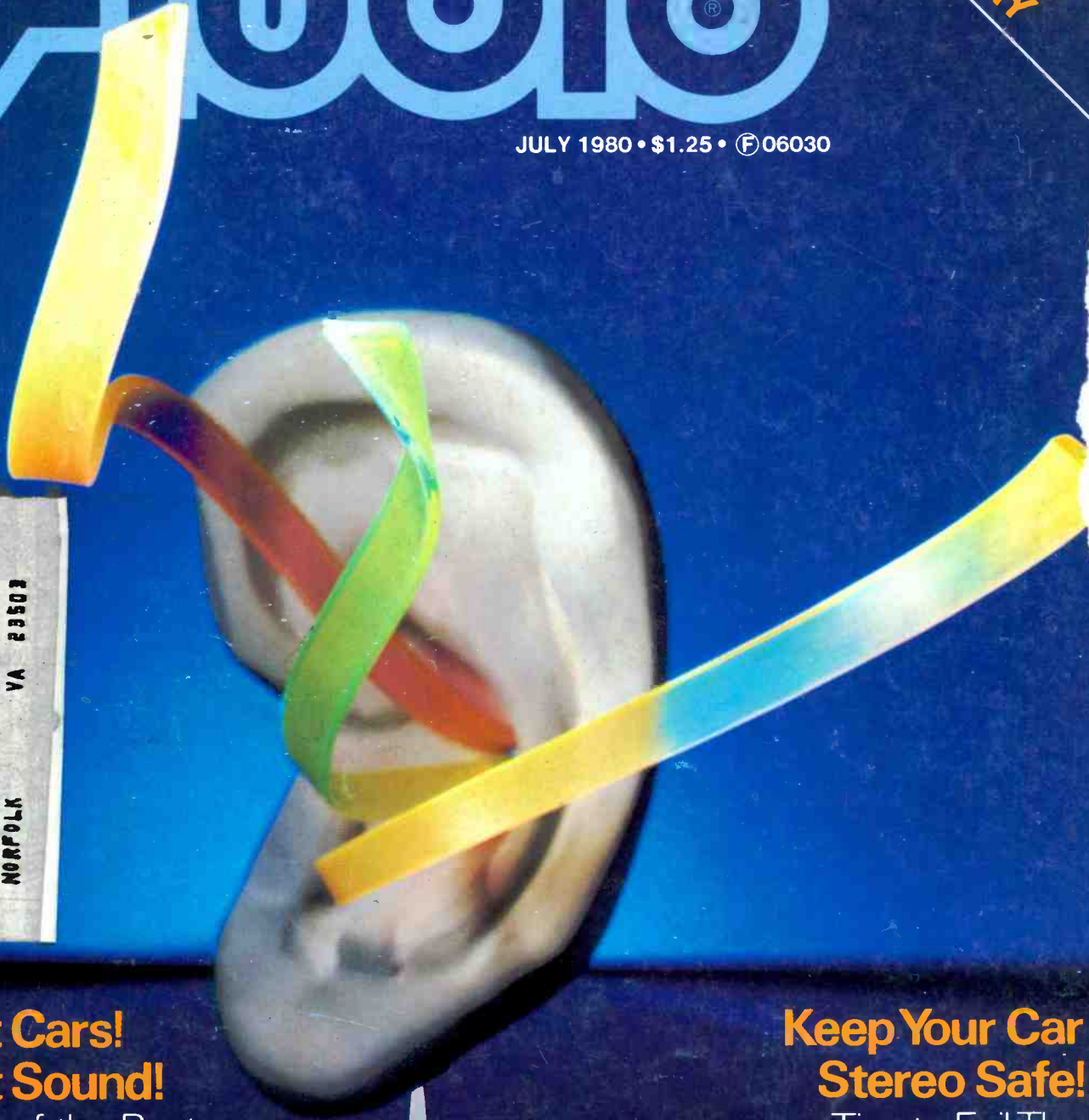


The  
Authoritative  
Magazine  
About  
High Fidelity

# Audio

6TH  
ANNUAL  
CAR STEREO  
DIRECTORY

JULY 1980 • \$1.25 • ©06030



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changes in temperature. But even the best of them just seem to reduce drift instead of eliminate it.

The Pioneer PL-400, on the other hand, has a Quartz PLL servo system that keeps rotational speed at a constant. And keeps the PL-400 unaffected by temperature changes, voltage fluctuations and other powerline anomalies.

These features work to keep the PL-400 sounding like a much more expensive turntable. But without our specially designed Coaxial Suspension system, they wouldn't be nearly as effective.

This free floating suspension system isolates the platter and tonearm from the rest of the turntable. So even if the base vibrates, the platter and tonearm don't.

This means you can shake, rattle and roll a lot more with a lot less worry that your turntable is doing the same thing.

Even the tonearm of the PL-400 is designed to give you better sound. Its

new "Mass Concentrated" design improves crossmodulation distortion and tracking accuracy. So you get more sound clarity and better channel separation.

All these features on a turntable the price of the PL-400 is unheard of. But Pioneer didn't stop there. The PL-400 also has full automatic controls. Including automatic lead-in, viscous damped cueing, automatic return, and automatic repeat. An easy to read one-stripe strobe that confirms platter speed accuracy. A quick start mechanism that starts the platter revolving as soon as the tonearm begins to move. And more.

So if you want to buy a \$200 turntable and are just interested in great specs, there are any number you can buy. But if you're interested in a \$200 turntable that will give you great sound, there's only one.

The Pioneer PL-400.

**PIONEER**<sup>®</sup>

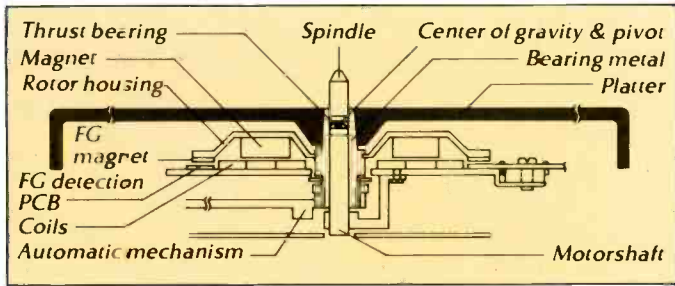
We bring it back alive

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Manufacturer's suggested retail prices. Actual prices will be set by individual dealers.

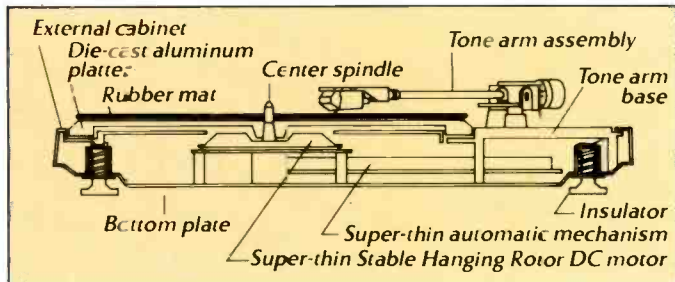
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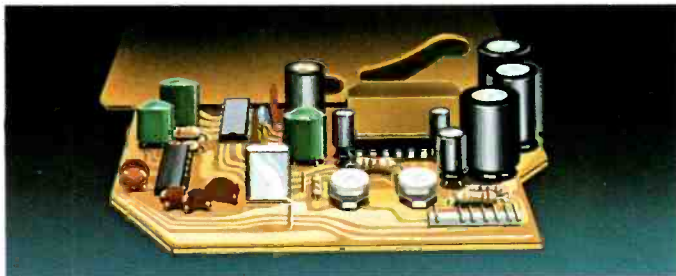
# INTRODUCING THE NEW PIONEER PL-400.



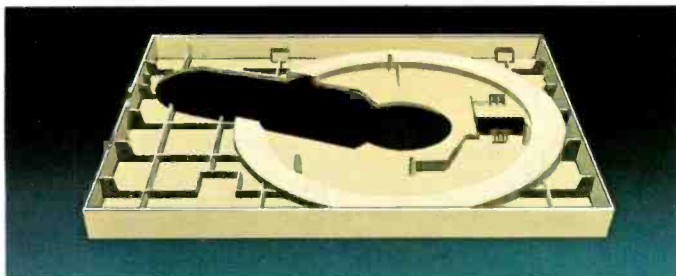
PIONEER'S NEW STABLE HANGING ROTOR. BY RAISING THE CENTER OF GRAVITY, WE LOWERED THE RATE OF DISTORTION.



PIONEER'S COAXIAL SUSPENSION SYSTEM. IT VIRTUALLY ELIMINATES VIBRATION AND RUMBLE.



THE PIONEER QUARTZ PHASE LOCK LOOP SYSTEM. BY AUTOMATIC MONITORING, ROTATIONAL SPEED IS KEPT CONSTANT TO REDUCE WOW AND FLUTTER.



THE PIONEER COMPUTER-DESIGNED HOWL-PROOF ENCASUREMENT. BY SLIMMING DOWN THE SIZE, WE SLIMMED DOWN ACOUSTIC RESONANCE.



PIONEER'S BEST-SOUNDING REASON OF ALL: THE PRICE. UNDER \$200.

Today, most turntables in the same price range look practically the same on paper. But they don't sound at all alike in your home.

Because equal specs don't necessarily mean equal sound. In fact, specs are just a measure of the distortion caused by your turntable itself. They tell nothing about how your machine prevents distortion caused by your environment.

Pioneer's new PL-400 turntable was designed to also keep external interference from coming between you and great sound.

Much of the success of our new PL-400 turntable revolves around our all new "Stable Hanging Rotor." The world's thinnest direct drive motor.

Unlike more massive conventional motors, the motor in the PL-400 is so thin, it allows the center of gravity to be at the pivot point of the rotating mechanism. So instead of the platter wobbling like a top, the platter on the PL-400 acts like a gyroscope to stabilize itself.

Although this technology is very difficult to understand, the result of it is very easily appreciated. You no longer are bothered by distortion caused by stylus mistracking or speed deviations. So you get just what's on your record. Nothing added to it. And nothing taken away.

But this super thin motor does more than eliminate distortion. It also eliminates any space wasting elements used in conventional motors. And because it's so much thinner than any other motor, the cabinet around the PL-400 is also a lot thinner. This 20% reduction in cabinet size means the PL-400 is 20% less likely to suffer from acoustic distortion.

Many turntables in this price range are direct drive. Some of them offer DC motors. Some of them have servo motors aimed at eliminating drift caused by

**IF ALL \$200 TURNTABLES HAVE  
THE SAME SPECS, HOW COME THE PL-400  
SOUNDS BETTER?**





**PIONEER** QUARTZ-PLL FULL-AUTOMATIC **PL-400**

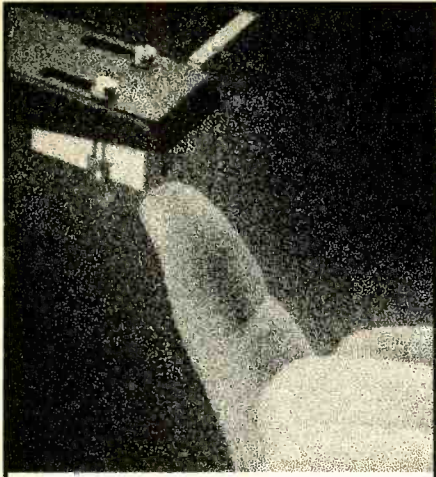
REPEAT

START/OUT

12:30 10:25 7:17

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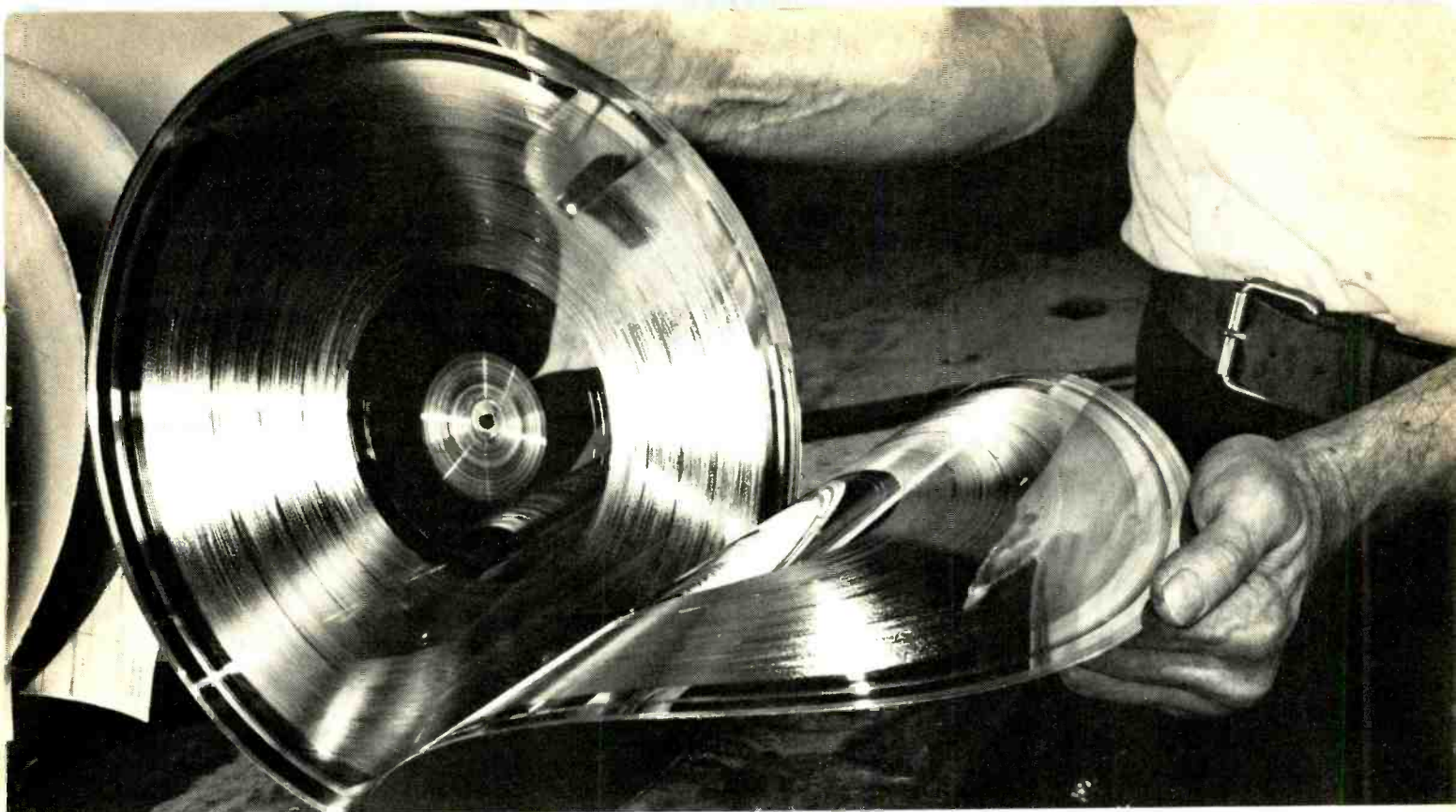
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**About the Cover:** As you travel down that ribbon of highway, consider a car stereo system from among those included in our 6th Annual Directory, beginning on page 28. And for tips to avoid having your components ripped off, consult Bob Curtis' article on page 60. Construction by Nick Aristovulos; photograph by Shig Ikeda.



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The Onkyo TX-7000 Quartz-Locked AM-FM Stereo Receiver is an outstanding example. Both its power amplifier and FM sections are rich with important new design concepts.

The TX-7000's power amplifier provides two major innovations never before present in a stereo receiver. The first is called Super-Servo and it totally eliminates the sonic "ghost signals" common to DC power amplifiers. As a result, each instrument and voice sounds purer and more individually real...

regardless of volume level. Perhaps for the first time, you'll experience stereo with true depth, spaciousness, and a remarkably discernable third-dimension.

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is Linear-Switching which lets us provide Class A amplifier sound quality with Class B power efficiency. Crossover distortion is significantly reduced. And output power is very highly efficient... 90 watts per channel with no more than 0.02% THD.\*

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A unique Human Touch Sensor automatically controls the Quartz-Locked system for more reliable and convenient operation... releasing the system instantly when it senses your touch on the tuning knob... engaging it again as your fingers leave the knob.

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original *n*: that from which a copy, reproduction or translation is made. (Webster's Collegiate Dictionary)



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# Audioclinic

Joseph Giovanelli

## RIAA Specifications

**Q.** For the past 1½ years, I have noticed increasingly "tight" RIAA equalization figures on phono sections of preamplifiers (e.g.  $\pm 1/4$ ,  $1/2$  dB, etc). My preamp is  $\pm 1$  dB. Can these differences really be heard? At what point does RIAA equalization become audible? — Bob Hoffman, Worth, Ill.

**A.** I would have to say that under some circumstances you are not likely to hear much difference between a phonograph having a "tight" RIAA spec and one having a "looser" spec, where the so-called loose specification is  $\pm 1$  dB.

The question really comes down to how much deviation from flatness of response can be detected by the ear. This is the issue if we are discussing RIAA or any other parameter in a system. Further, it depends on the frequency range where the curve departs from flatness. If it occurs at the high end, where there is very little recorded energy, we will not notice much of a difference with a total shift of 2 dB — which is what  $\pm 1$  dB can bring about. However, if the most serious departure of the curve takes place at perhaps 3 kHz, even 1 dB can make a considerable difference. This portion of the frequency spectrum is most sensitive to human hearing.

If the departure from flatness occurs at the very low end of the audio spectrum, again a 2-dB change probably won't be noticed — partly because of the lack of hearing sensitivity. If the frequency at which the 2 dB is measured is really low, it may well be that this shift won't matter since most recordings don't contain any significant bass energy at this point.

If you have a graphic equalizer which can be switched in and out, set it for a flat response and then introduce some small changes in response, at various portions of the spectrum. For simplicity, introduce just one boost or cut at a time. Note the audible differences when the equalizer is in or out, and, of course, use really wide-range material for the program source.

*Editor's Note:* Two dedicated audiophiles associated with the Univ. of Waterloo in Canada, Stanley Lipshitz and John Vanderkooy, recently made strenuous tests under double-blind conditions, and they conclude that as

little as 0.1 dB RIAA deviation can be heard reliably. It is well known that detection of such deviations is much easier with steady-state tones than with music, and some tests indicate that at least 3 dB of deviation on music is necessary before it can be detected reliably. What this matter comes down to then, is whether you, the listener, can hear such a difference and, perhaps more importantly, whether it bothers you.


## Masking of Music

**Q.** Do you think that most musical information on recordings is masked? Some instruments get covered up unless one listens very carefully with a good pair of headphones.

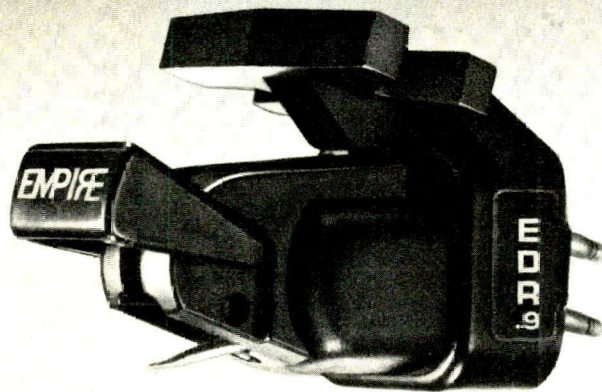
**A.** Should we not put all this "masked" music to good use? — Bob Hoffman, Worth, Ill.

**A.** To some extent musical information is always masked. Sit in a live concert and note the lack of absolute localization of some of the instruments. Some of the notes played may be blurred because of room reverberation; the faster the musical passages being played, the greater this kind of blurring will be.

The blurring is very evident when listening to music in large cathedrals. Pains were always taken by composers whose works were primarily intended for performance in such environments. They had to write so that the listeners would hear a minimum of masking and blurring.

In popular music this masking effect is introduced by the artist or the producer through special effects. These devices are used to heighten the effect, or mood, of the music being recorded and have proved to be beneficial in terms of increased sales of such recordings. A study of a number of albums will disclose that, at times, there is no masking, that all musical instruments do stand out. Indeed, entire albums are sometimes made in this manner. Sometimes, however, the so-called masking is alternately used and then removed, perhaps in the same musical selection, providing yet another means of contrast. 

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.



## INTRODUCING THE EMPIRE EDR.9 PHONO CARTRIDGE. IT SOUNDS AS GOOD ON A RECORD AS IT DOES ON PAPER.

It was inevitable . . .

With all the rapid developments being made in today's high fidelity technology, the tremendous advance in audible performance in Empire's new EDR.9 phono cartridge was bound to happen. And bound to come from Empire, as we have been designing and manufacturing the finest phono cartridges for over 18 years.

Until now, all phono cartridges were designed in the lab to achieve certain engineering characteristics and requirements. These lab characteristics and requirements took priority over actual listening tests because it was considered more important that the cartridges "measure right" or "test right"—so almost everyone was satisfied.

Empire's EDR.9 (for Extended Dynamic Response) has broken with this tradition, and is the first phono cartridge that not only meets the highest technological

and design specifications—but also our demanding listening tests—on an equal basis. In effect, it bridges the gap between the ideal blueprint and the actual sound.

The EDR.9 utilizes an L. A. C. (Large Area Contact) 0.9 stylus based upon—and named after—E. I. A. Standard RS-238B. This new design, resulting in a smaller radius and larger contact area, has a pressure index of 0.9, an improvement of almost six times the typical elliptical stylus and four times over the newest designs recently introduced by several other cartridge manufacturers. The result is that less pressure is applied to the vulnerable record groove, at the same time extending the bandwidth—including the important overtones and harmonic details.

In addition, Empire's exclusive, patented 3-Element Double Damped stylus assembly acts as an equalizer. This eliminates the high "Q" mechanical resonances typical of other stylus assemblies, producing a flatter response, and lessening wear

and tear on the record groove.

We could go into more technical detail, describing pole rods that are laminated, rather than just one piece, so as to reduce losses in the magnetic structure, resulting in flatter high frequency response with less distortion. Or how the EDR.9 weighs one gram less than previous Empire phono cartridges, making it a perfect match for today's advance, low mass tonearms.

But more important, as the EDR.9 cartridge represents a new approach to cartridge design, we ask that you consider it in a slightly different way as well. Send for our free technical brochure on the EDR.9, and then visit your audio dealer and listen. Don't go by specs alone.

That's because the new Empire EDR.9 is the first phono cartridge that not only meets the highest technological and design specifications—but also our demanding listening tests.  
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# Audio etc.

Edward Tatnall Canby

I had to omit a few items of audio interest from last month's account of the Canby Singers' bout with big-time television so this month's contribution is going to be articulated: Segment One, more TV.

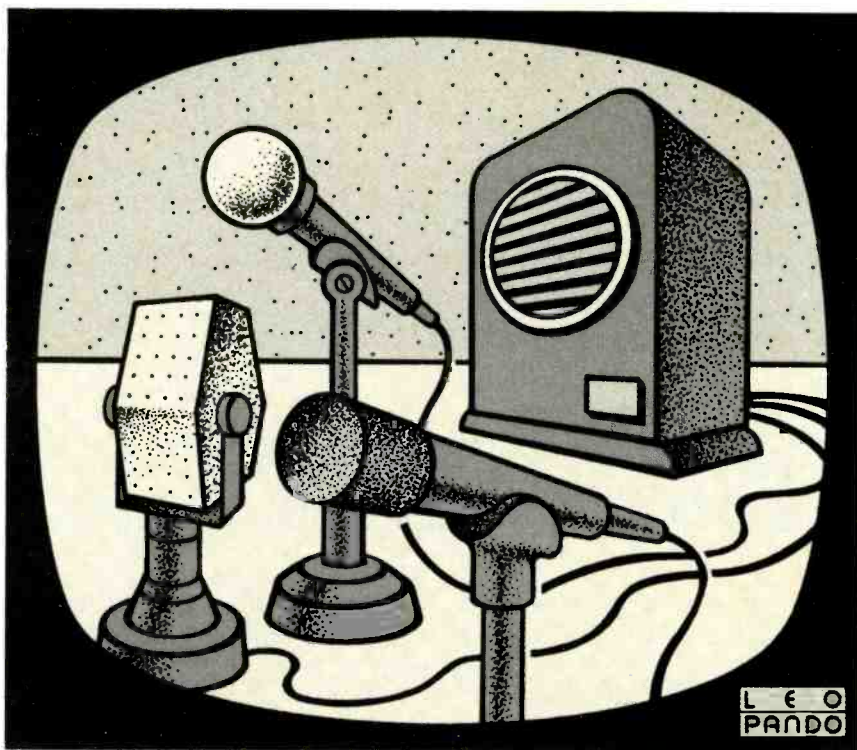
I must say again that I really got a strange feeling at that TV taping as I came up against genuine, all-out, single-channel professional recording of audio for the first time since around 1960! I'm sure most of our pros who are into recording of sound alone would have had the same reaction. ONE master channel! One-channel miking, one-channel cabling, one-channel everything, even a one-channel mixing board (plenty of inputs but the output was strictly singular). Think of the enormous complex of audio problems this avoids! No phasing, no cancellations, no this, no that....It must have been nice in the old days.

The man in charge of our TV audio, whose name I neglected to grab in all that hurrying and scurrying, though he may have lived in a mono world much longer than the rest of us, was not only amiable and cooperative but able to show a few tricks of his own. I was merely a musician, but he was receptive to my suggestions and had already taken care of one urgent request I had relayed in ahead of time — please, for our small chorus, keep the mikes away, no close-up effect, so we can blend together as the music requires. Vital.

On two disastrous earlier TV occasions in which I had been involved, the mikes were operated exactly like TV cameras — a sort of sonic-zoom close-up technique, magnifying individual voices, arm's length, at the expense of any sort of musical blend. We

were nice to look at, but we sounded just awful. The close-up technique is excellent for the video half of TV, but audio is another medium with utterly different needs. The sync is in time and in content, NOT in technique.

In all of the joint media featuring both sound and picture, we must keep in mind the needs of each of these in its own terms and keep them independent, though tied together. So it



always is in the movies, you will note, where experience goes back a full half century. Just watch and listen and you'll see how cleverly it is done there today. TV is younger. They'll learn.

Anyhow, ours was not going to be a multi-mike job, you can be sure. We had just one, single microphone, but it was duly placed well out, overhead, so that the singers did blend correctly, like the strings in a string orchestra. This choral sound, of course, went on unchanged throughout our "act" while the cameras, a number of them, rightly used the opposite technique, zeroing in on individual faces or close-up groups of singers for maximum visual interest. Good sound pickup. But

how about that very dead studio?

Our first offering, in fact, was a couple of pieces of Spanish cathedral music out of the 16th century, just crying for a vast and stony reverberation. And there we were in a padded box. So I asked my audio friend at the board whether he just might have a delay line or something (on that ancient equipment!) to give us a bit of synthetic church. By golly, he did have just that, no problem. Evidently the old board had been updated after all. We would need it throughout, I said, but maybe even a bit more strongly for that first cathedral music.

I had no chance to monitor the result (the chorus singing minus conductor out in the studio), not with five other musical acts all trying to get things together at the same time on the various sets around the studio's perimeter. So I left things to the audio man's good judgment, and it wasn't until Christmas morning that I heard the results, as finally broadcast. Not bad!, as I noted at the end of my first

installment last month. The man had the sense not to overwhelm us with synthesized glop-reverb; he added just enough to take us out of the anechoic and into a reasonable studio environment, if not exactly a church. Good compromise. And when you consider that this was mono reverb, 1940 style, he really did it OK. No surround sound, no fancy-phase ambience, not even the inestimable ordinary advantage of conventional stereo space.

## Compressed Canby

So I was happy. We had a good mike placement for a fine blend, a reasonable ambience, if synthetic, and we were singing well; everything should

# Morning Concert



You've driven to the end of the world. Alone.  
The engine is still warm.

Amid the roar of the waves and the cries of the gulls, you fire up your mobile high-fidelity system for a morning concert.

What will it be? Bach? Mozart? Perhaps some Keith Jarrett.

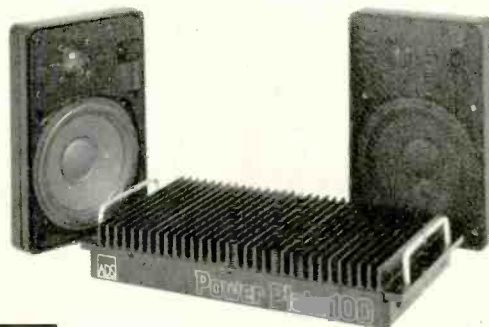
Whatever you choose, your system is equal to the task because you've chosen ADS.

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Audio for the critically demanding

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have been splendid in spite of the lo-fi broadcast chain. Except for one element I had entirely overlooked — never even thought of it. Compression. Wow, was there compression.

To be sure, I can't prove it. As I say, my thoughts were quite elsewhere as I listened to our broadcast and began to wonder why it was so disappointing in the sonic effect. We had worked hard, we did well, we should have *communicated*, in sound as well as sight. We did in the pictures. But our singing was lackluster, monotonous. I couldn't believe it.

Then it hit me what was wrong. We came to a work by the 16th-century Englishman Thomas Tallis, a stately hymn in which the last line of music is repeated as a sort of echo, very beautiful. We ALWAYS sing that echo as it should be, much less loud than the first time; indeed, we do it just as softly as we dare and the effect can be magical.

Now, as I listened to the TV broadcast, I heard us singing that second echo phrase *exactly as loudly as the first one*. No echo. Just a mechanical repetition. I was disgusted. After all

that rehearsal, couldn't we do a bit better than THAT? Then I thought, NO! I was there. I conducted. And we definitely did it the right way. Then, you see, I understood what had happened. Or must have happened. Electronic compression. We definitely did sing that echo phrase softly. But the **##\*\*#** compression circuit brought it crudely up so there was no echo effect, just a repeat at the same volume. Magic departed.

No wonder the entire performance seemed on the dull side. Everything we sang, apparently, was compressed to a stringent TV "normal" volume, the same monotonous level from start to finish. When we sang louder, we were implacably pulled down; when we sang softly, we were pulled up. Deadly — for our music. So I figure it out.

No, I am not blaming TV—for this is the sort of treatment that TV sound in fact requires, especially on a show that is normally done "live" (on tape) in real time, and thus is full of unexpected peaks and valleys of sound that could distract from the more important visual aspect. Face it, in this TV medium the audio is always going to be subservient, and has to be. Oddly enough, even when the audio—music like ours—is supposedly the main feature. So I am not criticizing, I am merely telling you. Moral: Don't sing Spanish cathedral music on TV if you want people to listen as well as watch.

Some of our audio techniques, for that matter, can actually enhance the impact, or at least favor the effect, of music that was not originally intended for reproduction (almost all classical material). This we should know. Even compression can be helpful, when used WITH CARE as an aid to the "compression" of some enormous musical work like an opera or a symphony to fit into a small living room where it was never supposed to be heard in the first place. All of which, of course, calls for our very best understanding and judgment in our record/broadcast procedures for such music. Right? So if you still think that most LP records are ruined by too much compression, just listen to the Canby Singers on TV. Maybe next Christmas morning?

#### Four, Three, Two, . . . A

P.S. You might be amused as to how the great pitch-pipe controversy ended. You'll remember that in the original real-time recording we were not going to be allowed to blow our pitch pipe (we sing entirely without accompaniment) in order to get ourselves started in the right key, and yet I knew that we HAD to blow it somehow—we do not all have absolute pitch (and we

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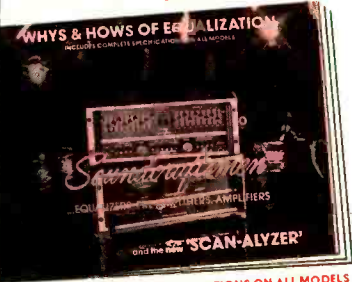
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# Technics

Everyone knows what Technics direct drive does for performance and accuracy in our turntables. That's why 73 of the top 100 radio stations that use turntables use Technics direct-drive turntables. Now, for only \$330\*, you can record your cassettes with the accuracy of Technics direct drive. And that says a lot about the Technics RS-M45.

So does its tape transport system. Especially when you consider what the RS-M45 has going for it: An FG servo DC direct-drive capstan motor. And while 0.035% wow and flutter can tell you a lot about our direct-drive performance, the world's only limited 3-year motor warranty† tells you a lot more.

Equally impressive are the RS-M45's solenoid controls. They not only make switching from one mode to another simple and accurate, they also put minimal strain on the tape transport system.

And to put minimal strain on you, there's the optional RP-9645 remote control unit. With it, all transport functions, as well as record mute, can be operated from your easy chair.

Just as special are the RS-M45's fluorescent VU meters with auto-reset peak-hold. They're fast, electronic and highly accurate. You'll also like Dolby's NR and a S/N ratio of 68 dB.

And if our SX record and playback heads make CrO<sub>2</sub> tape sound great (20 Hz-18 kHz), wait until you hear the increased frequency response (20 Hz-20 kHz) and extended dynamic range of metal.

Technics RS-M45. Direct drive and solenoid controls say it isn't your typical \$330 cassette deck. In fact, compared to the leading brands, it's one of a kind. And that's very typical of Technics.

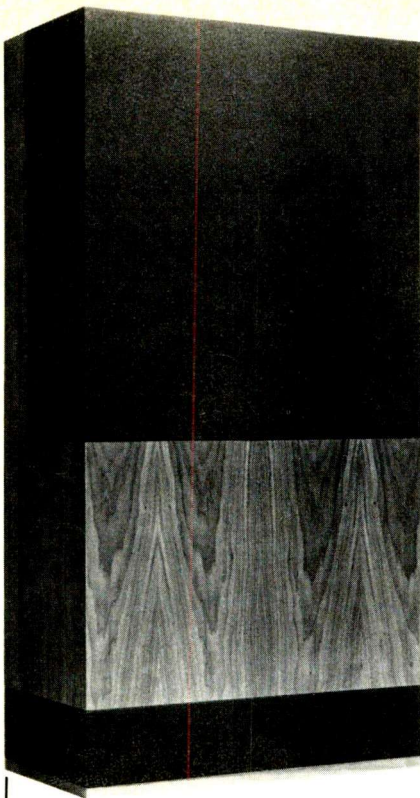
\* Technics recommended price, but actual price will be set by dealers.

† Limited 3-year warranty on the direct-drive motor and limited 2-year warranty on the deck. Includes labor and parts. Carry-in service. Proof of purchase required. Warranty is void for commercial use. § Dolby is a trademark of Dolby Laboratories.

## How to tape your records as accurately as Technics direct-drive turntables play them.



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# SNELL ACOUSTICS

would disagree, even if we did, depending on whether A is 435 or maybe 445). So I bided my time. There would be a way out—somehow.

When at last (after those four hours of snafu) we shifted from real-time recording to the new game plan, so much more practical (as we in audio know)—the editing-together of separately recorded segments—I was waiting and my pitch pipe blower, one of the basses, right with me. The instant I heard the producer start a sonic count-down for the opening segment of our part of the show, leading to the spoken introduction by the little lady host who stood beside me in front of the chorus, trailing her lavalier cable behind her—I knew I had it. “Four, Three, Two, ...” intoned the producer over the talkback from inside the control room, omitting “One,” and in that second of silence that stood for “One” I hissed in my loudest stage whisper, “Pitch!” and the pipe blew. Nobody flinched, the host began her spiel, and we were ready to sing.

I didn’t even bother to consult with the authorities afterwards; here was one area where audio and TV techniques agreed. On the TV air, as I expected, there was no pitch pipe sound, nor any hiss from me. Edited neatly out. So simple.

### Switching Made Simple

Now for the articulation. Two brief items, too long postponed, each involving a useful piece of equipment and both of them passive, no plug in the wall, no current drain. Is that rare. First, after an unconscionable time, the Russound TMS-2, a small switching box framed in good hardwood that could help you keep sane when you get involved in complicated switchings of numerous inputs and outputs in your home equipment. Too often, this sort of thing involves a bewildering number of levers and buttons too far apart to be easily reached, plus cables pulled out and re-inserted, usually into the wrong holes and by blind feel behind the units. It can be agonizing, as you surely know, especially if you are in a hurry. This switcher, like a number of others in the Russound line for different types of switching, is the home equivalent of those elaborate buses and cabled patchboards that used to be standard in much professional audio. (Now we use the new-type boards, to the tune of a few hundred thou per.)

I was in the throes of trying to reconnect a new version of my equipment via the usual mass of disconnected cables when I saw the Russound publicity and, in desperation, asked for one of these switchers to see if it

might help. Well, my cable spaghetti was too eccentric even for Russound—strictly my fault—and the TMS-2 didn’t happen to fit my then-current requirements; it was temporarily put aside. And so, of course, out of mind. But I am now looking straight at the thing in front of me, and indeed it is an ingenious consolidation of a lot of switching functions, for such a small box.

On the back of the TMS-2 are no less than 30 inputs, phono type, in stereo pairs, R and L, lined up neatly against white marking lines for the eye. On the left are three pairs of “add-on jacks,” *IN-BUSS*, *COPY-BUSS* and *OUT-BUSS*. Next to these, in the middle, are two more pairs, *TAPE MONITOR OUT*, and the same for in. Then, moving on to the right, you will see no less than five pairs of source inputs in a line on top, 1,2,3,4,5, and below them another five pairs of outputs, for the same. Count ‘em, 20 more. You can thus plug in up to five of your components, both in and out or either way, for treatment via the switches on the front.

On the front the switches, 10 three-way and one two-way, are neatly lined up in stagger formation, the positions connected by five white guide lines, the central one a fat line marked *COPY*. The top five switches, *RECORD*, one for each of your components, operate over the three uppermost white lines, from the top position, *IN*, to *OFF*, and then to *COPY* in three steps. Between each of these are the *PLAY* switches, staggered two lines downwards so that they move from *COPY* downwards to *OFF* and, at the bottom, *MONITOR*. To one side is a master two-way monitor switch marked *COPY* and *PLAY*.

Enough! It sounds awful but the eye can easily take in what the printed word can scarcely describe. In 10 minutes, I expect, you could be operating those switches with no trouble at all and in a half second you could do switching that might take a quarter hour on the original equipment, perhaps ending in chaos at that. I assume, though there might be a few bits of signal loss here and there with so much switching, that there is total absence of undesirables like hum — otherwise Russound would hardly have lasted so long in the market. So if you think that this model or maybe one of the others in the line might help you, then contact the outfit. Russound/FMP Inc., P.O. Box 204, Stratham, N.H. 03885. Or maybe your local dealer.

### On The Beam

The other item, on hand since late last year, has the slightly odd title of The Beam Box, which sounds as if it



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Then comes new Fuji Metal Tape. Cassette recorders equipped for metal are all in love with it. Not just because it won't clog heads or jam. But because of its inaudible noise. Greatly expanded dynamic-range. And smooth, ultra-wide response.

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might be a tweeter twin to the dbx superbass Boom Box. It isn't — it's an indoor FM antenna with interesting abilities, a serious and useful device.

