which may damage the output transistors. We like the idea of plug-in speaker connections for a system like this, but we'd rather KLH had used a different kind of plug.

Other observations: The record changer functioned smoothly and gently, but some rumble was clearly audible at moderate-to-high volume settings in the stereo mode, and flutter, although quite low, was detectable on instruments like chimes, oboe, and certain reedy organ stops. Incidentally, the stylus used in the Pickering pickup is a 0.7-mil spherical, so the apparently rather high 3-gram tracking force is actually quite safe (safer, in fact, than a lighter force might be).

The changer is shock-isolated on springs, and is very stable, requiring ridiculously large amounts of floor vibration in order to jar the

pickup out of the groove. There is no tendency toward acoustic feedback.

Just out of curiosity, we checked to see if it would be possible to assemble a system as good as this from separate components at anywhere near the cost. We failed, by a substantial margin. We also tried substituting other loudspeakers, and tried feeding other amplifiers to the Model 20 loudspeakers. No other combination sounded as good as the complete Model 20 system. Finally, we auditioned two other competitively-priced integrated systems, the Scott 2503 and the Harmon-Kardon SC-430, and while both were felt to be comparable to the KLH at the low end, neither one struck us as being as natural-sounding throughout the all-important middle range, nor as musically sweet at the high end. (We were unable to audition any of the comparable Fisher systems.)

Obviously, much of the success of the KLH Twenty is due to the careful integration of its parts. We would judge it to be one of the best, and probably *the* best buy in a high fidelity system today. But it is *not* to be considered a "starter set," that one can improve later on by adding larger speakers or "better" pickups, because *any* change (including the use of a different pickup stylus) will degrade the sound. It is a system to be bought, enjoyed for its superbly musical sound, and (when you feel you want something more ambitious) sold as a complete system. We suspect, though, that only dedicated perfectionists are likely to want anything better.

MFR'S COMMENT: No manufacturer can say much beyond "thank you" for such a glowing review of a product. There are a couple of points of information, however, that are worth making about the relatively new concept of integrated music systems.

The first is that the total acoustic output of any such system is a critical consideration. This is a function of both the power of the amplifier and the efficiency of the loudspeakers, and it is not a matter easily covered (or covered at all today) by a specification. But it is nonetheless very important, because it describes the actual sound level that can be produced in a room. It is also the factor that, system for system, costs a manufacturer the most money—involving the investment in the amplifier's power supply and the speakers' magnetic assemblies. The total acoustic output of the Model Twenty is considerably higher than that of any other manufacturer's similarly-priced system—enough higher to make a noticeable difference in cleanness when playing music at reasonably high levels in even a moderate-sized listening room. The actual acoustic output of most other \$400 systems seems to fall a

shade below the level of our \$300 Model Twenty-Four system.

Since total acoustic output is not likely to be cited very soon in specification sheets, it is definitely something for the critical listener to test for himself when making system comparisons in a store demonstration.

Second, a word about the turntable. As indicated in the report, the basic drive system is that of the Garrard AT-60, and one in which we were instrumental in getting Garrard to design for improved tracking of warped records and for resistance to jarring (as noted in the report). The improvement in the arm is anything but negligible, and is something we were able to obtain only because of our large-scale manufacture of integrated systems.

Our sincere thanks once again for the thorough treatment of and kind comments about the Model Twenty system.

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## Once Over Lightly

### Decca C4E Pickup

This is a later model of what was originally the Mark IV, which was found to have much promise but too many problems. The C4E is an improvement, but it still has some problems.

To date, we've tested six samples of the C4E. Of these, three were exceptionally good, surpassing every other pickup we have tested to date including the Ortofon SL-15. Two of them were not so good, being somewhat "hot" at the top and a bit shy on separation, while the remaining one was defective in a way that casts serious doubts on Decca's quality control. The sixth sample had practically no stereo separation, and as if that were not enough, its outputs were out of phase.

Because of quality control problems such as these, IMF (who had been importing the pickups into the U. S.) has decided to cease importing the pickups. A good C4E, though, is well worth having, and buyers who want to take pot luck on them can still order them (for considerably less than IMF's price) directly from dealers in England and from some sources in the U. S. If possible, though, it's best to try and get a hold of one that has been pretested for quality.

Also available from England, for about 50% higher cost, is a "special, hand-selected, super-performance" version of the C4E which is designated the SC4E. Presumably, these are C4E's that Decca's test department found to be outstandingly good, but if the C4E's can be as inconsistent as they are, we wonder how many sub-standard SC4E's are slipping through. We still think a hand-picked C4E would be the best choice.