It is an antenna inside a square box no bigger than a good tuner, which can replace a cumbersome outdoor monster and a heavyweight rotator with remarkably good results. This box antenna is not only small but it is also directional — and even more remarkable, it "rotates" its directionality, though there are no moving parts other than the controls. The box just

sits there and you twiddle its knobs. No power requirement either; only the pair of FM antenna connections.

I'm going to be careful not to get in over my dizzy head, since B•I•C includes very little information as to how their gadget works, but I do get the general idea and it is good. Those who are into the math of signal propagation will know that you can tune an antenna electronically as well as by shaving off pieces of wire or rod to the right length; also that you can fold an antenna up and still have it work, in a

smaller space. This one, if I see it rightly, is a double-folded dipole, a pair of them set at right angles and neatly fitted inside the box under a transparent top cover. The tuning and switching is entirely electronic. Nothing moves at all. Yet the antenna's directionality revolves all the way around, in 90-degree jumps, the box staying put. Surprising, if you didn't know it could be done.

We quickly found (myself and a knowledgeable hi-fi neighbor) that The Beam Box has a "ribbon" pattern of sensitivity rather than "cardioid." That is, instead of the primarily frontal directionality of the yagi type of antenna with reflectors, like a cardioid mike (you must move that one bodily around to change direction), The Beam Box has equal front and back sensitivity, in opposite directions, while the sides are very noticeably less sensitive — you can read this right off your signal strength meter, as you "revolve" the antenna through its four electronic positions. This type of directionality, to be sure, is not quite as versatile as the cardioid when it comes to reducing interference from unwanted stations, but you can still do a lot by shifting the antenna through its positions, as we immediately found. It fails only when two stations are exactly in opposite directions from your location. Most won't be.

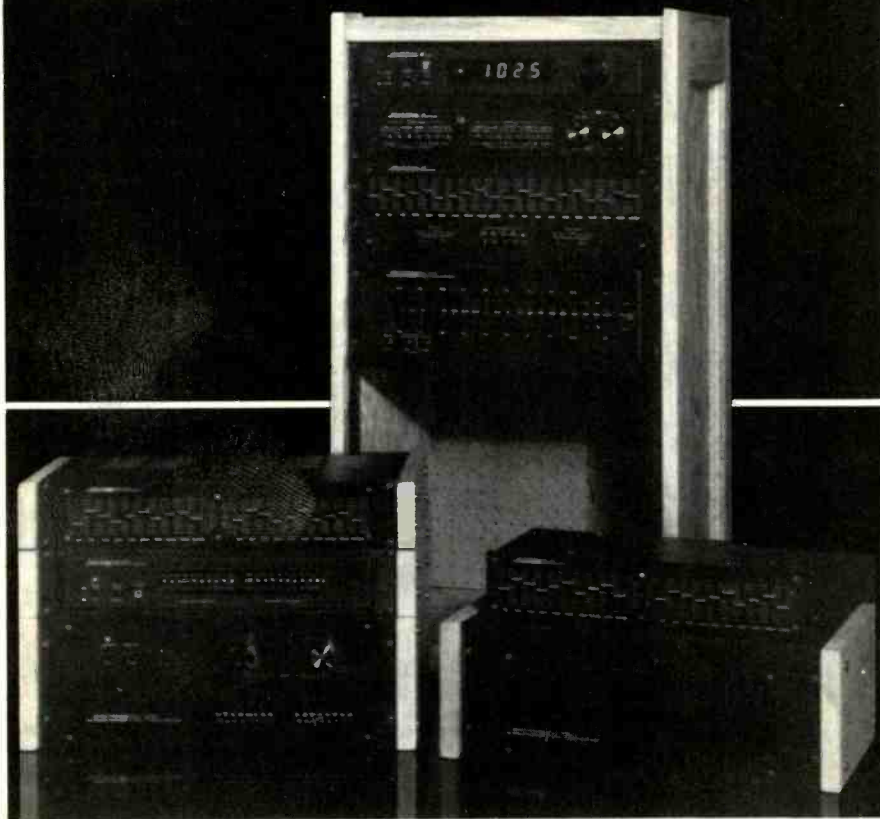
At my 100-mile range (80 to 120 miles to the stations I most want to hear) The Box did remarkably well, though it could not match my big rooftop yagi, understandably. I got all my favorite distant stations with complete limiting and silence — in mono. As might be expected, stereo was a bit noisy. Even so . . .

I'd recommend The Beam Box for anyone living in the larger fringe, say from 10 to maybe 40 miles out from major FM sources. In this vast area the indoor antenna should be excellent, with both extra sensitivity and adjustable directionality. (In the city a directional antenna isn't much use, with too many steel buildings around, and you really need multipath rejection.)

I should mention an excellent extra reason for Beam Box power — the antenna can be electronically fine-tuned to match the frequency of each station. Just peak up the signal on your signal strength meter. All the others merely average things out. A typical bit of thoroughness, and if this adds one more minor chore, it is surely worth turning one more knob for a better sound. These people really get the most out of their design. And so will you. ▲

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## 15 bands: total control.

That's right. A full *fifteen* bands are at your command with this graphic equalizer. To shape your music like no other car equalizer can.

Looking at the EQ400 you'll see five sliding controls with a  $\pm 12$  dB range. Look closer, and for each control lever there's a selector for three different bands. Fifteen in all.

Center frequencies controlled are:

60 Hz	80 Hz	125 Hz
160 Hz	250 Hz	400 Hz
630 Hz	1000 Hz	1600 Hz
2400 Hz	3500 Hz	5000 Hz
7000 Hz	10,000 Hz	14,000 Hz

## Even more precision.

Our desire for precision doesn't stop with the fifteen bands.

The EQ400 offers you more precise tuning *within* each band as well.

The top-mounted sliding scales on the EQ400 are physically almost twice as long as the short, front-mounted controls on most other equalizers. Which means far better resolution. For much more precise adjustments... and much more precise sound.

You can instantly compare any boost or attenuation you

the dash equalizer.

The EQ400 rests unassumingly under the dashboard. That is, until you're ready to use it.

Then... a slight pull slides it out to reveal a full, top-mounted illuminated control panel.

The top-mounted controls are easier to see, easier to reach and easier to use.

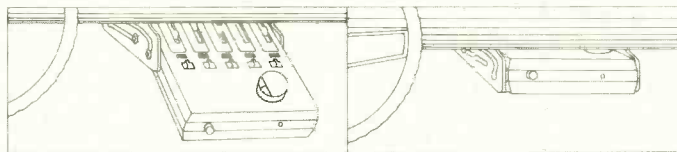
When you're finished adjusting, just slide the unit back under the dash. That way the controls aren't exposed where they can be accidentally bumped out of position. And meanwhile, an LED on the front glows to indicate the unit is on.

The same bracket can also be used to mount the equalizer right at your fingertips, between the bucket seats of smaller cars and vans.

## Your own kind of sound.

No longer do you have to settle for someone else's interpretation of your music.

Because now you can shape it and enhance it with music sculptor. The Jensen EQ400 graphic equalizer. Or the EQA3000 5-Band Graphic Equalizer with built-in dual 12-watt power amplifiers. Hear what they can do... soon.



The EQ400 has a special under dash mounting. This enables you to slide it out for easy adjustment. When you're finished, slide it back. The controls then can't be accidentally knocked out of adjustment.

make with the equalization defeat switch. A front-to-rear fader control offers additional flexibility. And with its switchable 10/47 ohm input impedance, the EQ400 can be connected to any low impedance stereo source.

## Slide out, tune in.

This is no ordinary under

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Herman Burstein

# Tape guide

## Equalizing Recordings

*Q. I am interested in an equalizer to clean up some muffled and boomy tape recordings. What features should I look for? — Wendy Rickert, Boulder Creek, Calif.*

A. Generally speaking, you should look for at least five bands of equalization in each channel (10 bands are preferable), very low distortion, absence of ringing effects, wide and flat frequency response when filter action is inactivated, high signal-to-noise ratio, and at least 12 dB of boost and cut in each band. The ability to change the filter "Q" or relative width of the filter is also of value, as you may wish to equalize only a narrow portion of the frequency spectrum; this is available in a parametric equalizer.

## High-Level Noise

*Q. After more than a year of consideration, comparison, conversation, reading, and budgeting, I decided that a particular model was far and away the best open-reel tape deck available for the money. I took the plunge. I like the unit. It's everything it's claimed to be — except for the very noticeable noise in the playback amplifier at relatively high levels after recording in the normal manner. My dealer recommended that I tape at a high level using a good-quality tape. After some experimentation I can record just below tape saturation and get away from the noise. But taping at such a high level seems to change the overall response of the machine — highs are attenuated and lows are accentuated. What would you recommend? Live with my present situation? Change internal alignment for correct response? Or what? — Skip Laughlin, Tulsa, Okla.*


A. I suggest that you take your tape deck, together with the tape you plan to use, to a competent technician and have him optimize the machine's performance in terms of adjusting bias, record equalization, audio drive current, and record level indication in accordance with the instructions of the tape deck's manufacturer. Even if it turns out that no changes have to be made in these adjustments, the expense is still apt to be worthwhile for the peace of mind it will give you.

Any tape machine will produce noticeable noise in playback at very loud levels. The S/N ratio of the best tape decks isn't up to that of the best amplifiers, although this differential is steadily diminishing. When you record at a level close to tape saturation for the body of the signal, chances are that you are getting into saturation at the high frequencies. Saturation of the high frequencies, therefore, accounts for your impression of attenuated highs. And attenuated highs, in relative terms, give an impression of emphasized bass.

## Flip-Side Crosstalk

*Q. I have an open-reel tape deck which is truly wonderful in all respects but one. The problem is what I feel to be an unacceptable level of crosstalk from the flip-side program material. Especially prominent are bass and percussion instruments, and the problem is particularly annoying during quiet portions of the side that I am listening to. Is there some defect in the deck? Since the deck is still under warranty, should I have it checked out by an authorized repair shop? — James Engel, Uniondale, N.Y.*

A. Your crosstalk problem is definitely not normal and should not occur to an audible extent in open-reel decks with any pretension to quality.

The problem appears to lie in vertical mispositioning of the record head with respect to the playback head so that tracks recorded on side B (flip side) are partially scanned by the gaps of the playback head. From top to bottom of the tape, which is assumed to be running from left to right, the tracks are numbered 1, 2, 3, 4, with three "islands" separating them. Tracks 1 and 3 are for recording in direction A; tracks 2 and 4 are for direction B (flip side). If the record head, say, is vertically mispositioned, some of the signal intended for tracks 1 and 3 may get on or near tracks 2 and 4. Definitely have your deck checked and corrected by an authorized service shop. 

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

DO YOUR TAPE  
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EVER TAKE  
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DO YOU PLAY?

If lately your favorite recordings sound like they're gradually unrecording, it could be the tape they're on.

You see the oxide particles on some tapes just aren't bound on very well. And when the oxide particles come off, your music could come off sounding faded and weak.

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# Behind the scenes

Bert Whyte

What do the Westbury Theater in Huntsville, Alabama, the Plaza Theater in Owensboro, Kentucky, the Radio City Music Hall in New York, the Europa Theatre in Duesseldorf, the Yurakuza Theater in Tokyo, and the Empire Theatre in London all have in common? Their marquees are emblazoned with the legend "Dolby Stereo," proudly proclaiming their ability to show films with this new kind of motion picture sound. In more than 1,800 theaters in the United States and around the world, theater owners have learned that being equipped to show films with Dolby stereo sound is a definite "plus" in attracting movie fans.

Part of this attraction is undoubtedly due to the movie patrons' familiarity with the Dolby name, as exemplified in the cassette recorders incorporating Dolby B noise reduction they use in their homes and in the Dolby B prerecorded cassettes they play back on these machines. With more than 100 licensing agreements with companies throughout the world, who manufacture more than 650 different Dolby B-Type products, ubiquitous is the word for Dolby. Indeed, the name Dolby in its various audio processing and equipment embodiments has nearly become a generic part of the language. It is also interesting to note that this not inconsiderable Dolby "industry," that now encompasses many aspects of the audio, motion picture and television business, all began with a young engineer's basic dislike of the tape hiss produced by magnetic tape recorders. That young engineer, of course, was Dr. Ray Dolby, who at that time was living in London. Dr. Dolby's development of his A301 Noise Reduction System has been well document-

ed in the audio press, and I am sure most readers are familiar with its genesis.

As I write this, I have just returned from a week-long visit to London, where I had the pleasure of a chat with Arthur Haddy, the brilliant engineer who guided the technical destinies of Decca Records for 52 years. As a friend of 25 years standing, I was saddened by the circumstances that resulted in the recent sale of Decca to

Georg Solti conducting the Chicago Symphony Orchestra.

End of one era, and the beginning of another? In a symbolic sense, yes. If digital recording becomes the universal standard for master recording, then ultimately it would make obsolete all forms of tape noise reduction . . . Dolby, dbx, Telcom or whatever. However, even if we assume the audio consumer finally has access to true digital playback systems, it will take years before an adequate library of digital recordings of the "basic" classical repertoire is available. Meanwhile, the average music lover will continue to use analog stereo discs and Dolby B prerecorded cassettes. In the case of this new digital recording of Mahler's *2nd Symphony*, it will be used to produce an analog stereo disc recording and ultimately a digital disc — but it will also be used to produce a prerecorded cassette with Dolby B noise reduction.

While Ray Dolby is keeping a close eye on digital developments and is quite aware of their implications, he uses this information to expand his business in logical directions. Hence, his deep involvement in Dolby processing and equipment manufacturing for motion picture sound and his latest development for consumer audio, the Dolby "HX" headroom extension system.

While Ray Dolby is keeping a close eye on digital developments and is quite aware of their implications, he uses this information to expand his business in logical directions. Hence, his deep involvement in Dolby processing and equipment manufacturing for motion picture sound and his latest development for consumer audio, the Dolby "HX" headroom extension system.

## Dolby Headquarters

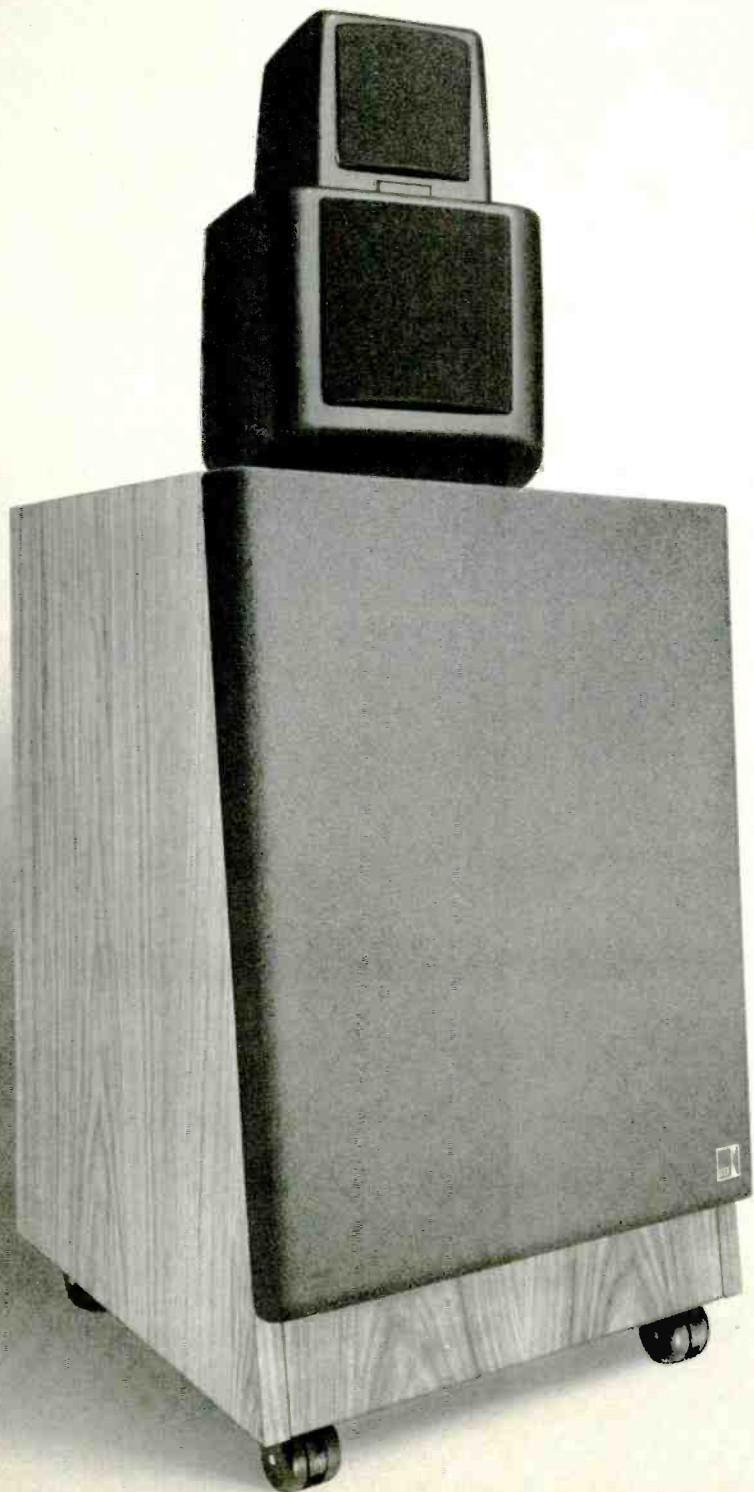
I have known Ray Dolby since 1968—before the B-Type noise reduction system came into being. Even back then, I had been involved in tape recording for nearly 20 years and had also developed an abiding hatred of tape hiss. When I heard about the Dolby A noise-reduction system, and



Polygram, the death of Decca's founder, Sir Edward Lewis, and the subsequent retirement of Arthur Haddy. It was Haddy, the "father" of Decca *ffrr* recording, who recognized the value of Ray Dolby's A301 Noise Reduction System and after extensive tests ordered nine of the systems in November, 1965. In November of 1966, Decca issued the first recording made with the Dolby A system, Mahler's *2nd Symphony* conducted by Georg Solti. Now, 14 years later, as Arthur and I were chatting, he told me that the Decca recording team (Jim Lock et al., kept intact by Polygram) were in Chicago making a digital recording of . . . Mahler's *2nd Symphony* with Sir

Illustration: Leo Pando

# KEF Reference Model 105 Series II: Unique Protection, Extraordinary Performance



The KEF Model 105 is now acclaimed as one of the most respected and reliable speaker systems. Since its introduction in 1977, the Model 105 has been adopted by audio testing laboratories and speaker manufacturers as a reference for evaluating other loudspeakers and audio products.

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KEF was the first company to develop computer-aided digital analysis for loudspeaker research and evaluation.

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Every vital characteristic is monitored by computer during the entire manufacturing and assembly process. Drive units and filter networks are measured individually. Performance data is recorded digitally and used to group carefully matched sets of components prior to assembly.

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The Model 105 Series II is fully protected against accidental overload by a self-powered electronic device called S-STOP (Steady State and Transient Overload Protection). This KEF development provides comprehensive protection against excessive voltage, thermal overload, and low frequency excursion:

**PEAK:** The peak protection mode causes the S-STOP circuit to operate whenever peak voltages to the system are so high as to be damaging to the dividing network, or likely to cause unacceptable distortion levels on program peaks.

**THERMAL:** The input level to each drive unit voice coil is continuously monitored, and whenever a safe operating temperature is exceeded, S-STOP is activated.

**LOW FREQUENCY EXCURSION:** The excursion of the low frequency unit is also monitored, and S-STOP is again activated whenever the input level on program peaks is sufficient to cause the maximum linear excursion of the bass unit to be exceeded.

The original Model 105 has become an industry reference point. KEF's continuous research & development has now produced the Model 105 Series II—a home speaker system that promises to be even more remarkable.

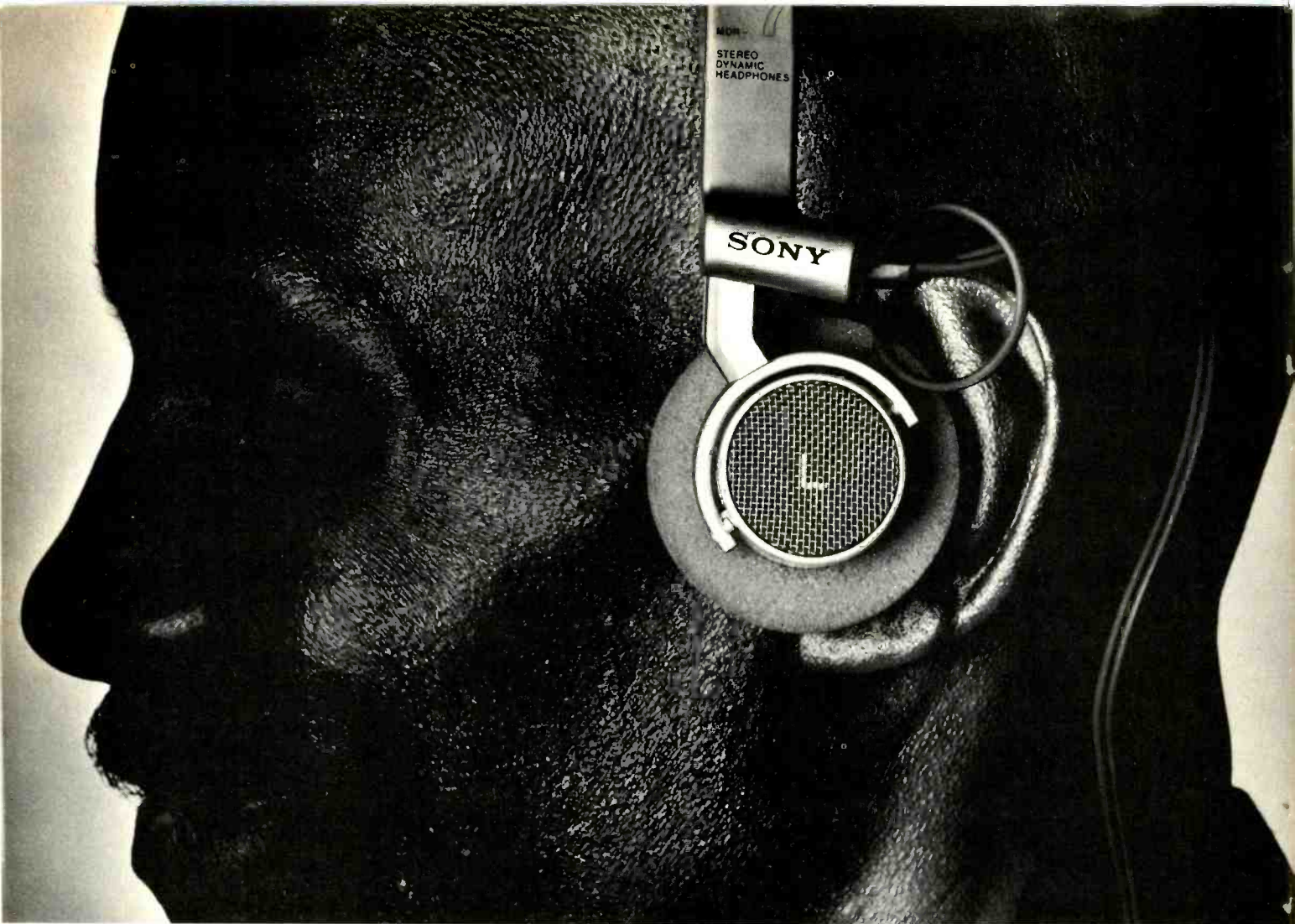
We would recommend that you visit your authorized KEF dealer for a thorough demonstration of the Model 105 Series II. The speaker system is available with an optional



full grille (not shown) and in various wood finishes. For the name of the dealer nearest you, write: KEF Electronics, Ltd., c/o Intratec, P.O. Box 17414, Dulles International Airport, Washington, D.C. 20041. Available in Canada.

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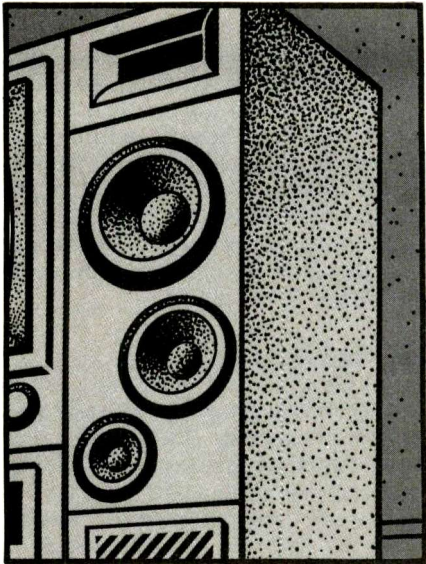
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subsequently found how effectively it dealt with the pernicious malady of tape hiss, I became an immediate and enthusiastic booster of the system. Since then, I have visited Ray and his charming wife Dagmar at their London headquarters on a number of occasions and have had the pleasure of having them as guests in my home on Long Island. In January of 1976, the Dolbys took up residence in San Francisco and opened a new headquarters office in that city. The San Francisco operation encompasses administration, research and development, new market development, international licensing, and United States sales. The London factory and offices continue to manufacture all Dolby professional equipment and handle international sales of same. Some months ago, Ray Dolby invited me to the new San Francisco headquarters, and I can tell you it was a rewarding experience.

In the Dolby building in downtown San Francisco, the two points of interest for me were the research and development lab, presided over by David Robinson, VP for Engineering and long-time associate of Ray Dolby, and a most elaborately equipped "mini-theater" projection room. As you might expect, the R&D lab is replete with the cool green color of precision Bruel and Kjaer oscillators and graphic recorders, spectrum analyzers, etc. as well as the precision 'scopes and lab exotica from other manufacturers. These days, David Robinson is kept busy with new developments in noise reduction for motion picture sound, as exemplified by the new CP200 Cinema Processor, an elaborate unit capable of reproduction of any of the Dolby encoded mono or stereo, optical or magnetic sound tracks. Of late, there has been new emphasis on Dolby noise-reduction equipment for video-tape

recorders. For example, the Dolby NRU-10 is an outboard A-Type two-channel audio noise-reduction system for professional video-tape recorders, providing 10 dB of noise reduction from 20 Hz upwards, and rising to 15 dB at 9 kHz and above. Then there is the Dolby Catalog No. 155, a two-channel audio noise-reduction unit with specifications similar to the NRU-10; the 155 is specifically designed to be incorporated in the Sony BVH-1000 video-tape recorder.

As you are probably aware, for some time now Japan has been broadcasting TV programs with stereo sound, and in fact there are TV sets on the Japanese market incorporating stereo audio systems. You may also know that a proposal to provide stereo audio for TV broadcasts in this country is now before the FCC. The general opinion is that action favorable to this proposal will be forthcoming within two years.

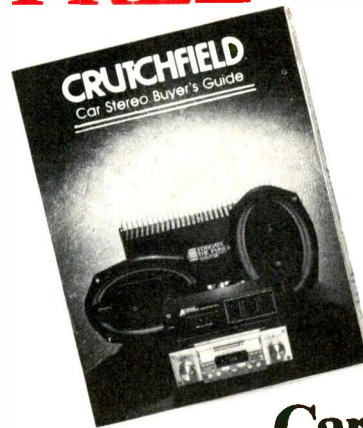
#### Noise Reduction in VCRs

Obviously, with TV stereo audio already being broadcast in Japan, those consumers who want to make home video recordings with the stereo sound will need new models of the video-cassette recorders incorporating stereo audio facilities. Furthermore, it is expected that many will want to play back these stereo recordings over their higher quality stereo component systems, rather than through the speakers in their TV sets. Since the VCR machines have narrow-track audio channels and operate at even slower speeds than an audio cassette, in order to avoid unacceptably noisy sound with higher levels of distortion, the new VHS two-channel video recorders will be equipped with Dolby B-Type noise reduction. Thus far, such VHS VCR manufacturers as JVC, Matsushita, Hitachi, Akai, Sharp, and Mitsubishi have agreed to incorporate Dolby noise reduction in their new stereo VCRs.

If I were a Texas oil baron, one of the things I would want in my home is a projection room just like the one at Dolby Laboratories in San Francisco. Here is a purpose-built room approximately 25 feet wide by 35 feet deep with 9-foot ceilings. It is acoustically treated for maximum intelligibility of dialogue and high-quality music sound. There is a wide-aspect-ratio projection screen, and in the projection booth are two modern, professional 35-mm projectors equipped for the showing of Dolby mono and stereo optical prints and a 70-mm projector with magnetic head for six-channel "surround" stereo playback of films like "Apocalypse Now." Needless to say, the room is equipped with a generous number of very comfortable

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seats. Ray Dolby treated me to one of the most stunning audio-visual experiences I have ever had. A demonstration film of excerpts from a number of productions was shown, and while the first two clips were interesting, the third clip from the picture "Days of Heaven" was simply mind-blowing. Now the speaker layout in this projection room has five speakers up-front behind the wide screen and a number of small, high-Q speakers mounted above the heads of the audience and disposed in a "string" starting about halfway back on each side of the room and continuing around to the back of the room. There may be as many as 14 small speakers mounted on each side and rear in this configuration. In this setup tracks 1, 3 and 5 are respectively left, center, and right screen. Speakers 2 and 4 carry bass-enhancement information below 100 Hz, which is combined with non-directional bass from track 6 and subsequently can be fed to subwoofers for ultra-low frequency effects. Mid- and high-frequency stereo surround information, which has been phase matrixed into tracks 2 and 4, is fed to the left and right, side and rear "strings" of speakers respectively.

The key scene in "Days of Heaven" shows some farmers surveying a sea of lush, golden wheat somewhere in the Midwest about the turn of the century, when to their horror, the wheat fields are attacked by a plague of locusts. While the farmers are frantically beating at the voracious insects, an old-fashioned steam tractor comes on the scene, somehow catches on fire, and the driver jumps for his life. The tractor, now an out-of-control juggernaut, careens through the wheat fields, which sets the wheat ablaze. Well . . . between the speakers up-front and all the surround speakers, the whir and buzz of countless billions of locusts is chillingly real. Then, add to this the cries of the farmers, the clanking and snorting sounds of the steam tractor,

and the crackle and pervasive low-frequency roar of the fire. The brilliance and clarity of the projection, the purity of the color, and the startling realism of all the sonic elements combine into an emotional experience of tremendous impact. If all motion pictures could be presented to the public with such outstandingly good audio and visual quality, the movie houses would be packed to the rafters!

### HX-ing Bias and EQ

On the consumer audio front, Dolby is concentrating on the HX headroom extension system. This system has been described in these pages before, but evidently quite a few people have the wrong impression about what it does. For example, some people think it is a new type of Dolby noise-reduction system. Rather, it is a rather clever adjunct to existing B-Type Dolby noise reduction, which through use of the control signal in the B-Type circuitry allows varying record bias and record equalization on a dynamic basis. This permits dramatically increased headroom in recording the very short wavelengths of high-level, high-frequency signals, and thus avoids tape saturation. The increase in high-frequency headroom can be as much as 10 dB above 10 kHz. With an increasing number of audiophiles recording their direct-cut and hybrid digital/analog discs to cassettes, the increased high-level, high-frequency energy on these discs has been causing severe problems with tape saturation. Many rock and pop albums, which make liberal use of electronic synthesizers, are nightmares to record cleanly because, unlike conventional musical instruments which have relatively low levels of high-frequency overtones, a synthesizer can easily produce a 15-kHz signal at very high level. . . . One of the most intriguing aspects of the Dolby HX system is that cassettes recorded with it can be played back on any cassette deck equipped with Dolby B noise reduction. In other words, there is no special HX playback circuitry involved. This naturally gives rise to the thought that one of these days we may have ultra-high-quality prerecorded cassettes using chromium dioxide or even metal-particle tape, which have been recorded with Dolby B-Type noise reduction and the HX headroom extension system. On the better cassette decks, this should enable music to be reproduced with a dynamic range of better than 70 dB! I'm sure even Ray Dolby didn't envision this kind of performance from a tiny cassette operating at 1 7/8 ips when he invented his noise-reduction system. **A**

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# Dear editor

## Lirpa MADness

I went to school (impressed?) and studied under Prof. I. Lirpa (even more impressed?). I'm glad to see he's getting the recognition he deserves. (Actually if he got the recognition he deserved, he'd be in jail.)

Anyway, I subscribe to and read Audio — and at times you guys are bananas. Maybe you'd like to review a record that lasts a half hour (some think it lasts for three days) and sells for only two bucks, with a free magazine attached

I'm talking about the MAD disco record for which I served as lyricist and creator.

It's a floppy disc, "floppy" referring to the disc, not the sales of the disc. Believe it or not we made it from a 24-track master, which meant using 24 paper cups and strings — quite an accomplishment not to get them all tangled up, which would put a knot in the fidelity!

Look for the MAD disco special issue on the newsstand.

Dick DeBartolo  
MAD Magazine  
New York, N.Y.

## Lirpa Tape Deck

Dear Editor:

In response to your review in the April, 1980 Equipment Profiles section, I suggest you check with Lirpa Labs and get more information on the Lirpa NUT-5 tape deck.

This unit utilizes a spring-mounted flywheel motor with special balsa-wood heads and accepts Lirpa Labs' new SADEX Cr<sub>2</sub>O<sub>3</sub> paper tape with micro sand particles. I believe Lirpa Labs has also developed a splicing medium of 100 percent pure pulp resin — Sap-Splice.

Jeffrey LeBrun  
Somers Point, N.J.

## Resolving the TIM/SID Controversy

Dear Editor:

In recent years one of the more controversial audio topics has been the subject of Transient Intermodulation Distortion (TIM) or Slewing Induced Distortion (SID) and their bearing on audio. While controversy surrounding

an issue has a positive result in openly airing differing views held, it has a more negative one in that it can potentially impede progress towards other equally serious problems. The undersigned authors, all having been principals to this issue, would like at this time to extend the following joint resolution towards ending controversy in this subject area.

The recent two-part article by Robert R. Cordell in *Audio* [12] can be interpreted to imply that there exists disagreement among these authors on this issue. We feel it is fitting that the public understand that there is in fact no controversy among us. We agree upon the distortion mechanism which gives rise to TIM and/or SID, as may be evidenced by our papers, with appropriate allowances for semantic differences, and different boundary conditions.

While we do not necessarily agree completely with the "view" of TIM as presented by Mr. Cordell, or some manners of his presentation, we have no strong desire to prolong arguments on this issue which might result only in further public confusion and controversy. We would refer those interested in technical details to some papers on amplifier designs [2, 9, 13, 19, 21, 22, 23], program rate-of-change characteristics [14, 15, 16, 20, 26, 27], measurements [10, 18, 19], and listening tests [24, 25, 26, 27].

We sincerely hope that debates upon these issues may be finally laid to rest, and look forward to working further in unison, as we examine in detail the many other technical problems facing high-quality audio reproduction.

John Curl  
Audio Consultant  
Berkeley, Calif.

Walter G. Jung  
Consulting Author

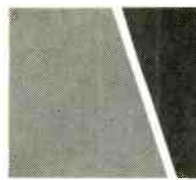
W. Marshall Leach, Jr.  
Associate Prof.  
Georgia Inst. of Technology  
Atlanta, Ga.

Matti Ojala  
Professor  
Tech. Research Centre of Finland  
Oulu, Finland

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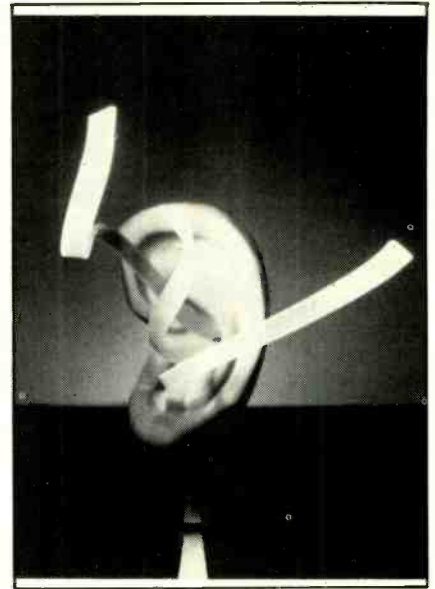
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# 6th ANNUAL CAR STEREO DIRECTORY

Our 6th Annual Car Stereo Directory reflects the attempt on the part of most firms in this industry to reach consensus on a set of measurement standards. However, there still are some discrepancies in certain specifications, largely in the amplifier power and tuner sensitivity areas because of the lack of a common basis for testing. We have made every effort to accurately transfer the manufacturer-supplied data to the

page, with the thought that some data is better than no data. We do urge the reader to contact companies and local dealers directly, since a listing of specs of radios/tape players, loudspeakers, and equalizers and amplifiers cannot do full justice to the increasingly advanced and sophisticated components becoming available for mobile installations. For a look at several of these, see "Great Cars! Great Sound!" on page 52.