These pickups, by the way, are quite hum-susceptible with some turntables, so check compatibility before buying, or try to buy with an option to return.

## Ortofon SL-15 Pickup

A sample of this arrived just before we went to press, but we took the opportunity to install it and listen to it for several hours. Our reaction? The best thing yet from Ortofon.

Actually, the SL-15 is exactly what we were hoping Ortofon would bring out (see the report on the S-15 in this issue). It is essentially a two-piece version of the S-15, with the cartridge part comprised

of a compact, lightweight unit that will mount easily in any universal-type arm. The bulky matching transformer is in a separate case, with the appropriate input and output connectors to allow insertion between the pickup leads and the preamp inputs.

To say that it works is putting it mildly. It has all the sonic virtues of the S-15 but has practically none of its installation problems. It still has the fierce magnetic attraction to steel platters that other Ortofon

(and Decca) pickups have, but gone are the problems of counterweighting and finding room for the connecting pins at the back of the cartridge shell.

One installation hint: If you have hum troubles with it, swap the connections into and out of the transformer, using the left-hand side for right and right for left. Make sure, though, that the left-channel pickup output ends up at the left-channel preamp input.

# Recommended Components

These are listings of high-fidelity components which we have found to be outstandingly good in each of four quality classes. They are *not* necessarily the only units which will meet the stated criteria of each class, but are simply ones that we know will provide the quality-conscious buyer with about the best sound he can get for his money.

The performance of systems using these components will depend to a great extent on care of installation, room acoustics, and the quality of available recordings, so we cannot assume any responsibility for the sound obtained from them. All we can do is assure buyers that the components listed are *intrinsically* excellent.

Components are selected for listing on the basis of our personal experience with them as well as reports from users and in other magazines. If a price-competitive component is not listed here, it is either because we have no information about its performance, or because we have found it to be inferior to a listed unit of comparable or lower price.

Ratings of amps, preamps and tuners are based, first on distortion, response linearity and other performance considerations, and then on control versatility, construction, appearance, and the unit's record of dependability up to the time when each listing is compiled.

Phono unit ratings are based primarily on cleanness and smoothness of disc re-

production, and absence of flutter and rumble. Acoustic feedback and mechanical shock isolation play a lesser role in the ratings, for the importance of these characteristics will depend on the individual installation. The buyer must determine whether these latter considerations might dictate the choice of a unit that is slightly less outstanding in primary performance characteristics.

Loudspeakers are rated according to over-all naturalness. A certain amount of "weighting" has been applied to the evaluations, reflecting (as it must) our personal reactions to the systems. Thus, a system with excellent middle and high-end performance may be rated below one that is somewhat less smooth and extended if its low-end performance is felt to be markedly inferior to the other.

Components of approximately equal quality (listed together in a single class) will usually offer different "extra" features that may swing the buyer to one particular unit. It is however assumed that the buyer will select his loudspeakers on the basis of room size, acoustics, and personal preference, and will make the necessary system adjustments correctly. Except where otherwise noted, a speaker should be driven by the amplifier in its same class whose power capability meets or exceeds the speaker's needs. Speakers are listed in each class in order of brilliance and efficiency.

Because many top-grade pickups, arms and turntables are mutually incompatible (because of potential hum, arm counterweighting and magnetic problems), phono units are listed as groups of these components which have been found to be suitable for use with one another.

Component categories are as follows: Class A—Highest in price, best potential (i.e., under ideal conditions) sound quality, no-holds-barred. Class B—Sonic quality about equal to that of Class A, but lower in cost and generally better suited to smaller listening rooms. Class C—Lower-quality sound, but far better than average home high-fidelity. Class D—Good, musical sound, but significantly less so than the best attainable.

*The following changes are being made in the listings, as of this issue:*

Shure V-15 pickup superseded by Ortofon SL-15.

ADC 401 speaker system superseded by Acoustic Research AR-4x.

Dual 1009 record changer superseded by Dual 1019 changer.

Ampez 354 tape recorder superseded by AG-440.

McIntosh MR-71 tuner superseded by MR-67.

Hartley 220MS/Holton speaker system added in Group B.

## Phono Units<sup>1</sup>

- (A) Thorens TD-124 with nonmagnetic platter, or TD-121 (33 $\frac{1}{2}$  rpm only); SME 3009 arm & IMF Mark II<sup>2</sup> pickup with SME adapter, or IMF Audio & Design arm & Ortofon SL-15 or S-15 pickup.
- (B) Acoustic Research TA (33 $\frac{1}{2}$  rpm only) or NA, and Shure V-15 pickup.
- (C) Acoustic Research turntable and Weathers Pro-66<sup>3</sup> or Ortofon SL-15 pickup; or Dual 1019 changer and Ortofon SL-15 pickup.
- (D) Bogen B51-S record player and ADC Point Four or Shure M-44 pickup; or Garrard A-70 changer and Shure M-44-5 pickup.

## Tape Recorders

- (A) Ampex AG-440; Scully 282-4; Ampex AG-350.
- (B) Ampex 602-2; Dynaco Beocord 2000; Sony 777.
- (C) Sony 350; Viking 88.
- (D) Sony 250.

## Tuners

- (A) Marantz 10-FM; McIntosh MR-67; McIntosh M-13 optional.
- (B) Dynaco FM-3; KLH-18.
- (C) EICO ST-97.
- (D) Heath AJ-12.

## Microphones

- (A, B) Sony C-37A; Neumann U-67.
- (C) B&O 100; E-V 666.
- (D) B&O 50; B&O 53.

## Headphones

- (A) Beyer DT-48.
- (B) Koss PRO-4.
- (C) Sharpe HA-10; Jensen HS-1; Superex STM.
- (D) R-Columbia Type A, Koss SP-3X; Ampex 140.

## Preamplifiers

- (A) Marantz 7; McIntosh C-22.
- (B) Dynaco PAS-2, PAS-3.

## Amplifiers

- (A) Marantz 9A or 8B Futterman H-3.
- (B) Dynaco Stereo 70; Stereo 120.
- (C) KLH Model 16.<sup>4</sup>
- (D) Dynaco SCA-35.<sup>4</sup>

## Speaker Systems

- (A) KLH 9; Bozak B-310; Electro-Voice Patrician 800; Altec A-7.
- (B) Acoustic Research AR-3; Janszen Z-600; Hartly 220MS/Holton.
- (C) Acoustic Research AR-2ax; KLH 6; KLH 7; Wharfedale W-40.
- (D) Acoustic Research AR-4x; KLH-17.

1. For 78 rpm, add extra plug-in head and General Electric 4G-040 pickup (or Decca 78 head if using Mk II).

2. Use with electrostatic tweeters.

3. Pro-66 designates a combination of the C-150 pickup and the C-66 pickup's wiring harness and preamp input adapters.

4. Integrated control amplifier.

# Record Reviews

## An Audio Obstacle Course

*The Shure Trackability Test Record.*  
Shure Bros. TTR-101.

Shure's new "Supertrack" V-15 Type II pickup was designed as an answer to all those high-powered discs whose excessive modulations make them shatter all over the place on lesser pickups. But just in case anyone didn't happen to own any of these difficult discs, Shure decided to issue one of these, too. The result is a collection of some of the meanest modulations ever gathered together in one place.

Each "test" is a series of four short musical excerpts, recorded at progressively higher levels but otherwise identical. Among the nastier items (from a pickup's viewpoint) are orchestral bells, piano, accordion and harpsichord, but everything on here is likely to give every pickup something to struggle with.

Also included are some silent grooves to evaluate hum, rumble and surface noise, and an area of blank, ungrooved surface for checking bias compensation. The latter is the only thing we are really dubious about, because it doesn't work the way it should.

Shure advises us to adjust the bias compensation until the stylus stays where it's placed on the blank area, skidding neither toward nor away from the center spindle. The resulting bias adjustment, however, yields what appears to be *over-correction*, for the pickup then breaks up on left-channel modulations before the recorded level is high enough to cause right-channel distortion. We still prefer to use this left-right comparison method for checking bias compensation, and the left-right bands on Shure's disc are an ideal way of doing this. With bias properly set (and assuming both channels of the system to be matched in volume and in component lineup), both channels will be equally clean, or equally distorted, on both the right- and left-channel tests.

How effective are the other tests? We found them to be at least as valid for comparison purposes as our own stock of horrors—the pile of discs we've accumulated for checking tracking ability. We found one section—the loudest accordion passage—to be a bit too much even for the Type II V-15. But we also found that our previously-determined ranking for the

relative trackability of the pickups we've tested was verified right down the line when using the TTR-101. And although you may be shocked by what you find when you try it on your own system, remember that there *are* pickups that can track it almost perfectly cleanly. (Incidentally, loudspeaker peaks and very small amounts of amplifier distortion can exaggerate tracking distortion out of all proportion to its actual severity, so don't be in too much of a hurry to blame your pickup if it makes a very poor showing.)

This is one of the few listening-type (as opposed to metered) test records we've found that really does what it's intended to do. And what more could we ask?