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2434 South 24th St.  
Phoenix, Ariz. 85034

**Grundig**

**GR Electronics**  
635 Madison Ave.  
New York, N.Y. 10022

**Hanabashiya Ltd.**  
39 West 28th St.  
New York, N.Y. 10001

**Hi Comp**  
See: Audiovox

**Infinity Systems**  
7930 Deering Ave.  
Canoga Park, Cal. 91304

**Intervox**  
Int'l. Components Corp.  
105 Maxess Rd.  
Melville, N.Y. 11746

**JBL**  
8500 Balboa Blvd.  
Northridge, Cal. 91329

**Jensen**  
4136 North United Pkwy.  
Schiller Park, Ill. 60176

**Jet Sound Labs**  
See: Car Tapes Inc.

**Kenwood**  
1315 E. Watsoncenter Rd.  
Carson, Cal. 90745

**Kraco Enterprises**  
505 East Euclid Ave.  
Compton, Cal. 90024

**Linear Power**  
11545 D Ave. East  
Auburn, Cal. 95603

**Marantz**  
20525 Nordhoff St.  
Chatsworth, Cal. 91311

**Marume Corp.**  
7022 Alondra Blvd.  
Paramount, Cal. 90723

**Matrecs Electronics**  
805 Woodman Ave.  
Windsor, Ill. 61089

**Melco Sales Inc.**  
3030 East Victoria St.  
Compton, Cal. 90221

**Mesa Electronic Sales**  
2940 Malmo Dr.  
Arlington Hts., Ill. 60005

**Micron**  
See: General Sound

**Mitsubishi**  
See: Melco Sales

**Motorola**  
Automotive Prod. Div.  
1299 East Algonquin Rd.  
Schaumburg, Ill. 60196

**Northstar Electronics**  
20850 Leapwood Ave.  
Carson, Cal. 90746

**Numark Electronics**  
P. O. Box 493  
Edison, N.J. 08817

**Orovox Sound**  
11545 Tuxford St.  
Sun Valley, Cal. 91352

**Panasonic**  
1 Panasonic Way  
Secaucus, N.J. 07094

**Pioneer**  
1925 East Dominguez St.  
Long Beach, Cal. 90810

**Polk Audio**  
1205 South Carey St.  
Baltimore, Md. 21230

**PSB Speakers**  
P. O. Box 144  
St. Jacobs, Ontario  
Canada NOB 2N0

**Pyle Industries**  
501 Center St.  
Huntington, Ind. 46750

**Pyramid Mobile Audio**  
P. O. Box 7338  
Arleta, Cal. 91331

**Quam-Nichols**  
234 East Marquette Rd.  
Chicago, Ill. 60637

**RCA Autosound**  
2000 Clements Bridge Rd.  
Deptford, N.J. 08096

**Radio Shack**  
14001 Tandy Center  
Fort Worth, Tex. 76102

**Royal Sound**  
200 Industrial Way West  
Eatontown, N.J. 07724

**Sanshu (America) Inc.**  
2814 Imperial Hwy.  
Brea, Cal. 92621

**Sanyo**  
P. O. Box 51777  
Compton, Cal. 90220

**Sharp**  
10 Keystone Place  
Paramus, N.J. 07652

**Sony**  
9 West 57th St.  
New York, N.Y. 10019

**Sparkomatic Corp.**  
Routes 6 and 209  
Milford, Pa. 18337

**Speco**  
Div., Component  
Specialties  
P. O. Box 624  
Lindenhurst, N.Y. 11757

**Trusonic**  
10530 Lawson River Ave.  
Fountain Valley, Cal.  
92708

**Ultralinear Loudspeakers**  
3228 East 50th St.  
Los Angeles, Cal. 90058

**Vikyo**  
See: Sanshu (America)

**Visionik**  
701 Heinz St.  
Berkeley, Cal. 94710

**Zapco**  
Zeff Advanced Products  
5018 Paradise Rd.  
Modesto, Cal. 95351

# RADIOS/TAPE PLAYERS



Alpine 7307



Clarion PE958A



Cobra 221



Craig T690

MANUFACTURER	Model	Price		Stereo (S), Mono (M), or 4-Channel (C)	FM Sensitivity, $\mu$ V (For 30dB Quieting)	Selectivity	Average Watts/Channel, At Rated Distortion	% Distortion at Rated Watts	Local/Distance Switch	Preset/Station? If Yes, Number AM, Number FM	Bass Control	Treble Control	Cassette	8-Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, Inches
AFCO	IDC-750A	179.95	S			6	10	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I		7x1 1/2x5 1/2
AIWA	CT1060Y	120.00	S			7	10	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	U	5 1/2x1 1/4x6 1/4
	CTR2030F	170.00	S			5	10	No	No	No	No	Yes	No	Yes	Yes	Yes	I		6 1/2x2x6
	CTR2060Y	190.00	S			7	10	No	No	No	No	Yes	No	Yes	Yes	Yes	I		7 1/2x1 1/4x6
	CTR3030		S			7	10	No	12	Yes	Yes	Yes	No	Yes	Yes	Yes	I		7 1/2x1 1/4x6
ALPINE	7307 Preamp	379.95	S	2.5	75				Auto	1 AM, 4 FM or 1 FM, 4 AM	Yes	Yes	Yes	No	No	Yes	Yes	I	7 1/2x2x5 1/4
	7123	319.95	S	2.5	75	2.2	0.8	No	No	1 AM, 4 FM or 1 FM, 4 AM	Yes	Yes	Yes	No	No	Yes	Yes	I	6 1/2x2x5 1/2
	7327	279.95	S	19.2 dBf	60	2.2	0.8	Auto	No	4 AM	Yes	Yes	Yes	No	No	Yes	Yes	I	6 1/2x2x4 1/2
	7128	299.95	S	23.2 dBf	60	2.2	0.8	Auto	5 AM, 5 FM	No	No	Yes	Yes	No	Yes	Yes	Yes	I	7x2x5 1/4
	7124	199.95	S	19.2 dBf	60	2.2	0.8	Auto	No	No	No	Yes	No	Yes	Yes	Yes	I	6 1/2x2x4 1/2	
AUTOMATE	AC-10	37.95	S			4	2.0	No	No	Yes	Yes	Yes	No	No	Yes	No	U		4 1/2x1 1/4x6
	AC-1000	95.95	S	5	50	4	2.0	Yes	No	No	No	Yes	No	No	Yes	No	I		7x1 1/2x5
	AC-3000	133.95	S	5	55	4	2.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I		7 1/2x1 1/4x5 1/2
	AC-5000	179.90	S	5	55	4	2.0	Yes	5AM or FM	No	No	Yes	No	Yes	Yes	Yes	I		7x1 1/4x5 1/2
BON SONIC	AC-7000	199.90	S	2.5	60	10	1.0	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	I		7x1 1/4x5 1/2
	433AF		S			3		Yes			Yes	Yes	Yes	No	No	Yes	No	I	
	H850		S			3		Yes			Yes	Yes	No	No	No	No	I		
	R455		S			3		Yes			Yes	Yes	Yes	Yes	Yes	Yes	I		
CLARION	PE958A	422.95	S	2.5	60			Yes	Yes	5AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	5 1/2x7x2 3/4; for use with GA301E or GA302E amp.
	PE751B	389.95	S	3	60	12		Yes	Yes	5AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	6 1/4x7x2
	PE765B	284.95	S	3	60	3	3	Yes	No	5AM or FM	No	Yes	Yes	No	Yes	Yes	Yes	I	7x5 1/2x2
	PE560A	215.50	S	3	60	3	3	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	I	5 1/2x7 1/2x2
	PE550A	278.95	S	3.5	60	3	3	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	I	7x6 1/2x2
	RE-338D	118.95	S			4		Yes	Yes	Yes	No	No	No	No	No	No	No	I	
	RE-436A	118.95	S			4		Yes	Yes	Yes	No	No	No	No	No	No	No	I	
	RE-338DV	124.95	S			4		Yes	Yes	Yes	No	No	No	No	No	No	No	I	
	PE-683A	128.95	S			4		Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	I	
	PE-676	184.50	S			4		Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	I	
	PE-666B	215.50	S			4		Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	I	
	PE-559A	184.50	S			4		Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	I	
	PE-765A	284.95	S			4		Yes	Yes	5	No	No	No	Yes	Yes	Yes	Yes	I	
	PE-840A	71.50	S			4						Yes	No	Yes	Yes	Yes	Yes	U	
	PE-828A	126.95	S			4						Yes	No	Yes	Yes	Yes	Yes	U	
	PE-838	226.95	S			10			Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	U	
	PE-684A	253.75	S			10		Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	U	
	PE-624	128.95	S			4			Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	I	
PE-623B	150.95	S			4					No	No	Yes	No	Yes	Yes	Yes	I		
PE-703A	194.95	S			4				5	No	No	Yes	No	Yes	Yes	Yes	I		
PE-450	70.75	S			4					No	No	Yes	No	Yes	Yes	Yes	U		
PE-453A	126.95	S			10					Yes	Yes	No	Yes	No	No	No	I		
COBRA	93	99.95	S	1.9	50	4	10	Yes	No	No	No	Yes	No	No	Yes	No	I		1 1/2x6 1/4x4 1/2
	94	99.95	S	1.9	50	4	10	Yes	No	No	No	No	Yes	No	No	No	I		1 1/2x6 1/4x4 1/2
	105	179.95	S	1.9	50	12	10	Yes	No	No	No	No	Yes	No	Yes	Yes	I		1 1/2x6 1/4x4 1/2
	98	189.95	S	1.9	50	12	10	Yes	No	No	No	No	Yes	No	Yes	No	I		2 1/2x7 1/2x6 1/4
	99	199.95	S	1.9	50	12	10	Yes	5AM or FM	No	No	Yes	No	No	Yes	No	I		2 1/2x7 1/2x6 1/4
	221	329.95	S	1.9	50	12	10	Yes	5AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I		2 1/2x7 1/2x5 1/4
	222	299.95	S	1.9	50	12	10	Yes	5AM or FM	Yes	Yes	No	Yes	No	No	No	I		2 1/2x7 1/2x5 1/4

# RADIOS/TAPE PLAYERS



Fujitsu Ten DP-644



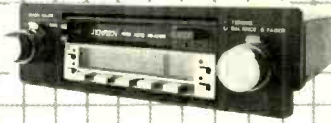
Hi Comp HCC-1030

MANUFACTURER	Model	Price		Stereo (S) Mono (M) or L-Channel (L) FM Sensitivity (uV) (For 30-dB Selectivity)	Selectivity	Average Watts (Channel, A Rated Distortion, % Distortion at Rated)	Local/Distance Switch	Pushbutton? If Yes, Number AM, Number FM	Bass Control	Treble Control	Cassette	& Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, inches		
CRAIG	R200	269.95	S	4.0@ 50 dB	70			Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2x7 1/2x5 1/2	
	R230	309.95	S	3.5@ 50 dB	70			Yes	5	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2x7 1/2x5 1/2	
	S609	119.95	S	15.0@ 50 dB	50	4.0	5.0	Yes	No	No	No	No	Yes	No	No	No	I	1 1/2x5 1/2x5	
	S632	169.95	S	3.2@ 50 dB	60	4	5.0	Yes	5	Yes	Yes	No	Yes	No	No	No	I	2 1/2x7 1/4x5 1/2	
	S686	324.95	S	4.0@ 50 dB	70	12	5	Yes	5	Yes	Yes	No	Yes	No	No	No	I	2 3/4x7 1/4x5 1/2	
	T621	119.95	S	6.3@ 50 dB	60	4	5.0	Yes	No	No	No	Yes	No	No	Yes	No	I	1 3/4x6 3/4x4 1/2	
	T639	159.95	S	8.9@ 50 dB	60	4	5.0	Yes	No	No	No	Yes	No	No	Yes	No	I	2x6 3/4x5	
	T610	119.95	S	4.4@ 50 dB	60	4	5.0	Yes	No	No	No	Yes	No	No	Yes	Yes	I	2x7 1/2x5 1/2	
	T617	159.95	S	2.8@ 50 dB	60	4	5.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	1 3/4x7 1/2x5 1/2	
	T640	189.95	S	4.4@ 50 dB	60	4	5.0	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	I	2x7 1/2x5 1/2	
	T681 A	189.95	S	4.0@ 50 dB	65	12.0	5.0	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	I	2x7 1/2x5 1/2	
	T689	229.95	S	4.3@ 50 dB	65	12.0	5.0	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	1 3/4x7 1/2x5 1/2	
	T690	314.95	S	5.0@ 50 dB	65	12.0	5.0	Yes	5	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2x7 1/2x6	
	T687	599.95	S	6.3@ 50 dB	60	12.5	1.0	Yes	5	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 3/4x7 1/2x5	
	T614	159.95	S	3.4@ 50 dB	60	4	5.0	Yes	No	No	No	Yes	No	No	Yes	Yes	I	2x7 1/2x5 1/2	
	T618	189.95	S	5.0@ 50 dB	60	4	5.0	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	1 3/4x7 1/2x5 1/2	
	T638	189.95	S	3.6@ 50 dB	60	4	5.0	Yes	5	No	No	Yes	No	No	Yes	Yes	I	2x7 1/2x5 1/2	
	T634	239.95	S	5.0@ 50 dB	60	4	5.0	Yes	5	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2x7 1/2x6	
	T619	279.95	S	5.0@ 50 dB	65	8	5.0	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2x7 1/2x5 1/2	
FUJITSU TEN	DP-644	249.95	S	20 dB	64	16	10	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	1 3/4x7x5 1/2	
	DP-620	149.95	S	18 dB	64	5	10	No	No	No	No	Yes	No	Yes	Yes	Yes	I	1 3/4x7x5 1/2	
	DP-7871	179.95	S	18 dB	64	5	10	No	No	No	No	Yes	No	Yes	Yes	Yes	I	1 3/4x7x5 1/2	
	DP-7872	179.95	S	18 dB	64	5	10	No	No	No	No	Yes	No	Yes	Yes	Yes	I	1 3/4x7x5 1/2	
	GP-7881	279.95	S	18 dB	64	4x5	10	Yes	No	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 3/4x7 1/2x5 1/2
	EP-820	569.95	S	20 dB	64			Yes	No	7 FM, 7 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 3/4x7x6 1/2
	Preamp																		
	DL-7841	129.95	S	18 dB	64	5	10	No	No	5 FM, 5 AM	Yes	Yes	No	Yes	No	No	No	I	2x7 1/2x6 1/2
	GL-7851	199.95	S	18 dB	64	5	10	Yes	No	5 FM, 5 AM	Yes	Yes	No	Yes	No	No	No	I	2x7 1/2x6 1/2
	EP-750-S1	489.95	S	20 dB	64			Yes	Yes	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 3/4x7 1/2x5 1/2
FULTRON	16-6800	399.95	S			9	0.01	Yes	7 AM, 7 FM		Yes	Yes	No	Yes	Yes	Yes	I	2 1/2x7x5 1/2	
	16-6615	199.95	S			5	0.01	Yes	5 AM or FM		Yes	Yes	No	No	Yes	Yes	I	2 1/2x7x5 1/2	
	16-6100	159.95	S			4	0.01	Yes	5 AM or FM	No	No	Yes	No	No	Yes	No	I	2 1/2x7x4 1/2	
	16-5200	149.95	S			4.5	0.01	Yes	No	No	Yes	No	No	Yes	Yes	No	I	1 3/4x6 3/4x4 1/2	
	16-5000	99.95	S			4	0.01	Yes	No	No	Yes	No	No	Yes	No	No	I	1 3/4x6 3/4x4 1/2	
	16-8600	499.95	S			4	0.01	Yes	4 AM or FM	No	No	No	Yes	No	No	No	I	2 3/4x7x7; plus CB.	
	16-6500	189.95	S			5	0.01	Yes	5 AM or FM		Yes	No	Yes	No	No	No	I	2 3/4x7x6	
	16-6300	159.95	S			4	0.01	Yes	5 AM or FM	No	No	No	Yes	No	No	No	I	2 1/2x7x5 1/2	
	16-5600	119.95	S			4.5	0.01	Yes	No	No	No	Yes	No	No	No	No	I	1 3/4x7x4 1/2	
	16-5300	99.95	S			4	0.01	Yes	No	No	No	Yes	No	No	No	No	I	1 3/4x6 3/4x4 1/2	
16-8400	399.95	S			3	0.01	Yes	5 AM or FM	No	No	No	No	No	No	No	I	2 3/4x7x6; plus CB.		

(continued)



# RADIO/TAPE PLAYERS



Jensen R406



Jet Sound Labs JS-6200



Kenwood KRC-711

MANUFACTURER	Model	Price		Stereo (S), Mono (M), or 4-Channel (Q)	FM Sensitivity (uV For 30-dB Quieting)	Selectivity	Average Watts/Channel At Rated Distortion	% Distortion at Rated Watts	Local/Distance Switch	Pushbuttons? If Yes, Number AM, Number FM	Bass Control	Treble Control	Cassette	8-Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, inches
FULTRON (continued)	16-4200	99.95	S			4	0.01	Yes	5 AM or FM	No	No	No	No	No	No	No	No	I	1 5/8x6 1/2x4 1/4
	16-3405/15	119.95	M			4	0.01	Yes	5 AM or FM	No	No	No	No	No	No	No	No	I	2 1/8x7 1/8x5
	16-3200	69.95	M			4	0.01	Yes	5 AM or FM	No	No	No	No	No	No	No	No	I	1 1/8x6 1/2x4 1/4
	16-2200	44.95	M			4	0.01		5 AM or FM	No	No	No	No	No	No	No	No	I	1 1/8x6 1/2x4 1/4
GRUNDIG	GCM 4650	187.00	S	2.3		7	10	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	7 1/8x1 1/4x5 1/4
	GCM 8100	250.00	S	2.5		7	10	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	I	7 1/8x1 1/4x5 1/4
	GCM 8200	259.00	S	2.5		7	10	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	7 1/8x2x5 1/8	
	GCM 9200	390.00	Q			20	10	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	I	7 1/8x2x5 1/8
	GCP 9300	329.00	S	2.3		7	10	Yes	5 AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	7 1/8x1 1/4x5 1/4
	GEM 5000	139.00	S	2.5		7	10	Yes	No	No	No	No	Yes					I	7 1/8x1 1/4x5 1/8
HI COMP	HCC-1020	332.00	S	1.2		15	1	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	2 1/8x7x6 1/8
	HCC-1025	380.00	S	1.2	70	15	1	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 3/8x7x5 1/2
	HCC-1030	420.00	S	1.2	70	15	1	Yes	5	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	3x7 1/2x5 1/4; Dolby NR.
	HCM-005	550.00	S	2.0	65			Yes	6 AM, 6 FM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2x7x6
	HCM-0010	650.00	S	1.2	70			Yes	6 AM, 6 FM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 3/8x7x4 3/8
JENSEN	R430	469.95	S	2.5	60	30	0.4	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	2 1/8x6x7
	R420	369.95	S	2.5	60	18	0.4	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	2 1/8x6x7
	R410	299.95	S	2.5	60	5	0.4	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	2 1/8x6x7
	R406	289.95	S	2.5	60	5	0.6	No	5 AM/FM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	1 3/8x6x7
	R405	279.95	S	2.5	60	5	0.4	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2x5 1/8x7
	R402	239.95	S	2.5	60	5	0.4	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	I	2x4 1/8x7
	R400	199.95	S	2.5	60	5	0.4	No	No	No	No	Yes	No	No	Yes	Yes	Yes	I	2x4 1/8x7
JET SOUND LABS	JS-6200	299.95	S	1.5	70	15	1.0	Yes	5 AM, 5 FM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 1/4x7x4 3/8
	JS-9700	179.95	S	1.7	40	8	1.0	Yes	5 AM or FM	No	No	Yes	No	Yes	Yes	Yes	Yes	I	2x6 1/8x5 1/2
	JS-9400	129.95	S	1.7	40	8	1.0	Yes	No	No	No	Yes	No	Yes	Yes	No	I	1 3/8x6 3/8x4 1/4	
	JS-8002	159.95	S	1.7	40	8	1.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	1 1/4x7x5 1/8	
	JS-8001	129.95	S	2.0	40	8	1.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	2x7x6 1/8	
	JS-8250	99.95	S	2.0	40	8	1.0	Yes	No	No	No	No	Yes	No	No	No	I	1 1/8x7x4 1/4	
	JS-9350	99.95	S	2.0	40	8	1.0	Yes	No	No	No	Yes	No	No	No	No	I	1 3/8x6 3/8x4 1/4	
	JS-600	89.95	S		5	1.0	No	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	U	2x7x6 1/2
JS-3500	119.95	S	2.5	40	5	1.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	U	2x7x6 1/2	
KENWOOD	KRC-711	449.00	S	1.5	65	†	1	No	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 3/8x7 1/8x5 1/8; † 4 front, 15 rear.
	KRC-511	379.00	S	1.5	65	4	1	No	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 3/8x7 1/8x5 1/8
	KRC-311	269.00	S	1.7	65	4	1	Yes	5 FM, 5 AM	No	No	Yes	No	Yes	Yes	Yes	Yes	I	2x7 1/4x5 1/8
	KRC-721	399.00	S	1.5	65			Yes	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	I	2 3/8x7 1/8x5 1/8
	KTC-767	299.00	S	1.1				Yes	5 AM, 6 FM, 6 AM	Yes	Yes	No	No					I	2 1/8x6 1/8x6 1/2
	KTC-757	269.00	S							Yes	Yes	Yes		Yes	Yes	Yes	Yes	I	2 1/8x6 1/8x6 1/2
																			I
KRACO	KGE-801	199.95	S	10	50	10	1.0	Yes	No	No	No	Yes	No	No	Yes	No	No	I/U	2x7x5
	LED-501	249.95	S	2.5	45	3.6	1.0	No	No	No	No	Yes	No	No	Yes	No	No	I/U	2x7 1/8x6
	LED-500	249.95	S	2.5	45	3.6	1.0	No	No	No	No	No	Yes	No	Yes	No	No	I/U	2x7 1/8x6
	KID-588	159.95	S	3	45	3.6	1.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	I/U	2x7 1/8x5 1/2
	KID-575	169.95	S	2	45	3.6	1.0	Yes	5 FM, 5 AM	No	No	No	No	Yes	No	No	No	I/U	2 3/8x7 1/8x6 1/4
	KID-566	129.95	S	2.5	35	3.6	1.0	Yes	No	No	No	No	Yes	No	No	No	No	I/U	2x7x5 1/4
	KID-565	119.95	S	3	35	3.6	1.0	Yes	No	No	No	No	Yes	No	No	No	No	I/U	2x7 1/8x5 1/2
	KID-587	169.95	S	2	45	3.6	1.0	No	5 FM, 5 AM	No	No	No	Yes	No	No	Yes	No	I/U	2x7 1/4x5 1/2
	KID-585	129.95	S	2.5	45	3.6	1.0	Yes	No	No	No	No	Yes	No	No	Yes	No	I/U	2x7 1/4x5 1/2
	KID-589	199.95	S	2.0	45	3.7	1.0	No	No	No	No	No	Yes	No	Yes	Yes	Yes	I/U	2x7 1/4x5 1/2

# RADIOS/TAPE PLAYERS



Kraco KGE-801



Marantz CAR-427

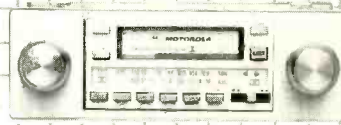


Mitsubishi RX-723

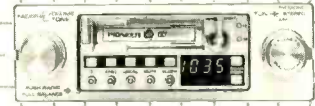
MANUFACTURER	Model	Price		Stereo (S), Mono (M), or 4-Channel (C)	FM Sensitivity (µV For 30dB Quieting)	Selectivity	Average Watts/Channel, All Rated Distortion	% Distortion at Rated Watts	Local/Distance Switch	Pushbuttons? If Yes, Number AM, Number FM	Bass Control	Treble Control	Cassette	8-Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, Inches
MARANTZ	CAR-427	625.00	S	1.0	70			No	5 AM, 5 FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 5 1/2	
	CAR-400	500.00	S	1.5	65	4	0.9	No	6 AM, 6 FM	Yes	Yes	Yes	No	No	Yes	Yes	I	2 1/2 x 7 1/2 x 5 1/2	
	CAR-410	390.00	S	1.1	60	4	0.9	Yes	6 AM, 6 FM	No	No	Yes	No	No	Yes	Yes	I	1 3/4 x 7 1/2 x 6	
	CAR-302	300.00	S	1.5	60	4	0.9	No	5 AM, 5 FM	Yes	Yes	Yes	No	No	Yes	Yes	I	2 1/2 x 7 1/2 x 4 3/4	
	CAR-301	270.00	S	1.1	70			No	5 AM, 5 FM	Yes	Yes	Yes	No	No	Yes	Yes	I	2 1/2 x 7 1/2 x 4 3/4	
	CAR-300	220.00	S	1.8	60	4	0.9	Yes	5 AM, 5 FM	No	No	Yes	No	No	Yes	Yes	I	2 1/2 x 7 1/2 x 5 1/2	
MARUME	M-P880	109.95	S	5		8	2	Yes	5 FM, 5 AM	No	No	No	Yes	No	No	No	I	2 x 5 1/2 x 6 1/2	
	M-5300/A	69.95	S	3.2		7	2.0	Yes	No	No	No	Yes	No	No	Yes	No	I	2 x 5 1/2 x 7 1/2	
	M-7700	109.95	S	5		7	2.0	Yes	No	No	No	Yes	No	Yes	Yes	I	2 x 5 1/2 x 6 1/2		
	M-P550	129.95	S	5		8	2.0	Yes	5 FM, 5 AM	No	No	Yes	No	No	Yes	Yes	I	1 3/4 x 5 1/2 x 6 1/2	
	M-999P	69.95				7				No	No	No	No	No	No	No	I		
MITSUBISHI	CZ-747	479.95	S	4	80			Yes	5 AM & FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 x 7 1/2 x 4 3/4	
	CZ-692	299.95	S	4	80			Yes	5 AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 4 3/4	
	RX-691	249.95	S	4	80	4	1.0	Yes	5 AM or FM	No	No	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 4 3/4	
	RX-752	229.95	S	4	86	4	1.0	No	5 AM or FM	No	No	Yes	No	Yes	Yes	Yes	I	2 x 7 1/2 x 6	
	RX-723	149.95	S	4	70	4	1.0	Yes	No	No	No	Yes	No	No	Yes	No	I	1 3/4 x 6 1/2 x 4 1/2	
	RX-2	299.95	S	4	75	4	1.0	Yes	6 AM & FM	No	No	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 6 1/2	
	RX-79	259.95	S	4	75	11	1.0	Yes	5 AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 6 1/2	
	RX-73	179.95	S	4	75	4	1.0	Yes	5 AM or FM	No	No	Yes	No	No	Yes	No	I	2 1/2 x 7 1/2 x 4 3/4	
	GX-101	99.95	S			7	1.0			No	No	Yes	No	No	Yes	No	U	2 x 5 1/2 x 6 1/2	
	GX-102	149.95	S			7	1.0			Yes	Yes	Yes	No	Yes	Yes	Yes	U	1 3/4 x 5 1/2 x 6 1/2	
RX-103	159.95	S	2	70	7	1.0	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	U	2 x 5 1/2 x 6 1/2		
MOTOROLA	700SX	129.95	S	2.5		4	10	Yes	No	No	No	Yes	No	Yes	No	Yes	I	4 1/4 x 6 1/2 x 1 1/2	
	600SX	129.95	S	2.5		4	10	Yes	No	No	No	Yes	Yes	No	Yes	No	I	4 1/4 x 6 1/2 x 1 1/2	
	TC894	389.95	S	7.5@50dB		12	10	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	I	2 1/2 x 7 1/2 x 7 1/2	
NORTHSTAR ELECTRONICS	NS 2000	99.95	S	3	20	4	10.0	Yes	No	No	No	Yes	No	No	Yes	No	I	1 3/4 x 6 1/2 x 5	
	NS 2500E	159.00	S	2.0	20	4.5	10.0	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	1 3/4 x 6 1/2 x 5 1/2	
	NS 3040E	199.00	S	3.5	25	15	10.0	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	1 3/4 x 6 1/2 x 5 1/2	
PANASONIC	CQ-8700	649.95	S	15dBf @30dB				Yes	5 FM, 5 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 x 7 x 5 1/2	
	CQ-7600	359.95	S	19dBf @50dB				Yes	No	No	No	Yes	No	Yes	Yes	I	2 x 7 x 5 1/2		
	CQ-7400	299.95	S	19dBf @50dB				Yes	No	No	No	Yes	No	Yes	Yes	I	2 x 7 x 5 1/2		
	CQ-6600	239.95	S	26dBf @50dB	4	5		Yes	5 AM or FM	No	No	Yes	No	No	Yes	Yes	I	2 x 7 x 5 1/2	
	CQ-6800	149.95	S	27dBf @50dB		3.75	5	Yes	No	No	No	Yes	No	No	No	No	I	1 3/4 x 7 x 1 1/4	
	CQ-S680	179.95	S	19dBf @50dB	55	4	1.0	No	5 AM or FM	No	No	Yes	No	No	Yes	Yes	I	2 1/2 x 7 x 5 1/2	
	CQ-S700	199.95	S	19dBf @50dB	55	4	1.0	No	5 AM or FM	Yes	Yes	Yes	No	No	Yes	Yes	I	2 1/2 x 7 x 5 1/2	
	CQ-S710	209.95	S	19dBf @50dB	55	4	1.0	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 x 5 1/2	
	CQ-S740	239.95	S	19dBf @50dB	55	4	1.0	No	5 AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 x 5 1/2	
	CQ-S780	279.95	S	19dBf @50dB	55	4	1.0	No	5 AM or FM	Yes	Yes	Yes	No	Yes	Yes	Yes	I	2 1/2 x 7 x 5 1/2	
	CQ-4600	239.95	S	26dBf @50dB	4	5.0		Yes	5 AM or FM	No	No	No	Yes	No	No	No	I	2 x 7 x 5 1/2	
	CQ-2800	139.95	S	27dBf @50dB		4.25	5.0	Yes	No	No	No	No	Yes	No	No	No	I	2 x 7 1/2 x 4 3/4	
	RM-310 Cockpit	599.95	S	19dBf @50dB		10		Yes	No	No	No	Yes	No	No	Yes	Yes	†	2 1/2 x 27 1/2 x 8 1/2; † over head.	

(continued)

# RADIOS/TAPE PLAYERS



Motorola TC894



Pioneer KE-5000

MANUFACTURER	Model	Price		Stereo (S), Mono (M), or A-Channel (O)	FM Speciality (O) (For 30-dB Quieting)	Selectivity	Average Watts/Channel at Rated Distortion	% Distortion at Rated Watts	Local/Distance Switch	Pushbuttons? If Yes, Number AM, Number FM	Bass Control	Treble Control	Cassette	8-Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, inches	
PANASONIC (continued)	Cockpit	599.95	S	18dBf @50dB		10		Yes	No	No	No	Yes	No	No	Yes	Yes	†		2½x7½x8½; † over head.	
	RM-610	999.95	S	18dBf @50dB		30		Yes	3 FM	Yes	Yes	Yes	No	Yes	Yes	Yes	†		3x27¼x9; † over head.	
	Cockpit CQ-8530	449.95	S	10dBf @50dB		12.5		Yes	6 FM, 6 AM	Yes	Yes	Yes	No	Yes	Yes	Yes	I		2¾x7½x6½	
PIONEER	TP-727	104.95	S	14.3	74	4		Yes	No	Yes	Yes	No	Yes		Yes		U		2½x6½x6¼	
	TP-900	179.95																	3x7½x7½	
	KP-272	89.95																	2x5½x6½	
	KP-373	114.95	S	14.3	74	4	4		Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	U		2x4½x6½
	KP-575	139.95																		2x6½x4¾
	KP-250	144.95																		2x6½x6¾
	KP-500	189.95	S	14.3	74	4	4		Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	U		3x7½x7½
	KP-6006	129.95																		2x7½x7½
	TP-7007	149.95																		2x7½x7½
	TP-9004	199.95	S	14.3	74	4	4		Yes	5FM, 5AM	No	No	No	Yes		No		I		3¼x7½x7¾
	TP-9005	199.95																		3¼x7½x7¾
	TP-9006	199.95																		3¼x7½x7¾
	KP-1500	119.95	S	20.7	50	5	5		Yes	No	No	No	Yes	No	No	Yes	No	I		1¾x6½x5¾
	KP-2500	139.95																		2x7½x7½
	KP-4500	159.95																		2x7½x7½
	KP-5500	179.95	S	14.3	74	5	5		No	5	No	No	Yes	No	No	Yes	Yes	I		2x7½x7½
	KP-8500	199.95																		3x7½x7½
	KE-2100	249.95																		2x7½x7½
	KE-3000	339.95	S	14.3	65	4	4		Yes	5FM, 5AM	No	No	Yes	No	No	Yes	Yes	I		2x7½x7½
	KE-5000	399.95																		3x7½x7½
	KP-3500	179.95																		2x7½x6¾
KP-4502	199.95	S	19.2	50	5	5		Yes	No	No	No	Yes	No	No	Yes	Yes	I		1¾x7½x6¾	
KP-8000	219.95																		2x7½x6½	
KE-2002	299.95																		2x7½x6¾	
KP-66G	129.95	S	14.3	74	74	74			No	Yes	Yes	Yes	No	No	Yes	Yes	U		2x4½x6½	
KP-77G	159.95																		2x6x6½	
KP-88G	159.95																		2x6x6½	
KPX-600	189.95	S	14.3	74	74	74			No	Yes	Yes	Yes	No	No	Yes	Yes	U		2¾x7½x6¾	
KP-707G	229.95																		2x6x6½	
KPX-9000	269.95																		2x7½x7½	
KPX-9500	299.95	S	14.3	74	74	74		No	5	Yes	Yes	Yes	No	No	Yes	Yes	I	3x7½x7½		
RCA	12R812	414.00	S	3	50	5	10	Yes	5FM or AM	No		Yes	No	Yes	Yes	Yes	I		3x7x5½	
	12R712	388.00																	3x7x6	
	12R807	255.70																	1¾x7x5½	
	12R806	180.40																	1¾x7x5½	
	12R704	158.90																	2¾x7x6	
	20C505	165.20																	2¾x7x6	
	12R210	110.15																	1¾x4¾x6¾	
	12R711	110.20																	1¾x6¾x4¾	
	12R610	179.70																	2¾x7½x4¾	
	12R612	104.65																	1¾x7x4½	
	12R611	84.75																	1¾x7x4½	
ROYAL SOUND	RS-2510	150.00	S	1.9	60	4	3	Yes	No	No	No	Yes	No	No	Yes	No	I		1¾x7x5¾	
	RS-2010N	150.00																	1¾x7x4¾	
SANYO	FT C6	109.95	S	3.0	50	4.5	10	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I		6¼x4¾x1¾	
	FT C8	159.95																	6¼x4¾x2	
	FT2200	349.95																	6¼x5x2	
	Preamp																			
	FT1490-2	239.95																	7x6x3	
	FT 1498	329.95																	7x6x2	
12-1886	179.95	S		50	12	10	10	Yes	5FM, 5AM	Yes	Yes	Yes	No	No	Yes	Yes	I/U		2¾x7x7½	
12-1887	179.95																		2¾x7x5½	

(continued)

# RADIOS/TAPE PLAYERS



Royal Sound RS-2010N



Sparkomatic SR-303

MANUFACTURER	Model	Price		Stereo (S), Mono (M), or 4 Channel (O)	FM Sensitivity (O) (For 30dB Quieting)	Selectivity	Average Watts (Channel, All Rated Distortion)	% Distortion (Channel, Watts)	Local/Distance Switch	Pushbuttons? If Yes, Number A.M. Number F.M.	Bass Control	Treble Control	Cassette	8-Track	Auto Reverse	Fast Forward	Fast Rewind	In-Dash (I) or Under-Dash (U)	Dimensions, Inches
SANYO (continued)	12-1889	179.95	S	3		7	10			No	No	Yes	No	No	Yes	Yes	I	1 1/4 x 4 1/8 x 1 1/8	
	12-1890	149.95	S			6	10			No	No	Yes	No	Yes	Yes	Yes	I/U	1 1/4 x 7 1/8 x 5 1/8	
	12-1891	129.95	S			4	10					Yes	No	No	Yes	Yes	I	2 1/8 x 7 x 5 1/8	
	12-1809	99.95	S			12	1.0			Yes	Yes	Yes	No	No	Yes	Yes	U	7 x 1 1/8 x 6 1/8	
	12-1884	99.95	S			4.0	10			No	No	Yes	No	No	Yes	Yes	I/U	1 1/4 x 7 1/8 x 5 1/8	
	12-1885	99.95	S	65		4.8	10			No	No	No	Yes	No	No	No	I/U	2 x 8 x 4 1/4	
	12-1892	99.95	S			4	10			Yes	No	Yes	No	No	Yes	No	I	1 1/4 x 6 1/8 x 4 1/4	
	12-1806	69.95	S			4	10	No		No	No	Yes	No	No	Yes	Yes	U	1 1/4 x 5 1/8 x 5 1/8	
	12-1805	64.95	S			4	10	No		No	No	Yes	No	No	Yes	Yes	U	1 1/4 x 6 1/8 x 5 1/8	
	12-1803	59.95	S			4	10	No		No	No	Yes	No	No	No	No	U	1 1/4 x 5 1/8 x 5 1/8	
	12-1801	42.95	S			4	10	No		No	No	No	Yes	No	Yes	No	U	2 1/4 x 4 3/8 x 6 1/8	
	SHARP	RG-3550	219.95	S	3.0		8	10	Yes		Yes	Yes	Yes	No	No	Yes	Yes	I	7 1/8 x 2 x 5 1/8
RG-3400		189.95	S	3.0		8	10	Yes		Yes	Yes	Yes	No	Yes	Yes	Yes	I	7 1/8 x 2 x 5 1/8	
RG-3200		169.95	S	3.0		8	10	Yes		Yes	Yes	Yes	No	No	Yes	Yes	I	7 1/8 x 2 x 5 1/8	
SONY	XT-1 Preamp	329.95	S	1.5	92				Auto	10 FM								I	5 1/4 x 1 1/2 x 7
	XT-22 Preamp	159.95	S	2	60				Yes	No								I	5 1/4 x 1 1/2 x 7 1/8
	XK-23 Preamp	249.95	S								Yes	Yes	Yes	No	Yes	Yes	Yes	I	5 1/4 x 1 1/4 x 7 1/8; Dolby NR.
	XK-21 Preamp	199.95	S								Yes	Yes	Yes	No	Yes	Yes	Yes	I	5 1/4 x 1 1/4 x 7 1/8
	XK-M11	259.95	S			6	0.8				Yes	Yes	Yes	No	Yes	Yes	Yes	I	5 1/4 x 1 1/4 x 8 1/4; Dolby NR.
	GD-R41	209.95	S			6	0.8				Yes	Yes	Yes	No	Yes	Yes	Yes	I	5 1/4 x 1 1/4 x 8
	XR-77		S	2	92		0.2	Yes		5 FM, 5 AM, 5 AM	Yes	Yes	Yes	Yes	No	Yes	Yes	I	
XR-70 Preamp		S	2	92		0.05	Yes		5 FM, 5 AM, 5 AM	Yes	Yes	Yes	No	No	Yes	Yes	I		
XR-50		S	3	75	6	0.9	Yes		No	Yes	Yes	Yes	No	No	Yes	Yes	I		
SPARKOMATIC	SR-3400	269.95	S	1		45	10	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	I	1 1/4 x 7 x 5 1/8	
	SR-3300	249.95	S	1		45	10	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	I	1 1/4 x 7 x 5 1/8	
	SR-3100	219.95	S	1		45	10	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	I	1 1/4 x 7 x 5 1/8	
	SR-2400	269.95	S	1		45	10	Yes	No	Yes	Yes	Yes	No	Yes	No	No	I	1 1/4 x 7 x 5 1/8	
	SR-2100	219.95	S	1		45	10	Yes	No	Yes	Yes	Yes	No	Yes	No	No	I	1 1/4 x 7 x 5 1/8	
	SR-303	159.95	S	7		10	10	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	I	1 1/4 x 7 x 4 3/8
	SR-302	159.95	S	7		10	10	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	I	2 1/4 x 7 1/8 x 4 3/8
VIKYO	AR-31	189.95	S			8	0.3	Yes	No	No	No	Yes	No	Yes	Yes	Yes	I	7 1/4 x 1 3/8 x 5 1/8	
	900S	99.95	S			4	0.35	Yes	No	No	No	Yes	No	No	Yes	No	I	7 1/4 x 2 x 4 3/8	