If you can't locate the disc at your local audio dealer's, you can get one by mail from Shure Bros., 222 Hartrey Ave., Evanston, Ill. The price is \$3.95, post-paid, and well worth it. But it may persuade you to buy a new pickup.

### Bartok: Bluebeard's Castle

*Ludwig, Berry, London Symphony, Kertesz.* London disc set (2) 1158 or tape 90119.

A magnificent recording, in London's larger-than-life format (somewhat overblown soloists, for instance), and an electrifying performance, combine to make this one of the most completely successful recordings of the past few years.

Neither the music nor the "plot" of Bartok's only opera are likely to be readily accessible to the listener who thinks of opera only in terms of Verdi or Puccini, but there is enough emotional and intellectual content in this to make each listening a fresh and revealing experience, as well as an emotionally exhausting one.

Most highly recommended, on either the disc or the tape.

### Dvorak: Symphony No. 8 (Old No. 4)

*Berlin Philharmonic, Kubelik.* DGG disc 139181 or tape DGC9181.

What, oh what, is happening to DGG? It begins to sound as if that last hold-out of musical recording is finally succumbing to the American style of hi-powered hi-fi.

We found this the most musically satisfying version of Dvorak's 4th (or 8th) that has been committed to stereo, but the sound is marred by an irksome shrillness that does little justice either to Dvorak or to DGG.

If you have the Kertesz recording of this on London, hang onto it. If you don't, get it. It's still the best combination of recording and performance available at the present time.

### Mahler: Symphony No. 2 ("Resurrection Symphony")

*London Symphony Chorus & Orchestra, Solti.* London discs (2) 2217 or tape LC80187.

### Rating the Pickups

*Below is an up-dated listing of our relative ratings of the pickups we have tested in The Stereophile, listed in descending order of preference. The ratings are based on the performance of each pickup under optimum conditions—that is, with a complementary tone arm and a suitable turntable — and are heavily weighted to favor tracking ability, naturalness and smoothness throughout the audible range. Price is not taken into account. The order of preference shown may not necessarily reflect the suitability of a given pickup for use in a given system. Other factors, such as high hum fields and tone arm compatibility may swing the balance of preference toward other, lower-rated models. For this reason, we suggest referring to published reports on a pickup before deciding to purchase it. Some compatible pickup-arm-turntable combinations are listed in the "Recommended Components" section on page 15.*

- (1) Decca Mk II
- (2) Ortofon SL-15
- (3) Shure V-15-II
- (4) Ortofon S-15
- (5) Decca Mark III
- (6) Euphonics Miniconic
- (7) Shure M55E
- (8) Decca Mk III
- (9) Weathers PS-11
- (10) ADC Point 4/E
- (11) ADC Point 4
- (12) Shure M44-5

*Some of the listed pickups are discontinued models, but may still be available used or at heavily discounted prices.*

This is supposedly one of the new Dolby-ized recordings. If it proves anything, it proves only the truth of our contention that the playback part of the Dolby system belongs in the home.

This is a stunning recording, and a hair-raising performance, but the tape version of it hisses. Not quite as much as on the usual 4-track pre-recorded tape, but not that much less, either. Clearly, there are limits to what the Dolby can accomplish at the manufacturing end of the chain.

The disc is superbly quiet, and a shade more lucid-sounding on good playback equipment, but the tape is a bit cleaner in the most massive crescendos. Take your pick.

#### Stravinsky: L'Histoire du Soldat

*Madeleine Milhaud, Jean Pierre Aumont, Martial Singher, instrumental ensemble conducted by Leopold Stokowsky.* Vanguard disc VSD-71165 (French version) or VSD-71166 (English version).

One of the first Dolby recordings (see "As We See It," Page 3) to be released by an American record manufacturer, this also happens to be the most satisfying performance of L'Histoire that's come along to date.

After the boldly printed banner announcement on the front of the record jacket, it was inevitable that the first thing we noticed about the sound was its startling absence of background noise. Subsequently, we also noticed that the over-all sound was a bit on the dry side, that the instrumental pickups were excellent, and that the

voices were somewhat too loud and too close-up.

The music, and the whole point of the work, is hardly likely to cheer you up, but the total effect is quite disturbing, and quite unforgettable.

#### More from the Top of the Pile

*(Recent releases featuring excellent sound. The discs are a bit better than the tapes in every case.)*

**Prima Donna.** Leontyne Price. RCA Victor.

**Mozart:** Piano Concertos No. 8 and 9. *Ashkenazy, Kertesz.* London.

**Elgar:** Enigma Variations. *Monteux, London Symphony.* RCA Victrola.

**Rachmaninoff:** Piano Concerto No. 3. *Ashkenazy, Fistoulari.* London.

**Dvorak:** Symphony No. 6 (Old No. 1). *Kertesz.* London.

**Dvorak:** Symphony No. 7 (Old No. 2). *Kertesz.* London.

**Tchaikovsky:** Manfred. *Markevitch.* Philips.

**Wagner:** Tristan und Isolde. *Bayreuth Festival.* DGG.

**Mozart:** Piano Quartets in G (K478) and E (K493). *Serkin, Schneider.* Vanguard.

**Sibelius:** Symphony No. 5. *Maazel.* London.

## Miscellany

### Construction Curb

Judging by the letters we received, some of which are printed in this issue, our Special Construction Issue on the home-brew amplifier was not an unqualified success with readers. In fact, it brought in more vituperative mail than any single issue we've published to date.

So we hereby promise, with hand on heart, that we shall nevermore devote an entire issue to one single topic, unless it happens to be another Special Equipment Reports Issue like this one. It seems that the equipment reports are the most popular part of the magazine, so if we ever again unbalance the content of an issue, it will be to favor that department.

### Assorted Errata

There were a number of errors and inconsistencies in the construction article in the last issue, none of them drastic but all of them a mite confusing. They're corrected below.

L-1 can be either 200 or 250 ma.

R-25 and R-26 should both be 2 W.

R-31 to 36 should be 1 W.

R-29 should be 220k.

R-28 should be 1 W.

J-2 Bias Test Point and the "Meter Test Point" are one and the same.

### Coming Up

In the next issue, we'll be reporting on the Ampex 915 and 4010 speakers, the Utah HS-3 speaker, the Revox tape recorder, the Shure M-75E pickup, the Ortofon RS-212 tone arm, the Dynaco PAT-4 solid-state preamp, and any other items we get ahold of in the meantime.

We'll also be broadening the coverage of our Equipment Reports section. Test results published in other magazines are generally very accurate, but are not usually evaluated from the viewpoint of the perfectionist. We will not quote from any of these reports, but we will describe how the equipment in question should perform, on the basis of the test results.

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### Ad Quote

The Fisher. . . . No ad man can do it justice. (From an ad in the New York Times Sunday magazine, for an expensive console stereo phonograph.)

*Justice may be blind, but is it deaf?*

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The coupon on page 18 can be clipped out without mutilating any of the magazine's editorial material.



**Constructive Criticism**

I have just received the "Winter Construction Issue." I can hardly wait for my subscription to expire.

How about a special issue for those of us who already own Marantz equipment, on how to convert it to a Heathkit?

Perhaps at \$2 an issue it would become a collector's item.

Leo W. Lakritz, M.D.  
Beloit, Wisc.

I was so pleased with your "Special Construction Issue" that I burned it, page by page. Now, either give me the kind of future issues I expected when I subscribed and then extend my subscription by one issue, or send my money back and forget the whole thing.

Richard Henry  
New York, N. Y.

Are you people nuts or something? Here I sit, for unending month after month, waiting for your next batch of equipment reports and record reviews, and what do I get for my patience? A whole issue aimed at the solder-and-spaghetti crowd.

Forget the "Special Construction" projects and give us what we subscribed for in the first place: Equipment reports.

Charleton Drew  
Cincinnati, Ohio

Your "Brute" amplifier looked worth building, so I tried it. I'm happy to say that it works very well, and it *does* sound better than the Stereo 70 that I cannibalized for some of the major parts, but I'm enclosing a list of some minor errors I found in the instructions and parts lists.

I am willing to bet, though, that a lot of your readers are going to be unhappy about not seeing any reports in that issue.

R. Bundy  
San Antonio, Tex.

*Well, we're glad somebody liked the construction article, and our thanks for the list of errors (which we've corrected on page 17). As for the reader reaction to that issue, see the other three letters above, and our comments on page 17.*

**Where's the Grenadier**

I notice that the Empire "Grenadier" speaker system is not included in your list of "Recommended Components." Is this because you haven't tested it, or is it because you *have* tested it and didn't like it? If you didn't like it, may I ask why not?

Whitney Greene  
Bronx, N. Y.

*We've never conducted a formal test of the Empire "Grenadier," but we have heard it on numerous occasions and concluded that it would not be of particular interest to Stereophile readers. Bass was excellent, as were treble dispersion and upper-end range, but these plusses were largely negated by what we felt to be some of the shrillest, peakiest - sounding highs we've heard from any modern speaker of comparable price.*

**Between the Devil . . .**

Why the devil don't you people answer your mail? I've sent you three letters asking about component problems of mine and all you do is send me post cards saying you haven't the time to answer individual letters of that kind. Have you no consideration for your readers at all?