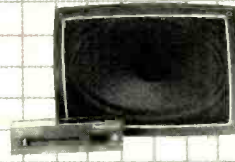
# SPEAKERS



Alpine 6204



ADS 300i



Altec Lansing SW-1

Afs Kriket Domax III



MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
AAL	Micro 100	109.00	50	4	4	4	50-20 ±3	2	S	7¼x4½x4½		
	Micro 100B	119.00	50	4	4	4	50-20 ±3	2	S	7¼x4½x4½		
ADCOM	ELF-1	200.00	40	4	8	8	40-20	2	S	4¼x7x4¼		
ADS	200C	250.00	50	4	4	4	55-22 ±5	2	S†	6¼x4¾x4¾	Opt. flush-mount frame.	
	300C	310.00	75	5½	4	4	40-23 ±5	2	S	8½x5¼x5¼	As above.	
	300i	250.00	100	5¼	4	4	50-20 ±3	2	F	8½x5¼x1½	3-position high-freq. contour switch.	
ADVENT	EQ-1	180.00		6x9					F	6x9x4	Built-in amp.	
AFS KRIKET	DOMAX III 8976	159.95	100	6x9	20	4	35-40	3	F	6x9x3¾		
	DOMAX II 8974	129.95	90	6x9	20	4	40-22	2	F	6x9x3¾		
	8272	84.95	35	5¼	20	4	70-20	2	F	5¼x2¾		
	8311	34.95	20	3½	3	8	80-18		F	3¾x1¾		
AIWA	SC16Y	80.00	30	6x9		4	90-20	3	S	10¾x1½x6¾	3-way treble control.	
ALPINE	6204	199.95	65	7	25	4	40-20 ±3	2	F	6¼x3¾		
	6302	119.95	50	6½	10	4	55-20 ±3	3	S	6½x2		
	6202	49.95	20	4	7	4	100-17 ±3	2		4x1¼		
ALTEC LANSING	TK1	69.95	2	3		4	5k-18k ±4	†	S	3½x3½x2¾	†Built-in 5-kHz crossover for AL1 system.	
	SK1	99.95	2	5¼	10	4	100-10 ±5	†		5½x5½x2¾	As above.	
	SW-1	219.95	†	6x9		1k	50-150Hz ±4			6½x9¾x4¼	As above; † built-in 40 W rms amp.	
	4A	159.95	2	6x9	15	4	80-18 ±6	2	S	6½x9¾x3½		
AUDIOTEX	30-3074	41.55	95.80†	30	6 x 9	20	4-8	40-20	3	F		†Kit with grilles and hardware.
	30-3072	41.15	91.35†	35	6 x 9	25	4-8	40-18	2	F		
	30-3071	33.20	75.40†	25	6 x 9	20	4-8	45-18	2	F		
	30-3070	29.15	68.25†	20	6 x 9	10	4-8	50-18	2	F		
	30-3054	23.55	57.20†	25	6 x 9	20	4-8	40-16	2	F		
	30-3053	19.75	51.15†	20	6 x 9	10	4-8	50-16	2	F		
	30-2648		97.85†	25	4 x 10	20	4-8	70-20	3	F		
	30-2647		85.70†	25	4 x 10	20	4-8	70-20	2	F		
	30-2646		56.85†	25	4 x 10	20	4-8	70-16	2	F		
	30-3056	18.45		15	4 x 10	10	4-8	60-14	2	F		
	30-3066	33.80	78.20†	25	5¼ rd.	20	4-8	50-20	2	F		
	30-3065	23.55	53.75†	25	5¼ rd.	20	4-8	50-16	2	F		
	30-3064	18.85	46.90†	20	5¼ rd.	10	4-8	55-15	2	F		
	30-3063	17.20	43.75†	16	5¼ rd.	5½	4-8	60-15	2	F		
	30-3047	18.85		15	5 x 7	10	4-8	50-14	2	F		
	30-5121		99.95	25			4-8	55-20	2	S	7¼x4¾x4¼	

# SPEAKERS



**Audiovox HI Comp HCS-342**

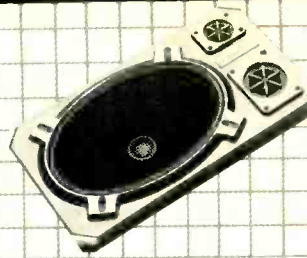
**Avid 10+**

**Canton AC-200**

MANUFACTURER	Model	Price \$		Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
		(If Sold Individually)	(If Sold in Pairs)									
AUDIOVOX	TRYVOX-40	69.00	25	4x10	20	8	70-17.5	3	F			
	COMP-100	126.00	50	4x4	10	8	50-20	2	S			
	DOME-20	93.00	40	6x9	20	8	60-18	2	F			
	COMP-60	100.00	50	6½	20	8		2	F			
	COID-69/20	52.00	20	6x9	20	8	60-16	2	F			
	TRYVOX-25	60.00	25	5½	20	8	65-16.5	3	F			
	TRYVOX-20	69.00	30	6x9	20	8	60-17	3	F			
	TRYVOX-30	84.00	30		20	8	65-18	3	F			
	HCS-59	100.00	60	5½	20	8	70-18	3	F			
	HCS-342	116.00	60	4x10	20	8	16-18	3	F			
	HCS-362	116.00	70	6x9	20	8	50-18	3	F			
	COSC-20	43.00	25	5½	20	8	70-15.5	2	F			
	CSW-40	37.00	15	5	10	8	100-15	2	F/S			
	COSC-5A	43.00	20	5	5	8	125-14	2	F			
	COID-41/20	52.00	15	4x10	20	8	85-16.5	2	F			
	COID-57/20	52.00	15	5x7	20	8	85-16.5	2	F			
	AVID	Ten	225.00	5	6½		4	50-20 ±3	2	F	11½x7½x1½	
Five		175.00	4	4½		4	60-20 ±5	2	F/S	9¼x5½x1	Adapts to 6x9, 4x10, 5x7, 4x7.	
One		60.00	4	6x9		4	70-16 ±5		F	6½x9½		
RD-5		60.00	4	4½		4	60-8 ±5		F	5½x5½		
Ten+		275.00	4	6½		4	50-20 ±3	3	F		Combo of models Ten & RD-5.	
BON SONIC	IS700		20	6x9	20	8		3	F			
BOSE	1401	259.00†		4½	9.1		40-17		F	4½x1½	†Includes booster/EQ (see "EQ/Amps" section.)	
BRAUN	Output C	299.95	50	4		4	50-25	2	S	4¼x6¾x4¼		
CANTON	HC-100	249.90	50	4		4	48-30	2	S	7¾x4¾x5¾	Wedge-shaped.	
	AC-200	379.90		4			48-25	2	S	7¾x4¾x5¾	Self-amplified, 30 W/ch.	
CERWIN-VEGA	CS-7	90.00	40	6x9	24	4	50-16	2	F	6½x9½x3		
	CS-18	150.00	75	6x9	88	4	40-20	2	F	6½x9½x4½		
CLARION	SK102	149.95	25	4x10	10	8	70-15 ±5	3	F	14x4½x1½		
	SK103	166.50	30	6x9	20	8	50-15 ±5	3	F	13x7¼x2¼		
	SK105	69.95	40	3	5	8	1k-19k ±5	2	S	5½x3½x1½	Tweeter for SK106 or SK107.	
	SK106	69.95	50	6x9	20	8	50-4 ±5		F	9½x6¾x4	Woofer for SK105.	
	SK107	69.95	80	6	16	8	70-3 ±5		F	6½x6½x4	As above.	
	SK99B	136.95	25			8	60-20	3				
	SK95	37.95	30		10	4		2				
	SK40C	38.95	20		10	4		2				
	SK42C	36.95	30		4	4						
	SK44C	57.50	30		10	4		2				Door applications.
SK45C	63.50	35		20	4		2					
SK89C	66.95	40		20	4		2					
COBRA	SP-552-20	49.95	30	5½	20	6	70-15	2	S			
	SP-553-20	69.95	30	5½	20	6	65-18	3	S			
	SP-692-20	59.95	30	6x9	20	6	50-15	2	S/F			
	SP-693-20	79.95	50	6x9	20	6	50-18	3	S/F			
	SP-402-20	59.95	25	4x10	20	6	70-15	2	S/F			
	SP-403-20	79.95	25	4x10	20	6	70-18	3	S/F			
CRAIG	R731	99.95	50	5½	11	6	60-17 ±6		F	5½x2½		
	R732	119.95	50	5½	20	6	50-17 ±6		F	5½x2½		
	R771	129.95	50	6x9	20	6	50-17 ±6		F	6x9x3¾		
	R772	119.95	50	6x9	20	6	45-17 ±6		F	6x9x2½		

(Continued)

# SPEAKERS



Cerwin-Vega CS-18

Clarion SK103

Cobra SP-403-20

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes	
CRAIG (Continued)	V190	29.95	10	5½	3	6	100-15 ±6		S	6½x6½x4¼			
	V240	29.95	25	4x10	10	4	80-15 ±6		F	4¾x10x2½			
	V300	22.95	15	3½	5.4	8	130-13 ±6		F	3½x3½x1½			
	V301	34.95	15	4	8	6	120-20 ±6		F	4x4x2			
	V304	39.95	25	5¼	13	8	70-16 ±6		F	6½x6½x2½			
	V362	59.95	25	6x9	20	6	60-20 ±6	2	F	6¾x9¾x3½			
	V380	44.95	20	6½	10	8	80-10		S	9¼x7½x6			
	V451	179.95	40	4	20	4	60-20	4	F	†		†Three pieces.	
	V480	159.95	40	4	10	4	120-20	2	S	10½x4¾x6¼			
	V321	49.95	25	5¼	10	6	70-20 ±6	2	S	6½x6½x2½			
	V341	29.95	15	4x6	5.4	6	90-20 ±6		F	4x6x2			
	V350	74.95	25	6x9	20	6	65-16 ±6	3	F	6¾x9¾x3¾			
	V360	39.95	25	4x10	10	8	70-18 ±6	2	F	4¾x10½x2¾			
	R780	129.95	50	5¼	11	4	80-17 ±6		S	11¾x6¾x9			
	V101	18.95	8	4	4	6	120-14 ±6		F	4x4x2½			
	V102	19.95	8	5¼	3.6	6	90-16 ±6		F	6½x6½x2½			
V103	29.95	10	5¼	5.4	6	80-17 ±6		F	6½x6½x2½				
V180	22.95	7	3x5	4	4	140-15 ±6		S	7x3½x4				
DAHLQUIST	ALS-3	250.00	40	4		4	45-22	3	S	7½x4½x4			
DIMENSION	MK 100-2	109.95	60	5¼	30	4	55-20	2	F	5¼x5¼x3½			For use w/ASW-50 combining network. As above.
	MK 200-2	139.95	60	6x9	30	4	40-20	2	F	6½x9½x4¼			
	MK 200-3	159.95	60	6x9	30	4	40x22	3	F	6½x9½x4¼			
	MK 100-¼	49.95	60	5¼	30	4	55-5		F	5¾x5¾x3¾			
	MK 200-W	59.95	60	6x9	30	4	40-5		F	6½x9½x4			
	MK-IV	49.95	40	4	8	4	95-20 ±3	2	S	7½x4¾x4¾			
	MK-IB	99.00	45	4½	8	4	89-20 ±3	2	S	7¼x5¼x4½			
	MK-IBB	125.00	45	4½	8	4	89-22 ±3	2	S	7¼x5¼x4½			
EPI	LS-70	75.00	60	6	18	8	70-20 ±3	2	F or S	9¾x6¾x3¾		Add-on system with level control.	
	LS-81	190.00	60	4½	12	4	80-20 ±3	2	F or S	7¾x4¾x2½			
	CSS	90.00	60	3½	6	4	125-5		F	6x1¼			
ERA	A500	37.95	10	4½x8½		8	80-20		F,S	¾x6x10			
	A2000F	35.50	10	5¼		8	70-20		F	6½x7¾			
FUJITSU TEN	SSB-4B39	159.95	60	4	8	4	70-22	2	S	9x5x6¼			
	SSB-8G3	24.95	20	5	8	8	50-15		F				
	SSB-8G4	30.95	20	5¼	10	8	50-20		F				
	SSB-8G5	25.95	20	5x7	6.6	8	80-15		F				
	SSB-4G24	19.95	10	5	5.4	4			F				
	SSB-4G25	26.95	10	5¼	10	4			F				
	SSB-4G31	23.95	10	5x7	6.3	4			F				
	SSB-8B5	139.95	20	4	8	8	70-20	2	S				
	SSB-8G11	42.95	20	4	6.6	8	90-15		F				
	SSB-8G12	124.95	20	6x9	20	8	45-20		F				
	SSB-8G13	89.95	20	4x10	10	8	60-20		F				
	SSB-8G15	99.95	20	6x9, 6x8	8	8	50-20		S				
	FULTRON	15-9220	14.95	5	5	3	8	70-14		S	3½x7½x6¾		Treble control.
15-9240		21.95	7	5	5	8	60-14		S/F	5x6¼x6½			
15-9260		129.95	45	4	10	4	60-14.5	2	S	3¾x9½x6½			
15-9420		15.95	5	5¼	3	8	80-12		F	5¼x2			
15-9430		24.95	10	4	10	8	50-13		F	4¾x1¾			
15-9440		26.95	10	5¼	10	8	50-13		F	5¼x2½			

# SPEAKERS



Craig V451

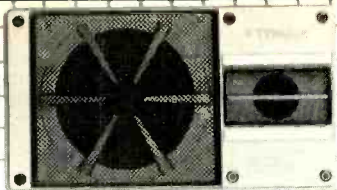


Dimension MK-1 B

MANUFACTURER	Model	Price \$ (If Sold Individually)	Price \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
FULTRON (Continued)	15-9460	36.95	10	5 1/2	10	8	50-15	2	F	5 1/2 x 2 1/2	Alum. voice-coil.	
	15-9470	46.95	25	5 1/4	20	8	30-15	2	F	5 1/4 x 2 1/2	Alum. voice-coil.	
	15-9660	39.95	10	6x9	10	8	40-14	2	F	6x9x3 1/4	Alum. voice-coil.	
	15-9670	49.95	25	6x9	20	8	40-15	2	F	6x9x3 1/2	Treble control.	
	15-9665	79.95	25	5 1/4	10	8	45-16.5	3	F	10x6 1/2 x 2 1/2	Treble control.	
	15-9690	69.95	30	6x9	20	8	30-16	3	F	6x9x3 1/2	Alum. voice-coil.	
	15-9696	79.95	35	6x9	30	8	30-16	4	F	6x9x3 1/2	Alum. voice-coil.	
	15-9490	59.95	30	5 1/4	20	8	30-16	3	F	5 1/4 x 3	Alum. voice-coil.	
	15-9560	36.95	10	4x10	10	8	35-14.5	2	F	4x10x3 1/2	Alum. voice-coil.	
	15-9590	69.95	30	4x10	20	8	30-16	3	F	4x10x3 1/2	Alum. voice-coil.	
15-9610	24.95	5	6x9	3	8	50-13		F	6x9x3			
GRUNDIG	3050	43.95	60	4 1/2	15	4	50-20		F			
	3060	39.95	60	5 1/4	15	4	40-5		F			
	3070	44.95	60	6 1/2	15	4	30-5		F			
	GLA 1230	41.95	30	4 1/2	6	4	50-16		F			
	GLA 1640	24.95	40	5 1/4	9	4	65-19		F			
GLA 1845	32.95	45	5 1/4	12	4	65-20	2	F				
INFINITY SYSTEMS	Infinitesimal	184.00	100	5	18	4	65-32 ± 2	2	S	11x6x5 1/4		
INTERVOX	K6X9T20	94.35	25	6 x 9	20	8	60-20	3	F			
	K400C10	60.65	20	4	10	8	95-17	2	F			
	K525C20	62.50	25	5 1/4	20	8	95-18	2	F			
	K4X10C20	72.10	25	4 x 10	20	8	65-16.5	2	F			
	K500T10	77.65	15	5	10	8	70-17	3	F			
	K525T20	83.15	25	5 1/4	20	8	65-20	3	F			
	K4X10T20	94.35	25	4 x 10	20	8	65-20	3	F			
	K5X7T20	94.35	25	5 x 7	20	8	65-20	3	F			
	K6X9C20	72.10	20	6 x 9	20	8	60-17	2	F			
	B400C10	165.55	50	4	10	4-8	80-20	2	S			
JBL	A15	179.95	30	5 1/2 rd.	14	4	40-15	2	F	5 1/2 rd.		
	A30	219.95	40	6x9	20	4	30-15	2	F	6 x 9		
	LEBT-H	135.00	50	8	6 lb.	8	35-15		F	8 x 3		
	D208H	90.00	50	8	2 1/2 lb.	8	60-10		F	8 x 3 1/2		
	LE10H	125.00	150	10	10 1/4 lb.	8	30-3		F	10 x 4 1/2		
	LE5H	60.00	50	5	1 1/2 lb.	8	300-15		F	5 x 1 1/2		
LE21H	45.00	35	1 1/2	1 1/2 lb.	8	2-15		F	1 1/2 x 7/8			
JENSEN	J1033 Triax II	149.95	100	6x9	20	4	40-20	3	F	6 1/2 x 9 1/2 x 3 1/2		
	J1065 Triax I	119.95	50	6x9	20	4	40-20	3	F	6 1/2 x 9 1/2 x 3 1/2		
	J1201 Coax II	99.95	50	6 1/2	16	4	55-20	2	F	6 1/2 x 6 1/2 x 1 1/2		
	J1186 Coax I	69.95	40	4 1/2	10	4	65-18	2	S/F	4 1/2 x 4 1/2 x 2 1/2		
	J1044	74.95	35			4-8	1k-40k		S	3 x 5 1/2 x 1 1/2		
	JET SOUND LABS	JSL-1511	99.95	50	5 1/4	20	8	55-18	3	F	2 1/4 x 6 1/2 x 10 1/4	
JS-5010		25.95	15	5 1/4	10	4	90-12		F	6 1/2 x 2 1/2		
JSW-500		12.95	8	5	5	8	100-10		F/S	6 x 5 1/4 x 4		
JSW-1200		25.95	20	5	10	8	100-12		F/S	6 x 5 1/4 x 4		
JS-25		9.95	8	5	3	8	100-10		F	6 1/2 x 2		
JSL-563TX		49.95	50	5 1/4	20	8	55-18	3	F	6 1/2 x 2 1/2		
JSL-980TX		69.95	50	6x9	20	8	50-18	3	F	6 1/4 x 9 1/4 x 3 1/2		
JS-560CX		29.95	20	5 1/4	20	4	70-14	2	F	6 1/4 x 2 1/2		
JS-950CX		39.95	20	6x9	20	4	50-15	2	F	6 1/4 x 9 1/4 x 3 1/2		
JSL-1043TX		59.95	50	4x10	20	8	60-15	3	F	10 1/4 x 4 1/4 x 3 1/2		
JS-350		17.95	12	3 1/2	3	8	100-10		F	3 1/2 x 2 1/2		
KENWOOD	KSC-701	229.00	70	4		4	60-21	3	S	9x7 1/2 x 5		
	KSC-501	149.00	40	4		4	60-20	2	S	8 1/2 x 4 1/4 x 5		
	KFC-692	139.00	70	6x9	20	4	40-20	3	F			
	KFC-693	119.00	70	6x9	20	4	40-20	2	F			
	KFC-694	65.00	25	6x9	10	4	45-20		F			
	KFC-161	79.00	25	6 1/2	20	4	55-20	2	F			
	KFC-162	69.00	25	6 1/2	10	4	80-18	2	F			
	KFC-163	49.00	25	6 1/2	10	4	55-20		F			
	KFC-121	39.00	15	5	4.3	4	100-20		F			
	KRACO	TRI-469	89.95	40	5 1/4	20	8	70-19 ± 5	3	S	6x9x2 1/4	
TRI-369		69.95	20	6 x 9	20	8	60-17 ± 5	3	F	3 1/4 x 6 1/2 x 9 1/4		
TRI-3-410		69.95	30	4 x 10	12	8	150-20 ± 5	3	S	4 1/4 x 10 1/4 x 2 1/4		
CX-410-20-F		49.95	25	4 x 10	20	8	100-19 ± 5	2	F	4x10x3 1/2		
CX-269-20-F		49.95	15	6 x 9	20	8	150-15 ± 5	2	F	3 1/4 x 6x9 1/4		



# SPEAKERS



Fujitsu Ten SSB-4B39



Infinity Infinitesimal



JBL A15

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to KHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
KRACO (Continued)	VCS-2000	149.95	40	4 1/2	8	8	120-20 ±5	2	S			
	TRI-359	59.95	25	6 1/4	20	8	75-17 ±5	3	F	6 1/4 x 3 1/4		
	CX-1-20-F	39.95	10	5 1/4	20	8	150-6.5 ±6	2	S	6 1/4 x 2 1/2		
MARANTZ	SS-5000	300.00	15	6x9	13	4	30-20	2	S		7 1/4 x 1 1/4 x 7 1/4	
	SS-5100	250.00	15	6x9	13	4	30-20	2	F		1 3/4 x 1 1/4 x 7 1/4	
	SS-825	90.00	15	6 1/4	20	8	50-20	3	F		6 1/4 x 6 2 1/8	
	SS-725	70.00	15	6 1/4	20	4	50-16	2	F		6 1/4 x 6 x 2 1/8	
	SS-569	130.00	15	6x9	20	8	40-20	4	F		9 3/8 x 6 1/8 x 4	
	SS-469	110.00	15	6x9	20	8	40-18	4	F		9 3/8 x 6 1/8 x 3 3/8	
	SS-269	70.00	15	6x9	20	4	40-15	2	F		9 3/8 x 6 1/8 x 3 3/8	
	SS-169	60.00	15	6x9	20	4	40-13	2	F		9 3/8 x 6 1/8 x 3 3/8	
	SS-3469	110.00	15	6x9	20	8	40-18	4	F		9 3/8 x 6 1/8 x 3 3/8	
	SS-3269	80.00	15	6x9	20	4	40-15	2	F		9 3/8 x 6 1/8 x 3 3/8	
	SS-3410	80.00	10	4x10	20	4	50-20	2	F		10 x 4 1/4 x 2 1/8	
	SS-3357	100.00	15	5x7	20	8	50-20	3	F		7 1/4 x 5 x 3	
SS-140	40.00	4	4	10	8	40-13		F		4 x 1 1/8		
MATRECS	Domeplex 20	89.95	40	6x9	20	8	35-20	2	S		6 x 9 x 4 1/4	Alum. voice-coil with ferrofluid.
	Domeplex 30	119.95	75	6x9	25	8	40-20	2	S		6 x 9 x 4	As above.
	Domeplex 40	179.95	150	6x9	38	8	35-20	2	S		6 x 9 x 4 1/4	As above.
MESA ELECTRONICS	15	140.00	30	3		4-8	60-20 ±6	2	S		6 x 3 3/8 x 3	
	30	69.95†	110.00	50	4	4-8	60-25	2	S		7 1/4 x 4 3/8 x 4 1/4	† Kit.
	MB5	74.95†	15	5 1/4	30	4-8	42-200Hz		F		5 1/2 rd.	
	MB6		30	6x9	30	4-8	37-200Hz		S		6x9	
	25-E	140.00	35	3		4	60-20	2	S		3 3/8 x 8 x 3 3/8	
20-ZX	110.00	30	3 1/2		4	60-20	2	S		8 1/2 x 4 1/4 x 6		
MICRON	400 Series	125.00	100	4		4-8	125-20	2	S		7 1/4 x 5 1/8 x 6 1/8	Opt. walnut, black, or white finish.
	500 Series	150.00	120	5 1/4		4-8	100-20	2	S		9 x 5 1/4 x 7 3/8	As above.
	600 Series	200.00	200	6 1/2		4-8	70-20	3	S		11 1/8 x 7 1/8 x 7 3/8	As above.
MITSUBISHI	SX-30SA	149.95	50	4	6.5	4	80-20	2	S		4 1/2 x 7 1/8 x 5 1/2	
	SX-10BA	129.95	50	4	6.5	4	95-15	2	S		4 1/2 x 7 1/8 x 5 1/2	
	SB-25A	39.95	20		0.028	4	5-20		S			Signal indicator.
	SG-69QA	119.95	20	6x9	21	4	50-20	4	F			
	SG-69TA	99.95	20	6x9	21	4	50-20	3	F			
	SG-69CA	79.95	20	6x9	21	4	50-20	2	F			
	SG-40CA	69.95	20	4x10	10	4	50-20	2	F			
	SG-13WA	49.95	20	5 1/4	6.4	4	75-15	2	F			
	SG-10WA	39.95	20	4	5.3	4	100-7	2	F			Waterproof cover.
	NORTHSTAR ELECTRONICS	NS 3296	49.95	15	6x9	20	8	30-19 ±5	3	F		6 x 9 x 3 1/2
NS 1196		29.95	12	6x9	10	8	30-18 ±5		F		6 x 9 x 3	
NS 155T		24.95	6	5 1/4	5.4	8	80-16 ±5		F		5 1/2 x 5 1/2 x 1 1/2	
NUMARK	MS100	149.95	50	4		4	40-25	2	S		7 x 4 x 4	
OROVOX	M 124	195.80	85	6x9	30	8	35-22	3	F		6x9, 3 1/2 x 7	
	M 112	179.80	80	5 1/4	30	8	45-22	3	F		5 1/4 x 3 1/2 x 7	
	M 120	159.25	80	6x9	30	8	35-22	2	F		6x9	
	XL 620C	103.20	50	6x9	20	8	50-22	2	F		6x9	
	M 75	171.20	40	4	10	8	75-22	2	S		8 x 4 x 4	
PANASONIC	EAB-915	29.95	10	4	7	4	50-15		F			
	EAB-752A	69.95	10	6x9	20	4	45-20	2	F			
	EAB-814	64.95	10	4x10	10	4	60-20	2	F			
	EAB-920	159.95	50	6x9	30	4	30-25	3	F			
	EAB-911	34.95	10	5	7	4	50-15		F			
	EAB-940	99.95	50	6x9	20	4	40-20	2	F			
	EAB-930	89.95	50	5 1/4	20	4	50-20	2	F			
	EAB-050	44.95	10	5	4.7	4	50-16		F			
	EAB-030	19.95	10	3 1/2	3.2	4	100-20		F			Built-in water shield. Rear deck application. Door application. Waterproof cone, door application. In-dash mounting. Door application.
	EAB-914	24.95	5	4	3	4	65-14		F			

# SPEAKERS



Jensen JT201 Coax II



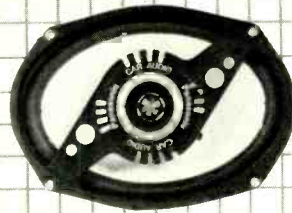
Kenwood KSC-701



Mitsubishi SX-30SA

MANUFACTURER	Model	Price \$ (If Sold Individually)	Price \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes	
PIONEER	TS-M2	44.95	10	2%	3	4	450-20			S	3x1 1/4x4 1/2		
	TS-T3	59.95	30	3 1/2	6 1/2	4	250-20			F	4x4 1/2x2 3/4		
	TS-W203	169.95	30	8	20	4	28-10			F	8 1/4x7 1/2x3 3/4		
	TS-202	199.95	30	8	20	4	30-20	2		F	8 1/4x7 1/2x3 3/4		
	P-10L	24.95	4	4	3 1/4	4	70-12			F	4 1/2x4 1/4x1 1/2		
	P-16L	27.95	4	6 1/2	3 1/4	4	60-13			F	6 1/2x1 1/4		
	TS-100	29.95	4	4	7	4	50-14			F	4 1/2x4 1/2x1 1/2		
	TS-120	36.95	4	5 1/2	3	4	80-16			F	5 1/2x1 1/2		
	TS-160	39.95	8	6 1/2	10	4	40-20			F	6 1/2x2 1/2		
	TS-121	41.95	8	5 1/2	4	4	80-16			F	5 1/2x1 1/2		
	TS-106	44.95	10	4	7	4	50-16			F	4 1/2x4 1/2x1 1/2		
	TS-107	49.95	10	4	6 1/2	4	50-20			F	6 1/2x2 1/2		
	TS-162DX	55.95	8	6 1/2	10	4	40-20	2		F	6 1/2x2 1/2		
	TS-164	59.95	8	6 1/2	10	4	40-16	2		F	6 1/2x2 1/2		
	TS-165	69.95	8	6 1/2	20	4	30-16	2		F	6 1/2x2 1/2		
	TS-167	72.95	8	6 1/2	10	4	30-20	2		F	6 1/2x2 1/2		
	TS-168	124.95	20	6 1/2	10	4	35-20	3		F	6 1/2x2 1/2		
	TS-410	44.95	10	10	10	4	45-13	2		F	10x4 1/2x2 1/2		
	TS-411	69.95	10	10	10	4	45-18	2		F	10x4 1/2x2 1/2		
	TS-571	59.95	10	8	10	4	50-18	2		F	8 1/2x5x2 1/2		
	TS-681	69.95	10	8	10	4	45-18	2		F	8x5 1/2x2 1/2		
	TS-691	49.95	8	6x9	10	4	40-16	2		F	9 1/2x6 1/2x3		
	TS-692	63.95	10	6x9	20	4	35-16	2		F	9 1/2x6 1/2x3		
	TS-693	71.95	8	6x9	10	4	40-16	2		F	9 1/2x6 1/2x3		
TS-694	85.95	10	6x9	20	4	35-18	2		F	9 1/2x6 1/2x3 1/2			
TS-696	119.95	20	6x9	20	4	30-20	2		F	9 1/2x6 1/2x3 1/2			
TS-695	139.95	20	6x9	20	4	30-20	3		F	9 1/2x6 1/2x3 1/2			
TS-5	29.95	4	5 1/4	3	4	180-13			S	8 1/2x5 1/2x4 1/4			
TS-35	44.95	20	5 1/4	5	4	180-13			S	8 1/2x6 1/4x4 1/4			
TS-X6	104.95	4	5	4	4	80-20	2		S	9 1/2x5 1/2x6 1/4			
TS-X9	209.95	20	3 1/2	7	4	50-22	2		S	8 1/2x5 1/2x7 1/4			
POLK AUDIO	Mini-Monitor II	114.95	60	4 1/2	6		60-20.5 ±2	3		S	13 1/2x6x4 1/4	Fluid-coupled sub-bass radiator.	
PSB SPEAKERS	Alpha II	220.00	15	4	4		100 - 21 ±2.5	2		S	9 1/2x5 1/4x5 1/4		
PYLE INDUSTRIES	F52C165-FP	49.60	110.85	30	5 1/4	16	4-8	60-20	2	F	5 1/2x5 1/4x2 1/2		
	F52C165-FP4	50.40		30	5 1/4	16	4	60-20	2	F	5 1/2x5 1/4x2 1/2		
	F69C190-FD	72.10	154.15	60	6x9	20	4-8	50-20	2	F	6 1/2x9 1/2x4		
	F69C290-FD	82.50	170.00	100	6x9	30	4-8	50-20	2	F	6 1/2x9 1/2x4 1/4		
	F69C290-FD4	83.25		100	6x9	30	4	50-20	2	F	6 1/2x9 1/2x4 1/4		
	F410C160-FP	49.90	109.90	30	4x10	16	4-8	60-20	2	F	4 1/2x10x3		
	F52C100-FP	42.50	95.85	20	5 1/4	10	4-8	65-20	2	F	5 1/2x5 1/4x2 1/2		
	F69C100-FP	49.90	110.85	30	6x9	10	4-8	55-19.5	2	F	6 1/2x9 1/2x3 1/4		
	F69C190-FP	59.90	129.15	60	6x9	20	4-8	40-19.5	2	F	6 1/2x9 1/2x4		
	F69C290-FP	68.25	147.50	100	6x9	30	4-8	50-19.5	2	F	6 1/2x9 1/2x4 1/4		
	F410C100-FP	43.25	99.15	30	4x10	10	4-8	65-20	2	F	4 1/2x10x3		
	F35C30-WF	19.60		16	3 1/2	3	4-8	50-17.5	2	F	3 1/2x4 1/2x1 1/2		
	F5C99-WF	22.90		18	5	10	4-8	90-18	2	F	5x2 1/2		
	F6C100-WF	25.60		30	6	10	4-8	30-18	2	F	6 1/2x2 1/2		
	F57C100-WF	25.60		28	5x7	10	4-8	60-18	2	F	5x7 1/2x2 1/2		
	F69C100-WF	24.15		30	6x9	10	4-8	55-18	2	F	6 1/2x9 1/2x3		
	F69C100-WF	26.60	69.90	30	6x9	10	4-8	55-18	2	F	6 1/2x9 1/2x3		
	F410C100-WF	26.25	65.60	30	4x10	10	4-8	65-18	2	F	4 1/2x10x2 1/2		
	P-G52N		11.25		5 1/4						F	6 1/2 rd.	
	G69ND	6.60			6x9						F	6 1/2x9 1/2	
G410ND	6.25			4x10						F	5 1/2x10 1/2		
W6C170-F	33.25		70	6	16	4-8	45-7.5		F	6 1/2x3 1/2			
W69C190-F	39.90		70	6x9	20	4-8	45-7.5		F	6 1/2x9 1/2x3 1/2			
W69C290-F	50.85		100	6x9	30	4-8	40-7		F	6 1/2x9 1/2x4			
W69C290-F4	51.60		100	6x9	30	4-8	40-7		F	6 1/2x9 1/2x4			
P-T3PA		31.60		3			3k-30k		F	3 1/2x 1/2			
PYRAMID MOBILE AUDIO	MA-TC1	374.56	100	6 1/2	20	4	35-22 ±3	3		F	7x11 1/2x3		
QUAM-NICHOLS	30C25Z8	8.75	3	3 Sq.	2.35	8-10		200-12			3x3x1 1/4		
	3C3Z8U	10.60	4	3 1/2 Sq.	3	8-10		180-9			3 1/2x3 1/2x1 1/2		
	5C3Z8	9.75	4	5	3	8-10		90-13			4 1/2x4 1/2x1 1/2		
	52C10Z8	14.95	10	5 1/4	10	8-10		125-9			5 1/2x5 1/4x2 1/2		
	52C10FEX	17.25	15	5 1/4	10	8-10		75-15			5 1/2x5 1/4x2 1/2	Air suspension.	
	52C10FEXZ4	17.25	15	5 1/4	10	3-4		75-15			5 1/2x5 1/4x2 1/2	As above.	
	68C20FEX	23.85	15	6x8	20	8-10		45-17			5 1/2x8x3 3/4	As above; Ford replacement	
	69C10FEX	19.25	15	6x9	10	8-10		45-17			6 1/2x9x3 1/2	Air suspension.	
	69C10FECO	33.95	15	6x9	10	8-10		45-20	2		6 1/2x9x3 1/2	As above.	
69C30FEX	37.75	40	6x9	28	4-8		35-15			6 1/2x9x3 1/2	As above.		

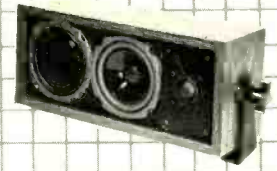
# SPEAKERS



Panasonic EAB-940



Pioneer TS-W203



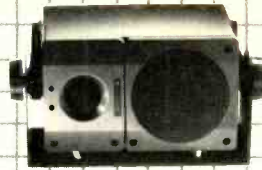
Polk Audio Mini-Monitor II

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Oz.	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
RCA	12R410	39.75	30	6½	20	4	65-15	2	F	6x2¼	Alum. voice-coil.	
	12R411	53.95	30	6½	20	4	65-18	3	F	6x2¼		
	12R412	47.75	30	6x9	20	4	65-15	2	F	6x9x3½	As above.	
	12R413	64.50	30	6x9	20	4	65-18	3	F	6x9x3½		
	12R414	47.75	30	4x10	20	4	65-15	2	F	4x10x2½	As above.	
	12R415	64.50	30	4x10	20	4	65-18	3	F	4x10x2½	Dual cone.	
	12R400A	19.50	10	5¼	4.6	3.2	50-10		F or S	6¼x6¼x3½	As above.	
	12R401E	17.50	10	5¼	4.6	3.2	50-10		F	5¼x5¼x1½	As above.	
	12R409	14.30	25	3	5	4	90-13		F	4¼x1½	As above.	
	12R405A	29.00	25	6x9	10	4	50-15		F	6¼x10x3½	As above.	
	12R406A	35.00	25	6x9	20	4	50-15		F	6¼x10x3½	As above.	
	12R416	21.00	30	4	10	4	65-15		F	4¼x1½	As above.	
	12R408A	23.00	25	6	10	8	80-11		F	6½x2½	As above.	
	RADIO SHACK	40-1297	12.95	30	4x10	10	8			F		
12-1844		17.95	20	5¼	4¼				S	7x7¼		
12-1843		17.95	20	5¼	4¼				F			
40-1280		16.95	30	6x9	10	8	40-16		F			
40-1288		12.95	30	5x7	10	8			F			
40-1000		24.95	30	6x9	20	8	20-20		F			
40-1340		19.95	35	6x9	16	8	40-40		F			
12-1851		10.95	5	5					F			
12-1852		10.95	5	5					F			
12-1848		29.95	30	5¼	10				F			
40-1010		29.95	50	6	16	8		2	F			
12-1849		27.95	20	5¼	8				S			
12-1855		27.95	20	5¼					F		Moisture seal for doors.	
12-1854		79.95	40	5¼				3	F			
12-1853		59.95	40	5½				2	S			
40-1256		49.95	60	6x9	20			3	F			
40-1255	39.95	60	6x9	20	8		2	F				
ROYAL SOUND	RS-6045N	150.00	50			8	80-20		S	6¼x4x4¼		
	RS-1000	300.00	100	10		8	20-15		F	11¼x6¼		
	RS-6030	120.00	30			4	100-20		S	6x3¼x3		
	RS-800	135.00	75	8		8	20-13		F	8¼x3¼		
	RS-6100	200.00	100			4	45-20		S	7¼x4¼x5½		
	RS-35B	70.00	100	2½		8	1.4k-5k		F	1¼x4½		
	RS-25CA	45.00	75	2		8	1.2k-20k		F	3¾x1¾x3¾		
	RS-10B	90.00	75	1		8	1.5k-20k		F	1½x4½		
SANYO	SP412	99.95	30	4x10	16	4	70-20	3	F	4x10x3		
	SP40	59.95	30	4	8	4	70-20	2	F	4 dia.		
	SP69A	219.95	120	6x9	30	4	40-20	3	F	6x9		
	SP90	219.95	120	4	12.6	4	80-20	2	S	9¼x7x5¼		
	SONY	XS-1	299.95	100	5		4	90-40 ±3	2	S	10½x5½x 7¾	
XS-11		229.95	70	5		4	90-19 ±3	2	S	9x5½x7¾		
XS-21		199.95	50	4		4	80-20 ±6	2	S	8¾x5¾x4¾		
XS-M33		199.95	70	6½		4	35-30 ±6	2	F	7¼x7¼x6¼	Self-contained amp, 12 W/ch. into 4 ohms, 30-20k, 0.8% THD. As above.	
XS-M31		159.95	50	5		4	40-18 ±6		F	5¼x5¼x5		
XS-62		109.95	40	6x9	20	4	55-18 ±6	2	F	6¼x9¼x4		
XS-63		139.95	40	6x9	20	4	55-18 ±6	3	F	6¼x9¼x4		
XS-66		159.95	80	6x9	40	4	50-18 ±6	3	F	6¼x9¼x4¼		
XS-43		139.95	40	4x10	20	4	65-18 ±6	3	F	4¼x10¼x3¾		
XS-611S		39.95	25	6½	6.5	4	70-15 ±6		F	7¼x1½		
SX-613S		64.95	25	6½	6.5	4	70-18 ±6	2	F	7¼x1½		
XS-601		149.95	70	6½		4	70-20 ±6	3	F	7¼x7¼x3¾		
XS-602		129.95	70	6½		4	70-19 ±6	2	F	7¼x7¼x3¾		
XS-201		79.95	50	5		4	80-17 ±6		F	5¼x5¼x2½		
XS-202		99.95	50	5		4	80-19 ±6	2	F	5¼x5¼x2½		
XS-203	49.95	25	5		4	80-18 ±6		F	5¼x2½			

# SPEAKERS



PSB Alpha II



Royal Sound RS-6100



Sparkomatic SK-6950

MANUFACTURER	Model	Price, \$ (If Sold Individually)	Price, \$ (If Sold in Pairs)	Recommended Max. Power, Watts	Woofer Size, Inches	Magnet Size, Inches	Impedance, Ohms	Frequency Response, Hz to kHz, ± dB	Two-way (2) or Three-way (3)	Flush Mount (F) or Surface Mount (S)	Overall Dimensions	Notes
SPARKOMATIC	SK-6950	99.95	100	6x9	20	4	50-20	4	F	6 1/2 x 9 1/2 x 4		
	SK-650	69.95	100	6	20	4	70-20	4	F	6 1/2 x 9 1/2 x 4		
	SK-600	39.95	15	5x7	20	4-8	70-15	2	F	6 1/2 x 6 1/2 x 1 1/2		
	SK-522T	59.95	40	5x7	20	4	60-17	3	S	8 x 6 x 5 1/2		
	SK-4120C	47.95	25	4x10	20	4	50-15	2	F	4 1/2 x 10 x 3 3/4		
SPECO	DMS-2	125.00	30	3 1/2	5	8	60-20	2	S	5 7/8 x 3 7/8 x 3		
	DMS-3	165.00	50	4	10	8	55-20	3	S	7 1/2 x 4 3/4 x 4 3/4		
	SK6930TD	155.00	100	6x9	30	4x8	50-20	3	F	6x9		
	SK6930CD	138.00	100	6x9	30	4x8	50-20	2	F	6x9		
	SK5A5S	35.75	20	5	8	8	110-10	2	F	5 dia.		With rainshield.
	SK69CA20Q-G	103.95	60	6x9	20	8	50-20	4	F	6x9x4		
	SK69CA20T-G	86.00	60	6x9	20	8	50-20	3	F	6x9x3 1/2		
	SK69CA20C-G	69.35	50	6x9	20	8	50-20	2	F	6x9x3 1/4		
	SK69CA10C-G	58.35	30	6x9	10	8	55-20	2	F	6x9x3 1/4		
	SK69CA27W-G	70.20	50	6x9	27	8	50-15	2	F	6x9x3		
	SK69CA20W-G	54.15	50	6x9	20	8	55-15	2	F	6x9x3		
	SK69CA10W-G	44.35	30	6x9	10	8	55-15	2	F	6x9x2 1/4		
	SK410CA20C-G	69.35	40	4x10	20	8	50-20	2	F	11 1/4 x 12 1/4 x 3 3/4		
	SK410CA20W-G	56.90	35	4x10	20	8	50-18	2	F	11 1/4 x 12 1/4 x 3 3/4		
	SK410CA10W-G	47.10	30	4x10	10	8	50-15	2	F	11 1/4 x 12 1/4 x 3 3/4		
	SK410CF10W-G	41.50	20	4x10	10	8	140-18	2	F	4 1/2 x 11 x 4 1/4		
	SK410CF5W-G	36.00	10	4x10	5	8	140-18	2	F	4 1/2 x 11 x 4 1/4		
	SK51CA20T-G	86.00	50	5 1/2	20	8	80-20	3	F	5 1/2 dia.		
	SK51CA20C-G	58.15	30	5 1/2	20	8	130-20	2	S	14 x 7 1/4 x 3 1/2		
	SK51CA10C-G	52.65	20	5 1/2	10	8	130-20	2	S	5 1/2 dia.		
	SK51CA10W-G	41.50	30	5 1/2	10	8	80-15	2	S	5 1/2 dia.		
	SK51CF5W-G	30.40	10	5 1/2	5	8	125-20	2	S	5 1/2 dia.		
SK51CF3W-G	27.65	10	5 1/2	3	8	125-20	2	S	5 1/2 dia.			
SK4CA10C-G	51.25	4	4	10	8	30-17	2	F	11 1/4 x 5 x 3 3/4			
SK4CA10-G	41.50	4	4	10	8	90-18	2	F	11 1/4 x 5 x 3 3/4			
SK4CF3-G	26.25	4	4	3	8			F	6 1/4 x 5 1/2 x 4			
TRUSONIC	K6943	199.00	10	6x9	40	4	25-25	3	F	6x9x4 1/4		Waterproof, bi-amp capable, alum. voice-coil.
	K6942	169.00	10	6x9	40	4	25-25	2	F	6x9x4 1/4		As above.
	K6923	174.00	10	6x9	20	4	30-25	3	F	6x9x3 3/4		As above.
	K6922	144.00	10	6x9	20	4	30-25	2	F	6x9x3 3/4		As above.
	K5722	124.00	10	5x7	20	4	40-25	2	F	5x7x3 3/4		As above.
	K6042	149.00	10	6 1/2	40	4	35-25	2	F	6 1/2 x 3		As above.
	K6022	124.00	10	6 1/2	20	4	40-25	2	F	6 1/2 x 2 1/2		As above.
	K6941	145.00	10	6x9	40	4	25-2	1	F	6x9x4		As above.
K6021	110.00	10	6 1/2	20	4	40-2	1	F	6 1/2 x 2 1/2		As above.	
ULTRALINEAR	M14	149.95	40	4	16 1/2	4-8	53-18	2	S	7 1/2 x 4 3/4 x 4 3/4		
VISONIK	D 4000	110.00	50	4	4	4-8	50-25	2	S	6 3/4 x 4 1/2 x 4 1/2		
	D 5000	130.00	50	4	4	4-8	+4, -8	2	S	6 3/4 x 4 1/2 x 4 1/2		
	Tri-phase Components	200.00	100	6x9	4	4	40-18	3	F	±4		
Co-Phase Components	150.00	80	6x9	4	4	40-18	2	F	±4			
ZAPCO	W6915304	46.00	75	6x9	30	4			F			
	W6915308	46.00	75	6x9	30	8			F			
	W815308	46.00	75	8	30	8			F			
	T-108	48.00					5k-20k		F			

# JVC introduces a tonearm that out-thinks warps and resonances.

Ideally, a stylus should operate in a resonance-free environment where it can respond to groove modulations and nothing else.

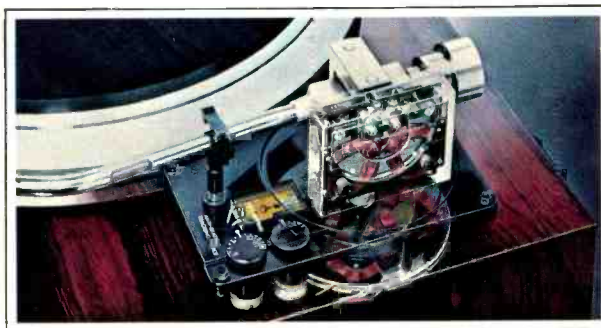
That, unfortunately, has been a tall order for tonearm designers. Because minimizing one kind of resonance makes the arm susceptible to other kinds.

Low-mass arms are the least susceptible to warp-induced resonances. But they're the most likely to have structural resonances which color the sound of the music.

Higher-mass arms are less likely to have structural resonances. But they may have trouble negotiating warps and large groove modulations, especially with high-compliance cartridges.

JVC engineers have attacked this problem by developing a tonearm that "thinks". Called the Electro-Dynamic tonearm, it causes the stylus to "see" ideal effective mass, even though the arm itself is medium-mass and very rigid.

Whenever a surface warp or eccentricity begins to create abnormal arm movement, two motors provide instant dynamic compensation. So the arm is not "thrown"

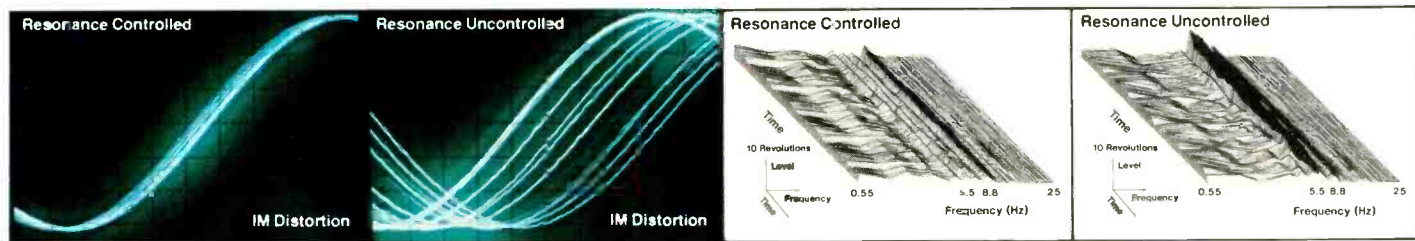


by forces of inertia, momentum and gravity. The stylus remains properly seated in the groove. As a result, you hear stunning clarity (because of reduced IM distortion), stable stereo imaging and superb tracking of even the most difficult groove modulations.

As exciting as our E-D system is, you should not overlook the qualities of the turntables that feature it.

The QL-Y5F, for example, includes a double-servo quartz system which regulates platter rotation with greater accuracy than single-servo systems. The heavy platter and high-torque, coreless DC direct drive motor sustain a very high moment of inertia, avoiding the transient speed variations that can color sound timbres. Front-panel switches control the up/down and left/right movement of the arm, without the user ever having to touch the arm itself.

If your system can benefit from a turntable of this caliber, you will undoubtedly want to evaluate the QL-Y5F and its E-D tonearm for yourself. Please dial 800-221-7502 for the location of your nearest JVC dealer (in New York State 212-476-8300).

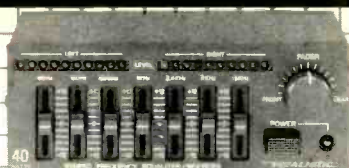


58-75 Queens Midtown Expressway, Maspeth, N.Y. 11378.

**JVC**  
US JVC CORP.

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# AMPS/ EQUALIZERS



Radio Shack 12-1862



Sparkomatic GE-1000



Zapco PEQ

MANUFACTURER	Model	Price	Amp=Amplifier; EQ=Equalizer; Both=Both	Number of Bands of EQ	Separate Controls for Each Stereo Channel?	Boost/Cut Range, dB	Watts into 4 ohms	% THD at Rated Output	Dimensions, inches
PYRAMID MOBILE AUDIO (continued)	MA-7P	99.95	EQ	7	Yes	±12			1½x5½x1¼
	MA-100	174.95	Amp				50	1	2x4x6
	MA-100B	217.96	Amp				50	0.03	1½x4x6
	MA-270	399.90	Amp				135	0.05	3x6x11
RCA	12R906	44.75	Amp		No		20	10	5½x4x1¼
RADIO SHACK	12-1860	27.95	Amp	5	No	±12	12	10.0	
	12-1861	69.95	Both	5	No	±12	20	10.0	
	12-1863	49.95	Both	5	No	±12	20	10.0	
	12-1862	79.95	Both	7	No	±12	20	10.0	
ROYAL SOUND	EA-600	120.00	Both	5	No	±12	20	0.3	2½x7½x6¾
	RA-6000	350.00	Amp				60	0.2	2½x7½x9¾
	RC-2000	350.00	EQ	7	No	±12			2½x7½x5¾
	RA-600N	130.00	Amp				20	0.2	1½x6¾x5¾
SANYO	PA6060	219.95	Amp				30	0.05	3x4½x7¾
	PA6120	279.95	Amp				60	0.05	3½x7½x14
	EQZ6200	79.95	EQ	7	No	±12		0.1	2x6½x4¾
	EQZ6400	109.95	EQ	7	No	±12		0.1	2x7½x5
SONY	XE-9 Preamp	114.95	EQ	9	No	±12		0.05	5½x1½x7¾
	XM-1	299.95	Amp				70	0.08	5½x1¼x10¼; Class "D" digital.
	XM-41	89.95	Amp				20	0.06	5½x1½x6¾
	XM-21	59.95	Amp				6	0.06	5½x1½x4¾
	GB-40	99.95	Amp				20, 4x6	0.5	5½x1½x7¾; mtkc mixing, fader.
SPARKOMATIC	GE-1000	189.95	Both	7	No	±12	100	0.01	7½x2½x9¼
	GE-500	89.95	Both	5	No	±12	45	10	Visual response curve on illuminated screen.
	LC-101	49.95	Amp		No	±10	36	10	5½x1½x6¾
	LC-50	29.95	Amp				36	10	4x1½x5
VISONIK	A-401	128.00	Amp		No	±12	40	0.25	2½x5½x6
	AS-2000	120.00	Bass Amp				60 (Mono)	0.25	5½x6½x2; resp. 30Hz-160Hz.
	PA-1	130.00	EQ Preamp	3	No	±15		0.01	7x1½x4
ZAPCO	150-L	375.00	Amp				150	0.2	5½x5½x1¼; power supply, 7x8x2½.
	150-L w/ESM	440.00	Amp				165	0.2	Units as above.
	150-LA incl. ESM	460.00	Amp				155	0.08	Units as above.
	PEQ	265.00	EQ	9	Yes	±18			1½x4½x8¾; incl. preamp, sep. vol. contr., var. gain, clipping ind., on/off switch.

# JBL's new L112.

Lower, higher, faster, flatter.



Listen to years of research at the leading edge of transducer engineering.

Lasers, holography, computers and the human ear interfacing toward one end: a new state-of-the-art in bookshelf loudspeakers. ... JBL's new L112.

**Lower.** The L112's Symmetrical Field Geometry 12" woofer, with its larger 3" voice coil and specially-coated cone, delivers the low notes of music with extremely low distortion. Lower than any other bookshelf speaker we've ever tested. You'll hear crisp, clean, powerful bass all the way down to the

lowest notes.

**Higher.** A new vapor aluminum-coated lightweight phenolic Dome Radiator was developed through the use of laser holography. This laser research helps our engineers examine tweeter cone movement like an X-ray allows physicians to examine the human body. Diaphragm excursions have been refined for exceptionally smooth response, maximum stereo imaging and high-power handling. You'll hear harmonics you've never heard before.

**Faster.** JBL's new High Resolution Dividing Network enables

the L112 to deliver transients with startling immediacy. It controls each of the L112's drivers throughout their full operating range. You'll hear sound so coherent, it will seem that only one extremely wide-range transducer is responsible—not three!

**Flatter.** The flat frequency response measurements of the L112 qualify this speaker as the most accurate bookshelf performer we've tested in JBL history.

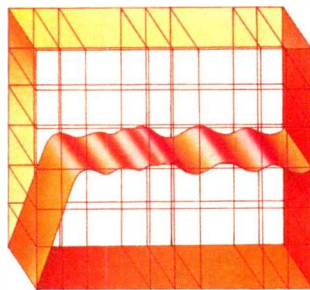
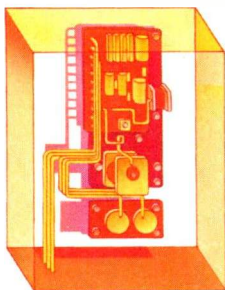
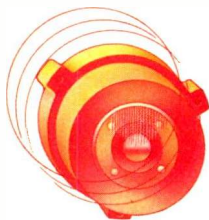
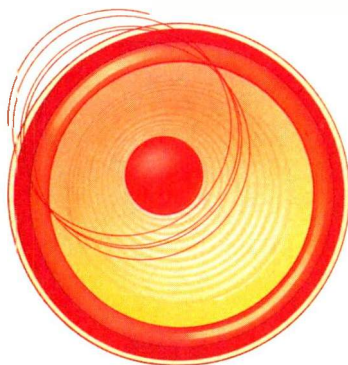
The L112 represents more than engineering excellence. It's also excellence in quality assurance and manufacturing. In JBL's ma-

chine shop, we hold tolerances on the L112 components such as pole pieces to 2/10,000ths of an inch! These are tolerances normally found only in aerospace technology.

Each speaker is crafted in the USA at our Northridge, California facility, inspected and tested at over 50 test stations and beautifully hand-finished with oiled and rubbed American walnut veneer.

Listen to musical reproduction at technology's leading edge. At your JBL dealer.

James B. Lansing Sound, Inc.,  
8500 Balboa Blvd.,  
Northridge, CA 91329.

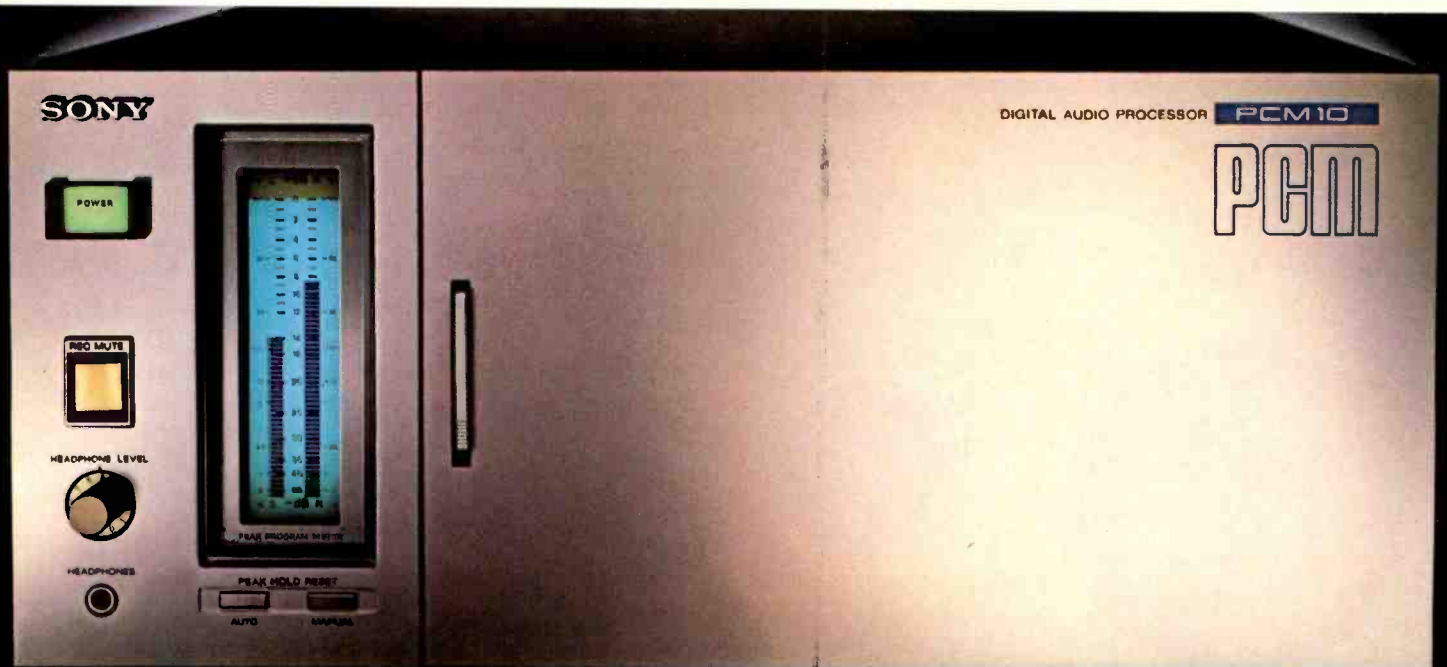


JBL First with the pros.

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# DON'T LET YOUR EGO STAND BETWEEN YOU AND BETTER SOUND.



PCM 10 TWO CHANNEL DIGITAL AUDIO PROCESSOR: Advanced sampling and quantization of musical signals / Specially designed to be used with home-use video tape recorders such as Sony Betamax™ / 14-bit quantization (12-bit, 3 polygonal linear) provides better than 85 dB dynamic range / Frequency response DC-20 kHz  $\pm$  1 dB / Features include liquid crystal (LCD) Peak Program Meters and Record Mute control / Conforms to EIAJ standard form at.



PS-B80 TURNTABLE: Velocity Feedback (VFB) electronically controlled tone arm system allows automatic tracking, antiskating, and tone arm damping operation / Microprocessor-programmable functions and replay flexibility / Quartz X-tal locked, fully automatic DD turntable, with high-torque BSL motor and Magnedisc servo control / SBMC chassis material, with height-adjustable viscous feet.

XL-55 PRO CARTRIDGE: Sony developed figure 8 moving-coil voltage generating system / 'Air core' armature design, with multiple cantilever construction / Integrated magnesium die-cast low-resonance head shell.



There are those who insist that the most sophisticated audio equipment can only be produced by relatively unknown companies.

At Sony, we take exception to this unwarranted position.

First, because there's probably no audio company in the world that can match the technological resources and research facilities of Sony.

Second, because it is our contention that the Sony Audio Lab components pictured here represent the absolute state of the audio art.

And finally, because no other audio company can match Sony's record for innovation and quality.

So the point of all this is simple.

If you're looking for the ultimate in audio equipment and you find yourself unduly prejudiced at the sight of our name, do us both a big favor.

Close your eyes. And just listen.

**SONY**  
High Fidelity

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TC-K88B CASSETTE DECK: Sendust & Ferrite record / playback head / Metal tape capability / 3 BSL motors, quartz lock direct drive / Micro-processor-IC solenoid logic controls, with Automatic Music Sensor / Power Loading Cassette Module / 33-element LCD Peak Program Meters.



ST-J88B TUNER: Quartz lock frequency synthesis tuner / Varactor diode-MOS FET front end, with Uni-Phase IF filters / Auto and manual 'step' tuning or full 8-station memory with nonvolatile Sony MN-OS memory IC / 2 discrete IF circuits for narrow and normal modes.



TA-E88B PREAMPLIFIER: All-stage DC configuration / 'Dual mono' straight-path-signal design / Subchassis isolated dual power supplies / Built-in self-powered head amplifier using Sony LEC low-noise transistors / Selectable phono impedance and capacitance.



TA-N88B AMPLIFIER: Pulse Width Modulation (Class D) amplifier design / Vertical FET (M-FET) power output transistors / High regulation Pulse Locked Power Supply (PLPS) / 'Dual mono' amplifier configuration / 3-stage protection circuitry.



TA-D88B ELECTRONIC CROSSOVER NETWORK: Plug-in filter modules offer choice of 12 crossover points / Bessel-function filters provide up to 24 dB per octave slopes / Up to -30 dB attenuation range / 'Dual mono' configuration, with subchassis isolated power supply.

# Great Cars! Great Sound!

## Photos of the Best In Auto Hi-Fi

Gary Stock

Ah, the auto shows of our youth. A noisy auditorium or armory on the wrong side of town was transformed for a day or two into motoring nirvana. Endless arrays of chrome-plated accessories gleamed like constellations under the lights. Soot-streaked racing machines crouched close to the floor while drivers in fireproof suits autographed photos of their crashes. Detroit's latest offerings revolved slowly on mammoth platforms as languorous, alabaster-skinned models in evening gowns posed on their contours. A thousand teenage boys took turns at the wheels of the sports models, each lost in fantasies of speed and automotive glamor. And at the center of it all, the show cars, experimental one-of-a-kind dream machines constructed by the automakers to try out exotic styling on the public, to cast a golden glow of association on the family sedans that bore the same name, and to prove that Detroit was capable of anything that could be conceived by the mind of a designer. Cars that were never to be mass-produced, built only to fire the imaginations of those who saw them.

The auto shows are still with us, though with reduced splendor. The cars are slower, smaller, lumpier in appearance, and equipped not with super-engines but with the less-than-glamorous equipment needed to reduce pollution and improve mileage. The chrome widgets are gone, victims of a downturned

economy and the end of mass adolescent fascination with the automobile. And the show cars are largely gone too, at least as we knew them. The few styling studies that do turn up at auto shows are usually egg-shaped electric or propane econo-cars, interesting exercises, but hardly the stuff that dreams are made of.

Another kind of show car is turning up in growing numbers, however — the auto sound show car, usually assembled by a manufacturer of hi-fi automotive equipment as a means of demonstrating its products at trade conventions and the like. The best of these are as dreamlike as the high-performance show cars of the '50s and '60s. Subwoofers, fully metal-compatible cassette decks, and tri-amplification are common, as are maximum sound levels guaranteed to take your brain away and blur your vision (presumably not while in motion). In some cases, the total value of the sound system exceeds that of the car itself.

A whole fleet of these supercars turned up at the recent Consumer Electronics Show in Las Vegas, and we found them intriguing enough to merit showing to our readers because of the high level of engineering sophistication, their outstanding sonic performance, and because they're just plain fun to look at inside and out. Herewith, then, **Audio's** own auto show, five audiophile dream-machines.



## Altec's BMW 320i

**The Car.** To aficionados of Grand Touring cars, the name BMW needs little introduction. The German company has established itself as the premier producer of performance sedans and coupes for long-distance, high-speed driving. The model pictured here, the 320i, is the successor to BMW's 2002, which was largely responsible for the development of that reputation. The 320i is powered by a two-liter, fuel-injected inline four, and also incorporates independent suspension on all four wheels, as well as BMW's characteristically superb gearbox and instrument panel layout. Not your typical family sedan.

Altec has taken this 320i even further in the direction of sporting performance through the addition of a number of interesting options, including Recaro "N" seats in front (with Recaro upholstery on the rear seats as well), a special sport suspension that lowers the car by two inches, a Bavarian Motorsports air dam, a Momo steering wheel, and Dunlop SP Sport Super tires. In addition, the car was repainted in Altec's corporate colors by noted Southern California custom paint shop, Jeff's Place.

**The Sound System.** As the front end of this system, Altec used Alpine's 7307 cassette/receiver unit, mounted in the standard center-console position, and connected to an Alpine 3003 four-channel equalizer/amplifier, which has five bands of equalization and a total of 80 watts continuous power. The system's bass end is handled by Altec's own SW-1 Power Bass system, comprised of a control unit (also mounted in the center console) and 6x9 subwoofer, with integral power amplifier, mounted in the center of the rear deck. For rear-channel reproduction of midrange and treble, two Altec 6x9 48 Duplex speakers are used. Frontal speakers are Altec SK-1 midrange drivers and TK-1 treble units, mounted in separate enclosures in each of the doors. Owners of the 320i may note that the door map pockets were removed to permit optimal positioning of the midrange drivers. One other interesting point about this 320i is the example of egalitarianism it will set for the hi-fi industry. Rather than eventually becoming the plush perk of some corporate executive, the car is being given away — as the grand prize in Altec's contest for retail salespeople.



## Blaupunkt's B&B/Mercedes CW 311

**The Car.** The B&B CW 311 harkens back to an earlier era, in that it is a one-off experimental car built to demonstrate a company's capabilities — in this case, however, the capabilities of a West German aftermarket modification company rather than an auto manufacturer. B&B's stock-in-trade is the sophisticated reworking of high-performance European cars (primarily Porsche, BMW, and Mercedes-Benz, we are told) to further improve their road performance. The CW 311 is an extension of that capability, designed by B&B and constructed around a 6.3-liter Mercedes-Benz V-8 engine and a hand-built tubular space frame. The specifications of the car — 375 brake horsepower, a 0 to 60 time of 4.5 seconds, and a top speed of 200 miles an hour — clearly proclaim it as an extraordinary vehicle and also consign it, alas, to countries with less restrictive regulations. The 311 designation, by the way, refers to the car's incredibly low 0.311 drag coefficient. Price? \$340,000, but you needn't have asked. Only one currently exists.

**The Sound System.** B&B turned to Blaupunkt for the 311's components, using the European, stalk-mounted "Berlin" cassette/receiver combination, a unit that has been de rigueur among European driving enthusiasts for years, but has become available in the U.S. only recently. The Berlin's stalk is flexible, permitting the control head to be moved to any convenient position for the driver. In addition to a six-station memory (activated by the buttons on top of the control head), station scanning, and reception on short- and long-wave bands as well as FM stereo and AM, the Berlin can record either off the air or from a microphone and has a control which automatically varies volume to compensate for changes in ambient noise level. The system's gain is controlled by a bar on the head's front face, tone and balance by knobs inset into the rear panel of the head, and station-seeking by another front-face bar, so there is little need to touch the dash unit except when inserting or removing a cassette. The Berlin has four channels of amplification, each rated at 20 watts continuous. Both of the two door-mounted speaker systems



consist of six 4-inch bass drivers and a one-inch fabric dome tweeter, with a passive crossover network. Maximum

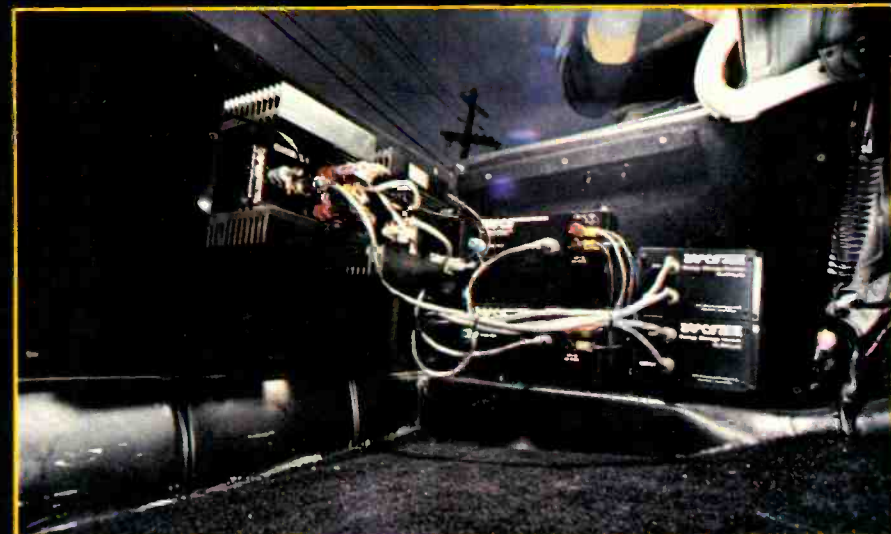
sound pressure levels are in the 120-dB SPL range, by this journalist's estimate.



## Zapco's Firebird Formula

**The Car.** Although not quite as exotic as a Ferrari or the one-off B&B, the Firebird Formula is regarded as one of the better examples of "American Iron" available today, a very good Grand Touring car by any standard. It is also by far the most accessible of the automobiles in this group, and therefore serves as a good rational (as opposed to sky's-the-limit) benchmark for the systems assembled by mere mortals. Zapco's version is mechanically stock, powered by GM's venerable overhead-valve 350 cubic inch V-8, with a live rear axle and three-speed automatic transmission. The car has been outfitted with a full complement of fiberglass fender flares, and both front and rear spoilers, along with wire wheel covers and Goodrich T/A 50-series tires. In short, a classic Boulevard Racer, perfect for Saturday nights in midsummer.

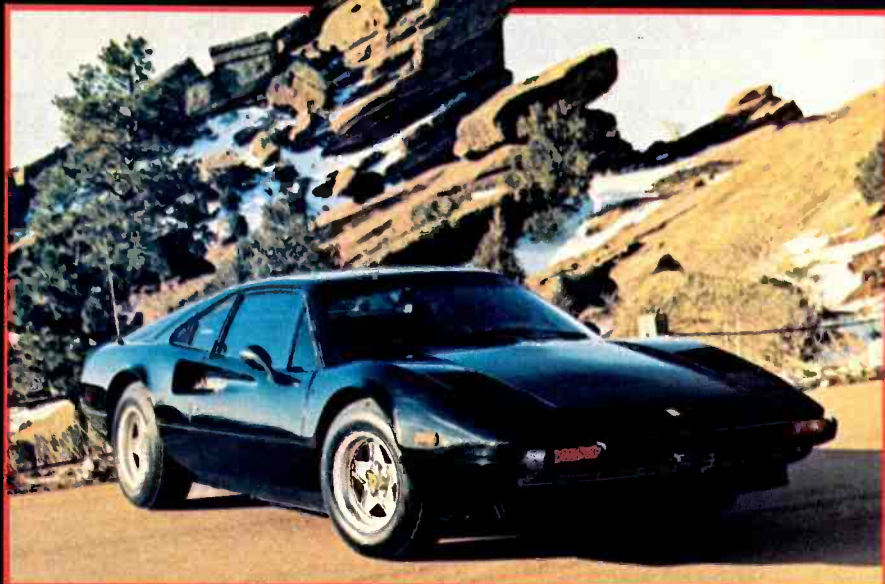
**The Sound System.** Zapco began with the Concord 505 cassette/receiver combination (mounted in the dashboard). Signals from this unit are preamplified and equalized by Zapco's Model PEQ preamp/equalizer, which incorporates nine bands of equalization, clipping indicators, and the master volume control. As installed in this car, the PEQ pops up out of the center armrest and may be folded out of view. The touch-tone pad located in front of the PEQ is a code-punch anti-theft device, by the way. The system's power amplification is mounted in the trunk: Two Zapco Model 150L amplifiers with separate switching power supplies and ESM Energy Storage Modules, each rated at 160 watts continuous, for a total of 320 watts system power. Four 8-inch Zapco W815308 bass drivers are mounted in the rear deck and fed by the low-pass section of two Zapco PEX electronic crossovers. Two Zapco T108 horn tweeters are also mounted on the rear deck. The door-mounted front speakers each consist of one T108 and two Jensen five-inch midrange drivers, mounted in separate enclosures. Total price (excluding the rather exotic alarm system) would run in the \$2,100 range, according to Zapco. An entirely reasonable price, given that the system demonstrated at the Consumer Electronics Show was capable of 130 dB plus levels!



## Audio Interiors' Ferrari 308 GTB

**The Car.** No group of exotic cars would be complete without a Ferrari; this one, interestingly enough, was outfitted not by an autostereo manufacturer but by one of the more prominent custom installers in the West, Audio Interiors of Englewood, Colorado. As befits the name, the car itself has all of the right stuff — a three-liter aluminum engine mid-mounted and topped by a whole gang of thirsty Weber carburetors, a five-speed gearbox, fully independent suspension, huge disc brakes, Cromodora wheels, and Michelin's best sport tires, along with a control console that is widely viewed as the best man-machine interface on wheels. Enough said.

**The Sound System.** Audio Interiors began their installation with an Alpine 7307 cassette/receiver combination, bypassing some of that unit's functions and using an AudioMobile SP300 preamplifier for level control. Both units were mounted in the car's center console. The remainder of the system is quad-amplified, with crossover points at 120, 1500, and 5,000 Hz. Due to the lack of available interior space, a single JBL LE 10H 10-inch bass driver was mounted in a covered sub-enclosure near the front end of the passenger-side compartment (about where the passenger's feet would be). This subwoofer is fed by an AudioMobile SA2000 200-watt amplifier in bridged mono mode, coupled to the remainder of the system via an AudioMobile CXE-2 electronic crossover. Mid-bass and lower midrange frequencies are handled by two JBL 2108 eight-inch bass drivers, mounted in the car's doors, and fed by another SA2000 power amplifier in conventional stereo configuration (in this mode the amplifier has 50 watts continuous power per channel) and the high-pass section of the same CXE-2 electronic crossover. Two EPI LS-35 four-inch midrange drivers were installed at the outer ends of the dash, and two Audax HD 100 25 A one-inch fabric dome tweeters in place of the power window switches at the extreme upper front corner of the doors, thus placing the two drivers very close together when the doors are closed. The power window switches were reinstalled further back on the doors. The midrange and treble units are each fed by one channel of an AudioMobile SA-



400 power amplifier (20 watts per channel in stereo mode), and by an AudioMobile CXE-2 electronic crossover. Total power for the system is 380 watts continuous, and Audio Interiors has used real-time analysis to verify that the system response is within  $\pm 6$  dB from 35 to 19,000 Hz, with a maximum output of 130 dB "A" at two percent total harmonic distortion. Price of the system, if it were to be installed in another 308 GTB, would be about \$5,200, not counting string-back driving gloves.



Upgrade to...

# AIWA

## AIWA AD-M700 3-HEAD METAL TAPE COMPATIBLE CASSETTE DECKS

### We'll go head to head with anyone

Aiwa's AD-M700 cassette decks in contemporary-styled silver or in a black rack-mount handle cabinets have a 3-head Double Dolby\* NR configuration. So do some high-priced decks. What the high-priced decks don't have is Aiwa's unique V-cut head geometry to cancel out low-frequency contour effect, i.e., get rid of the roughness. While the record and playback heads are placed in single housing, they are completely separate, allowing each head to have the ideal gap width for its specific purpose. This provides low noise recordings with extended frequency response.

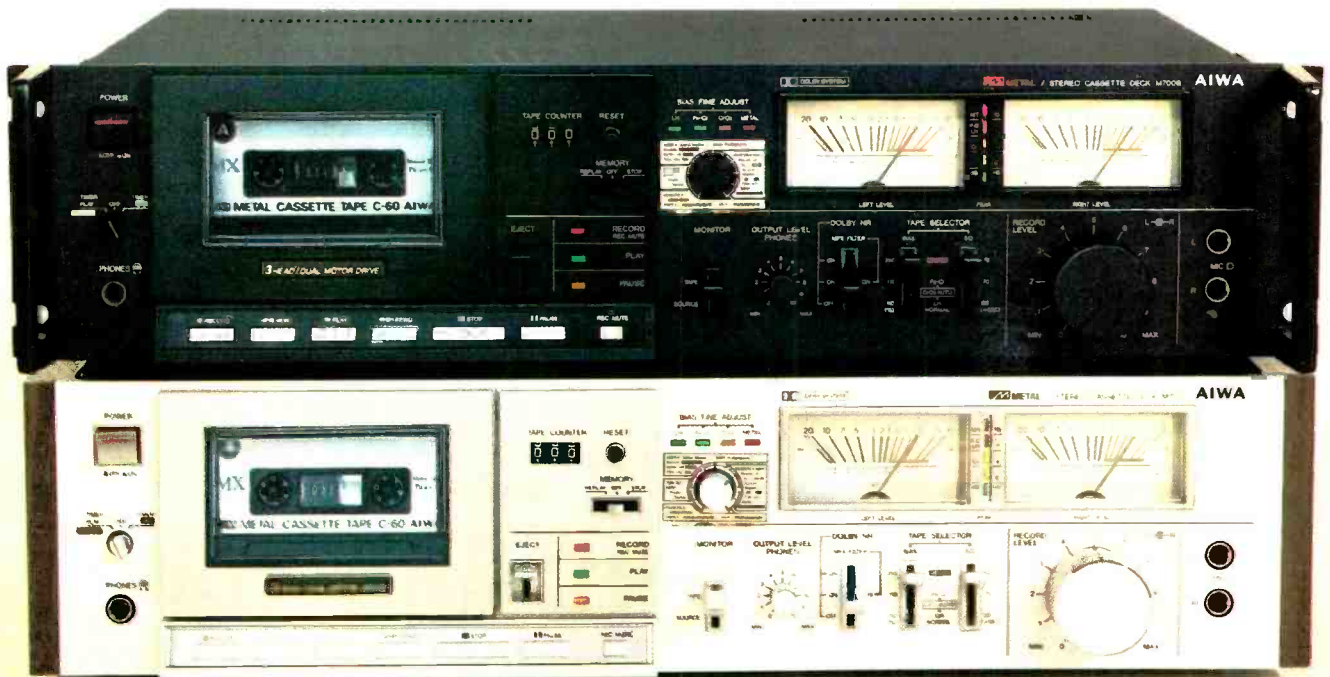
To match this supreme head-system performance, we've used a 2-motor tape transport for dependability and smoothness as well as a phenomenal 0.04% Wow and Flutter WRMS.