H. W. Wetzel  
Brooklyn, N. Y.

**. . . and the Deep Blue Sea**

Why haven't I received my Spring issue? You said it would be mailed early in June, and here it is near the end of June and it hasn't come yet. What do you do with your time, anyway. Sit on your tail?

Donald Reamer  
Toronto, Canada

*This is what is known as a dilemma. When we don't get the magazine out on time, or answer individual letters promptly, we get deluged with other, more irate letters like the ones above. When we take the time to answer these, we take time away from the production of the magazine which, in turn, brings in more letters.*

*We read every letter we get, we appreciate readers' comments, suggestions and criticisms and, indeed, we need them in order to know how future issues can best be made to meet your needs.*

*We'd like to answer all letters, and we try to be as helpful as possible when readers have problems that we can't answer in the magazine, but our first obligation to all our readers is to (try to) get the magazine out reasonably on schedule, and this must take priority over individual problems. So, please, don't be irate or insulted if we sometimes take an impossibly long time to answer some of your letters.*

**Subscription Order**

(See page 17)

I enclose a check or money order in the amount of \$4 (U. S.), for a one-year (4-issue) subscription to **The Stereophile** magazine. (Pan-American countries \$4.25; other Foreign countries \$4.75.)

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## Unheard Recommendation

On page 10 of your Autumn issue (Column 3, Line 12) you stated that you had not as yet heard the Acoustic Research AR-4x speaker. How, then, could you include it in your list of "Recommended Components" in that same issue of the magazine?

D. F. Wisniewski  
Auburn, Mich.

*Because we had heard the AR-4 (although we hadn't had the chance to conduct a formal test of it), and had learned through experience that whenever AR "improves" a product, the improved version is invariably better than the original version.*

*The original AR-4 that we heard was good enough to warrant inclusion in the list of "Recommended Com-*

*ponents," so it was safe to assume that the AR-4x could be recommended.*

## Vilchur Leaves AR

We had wondered if we shouldn't put a black box around this announcement, but since it isn't a death notice, we decided against it. That is not to say, though, that we weren't saddened to hear that Edgar Vilchur and Acoustic Research have parted company.

To us, Ed was Acoustic Research. He invented the loudspeaker that started the company, his ingenuity and integrity were behind every product the company made, and he set an enviable example in the industry for fairness in dealing with customers. Now, he has moved on to the presi-

dency of a non-profit organization devoted to research into hearing aids, and while we wish him well, we're sorry to see him leave the high-fidelity field.

## Is Your Time Up?

If your mailing label on this issue of *The Stereophile* bears the hyphenated numbers 2-4 or 1-67, your time is up. This is the last issue coming to you on your present subscription. If you wish to continue supporting this worthy charity (and why not?), please send in your renewal now, before it slips your mind. There's a subscription blank on page 18.

## Audio Mart



The Audio Mart publishes, free of charge, Buy, Sell or Swap ads from subscribers. Ads are published as received, so we cannot be responsible for the condition or quality of the items advertised for sale in Audio Mart. Each ad received will be run once, in the earliest possible issue. Ads may be repeated any number of times, but we must receive specific notification each time you wish us to rerun your ad. Dealer ads cannot be accepted, except for components that are used or obsolete.

### FOR SALE

Decca/London C4E pckp, new, pre-tested; \$70. Will guarantee performance. E. L. Coggins, 14 Diane Dr., Malvern, Pa. 19355. Phone 215-N14-3126.

Citation I, \$90; almost-new Dyna PAS-3X, \$65; Dyna Stereo 70, \$75; AR XA trnbl w/Ortofon SPE/GT w/new stylus, \$90; ADC Point 10E, \$20. Larry Klugman, Box 248, Rantoul, Ill. Phone 217-356-0762 or 217-333-0098.

Two Bozak B-302A spkr systrs in Bozak early-American encls. Antique maple finish. \$330 for the pair. Lloyd E. Bull, 1124 West Clay St., Lancaster, Pa. 17603.

Marantz 7T prmp; Sony 3120 ampl; McIntosh M-65 trn in wint case; Dual 1019 chgr w/Shure V-15 Type II pckp; pair of Hartley-Luth Holton spkr systrs or the 220MS drivers. Everything absolutely as new. Will sell individual items to highest bidders. Paul Heath, 81 Big Tree St., Livonia, N. Y. Phone 346-5630.