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Finally, to make the most of Aiwa's superb heads and transport system, we've put in a continuous variable bias adjust control for the optimum flat response regardless of what—or whose—tape you use, including metal particle tape.

All of this gives you terrific sound with a frequency response of 20-19,000Hz with metal tape; S/N ratio of 65dB (Dolby\* on, FeCr tape). Then we added these fine touches for convenience and versatility...feather-touch logic controls, continuous repeat and memory replay, 5-point multi-color peak reading LEDs, REC/MUTE edit replay and a host of other high-priced features that come with any Aiwa cassette deck. Look for Aiwa's AD-M700J in silver; AD-M700BJ in rack-mounting black. We've used our heads. For you.

\*Dolby is a trademark of Dolby Laboratories, Inc.



Upgrade to...

# AIWA®

AMERICA, INC.

35 Oxford Drive

Moonachie, New Jersey 07074

## AudioMobile's Rolls Royce Corniche

**The Car.** A Rolls Royce; 1976 vintage, to be precise. Little more need be said, except by way of background information. The car belongs to a West Coast disco producer who commissioned AudioMobile to develop a sound system good enough for high-volume evaluation of album mixdowns — a particularly critical element in developing successful disco material. The AudioMobile factory undertook the project as a design exercise, detailing the installation's many difficult aspects in a white paper on mobile system design that they prepared for their dealers. Among the system requirements established by the owner were a maximum sound pressure level of no less than 120 dB SPL at frequencies below 150 Hz, and a minimum degree of alteration to the automobile's Connolly leather and burl walnut interior.

**The Sound System.** After some evaluation, AudioMobile elected to split the front end of the Corniche's sound system into two elements. As the FM source, they retained the Blaupunkt "Frankfurt" fitted by Rolls Royce at the factory, modifying it internally to match the FM de-emphasis characteristic used in American broadcasting. For cassette playback, a Nakamichi 250 deck was mounted in a semi-exposed position on the center console. Switching between the two units is accomplished with an AudioMobile-built electronic switch/muting circuit. The system's preamplifier is an AudioMobile SP300, which incorporates clipping indicators, a switching supply with high noise isolation, and a three-band equalizer with fairly broad slopes, into a single small unit (front panel dimensions of 1.6x4.5 inches). The system is tri-amplified using three AudioMobile CXE-2 electronic crossovers and a total of six power amplifiers, with crossover frequencies at approximately 150 and 2,000 Hz; cut-off points for the high- and low-pass sections of the crossovers were deliberately made asymmetrical to further smooth the system's total response. Two Altec 417 12-inch bass units, each driven by a 200-watt AudioMobile amplifier in bridged mono mode, were installed in a custom-built trunk enclosure and act as the system's subwoofer. Four midrange-treble speaker systems, each consisting of a



Danish SEAS 4½-inch midrange and a French Audax one-inch fabric dome tweeter, cover the remainder of the audio spectrum; two were mounted in the rear-seat armrest and two at an upward-firing angle in the doors. Each pair of these systems is powered by a 50-watt/channel AudioMobile SA200 midrange amplifier and a 20-watt/channel AudioMobile SA400 treble amplifier. Total power is 720 watts

continuous, adequate, according to the system's designers, for painfully high-level playback with the car's top either up or down. Reproducing this system in your Corniche would cost a mere \$12,000 and take six weeks. Or, second thought, you might add \$4,000 or so to that figure to cover the cost of a Honda or Toyota to drive in the interim. After all, it only raises the system budget by 33 percent! *A*



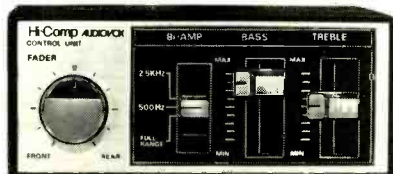
# Is true "high fidelity" sound really feasible in a small car? Yes, says Audiovox Hi-Comp. But be careful.

By Robert Harris, Technical Director

It has always been a tricky business to create crisp, clear perfect sound in the confined space of a small car. The results have often been painfully amateur.

Audiovox takes it for granted that you understand the importance of matched, compatible components. What it dreads seeing is overpowered units combined with underpowered speakers, and incorrectly placed.

Here, from the Hi-Comp division of Audiovox, is an advanced system that will deliver that true high fidelity sound you want for your domestic or imported compact car. To extract the

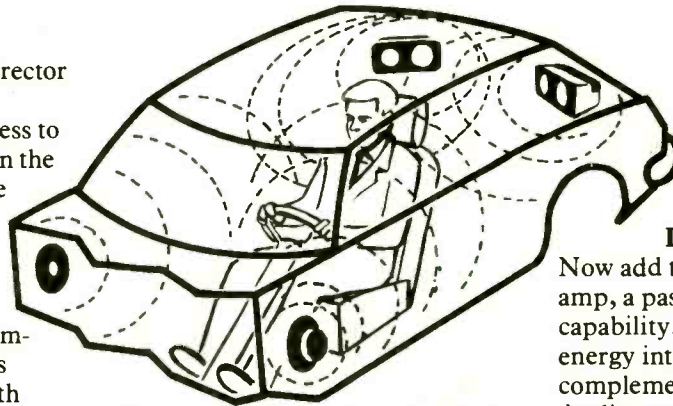


HCE-720 Hi-Comp passive equalizer.

best possible sound from it – clean, directed sound – write for a free copy of "The Dynamics of Speaker Placement in an Automobile."

## The cornerstone

This Hi-Comp system begins with the HCC-550 AM/FM multiplex radio with auto-reverse stereo cassette player.



Illustrated: a well-balanced four speaker system, you're surrounded with sound.

Examine the illustration below and you'll discover the major features that are built into this unit.

## The heart of the matter

Additional power for the system is supplied by a 36-watt stereo amplifier – the HCB-820. A few impressive specs: 15-30,000 hz frequency response range +1 db... 18 watts RMS per channel from 20-20,000 hz at less than .1% THD into 4 ohms... powerful direct-coupled complimentary bridge audio output.



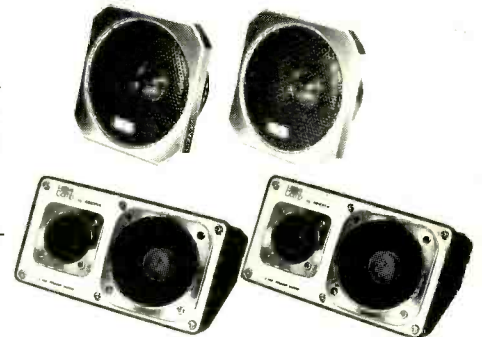
HCB-820 Hi-Comp 36-watt 2-channel amplifier.

Couple a pair of these amplifiers together and you've got power to spare.

## Last. But not least.

Now add the HCE-720 dual slide pre-amp, a passive equalizer with bi-amp capability. And, to convert all that energy into pure sound, a full complement of Hi-performance Audiovox Hi-Comp speakers.

You'll want a pair of HCS-10 4" round speakers with 7 oz. strontium magnets, capable of handling 20 watts with 120-15,000 hz frequency



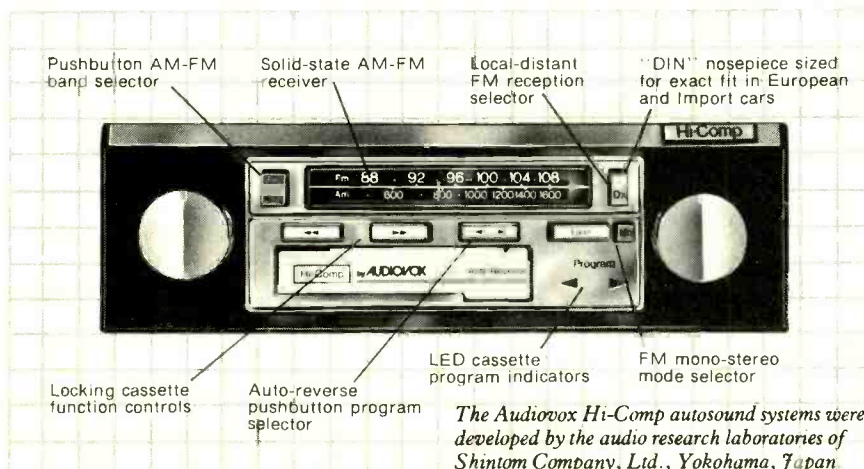
HCS-10 & HCS-90 Hi-Comp high-performance speakers.

response; to put in the door or kick panel, plus a pair of 2-way surface-mount HCS-90 speakers with 4" woofer and 2½" tweeter and a capability of 60 watts with 110-23,000 hz frequency response. They're perfect where space doesn't permit a flush mount installation.

## The sound you want

The Audiovox Hi-Comp system recommended here isn't cheap, about \$500.00; you're paying for high technology. But it will produce optimal super sound in a small car... provided you don't goof when it comes to the placement of the speakers.

For further information, write to:  
R. Harris, Technical Director, Dept. 11N,  
Hi-Comp Division, Audiovox Corp.,  
150 Marcus Blvd., Hauppauge, NY  
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- Pushbutton AM-FM band selector
- Solid-state AM-FM receiver
- Local-distant FM reception selector
- "DIN" nosepiece sized for exact fit in European and Import cars
- Locking cassette function controls
- Auto-reverse pushbutton program selector
- LED cassette program indicators
- FM mono-stereo mode selector

The Audiovox Hi-Comp autosound systems were developed by the audio research laboratories of Shintom Company, Ltd., Yokohama, Japan.

Enter No. 4 on Reader Service Card

The man pulled his coat tight against the night wind and shrank back into the doorway, waiting. The parking lot near the back of the motel was lonely and dark. As he silently watched and waited he saw tired travelers struggle out of their cars, grunt and stagger as they unloaded heavy luggage and trudged wearily into the motel. He envied them their soft beds.

Patiently John watched. Patiently John waited.

After an hour had passed with no more late arrivals, John moved quietly out from the shadows. In his hand he grasped a slender piece of metal with a hook cut out of one end.

Looking around carefully, his glance darting into every nearby shadow, John moved stealthily up to the side of a maroon car parked in the deeper shade under a leafy maple tree. With the quickness of an expert, he slid the metal bar between the glass and the body of the car's right front door. Deftly he slipped the bar downward and forward until it caught under the locking mechanism. It only took a moment.

Suddenly, with a sharp upward snap of his wrist, John pulled. There was a loud pop, and the lock-plunger sprang up unlocking the door. Instantly he was inside the car, skillfully disconnecting and removing the expensive car stereo set hanging below the dashboard.

Within 90 seconds from the time John left his hiding place along the wall of the motel, he had disappeared across the nearby field to his waiting car parked along the highway; under his arm he carried a \$1,500.00 car stereo system.

Car thieves take pride in the speed with which they can get into a locked car, any locked car. Some boast they can do what John did in less than 60 seconds. By their standards John would be considered slow at his job.

### The Hand is Quicker . . .

Why is speed so important? Speed isn't always important, though it can be if the car has an alarm. However, the true pro doesn't care whether the car has an alarm or not, because even if the siren hoots, bells ring, and rockets start to blaze into the heavens, the thief knows he'll be gone before there's time for anyone to act.

Of course, John had picked his victim carefully. The stereo set was mounted beneath the dashboard and his small crowbar had made it easy to pry the set loose from its mounting. But even installing the stereo into the

dashboard doesn't stop a determined thief. One salesman I know was shocked to find his built-in stereo gone. The thief had used a power saw and neatly cut the car dashboard around the stereo console, leaving a gaping hole.

Spring and early summer are the time of year when flowers spring out of the good earth and stereo car thieves spring from the swamps. It's the time of year when you'll be planning vacation trips, and visits to

is estimated at \$700. That's a solid investment and one you want to protect.

Is protection that important? Indeed it is. Experts in the field—and their findings are confirmed by stores that sell mobile hi-fi units—estimate that at least 15 percent of all such systems being bought and installed today are sooner or later ripped off by the professional gangs of car thieves. As one store owner put it: "We find at least two sales a day of car stereo equipment are to people purchasing re-

# Keep Your Car Stereo Safe!

## Tips To Foil The Professional Thief Bob Curtis\*

\*Security consultant, author and lecturer Dayton, Ohio

friends and relatives, in addition to your usual trips to the local shopping mall.

Thieves will also be doing some shopping, and you'll want to keep your car stereo equipment off their shopping list. To do this isn't easy, but perhaps one basic principle should be kept in mind. Car crooks are lazy people, and they look for jobs that take the least effort. That's a clue for you. To protect your valuable car stereo, make it tough for them. If you do so, chances are you'll keep your set.

Today's hi-fi mobile stereos generally range in price from a low of \$200 to a high of \$2,000. The average value

placement sets for the components that have been stolen from their cars."

As hi-fi sales to car owners continue to grow, these rip-offs will become even more prevalent. Until recently the big thefts were of CBs, but with the growth of the hi-fi car stereo market, the percentage of mobile equipment is now larger for hi-fi equipment than it is for CBs.

### Where it Goes

What do larcenists do with their hi-fi loot? Fences handle much of it. Some is sold to individuals, friends or contacts looking for a bargain who don't ask where the equipment comes

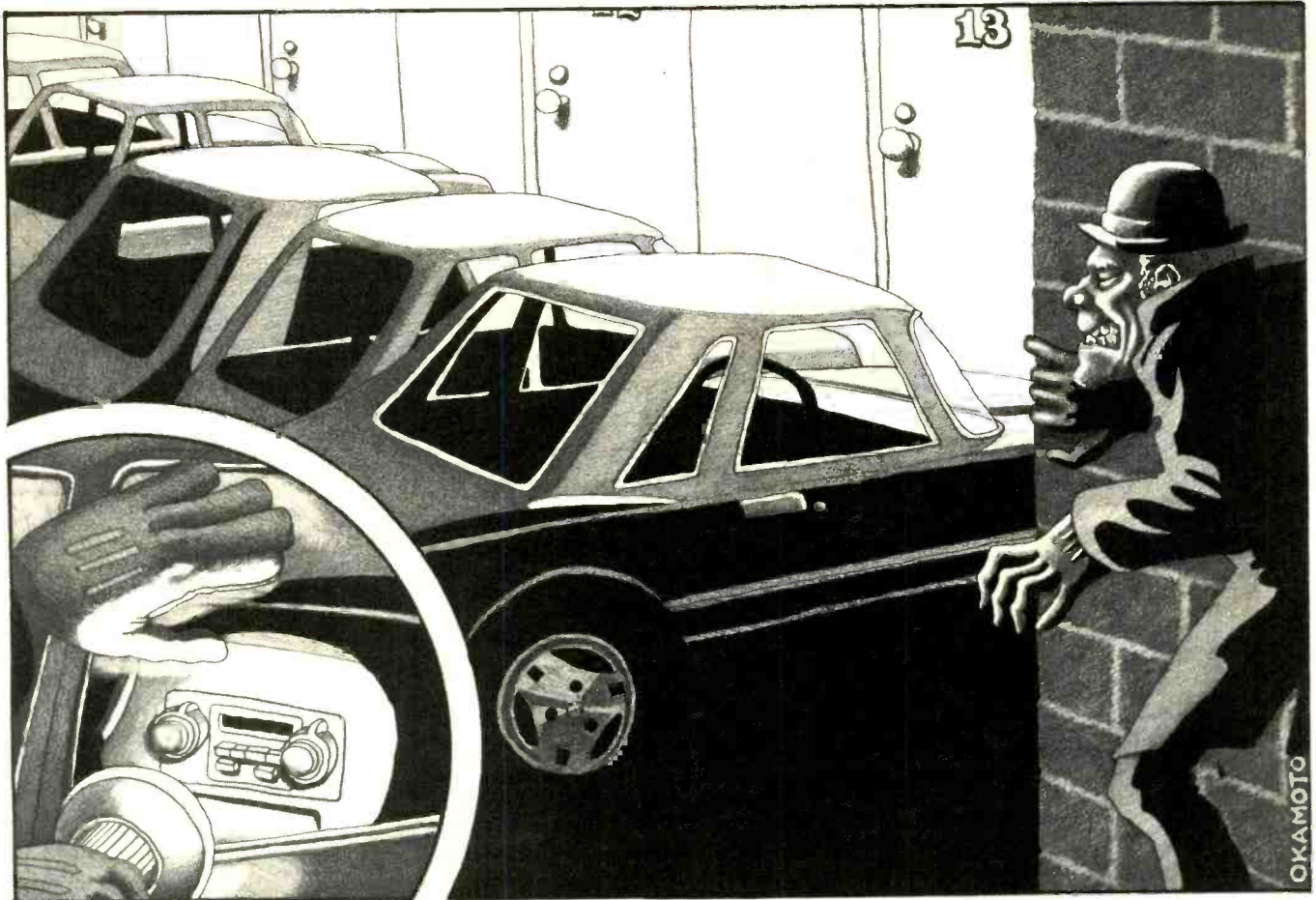
from. But much is sold to a few shady installation firms that have a tie to professional crime. At the moment CBs are a drug on the market, but the more valuable and still relatively rare hi-fi units, particularly the top-of-the-line units, are much in demand, so thieves find a ready market for these wares. Some owners of stereo equipment are getting desperate in their attempts to protect it. One van owner I know installed a neat alarm that he personally designed. Once a crook gets into his

clauses written into their policies to that effect. Insurance may cover hi-fi equipment built into the car by the manufacturer, or at least installed in the dashboard space provided for this by the car maker. But even such coverage often requires an additional rider on the policy and an extra fee. The AAA in Ohio, for example, will cover stereo equipment built into the dashboard in the space provided by the car maker, but charges an extra fee of \$25.00. Before you rely on your car in-

out by removing only eight screws, but it is a considerable improvement over past years. Under-dash users would be wise to remove rack-mounted sets when leaving the car, and lock them in the trunk.

### Protecting Yours

Direct alarm security of the hi-fi equipment in cars is not the usual approach. Instead, an alarm system should be used to protect the car itself and thereby protect the hi-fi units.



van and starts to fool with his set, an alarm goes off triggering a mammoth explosion of tear gas inside the van. Clever, yes? Effective? No doubt!

Tear gas sounds neat, and probably is useless . . . in an accident the force of the crash triggers the device. Or perhaps while storming down an interstate highway the alarm malfunctions, exploding a cloud of tear gas into the eyes of the driver. (That's a picture to reckon with!)

Some people mistakenly believe they are covered against mobile stereo theft by their car insurance policy. For the most part insurance firms will not cover such accessories and have

insurance or home-owners policy, be sure to check with your insurance agent.

Car manufacturers are becoming aware of the consumer's need to protect car stereo equipment. While older car models usually had a simple hole for such installations, the newer models provide better mounting protection. A chassis mounting bracket is provided by the car makers so equipment can be bolted into it, and a face plate is provided to cover the edges of the hi-fi unit once it is slipped into the dashboard. The mounting is still no great challenge to the professional thief, since he can get the equipment

Alarms come in several types. Of critical importance is the kind of sensor selected for the alarm system. Many car alarms use a plunger unit. (A glance at the inside of the car door will reveal the plunger used to switch on the car's overhead interior light when the door is opened.) The built-in plunger for the car ceiling light can be tied into the alarm system; a similar plunger can be installed to protect the car hood and thereby also guard the car battery. A plunger can also be used in the trunk to trigger an alarm should that lock be tampered with.

Other units use a touch-sensitive sensor to trigger the alarm. This can be

a capacitor system that reacts to human touch of the door handle or to the body of the car. Your hand on the door can, of course, set off the alarm or the hand of a passer-by can also send your alarm system into a tizzy. After all, the touch of a thief intent on larceny or that of a passer-by intent on preventing a fall are all the same to such an alarm system.

Vibration switches can also be used to trigger the alarm. Unfortunately they can respond to a nervous or incompetent car-jockey who carelessly backs into your bumper. Any such smack will set the vibration alarm screaming as loudly as a kicked dog.

Sonic transducers mounted at the end of each side of the car's front seat will register the sound of clashing metal . . . or the click of the door lock being jimmied open. The sensitivity of sound and movement sensors can usually be set by the car owner and will determine the extent of false alarms as well as the degree of protection the sensor provides against the unwanted intruder. Just don't park next to a construction site.

Another type of sensing device is a voltage sensor. This one's tied into the car electrical circuits and reacts to any changes in the voltage of the car's electrical current once it is activated. It can read the current flow and detect tampering with any part of the car wired for protection including the hood, doors, trunk and even lights, brake pedal, glove compartment light, and the stereo components inside the car itself.

Some thieves use a tow truck to lift up one end of the car and then simply tow it away. A simple mercury switch tied into the alarm can be used to trip the siren should this occur. These switches have a small problem, however, in that you can't park your car on a hill and set the alarm because that little pool of liquid mercury inside the capsule can't tell the difference between the tilt of a hill and the tilt of a tow truck.

Depending upon the alarm you purchase, once the sensor is tampered with by accident, by nature, or by a thief, one or more of several things happen. In some systems the car horn starts to blow to attract the attention of passers-by. Other alarms include a siren that screams with the zing of sharp nails scratched over a blackboard. Some combine the sounds of a buzzer or siren alarm with flashing headlights, a sure rouser after dusk.

Whatever the screams and lights activated by the alarm, once triggered

you can be sure of one thing: They will be draining the car battery. And the louder and longer the racket, the more juice is pulled off the power source. Invariably all car alarm systems use the auto's own battery as its power source. Alarms that run continuously until shut off are rough on the battery. Assuming the owner doesn't return right away (and that passers-by do nothing to stop the screaming), the driver may later come back to a silent car with a dead battery which, much to his chagrin, refuses to start. Not a pleasant surprise on top of having his stereo ripped off.

To offset this power loss problem many alarms today sound intermittently. One, for example, blasts its signal for 30 seconds, then is silent for 30 seconds, and repeats this cycle continuously until turned off. Another alarm currently on the market sounds continuously for four minutes, then shuts itself off and rearms its sensors, waiting for any further attacks.

Certainly when buying an alarm system for your car, it is best to consider the possible battery drain and related effectiveness of the alarm signals.

### Advanced Warning Systems

One particularly sophisticated alarm system that has recently reached the market is the "Autoalert" or "Mobile-Alert Vehicle Security System." (Each maker uses a different trade name for its product.) This new type of alarm provides a pocket pager so the car owner can be made aware his car is being tampered with as long as he has the pager on his person and is within a reasonable distance from his car. One unit claims the pager can receive an alarm signal up to a half mile from the car under favorable conditions. Another company boasts that a farmer can receive a signal up to seven miles from the parked vehicle. Both distances are, of course, subject to problems of land contour, electrical interference, and so on. These units can only be legally operated if the car owner has a CB license as they broadcast on the citizen's band.

The system consists of a mini-transmitter mounted behind the dash which receives a triggering signal from whatever sensors you have wired into it. One unit provides two transducers to measure sound and these are mounted either on the dashboard or on the car seat near the car doors.

The mini-transmitter is powered by the car battery and is tied into the car antenna which is used for broadcasting the warning signal to a pocket re-

ceiver carried by the car driver. The pocket receiver uses two AA batteries that will last up to three months if the pager is used 20 hours a day. Sensitivity of the transducers can be set by the car owner.

One good source of data on alarm systems, as well as technical data on car stereos, is Crutchfield Corp., which maintains toll-free telephone lines to answer questions. These phone numbers are (800) 446-7072 and, in Virginia, (800) 552-3961.

Considering that over a million cars were stolen last year in our country and that many thousands of cars had their CB and stereo equipment ripped off, the use of an alarm system to protect your car and its accessories is well worth considering.

But when selecting an alarm system, keep some of the obvious problems in mind. The wrong type of sensor may provide undesirable false alarms. The mercury switch for defeating tow-truck thieves is particularly vulnerable, as are capacitor-type sensors. The voltage sensor and the old reliable plunger types may be more practical in the long run. A sonic transducer type can work well if properly designed and tuned to proper sensitivity, but a vibration sensor may be difficult to tune to a point where it is sensitive enough to detect a thief but not so sensitive that it is triggered by accidental touch from a car being carelessly parked.



T E A C

# TEAC TODAY: THE ALL-TIME LOW IN TAPE NOISE.

On paper, the specifications\* look unbelievable:

80dB signal-to-noise ratio, 95dB dynamic range and 15dB more headroom than you've ever had. The sound is so noise-free, it's scary. And once you listen to the audio performance of the A-550RX, you'll know that cassette recording will never be the same.

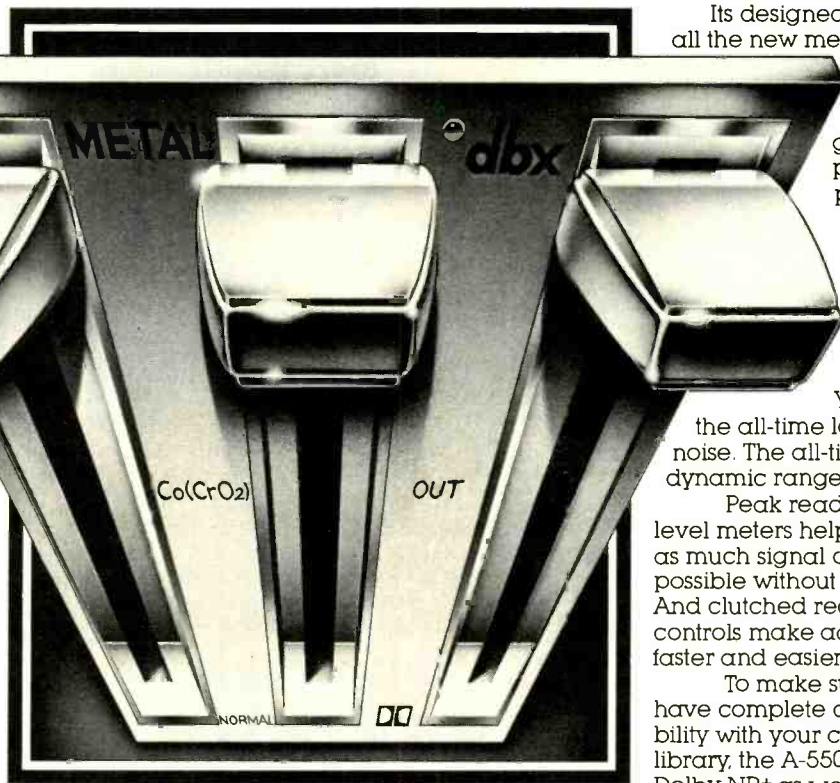
You'll hear signal without noise or hiss. Louder louds and softer softs. And you'll never have to be bothered by tape saturation again. All this because the A-550RX is the only mid-priced cassette deck ever to include integral dbx\*\* noise elimination plus complete metal tape capabilities.

A few years ago, the dbx system helped us revolutionize professional recording. Now the same technology is helping us move cassette performance into a new era. On the A-550RX, dbx II gives you broadband noise elimination and dramatically improved dynamic range. Signal articulation that's better defined than anything you've ever heard from a cassette tape. And the A-550RX doesn't stop there.

Full logic micro-switches control the high-stability transport. The A-550RX accepts our RC-90 remote control unit. And rack mounting hardware is available optionally. So listen to something you've never heard before.

The amazing A-550RX. You'll hear completely noise-free cassette recordings with the broadest dynamic range available.

So listen to something you've never heard before.



Its designed to handle all the new metal tape formulations. Which means you get the unprecedented performance of dbx II with the additional improvements provided by metal tape. You'll hear the all-time low in tape noise. The all-time high in dynamic range. Peak reading dB level meters help you get as much signal on tape as possible without distortion. And clutched record level controls make adjustments faster and easier.

To make sure you have complete compatibility with your current tape library, the A-550RX has Dolby NR† as well.

So listen to something you've never heard before.

The amazing A-550RX. You'll hear completely noise-free cassette recordings with the broadest dynamic range available.

So listen to something you've never heard before.

The amazing A-550RX. You'll hear completely noise-free cassette recordings with the broadest dynamic range available.

## TEAC®



\*Measurements made with metal particle tape  
\*\*dbx is a trademark of dbx, Inc.  
†Dolby is a trademark of Dolby Laboratories

All alarms have one Achilles' heel, their power source. In theory at least, a car alarm should have its own battery supply and not be tied into the car battery. A second-best arrangement, if the car battery must be used, is to make sure the battery is protected from criminal sabotage. Once the thief can gain access to battery wires running to the car's electrical system or can get his metal claws onto the battery terminals themselves, he can defeat any alarm system by simply cutting off the source of its power. A siren

without a battery makes a silent scream.

In addition to draining the car battery, car alarms that ring bells, blow horns, and screech with sirens face another difficulty, one shared by building owners with proprietary alarms using a bell on the outside of the building. The problem is one of public indifference.

We are in the era of indifference. When a car alarm goes off, what do passers-by do? Most glance at the car, smile wisely, and shuffle on their way.

After all, who wants to get involved?

What do you do when you hear a car alarm go off? You glance at the car, assume it is a malfunction of some sort that's triggered a false alarm, or decide that some good citizen is already phoning the police, and you go on your way with the screams of the siren growing fainter. The pager system has a major advantage here because the alarm signal alerts at least one person who cares that something is going on that's not right and that involves his car.

But in the end an alarm system is still more of a deterrent than anything else; it does not offer complete protection for your stereo equipment.

### Parking Problems

Where you park is often more important than installing an alarm. As one crook explained: "Any car I spot on a dimly lit street with a door unlocked or the window ajar, belongs to me if I want it." This guy had over 25 years experience as a car thief, so his words are worth remembering.

If you park your car in a driveway beside your home, face the nose of the car toward the street so any tampering under the hood is easily visible to a passer-by.

If you park on the street or in a shopper's parking lot, put your car in a brightly lit and busy spot. Only the dumbest car thieves ever try to rip off a car parked in a busy, well-lit location. Don't park in a dark alley or at the back of a large parking lot.

When traveling on a trip be aware of the "watchers" like John. These thieves let their victims come to them. They hang around rest areas or restaurants along busy interstate highways or turnpikes. When a family goes in a restaurant to eat, the thief knows he has at least 30 minutes to get to work with his iron. Often the thief will be into the car and gone with the loot before the family has ordered its meal. Remember that out-of-state license plates shout to a thief.

Parking at an airport can be dangerous too. Be sure windows are rolled up tight, doors are locked, and that the parking lot claim check is tucked safely away in your wallet.

Use tapered "anti-theft" door lock knobs to further hamper access with a coat hanger or other device. Tuck everything of value into the trunk when you leave the vehicle. Car boosters usually steal what they can see.

Try and avoid public parking where you have to leave the car keys in your car. Even leaving keys with an attendant is a risky business. Find a lot where



The new  
clean look,  
clean sound  
from Crown.

The Crown Power Line One amp and Straight Line One pre-amp were designed for people who seek accurate sound, whose joy is in listening and to whom simplicity of operation is important.

Such listeners have usually learned to listen with tone controls set flat. Those who did want a different response curve were frustrated with the usual tone controls, since only a limited roll-off pattern was available. Accurate sound could be achieved most satisfactorily with a separate equalizer.

So, by design, and for such people, we did not put tone controls on either of these particular Crown units. We did, however, build in important improvements in sonic quality. Frequency response on both units is  $\pm 0.1$  dB, 20 Hz-20 KHz with 1M distortion below .001%, as acoustically transparent as you can get.

The Straight Line One phono pre-amp module is a separate unit to be mounted close to the turntable. This solved an RF interference problem, and enabled Crown to engineer the quietest circuitry ever included in a phono pre-amp. Your

cartridge will generate more thermal noise than the circuitry in the SL-1 phono module.

The separation of phono module and pre-amp also gives you greater system flexibility, since any or all of the inputs can be used for turntables. There's also a moving-coil phono module available.

You'll find distortion indicators on the front panel of both units, to help you achieve optimum system balance. There's front panel speaker switching, the Crown IOC distortion detection circuit, peak output LED's, and a new concept in DC speaker protection.

The SL-1 and PL-1 are available in silver-colored front panels to match other Crown units, or in black.

Best of all, these are Crown units, built in the USA, and incorporating everything Crown has learned in thirty years of building state-of-the-art audio components.

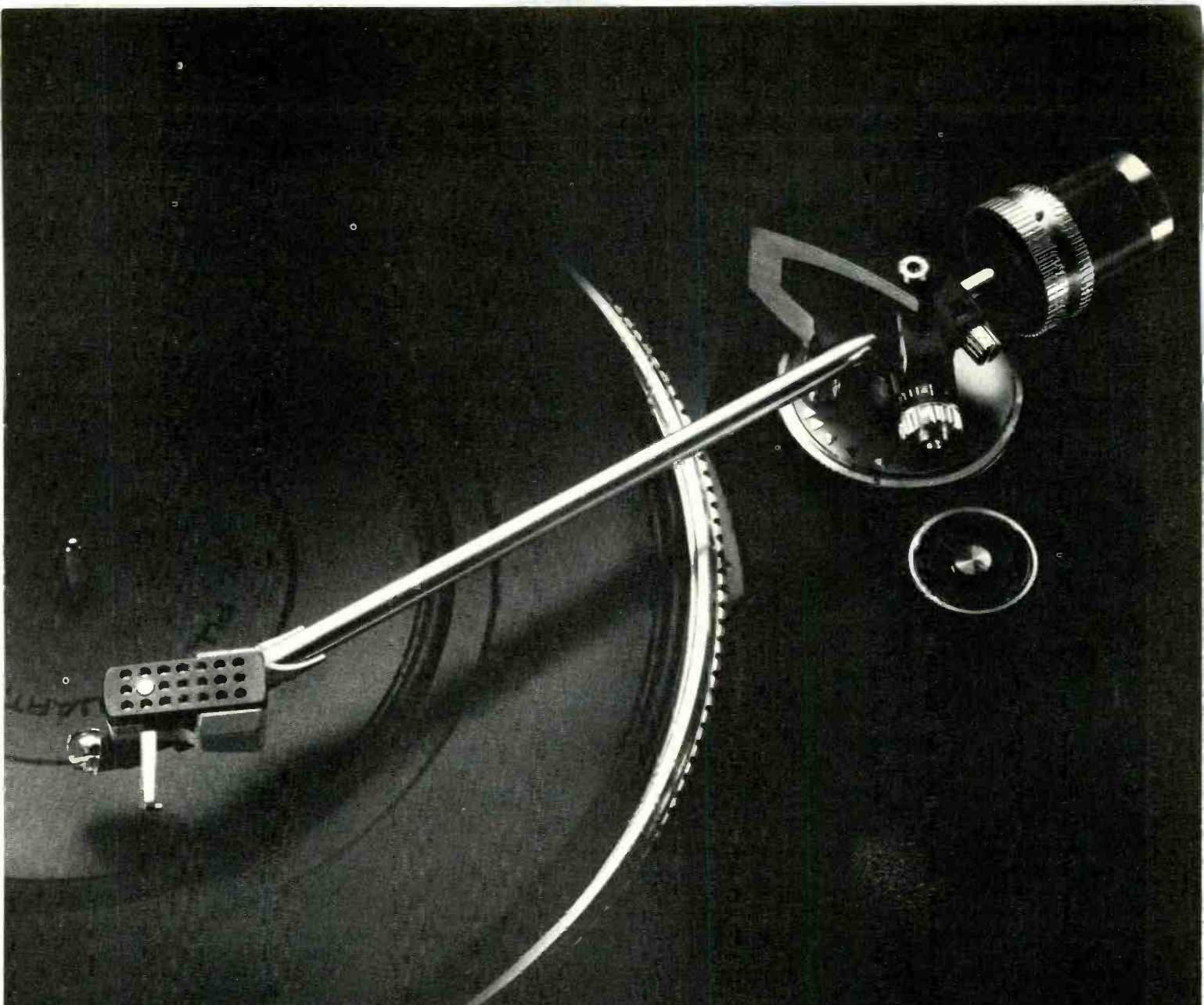
If you're prepared to invest about \$1100 in really fine audio, visit your Crown dealer for a full hearing on this great combination from Crown. Listen carefully, and enjoy clean, clear sound.



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This year, the quartz PLL direct drive 731Q, with its ultra-low-mass (ULM) tonearm and cartridge system, expresses our attitude perfectly.

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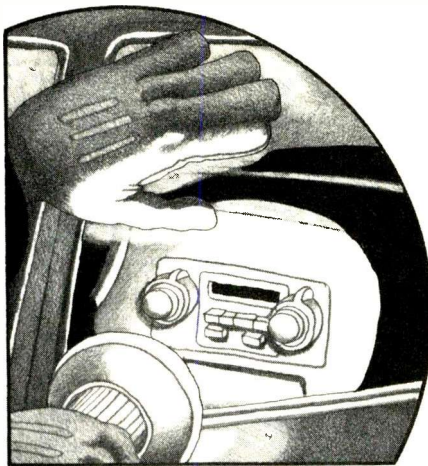
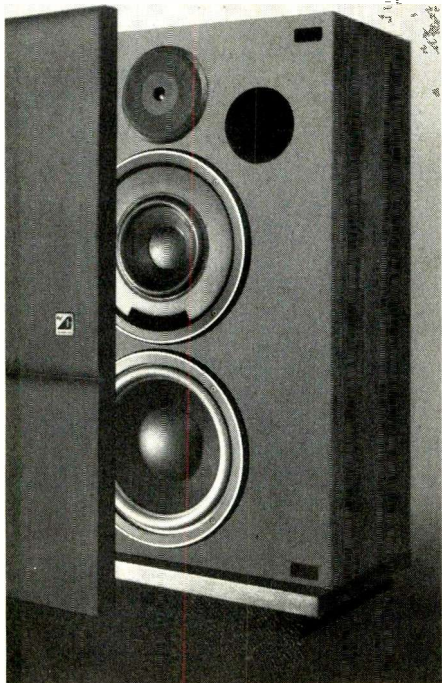
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you can lock your car and take away the key. If you must leave a key, leave only the ignition; don't leave the trunk key or your house or office keys because that invites duplication and later burglary. Cases have been uncovered in which the lot attendant worked with a gang of criminals who drove the customer's car from the lot to the customer's home. It caused no suspicion to have the car parked in the driveway of the customer's home since the car was often seen there. The gang looted the house and then returned the car to the lot. It's bad enough to have burglars rip off your home, but to carry away their loot in your own car, that's heavy stuff indeed!

Never leave a car title or registration in the glove compartment, and keep all gasoline credit cards on your person. If your car is stolen, these items make the thief appear to be the lawful driver of your car; it's also easier for a thief to sell your car.

Make sure you have a couple of copies of a list of the serial numbers on your stereo equipment. Keep this list in the house and another copy at your office. Don't leave it in the car.

If your stereo equipment is stolen and later recovered by the police, you cannot reclaim it unless you can positively identify it as yours. Therefore, it is wise to get an inexpensive engraving tool and mark your name or some secret symbol onto each of your hi-fi units. A motorized engraver costs less than \$20 and has a stroke adjustment to regulate the depth of engraving from deep to delicate. It comes complete with a carbide engraving point (carbide being second only to diamond in toughness), so you can put your mark onto metal or glass as easily as writing with a pen on paper.

### Plain Clothes or Uniform?

Whether you have an alarm or not,

some people suggest you put a sticker on your car window or windshield warning would-be burglars the car is alarmed. I personally don't go for that bit, as my experience is that stickers of this kind work against you. It tells the thief you feel you have something valuable in the car to protect and this makes him curious to find out what that precious thing is. I'd prefer not to whet the crook's curiosity. Leave those stickers off the car. Let the alarm system speak for itself. Pretend there's nothing worth breaking into the car for.

And that brings me to a neat idea used by some hi-fi buffs for protecting their equipment. They subscribe to the school of camouflage. Remember the way tanks and ships were painted during the war? And how GI ground troops were disguised with battle fatigues that look like an LSD trip?

This same camouflage principle can protect your dashboard hi-fi from prying eyes. One fellow I know got a clip to hold a Kleenex tissue box on his dashboard. He emptied the tissue box, then cut out a square hole in the back of the box so it fitted down over the tuning strip and dials on his hi-fi set. The finishing touch was a single Kleenex tissue sticking up out of the slot in the top of the box. Whenever he parked his car, he simply dropped the tissue box into place and a casual viewer peering into the car never suspected he was the owner of a costly car stereo set.

You can disguise your hi-fi in a variety of ways limited only by your imagination. A phony segment of dashboard can slip up from underneath to conceal your set, or a hanging sign pretending to be cute ("Closed for Operations," "Don't Disturb," "Shhhh Mayonnaise is Dressing" or whatever) may give protection from prying greedy eyes.

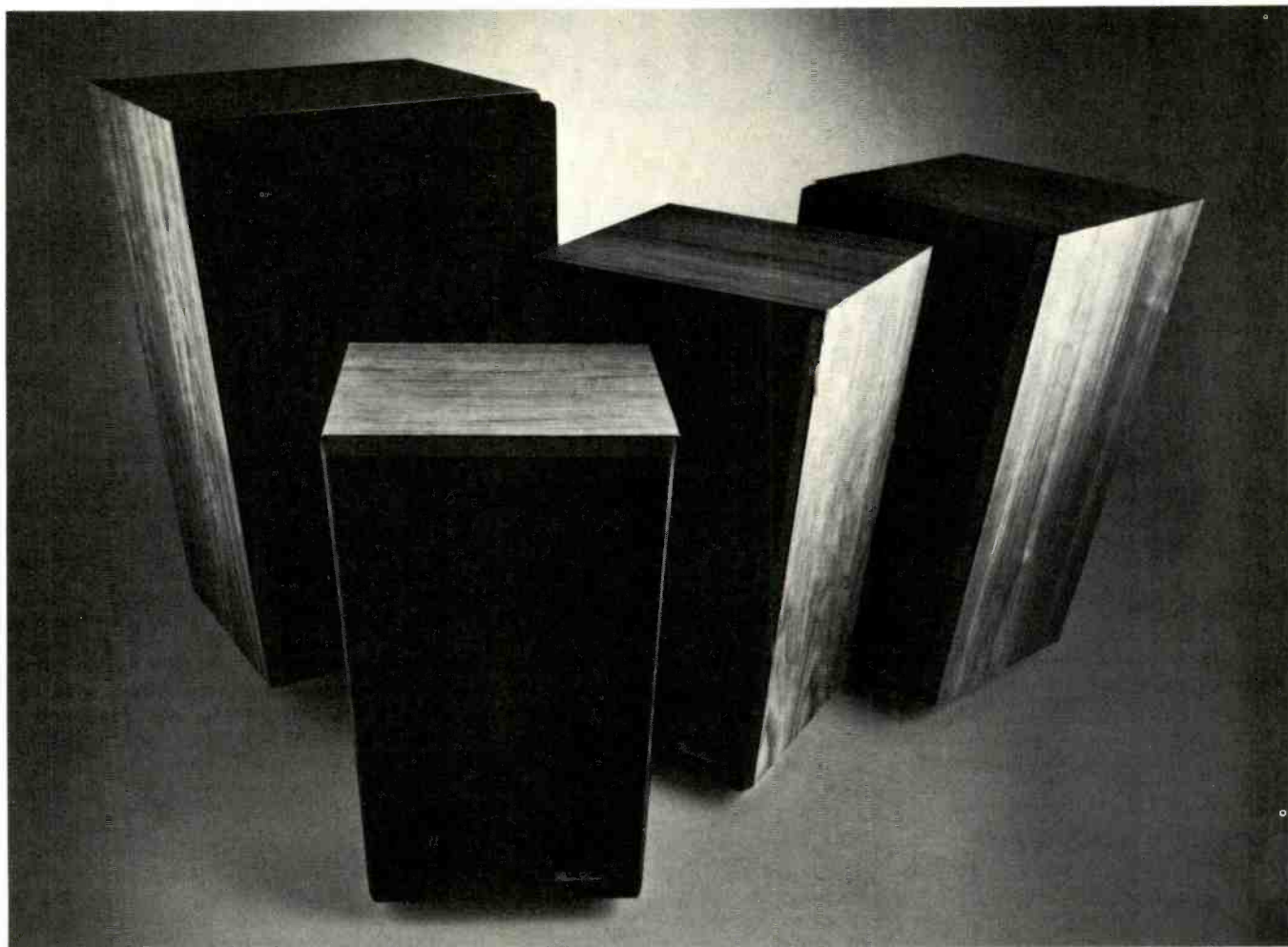
Take your pick: Alarm system, proper parking in a busy place, pocket pager, camouflage, and so on. Of course, for the ultimate buff looking for absolute protection, I have little to offer.

Let's face it, if the professional thief has his mind set on ripping off your stereo set, he's probably going to do it. But using some of these suggestions along with a dose of common sense (don't leave cassette tapes loose and visible on the seat of your car as that's too inviting to the thief), you can protect yourself from most of these crooks.

Whatever you do, don't make their job easy. A



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- Applying every computer-aided technique available, including extensive laser-holographic analysis.
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- Pursuing "no-compromise" quality at every stage of design, prototype development, test and manufacturing.

The result was an exact discipline of speaker design that far exceeds anything ever produced. Or heard. In fact, anything less and the listener invariably experiences *the speakers*. Instead of *the music*. We urge you to contact your Phase Linear audio dealer and audition the Phase Linear P-500 Purespeakers.



### **P-580 System Specifications:**

Frequency Response: 28Hz-120,000Hz  $\pm$  2.5dB.  
Total Harmonic Distortion Content: 20Hz-20kHz, less than 0.3%  
Intermodulation Distortion: (SMPTE) less than 0.03%  
Sensitivity: 91dB, 1 watt at 1 meter.  
Driver Complement: 9mg. Ribbon Tweeter, 2½" Beryllium Dome Midrange with Cantilever Suspension, 15" Concentric Rib Woofer.

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# Equipment profiles

## JVC Model A-X9 Stereo Integrated Amplifier



### Manufacturer's Specifications

**Power Output:** 100 watts per channel, 8-ohm loads, 20 Hz to 20 kHz; 105 watts at 1 kHz.

**Rated THD:** 0.005 percent.

**SMPTE IMD:** 0.002 percent.

**Frequency Response:** High level, d.c. to 200 kHz, +0, -3.0 dB; phono, RIAA,  $\pm 0.2$  dB.

**Damping Factor:** 200 at 1 kHz, 8 ohms.

**Input Sensitivity:** MM phono, 2.5 mV; MC phono, 200  $\mu$ V; high level, 200 mV; all for rated output.

**Phono Overload:** MM, 350 mV at 1 kHz; MC, 26 mV at 1 kHz.

**S/N Ratio:** MM phono, 82 dB; MC phono, 75 dB; high level, 85 dB; all rated via new IHF.

**Tone Control Range:** Bass,  $\pm 8$  dB at 100 Hz; treble,  $\pm 8$  dB at 10 kHz.

**Subsonic Filter:** 18 Hz, 6 dB per octave.  
**Muting:** -20 dB.

**Power Requirements:** 120 V, 60 Hz, 400 watts (505 VA).

**Dimensions:** 17 $\frac{3}{4}$  in. (44.375 cm) W x 6 $\frac{1}{4}$  in. (15.625 cm) H x 16 $\frac{3}{4}$  in. (41.875 cm) D.

**Weight:** 36.5 lbs. (16.6 kg).

**Price:** \$900.00.

JVC's Model A-X9 integrated amplifier is one of several products produced by that company which employs their newly developed "Super A" circuit. This circuit is said to provide the benefits of Class A operation (no notch or switching distortion) with efficiency approximating that of a conventional Class B circuit. Essentially, the Super A circuit employs a novel variable bias system for the output stages which keeps them in a state of conduction at all times, as would be the case in ordinary Class A operation. We will describe this circuit in some detail shortly.

Physically, Model A-X9 looks more like a sleekly designed basic power amplifier than a full-featured integrated amp. That is because most of the less-often-used controls are concealed behind a hinged door panel which is normally closed, providing an uncluttered appearance.

The controls that remain visible with the hinged door snapped shut include a massive master volume control, calibrated in dB with reference to maximum setting, and six slim, vertically oriented, bar-type touch switches which handle power on/off, audio muting, tape monitor selection, and

auxiliary, tuner or phono program-source selection. Secondary controls and features behind the closed door include the usual phone jack, two separate speaker selector buttons, a subsonic switch, a tone defeat switch, bass and treble tone controls, tape-2 in-and-out jacks (which parallel similar in-and-out jacks located on the rear panel), a balance control, and eight more small push buttons at the lower right of the panel. These switches include a *Record Off* switch which physically disconnects the record-out jacks from the rest of the circuitry to prevent possible loading effects when connected tape decks are turned off. A tape/record source switch follows (it reconnects the record-out jacks), then comes a dubbing switch, a tape-2 front-back switch (which selects the correct front or back terminals for tape deck connection), a tape 1/2 switch, a switch which selects moving-magnet or moving-coil circuitry for the phono inputs, and a phono selector switch which chooses phono 1 or phono 2 inputs. Since the MC/MM switch is separate from the phono 1/phono 2 switch, either set of inputs can accommodate either type of phono cartridge, MM or MC.

The rear panel of the A-X9 is equipped with the necessary phono 1 and phono 2 terminals, chassis ground terminals, a cartridge load selector switch (with settings for 47 kilohms, 100 kilohms and 100 ohms for MC cartridges), high-level input jacks and two sets of tape-out, tape-in jacks. The two sets of speaker connection terminals at panel-center are clearly labelled as to channel and polarity. A line fuse holder and three convenience outlets (two switched, one unswitched) complete the rear panel layout.

### Construction and Circuit Highlights

The high-capacity (380 VA) power transformer visible in the photo of the internal layout of the A-X9 is constructed with two sets of secondary windings. One of these is for the voltage amplifying stage, while a separate winding is used for output stage powering. For the early-stage supply, a constant-voltage circuit with a cascode amplifier is provided for low-impedance operation (less than 0.01 ohm) across a frequency range from 10 Hz to 100 kHz.

The most interesting circuit feature of the A-X9 is, of course, the Super A principle developed by JVC. Figure 1 shows a highly simplified circuit diagram of the Super A power stage. The portion within the dotted lines corresponds to the Super-A bias circuit, in which  $A_1$  and  $A_2$ , on the one hand, and  $VB_1$  and  $VB_2$  on the other, have identical functions and are arranged symmetrically in relation to the NPN and PNP side of the output stages.

The circuit operates as follows:  $A_1$  and  $A_2$  detect current variations of the power stage and apply input in the form of current output to  $VB_1$  and  $VB_2$ .  $VB_1$  and  $VB_2$  receive current output from  $A_1$  and  $A_2$  and perform current-to-voltage conversion, thereby varying the bias voltage applied to the power stage. The current detection amplifiers at  $A_1$  and  $A_2$  have logarithmic input/output characteristics in order to properly control bias-voltage variation characteristics.  $E_1$  is a voltage-regulated circuit, the principal functions of which are to determine the amount of idle current at the power stage and to adjust that idle current for any wide temperature variations which might occur within the amplifier.

JVC has also come up with an innovative cascode amplifier circuit for use in earlier stages and in the driver stage of the A-X9 which, according to the company, reduces various

forms of early-stage distortion that have previously not been dealt with. The basic circuit of this cascode amplifier is shown in simplified form in Fig. 2. This amplifier circuit is said to provide excellent linearity through a combination of the common-emitter and common-base circuits, since the forms of distortion created by each of these circuits individually are cancelled by each other. In this cascode circuit, input signal  $I_b$  is first amplified  $\beta$  times by the common-emitter circuit  $Q_1$  which provides a large current gain. The signal is then applied to the emitter of the common-base circuit,  $Q_2$ , where it is amplified  $\alpha$  times, thereby producing an output voltage across  $R_L$  which is equal to:

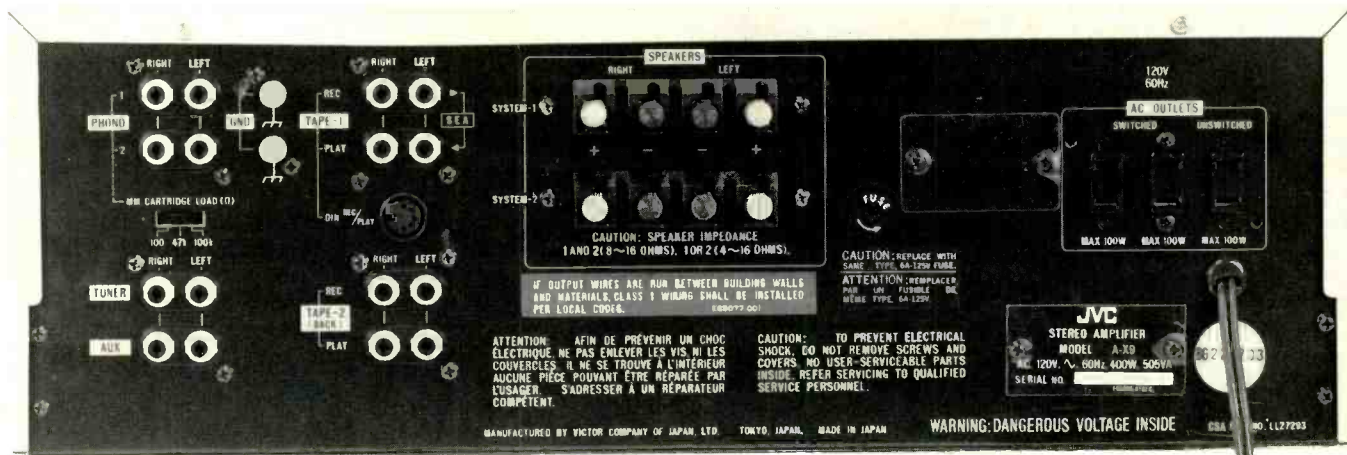
$$V_0 = \alpha \beta R_L I_b.$$

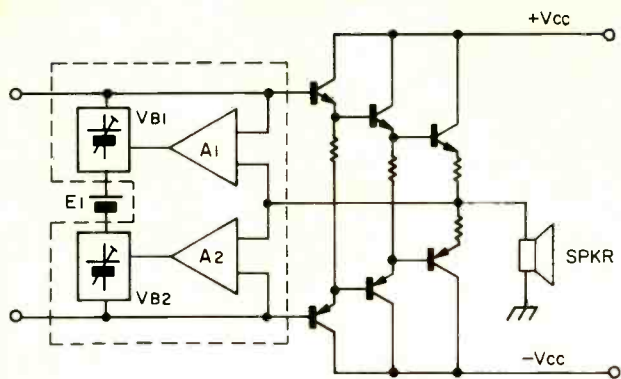
According to JVC, this type of driver stage takes complete advantage of the properties of cascode operation and reduces the distortion figure in the voltage and driver stages of an amplifier by a complete order of magnitude compared with conventional amplifiers.

### Performance Measurements

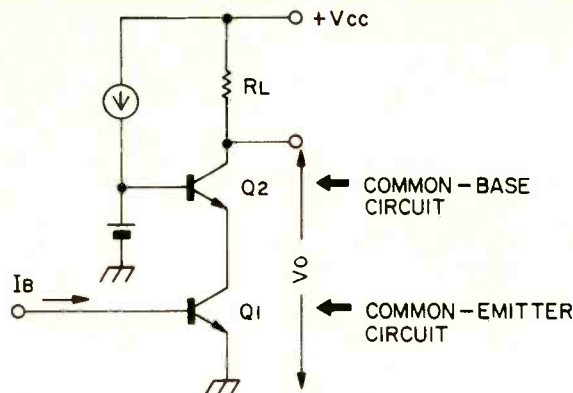
The power amplifier section of the A-X9 delivered 107 watts per channel at mid-frequencies for its ultra-low rated distortion of 0.005 percent. At 20 kHz, the amplifier was able to deliver just a bit more than its rated 100 watts for the same low distortion level. IM distortion was less than 0.002 percent, lower than the residual IM distortion component present in our test signal source. We attempted to measure other forms of IM distortion, using our two-tone distortion measurement system, such as CCIF IM and IHF IM, but in all cases we were limited by the test signals and the measurement equipment, rather than by the amplifier's actual performance. There would be no point in presenting graphs of power output versus distortion or of distortion versus frequency at rated output, since such curves would, in reality, be nothing more than graphs of the distortion of our own test equipment!

IHF dynamic headroom measured approximately 0.8 dB, while damping factor, at 50 Hz, was in excess of 150 for an 8-ohm load. Slew rate for the amplifier, measured from AUX in to speakers out was in excess of 50 volts per microsecond. We made an attempt to measure TIM, per the square-wave/sine-wave method which seems to be gaining general ac-





**Fig. 1 — Simplified schematic of JVC Super A output stage.**



**Fig. 2 — Simplified schematic of cascode voltage amp/driver stage used in Super A amplifiers.**

ceptance, but here, again, we could detect no evidence of TIM distortion contributed by the A-X9 amplifier itself. Frequency response was confirmed as extending from near-d.c. up to 220 kHz for the -3 dB roll-off points.

In measuring the phono preamp section, we found that RIAA equalization was accurate to better than 0.2 dB from 20 Hz to 20 kHz. Phono overload at 1 kHz using the MM input configuration was 380 mV, well above the 350 mV claimed by JVC, while for the MC inputs it measured 30 mV. Input sensitivities, translated to the new 1-watt output reference, worked out to be 0.25 mV for the MM inputs and 20  $\mu$ V for the MC inputs. Signal-to-noise ratio was 84 dB for the moving-magnet phono inputs, a bit better than the 82 dB claimed, while for the MC inputs we measured 68 dB, somewhat poorer than the 75 dB claimed. S/N via the high-level inputs (referenced to 0.5-volt input and 1-watt output) measured 88 dB, as against 85 dB claimed, while residual hum and noise at minimum volume was an impressive 113 dB below rated output.

Tone control range is shown in the spectrum-analyzer sweep photo of Fig. 3. Note that JVC chose to limit the maximum range of the bass and treble controls to a moderate  $\pm 8$  dB at the frequency extremes even though the A-X9 is a fairly powerful amplifier — a design approach with which we fully agree. Whether this moderate approach arises out of design philosophy on the part of JVC or out of some circuit necessity is really of no great concern to us, but we note that the A-X9 has no tone-control amplifier stage per se. Instead, the tone control circuit is incorporated as part of the negative feedback network of the power amplifier. One advantage of this approach, which does seem to be valid, is that all high-level signals, such as those from a tuner or tape deck, are directly

fed to the power amp for true d.c. operation from input to output and with no intervening coupling capacitors.

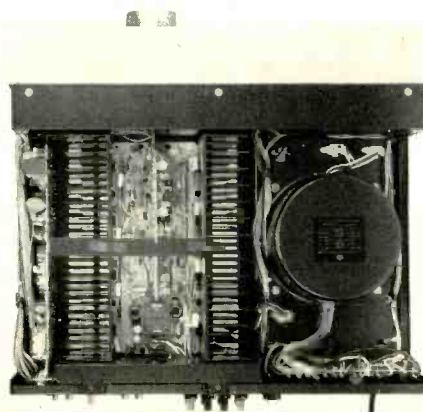
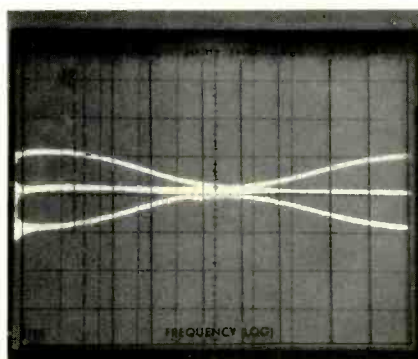
### Use and Listening Tests

We found the JVC A-X9 amplifier to be a versatile unit that manages to incorporate just about every feature that a serious audiophile might deem to be important in an integrated amplifier. While it does lack secondary tone controls, such as a midrange or presence control, and variable turnover frequencies, it more than makes up for these minor deficiencies in its ultra-low distortion characteristics, whether measured statically or under dynamic conditions. Musical reproduction, using the A-X9 coupled to a pair of Phase Research RT speaker systems, was especially good when the amplifier was called upon to reproduce some of the more complex signal structures contained in many of our master tape recordings and in some of our new digitally mastered, high-dynamic-range discs. We cannot honestly say that sound quality was noticeably better specifically because of the Super A circuitry, but we certainly can have no objection to an amplifier which operates with the efficiency of a Class B unit, yet eliminates any possibility of switching distortion by always keeping its output transistors in a conducting mode. There has been a lot of controversy lately concerning the question of whether this design and other similar quasi-Class A amplifier design approaches deserve to be called Class A amplifiers. As far as I am concerned, that is purely a semantic question, and one that I'll leave to language authorities. My own feeling about the JVC A-X9 integrated amplifier is that it is a superbly designed piece of equipment that delivers good performance at any listening level, whether you call it Class A or Class Z.

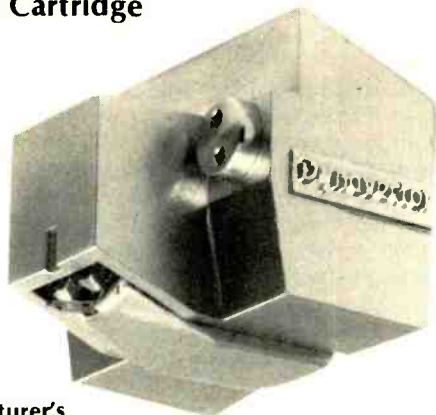
*Leonard Feldman*

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**Fig. 3 — Range of tone control operation; vertical scale is 10 dB per division.**



## Dynavector DV/Karat Diamond Moving-Coil Phono Cartridge



### Manufacturer's Specifications

**Output Voltage:** 0.2 mV at 1 kHz, 5 cm/S.

**Frequency Response:** 20 to 70,000 Hz.

**Separation:** 20 dB at 1 kHz.

**Channel Balance:** 1 dB at 1 kHz.

**Stylus:** Line Contact (0.1 x 0.1 mm), naked diamond.

**Cantilever:** 0.4 x 0.4 x 2.5 mm oblique-cut, solid diamond.

**Compliance:**  $15 \times 10^{-6}$  cm/dyne.

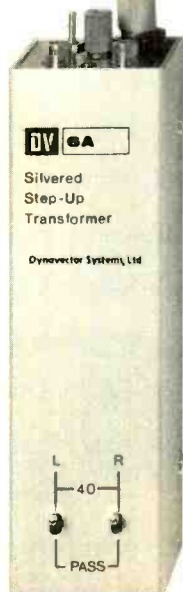
**Impedance:** D.c. resistance, 30 ohms; inductance, 80  $\mu$ H.

**Tracking Force:** 1.5 (+1.0, -0.3) grams.

**Vertical Tracking Angle:** 20 degrees.

**Weight:** 5.3 grams.

**Price:** \$1,000.00.



## DV-6A Silver Wire Transformer

**Input Impedance:** 3 to 40 ohms.

**Output Impedance:** 9,000 ohms.

**Load Resistance:** 30 to 47 kilohms.

**Step-Up Ratio:** 1:13.

**Frequency Response:** 10 to 70,000 Hz, +0, -1 dB.

**Crosstalk:** Lower than 75 dB.

**Maximum Input:** 300 mV (50 Hz).

**Distortion:** Less than 0.01 percent at 5 mV input.

**Switchable Connections:** Balanced or unbalanced, pass or 3 to 40 ohm input.

**Dimensions:** 2¼ in. (5.2 cm) W x 7⅞ in. (19.1 cm) D x 3 in. (7.5 cm) H.

**Price:** \$450.00.

For those who will not simply pass out at the thought of a phono cartridge costing a cool \$1,000.00 and still needing an outlay of at least another \$200.00 before it will interface with a standard phono input, the following report will be of interest. It is of the Dynavector DV/Karat Diamond cartridge.

The outward appearance of this cartridge is of unusual design. The gold-color body shell is made from fiberglass — reinforced polycarbonate which has a metallic-like hardness and low mass. The main body dimensions are 19 mm wide by 10 mm long, with the stylus assembly being 15 mm long by 8 mm wide. The overall height is 15 mm, and the mounting centers are the standard 12.5 mm. To mount the cartridge, the mounting screws are inserted through the top of the headshell directly into the threaded mounting holes in the cartridge body. This mounting process makes it easier to mount the cartridge than if the usual screws and nuts are required. The front of the cartridge has an indexing slot for locating the stylus during cueing.

The unique and expensive feature of the DV-Karat Diamond phono cartridge is its cantilever, which is made entirely from a natural octahedron diamond to a size of 0.4 x 0.4 x 2.5 mm. This 2.5 mm long cantilever has its 0.1 square mm stylus mounting hole precision cut by a YAG laser beam machining process. The line-contact shaped 0.1 square mm nude diamond stylus is carefully mounted in the cantilever for the unique stylus-cantilever assembly. The armature for the moving coil is 1 mm square and 0.5 mm thick, upon which are wound 40 turns per channel of 11 micron thick silver wire whose purity is 99.99 percent. The magnets are made from very strong but lightweight rare earth magnetic material.

Just about every cartridge, from moving magnet to moving

coil, is designed for as flat a frequency response as possible between 20 Hz and 20 kHz or better. However, no two cartridges sound alike nor does their reproduction of a square wave look alike. These differences are probably caused by the differences in damping material, cantilever material and design, and stylus shape — all within the physical rather than electrical parameters of the cartridge. In recent years there have been many stylus and cantilever designs, but still no change of major importance since the introduction of the Shibata stylus. Currently, Dynavector design engineers have taken another look at the cantilever design, particularly at the wave propagation along the cantilever. To improve the wave propagation problem, the Dynavector engineers have reduced the length of the cantilever to an unprecedented 2.5 mm instead of the usual 5 to 7 mm length and made it entirely from a solid natural diamond. Dynavector claims that the very short cantilever markedly reduces the dispersion of the propagation wave form of the musical signal along the cantilever, leading to a more realistic sound from the modulated grooves of a record. Further, because of the very small size of the cantilever, the resonant frequency is claimed to be higher than 50 kHz. With this design, the usual rubber damping is not necessary, thus ambient temperature has no deleterious effect upon the damping material used. Rubber material is used only for the suspension of the cantilever to overcome its tendency toward upward movement while playing a record — this use is not a damping action.

The Dynavector DV-Karat Diamond is packed in a gold-colored box which contains a frequency response curve plotted for the individual cartridge as well as the usual mounting hardware.

## Measurements

As is our practice, measurements were made on both channels, but only the left channel is reported. During the test period, the ambient temperature was 71 degrees F. (21.67 degrees C) and the relative humidity was 59 percent,  $\pm 2$  percent. The DV-Karat Diamond cartridge was mounted in a Technics headshell and used with the Technics EPA-100 tonearm mounted on a Technics SP-10 Mk II turntable. Voltage step-up was made using the DV-6A silver wire, 3 to 40 ohm impedance transformer. Since this transformer was specifically designed for the DV-Karat Diamond cartridge, all measurements and listening tests were made using the DV-

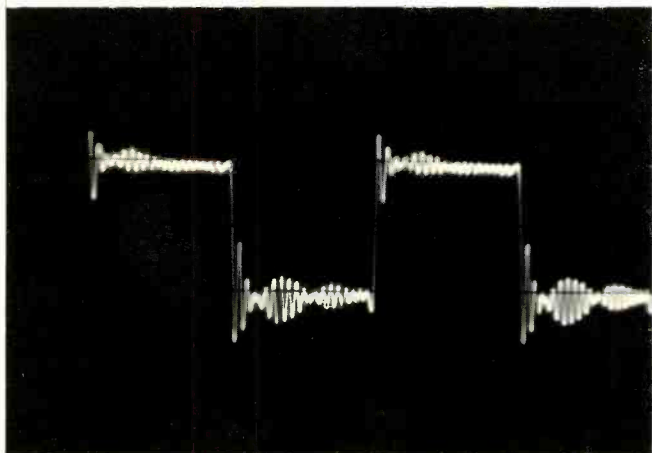


Fig. 1—Response to 1-kHz square wave.

6A silver wire transformer. The transformer's frequency response measured -1 dB at 20 Hz, flat from 40 Hz to 20 kHz, -1 dB at 30 kHz, and -3 dB at 50 kHz. The gain of the DV-6A transformer measured 22 dB.

All measurements of the cartridge were made at the recommended vertical tracking force of 1.5 grams. The optimum anti-skating force for this cartridge was found to be 1.8 grams. The cartridge was oriented in the headshell and tonearm for correct lateral alignment with the Dennesen Geometric Soundtractor, which automatically sets the appropriate overhang for any pivoted tonearm effective length.

Frequency response, using the Columbia STR-170 test record, is -2.25 dB at 40 Hz and then  $\pm 0$  dB from 60 Hz to 20 kHz (truly ruler flat). This is one of the flattest frequency response measurements we have ever encountered. Frequency response was checked out to 50 kHz, using the JVC TRS-1005 test record, and found to be  $\pm 0$  dB from 1 kHz to 18.5 kHz, +0.5 dB at 20 kHz, +1.6 dB at 30 kHz, then flattening out at +1.8 dB for 40 kHz and 50 kHz. This is a truly remarkable frequency response. Separation is 21.5 dB at 1 kHz, 21.75 dB at 10 kHz, 17.25 dB at 15 kHz, 14.25 dB at 20 kHz, 14.75 dB at 30 kHz, 14.5 dB at 40 kHz, and 13 dB at 50 kHz. This amount of separation is more than adequate for a well-defined stereo effect on playback.

The response to a 1-kHz square wave shows some overshoot followed by ringing that decayed rapidly. This type of square wave appearance is not uncommon with a moving-coil cartridge that has an extended high-frequency response to 50 kHz. The stylus resonance is around 41 kHz. The cartridge-arm low-frequency resonance was at 10 Hz laterally with an amplitude of about +0.7 dB and about 13 Hz vertically, using the Technics EPA-100 tonearm. Because of the low-frequency resonance, it is suggested that this cartridge be used only in tonearms of medium to low mass.

The following test records were used in making the reported measurements: Shure TTR-103, TTR-109, TTR-110, and TTR-115; Columbia STR-170, STR-100, and STR-112; Deutsches Hi-Fi No. 2; Nippon Columbia Audio Technical Record (PCM) XG-7002, and the Ortofon Direct-Cut Pickup Test Record 0001.

Wt., 5.25 g; tracking force, 1.5 g; opt. anti-skating force, 1.8 g; output, 77  $\mu\text{V}/\text{cm}/\text{S}$ , with DV-6A transformer, 0.90 mV/cm/S; IM distortion: (4:1) +9 dB lateral, 200/4000 Hz, 2.2 percent, +6 dB vertical, 200/4000 Hz, 4.3 percent; crosstalk (using Shure TTR-109), 26 dB; channel balance, better than 0.1 dB; trackability: high freq. (10.8 kHz pulsed), 30 cm/S, mid-freq. (1000 + 1500 Hz, lat. cut), 25 cm/S, low freq. (400 + 4000 Hz, lat. cut), 24 cm/S; Deutsches Hi-Fi No. 2 300-Hz test band was tracked cleanly to 86  $\mu\text{m}$  (0.0086 cm), lateral at 16.20 cm/S at +9.60 dB and 43  $\mu\text{m}$  (0.0043 cm), vertical at 8.12 cm/S at 3.64 dB. The latter measurements are excellent inasmuch as there are very few cartridges that can track the higher 300-Hz bands on the test record.

The DV-Karat Diamond cartridge with its DV-6A silver wire transformer was able to breeze through the Shure Obstacle Course—Era III test record. The Shure Obstacle Course—Era IV caused no problem except for band 5 of the harp test, where just a hint of possible mistracking was heard. This cartridge performed exceptionally well, particularly so since only an occasional cartridge can reproduce all the levels of the various bands on these two test records.

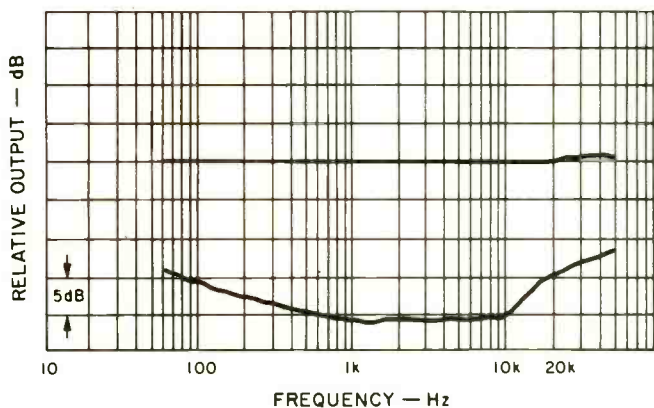


Fig. 2—Response of left channel and separation.

## Listening and Use Tests

As usual, we performed our listening evaluation both before and after measurement. The very first record we played with the DV-Karat Diamond cartridge and the DV-6A transformer combination impressed us with its extraordinary sonic clarity, bass response, transient response, and transparency of sound. Sonically, the cartridge was found to be wholly neutral, adding no coloration nor audible distortion to the reproduced sound. For what it's worth, the DV-Karat Diamond cartridge encountered no difficulty in reproducing the cannon shots on the Telarc 10041 Tchaikovsky: "1812" Overture, Op. 49 recording and the 19.2-Hz organ pedal in the Franck: *Pastorale in E Major* as recorded on the Hammond Castle Pipe Organ by Decibel Records DB 1000 (Box 631, Lexington, Mass. 02173). Without a doubt, this cartridge will cleanly reproduce any recorded sound.

After a period of prolonged listening, we are of the opinion that musically it is one of the most rewarding phono cartridges we have thus far encountered. For those who do extensive listening it can be particularly recommended for its non-fatiguing characteristics.

B. V. Pisha

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## Evaluation Equipment and Records

The following equipment and specific records listed below, as well as many discs listed in past reports, were utilized in the listening evaluation of the Dynavector DV-Karat Diamond phono cartridge: Technics SP-10 MkII turntable Technics EPA-100 tonearm, Nikko Beta 1 preamplifier, Crown IC-150A preamplifier, Audionics of Oregon Space and Image Composer, Audire DM-700 power amplifier, Audio Innovations LED 2C Dynamic Power Display, and a pair of stacked Duntech DL-15B speakers in each channel. Each pair of speakers was connected to the Audire DM-700 power amplifier with Monster Cable. The turntable was equipped with the Hiraoka Disk-SE22 turntable mat.

The following records were among those used to aurally assess the performance of the Dynavector DV-Karat Diamond phono cartridge:

### Stereo

*The Manhattan Transfer-Live*— Mobile Fidelity Sound Lab MFSL 1-022.  
 The Crusaders, *Chain Reaction*—Mobile Fidelity Sound Lab MFSL 1-010.  
 Mahler: *Symphony No. 4*, Karajan, Berliner Philharmoniker—Deutsche Grammophon 2531 205.  
*Virtuose Kammermusik*, Wolfgang Schulz, Querflöte—Telefunken 6.42364A.P.  
 Bach: *Die Dreifaltigkeitsorgel zu Ottoburen*, Ton Koopman (organist)—Telefunken 6.35375DX.  
 Indianapolis Symphony Orchestra, *Fifty Colorful Years*— RCA DPL2-0432.  
*Parnassus Ensemble*— Accent Acc 7806.  
 Kabi Laretei (piano), *Close-Ups, The Film Music of Ingmar Bergman* — Proprius: Prop 7829.  
 Mozart: *Requiem*, The Stockholm St. Jacob Choir, Stefan Skold—Proprius Prop 7815.  
 Pavarotti, *O Sole Mio, Favorite Neapolitan Songs* — London OS 26560.  
 Mendelssohn: *Symphonien Nos. 4 & 5*, Bernstein, Israel Philharmonic Orchestra—Deutsche Grammophon 2531 097.  
 Handel: *Organ Concertos*, George Malcolm (organ)—Argo ZRG 888.  
**Direct to Disc**  
 Spaccò Organ, Jonas Nordwall (organ)—Crystal Clear Records CCS 6003.  
 Laurindo Almeida, *New Directions*— Crystal Clear Records CCS 8007.  
 Tractin, Lew Tabackin Quartet—RCA (Japan) RDC-3.

Vivaldi: *Concerto in E, Op. 8, No. 1 "Spring"/The Beatles Medley*, M. Hayakawa, Vivaldi Ensemble, Tokyo—RCA (Japan) RDC-2.  
 Montgomery and Lytle, *Ragtime Piano for Four Hands*— Sonic Arts Laboratory Series No. 6.  
*Woofers, Tweeters and All That Jazz* (Binaural) — Sonic Arts Lab. Series No. 7.  
 Beethoven: *Piano Sonata No. 23 in F Minor, Op. 57 "Appassionata"*, I. Kamiya, pianist playing the Bosendorfer Imperial piano — RCA (Japan) RDC-4.  
 Vivaldi: *Four Seasons*, M. Hayakawa, Vivaldi Ensemble, Tokyo — RCA (Japan) RDCE-301-2.  
*New Baby*, Randi and Quest — Sheffield Lab. 12.  
*Introducing Bosendorfer (Imperial) and Kimball (Professional): The State of the Art in Recording Piano* — Kimball Piano & Organ Co., Jasper, IN 47546.