Dyna Stereo 70, 2 yrs old, all new tubes, exc condn, \$55. Frank W. Farlow, 42 Wendell St., Cambridge, Mass. 02138.

Futterman H-3 ampl, good condn, recently checked; \$175. M. Rudo, 1254 Overlook Drive, Washington, Pa. 15301. Phone 412-225-5339.

Pair of KLH Model 4 spkr systrs, approx 4 yrs old, exc condn. Make offer, or will trade for pair of AR-3's. Also, Channel Master stereo FM-AM trn, Model 6612, less than 1 yr old, perf condn, orig cost \$120; will sell for \$65. James A. Stacey, Box 917, Michigan Center, Mich. 49425.

Magnecord 1028-P4 rcd w/case, 200 hrs use; \$600. Crown SS-724 rcd w/case and all possible circuit boards, 50 hrs use; \$750. Ampex AG-350, 200 hrs use; \$1200. James R. Foley, 151 Marina Dr., Apt J, Edison, N. J. 08904. Phone 201-247-5520.

Acoustech III ampl, Serial #6698. Carefully assembled from kit, 1 yr old, absolutely perf condn; owner simply prefers sound of Marantz. \$125, incl shipping costs. All inquiries answered. Alex Martin, 5642 Macey, Cincinnati, Ohio 45227. Phone 513-272-0019.

Half-track tapes, cheap. Some pre-recorded, others home-recorded. Write for details. Fisher

TFM-200 trn, \$135; Tandberg Model 3 stereo tape rcd, 1/2-track record, 2-tr stereo play, \$115. All items in exc condn. Tom Higgins, 423 Church St., Alexandria, Va. 22314. Phone 836-4615.

Citation II, mint condn, \$120; Ampex 960, mint condn, \$225; Citation III, mint condn, \$110; Ampex 2050, exc condn, \$236; AR-3 spkr syst, oiled wint, \$160. REA extra. G. A. Pratt, 1201 Ellis, Cedar Rapids, Iowa 52405.

Three AR4x (OW) spkr systrs. Pract new, in orig pckg cartons. Function beautifully, no cabnt scratches; \$75. C. F. Glass, YMCA 605 Clinch, Knoxville, Tenn., 37902.

Viable nits, suitable for picking. Ideal for the perfectionist who has everything but worries about it. Package of 50; best offer takes it. Box 20, Dept N, The Steeophile.

Personal record collection. Classical, jazz, country-and-folk, foreign, etc. All one owner, many played but once on professional arm. Send for lists. Allerton Hawkes, 58 Hardy Rd., Westbrook, Me., 04092.

Marantz SLT-12 trnbl, like new, \$220. McIntosh MR-67 stereo FM tuner in wint cabnt, exc condn, \$220. Marshall Sternberg, 131 N. Croft St., Los Angeles, Calif. 90048.

Audax (Rek-O-Kut) KT-12 mono tone arm w/instructions, \$4. Dean Bekken, 6115 Terryhill Dr., La Jolla, Calif. 92037.

Pair of Janszen 130 four-element electrostatic twtrs, mahogany; \$65 each or \$120 for both. Will be shipped direct from factory after checkup. Ampex 601 tape rcd w/flutter filter installed; 1/2-track mono; \$250. RCA 44-BX ribbon microphone, \$50. All prices FOB. T. Groom, 324 N. Spring St., Murfreesboro, Tenn. 37130.

Heath AA-161 mono amp, 14 watts, \$26; Heath FM-4 trn, aligned, \$35; Heath A-7E mono amp, 7 watts, \$10; Empire 880p cartridge, new, \$15; Grado BE cartridge, used abt 5 hrs, \$18; Shure M-44-7 cartridge, used abt 10 hrs, \$15. Paul L. Dalton, 112 Rhode Island Ave., Lynchburg, Va. 24502.

Genuine Klipschorn, 1950 vintage, medium-shade mahogany finish, with all latest components; \$500. Acoustech III, factory-wired, \$135; Acoustech VI, factory-wired prmp w/wint cover, \$135. T. Groom, 324 North Spring St., Murfreesboro, Tenn. Ortofon SPE pckp, 1 yr old; Weathers ML-66 trnbl w/LDM pckp. Best offer. Jim Ver Meer, Rte 3, Pella, Iowa 50219.

Electrostat-type tweeters w/proper cover nets and woofer level controls. K. Lozier, Jr., 103 N. Eleventh St., Lantana, Fla. 33460.