### Pulse Code Modulation (PCM) Digital to Analog

Ravel: *Daphnis et Chloe, Mata*, Dallas Symphony Orchestra and Chorus — RCA ARC1-3458.  
 Stravinsky: *The Firebird: Suite (1919); Symphony in Three Movements*, Mata, Dallas Symphony Orchestra—RCA ARC1-3459.  
*Digital Spectacular*, Stanley Black—His Piano and Orchestra—London LDP 30001.  
 Mozart: *Symphony No. 38 in D Major ("Prague") and Symphony No. 36 in C Major ("Linz")*, Suitner, NHK Symphony Orchestra—Denon OX-7156-ND.  
*Famous Classical Music on Screen*—Denon OX-7146-ND.  
*Beloved Screen Music*— Denon SX-7008.  
*Screen Music for Lovers*— Denon SX-7007.  
 Schubert: *Sonata in A Minor for Arpeggione and Piano; Vextemp: Sonata in B-flat Major for Viola and Piano*— Denon OX-7154-ND.

Proprius and Accent records are distributed by Audio Source, 1185 Chess Dr., Suite C, Foster City, Cal. 94404.

Sonic Arts Corp. and RCA (Japan) direct-to-disc records are distributed by Audio Technica U.S., 33 Shiawasee Ave., Fairlawn, Ohio 44313.

Denon records are distributed by American Audioport, 1407 North Providence Rd., Columbia, Mo. 65201.

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## Connoisseur Model BD2A Turntable



### Manufacturer's Specifications

**Speeds:** 33 $\frac{1}{3}$  and 45 rpm.

**Wow & Flutter:** Less than 0.065 per cent.

**Rumble:** -65 dB per DIN 45-539.

**Features:** Auto lift, belt drive, 45-degree gimbal arm suspension.

**Dimensions:** 18 in. (45 cm) W x 15 in. (37.5 cm) D x 6 in. (15 cm) H.

**Voltage Required:** 200/250 or 100/125 a.c.

**Power Consumption:** Less than 5 watts.

**Price:** \$220.00.

Connoisseur is one of the oldest manufacturers of turntables anywhere in the world, and it is interesting to recall that the firm's founder, Arnold Sugden, was making stereo records long before they were generally available commercially. The company is situated in Yorkshire, England, not far from some other British hi-fi equipment manufacturers including Rank/Wharfedale, Fane Acoustics, Richard Allen, and Castle Acoustics.

The Connoisseur turntable selected for this review is the Model BD2A, and I must say it right at the outset—the design will not appeal to those who are addicted to lights, bells, whistles, and other sorts of fluff which do not, at least in my opinion, affect the basic performance. There is no digital read-out, variable speed control, logic circuitry, or rows of

shining push buttons. The BD2A doesn't even boast a calibrated tracking-force dial or a strobe light speed indicator.

Rather, the design will appeal to those who are interested in a simple, no-frills concept—a good basic design, providing first-rate basic performance, but no more. Through the use of a small a.c. motor with a belt drive, to the platter, and by application of a healthy dose of common sense and lots of precision engineering, better than average results are obtained. And all of this comes in at what must be considered these days to be a rather moderate cost.

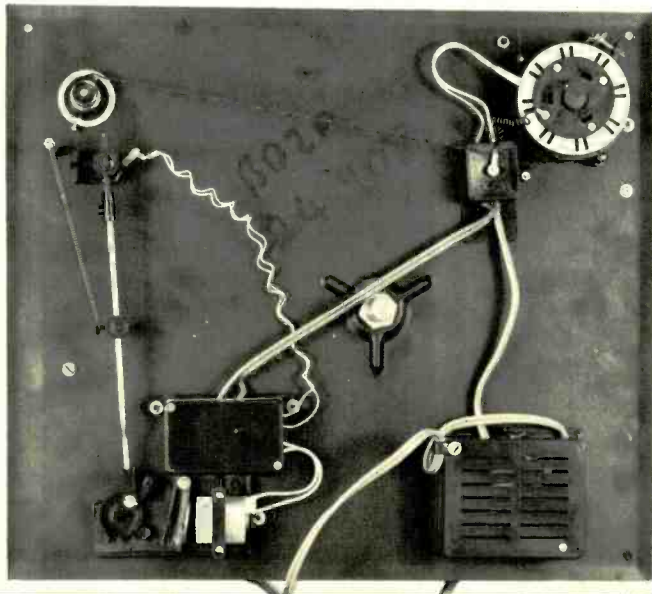
The motor is a synchronous constant-speed type with self-aligning bearings made of bronze, and it rotates at 450 rpm when running on 60-Hz current. The drive is taken from a twin-stepped pulley wheel to the platter by a rubber belt,



which is round in cross-section and treated with a silicon compound. Speed changes are effected through a lever which moves the belt by means of a fork. The motor itself is suspended on a sort of rubber bushing, and there is a bias tension to offset any pressure from the driving belt. Such a tension will help keep the bearing in proper round and prevent any asymmetrical wear.

The platter is made from a lathe-turned aluminum casting, weighs 2¾ lbs., and rotates on a manganese-bronze bearing fitted with a hard steel thrust ball. Following what is the most common European practice, the arm uses a straight-line tube design, while the angled headshell simply plugs in. The counterweight is mounted at the rear of the arm and, as stated earlier, is not calibrated. The correct tracking force is obtained by use of the high-precision balance supplied with the BD2A. An unusual feature of the arm is the use of 45-degree pivots which allows the connecting leads to be brought through the center and thus avoid torsional twisting. Anti-skating bias is provided by means of a tiny rod and weight which are carried on a concentric gimbal.

The cue lift platform is located just in front of the arm base, and it is operated by a knob on the right-hand side of the unit, up near the front. The height setting is controlled by a small thumb wheel at the base of the lift platform, which also contains a reed switch for operating the automatic arm lift at record ending. When the stylus enters the run-out groove, a tiny magnet mounted under the arm triggers the switch, which then discharges a capacitor through a solenoid. The on/off switch is at the front, to the left, and it controls a mechanical brake, as well as switching the power off.



Styling is clean and uncluttered, with a matte-black vinyl covering on the base and top plate contrasting nicely with the aluminum rectangle going around the top plate and the aluminum plate carrying the *On/Off* and *Cue* levers. The friction lid hinges are more substantial than those commonly used, while two black plastic buttons allow the dust cover to be lifted without leaving fingerprints. The unit stands on four acoustically sprung and damped isolation feet, and it comes complete with mounting hardware for the cartridge, a small bottle of oil, a tube of silicon compound for the belt, extra weights for tracking and anti-skating adjustments, the aforementioned balance scale, and a cardboard protractor.

### Measurements and Use Tests

For test purposes a Stanton 881S phono cartridge was mounted in the low-mass headshell and aligned as suggested in the instructions. This gave a maximum error of five degrees, which is fairly typical of arms with a length of 8¼ inches with an overhang of 9/16 inch. Tracking force was set to 1½ grams (after checking the balance for accuracy, which was extremely good, by the way), and the anti-skating weight adjusted accordingly.

Wow and flutter measured 0.06 percent (DIN 45-507), and rumble was a low -63 using the ARRL weighting. The ARRL weighting, as most will know, is not strictly comparable to the DIN method used by Connoisseur for their specification. However, the two methods are sufficiently alike that it is to be expected that the BD2A should be pretty well on spec.

Arm resonance with the Stanton cartridge came out at 10.5 Hz, with a rise of 4 dB. Both lateral and vertical bearing friction were insignificant. Speeds were less than 0.1 percent fast, and torque was apparently unaffected by use of a Dust Bug or similar device, which does not always happen with belt-driven turntables. The cue lift was nicely done, quite positive to the touch, and I found the backlash negligible when the control was adjusted for minimum height. Although the initial tests were made with a tracking force of 1½ grams, I found later on that the cartridge performed quite happily at 1 gram in this arm. However, to be on the safe side, I would recommend that both tracking and anti-skating forces be set at 1¼ grams. Acoustic feedback proved to be less of a problem with the BD2A than with many other turntables, apparently because of the good design of the isolating feet. Mechanically, the unit is remarkably quiet, while the unit as a whole is well engineered and made. The low-friction, low-mass tonearm can be used with confidence in combination with most any high-compliance phono cartridge.

To sum up: This turntable represents good value for dollar in that it provides good basic performance at a price which must be considered as moderate to low in these days of heavyweight inflation. It is not for everyone; those who are after a turntable with *everything* will be turned off by the economy of this straightforward design. But, to others, design simplicity and engineering elegance are virtues, which lead to the truly good standards of performance, and the BD2A will appeal to folks such as these.

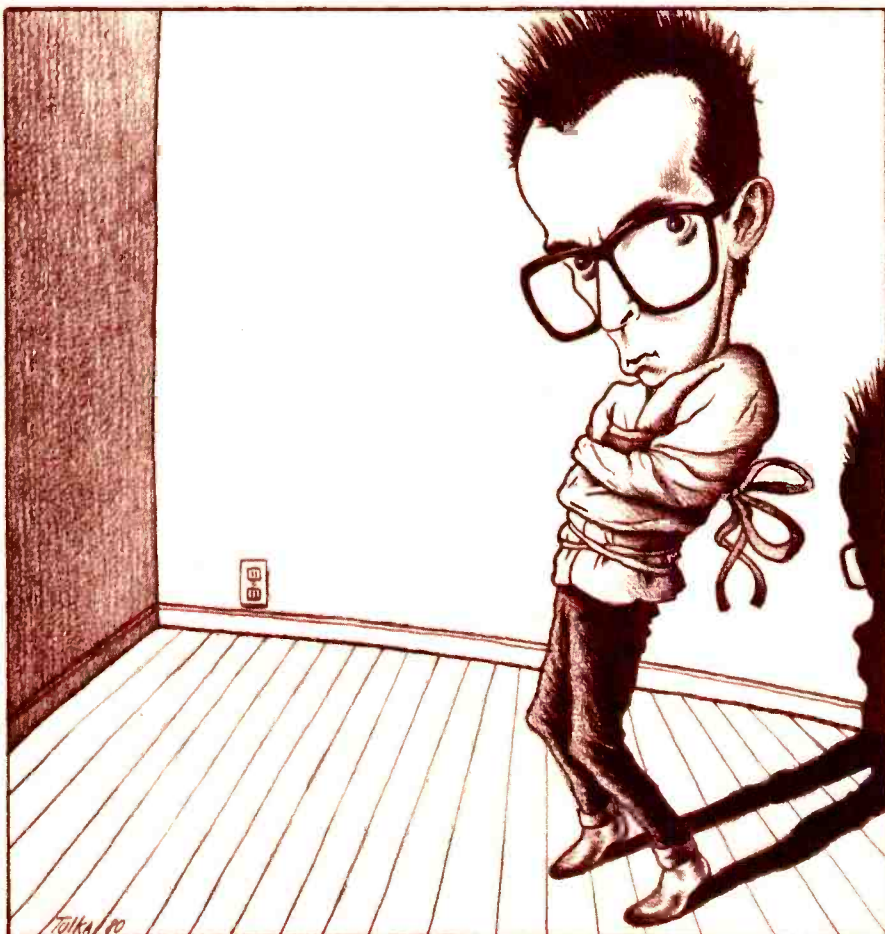
George W. Tillett

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Jon Tiven

Michael Tearson

# The column



**Get Happy:** Elvis Costello & The Attractions

Columbia JC 36347, stereo, \$7.98.

Any review of Elvis Costello should, I feel, be prefaced by a disclaimer: This is Perhaps the Most Important New Artist to Emerge in the Past Five Years and All Criticisms Should Be Taken with a Grain of Salt. The guy created a style which has been aped by many more successful (financially) than himself, but he has chosen not to dilute his art and has made four non-compromising albums that are all humanly flawed but will most likely stand the test of time long after Joe Jackson's in the ground. Elvis is obviously a gifted songwriter of many dimensions, a highly complex individual with tons of personal problems, and for some convoluted reason he lets it all out on his records, articulating his confusion in a code that makes Bob Dylan's language seem comparatively

transparent. Despite the fact that I'm a little tired of trying to listen to Elvis through Nick Lowe's production, and regardless of my personal opinion that many of the 20 songs on **Get Happy** aren't as strong as the others, and even though there may not be any hit singles on it, I must say that I enjoy the record more than just about any I've heard this year. Although the contents haven't completely settled yet, I look forward with eager anticipation to Elvis' next record.

Probably the most revolutionary thing about the album is that it's got 10 tunes per side, the first album of this length since Todd Rundgren's **Initiation** (I guess anybody who goes out with Bebe Buell for any time eventually gets an attack of longwindedness), and I'd guess that this is only a third of the songs Elvis has written since the last album (he's legendary for throwing out a tune a day).

Musically speaking, **Get Happy** isn't a major departure for Elvis. There are a few reggaefied/ska-ish tunes, as the current English bluebeat revival has his involvement (he produced *The Specials* and also had a single out called *Watching the Detectives* which was highly reggaed). Whereas the last album was somewhat keyboard dominated, this one tends toward emphasizing the bass guitar (the best musician in the group). **Get Happy's** hooks tend to be slightly more obscure than usual, but maybe because it's more difficult for 20 or so refrains to sink in. My personal favorites from the album are *Love for Tender* (Declan McManus meets the Jackson Five), *Riot Act* (wonderful chord progression), *Motel Matches* (one of his better ballads), *New Amsterdam* (can't wait for Crosby, Stills & Nash to cover it), *Secondary Modern* (seemingly a sequel to *Green Shirt*), and *The Imposter* (Elvis about Elvis, sort of like *Big Boys*). The cover tunes are OK, although I prefer Heads Hands & Feet's *I Stand Accused* to the British single, *I Can't Stand Up for Falling Down* (not a song about impotence).

It's interesting to note that the sides are listed one way on the jacket and the other way on the record, i.e. what is side one on the jacket is side two on the label. This is either part of the artist's decision to confuse listeners and radio folks, or the record company's decision (at the last minute) that the side labeled one on the jacket is the weaker of the two (which is, in fact, true). In any case, Elvis once again treats us to an album which has us hopefully awaiting his next, in the expectation that he will finally come up with the LP which truly represents the high points of his talent. In the meantime, we have **Get Happy**, which almost comes close. J.T.

Sound: B-

Performance: A-

**Get Happy:** Elvis Costello & The Attractions

Columbia JC 36347, stereo, \$7.98.

Elvis Costello's fourth album, **Get Happy**, could hardly have been more different from the third, **Armed Forces**. **Forces** was very carefully crafted, very much a studio and stereo creation

Illustration: Rick Tulka

with very good sound. **Get Happy** is very ambitious, containing 20 songs, ten per side. By aural appearances the album was mostly recorded live in the studio with minimal overdubbing and done rapid-fire, one song after another. The sound is tough and raw. Costello's voice is most often buried in the mix and undecipherable while the band has never sounded muddier.

As for the songs, 18 are originals and two are covers, one an obscure Sam & Dave B-side, the other a Mersey Beats song. Oddly, Costello seems intent on undermining some of his best ideas either through the deliberately cheesy recording or opaque arrangements. *B Movies* is an excellent example. When I first heard it played as a brand new song, it was an angry, driving, full-throated rocker written right after the infamous remark about Ray Charles and the ensuing incident with Bonnie Bramlett—which had occurred only a week before. Now on the record the

melody is a different, cuter one that forces the words into a jumble. The voice of fury gives way to a petulant whine.

Frankly, out of 20 songs, some are awfully good. With that many so it should be. Two ballads—*Motel Matches* and *Riot Act*—stand out. *High Fidelity* is a wonderful song with an insistent catch line in "Can you hear me?" *Beaten to the Punch* is spunky, and *Black and White World* is challenging. But the overall impression, an unavoidable one, is confusion amidst all the '60s sounds.

Costello and producer Nick Lowe have admirably reached for a lot, but they've made it as difficult as they could for a listener to absorb. Producer Lowe has written some brief notes for the album's back cover, obviously tongue in cheek, but they bear quoting: "Elvis and I talked long and hard about the wisdom of taking this unusual step [of putting 10 songs on a

side], and [we] are proud that we can now reassure hi-fi enthusiasts and/or people who never bought a record made before 1967 that with the inclusion of this extra music time they will find no loss of sound quality due to 'groove cramming' as the record nears the end of each face (i.e. the hole in the middle)." I must read this note as sardonic, contemptuous and damn near downright insulting. In fact, the songs are all so short that while **Get Happy** does have an admittedly generous amount of playing time, it by no means represents a breakthrough of any kind. Further, the sound, as I've already noted, is so muddy and impenetrable that the album is no less than a gratuitous slap in the face, particularly after the technical excellence displayed on **Armed Forces**. And it is not anywhere near as much fun either.

M.T.

Sound: D

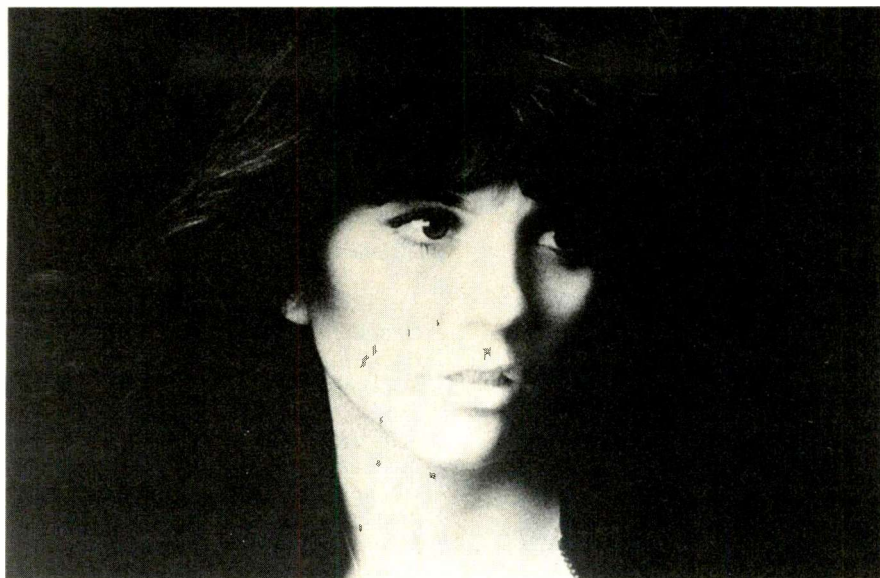
Performance: C-

#### Mad Love: Linda Ronstadt

**Elektra/Asylum SE-510**, stereo, \$8.98.

Any New Wave fan worth his weight in safety pins is going to take offense at this record, the mere concept of Elvis Costello-written tunes appearing with those by Los Angeles Knack-clones The Cretones being too much to stomach. One would have hoped that the influx of punk and its garbaged-out friends would have led the Jackson Browne/Eagles/etc. school of rock out of their laid-back stupors and merely encouraged them to rediscover their American rock 'n' roll roots. After all, the successful English bands of today are just aping Yank rock of the Fifties and early Sixties, and that certainly would be easier for Russ Kunkel to relate to than Gary Numan or Rat Scabies. Unfortunately, these Los Angeles types don't have enough imagination to put all that together, and when Linda Ronstadt decided to make herself a New Wave album her role models were handpicked from the British charts. Her backing band/songwriters were Wendy Waldman's band, who must have recently discovered the wonders of punk, chopped off their beards and dropped all their augmented sevenths in a bucket.

**Mad Love** isn't a terrible album, but it doesn't stand a chance of ringing true. Instead of making the Elvis Costello songs sound like they were written for her, Linda sings them in a



hyper style, with Peter Asher's arrangements note-for-note from the originals. This is most unfortunate, as (a) there was plenty of room for interpretation and improvement and (b) Linda's not exactly the most comfortable vocally when she sings frenetically. As far as the Cretones-penned tunes, well, they ring with as much authenticity as you'd expect from someone who was playing Eagles-rock all his life and then discovered Blondie.

However, I must say that I don't mind at all. I'd rather Linda be carrying

the New Wave banner and make the genre a little more acceptable to AM radio disc jockeys than continue flogging a long-dead horse, even if it doesn't exactly suit her personally. One day she might discover what she really wants to sound like and be more than a mere reflection of whatever's trendy, but if she wants to be a 12-inch ad for Elvis Costello, that's her prerogative. I suggest you purchase the original myself.

J.T.

Sound: B-

Performance: B-

## The Audio Critic reports a major speaker development.

In its forthcoming ninth issue (Vol. 2, No. 3), The Audio Critic acquaints you with a new speaker system that just might shake up the whole speaker world.

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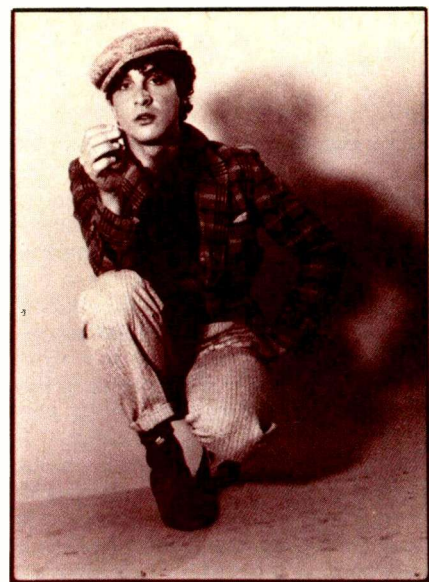


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### Sylvain Sylvain RCA AFL1-3475, stereo, \$7.98.

A veteran of The New York Dolls, Sylvain comes on like some Sal Mineo-styled squirt who rocks his little Manhattan butt off, but he's got his share of problems getting the news out on his debut solo effort. First off, his band sounds like the lamer side of yesterday, in most cases failing to give him the proper drive and power that his songs and vocal delivery require. Secondly, he co-produced the album with two engineers, and the result is a disappointingly thin-sounding record with vocals which are a little too strong emotionally at times and could have used an edit here and there. And to add insult to injury, the strongest tunes are almost all on side two, which puts little Syl at quite a disadvantage with the DJs of the world who might needledrop on side one and just say forget it.

All this considered, **Sylvain Sylvain** is a collection of some very hot rockers and no shortage of personality — considering that the boy was born in the Middle East, you wonder how he ends up sounding like he's ready to do for Brooklynese what Wreckless Eric does for Cockney. Not that he needs an interpreter, but his vocals lay the accent on a little thick so get ready for it, nasality and all. But skip side one and go straight to *Every Boy and Every Girl* which, with a few embellishments, could actually end up as a hit single, sounding like an outtake from **The Beatles' Second Album**. *14th Street Beat* is a little mindless, but the rhythm'll get you every time. *Deeper and Deeper* sounds like a classic from 20 years ago, even though it's only two



or three years old — it's the strongest ballad on the album; *Without You and I'm So Sorry* on side one are completely overdone in the sappy arrangements department. Finally on side two, *Ain't Got No Home* is a raver in a way that The Band never got close to with their cover. Now skip to side one again, play *Emily*, and you've got five killer tunes — but five killers doth not an album make. Unfortunately, **Sylvain Sylvain** is a terrific EP and once he gets his ensemble together (word is that he's sacked his entire band), a great second album could be in the works. It's not inevitable, mind you, but somewhere Sylvain has got a definite rock album in him, and one of these days he might even put it out. *J.T.*

Sound: C

Performance: B

### Dancing in the Dragon's Jaw: Bruce Cockburn Millenium/RCA BXL1-7747, stereo, \$7.98.

If there was justice in the music business, Bruce Cockburn would not still be Canada's best kept secret south of the border. At home he is regarded as almost a national treasure who performs regularly to packed halls. In the U.S. several of his 10 albums have been released, most notably the wonderful *In the Falling Dark*, but none has made the slightest dent, which is a pity. As a poet, Bruce is at the very least the equal of Joni Mitchell and very possibly better. His writing has true substance and meaning and depth. The music he sets his lyrics to is richly textured and jazz-tinged, and the musicians he attracts are Canada's cream, sensitive and probing players.

**Dancing in the Dragon's Jaw** is surely one of Cockburn's very best albums. It boasts liberal doses of every element

I've mentioned: Probing songs with excellent lyrics and breathtaking instrumental performances, not the least by Cockburn himself on guitar — he is a dazzling player himself who can cascade notes at will. As is also usually the case with Bruce's records, the album boasts crystalline recording and excellent production by Eugene Martynec who has handled most of Cockburn's output to date.

If this was a fair world, there would be no question about **Dancing in the Dragon's Jaw** finally bringing Bruce Cockburn's extraordinary talent the recognition and appreciation so long and so obviously overdue him in the States. Canada has given us Joni Mitchell, Gordon Lightfoot and Neil Young, to name only a few. Cockburn is at least the equal of any of them, and he should be heard. *M.T.*

Sound: A

Performance: A

John Lissner

John Diliberto

# Jazz & blues

**The Harmonica According to Charlie Musselwhite:** Charlie Musselwhite  
**Kicking Mule 305**, stereo, \$7.98.

Soaring, exhilarating, swooping harp lines are what his fans have come to expect from blues harp master Charlie Musselwhite, and that's just what he delivers on this album. He's back in fighting form after his lackluster Crystal Clear set, and harp fans will find this disc an absolute joy.

The album was cut in England with a pickup band of local musicians who are competent enough, but don't quite measure up to Musselwhite's best bands of the past. As if to prove the point, he's remade *It Ain't Right*, (here called *Pistol in Your Face* but musically virtually identical) which first appeared on his landmark **Takin' My Time**. On that earlier record, Musselwhite and his sidemen raced through the tune with a frantic urgency, as though only four minutes of studio time remained in which to cut a five-minute song.

This time out, the level of teamwork is not as high. His band seems content to merely lay down a workman-like rhythm and leave all the instrumental chores to Musselwhite, who predictably comes through with flying colors. The key to the difference between the two versions rests in the virtues of road-seasoned sidemen, as opposed to pickup bands. Musselwhite's best work has been done with groups that had worked with him extensively before recording, allowing an almost intuitive interaction in the studio that's largely absent on this set.

The album greatly benefits from a diverse selection of material which ranges from rave-up amplified harp showcases, reflecting the influence of Little Walter Jacobs and Shakey Horton, to acoustic numbers modeled on traditional themes. Of special interest is *Tuff*, originally an instrumental by saxophonist Ace Cannon, which is a prototypical end-of-the-night bar song. Musselwhite's full-bodied wailing rendition of it recalls Junior Wells' description of a blues harp as a "Mississippi saxophone."

**The Harmonica According to Charlie Musselwhite** offers further proof (not that true believers needed any)



that few living harp players can compare to this 35-year-old veteran of Chicago's clubs.  
Roy Greenberg

Sound: B                      Performance: A-

**Bloomfield/Harris:** Michael Bloomfield and Woody Harris  
**Kicking Mule KM 164**, stereo, \$7.98.

This is an unusual record, to say the least. Who would have guessed that one of America's most respected neoblues guitarists (Bloomfield) would team with a woefully under-recognized composer (Harris), whose normal concern is a cross-fertilization of folk-guitar concepts with chamber music, to play a series of instrumental duet arrangements of traditional gospel songs?

Truth be told, this will not be to ev-

eryone's liking, at least not right away. It has to sink in, if only because the duo's approach to the material is far removed from the virtuosic flashiness normally expected from such "super sessions," and is instead very sober and dignified. In addition, the fact that the first cut, *I'll Overcome* (of which the more familiar *We Shall Overcome* is a slight variation), is also the most technically flawed lends an unfortunate impression of what is to come. But live with it awhile, for the more one listens, the more one realizes that this is a very special record.

Bloomfield assumes the lead on most of the tracks, dividing his time between acoustic (picked on three cuts, slide on one) and heavily reverberated electric slide guitar. He states the melody in a direct, unaffected manner, then proceeds to thoroughly



investigate the theme, extracting from it a wealth of nuances, subtleties, and implications without straying far from the song's original intentions. Harris provides a simple, steady, sensitive, and supportive backdrop, supplying not so much rhythm as body, structure, and guidance to Bloomfield's thematic improvisations. It all sounds so easy and unsophisticated, though actually a great deal of thought, care, inspiration, and discipline has gone into this quietly emotional and ultimately moving music.

Most of the songs originate in the black gospel tradition, except for two — *I Am a Pilgrim* (played with a livelier-stepping bounce than the other tunes, as befits a Merle Travis favorite) and The Country Gentlemen's beautiful bluegrass hymn, *Have Thine Own Way* — which come from country-gospel. Each guitarist has a solo track; Harris tastefully embellishes Joseph Spence's *Great Dreams from Heaven*, while Bloomfield plays an eerily tremulous *Peace in the Valley* on electric slide over his own acoustic accompaniment. It should be noted that the titles of *Just a Closer Walk with Thee* (given a unique Hawaiian-blues interpretation) and *Farther Along* are reversed in the title listing and on the label, but are in the correct order in the liner notes.

This is hardly a record to turn to for instant gratification. Nevertheless, it shouldn't be long before many people will be listening to **Bloomfield/Harris** with the same esteem that Bloomfield and Harris have themselves accorded their sources for the songs on this one-of-a-kind record. *Tom Bingham*

Sound: B Performance: B+



**Pick 'Em:** Ron Carter  
Milestone M-9092, stereo, \$7.98.

Ron Carter is a formidable bassist whose broad, rich sound and distinctive intonation have imbued even the most pedestrian sessions with a feeling of vitality. His work with the decidedly non-pedestrian Miles Davis is, of course, legendary.

On his own albums Carter seems to founder in an absence of inspiration, yet they all have unique facets as he places his bass in different settings, often with strings. His working quartet is an unusual assemblage that has Carter pairing his piccolo bass with the standard upright of Buster Williams, in addition to pianist Kenny Barron and drummer Ben Riley. On the **Piccolo** album he proved that this could be a dynamic combination, but most of his albums fall in the area of sophisticated background music, and **Pick 'Em** is one of those.

His "piccolo" quartet is augmented on all tracks by a cello quartet. The arrangements are tasteful and avoid the syrup, but the effect is somnambulant. Even Miles' *All Blues* is given a walk-through performance. The title piece seems to jump off the disc by comparison. It plays like a soundtrack to western Americana with cellos sawing and Hugh McCracken's open-road harmonica. But the road goes nowhere, and it is followed by the aptly titled *Tranquil*.

The album is crisply recorded with the strings integrated with Carter's quartet. But easy playing, no matter how great the chops, can yield only easy-listening music. *John Diliberto*

Sound: B+ Performance: C



**Fine and Mellow:** Ella Fitzgerald  
Pablo 2310 829, stereo, \$8.98.

Fine and mellow is right; this is Ella's best album in years. These sessions were actually recorded by Norman Granz in 1974 at the MGM studio in Los Angeles with Ella in full command of her vocal powers. **Fine and Mellow** may be the finest jazz album she has ever made, and ranks with her superb pop efforts like *Ella Sings Gershwin*, recorded some years ago for Decca. The session is wonderfully relaxed, and Ella and the musicians seem to be having a ball.

One of the most striking things about **Fine and Mellow** is the marvelous vocal and instrumental partner-

ship. Ella is sustained and complemented by an outstanding rhythm team — Louis Bellson, drums; Ray Brown, bass; Joe Pass, guitar, and her own accompanist, Tommy Flanagan on piano. The four horns are superb — Zoot Sims and "Lockjaw" Davis on tenors; Clark Terry and "Sweets" Edison, trumpets. Beautifully backed by this cohesive group, the First Lady of Song floats through numbers like *I'm Just a Lucky So & So*, *I Don't Stand a Ghost of a Chance*, *I'm in the Mood for Love*, and *Polka Dots & Moonbeams* with skillful phrasing. Her rendition of Monk's *Round Midnight* is feelingful and evocative as she gently entones the lyrics and colors the melodic line to the accompaniment of beautiful obligatos by Clark Terry, Sweets Edison, and Jaws Davis.

She really swings up a storm on Ellington's *Rockin' in Rhythm*, plunging exuberantly ahead, accompanied by Flanagan's crisp, jaunty piano and with some fine choruses by Zoot, Sweets, and Jaws dancing alongside her. She does some fine scatting here, wailing like a hot tenor sax. Her earthy approach to *Fine and Mellow*, a blues forever identified with Billie Holiday, is as fine as Lady Day's classic version. Engineer Ed Greene is responsible for the admirable recorded sound.

*John Lissner*

Sound: A Performance: A+

# Classical reviews

Edward Tatnall  
Canby

**Vivaldi: The Four Seasons.** Performed on authentic instruments by the English Concert, Trevor Pinnock, dir. Vanguard VSD 71257, stereo, \$7.98.

You have never *heard* this familiar work until you have heard this extraordinary performance — extraordinary in three ways. First, it makes use of strings in the original unaltered “Baroque” condition, as they existed (here in originals and modern copies) before all the strings were beefed up for louder, stronger sound in the early 19th century. A mild difference on records (we cannot hear the difference in absolute volume) but a wonderfully subtle one in terms of tone color. Second, these strings are played with very little of the modern vibrato, for a sound that is most unusual and, I strongly feel, indeed the kind of sound that would have been produced in Vivaldi’s day from a string orchestra. Vibrato is a matter of choice, via the fingers.

Third, Trevor Pinnock, celebrated British harpsichordist, has worked out with this small orchestra an absolutely remarkable interpretation of the music, awesomely dramatic. You won’t believe it, if you have heard the music in “ordinary” recordings with standard modern string players. Too dramatic? One might think so, but not really. These “nature” effects, thunderstorms, depictions of spring and summer and winter, were surely a new sort of excitement for the musical audiences and we can assume that Vivaldi knew exactly what he was doing and how to wring every bit of drama out of his pictorial effects. That is what happens right here. You’ll never want to play your other versions again — unless as so much hi-fi sound.

Sound: B+ Recording: A- Surfaces: B

**Dussek: Complete Piano Sonatas, Vol. 3.** Frederick Marvin. Genesis GS 1071, stereo, \$6.98.

I look forward to each of the volumes in this series, which intends to cover no less than 49 works by this too-neglected big composer (and virtuoso pianist) of the turn of the 19th century. The music is really fascinating, out of the Mozart-Beethoven-



Weber period, and Frederick Marvin’s dedicated and passionately Romantic playing is immensely communicative. Dussek is no Mozart, nor yet a Beethoven, but these were the super-unusual types of their day; other excellent composers of a milder but still highly original nature were writing top-level music. Dussek was one of the best.

The early sonata here, the short Op. 10, number 2, distinctly suggests the late Mozart of the serious piano *Fantasies* as well as Haydn in a similar vein — Dussek was four years younger than Mozart. But the middle-period Op. 35 (1797) and particularly the big late piece, Op. 75, are very much of the early 19th century, the time of Beethoven and even of Weber and Schubert, suggestions of which are everywhere

in this work. Remarkable, since Dussek was 10 years older than Beethoven and no less than 26 years older than Weber, who was at this time still in his early career. As for Schubert — a mere 37 years younger than Dussek! Which merely shows that this man, in his last year of life, was very much up on current musical thinking of the time, hinting at Schubert (and even Chopin) before Schubert even arrived. It was the younger composers who did the borrowing.

Very good piano recording here and the piano itself is excellent for the music, rather hard and clanky in the loud parts, muffled in the soft. As would be Dussek’s own piano, circa 1811.

Sound: B+ Recording: A- Surfaces: B+

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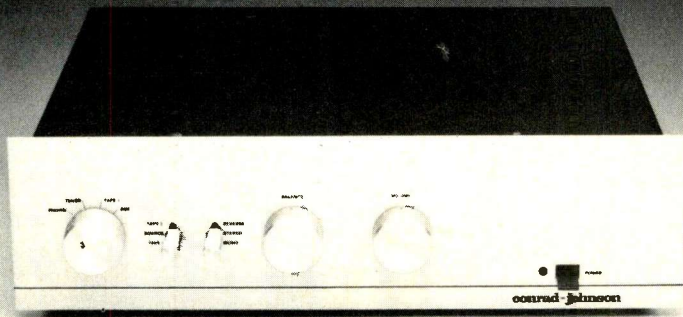
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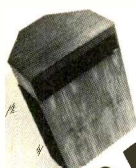
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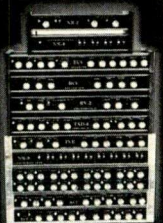
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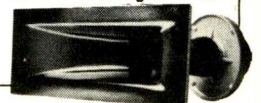
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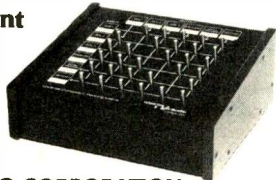
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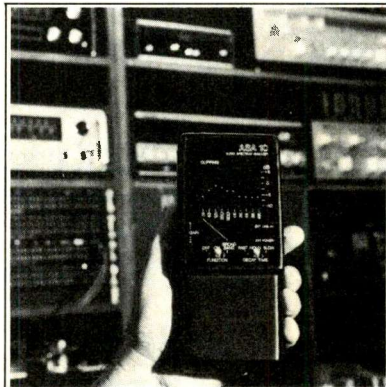
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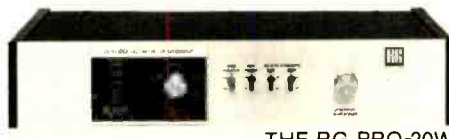
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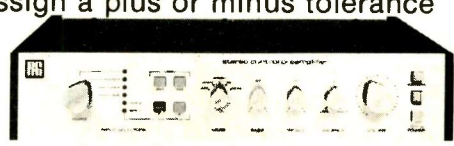
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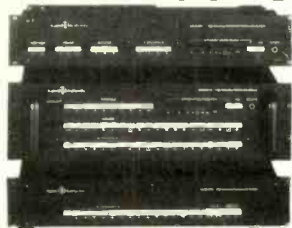
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High Fidelity Magazine  
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Fanfare Magazine, 3/4 1980

## Bert Whyte, dean of American audio critics, in his column "Behind the Scenes":

"TOWERS OF POWER: For some time now, a company named VMPS Audio Products has been advertising columnar type loudspeakers, utilizing multiple driver units and making some fairly outrageous claims for performance, and all at quite modest prices. Lo and behold I found a demonstration room for this company (at WCES), and asked for a demonstration. Well!!! It is rare that anything in audio surprises me after all these years, but I was literally flabbergasted by hearing some of the best sound at the Show!... The top-of-the-line VMPS Super Tower II was demonstrated in the bi-amp mode using Bedini Class A, 100W/ch and 25W/ch amplifiers. Doesn't sound like much power? Well, the efficiency is 103dB at 1W/1m. If you would like to feed in the maximum 500W, you will get a chest-squeezing 132dB output! (We) played a variety of music, all of which was very smooth and clean, highly detailed with tight, rock-solid bass fundamentals, minimal coloration, and in spite of the multiple drivers, no sense of disparate sound sources. Imaging, in fact, was quite good. Then we played the Telarc *1812 Overture*, and not only were the cannon reproduced with gut-thumping power, but you heard the real low-frequency fundamental with no doubling. I am certain that this speaker is one of the few that will have no difficulties handling the dynamic range of true digital recordings when they finally arrive on the scene."

Audio Magazine, May 1980

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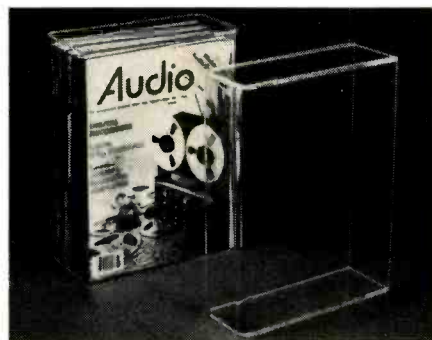
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