Decca Mark II stereo pckp w/SM-E adapter, \$45 or trade for Shure V-15 (state age and condn). Fairchild 500 arm w/SM-2 pckp, both new; \$20. Ortofon SMG-12 arm w/bias compensator, \$20. F. R. Hermann, 208 David Hall Rd., Dover, Del. 19901.

Conrac Fleetwood Model 800 custom TV set; 21-inch, full remote control. Nope, it's not color; just state-of-the-art B&W. Also, KLH Model B and Model 13 stereo FM receiving system. Fed H. Steele, 502 Homewood Dr. S.W., Huntsville, Ala. 35801. Phone 205-881-4696.

Ortofon S-15/T, \$35. Will have checked out by ELPA before sale if desired. J. D. O'Connell, 90 Tappan Ave., Belleville, N. J. 07109.

Ampex 4460 tape deck, exc condn. Best offer plus shipping. S. Sarper, 507 Shady Ave., Pittsburgh, Pa. 15206.

McIntosh 75-watt power amps, \$225 for the pair. Guaranteed to meet m.r.'s specs. Thomas A. Burns, 335 Laurel Dr., Arcata, Calif. 095521 or phone Area 707, 822-6772.

Decca Professional tone arm w/Mark III pckp, \$55, or will trade Mark III for Mark II. Mark III used very little. John J. Kempel, 1154 Irwin Dr., Pontiac, Mich. 48054.

Pair of Bozak B-302A spkr systrs, matched pair French Prov encls, like new. Two years old, \$415. Shure M-55E pckp, used 1 hour for testing only; will sell with new stylus, \$25. Shure M-55E used for less than 400 hours, very good condn, \$15. E. L. Coggins, 14 Diane Dr. Malvern, Pa. 19355. Phone 215-N14-3126.

Fisher K10 Spacexander, less than 3 mo old, \$45 or swap for good used mono or stereo amp. Orig price of K10 \$71. Perf condn. Richard Price, 1913 N. 12th St., Phila., Pa. 19122.

Sony C-37 capacitor microphone & supply, w/carrying case. Never used, \$200. No triflers. John R. Laub, 389 Boyd St., Camden, N. J. 08105. Phone 609-365-1399.

### WANTED

Marantz tube-type stereo pwr amp, Marantz tube-type stereo prmp, Futterman pwr amp, pair of KLH Model Four spkr systrs. Send details to Tom Groom, 324 N. Spring St., Murfreesboro, Tenn. 37130.

Four-channel (not four-track) tape deck—Viking, Ampex, Scully, Alsa, Dyna prmp. Send details and quotes to Fred V. Colletti, 42 Mall View Gardens, Maple Shade, N. J. 07052.

Rek-O-Kut APK Autopoise automatic tone arm converter of AP-320 automatic arm. Pat O'Brien, 647 South Waverly, Dearborn, Mich. 48124.

Klipschorn spkr syst. State age, finish, drivers and condn. Also Marantz or Heath electronic cover. R. J. Vande bill, 38 West River Rd., Rumson, N. J. 07760.

Audiophiles in Philadelphia area who are interested in forming an audio club. Write to Richard Price, 1913 N. 12th St., Phila., Pa. 19122 or phone PO-9-4731.

Pair of Janszen Z-600 spkr systrs, JBL SE-400 stereo pwr amp or Acoustech III stereo pwr amp or Dyna Stereo 120 pwr amp. State age and condn. F. R. Hermann, 208 David Hall Rd., Dover, Del. 19901.

### Stereophile Back Issues:

Will pay \$3 per issue for Volume I Numbers 5, 6, 7 and 8. R. E. Ivedson, M.D., 609 Ninth Ave. SE, Minot, N. Dak. 58701.

Wish to buy (\$1.50 each) or rent (50¢ each) issues 1 to 11. Thomas C. Mayberry, 2136 Sunset Dr., Stillwater, Okla. 74074. Please write in advance.

Wish to buy, borrow or rent issues Number 1, 3, 5, 6 and 7 of Volume I. Will pay reasonable price. Please write or call before sending. Lester A. Sebel, 3479 Seymour Ave., Bronx, N. Y. 10469. Phone 212-TU-2-8837.

Wish to borrow or rent all back issues up to Number 2 of 1966. Deposit if desired, and will return by air mail. State price. Dr. Neal Smith, Box 2072 Balboa, Canal Zone.

Will pay \$3 each plus insured postage for rent of issues 3 and 7 of Volume I. Joe Parlove, 108 1/2 Main St., Box 127, Royal Oak, Mich. 48068.

Buy, borrow or rent issues 1 through 9. Thomas M. Higgins III, 823 Church St., Alexandria, Va. 22314.

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